

Republic of Panama

Environmental impact study

Category II

Type of project: Commercial

Project Name:

*"Project of receipt, storage, regasification,
Distribution and marketing of natural gas, and construction
In a thermal power plant"*

The project promoter: LNG GROUP PANAMA, S.A.

Legal Representative: JOSE DAPELO BENITEZ

Passport: C488000

Telephone: (507) 391-6995 and (507) 263-2084

Fax: (507) 263-0284

Location:

Colon, Cristobal Colon, district, province of Colon

The consultant's name and register:

Lic. Dagmar Henríquez. Registration N° IAR- 068 - 2000

Telephone: 270-1097

July 2010

1.0. Index

No.	Topic	P. No.
1.0	Index	2
2.0	Executive summary	7
2.1	The company's general data:	7
	A) Contact Person	7
	B) Numbers of telephones and cell phones	7
	C) Email	7
	D) Web Page	7
	E) Name and registration of the Consultant	7
2.2	A brief description of the project, work or activity; to develop, approximate budget	7
2.3	Synthesis of the characteristics of the area of influence of the project, work or activity	18
2.4	More relevant information about the critical environmental problems generated by the project, work or activity	24
2.5	Description of the positive and negative impacts generated by the project, work or activity	24
2.6	Description of mitigation measures, monitoring, surveillance and control provided for in respect of each type of environmental impact identified.	27
2.7	Description of the public participation plan made	28
2.8	The sources of information used (bibliography)	31
3	Introduction	32
3.1	Scope, objectives and methodology of the study presented	32
3.2	Characterization: Justification of the category of the EsIA in function of the environmental protection	34
4	GENERAL INFORMATION	35
4.1	The project sponsor, type of business, location, certificate of existence and legal representation of the company and certificate of registration of the property, contract, and other	38
4.2	Paz y Salvo issued by ANAM, and a copy of the receipt of payment, the procedures of the evaluation	38
5	Description of the project, work or activity	39
5.1	Objective of the project, work or activity and its justification	40
5.2	Geographical location. Map at scale 1:50.000 and UTM coordinates of the polygon of the project	41
5.3	Legislation, standards, techniques and instruments of environmental management and its relationship with the project, work or activity	41

No.	Topic	P. No.
5.4	Description of the phases of the project, work or activity	44
5.4.1	Planning	44
5.4.2	Construction/implementation	44
5.4.3	Operation	47
5.4.4	Abandonment	51
5.4.5	Schedule and time of execution of each phase	51
5.5	To develop infrastructure and equipment to be used	52
5.6	Input requirements during the construction/implementation and operation	55
5.6.1	Needs of basic services (water, energy, sewage, roads, public transport, other)	55
5.6.2	Labor (during construction and operation), direct and indirect employment generated	57
5.7	Handling and disposal of waste at all stages	59
5.7.1	Solid	59
5.7.2	Liquid	60
5.7.3	Gaseous	60
5.7.4	Dangerous	63
5.8	Consistent with the land use plan	63
5.9	The overall amount of the investment	63
6	Description of the physical environment	64
6.1	Regional geological formations	65
6.1.2	Local geological units	66
6.1.3	Geotechnical characterization	N/A
6.2	Geomorphology	67
6.3	Characterization of the soil	67
6.3.1	The description of the land use	67
6.3.2	Apportionment of property	67
6.3.3	Ability to use and fitness	67
6.4	Topography	70
6.4.1	Topographic map or plane, according to area to develop 1:50.000 scale	70
6.5	Climate	70
6.6	Hydrology	75
6.6.1	Quality of surface waters	75
6.6.1.a	Flow rates (maximum, minimum and average annual)	75
6.6.1.b	Current, tides and waves	75
6.6.2	Groundwater	77
6.6.2.a	Identification of aquifer	77
6.7	Air Quality	77
6.7.1	Noise	77
6.7.2	Smells	80

No.	Topic	P. No.
6.8	Background information on the vulnerability to natural hazards in the area	80
6.9	Identification of flood-prone sites	80
6.10	Identification of the sites prone to erosion and landslides	80
7	Description of the biological environment	81
7.1	Characteristics of the flora	81
7.1.1.	Characterization of plant, forest inventory (apply forestry techniques recognized by ANAM)	82
7.1.2.	Inventory of exotic species, threats, endemic and in danger of extinction	83
7.1.3.	Map of vegetation cover and land use on a scale of 1:20.000	83
7.2	Characteristics of the fauna	84
7.2.1	Inventory of species endemic, vulnerable, threatened or in danger of extinction	85
7.3	Fragile Ecosystems	86
7.3.1	Representativeness of ecosystems	86
8	Description OF THE SOCIO-ECONOMIC ENVIRONMENT	86
8.1	Current use of the land in neighboring sites	87
8.2	Characteristics of the population (cultural and educational level)	87
8.2.1	Demographics, social and economic	88
8.2.2	Index of mortality and morbidity	N/A
8.2.3	Index of employment and other similar to provide relevant information on the quality of life of the affected communities	91
8.2.4	Equipment, services, infrastructure and economic activities	100
8.3	Local perceptions about the project, work or activity (through the Citizen Participation Plan)	102
8.4	Historical sites, archaeological and cultural declared	106
8.5	Description of the Landscape	112
9	Identification of specific environmental and social impacts	112
9.1.	Analysis of the environmental situation (baseline) in comparison with the transformations of the environment expected	112
9.2.	Identification of specific environmental impacts, their character, degree of disturbance, environmental importance, risk of occurrence, extent of the area, duration and reversibility between other	112

