

INTRODUCTION

PREPA's Strategic Plan and the Government's Energy Reform are geared to reduce the cost of electricity for end users in Puerto Rico. A number of factors contribute to the high cost of electricity in Puerto Rico. These factors are as follows:

1. The current heavy reliance on oil-derived fuels for the generation of electricity is a major factor in the high cost of electricity.
 - Most of PREPA's electricity requirements are provided using residual fuel in its steam plants.
2. PREPA is an isolated system without interconnections and must maintain greater generating capacity reserve margins to maintain its system reliability than otherwise would be necessary, with the corresponding higher capital, operating and maintenance costs.
3. Most of PREPA's generating capacity is located on the Southern part of the island and many of these units are among PREPA's oldest, least efficient, units with high operating costs and emissions.

PREPA's total generating capacity is 5,840 MW. It self generates approximately 70% of its electrical capacity and purchases the remainder from two co-generators. The Via Verde project will be an energy complex with two primary components: (i) a 92 miles pipeline to transport the natural gas from Peñuelas to the PREPA's generating plants at Arecibo (Cambalache), Toa Baja (Palo Seco), and San Juan (San Juan) located in the north coast of the island and (ii) the conversion of the existing boilers to a co-firing combustion system at these locations. The project will provide generation capacity to the grid Puerto Rico Electric Power Authority by 2012, and will be an important component of the Puerto Rico's gas infrastructure. As a separate project, Via Verde could also provide natural gas to facilitate the conversion of the 820-MW South Coast Power Plant, which is currently burning liquid fuel (bunker-C).

Environmental Benefits

The project was designed to comply with the Puerto Rico's environmental controls and regulations, especially on air emissions, ambient air quality, wastewater effluent, ambient water quality, and noise. Given the management measures, monitoring by the best available technology, and commitments for the project, including the environmental regulations set by the Environmental Quality Board, the project's impacts on the environment will be manageable. The project will ensure that it meets the Environmental Protection Agency's standards and regulations. This project is indispensable to reduce the air pollution resulting from the use of fuel oil #6 in Puerto Rico.

In view of the move towards cleaner energy sources and the need to diversify the Puerto Rico's energy supply mix, natural gas was considered for the project. Natural Gas meets environmental regulations through the use of proven state-of-the-art low emissions and environmental control technologies. LNG was a superior alternative since it is the cleanest burning fuel, with least emissions per kilowatt-hour of electricity

generated; it is odorless, nontoxic, and has very low level contaminant levels; it requires no environmental cleanup for spills; and there are no procurement problems.

Vía Verde Description:

The Puerto Rico Power Electric Authority (PREPA) proposes the construction of a carbon steel pipeline with the following Specifications:

- API 5L, grade X70,
- Schedule from 0.375 to 0.500 inches, depending in its classification,
- Twenty Four (24) inches in diameter,
- Fusion Bonded Epoxy of, at least, 14 Mils for corrosion protection,
- Cathodic Protection by impressed current for an additional corrosion protection,
- Meets the standards and regulations set for by entities such as: DOT 40 CFR 192, ASME B31.8, ASTM, ANSI, NACE, NFPA, API, OSHA, and the Puerto Rico Public Service Commission,

The transmission pipeline will be used for transferring natural gas from EcoEléctrica, in Peñuelas where the Liquefied Natural Gas storage tank is located, to PREPA's generating plants at Arecibo (Cambalache), Toa Baja (Palo Seco), and San Juan (San Juan). The pipeline will be underground and it will be approximately 92 miles long. The pipeline will require a Maintenance Right of Way (ROW) of 150 feet wide. Out of these 150 feet, the construction process will only impact 100 feet. After construction is finished, 50 out of the 100 feet will be restored to its original state, and only 50 feet will remain as a permanent operational ROW, which will be kept free of deeply rooted vegetation. Total Impacted Area: 1,107.4 acres, approximately, and an additional 32 acres for special situations such as water body crossings. The pipeline will go across 13 municipalities and 48 wards. The municipalities are: Peñuelas, Adjuntas, Utuado, Arecibo, Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado, Toa Baja, Cataño, Bayamón, and Guaynabo. The estimated cost of the project is approximately \$447 millions (design, material acquisition, shipping and delivery, construction, state and local rights and taxes, land acquisition, field studies, environmental documents and permits). An additional \$50 to \$70 million will be required for the conversion of generating units for the use of natural gas. The direct temporary employments are estimated to be between 1,000 y 1,200 and the indirect temporary employments between 4,000 to 4,500.

PREPA has submitted the Preliminary Environmental Impact Statement (P-EIS) to the Environmental Quality Board (EQB) for review and Public Hearings and will adopt any comments or recommendations that are legally binding.

ALTERNATIVES ANALYSIS

Background

Section 404(b)(1) of the Clean Water Act prohibits the discharge of dredged or fill material into waters of the United States unless the proposed discharge is the least environmentally damaging practicable alternative capable of achieving the project purpose. Alternative routes for the pipeline and to the pipeline were evaluated pursuant to 40 CFR 230.10. The National Environmental Policy Act (NEPA) and implementing regulations at 40 CFR 1502.14, together with the Commonwealth Policy Act, require a range of reasonable alternatives including the no action alternative be evaluated. Under these laws and regulations, the no action alternative and action alternatives that meet the project purpose and need of the preferred alternative are considered to be reasonable alternatives. Under the aforementioned laws, these alternatives do not need to be available to the applicant. Though the Corps will evaluate these alternatives, the alternatives selected should be available to the applicant at the time of the permit decision.

The Government of Puerto Rico's 1993 Energy Policy acknowledged the island's high dependency on oil, which at the time was 99%, and the high environmental cost this caused. The policy directs the Puerto Rico Electric Power Authority (PREPA) diversification of fuel sources for power generation to reduce the volatility of oil prices and overall power generation costs and to introduce environmental criteria for the selection of new power plants. Following is a detailed discussion of alternatives to the proposed Via Verde project that meet the project purpose and need. Each alternative discussed addresses logistics, technology, cost and environmental consequences and is followed by a statement indicating whether or not we consider the alternative to be practicable. Among alternatives considered were: the construction of a natural gas import terminal on the north coast of the island, three tanker and buoys systems (Deepwater Port) for receipt of natural gas at Palo Seco, San Juan and Cambalache plants, and several terrestrial alignments for a natural gas pipeline system. The alternative of no action was also analyzed.

EVALUATION CRITERIA

To evaluate the data on each of the alternatives discussed, a set of criteria was defined and rated. Also, weight was given to each criterion according to its importance. Each alternative will be discussed separately and at the end, a table will be presented where the criteria is applied and the rating is multiplied by the weight to obtain a numerical value for each alternative. The alternative with the highest value is deemed the best alternative for construction.

Criteria used for site evaluation

Criterion number	Criterion	Consideration
1	Land Use	Avoid land targeted for high density developments. Favorable land uses considered to be public, commercial, agricultural, industrial
2	Bodies of water	Reduce number, complexity and width of crossings
3	Forests and nature reserves	Avoid or minimized to the maximum extent possible impact to known sites
4	Endangered species	Avoid or minimize to the maximum extent possible impact to the species and their habitat
5	Architectural and Archaeological findings	Avoid or minimized to the maximum extent possible impact to known sites
6	Road crossings	Reduce number of road crossings
7	Zoning	Favorable zoning designations: non residential, public, industrial, agricultural, commercial and non-zoned.
8	Topography	Seek route with smallest number of abrupt topographic changes
9	Community	Maximize safety to residents, avoid or minimize number of dwellings directly impacted by the project (expropriation)
10	Pipeline length	Reduce pipeline length to minimize impacts. Place pipeline parallel to or along existing linear disturbances (ROW's)
11	Impacts to jurisdictional areas	Avoid or minimized to the maximum extent possible, impact to jurisdictional areas
12	Pipeline security	Ideally the pipeline is located on private property where public access is limited. The pipeline is ideally suited to rural land uses unlikely to be targeted for high density

Criterion number	Criterion	Consideration
		uses.
13	Impact on transportation or traffic	Avoid or minimize to the maximum extent possible, impact to transportation and terrestrial or maritime traffic
14	Water Quality	Avoid or minimize to the maximum extent possible, impact to water quality, especially permanent effects
15	Aquatic resources	Avoid or minimize to the maximum extent possible, impact to aquatic resources
16	Cost	Develop project that is within the company's financial possibilities
17	Noise impact to communities and species	Minimize noise impact during construction and operation
18	Essential fish habitat	Avoid or minimize impact to this resource
19	Corals	Avoid or minimize impact to this resource
20	Ease of access	The location needs to provide safe access for routine maintenance and integrity monitoring.
21	Exclusion zone	Project location must comply with regulatory requirements on exclusion zones. A special exclusion zone could also be defined by the owner to avoid impact to certain resources.

Rating assigned to each criterion

Criterion number	Criterion	Comment	Condition	Rating
1	Land Use	Per cent of the project in land favorable to construction	0-10	5
			11-100	10
2	Bodies of water	Number of points where the project intercepts a body of water	0-25 crossings	10
			25-100	5
3	Forests and nature reserves	Per cent of the project in forest and nature reserves	0-10	10
			11-20	5

Criterion number	Criterion	Comment	Condition	Rating
4	Endangered species	Per cent of project in areas where these species are found	0-5	10
			5-10	5
5	Architectural and Archaeological findings	Number of sites impacted by the project	0-5	10
			5-10	5
6	Road crossings	Number of crossings	0-40	10
			41-100	5
7	Zoning	Per cent of the project in favorable zoning	0-20	5
			21-100	10
8	Topography	Number of abrupt topographic changes	0-60	10
			60-100	5
9	Community	Number of residences impacted by expropriation	0-15	10
			16-100	5
10	Pipeline length	Covers less miles from point A to point B	Less than 50 miles	10
			More than 50 miles	5
11	Impacts to jurisdictional areas	Percentage of project in jurisdictional areas	0-20	10
			21-50	5
12	Pipeline security	Percentage of auxiliary equipment exposed and accessible to public	0-5	10
			6-10	5
13	Impact on transportation or traffic	Has potential to affect land or marine traffic	Minimum or no impact	10
			Significant	5
14	Water Quality	Turbidity Sedimentation	Permanent	5
			Temporary	10
15	Aquatic resources	General impact to species	Permanent	5
			Temporary	10
16	Cost	Cost efficient	Less than 1 billion	10
			Greater than 1 billion	5
17	Noise impact to communities and species	Produces noise during construction or operation that impacts quality of life or harasses species	Yes	5
			No	10
18	Essential fish habitat	Per cent of the project in	Less or equal to 5	10

Criterion number	Criterion	Comment	Condition	Rating
19	Corals	Per cent of the project in designated areas	Greater than 5	5
			Less or equal to 5	10
20	Ease of access	Safe access for maintenance and inspections	Yes	10
			No	5
21	Exclusion zone	Project location complies with regulatory requirements on exclusion zones	Yes	10
			No	5

Weight assigned to each criterion

1. Important

2. Mid importance

3. More important

Criterion number	Criterion	Weight
1	Land Use	3
2	Bodies of water	2
3	Forests and nature reserves	2
4	Endangered species	3
5	Architectural and Archaeological findings	2
6	Road crossings	2
7	Zoning	3
8	Topography	2
9	Community	3
10	Pipeline length	2
11	Impacts to jurisdictional areas	3
12	Pipeline security	3
13	Impacts on transportation or traffic	3
14	Water quality	3
15	Aquatic resources	3
16	Cost	3
17	Noise impact on communities an species	2
18	Essential fish habitat	2
19	Corals	2
20	Ease of access	2

Criterion number	Criterion	Weight
21	Exclusion zone	3

DESCRIPTION OF ALTERNATIVES CONSIDERED

No Action

The alternative of no action, although considered, was found not feasible given the transcendence, importance; and public welfare pursued by the project.