No.	Topic	P. No.
9.3	Methodologies used in function of: (a) the nature of action, (b) the environmental variables affected; and (c) the environmental characteristics of the area of influence involved	133
9.4	Analysis of the social and economic impacts to the community produced by the project	137
10	Environmental Management Plan (EMP)	138
10.1	Description of mitigation measures specific to each environmental impact	138
10.2	Responsible for the implementation of the measures	147
No.	Topic	P. No.
10.3	Monitoring	147
10.4	Implementation Schedule	151
10.5	Citizen Participation Plan	153
10.6	Risk Prevention Plan	154
10.7	Plan of rescue and relocation of Fauna and Flora	161
10.8	Environmental Education Plan	165
10.9	Contingency Plan	167
10.10	Environmental Recovery Plan and abandonment	174
10.11	Environmental management costs	174
11	Economic adjustment BY SOCIAL AND ENVIRONMENTAL EXTERNALITIES AND COST-BENEFIT ANALYSIS OF END	175
11.1	Monetary valuation of the Environmental Impact	175
11.2	Monetary valuation of social externalities	180
11.3	Calculations of the VAN	N/A
12	List OF PROFESSIONALS WHO PARTICIPATED IN THE PREPARATION OF THE ENVIRONMENTAL IMPACT STUDY(S) SIGNATURE(S), responsibilities.	181
12.1	Duly notarized signatures	181
12.2	Record number of consultant(s)	181
13	Conclusions and recommendations	181
14	BIBLIOGRAFIA	183
15	Annexs	184
	No. 1 to the company's General Promoter of the project, a photocopy of the identity card / passport of the legal representative (notarized). Certificate of good standing and dignitary of the original company in the public registry. Writing of the Company.	

No.	Topic	P. No.
	<p>No. 2 drawings of the land (polygonal) of the project and regional localization of the project. 4243 Topographic Sheet IV IGNTG - MOP. 1:50 scale:000</p> <p>No. 3. Lease and Investment: Cabinet Resolution No. 2, of 19 January 2010.</p> <p>No.4 surveys, the results in original</p>	

Observation N/A - Not Applicable

2.0 EXECUTIVE SUMMARY

2.1 General Data Of The Company

The project sponsor is **LNG GROUP PANAMA, S.A.**, whose legal representative is **JOSÉ DAPELO BENITES**, with passport No. C488000. The company is written in the Public Registry of Panama in 674296, 1643967 Document tab.

A) Contact Person: Mr. Julio Fabrega

B) Telephone: +507 391-6995 / +507 263-2084, Fax +507 263-0284.

C) Email Address:

D) Consultant web:

E) Consultant: Dagmar Henriquez, Registration: IAR -068-2000

2.2 Description of the project; Area to be developed, approximate budget.

It is very important to note that in the EIA presented is only and exclusively the liquefied natural gas terminal and the central heat shield. For the other infrastructure to support the development of this project will be presented the respective environmental impact studies.

The project will consist in the installation of a terminal to exploit and develop the activity of reception, storage and regasification, distribution and marketing of natural gas, as well as to exploit and develop the activity of electricity generation through the construction, installation, operation, and maintenance of a 150MW combined cycle power plant using natural gas as a fuel, with their respective lines of connection to the transmission networks, processing equipment and fuel handling facilities, in order to produce and sell power and energy, and all that is contemplated and planned for the areas free of oil. The project is located with the following coordinates in UTM: 1031911 E 0620402 N (polygon 04-01 of 7,033.23 ha + 40 m²) and 1032359 E 0620112 N (Lot B of 7 ha + 8, 911, 85 m²).

The Liquefied Natural Gas (LNG) - Telfers Island, in the province of Colon, will occupy an area of approximately 40 hectares in which you will build the main components of the project and will be located in the plot No. 3 The plan prepared by the Administrative Unit of goods reversed.

For the design of the capacity of the Thermal power station and the commercial strategy of the business, takes into consideration the current conditions of the Panamanian Electricity Market, market projections for the short and medium term, and the projection of the demand in the area of the plant to supply the new industries that are installed.

The plant will be located in the area Telfers Island, in the plot No. 1 The plan prepared by the Administrative Unit of goods reversed. In the first phase of the project, the plant will consist of two natural gas turbines with a capacity of 45 MW each, with their respective generators. The fuel necessary for the generation of these two turbines will be the natural gas. For the second phase will be installed a boiler to generate steam and a steam turbine of 40 MW of capacity and two heat recovery systems.

In the planning stage, perform a variety of activities, among which we can mention: Collection of existing information, the conduct of preliminary field studies and final designs, studies of current capacity and feasibility of drinking water systems, sanitary service, electrical service and communications, preparation of the Environmental Impact Study and its approval, obtaining all permits with the corresponding authorities.

The construction of the project involves activities such as the rethinking of the area, movement of land, demarcation of spaces, excavations for foundations, construction of the infrastructures designed, installation of equipment. Will be used in the construction materials of first quality and will comply with the technical standards of quality materials and construction of structures and services.

The activities mentioned above, the field work is relevant from an environmental point of view, since the actions that will be taken for the physical works of the project, constitute potential sources of impact.

The operation phase includes the operation of the Liquefied Natural Gas Terminal and the operation of the thermal power station.

In this study we analyze only the construction of the Liquefied Natural Gas Terminal and Thermoelectric Power Plant.

Liquefied Natural Gas Terminal

In the Liquefied Natural Gas Terminal will be carried out several operations and for each one will be built the necessary structure and appropriate equipment will be installed.

- ***Reception of the liquefied natural gas***

The receiving dock of Liquefied Natural Gas (LNG) is designed to download methane tankers of 70,000 - 180,000 m³ of capacity. You will have 800 m long and may receive a capacity between 70 thousand and 180 thousand m³. Once the ship docks at the pier, five special download arms that are cooled gradually until the temperature of the LNG (-160° Celsius) to proceed with the operation. Three of these arms deal for the download, one only for the return of the gases of evaporation, and the remaining arm may be interchangeably both functions. Each arm is designed for a normal discharge capacity of 3 thousand m³/h, liquefied natural gas is pumped from the ship to the cryogenic tanks for storage of the Terminal. The download time of a boat with LNG is 10 to 12 hours.

- ***Storage***

The terminal will have two high-security cryogenic tanks with a total capacity to store 150 thousand m³ of LNG in two tanks of 75 thousand m³ (with a diameter of 61 m and 41 m in height). The cryogenic tanks are designed to withstand earthquakes adjusted to international standards.

The Liquefied Natural Gas (LNG) is stored without pressure to -160° Celsius in special cryogenic tanks sealed. These tanks have a system of two compartments, the main nickel steel and aluminum, which is designed to hold the LNG at low temperatures, and the

secondary concrete, designed to ensure that any leakage is contained and isolated. The storage facilities used advanced monitoring systems to detect immediately spills, leaks or leakage of gas liquid or gaseous. All piping that goes in and out of the tanks on the top and on the level of the gas stored, so as to avoid leaks through valves and connections. In addition, these tanks have various security systems such as alarms, emergency closings and controlled atmosphere.

- ***Gasification***

Once you need Natural Gas, LNG is removed from the tanks by means of a pumping system, to be warmed in vaporizers to the temperature at which returns to its gaseous state. Starts the process of making it back to the gaseous state. This operation is performed through pumps that carry the LNG to pressure from the tanks to the regasification plant area, where you will find the best vaporizers. The Terminal considers 2 vaporizers of open panel (ORV), which will operate in, each of them with a regasification capacity of 3 million m³ per day. In descriptive terms, the vaporizers Open Rack Panel Vaporizers, ORV) consist of pipes that are bathed with a film of sea water at room temperature. As the sea water temperature is very higher than the temperature of the LNG (between 18 and 20 ° Celsius depending on the time of year, against -160° Celsius), the Natural Gas in liquid is heated with sea water, returning to its gaseous phase. The exchange of temperature vaporizes the LNG, sending the Natural Gas to the pressure and temperature to the transportation pipelines.

- ***Distribution of natural gas***

The distribution of Natural Gas, already in a gaseous state, will be carried out through a system of pipeline to the facilities of the large consumers and to the Natural Gas deposits (gasometers) to be installed on the Atlantic coast and in the pacific coast. In these deposits of natural gas will be compressed gas to enable their transport by trucks and rail cars to those areas of consumption where there is economic transport by pipeline.

Thermoelectric

The project of the Central Heating is carried out in two phases.

In the first phase of the project, the plant will consist of two natural gas turbines with a capacity of 45 MW each, with their respective generators. The fuel necessary for the generation of these two turbines will be the natural gas.

For the second phase will be installed a boiler to generate steam and a steam turbine of 40 MW of capacity and two heat recovery systems. The water required for the generation of steam will be taken from the Lemon Bay. The water of the bay will be carried out through a pipe of 30 inches in diameter and will be buried in all the way from the Lemon Bay to the Central Heat Shield. The plant will have an installed capacity of 130 MW. The annual generation will be approximately 1,120 GW/h/year.

The marketing of the electrical energy generated will be carried out through contracts of sale (Power Purchase Agreements, mainly to large industry of Panama, to large consumers in the area of the Atlantic and the Pacific, energy distributors at the national level and the remaining power will be negotiated in the Telfers Island area with the new industries that are installed. The 65% of the energy produced, in term contracts (PPP's) to five or ten years placed the great industries of Panama, and to industries installed within the area Telfers Island. The 35% of the energy produced, in the Wholesale Electricity Market, in contracts for the sale of electrical energy to the casual market or "Spot Market".

The panel is composed of:

- 2 natural gas turbines of 45 MW capacity each;
- 2 Heat Recovery Systems;
- 1 steam turbine of 40 MW of capacity;
- The corresponding processing equipment;
- Beach maneuvers;
- High Voltage Line (LAT) to a remote substation of the interconnected system;
- Up grade of the remote substation in order to receive the power generated by the plant;

- Facilities for the reception of natural gas
- Aqueduct
- Maintenance Workshops

It is not considered stage of **abandonment** in this project, however, once the construction phase will leave the place totally clear of debris and completely clean.

The project will be developed in three stages. In the first stage will be built the Liquefied Natural Gas Terminal, in the second stage, will build the plant, which in turn will have two phases. In the first phase two turbines will be installed in the second phase, a boiler and turbine.

According to what is established in the lease and investment, the implementation of the project will be carried out according to the schedule attached.

PHASES	DURATION	DESCRIPTION	AMOUNT (B/.)
PHASE 1	3 years after the date of the order to proceed	Reception, storage and regasification of Liquefied Natural Gas	300,000,000.00
PHASE 2	2 years counted from the expiration of the Phase 1	Vehicular Natural Gas Infrastructure	45,000,000.00
		Distribution Infrastructure for Domestic Use	115,000,000.00
		Pipeline System	160,000,000.00
		Thermal	130,000,000.00
		TOTAL	750,000,000.00

With all the assumptions listed above would be a daily flow or spending estimated at 220,000 m³ of sea water, which with 20 days of productive hours give a design flow of 11,000 m³/h (3 m³/sec).

During the **construction** materials of construction typical: sand, cement, iron, concrete, steel plates with special alloy steel pipes, thermal insulation materials.