Preliminary environmental impacts and direct/indirect impacts associated with construction of a natural gas pipeline are considered. If the project is not built the following impacts would be avoided:

- Impacts from moving earth that could result in erosion and sedimentation in bodies of water
- Temporary increases in noise levels
- Impacts to forest reserves
- Temporary impacts to wetlands and other bodies of surface water
- Impacts to farmland
- Temporary impacts to infrastructure such as waterlines, buildings and (possible) phone lines
- Temporary impacts to traffic and roads, i.e. detours
- Potential impacts to archaeological sites
- Acquisition of land by expropriation

However, if the project is built most of these impacts, if not avoided completely, could be minimized and mitigated using engineering design options and support from agencies and municipalities the project would cross through.

No action is not indicative of no impact, since with this alternative PREPA will be forced to continue to produce electricity by burning petroleum products that generate greater amount of pollutants emitted to the air. While some of these emissions can be controlled by using technology that requires, in many cases, an investment of millions of dollars, modern emission reduction highlights that the emissions of these derivatives of petroleum would be greater if related to the burning of natural gas. In addition, maintenance of petroleum burning units has to take place more frequently and with higher costs to guarantee

optimal operation. Continuing to burn petroleum derivatives has other implications, such as an increased frequency of deliveries of these fuels to our ports which increases erosion of the seabed and the likelihood of spills. The continued use of fuels derived from petroleum increases the cost of electricity, which negatively impacts the Puerto Rican economy and results in a lower quality of life for its citizens. Finally, liquid fuels expose PREPA to fluctuations in the market value creating instability in the costs of energy production and invoices. Recognizing that the Puerto Rico economy is directly linked to PREPA's stability, it is important for the company to meet its strategic development plans and maintain a fixed cost structure to avoid sudden peaks of variations in the cost of purchased fuel. Compliance with this plan demonstrates vision, stability and commitment to customers, the ability to assess complex situations of world character and the ability to develop strategies to minimize adverse impacts making it easier to expand options to obtain fuels in the future.

After evaluating local and global dynamics, PREPA developed a strategic plan to guide future development of the company and Puerto Rico. This plan includes the following parameters:

- Diversification of energy sources
- Reduction in costs
- Geographic diversification of generating electricity
- Environmental considerations
- Expansion of electrical generation
- Diversification of revenue

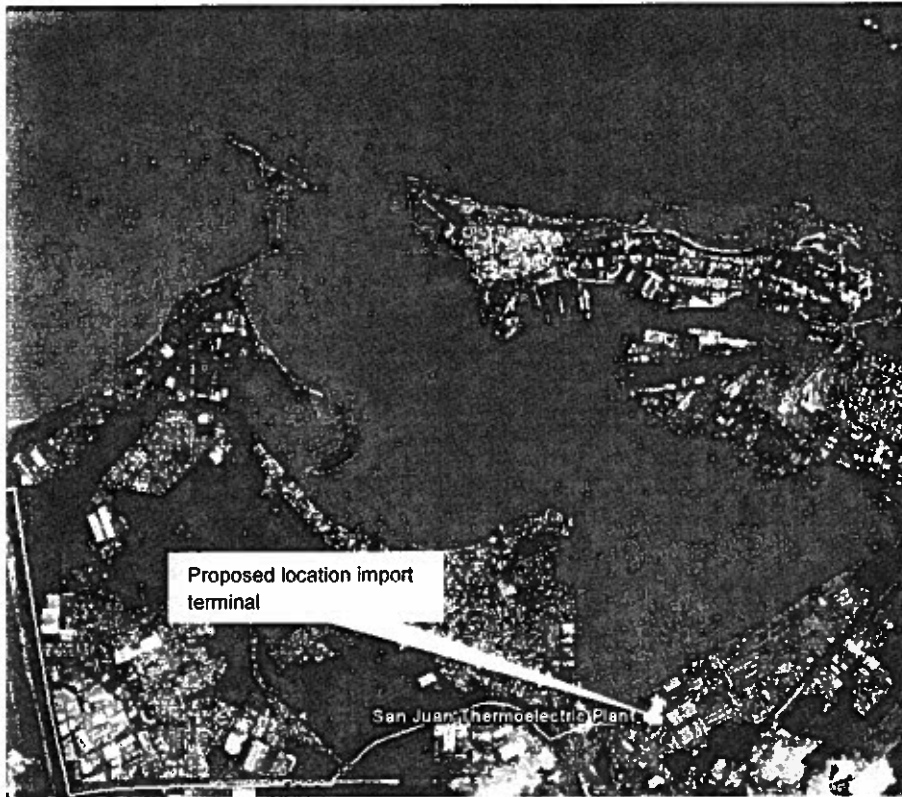
The Via Verde project is part of the plan to diversify fuels which can make PREPA better. In addition, there are important environmental considerations to help AEE to more effectively manage their energy costs. A significant percent of Puerto Rico's generated electrical power depends on oil. At the moment, AEE uses only No. 2 fuel (light distillate) and No. 6 (bunker C) its generator units and it buys electricity, in turn, from the AES co-generators in the municipality of Guayama (coal) and EcoElectrica in the municipality of Penuelas (natural gas). With the introduction of the co-generators AEE began to buy electricity generated from NG or coal but internally AEE still depends exclusively on oil.

PREPA aims to reduce its dependence on the use of oil, which currently is approximately 68%, to approximately 12% by 2014. To do this PREPA must identify alternative fuels that can meet their customers demand for power. Lack of action would only aggravate the current dependence on oil, and at a time of seizure or high global demand, Puerto Rico would have no viable alternatives to generate electricity. In addition, no action exposes PREPA to sudden changes in the cost of oil which reduces the economic capacity of PREPA and, consequently, the Puerto Rican economy. It is important to highlight that PREPA is limited by regulations to the type of fuel it can burn. The greatest limitation is the amount of sulfur contained in fuel. Low sulfur fuel is more expensive than fuel with higher sulfur content. If there are shortages in this type of fuel, or if PREPA cannot set contracts with the suppliers, there are only two options left: reduce the production of electricity, which is not feasible, or burn a cheaper fuel with higher sulfur content in violation of established environmental permits, with subsequent exposure to fines and sanctions from regulatory agencies. The use of natural gas significantly decreases emissions of pollutants to the environment. No action means PREPA must expend significant capital to reduce emissions that result from burning oil and to maintain their units, instead of using that capital to develop a more efficient system that uses cleaner fuel with lower maintenance costs.

The No Action Alternative would not meet the project purpose and will not be considered further.

Construction of a Liquefied Natural Gas Import Terminal

Currently Puerto Rico has the EcoElectrica Cogeneradora in the municipality of Peñuelas, to receive LNG (and meet PREPA's needs). Still, the alternative of building a new terminal closer to PREPA's power facilities was evaluated in consideration of environmental impacts potentially associated with the construction of a delivery pipeline from the EcoElectrica terminal. A location between the three power plants on the northern coast selected to convert to Natural Gas (NG) was identified next to the Central Thermoelectric San Juan (CTSJ) unit. Currently, an existing pier has infrastructure to transport diesel and Bunker C Fuel to two of the three plants, San Juan and Palo Seco.



A new LNG import terminal must be able to receive, download, and store up to 3.0 Bcf/d (3 trillion cubic feet) of liquid natural gas imported by sea. In addition, facilities to gasify and handle the natural gas would also need to be built. The construction of the terminal would result in an environmental impact associated with the different stages of the construction and operation, which include:

- Build, repair, or expand (depending on the case), a pier for receipt of liquid natural gas.
- Increase in the transit of ships.
- Construction of a tank for liquid natural gas storage and gasification - this plant would require an area of approximately 25 acres.
- Constructing navigation channels to support transit tankers, which would mean dredging and disposing dredged material.

Selecting a place to construct a terminal to receive liquid natural gas requires a deep port to minimize the environmental impacts associated with the development and operation of the terminal. In addition, a relatively low population density area with industrial development is necessary.

Three (3) criteria were used to determine whether building close to PREPA's installation import terminal was a viable alternative. These were: 1) specific factors at the workplace, 2) maritime operations and, 3) environmental issues.

1. Factors specific to the workplace

Availability of land

A suitable location must have enough space available to accommodate the proposed installation and all safety components required by the Federal Department of transportation regulations (49 CFR part 193), the U.S. Coast Guard (33 CFR part 127) and the National Fire Protection Association (NFPA). In addition, a site must comply with the regulatory distance required between structures used to gasify LNG and the LNG storage tank. Facilities would need to occupy an area of approximately 25 acres. Structures would include, among other components, a dual containment tank 167 feet in height and diameter with the ability to store 1,000,000 barrels of liquid natural gas at a temperature of minus 260 degrees Fahrenheit and a pressure of 2.0269 psig; vaporization or gasification systems to gasify liquid natural gas, and pipes to transport the natural gas to the power stations. Other factors to be considered would include activities outside and adjacent to the terminal and the distance or separation needed between the terminal to occupied areas of activity and/or populated areas (49 CFR parts 193.2055, 193.2057 and/or populated areas.

Availability of a coastal area

A site must have an available maritime quay with facilities for tankers 950 feet long, with PIP cubic meters capacity, and a minimum 40-foot boat anchor area. The criteria used to assess whether a port or dock has the capacity for this type of project are the depth of greater than 40 feet, navigation channels with extension airway passage (greater than 180 feet) and proximity to equipment to conduct storage and gasification of liquid natural gas. The quay must be approximately 30 feet wide by 1,700 long and have, among others: teams to tie up the tanker to the dock; a boat platform with two levels at the end (a 40-foot wide by 100 long lower level and 20 wide and 100 long upper level); and a emergency spill collection system.

Disposal of dredged material

Any area under consideration must include the requirement to dredge to create a proper shipping channel for the maritime tanker traffic to deliver the liquid natural gas; also a site must be identified for

dredged material generated during construction and future maintenance operations required for the channel.

2. Maritime Operations

Increase in ships

The transit of tanker ships is subject to more restrictions than general maritime traffic. Federal regulations and restrictions could affect other shipping and increase the risk of affecting other users of the navigation channel.

Access to the navigation channel

The quicker a tanker vessel can arrive at the terminal, unload and return to sea, the more economic the operation is. A shorter channel would reduce possible adverse effects on traffic for other ships from marine transit restrictions. Yaw (amplitude and proximity) area: a typical liquid natural gas tanker ship would require a dock with a minimum turning diameter of 1,200 feet and 40 feet of depth.

3. Environmental issues

Environmental consequences

Minimizing environmental impact by using places previously impacted, including the place for dock, and areas zoned for this type of use.

Compatibility with the region

The place must be compatible with future developments on adjacent properties.

According to the rating system described above, the import terminal is favorable based on the following criteria:

1. The land to be used for the project is compatible with the uses defined in the criteria (commercial, industrial, public, agricultural).
2. Bodies of water- the number of water bodies to be crossed are reduced, since the length of pipe between Peñuelas and Arecibo is eliminated with this option.
3. Forests and Reserves- the percentage of forests and reserves is considerably reduced because the length of pipe between Peñuelas and Arecibo is eliminated
4. Architectural and Archaeological findings- no findings anticipated in the marine portion of the project. There are no findings in the land portion from San Juan to Arecibo.
5. Road crossings- the number of road crossings is reduced since the length of pipe from Peñuelas to Arecibo is eliminated.
6. Zoning- the zoning in the project area is compatible with the zoning designated in the criteria: non residential, public, industrial, agricultural, commercial and non-zoned.

7. Topography- the number of abrupt topographic changes is significantly reduced since the length of pipe from Peñuelas to Arecibo is eliminated.
8. Community- the number of residences expropriated is reduced.
9. Pipe length- the length of pipe needed is reduced.
10. Pipeline security – the pipe is still underground.
11. Noise impact – the noise levels will be compatible with the noise levels in the area.