During the **implementation and operation**, is based on the provision of LNG as a fuel, sea water for the warming in the regasification process (previous data), diesel as an alternative fuel, electric power generation, water usually drinking water for human consumption of staff and demineralized water for generation turbines (emission control). The Liquefied Natural Gas (LNG) is difficult to ignite or explode and is non-toxic and non-corrosive. It is a colorless and odorless element that does not contaminate the soil or water, and that in the event of a spill evaporates and leaves no residue.

The project will require sea water for the generation of steam in the boiler and to the process of regasification plant at the Terminal will be taken from the area of Puerto Cristóbal. The water will be carried out through a pipe of 30 inches in diameter and will be buried in all the way from the area of Puerto Cristóbal until the location of both projects. The implementation of this project will not have significant impacts in greater demand for drinking water in the region of influence. The project will not affect the distribution of water in the area where it is located.

In the **construction phase** you will need the following staff (skilled and unskilled): a Structural Engineer, Civil Engineer with specialty in health care, Civil Engineer, Architect, Technicians, Electricians, Plumbers, Carpenters, Masons, Surveyor, painters, inspectors, Administrative Staff (Manager, secretary, etc.), Foreman, Electrician.

In the stage of **operation** will need to be skilled and qualified: Plant Manager, Supervisors, Operators, Assistant Operations, Mechanical Engineer, Electrical Engineer, Assistant Manager, cleaning staff, security, Drivers, General Manager, responsible for contracts, Chief

of Finance, Personnel, Technical Support Engineer, Accountant, Assistant Accountant, Secretary, Clerk.

In the **construction phase**, the solid waste that this project is going to produce are diverse composition (vegetation and land) extracted from the land levelling, household waste generated in places of rest and feeding of workers (food, paper, cans, plastics and other), remains of construction materials, packaging equipment.

In the **operation stage of** the solid waste generated in the project are domestic type waste (paper, packaging, office materials, remains of food, plastics) from the administrative offices and generated by the employees, packaging, paper, packaging, pieces from the maintenance of the equipment installed in the Terminal and the thermoelectric plant, material type of sludge resulting from the demineralization of sea water, which will be used in the boilers for the operation of the steam turbines in the power plant.

In the **construction phase**, it is expected that the proposed project will generate the following liquid waste: spills of hydrocarbons and fuels from the equipment used in the construction of the infrastructure, liquids from the physiological needs of the workers who will work in the construction of the project. Provide staff with portable toilets, waste will be collected by a contractor who meets the standards of disposal of waste water and sludge.

In the **operation stage of** liquid wastes that are generated are: wastewater generated by the employees and from health services and sink installed in the administrative office of the terminal and in the Thermoelectric Power Plant.

In the **construction phase**, the gaseous waste that are generated are the gases of the combustion products of the operation of the equipment used, such as trucks, tractor, backhoe, shovel, etc. These emissions are minimal, since this team consists of systems of control of exhaust gases.

In the **operation stage of** the main source of gaseous emissions will be the Thermoelectric Power Plant.

The emission of waste into the [atmosphere](#) and the own [combustion processes](#) that occur in the thermal power plants have a significant impact on the environment. In any case, to a greater or lesser extent, all of them emitted to the atmosphere carbon dioxide, CO₂ . Depending on the fuel, and assuming a return of 40% on the primary energy consumed, a [thermal power plant](#) emits approximately:

Fuel	Emission of CO ₂ Kg/kWh
Natural Gas	0.44
Fuel oil	0.71
Biomass (Wood)	0.82
Coal	1.45

In the case of the project is to be developed, 1 as natural gas plants can be operated with the so-called [combined cycle](#), which allows higher yields (up to a little over 50%), it would still take the plants that work with this fuel less polluting. The combined cycle natural gas are much cheaper (reaching the 50%) than a conventional thermoelectric, increasing the thermal energy generated (and hence profits) with the same amount of fuel, and lowering emissions cited above in a 120%, 0.35 kg of CO₂ , for each KW produced.

The gaseous emissions in a center that uses natural gas as a fuel in the process of power generation have the following composition:

Load Condition		BASE	BASE	BASE
NOx	ppmvd @ 15% O2	42.	42.	42.
CO	ppmvd	10.	10.	10.
UHC	ppmvw	7.	7.	7.

EXHAUST ANALYSIS % VOL.

Argon	0.86	0.88	0.85
Nitrogen	72.05	72.66	70.73
Oxygen	12.86	12.94	12.63
Carbon Dioxide	3.27	3.31	3.20
Water	10.97	10.22	12.59

Hazardous waste will not be generated during the construction and operation of the project.

The area where the Terminal and the Thermal corresponds to an area where there are already established companies with operations similar to our project as are Atlantic Pacific, S.A. (APSA) in the storage of fuel from the Atlantic Coast and the PETROPORT with the storage of Liquefied Petroleum Gas which are neighbors of the area selected in the Telfers Island.

The estimated investment of the work is of B/. 750,000,000.00.

2.3 Summary of the characteristics of the areas of influence of the project.

The plains of the coast of Colon, where the project, belong to the group Aguadulce training Rio Hato (QR - Aha) and lithological composition is characterized by the presence of conglomerates, sandstones, shales, tobas, sandstones are not consolidated and pumice. These materials belong to the group of sedimentary rocks, which for the training Rio Hato and sedimentation Gatun Locks at the end of the Quaternary period (approximately 10.000 years ago), within the recent period, known as the Holocene epoch of the Cenozoic Era.

The lithological conformation of the area has been influenced by the volcanic processes of the activity of the "Valle de Anton", which can be seen through the presence of tuff and pumice; the participation of mechanical and chemical processes that have developed sedimentary rocks of the place.

The stratigraphy of the area of the development of the project, in the top¹, is characterized by non-consolidated sediments, filled with sand and corals. Underlying in addition, formations of lacustrine sediments ² (sediments Holocenos), made up mainly of silty sand, silt and organic clays.

The soil has a use of operations similar to our project as are Atlantic Pacific, S.A. (APSA) in the storage of fuel from the Atlantic Coast and the PETROPORT with the storage of Liquefied Petroleum Gas which are neighbors of the area selected in the Telfers Island. We also develop activities of the authority of the Panama Canal and Panama Ports Company.

The area is made up of **LOT B**, of 78,911.85 m², with 30106-118990 Approved Level, and the **polygon 04-01** of 400,000.00 m², with 30106-118989 Approved Level, which together have an area of 478,911.85 m², which are part of the Farm No. 12875, inscribed in the roll 18.598 1 document, in the section of the Interoceanic Region, Province of Colon, of the Public Registry, located in the sector of Telfers, township of Cristóbal, district and province of Colón. (See Appendix No. 1. Disclaimer The property).

¹ Geological Map, Republic of Panama, Ministry of Trade and Industry, Mineral Resources, 1991

² Geologic Map of the Panama Canal and Vicinity, Republic of Panama, 1980

The agrological capacity in the area of the project, corresponds to soils of class V, VI and VII (according to the classification of the Soil Conservation Service of U.S.A. The project area has traditionally been used for activities related to the adjacent port facilities and distribution of liquefied gas.

Las terrain elevations, where the project is located, in meters above sea level range from 0 to 2 meters above sea level in the lower elevation sites located in the coastal areas of the Caribbean Sea.

The climate that is presented in the study area, is determined by the influence of the oceanic masses, mainly in this case, the Caribbean Sea. The high humidity is an example of this, determining the properties of temperature of the air masses circulating between the oceans. According to the Köppen classification system, of the three (3) Climatic zones that exist in the Canal Watershed in the project area is considered to be tropical wet climate (AWI), which is characterized by a higher average annual rainfall of 2.500 mm, a summer of three (3) months and an average annual temperature between 24° C and 26° C.

The meteorological features of the area of influence of the project, described for the elements: temperature, precipitation, and wind. This information is useful for establishing basic conditions for the design, construction and operation of the project must have.

The average annual temperature registered is of 26.88° C (80.4° F), with an absolute minimum temperature that goes up to 18.88° C (66° F) between the months of November and December, and an absolute maximum temperature of 52.5° C (95°F), registered in the months of May and October. However, the minimum and maximum averages for the year are located at 24.55° C (76.2° F) and 29.33°C (84.8° F), respectively, which shows a thermal gradient averaged approximately ± 2.4 °C.

In general, the rainy season is beginning in the month of April and ends in the month of November to December; but is mainly concentrated between the months of October and November.

The currents are linked closely to the movements of the earth and the exposure of the oceans to the solar rays. In turn, the sea-atmosphere interaction determines the properties of heat and humidity of the air masses that circulate through the oceans, affecting heavily the meteorology which is manifested on the earth.

The hydrometeorological information is presented below:

Average tides in the area of Columbus
(With reference to the data of the precise level of the Panama Canal)

Averages	Height in feet
Monthly of the highest high tide	+1.022
High Tide	+0.453
Sea Level	+0.016
Low Tide	-0.405
Monthly of the lowest tide	-0.818

Source: Department of Meteorology of the Panama Canal Authority, 1994

There are no wells drilled within the project area. The activities to be developed will affect groundwater.

The characteristics of the air quality are modified by the presence of sources of pollutants, of which in the project's area of influence, are distinguished only the corresponding to mobile sources of existing landfill and vehicles that circulate in the area and on the access roads.

Now the area is characterized with certain levels of noise by reason that the path that limits the field is used by heavy equipment transports grain or other goods to the interior of the country.

It was a timely noise sampling using a sound level meter digital brand Radio Shack 33-2055 model, with a range of manual operation of 50 to 126 decibels (db), with factory calibration.

The project will be implemented in stages and levels of noise generated will vary depending on the activities to be carried out in each one. The phase that will generate greater amount of noise will be the movement of land due to the machinery used. In the stage of operation noise is generated in the thermoelectric plant by the operation of the turbines.

During the visit in the project area were perceived characteristic smells of the garbage dump located in the area.

According to the "Map of areas of life of Panama ³", the project is located in an area of tropical moist forest (BH-T), which is reinforced with the plant characteristics described by Tosi in the book "Forest Inventories and Demonstrations, Panama, Areas of Life" observed in the field.

We can conclude that the vegetation present in the project area consists of a mixture of different stages of vegetation, in which you can clearly see a transition from secondary forest and young forest. From a low vegetation height that ranges between 3 and 7 m.

Then a preliminary list of the most notable species recorded in these types of vegetation or vegetative covers.

Species of flora characteristic of the area of the Project

Family	Common Name	Scientific Name	T O	H	L	Ar
Cecropiaceae	Guarumo	Cecropia peltata	X			
Boraginaceae	Language of ox	Cordia curassavica				X
Polygonaceae	Uvillo	Coccoloba sp	X			
Malvaceae	Brush	Aids sp,				X
Rubiácea	Uvito	Palicourea guianensis				X

Legend: where A= Tree; Ar= shrub; H= Grass; L= Liana

Indicator species were observed in the project area of scrub bush *Zarza (Byttneria aculeata)* and the indicator species of nutrient-poor soils not suited for agricultural crops. There were no species in danger of extinction or endemic species whose populations may be affected by the project. The identification of the wildlife of the area of the project was done through inspections of the area, in which we had the opportunity to observe and identify the species

³ (3 <http://www.anam.gob.pa>)

of birds, and reptiles. During the tour there was a lot of smoke from a fire in the existing landfill, which resulted in the absence of animals in the area, except turkey vultures that remained at the site of the landfill. We can mention that there are species identified by the inhabitants, among which we can mention smoke it could be observed that some ñeques (*Dasyprocta punctata*), lazy two fingers (*Choloepus hoffmanni*) and three-toed sloth (*Bradipus variegatus*). They also identify the presence of reptiles. Observed *Caiman crocodilus*, *Boa constrictor*, *Ameiba ameiba*, *Iguana iguana* and *Basiliscus basiliscus*.