The import terminal proved disadvantageous based on the following criteria:

1. Endangered species- to bring the natural gas tanker to the selected location, the navigation channel must be dredged and a disposal site identified. The Estuary of the Bay of San Juan (EBSJ) is composed of several bodies of water. The EBSJ provides food and shelter to eight species of fauna and 17 species of flora in danger of extinction, such as the Antillean Manatee and several species of turtles, including the hawksbill and leatherback; 160 species of birds, such as the Brown Pelican and the Heron; 19 species of reptiles and amphibians, such as the coquí and Puerto Rican boa; 124 species of fish, Tarpon and bass; and 300 species of wetland plants are found on EBSJ.
2. Impact to jurisdictional areas- the San Juan Bay is considered waters of the United States. In addition to this, a disposal site for the dredged material must be identified. A deep water disposal site would also fall under the jurisdiction of the USACE.
3. Cost – the estimated cost to build an import terminal is approximately \$1.2-\$1.5 billion, above the government's financial capability at the moment.
4. Impact to transportation and traffic- the dredging operation to prepare the navigation channel and the gas natural tankers entering the area would have a significant impact on the maritime traffic of San Juan Bay. Also, there would be an increase in maritime traffic due to the LNG ships entering the area. The transit of tanker ships is subject to more restrictions than general maritime traffic. Federal regulations and restrictions could affect other shipping and increase the risk of affecting other users of the navigation channel. One example of an effect would be the increase in maritime traffic restrictions which make it difficult, if not impossible, for others to use the navigation channels simultaneously with LNG tankers.
5. Water quality and aquatic resources- Dredging operations would degrade the quality of the receiving waters due to suspended fine sediments. Effects from the turbidity plume

could occur daily during working hours and up to two (2) hours after the discharge of dredged material is completed. This would affect water quality and, consequently, water quality parameters required by environmental permits governing the CTSJ, especially turbidity, sedimentation and suspended solids.

6. Essential fish habitat – There are no identified essential fish habitats in the San Juan Bay.
7. Ease of access – the quicker a tanker vessel can arrive at the terminal, unload and return to sea, the more economic and safe is the operation. In order to reach the unloading pier, the LNG tanker must use three channels, Bar, Anegado and Army Terminal, until it reaches the pier at Puerto Nuevo Bay. A shorter channel would reduce possible adverse effects on traffic for other ships from marine transit restrictions.
8. Corals- the entire north coast of Puerto Rico is designated critical habitat for elkhorn and staghorn coral. Species specific studies would have to be performed to determine the status of the species, if dredging is needed in designated areas.
9. Exclusion zone- the regulations establish an exclusion zone of 1-2 mile radius for the storage tank needed to store the LNG. This exclusion zone limitation could not be met.

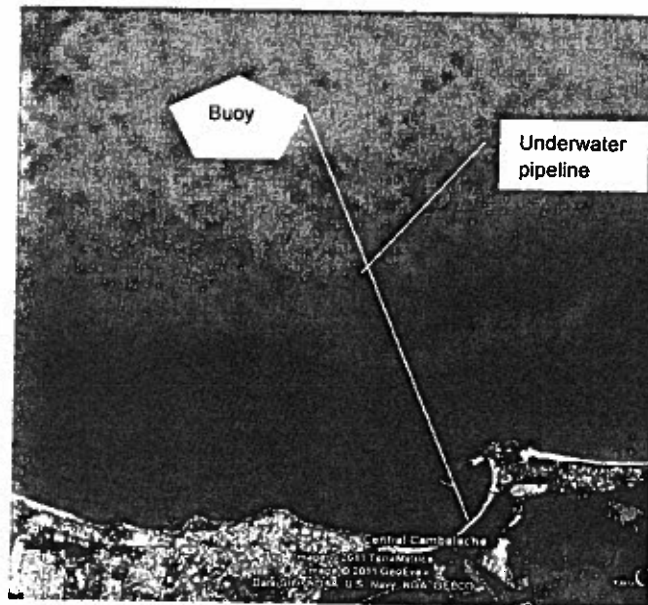
Construction of a system of buoys and tankers (Deep water Port) in San Juan, Palo Seco and Arecibo

As one of the alternatives to the project, the installation and operation of tankers and a buoy for the receipt, storage and regasification to transport natural gas to each area in the north central system was considered. The buoy would be located 5km from the coast in Palo Seco and Arecibo. In San Juan, the buoy will be located 8 km offshore. The infrastructure needed is:

- one submerged turret loading buoy that connects to the vessel and serves as both a mooring for the vessel and a conduit for the discharge of natural gas
- chains, wire rope, and anchors used to secure the buoy to the seabed
- a flexible riser designed to connect the buoy to a seabed pipeline end manifold (PLEM) – allowing tie-in to a subsea pipeline

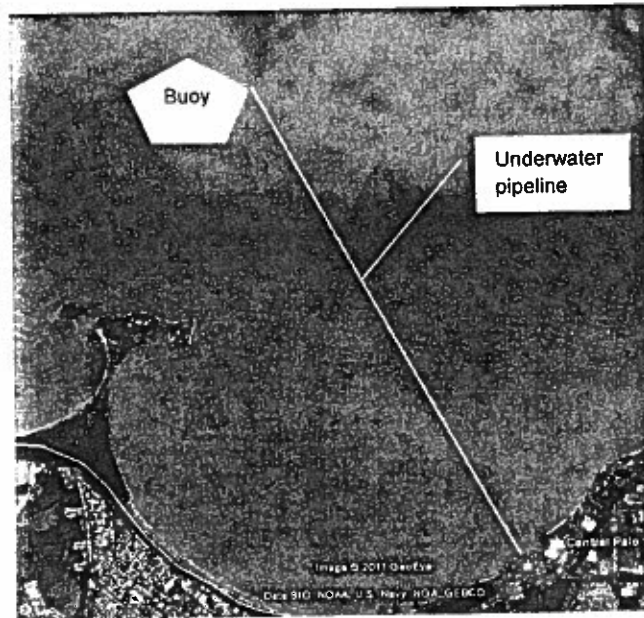
- a subsea PLEM that incorporates necessary control instrumentation and related valving; and,
- an interconnecting subsea pipeline to tie into downstream delivery infrastructure.

The delivery tanker will have a regasification system. This tanker will dock at the buoy which keeps afloat lines connecting the tanker to a pipeline on the seabed. This pipeline will transport compressed gas to a receiving terminal near the central power unit.

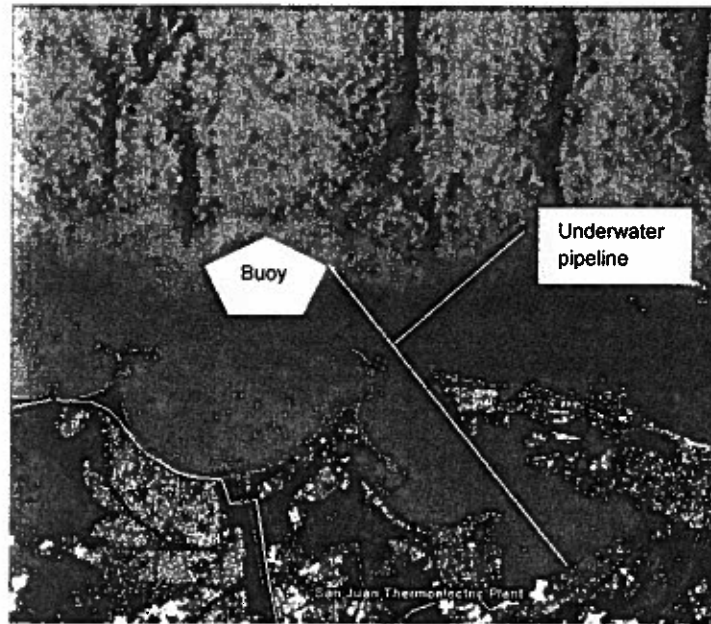


Proposed location LNG receiving buoy

Cambalache, Arecibo



**Proposed location LNG receiving buoy
Palo Seco, Toa Baja**



**Proposed location LNG receiving buoy
San Juan**

According to the ranking system described above, the buoy and barge system is favorable based on the following criteria:

1. Forests and Reserves- no forests and reserves are affected by this alternative
2. Architectural and Archaeological findings- no findings anticipated in the marine portion of the project, but required studies will be performed.
3. Road crossings- no road crossings
4. Topography- it is assumed that the seabed in the area is flat, but a bathymetric study will be performed
5. Community- no residences will be expropriated due to the projects construction.
6. Pipe length- the length of pipe needed is reduced
7. Pipeline security – the pipe is still underground

The import terminal proved disadvantageous based on the following criteria:

1. Bodies of water- although only one body of water is affected by the project, there are no alternatives to avoid its impact. Directional drilling is not an option in this case. The pipe to transport the gas must be buried in a trench of approximately 3 ft deep and 4 ft wide

for a length of ocean between 5-8 miles, per buoy. Also, there will be impact on the sea floor during the installation of the anchors and other equipment related to the buoys.

2. Endangered species- a number of endangered species of sea turtles, whales and others could be affected by the project's construction.
3. Impact to jurisdictional areas- waters affected by the project in San Juan, Palo Seco and Arecibo are jurisdictional.
4. Cost – The AEE would request a private company with expertise in the design, construction, and operating system of a Deepwater Port. This could cost AEE between \$70 and \$80 million per year, subject to signing a contract with that company for a period of not less than 20 years. At the end of the 20 year period the total cost would be approximately \$1.6 billion dollars, per buoy system.
5. Impact to transportation and traffic- As in other cases, the Coast Guard may impose safety zones restrictions extending at least 500 meters in all directions from the buoy to protect vessels and mariners from potential safety hazards associated with the construction of the deepwater port facilities, and to protect the port's infrastructure. All vessels will be prohibited from entering into, remaining or moving within the safety zone.
6. Water quality and aquatic resources- The primary physical impact of construction on water quality would occur as a direct or indirect result of the sediment plume that will be created from setting the buoy anchors, installing the flowlines, and temporarily laying the mooring chain on the seafloor. Although temporary, plumes resulting from disturbance to the seafloor would be exposed to currents with the potential to carry them into the surrounding environment and strip nutrients and/or contaminants from the sediments and release them to the water column. The extent and duration of the turbidity plumes would be based on the strength of the currents at the location of the specific activity. Sediment re-suspension could release sediment bound contaminants, but this is an assumption that need to be validated by chemical analysis of the sediments.

Withdrawal of ballast and cooling water at the port as the regasification vessel unloads cargo (approximately 1 million gallons per day) could potentially entrain zooplankton and ichthyoplankton that serve as prey for other species.

7. Noise impact - During port operations, sound will be generated by the regasification of the LNG aboard the regasification vessel and the use of thrusters by vessels maneuvering and maintaining position at the port. Another potential sound source would be sound generated from large construction-type dynamic positioning (DP) vessels used for a major repair of the subsea pipeline or unloading facility. Of these potential operations and maintenance/repair sound sources, thruster use for DP is the most significant. The National Marine Fisheries Service recognizes three kinds of sound: continuous, intermittent (or transient), and pulsive. The project will not cause pulsive noise activities. Rather, the sound sources of potential concern will be continuous and intermittent sound sources, including underwater sound generated by regasification/offloading (continuous) and dynamic positioning of vessels (regasification and large repair vessels) using thrusters (intermittent). Both continuous and intermittent sound sources are subject to the National Marine Fisheries Service's 120 dB re 1 μ Pa threshold for determining levels of underwater sound that may result in the disturbance of marine mammals. Potential effects of noise on marine mammals include masking, disturbance (behavioral), hearing impairment (temporary threshold shift [TTS] and permanent threshold shift [PTS]), and non-auditory physiological effects.
8. Essential fish habitat - Withdrawal of ballast and cooling water at the port as the regasification vessel unloads cargo (approximately 1 million gallons per day) could potentially entrain plankton and fish larvae .
9. Ease of access – although the delivery tankers will have easy access to the buoys, on shore personnel will have to travel 5-8 miles in case emergency situations arise.
10. Corals- the entire north coast of Puerto Rico is designated critical habitat for elkhorn and staghorn coral. Species specific studies would have to be performed to determine the status of the species. The species could be affected by trenching done to install the underwater pipeline.

11. The land to be used for the project is not compatible with the uses defined in the criteria (commercial, industrial, public, agricultural).
12. Exclusion zone- the Coast Guard will determine the exclusion zone during construction and operation of the project
13. Zoning- the zoning in the project area is not compatible with the zoning designated in the criteria: non residential, public, industrial, agricultural, commercial and non-zoned

Construction of a Natural Gas Pipeline (Terrestrial routes)

The purpose of this analysis is to select the best terrestrial route for a pipeline to deliver natural gas from the Ecoelectrica facility in Peñuelas to the Cambalache, Palo Seco and San Juan plants. Other works and studies contracted by PREPA were used during the Alternative Routes Selection effort. Part of the study conducted by *Power Technologies Corporation (PTC)* in 2006 was used for this analysis (*Corridor and Alternative Routes Selection Study*). The PTC study was inclusive since it took into consideration the entire island. Corridors were evaluated every 1,000 meters and used the following criteria for such evaluation; topography, land use, existing corridors, and sensitive areas. Options were refined with other factors such as: individual residences, minor topographic variations, sensitive habitats identified during field visits, and methodology of construction in areas of greatest difficulty, such as: steep slopes, bridges and densely populated areas. Finally, the study selected multiple routes to bring natural gas to various points of the island. These included the PREPA facilities at Arecibo, San Juan and Palo Seco, which are the focal points of this Via Verde project.

The study carried out by PTC identified two viable alignments to transport natural gas from EcoElectrica to Central Cambalache and two segments from San Juan to Cambalache.

Ecoelectrica to Cambalache Segments

1. Alignment South to North "A"

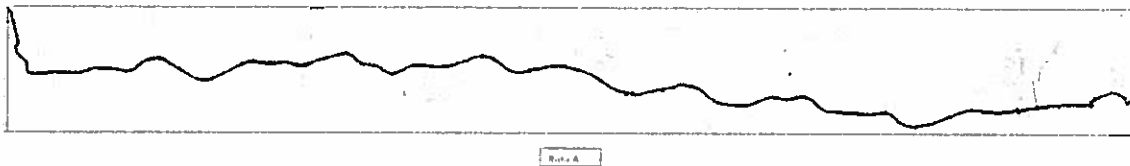
Starting at EcoElectrica, take a Northeast route overland to Ponce and then follow the State Road 10 road easement. The route follows State Road 10 through Adjuntas and Utuado. At Utuado the pipeline moves away from but parallel to the State Road 10 corridor until it reaches Arecibo. At Arecibo the route follows Northern plains until it reaches Central Cambalache. This route runs a total of 45.1 miles and the study labeled this alignment "Overland".

2. Alignment South to North "B"

Starting at EcoElectrica, take one of two options to get to State Road 10. The first is to follow the right-of-way of the southern gas pipeline to Ponce and the second option is to take the State Road 10 right-of-way from Guayanilla. Both go to the west of Ponce where the pipeline route follows the State Road 10 right-of-way State Road 10 until it reaches Central Cambalache. This route runs a total of 36.8 miles and the study labeled this alignment "DOT Route". The study also identified two viable alignments for the proposed natural gas pipeline, from Central Cambalache to San Juan and Palo Seco.

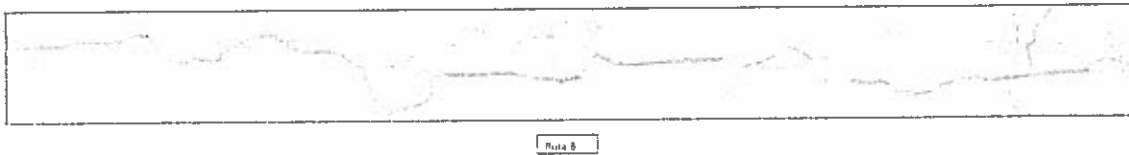
San Juan to Cambalache Segments (East to West)

3. Alignment East to West "A" (Include drawing)



From San Juan, in Levittown, take a path west and cross the Municipalities, of Toa Baja, Dorado, Vega Alta, Vega Baja, Manati and Barceloneta to Arecibo. This route runs a total of 44.6 miles. The study labeled this alignment "Overland Corridor".

4. Alignment East to West "B"



From Cataño, follow the PR-22 right-of-way to Arecibo. This route crosses the Municipalities of Toa Baja, Dorado, Vega Alta, Vega Baja, Manati and Barceloneta. This route would necessitate an investigation to determine if the pipeline would interfere with the right-of-way of the Superacueducto (Super Aqueduct). This alignment runs a total of 45.6 miles and the study called this alignment "DOT Corridor".

5. Alignment "C" segments



A third alignment, which was not contemplated in any of the previous studies contracted by PREPA, was also considered for the Via Verde project that ran near both of the other two alternative routes but avoided more residential areas. In summary, three (3) routes were considered for the pipeline corridor from EcoElectrica to Arecibo and then from Arecibo to San Juan. These were: alignment South-North A (SNA), alignment South-North B (SNB), alignment South-North C (SNC); alignment West-East A (OEA), West-East B (OEB), West-East C (OEC).

Evaluation criteria for terrestrial route comparison

The following environmental criteria were used to evaluate the six alignment segments and determine which segments met the criteria as explained below:

- **Use of land** - The different uses of land were analyzed in each alignment. A route was defined as favorable for pipeline construction if existing land use was currently used for public, industrial, agricultural and commercial applications. A route was defined as not favorable for construction if land was currently in residential use and/or environmentally-sensitive. The percentage of the alignment with favorable uses and

then the percentage not favorable were compared to obtain a final value. The route which had the largest value received the positive (+) value.

- **Impacted water bodies** - The number of crossings of bodies of water increases the difficulty to construct the pipeline. Crossing a large body of water would need special construction methods to avoid adverse impacts. These construction methods increase the cost of the project. All bodies of water which were intercepted by an alignment were counted. The route with the fewest water body crossings received a positive (+) value.
- **Forests or nature reserves** - Forests and nature reserves were areas considered important public resources due to their high ecological value. For selection of a positive (+) value the criteria considered avoidance or minimization of impacts to these areas. The percentage of forested/nature reserves impacted was measured against the total length of each route alternative. The route with the smallest percentage of forests and nature reserves received the positive (+) value.
- **Endangered Species** - This criterion measured the extent of the alignment alternative that was considered protected habitat and/or had listed species present. The route alternative with the smallest percentage of impact in protected habitat received the positive (+) value.
- **Archaeological sites** - All identified architectural and archaeological sites that would be intercepted by an alignment alternative were marked. The route with the fewest sites received the positive (+) value.
- **Highway crossings** - Road crossings increase the difficulty of pipeline construction since special construction methods are needed to avoid affecting the integrity of the infrastructure and vehicle congestion. All roads intercepted by an alignment alternative were identified. The route with the fewest road crossings received the positive (+) value.
- **Zoning** - The different zonings were identified for each alignment alternative. Favorable zonings were considered to be non residential, public, industrial, agricultural, commercial and non-zoned. Not favorable was considered to be areas zoned residential, or areas identified as forests, historical sites and conservation lands. We measured the extent of alignment with terrain for favorable zoning against not-favorable zoning to obtain a final value. The route which had the largest value (favorable vs. not-favorable) received the positive (+) value.

- **Topography** - Puerto Rico has a variety of topographical areas within its limited geographical scope. The Cordillera Central area is characterized by its rugged topography. We analyzed different levels and steepness of topography and types of soils within each alignment. Abrupt changes in the topographic levels were marked. The route which had the smallest number of abrupt topographic changes received the positive (+) value.
- **Residential areas** - Due to its limited geography and high population density, Puerto Rico has abundant residential areas, especially in the coastal plains. Distance from Residential Areas, as part of the general public safety factors was considered to be a very important factor in identifying the best, practicable alternative. For this reason, greater weight was given in the project planning criterion to minimize the number of homes in the vicinity of an alignment. Any residence which would be within 150 feet from the center of an alignment was identified and counted. The route with the fewest number of residences received the positive (++) value.

To determine the best terrestrial alternative, the three (3) segment alternatives for the South-North section were compared to each other based on the results obtained once the criteria was applied. The three (3) segment alternatives for the East- West section were also compared. The route option with the least impact to each criterion received a positive value (+). Then the total number of positive values for each route alternative was added and tabulated. The route option with the largest number of criteria in its favor was selected. The analysis is summarized in the Table 1.

Table 1: Route Selection Matrix for Terrestrial Route

Criteria	South North A		South North B		South North C		West East A		West East B		West East C	
Use of land	3.09		8.68		14.35	+	1.32		14.38		18.89	+
Bodies of water	23		25		20	+	15		12	+	13	
Forests or nature reserves	1.39	+	2.50		3.04		0.59		0.03	+	2.79	
Endangered Species	6.49		11.69		6.01	+	7.03		1.53	+	10.43	
Architectural and archaeological findings	1		0	+	0	+	0	+	0	+	0	+
Highway crossings	40		28		21	+	64		47		30	+
Zoning	24.21		30.61		33.41	+	4.28		0.44		32.42	+
Topography	86		78		59	+	15		12	+	13	
Residences	17		2	+	2	++	29		22		1	++
Total Positive criteria		1		3		9		1		5		6

Of the three south-north segments, the South-North C (SNC) segment was the most favorable with nine positive points, while South-North B had three positive points and South-North A only one positive point. Minimal direct impact to residential areas also favored segment SNC.

Of the three west-east (east-west) segments, the West East C (OEC) segment was the most favorable with six positive points while, West-East B had five positive points and West-East A only

one positive point. Again, direct impact to residences strongly supported segment OEC since only one residence would be directly impacted while the other two segments potentially directly impact over twenty residences each.

Based on this analysis, together, segment South North C and segment West East C were selected as the best option for a pipeline route.

EVALUATION OF ALTERNATIVES USING RATING AND WEIGHT – Table 2

Criteria	Terrestrial Route			Buoys			Import Terminal		
	Rating	Weight	Total	Rating	Weight	Total	Rating	Weight	Total
Land use	10	3	30	5	3	15	10	3	30
Bodies of water	5	2	10	5	2	10	10	2	20
Forests and nature reserves	5	2	10	10	2	20	10	2	20
Endangered species	5	3	15	5	3	15	5	3	15
Architectural and archaeological findings	10	2	20	10	2	20	10	2	20
Road crossings	5	2	10	10	2	20	10	2	20
Zoning	10	3	30	10	3	30	10	3	30
Topography	5	2	10	10	2	20	10	2	20
Community	10	3	30	10	3	30	10	3	30
Pipe length	5	2	10	5	2	10	10	2	20
Impact to jurisdictional areas	5	3	15	5	3	15	5	3	15
Pipe security	10	3	30	10	3	30	10	3	30
Impact on transportation and traffic	10	2	20	5	2	10	5	2	10
Water quality	10	3	30	5	3	15	5	3	15
Aquatic Resources	10	3	30	5	5	25	5	5	25
Cost	10	3	30	10	3	30	5	3	15
Noise impact	10	2	20	5	2	10	10	2	20
Essential fish habitat	10	2	20	10	2	20	5	2	10
Ease of access	10	2	20	5	2	10	5	2	10
Corals	10	2	20	5	2	10	5	2	10

TOTAL

410

365

385

CONCLUSIONS

1. The alternative of building a terminal at or near the CTSJ is not feasible, nor practicable, when comparing potential environmental impacts associated with the construction of a natural gas pipeline to service AEE's power stations. It must be considered that the process of constructing and operating an LNG import terminal is complex. Permits and endorsements are regulated by the Federal Energy Regulatory Commission (FERC). In comparison, the EcoElectrica studies and permit process to construct an import terminal and start of the operation took between 7 to 10 years. This timeline would not satisfy AEE's need to begin a project to facilitate the transition from oil to a renewable source of energy. The cost of the existing EcoElectrica terminal fluctuated around \$570 million in 1995. Considering inflation, the construction of a similar terminal today would be too onerous as it would be beyond \$1 billion. As a project of the Government of Puerto Rico, it would require funding through bond issues, limiting savings on electrical bills.

Although an area of maritime use, the CTSJ (as well as the other two stations in the northern area) does not comply with depth criteria or the anchor capacity for the necessary tankers. This alternative lacks a dredged material disposal area and necessary dredging activity would adversely impact the benthic community in the area. Maritime traffic would be highly compromised by the existence of only one entrance channel to San Juan Bay. It is believed that locating a receiving terminal here would adversely impact the local economy, as well as the tourism industry.