In the area of influence of the project, are not representative ecosystems of significant ecological importance.

The current use of adjoining sites of the project, as we have indicated above the area where the Terminal and the Thermal corresponds to an area where there are already established companies with operations similar to our project as are Atlantic Pacific, S.A. (APSA) in the storage of fuel from the Atlantic Coast and the PETROPORT with the storage of Liquefied Petroleum Gas which are neighbors of the area selected in the Telfers Island.

According to figures from the National Population and Housing Censuses in the year 2000, the province of Colón has a population of 204.208 inhabitants and a population density of 41.8 inhabitants per km². By comparing these figures with those of 1990, when the total population of the province was of 168.294 inhabitants with a population density of 34.4 inhabitants/km², there has been a growth of 32.514 inhabitants in 10 years. The Index of masculinity is referred to the relationship between the number of men and women in a given population, which is expressed as the number of males per 100 females. At the level of district, Christopher for the 2000 an increase has been observed in the male population, with a number of 312 men over the total number of women.

In relation to the percentage of unemployed in the province, there is a 17.60% across the province, on the other hand, in the district the 17.94% is also unoccupied. To observe these percentages, it is concluded that the unemployment of Colon is not so high and that the

increasing opening of labor markets in the region is able to absorb the labor potential. The median monthly income in the home of the province is of B/ 377.6 and B/.416.8 district. With these figures can be perceived that the income of the inhabitants of Colon is quite acceptable, but as specified in the previous paragraph, these figures are presented as median and cannot determine other income higher or lower.

Currently, in the city of Colon and the surrounding area, including the community of Sabanitas, the management system of the wastewater consists basically in the sanitary sewer of the I.D.A.A.N. In the city of Colón and its surroundings, including the communities of Sabanitas, Cativa, Puerto Pilon, Villa Alondra and Cristobal, the management system of the wastewater consists basically in the sanitary sewer system and primary treatment in septic tanks and percolation Imhoff and seagrass beds. The predominant productive activity of the community is oriented toward commercial, industrial, transport, storage.

2.4 More relevant information about the critical environmental problems generated by the project

The project consists of the construction of a liquefied natural gas terminal and a thermoelectric power plant. The area where the aim is to develop the project is an area designated for industrial use, where there is already operating a liquefied natural gas terminal.

The construction of the project will affect the landscape partially, the existing vegetation and fauna present. Affected the air quality in the construction stage by contamination with dust, produced by the movement of soil and traffic of heavy equipment, and in the operation stage by gaseous emissions of thermoelectric power plant. You can register vibrations and noise from the operation of turbines and generators of electric energy and for the operation of the gold teams involved in the activities. Being the gas a volatile substance and with explosive powers, there is the possibility of a fire and explosion hazard.

2.5 Short of scrimption of positive and negative impacts generated by the project

The potential **positive impacts** are: employment generation, improvement of the quality of life of the population, development and intensification of economic activities, increase in the value of the land, changes in the division and possession of the property, uses compatible with the territorial planning.

The following are the possible **negative impacts** that can be generated in the middle by the actions of the project.

Potential Impact	Description
Increased levels of emission of particulate material	Is produced by the generation or increase of particulate emissions, the effect of the movements of land, loading and transport of materials, movement of equipment in the work, fixed machinery operation and traffic. You can directly affect the quality of the air in the immediate area of influence of the project.
Increased levels of emission of combustion gases	Corresponds to an increase in greenhouse gas emissions resulting from the combustion of fuels (mainly carbon monoxide, oxides of nitrogen, sulfur dioxide and organic gases), due to the movement and movement of machinery, vehicles and aircraft. You can directly alter the quality of the air in the direct area of influence of the project.
Alteration of the geological material Formations (Gatun and Aguadulce)	Is the scarification or destruction of formations, product of the movement of earth, rocks for the obtaining of stone material for fills and achieve grade level.
Modification of the topography or shape of the highlight current	This impact is originating with the actions of movement of earth and rock, leveling and compaction of the soil, which involve the court of wavy and fill areas of sites with depressions, to obtain a flat topography for the construction of the civil works of the project.
Soil Erosion	This impact would be produced by the elimination of vegetation cover and land movement that exposes the soil to the effects of the rain water runoff, intensified by the existence of slopes of fillers is not protected, with slopes or inclines.
Soil loss	It consists in the removal and total or partial burial of the soil horizons product of the occupation of the land for the construction of the project works.