2. The system of mono buoy and tanker would cost approximately \$70 to \$80 million per year. The plants (Cambalache, Palo Seco and San Juan) have a small footprint and do not have space to locate the terminal facility to receive the CNG. The period of time required to put the system into operation, in compliance with all applicable federal and State legislation is estimated between 5 to 8 years. Although this project is not viable at this time, PREPA will continue to study this possibility since multiple projects using two buoys a natural gas without compression have been constructed in the US Mainland and are operating successfully.

3. Although the terrestrial route is not without impacts, it is the best alternative to deliver natural gas to PREPA's plants in northern Puerto Rico. Impacts to human and other resources can be avoided, minimized or mitigated. There is extensive knowledge about the resources affected by the project and PREPA will work following the regulatory agencies recommendations and strict construction codes.

ELECTRIC POWER AUTHORITY
Puerto Rico's Via Verde Project
Preliminary Environmental Impact Statement (DIA-P)

Summary

This project is one of the tools needed to address the emergency regarding the infrastructure for generating electric power decreed by the Hon. Luis G. Fortuño Bursset in Executive Order OE-2010-034, under Law 76 of May 5, 2000. In addition, it is essential to comply with the commitment of his work program aimed to reduce the energy cost and to strengthen Puerto Rico's economy.

What is proposed is the construction of a 24" diameter steel pipeline to transport natural gas from the facilities of EcoEléctrica to the Cambalache, San Juan and Palo Seco Power Plants. The pipeline will be underground, it extends for some 92 miles and it will run through the municipalities of Peñuelas, Adjuntas, Utuado, Arecibo, Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado, Toa Baja, Cataño, Bayamón and Guaynabo. The works will include clearing the right of way, excavation of trenches and installation and testing of the pipeline. In addition, they include modifications to units of the Cambalache, Palo Seco and San Juan power plants to enable them to burn natural gas as well as liquid fuels. The estimated cost of the project will be \$447,000,000 dollars which includes the cost of design, purchase, conveyance of and delivery of materials, construction, payment of municipal licenses and taxes, if applicable, purchase of land, studies and permits. The cost for the conversion of the units to natural gas is estimated to be between \$50 to \$70 million dollars. Approximately between 1,000 and 1,200 temporary direct and 4,000 to 5,000 indirect jobs will be generated.

A. Project Rationale

Currently, 99% of the electricity generated by the Electric Power Authority (Autoridad de Energía Eléctrica or AEE, in Spanish) is obtained from petroleum. The excessive and unpredictable increase in the cost of liquid fuels makes us less competitive in a global economy. To control and reduce the high cost of electricity the AEE's Governing Board approved a General Strategic Plan for the Development and Expansion of Generating Capacity. This Plan established, as a quicker, more viable and environmentally safe alternative, that generating capacity would be added using natural gas as the main fuel, as part of the strategy to diversify fuel that would allow us to reduce the operating costs and to maintain sustained environmental compliance.

The main reasons for this determination are the following: in Puerto Rico there already is a Liquefied Natural Gas Terminal; the historical and projected price of natural gas is lower than the distillate fuels and it will be cheaper than residual No. 6 fuel oil; reduces the maintenance cost of the units, which are prepared, or can be modified, for its use; the technology is developed and tested; and there exist confirmed reserves of natural gas in different parts of the world. The use of natural gas for the production of electric

energy increased during the last three years in the United States thanks to the implementation of an intensive domestic policy to promote the extraction of this fuel from non-conventional sources. This action was reflected in the international markets as a reduction in the price of the fuel, which permits Puerto Rico to buy this product at low and favorable prices.

In addition, when analyzing Puerto Rico's economic situation, and its relation with the sudden changes in the cost of liquid fossil fuels, it was concluded that Puerto Rico's economy is not viable, unless its vulnerability to the shocks of crude oil markets is reduced dramatically.¹ This reduction is achieved by diversifying the sources for generating electricity through the use of natural gas, as a transition to the effective use of renewable sources of energy in the future. The direct result will be the strengthening of our economy and, at the same time, the improvement of the environment, as demonstrated by the interpretation made by economists of the Environmental Kuznet's Curve.

Most of the electricity is produced in the south of Puerto Rico, but it is consumed in greater quantities in the north. Hence, the need for a geographical diversification with respect to the generation of electricity. With the construction of the Via Verde project, the AEE will be able to increase generation in the north and to improve the electrical system reliability.. This will give the AEE greater flexibility to choose the parameters to work on the point and with the fuel that will permit the most efficient and economical generation of electricity and with a lesser generation costs and impact on the environment.

On the face of the economic crisis confronting Puerto Rico, the AEE amended its Fuel Diversification Plan to accelerate the transition, through the use of natural gas, to the effective use of renewable energy sources. In the measure in which the use of natural gas cheapens the cost of electric energy and drives the country's economic recovery we will be in position to promote the development and establishment of generation from renewable energy sources. With this in sight the AEE signed several contracts to receive and acquire from private cogenerators a total of 295 MW in renewable energy projects and it is considering proposals to receive and acquire an additional 207 MW. In addition, internally the AEE is studying the viability of renewable solar thermal energy which would generate 50 MW.

B. Description of the Environment

A description of the environment in the zones through which the project will pass is

¹ Comments in reaction to the conference titled "Transition to an Energy Use and Production Structure that will Permit Efficiency and Growth at a Sustainable Rate" by Gerrit Jan Schaeffer, drafted by Dr. Elías R. Gutierrez, February 19, 2010.

discussed in Chapter 3. The project consists of the construction and installation of a natural gas transportation system through the municipalities of Peñuelas, Adjuntas, Utuado, Arecibo, Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado, Toa Baja, Cataño, Bayamón and Guaynabo. The same will have a longitude of 92 miles approximately and will require a maintenance right of way of 150' on each side of the pipeline. The construction will impact, within the right of way and throughout its length, a width of 100' (30.48 m) for the construction within which will be created a 50' (15.24 m) operational right of way and the remaining 50' in width will be restored to its original state once construction activities are completed. The total area impacted by the project will be 1,113.8 acres approximately. An additional area of 32 acres will be required for special and particular situations necessary in this type of construction.

The 48 wards (barrios) through which the pipeline will cross are: in Peñuelas, the wards of Tallaboa Poniente, Encarnación, Tallaboa Saliente, Tallaboa Alta and Rucio; in Adjuntas the wards of Saltillo, Portugués, Vegas Arriba, Vegas Abajo and Pellejas; in Utuado, the wards of Arenas, Salto Arriba, Pueblo, Salto Abajo, Río Abajo, Caguana and Caniaco; In Arecibo, the wards of Río Arriba, Hato Viejo, Carreras, Tanamá, Cambalache, Santana, Factor and Garrochales; in Barceloneta, the wards of Garrochales and Palmas Altas, in Manatí, the wards of Tierras Nuevas Poniente, Bajura Afuera, Río Arriba Poniente, Río Arriba Saliente and Coto Sur; in Vega Baja, the wards of Pugnado Afuera, Río Abajo and Almirante Norte; in Vega Alta, the wards of Bajura, Sabana and Espinosa; in Dorado, the wards of Higuillar, Maguayo and Mameyal; in Toa Baja, the wards of Media Luna, Candelaria, Sabana Seca and Palo Seco; in Cataño, the Palmas ward; in Bayamón the Juan Sánchez ward and in Guaynabo the Juan Sánchez ward.

The environmental document presents a general description of the different environmental aspects characteristic of each one of the municipalities through which the Via Verde pipeline will cross. In addition, the AEE has contracted Asesores Ambientales y Educativos (AAE) to conduct the project's environmental studies. They, in turn, contracted diverse firms to realize the same. The firms contracted were the following: for the flora and fauna study the firm of Coll, Rivera Environmental; for the geology study, the firm of Geo Cim, Inc; for the Jurisdictional Determination, Coll Rivera Environmental; for the archeological study Phase 1A, archeologists Marisol Rodríguez Miranda and Carlos Ayes Suárez. These studies are part of the appendixes that are presented together with the environmental document.

The most relevant aspects regarding the environment are summarized as follows:

- Flora and fauna

For purposes of the flora and fauna, the study area was divided into five sub-areas: subtropical dry forest, subtropical wet forest plains, mogotes of the subtropical wet forest, subtropical wet forest, and lower-montano subtropical wet forest.

For the subtropical dry forest, the total plant species found was 164, divided into 57 families, and the total animal species found was 65 divided into 33 families. Of these, the critical species of flora, regulated and in danger of extinction, according to the Department of Natural and Environmental Resources (DNER) were: palo de vaca (pigeon-berry), jayajabico (soldierwood), guayacán blanco (Hollywood lignumvitae), *Passiflora bilobata* Jussieu, palo de violeta (violet tree) and jusillo (*Henriettea squamulosum*). The species of fauna were: pato quijada colorada (White-cheeked Pintail or Bahama Duck), guabairo (Puerto Rican Whip-Poor-Will, *Caprimulgus vociferous noctitherus*), paloma perdiz áurea (Key West Quail Dove), calandria (Puerto Rican Black-Cowled Oriole) and bien-te-veo (Puerto Rican Vireo).

For the subtropical wet forest plains the plant species was 353, divided into 86 families, and the total animal species was 90, divided into 47 families. Of these, the critical flora species, regulated and in danger of extinction, according to the DNER were: higüerillo (white fiddlewood), cedro hembra (Spanish cedar), ceiba (Silk-cotton tree) and avispillo (Jamaica ocotea). The species of fauna were: culebra corredora (Puerto Rican Racer Snake), paloma cabeciblanca (White-crowned Pigeon), boa de Puerto Rico (Puerto Rican Boa), buruquena (Freshwater Crab), calandria (Puerto Rican Black-Cowled Oriole) and the bien-te-veo (Puerto Rican Vireo).

For the area of subtropical wet forest mogotes the total species of plants was 424, divided into 91 families and the total species of animals was 86, divided into 41 families. Of these, the critical species of flora, regulated and in danger of extinction, according to the DNER were: palo de vaca (pigeon-berry), doncella (*Brysonima coriacea*), ceiba (Silk-cotton tree), almez (*Celtis australis*), ortegón (*Coccoloba swartzii*), palma plateada (Tyre palm), jayajabico (soldierwood), palma de lluvia (Llume palm), corcho blanco (Water Mampoo), *Hyperbaena domingensis*, lebisa (*Licaria triandra*), *Maytenus ponceana*, *Passiflora Murucuja* L., palo de violeta (Violet Tree), *Pristimera caribaea*, almendrón (Florida poison tree), palma de sombrero (Puerto Rico Palmetto), ortiga (*Urera baccifera*), *Zamia amblyphyllidia*. The species of fauna were: culebra corredora (Puerto Rican Racer snake), boa de Puerto Rico (Puerto Rican Boa), calandria (Puerto Rican Black-Cowled Oriole) and the bien-te-veo (Puerto Rican Vireo).

For the area of the subtropical wet forest the total species of plants was 363, divided into 94 families, and the total species of fauna was 64, divided into 28 families. Of these, the critical species of flora, regulated and in danger of extinction, according to the DNER were: culantrillo, higüerillo (white fiddlewood), doncella (*Brysonima coriacea*), cedro hembra (Spanish-cedar), ceiba (Silk-cotton tree), plateado (*Exostema ellipticum*), *Hibiscus trilobus*, palo de peo (*Lasianthus lanceolatus*), laurel (Jamaica ocotea), almendrón (Florida poison tree), yagrumillo (*Schefflera gleasonii*) and ortiga (*Urera baccifera*). The species of fauna were: culebra corredora (Puerto Rican Racer Snake), calandria (Puerto Rican Black-Cowled Oriole) and bien-te-veo (Puerto Rican Vireo).

For the area of lower-montano subtropical wet forest the total of plant species was 86, divided into 41 families and the total animal species was 20, divided into 12 families. Of

these, the critical flora species, regulated and in danger of extinction, according to the DRNA was cedro macho (*Hyeronima clusioides*). The fauna species was the bien-te-veo (Puerto Rican Vireo).