Potential Impact	Description
Alteration of the physical properties of the soil	This is the physical modification of the soil, in terms of their apparent density, permeability and structure by the compaction.
Alteration of the quality of soils	Would take place by the accidental contamination or bad practices, by the dumping of substances or solid and liquid wastes during the construction and operation of the project works.
Alteration of the quality of the waters	Would correspond to a variation of physical-chemical concentrations that have the waters with respect to the base line, due to the movement of earth and rock, loading and transport of materials, movement and operation of equipment, machinery and vehicles, waste management, use and management of hazardous substances or contaminants. These actions can produce the contribution of pollutants by inappropriate practices or accidental spills.
Risk of damage to the people, by the increase of the levels of noise	This impact would occur when, in the presence of sensitive receptors, the emission of noise exceeds the value set by the legislation in force.
Risk of damage to the fauna, by the levels of noise generated	This impact would be submitted when the elements of the fauna present in the project areas and its surroundings, are affected in their habits due to an increase in the levels, frequencies and durations of noise. This can affect the habits, migration, reproductive rights, among others.
Risk of loss of biodiversity through the removal of vegetation and flora	It would be up to the elimination of the existing vegetation in the area and the possible, or not, replacement of the same by natural or anthropogenic processes.
Risk of loss of habitat for wildlife	Triggered by the disappearance and subsequent replacement of a habitat for wildlife, due to the removal of the vegetation cover, leveling and compaction of the soil, paving, stabilization and revegetation.
Generation of jobs	The implementation and operation of the Project works will require a direct way the hiring of labor and indirectly induced employment, due to the multiplier effect of economic activities that would lead to a fundamentally strong modification of the labor market in the district of Columbus.
Risk of accidents	Would consist in the possibility of a worker suffering a certain damage resulting from their work activity. Are considered diseases, diseases or injuries with reason or on the occasion of the work.
Migration of population	The generation of expectations for work in other areas of the country, can cause displacement of people in search of jobs that the development of the project demand or induces, altering the demographic structure and the population of the District of Columbus.
Improving the quality of life of the population	The generation and development of economic activities, increased employment, creating sources of income for the population and the State, the establishment of services, improvement of the environment and other externalities of the project may contribute to the improvement in the living conditions of the population.

Potential Impact	Description
Development and intensification of economic activities	The creation of a thermal power plant and the distribution and marketing of natural gas, would result in the creation of externalities that encourage investment and multiplication of complementary activities or support, as well as other similar or specialized, aimed at different markets.
Changes in the division and possession of the property	The project considers the use of the plots of land in concession to develop the project. In this way, the state-owned land are delivered in concession to a private for the installation and development of economic activities
Increase in the value of the land	The establishment of the project involves the establishment of basic services that require industries to be able to carry out its work (sewers, roads, electricity, telephone, etc.), along with the area of value added activities. Each of these items adds value to the ground, since there would be a demand for the areas that they plan to develop by third parties for commercial-industrial uses.
Involvement of the system of collection and disposal of solid waste, increase in his generation	Would be generated by the increase in demand and coverage of basic services for collection and disposal of waste and construction, affecting their availability and quality.
Alteration of the traffic	During the stages of construction and operation would be an alteration of the traffic, by an increase in vehicular movement on main roads. These have a volume flow schedule, which will increase with the entry and exit of freight transport and other minor vehicles that will accede to the project.
Deterioration of the road network	Would be produced by the movement of trucks and heavy equipment on the tracks, product of the transport of materials and other products, without complying with the standards that can support each way. This impact can cause indirect effects such as damage to vehicles, vehicle maintenance costs and increased costs in maintenance of the roads by the competent institution.
Uses compatible with the territorial planning	Within the areas that can intervene the project, there are zoning with land uses that correspond to the activities that the project will develop.

Source: Prepared by the consultant. 2010

2.6 Description of mitigation measures, monitoring, surveillance and control provided for in respect of each type of environmental impact identified.

The following are recommended mitigation measures:

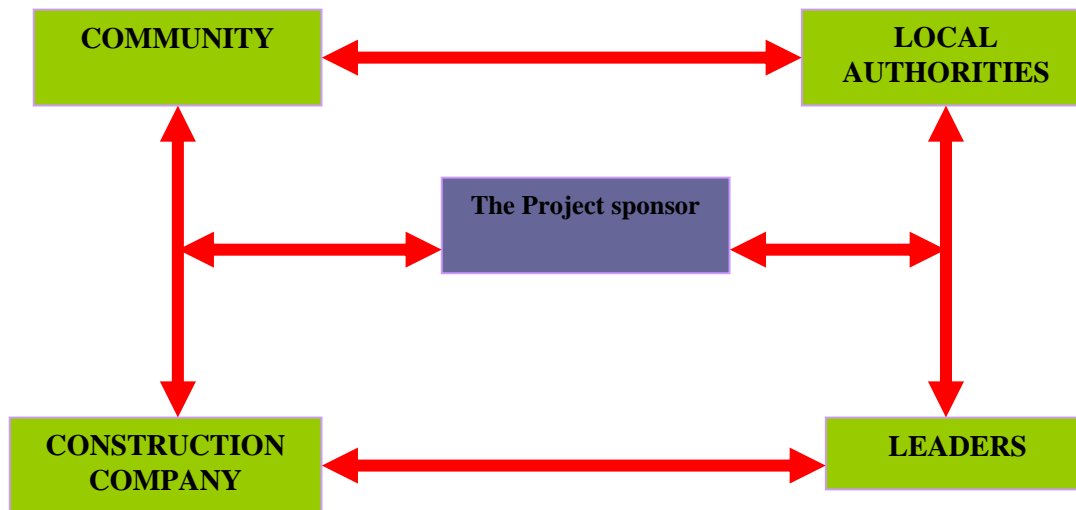
- Require contractors machinery in good mechanical condition. Check that the machines are in good state of maintenance during the work to be done in the project.
- The equipment and machines will receive regular maintenance and will remain in good working order to avoid and prevent excessive emissions and noise.
- Silencers or other noise control mechanisms will be used and maintained in good condition.
- The trucks traveling on public roads will be equipped with a canvas cover to prevent dust and the fall of materials during transport.
- These trucks must be in perfect operating condition to ensure public and occupational health and safety during operations.
- With regard to the emissions into the atmosphere of the different machinery to be used, must be permanent maintenance (fortnightly) in order to avoid pollution.
- All equipment must comply with the established noise limits for residential areas. Noise monitoring will be carried out with the aim of determining remedies and enforcement of environmental standards. In the case of detected levels of noise outside permissible limits, corrective measures will be necessary, such as vehicle maintenance, noise mitigation barriers, etc.