Although according to the consultation made with the United States Fish and Wildlife Service (F&WS), the project could affect habitat adequate to several species, none of these species was detected during the field work, with the exception of the guabairo (Puerto Rican Nightjar).

- Geology

According to the study of the geology, the area through which the project will cross is very diverse and it encompasses close to 90 million years of Puerto Rico's geological history. The geological report indicates that the alignment crosses two geological faults that cross in the general direction of east to west in the Juana Diaz outcropping, both of the normal type. These, like the other geological faults that cross the alignment, are considered inactive. The alignment enters the layer of rocks from the Eocene (40 to 55 million years ago) which is comprised in the Great Southern Puerto Rico Fault Zone. The layer, some 4.5 km wide, extends until the margin of the Utuado Pluton, an extensive mass of intrusive rock that is also within the alignment. Also, along a 14 km stretch, the alignment crosses two of the types of topographical zones that characterize the Karst Zone; which are not necessarily part of the protected Karst Zone, according to the DNER.

The report concludes with a discussion of the limitations that the alignment's geology can present to the Via Verde project. , It indicates that none of them present a major impact to the project, since all of them are addressed with the geologic and geotechnical study that is the basis for the design and construction which minimizes or eliminates their possible impacts.

- Natural systems

The project will cross through a great variety of natural and artificial systems characteristic to the island. The most significant natural and artificial systems within a distance of 400 mt or less of the proposed project alignments were considered in the document.

Next to the project are five bays (the Tallaboa Bay in the Municipality of Peñuelas, the Guayanilla Bay in the Municipality of Guayanilla, the Toa Bay in the Municipality of Toa Baja, the San Juan Bay and the Puerto Nuevo Bay); one cove (Boca Vieja in the Sabana Seca ward of the Municipality of Toa Baja); three estuaries (the estuary of the Tallaboa Bay, the Cocal River estuary, and the San Juan Bay estuary); one beach (Punta Salinas Beach); three forests (Bosque del Pueblo, Rio Abajo Forest and Vega Forest); two quarries (in the municipalities of Peñuelas and Utuado); two salt mines (in the Tallaboa Poniente ward of the Municipality of Peñuelas); four marsh areas

(freshwater marsh in the Santana ward and the Caño Tiburones marsh, both in the Municipality of Arecibo; San Pedro marsh in the Sabana Seca ward of the Municipality of Toa Baja, and Las Cucharillas marsh between the municipalities of Guaynabo, Toa Baja and, for the most part, Cataño); 31 aquifer areas (two each in the municipalities of Peñuelas, Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado, Toa Baja and Cataño; three in the Municipality of Adjuntas; five in each of the municipalities of Utuado and Arecibo; and one each in the municipalities of Bayamón and Guaynabo); three springs in the Municipality of Arecibo; 18 canals (three in the Municipality of Peñuelas, seven in the Municipality of Arecibo, three in the Municipality of Manatí, one in the Municipality of Vega Baja, one in the Municipality of Dorado, two in the Municipality of Cataño, and one in the Municipality of Guaynabo); six lakes and lagoons (one artificial body of water in the Tallaboa Alta ward of the Municipality of Peñuelas; the Adjuntas lake, in the Juan Gonzalez ward; the Pellejas lake in the Pellejas ward, and the Garzas lake between the Garzas and Saltillo wards; the Matrullas lagoon in the Palo Seco ward of the Municipality of Toa Baja; and Secreta lagoon in the Palmas ward of the Municipality of Cataño); six cave systems (five in the Municipality of Arecibo and one in the Municipality of Vega Baja); a 3.91 lineal-mile crossing in the Carst Belt Region in the Municipality of Manatí; 156 drinking water wells and sampling stations; 117 creeks; 13 rivers (the Tallaboa river in the Municipality of Peñuelas; the Corcho river in the Portugués ward of the Municipality of Adjuntas; the Pellejas river in the Vegas Abajo ward of the Municipality of Adjuntas; the Rio Grande de Arecibo in the Pellejas ward of the Municipality of Adjuntas, and in the Carreras, Hato Viejo and Tanamá wards of the Municipality of Arecibo; the Caguanita river in the Caguana ward of the Municipality of Utuado; the Caguanas river in the Caguanas ward of the Municipality of Utuado; the Tanamá river in the Tanamá ward of the Municipality of Arecibo; the Rio Grande de Manatí in the Palmas Altas, Bajura Afuera and Rio Arriba Poniente wards of the Municipality of Manatí; the Cibuco river in the Municipality of Vega Baja; the La Plata river in the Municipality of Dorado; the Cocal river in the Sabana Seca ward of the Municipality of Toa Baja; the Hondo river in the Palmas ward of the Municipality of Cataño; the Bayamón river in the Palmas ward of the Municipality of Cataño); four natural reserves (Tiburones Canal Natural Reserve, Hacienda La Esperanza Nature Reserve, El Indio Natural Reserve and the Las Cucharillas Marsh Nature Reserve); 128 sinkholes (3 in the Municipality of Utuado, 64 in the Municipality of Arecibo, 47 in the Municipality of Manatí, 9 in the Municipality of Vega Baja, 2 in the Municipality of Guaynabo and one each in the municipalities of Dorado, Toa Baja and Cataño - the alignment will cross over 21 of which 14 had already been impacted by PR-10).

It is stressed that the project will not impact or affect coral reefs, cays, dunes, cisterns, dams, reservoirs, drinking water intakes or irrigation systems because none are in areas near the project.

- Determination of Jurisdiction

The determination of jurisdiction study concluded that of the 2,988,833.3 m² (738.6

acres) of wetlands under the jurisdiction of the United States Corps of Engineers delimited for this project, the project's construction right of way will cover some 369.3 acres.

The delimited wetlands are classified in the following categories: palustrine forested, palustrine herbaceous, palustrine herbaceous in agricultural use in the past or in the present, estuarine forested, estuarine forested canals and estuarine salt marshes. Approximately 2.0 acres of palustrine forested wetlands were delimited; 310.1 acres of palustrine herbaceous wetlands; 397.8 acres of palustrine herbaceous wetlands in agricultural use in the past or in the present; 23.6 acres of estuarine forested wetlands; 1.2 acres of estuarine forested canals; and 3.9 acres of estuarine salt marsh wetlands.

- Soil Classifications

The project is distributed in 419 plots of which 84.8% belong to the private sector and 15.2% to the public sector. The different types of use of the soils through which the alignment will cross were distributed approximately in the following manner: industrial area, 3.1%; public and recreational area, 2.8%; transportation area, 0.3%; commercial area, 0.1%; residential area, 1.0%; agricultural area, 56.2%; forest area, 35.3%; and hydrographic-hydrological area, 1.3%.

Of the 92 miles the project encompasses, 4.3% will be in a zone classified as having a 0.2% annual probability of risk of flooding, 0.43% will be in a zone classified as A (areas with a 1% annual probability of flooding and a 26% probability of flooding within 30 years), 38.9% will be in a zone classified as AE (areas with a 1% annual probability of flooding and a 26% probability of flooding within the next 30 years), 3.8% will be in a zone classified as VE (area with an annual probability of flooding equal to, or greater than 1% and a 26% probability of flooding within 30 years) and 54.5% will be in a zone classified as X (area with an annual probability of flooding of less than 1%).

- Highway crossings

Sixty three (63) state highway crossings are identified as intercepted by the project's alignment. These are indicated in Addendum 1, Highway Crossings.

- Proximity to the communities and quiet zones

The sectors or communities close to the project's alignment, approximately 400 meters or less from them, and each municipality's quiet zones closest to the project were determined. The findings are gathered in Addendum 2, Distance to the Communities and Quiet Zones.

- Archaeological and architectural findings and cultural and historic sites

The Phase 1A study identified the already known archaeological resources and

established the basis for discovering additional resources in the project's area. The following findings are worth highlighting:

In the Municipality of Peñuelas - vestiges of the railroad line and the Loyola Hacienda in the Tallaboa Poniente ward; a small shell heap with pottery and conch shell fragments from the chicoid taino period in the Encarnación ward; the Dolores and Coto Haciendas in the Rucio ward.

In the Municipality of Utuado: an archeological find near the cemetery and the river crossing.

In the Municipality of Arecibo: archaeological residues inside a cave with habitation remains and several in the Rio Arriba ward; archaeological finds in Refugio Salmón and in the Ventana cave, in the Hato Viejo ward; residues, a cave or rockshelter, petroglyphs and pictographs and historical material were found in Matos Cave in the Carreras ward.

In the Municipality of Barceloneta, in the Palmas Altas ward there are vestiges of the railroad line that intercept the alignment at mile 53.25. The Phase 1A Archaeological Study recommends a 1B Phase, with the exclusion of the mountainous areas and the Tiburones Marsh zone, for the whole area the project will traverse in this municipality.

In the Municipality of Manatí: two architectural structures, the Truss Bridge and Central Monserrate sugarcane mill.

In the Municipality of Vega Baja: an architectural structure, Hacienda Monserrate; the study recommends going ahead with Phase 1B in the Paso del Indio area.

In the Municipality of Vega Alta: architectural structure, a bridge; the Abra de los Perros Cave is considered an area of archaeological findings.

In the Municipality of Dorado: Casa Hernandez or the residence of Mrs. Antonia Ramirez; abundant dispersed materials were found of the Taíno/Colonial period of the late 19th Century; material on the surface of the Taíno, subtaíno, late saladoid and colonial period in Punta Corozo; a multi-component site with Taíno and late 19th century colonial period in the Mameyal ward.

In the Municipality of Toa Baja: Santa Elena dairy farm; fragments of 19th century historical ceramic dispersed on the surface; ruins of the Our Lady of Candelaria shrine in the ancient Hacienda El Plantaje, in the Sabana Seca ward of Toa Baja; an archaeological site under the gravel topping in the posterior part of land belonging to the Electric Power Authority, in the Palo Seco ward.

In the Municipality of Cataño: Hacienda Palmas in the Palmas ward.

C. Study of Alternatives and selection of the alignment

Chapter 4 analyzes in detail the alternatives considered for the execution of this project. The following were considered among such alternatives: land alignments for a natural gas pipeline; the use of a system of barges and buoys to receive, re-gasify, store and provide natural gas; the construction of a liquified natural gas receiving and re-gasification terminal. In addition the utilization of renewable energie options technically and commercially proven and the No Action alternative were also considered.

- No Action

The No Action alternative was found to be not feasible given the transcendence, importance and public well-being sought by the project. It was considered that, although this alternative would avoid the impact related to the construction, installation and operation of a pipeline to transport natural gas, such impact can be minimized and mitigated. This alternative is not indicative of no impact, since it forces the continued burning of petroleum derived products which generate a greater amount of pollutinon and emissions into the air and at higher costs than the burning of natural gas, which would make the service of electric power more expensive and it would negatively impact Puerto Rico's economy.

The No Action option would not permit maintaining a structure of fixed costs that would avoid the abrupt peak changes in the cost of the fuel acquired. This can only be avoided by reducing the dependence on the use of petroleum and expensive fossil fuels. In addition, the limitations of the federal and state permits on the type of fuel that can be burned would lead us to one of two options: to cease generating electricity, which is not viable, or burn a cheaper fuel with higher sulfur content than that contained in said permits, which would expose us to fines and sanctions.

- Liquified natural gas receiving terminal in the San Juan Power Plant

Even though Puerto Rico has an Liquefied Natural Gas (LNG) Terminal with the capacity to supply our needs, at the EcoElectrica Cogenerator facility, the alternative of constructing a new LNG terminal near the San Juan Thermoelectric Plant was considered because it would be near an existing dock for the receipt of fossil fuel. Three criteria were used determine whether this was a viable alternative: specific site factors, maritime operations, and environmental issues.

The analysis of these criteria leads us to the conclusion that this was not a viable alternative for the following reasons: we would need to dredge the navigational canal and the turning basin; the dredged material would present the problem of securing an adequate disposal location; the dredging and disposal operations would produce a high concentration of sediments, which would impact the benthic area and the water quality even more; maritime traffic would be adversely affected and as a consequence our economy and tourism because the San Juan Bay is the backbone of our tourist

economy; the increase in maritime traffic would affect marine life in the area; there would be an increase in the temperature of the Puerto Nuevo Bay waters, which would have a cumulative effect on the benthic community of the bay, water quality would be affected and, in consequence, the water quality parameters required in the environmental permits which govern the power plant; due to space limitations in the power plant and in areas near it, we would be unable to comply with the regulations that determine the space that must exist between the different elements within the terminal and the establishment of an exclusion zone or distance from populated areas; the environmental impact associated with the construction of the pipelines to transport natural gas in the North of the island would not be eliminated; the process of studies and permits together with the construction and commencement of the operation could take from 7 to 10 years, it would not satisfy our need for an immediate project to propitiate the transition from petroleum to renewable sources of energy; the project would be too onerous because it would surpass \$1,000 million.

- Systems of barges and buoys

The installation of a system of barges and monobuoy for the receipt, storage, re-gasification and transport of the natural gas was considered as one of the alternatives. The AEE evaluated the viability of the construction of these systems in three areas: San Juan, Toa Baja and Arecibo. The criteria considered in such evaluation were: costs, space, time to have it operational, permits, safety, environmental justice, past experiences in Puerto Rico and the United States.

The process for the design, construction and operation of the barges and buoy system would have an approximate cost for each power plant of between 70 and 80 million dollars yearly, subject to the signing of a contract with the company in charge of the process for a term of not less than 20 years. At the end of the 20 years the cost would be some 1.6 billion dollars for each power plant. The time period required to start the operation of the system would be between 5 and 8 years. In addition, an analysis for each power plant demonstrated that it is not a viable alternative in the short term.

The San Juan Power Plant does not have space available to locate the receiving terminal; the pipeline to the power plant would run through an area of intense maritime traffic; there are low-income communities near the project that would be affected; the proximity of CAPECO would influence the community's perception of the project.

The Palo Seco Power Plant does not have space to locate the receiving terminal; the permits process is complicated and costly; there are low-income communities near the project that would be affected, the proximity to CAPECO would influence the community's perception of the project.

The Cambalache Power Plant does not have space available to locate the receiving terminal; the permits process is complicated and costly; there are low-income communities near the project that would be affected.

The foregoing ruled out the construction of a system of barges and monobuoy for the receipt, storage, re-gasification and transport of natural gas within the time frame required for the action under consideration. Consequently, the supply of natural gas to this power plant will have to be through a gas transport pipeline, inevitably.

- Natural gas pipeline

In this analysis, some components of the study owned by the AEE and conducted under contract by *Power Technologies Corporation (PTC)* in 2006, titled: *Corridor and Alternative Routes Selection Study*. The two alignments suggested in the PTC study to carry natural gas from EcoEléctrica to Cambalache Power Plant were analyzed, together with a third alignment not considered in the study. The same was done with the alignments suggested in the study for the transport of natural gas from Cambalache Power Plant to the metropolitan area power plants, Palo Seco and San Juan.

For the selection of the alignment with the greater potential for development, the three alignments for each stretch were compared and the alignment that obtained the greater number of positive criteria in its favor was selected. Eight criteria were used to compare each stretch: land use; bodies of water impacted; miles of forest or natural reserves impacted; endangered species; archaeological findings; highway crossings; zoning or soil calification and nearby residences. For each criterion, a positive (+) value was assigned to the most favored stretch, except for the criterion of nearby residences, which was assigned a value of two (++) positives since one of the primary goals of the project is to be as far away as possible from communities or inhabited areas.

The matrix created would indicate which alignment would have the greater potential for development for each stretch. The alignment selected for the project would be the union of the two favored segments. Necessary variances were incorporated into this selected alignment due to different reasons: minimal impact to the communities, avoiding or minimizing the environmental impacts, economic factors and factors associated to the construction. The total number of variances incorporated were 18, broken as follows: 12 variances to keep far away from communities; three variances to avoid or minimize environmental impacts; one variance for economic factors; and two variances for construction reasons. The incorporation of these variances resulted in the alignment presented in this environmental document.

D. Project Description

Via Verde will provide a natural gas transport system from EcoEléctrica in Peñuelas to the AEE's Cambalache, Palo Seco and San Juan power plants through some 92 miles of 24" diameter, underground steel pipeline.

The pipeline and the other construction materials will be ordered from companies outside of Puerto Rico and will be received by the Port of the Américas and the San

Juan Port Zone. Six operation centers will be established located adjacent to each port, plus in the areas of Utuado, Arecibo, Vega Alta and Toa Baja. Their locations are already impacted by industrial activity and their use will be temporary in nature while the project is under construction. They will serve as bases for the receipt, storage, inventory and dispatch of materials and equipment for the project.

The project will have a cost of \$447,000,000 dollars. This sum includes the items of design, purchase, hauling and delivery of materials, construction, payment of licenses and taxes, land acquisitions, studies and permits. The cost of the conversion to natural gas of the units is estimated at between 50 and 70 million dollars.

Before the excavation begins there will be coordination with the Public Service Commission or with the Permit Office (Oficina de Gerencia de Permisos), as applicable, so that the agencies or companies with underground infrastructure mark the location of said infrastructure. Whenever possible, a minimum distance of 24" from other underground infrastructure will be maintained.

Four gas flow meters with their respective equipment, one bidirectional PIG launcher/receiver and one PIG receiver will be installed, and connections will be provided for a portable PIG launcher/receiver unit. The latter are to carry out inspections, measurements and cleaning inside the pipeline. In addition, isolation or security block valves will be installed to isolate segments in case of inspections, repairs or emergencies, the number and location of which will be determined by the class and location.

The equipment will have the capacity to operate at maximum pressure and temperature of 1,450 psi and 120°F, but the entry pressure will be 650 psi and it will be reduced to 400 psi before it enters the combustion turbines.

- Natural Gas

Natural gas is a fossil fuel formed by organic matter underground at high pressure for geological-scale times. It is a mixture of hydrocarbons whose principal component is methane (CH₄). It is colorless and odorless and it is lighter than air; its specific gravity fluctuates between 0.55 and 0.64; its explosive limit is 3-17%, outside of these limits there is no combustion. Natural gas is non-toxic, but it is a simple asphyxiant if it displaces oxygen, which could produce dizziness, deep breathing or, due to the need for air, nausea and unconsciousness in case of overexposure, which would require immediate medical attention. It is not classified as carcinogen or potentially carcinogen.

To address leakages the emergency response and rescue personnel must use a self-contained respirator (SCBA) and fire-resistant clothing, and they must have the training required by Law (29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*). All personnel must be evacuated from the affected area and if it is in a confined space, the area ventilation is to be increased.

One cubic foot of natural gas produces an average of 1,000 BTU. It represents one fifth of the world's energy consumption. It is one of the cleanest fossil fuels and better for the environment because the sulfur dioxide emissions are minimal and those of nitrous oxide and carbon dioxide are less than those of other fossil fuels. The natural gas industry is comprised of three segments: production, transmission and distribution. In Puerto Rico it is used in its entirety for the generation of electricity although natural gas has other domestic, commercial, industrial and transportation uses.

- Personal safety

The construction project will be contracted out. The contractor will be responsible for submitting a work plan which includes the health and safety aspects established in the Code of Federal Regulations, Title 29, *Labor*, Part 1910, *Occupational Safety and Health Standards* and Part 1926, *Safety and Health Regulations for Construction*.

- Construction stages

The construction will be done by segments and it will follow a specific sequence (production line style). Each construction stage will be described below.

- Identification of owners, Surveying I and Environmental Studies

The *New Star Acquisitions* company was hired for this stage. They identified the land owners; they were asked for an access permit to carry out the land surveying and the pertinent environmental studies and one was signed. In the first stage of the surveying the LIDAR aerial technology was used; with the alignment's coordinates the environmental studies were started.

- Clearance of the right of way

Once the land comprising the right of way has been acquired, heavy machinery will be used to clear and level. Although the construction right of way will be 100' in flat areas, on mountainous areas and in places where the horizontal directional drilling is made, it may range from 100 to 300 feet. It is estimated that 1,113.8 acres will be impacted and 687,760 cubic meters of soil will be removed. The soil removed will be stored to be used later in the restoration stage. The necessary measures will be taken to minimize sedimentation of the water bodies.

- Land surveying

The center points of the line will be checked and marked. Then the pipeline (in 40-foot long spreads) is laid throughout the alignment.

- o Trench Construction

Specialized machinery will be used for the construction of the trenches (*wheel ditcher*) or machinery with a mechanical arm, depending on the conditions of the area. The trenches will be 5 to 6 feet deep and 4 to 5 feet wide, so as to allow a 3-foot cap over the pipeline. The removed soil will be sifted and stored alongside the trench to cover the same later. The remainder will be disposed of in an authorized landfill. It is estimated that 494,206 cubic meters of soil will be removed.

The highway crossings will be made by boring and the pipeline will be at a minimum of 4 feet under the same highway. (See addendum 1, Highway Crossings). These segments will be designed to tolerate the weights associated to the highway and the vehicles that pass through it. The crossings of bodies of water and of some highways will be made by horizontal directional drilling (HDD). This is a "dry" crossing method because it does not interfere with the flow of the body of water, and it is made underneath the bed of the body of water. A dye will be added to detect small bentonite leaks. Ten bodies of water were identified that will be crossed by HDD. In addition, 66 crossings of bodies of water were identified to be crossed by open trench. Addendum 3, Crossings of Bodies of Water, contains the bodies of water and the coordinates where the project will cross.

- o Welding and bending

Once the pipeline is positioned, the necessary bending is made to couple it to the ground with machinery that exerts hydraulic pressure. Then it is laid on supports, the ends are cleaned, lined up and welded using the manual submerged arc welding method. The welded seams will be checked with non-destructive methods; if any flaw is detected, the weld is repaired or it is cut off and a new weld is made. Lastly, the ends are covered with a protective coating. Next a second inspection of the pipeline protective coating is made.

- o Lowering and backfill of the trench

The pipeline is lifted using specialized machinery (sidebooms) and it is lowered into the trench. Fine-particle sifted soil is used first to back-fill the trench to prevent damage to the protective coating. Then the remainder of the soil and small stones are deposited on the excavated trench and finally the top soil is placed within the construction area. In total the minimum cover will be 36 inches and 48 inches in agricultural areas. The recommendations of the Highways Authority with respect to the backfill material to be used will be followed in crossings of highways, roadways and roads where the open trench method was used.

- Hydrostatic testing

In compliance with 49 CFR 192.505, *Strength test requirements for steel pipeline*, hydrostatic testing will be conducted on the totality of the pipeline. The pressure will be higher than the operating pressure for at least eight hours.

- Pipeline right of way restoration

After passing the hydrostatic test, the right of way will be restored. Of the 100 feet width of the construction right of way, 50 will be restored to their original state; the remaining 50 feet will be a permanent or operations right of way, which will be restored only with wild vegetation or lawn without deep roots. In agricultural lands it may be used to plant crops that don't have deep roots. On wetlands, mitigation will be carried out "on site".

- Construction in special areas

- Wetlands and mangrove areas

In non-saturated areas the same equipment and procedure of open trench will be used. In saturated areas, the pipeline is welded outside the wetland area; the excavation and backfill of the trench is made with backhoes; the pipeline is installed by the push and pull method through flotation buoys; the buoys are removed and the pipeline is sunk by its cement coating or using weights.

To prevent the equipment from sinking or to avoid disturbing the soil or excessive turbidity of the water, timber mats or timber rip-raps will be placed. The organic cover extracted will be stored and used as backfill.

- Earthquake prone areas

Via Verde will be designed and constructed with similar specifications to those used in places with a higher incidence of intense earthquakes, like California and Alaska. The following measures will be incorporated to the design to guarantee the integrity and continuous operation of Via Verde: the relative alignment of the pipeline relative to the faults to diminish the impact of a slip in such fault; burying the pipeline in a wide trench, with long lateral slopes filled with compacted sand to allow for the deformation of the pipeline during a seismic event; including enough bends in the design of the pipeline to guarantee its flexibility; the results of the geotechnical studies that will be conducted to evaluate the properties of the soil.