2.7. Description of the citizen participation plan.

Depending on the scope of the Executive Decree 123 of 14 August 2009, in its Chapter II: The Citizen Participation Plan, Article 30, we describe as developed by the consultant team in this area.

A. Identification of key actors within the area of influence of the project, work or activity (communities, authorities, organizations, community boards, environmental advisory councils, other).

The actors involved in the project which is the subject of study, can be clearly observed in the structure below.



The relationship that must exist between the different actors involved in the implementation of the project is broadly reflected in the figure. This implies a close relationship between the different actors, which allows an absolute communication and trust between them, which ensures continuity of the project. The fundamental actor of the work, is identified with the community to avoid misunderstanding and mistrust.

B. Participation techniques employed to key stakeholders (surveys, interviews, workshops, assemblies, meetings, etc.), the results obtained and its analysis.

Within the participatory techniques employed, we have the implementation of survey, informal interviews. Everything was led by a document attached in the annex. The results in our view were satisfactory and can be seen clearly in point 8.3 (local perception on the project, work or activity (through the Citizen Participation Plan). An objective analysis of the results of the Plan of participation, the acceptance of the work but, with some apprehensions that are no more than a reflection of lack of information and domain on the subject of the work proposal.

C. Techniques of dissemination of information employees. Given the complexity and dominion of the topic to be discussed, was used as the diffusion technique, the open conversation. This allowed a direct relationship with the main actors of the project. This discussion was allowed in the first place, trust between them and, on the other hand, a comprehensive explanation of the scope of work proposal for its development. In the annex is an informative document of Notice of Public Consultation, which was used as a guide to inform the community about the scope and development of the work proposal.

D. Information request and response to the community. One of the concerns presented by the community is the contamination of the environment, fauna, flora and people. If it is true, was expanded in some way the explanation of the scope of the work, it is recommended that the implementation of alternatives that permit the increase, to the extent possible, the degree of knowledge of the community on the proposed project. This will help to avoid any disagreement about the project, once the implementation of the same. This is the best means of responding to the requests for information and response to the same.

E. Input from key stakeholders. For the phase that involved the community in the Citizen Participation Plan, one of the greatest contributions, was offered by the consultant team. The contact between the two sides, cleared my doubts with the daily live and evolve in the area you have chosen to run the project. In the analysis of point b (participatory techniques employed to key stakeholders (surveys, interviews, workshops, assemblies, meetings, etc.), the results obtained and its analysis, with clarity, the latent concern of the inhabitants of the area of influence of the project and the mechanisms that the consultant team poses to settle the differences indicated by them.

F. Identification and resolution of possible conflicts generated or strengthened by the project. A fundamental aspect that must be considered by the managers of the work, is to maintain a direct and permanent communication with the community, so that if it were ever to be some inconvenience, this can be remedied by means of dialog and understanding between the parties. It is advisable and prudent, provide all possible opportunities to those

who express affectation or disagreement around the project, as well as delivering answers that satisfy the nonconformity of the affected.

To occur some incident in this regard, we must not lose sight of the three fundamental characteristics for the resolution of conflicts and which we quote below: Focus the dispute to apply a solution, the negotiations must be based on the interest and can be supported with the existence of a third of impartial type.

It is the responsibility of the Company, strict compliance with the agreements established with the Community, prior to the start of the construction of the work or any that may arise during the process or when it is to start operations. This will help to ensure the strengthening of the relations that should prevail between the Community and the promoter of the project.

2.8. Sources of Information Used

- CITES, 1996. Appendices I, II and III, to the Convention on International Trade in Endangered Species of Wild Fauna and Flora.
- The Comptroller General of the Republic, Statistics and Census. 2001. Panama in figures.
- The Comptroller General of the Republic. 2000. National censuses of population, VI. Directorate of Statistics and Censuses.
- Fudis, Sustainable Development. 2006. Local Diagnostic and Statistics
- Management of Hydrometeorology and Studies of ETESA. 2003. Data from weather stations of Panama (Graphs of daily temperature and precipitation).
- Holdridge, L. R. 1996. Ecology based on areas of life. IICA, San José, Costa Rica. 216 pages.
- National Geographic Institute "Tommy". 1988. National Atlas of the Republic of Panama.
- Law 23 of 23 January 1967, which protect certain species that are in serious threat of extinction.

- Martinez Alier and Klaus Schlupmann. "The Ecology and the Economy". The Economic Culture Fund, Mexico, 1991
 - Mendez, E. 1970. The main wild mammals of Panama. The Gorgas Memorial Laboratory, Panama, 282 pp.
- Perelló Sivera, John. "Environmental economics". U . IN ALICANTE, Spain, 1996
 - Peter Singer. "Compendium of Ethics". ALIANZA EDITORIAL, Spain, 1995
 - R. Whittaker. "Communities and Ecosystems". McMILLAN, New York, 1978
 - DGNTI-COPANIT Technical Regulation 35-2000. Discharges of liquid effluents directly to bodies and masses of surface water and groundwater.
 - DGNTI-COPANIT Technical Regulation 39-2000. Discharges of liquid effluents directly to wastewater collection systems.