- Karst zone areas

During the construction there will be a resident biologist at all times to evaluate the area carefully. Only light equipment will enter to minimize the possibility of harm. Adequate

erosion and sedimentation controls will be established. There will not be any operation centers or auxiliary spaces of the construction in this zone. The pipeline will be installed through the pulling method to minimize the heavy equipment. The backfill will be adequate to permit the hydraulic capacity of the soil. Once the trench is covered, vegetation will be immediately planted in the area surrounding the permanent right of way. The pipeline patrolling program during the operation will give special attention to the soil to detect any erosion.

- Use of explosives

The use of explosives will not be necessary. Nevertheless, if any area were identified in which the use of explosives is indispensable, it will be made only by specialized personnel and in compliance with the applicable laws and regulations.

- Conversion of Units to natural gas

The units that will use natural gas for the production of energy will be: Units 1, 2 and 3 of the Cambalache Power Station; Units 3 and 4 of the Palo Seco Power Station; Units 7, 8, 9, 10 and Combined Cycle Units 5 and 6 of the San Juan Power Station. The units will be modified so they can burn natural gas, Bunker C or a combination of both. The minimum and maximum flow of natural gas each power station will need, respectively, will be: 5.5 and 61, 1.1 and 84, 1.1 and 180 MMSCFD. The systems that will require modifications, among others, will be: modifications to boilers and their gas supply system and modifications to turbines.

- Risk analysis and safety measures

The safety aspects of the gas pipelines are addressed by the Office of Pipeline Safety (OPS). It is in charge of carrying out inspections, establish regulations, promote research, issue compliance orders, apply civil and criminal penalties and educate the public, among other functions. The Pipeline Safety Improvement Act established an alliance between the Federal Department of Transportation, the Energy Department and the National Institute of Standards and Technology, to conduct research, make demonstrations and standardize procedures that guarantee the integrity of pipelines. Via Verde of Puerto Rico will be governed by the codes of the Federal Department of Transportation.

According to the OPS, the causes of incidents and accidents in the natural gas pipelines are, in order of probability of occurrence: corrosion, excavations, failure of the construction materials, action of the forces of nature, human error and unknown or miscellaneous causes. The OPS established preventive measures to minimize each one of these risks.

- Information program

One of the most important factors of Via Verde is safety, for which reason keeping the public informed is vital to the success of the project. The AEE established a public information plan in two phases.

The first one already commenced and it covers the periods of time before and during the construction. We continue to present the project to the mayors and their legislative assemblies, to agencies with inherence in the project, professional forums and to the general communities. The presentations have the purpose of: conveying clear, concise and correct information; know and respond to the communities' concerns; and establish a point of contact between the community and the AEE. In addition, the different means of communication are used to convey the information.

The second phase will be during the operation of the project. A written Public Information Plan will be developed in accordance with 49 CFR 192.616, Public Awareness, and the American Petroleum Institute, Public Awareness, Recommended Practice 1162.

- Class location

The different specifications for the manufacture of the pipeline are established in 49 CFR 192.5, Class Location, in accordance with its location or the population density. The regulated specifications that will depend on the classification are, among others: thickness of the pipeline, distance between valves, operating pressure, frequency of inspections and tests. The class unit by location extends to 220 yards (200 meters) on both sides of the line center of any continuous mile of pipeline. There are four classes defined in the following way: Class 1- area near the coast or which contains 10 or less buildings designated for human occupation; Class 2 - area which contains more than 10 but less than 46 buildings; Class 3 - area that contains more than 46 buildings or where the pipeline is within 100 yards of a well defined place (building, children's play area, recreational area, open air theater, or where the public congregates) and is occupied by 20 or more persons, at least 5 days in the week for 10 weeks in any 12 month period (the days and weeks don't need to be consecutive); Class 4 - area where there are four storey buildings or taller.

The classification of the class unit by location may vary by the increase in the population density after the pipeline is installed and in use. The federal regulation establishes that a study must be made to determine, among other things, the hoop stress and the yield strength. This study will determine whether there will be a need to vary the operational pressure so as to adapt to the new class by location. The applicable regulation is 49 CFR 192, sections 609, Change in Class Location: Required Study, 611, 553, General Requirements, and 555, Up rating to Pressures that Will Produce a Hoop Stress of 30% or more of SMYS (Specified Maximum Yield Strength) in Steel Pipelines.

- Pipeline specifications

The life span of the Via Verde pipeline is fifty years. The same will be designed in accordance with federal regulation 49 CFR 192, sections 105, Design Formula for Steel Pipe and 111, 107, 113 and 115, Design Factor for Steel Pipe, Yield Strength for Steel Pipe, Longitudinal Joint Factor for Steel Pipe and Temperature De-rating Factor for Steel Pipe, and standard 5L of the American Petroleum Institute (API 5L). Among the tests to be conducted on the pipeline are: chemical analysis, impact, hardness, hydrostatic and weld tests.

- o Corrosion control

A Fusion Bonded Epoxy (FBE) external coating will be applied to the pipeline. A second coating, Tough Coat, will be applied over the FBE to the part of the pipeline that passes through bodies of water and under highways for protection when the pipeline is pulled from one side to the other. In addition, the pipeline will have cathodic protection to prevent corrosion. The pipeline will be evaluated annually to insure the functioning of the cathodic protection and the voltage will be monitored by monitoring stations that will check the functioning of the rectifiers. All the parameters of the federal regulations will be followed: 49 CFR 192, sections 463, External Corrosion Control: Cathodic Protection, 469, External Corrosion Control, Test Stations. During the operation, a PIG (pipeline inspection gauge) will also be used, a tool that runs the length of the pipeline and uses non-destructive methods to identify and document defects and anomalies in the same.

- o Welding

Welders will be qualified before the project starts; and all of them must pass the tests required for this type of welds. The destructive method will be used for the qualification of the pipeline welds. It consists in evaluating the weld measuring the force needed to break it. Approved welders will be assigned an identification number that must be placed on every welding job s/he performs. If any irregularities are detected in the weld during the X-ray test or the hydrostatic test, the welder will be removed from the job immediately and the weld will either be repaired, or it will be cut off and a new weld will be made. The weld inspections will be visual, by an inspector with specific expertise in the type of weld, and through X-rays. The welds will be covered with a protective coating. The applicable regulation is 49 CFR 192, section 243, Non-destructive Testing.

- o Hydrostatic test

Once the pipeline has been lowered into the trench and covered, it is filled with water and a test pressure greater than the maximum allowable operating pressure (MAOP) is applied. The test pressure is 1.1 times the MAOP in open spaces, 1.25 times in Class 2 locations and 1.5 times in Class 3 locations. The pressure applied is stabilized for 8 hours. The test helps locate areas in the pipeline (including the welds) that cannot

tolerate elevated pressures and which therefore fail.

- Pressure control equipment, isolation valves

To prevent accidents caused by excessive pressure, monitoring and protection equipment to guard from harm caused by elevated pressures will be installed. In addition, valves will be installed that will isolate sections of the pipeline in case of emergency or to perform inspections and repairs. These will be placed by intervals as required by regulation, as a function of the Class by Location.

- Precautions for excavations

The greatest risks to the integrity of the pipeline are excavation activities whereby any contact with the pipeline must be informed to the operator for the corresponding actions. Before excavating, every person must communicate with the Public Service Commission, or the Permits Office (OGP), as applicable. They will communicate with the operator who will mark the pipeline's alignment. Work will be done in conjunction with the municipalities to establish an excavation control mechanism. An inspector will be assigned to be present during the excavation.

- Operator qualification

The OPS requires that the operator and personnel hired by him takes part in a formal personnel qualification program (Operator Qualification Rule, August 27, 1999), which must be in writing. This plan must start before the pipeline begins to operate. The personnel qualification program is governed by 49 CFR 192.805, Qualification Program, and it must be documented in accordance with 49 CFR 192.807, Recordkeeping, to demonstrate compliance with the written plan. The OPS established an inspection protocol for use by federal and state inspectors. In addition, the operation personnel must comply with the Regulations of the Testing Program to Detect Controlled Substances in Officers and Employees of the AEE.

- Clearance distance from the pipeline

The regulation, for the purpose of protecting the underground pipeline, requires that it keep a distance of 12 inches from other underground equipment and infrastructure (49 CFR 192.325). Nevertheless, whenever possible a distance of 24 inches will be kept. The regulation does not provide distance requirements between the pipeline and buildings or dwellings.

- Inspection and maintenance

A Pipeline Integrity Management Program will be developed and established pursuant to 49 CFR 192.911, which will discuss the specific risks for each high consequence area (HCA, or AAC for *Area de Alta Consecuencia* in Spanish) identified in accordance with 49 CFR 192.905. In addition, an Inspection and Maintenance Program will be prepared that will cover the pipeline, flow meters, valves and other equipment. Copies

of these will be kept in our Power Plants and in EcoEléctrica. In addition, pursuant to 49 CFR 192.709, Recordkeeping, a file will be kept for everything related to the repairs, patrolling, inspections and tests.

- Patrolling

The AEE will establish a patrolling program to observe evidences of leakage and conditions in the right of way that may affect the integrity of the pipeline. The patrolling methods will be: walk through, drive through or helicopter flights. The frequency of patrolling is established in 49 CFR 192.705, Transmission Lines: Patrolling, and it depends on the class by location.

- Markers

Once the line is constructed, markers will be placed throughout its length. The places, reasons and information the markers must have are regulated in 49 CFR 192.707, Line Markers for Mains and Transmission Lines.

E. Impacts

Every possible effort was made to avoid areas or habitats of ecological value and to avoid significant impacts. In places where it is unavoidable, measures will be taken to minimize the negative effects and mitigate the impact caused.

- Deforestation and soil movement

It is estimated that 1,113.8 acres of land will be impacted. All the trees and vegetation will be removed from that area. The movement of soil for the project's construction is 1,181,966 cubic meters, approximately. The impact caused by these activities will be soil erosion, sedimentation of bodies of water, emission of fugitive dust, possible reduction in the soil's absorption capacity due to compaction, increase in the potential for the introduction of invasive species and reduction of available habitat for fauna.

- Emissions of fugitive dust

The following measures will be taken to minimize these impacts: a construction permit will be requested for fugitive dust emission sources; a Notice of Intent will be filed and a Storm Water Pollution Prevention Plan will be prepared; sprinkler trucks will be used to sprinkle the areas; dump trucks will use tarps.

- Erosion and sedimentation

To minimize the impact the following measures will be taken: the work area will be demarcated to avoid removal from outside the area; an Erosion and Sedimentation Control Plan will be prepared; a Notice of Intent will be filed and a Storm Water

Pollution Prevention Plan will be prepared; the soil will be stored adjacent to the trenches or be reused as backfill (the remainder will be disposed of in an authorized landfill); the soil will be compacted; and the removed vegetable cover and trees will be mechanically shredded and reused as wood chips; in areas of marked slopes, terraces will be built and covered with wood chips.

- Karst Zone

The protected karst zone in Puerto Rico covers some 151 square miles. Vía Verde will cross over some 3.91 linear miles, or 0.08 square miles of these, which is equivalent to 0.05% of the protected karst zone. During the construction there will be a resident biologist available at all times to evaluate the area carefully. Only light equipment will enter the zone to minimize the probability of damage, for that reason the installation of the pipeline within said area will be using the push and pull method. Adequate erosion and sedimentation controls will be established. There will be no operation centers or auxiliary spaces to the construction in this zone. The backfill will be adequate to allow the soil's hydraulic capacity. Once the trench is covered, vegetation will be planted immediately in the area surrounding the permanent right of way. The pipeline patrolling program during the operation will pay special attention to the soil to detect any erosion.

- Agriculture

The potential impacts on agricultural land will include: crop losses, interference with agricultural drainage, loss of top soil, soil compacting and impact to irrigation systems. Once the construction is finished, the use of the soil will continue as before, including planting as long as it doesn't include trees whose roots may interfere with the pipeline.

The following measures were evaluated to minimize or mitigate the impacts and the viable ones will be implemented: the time of less impact to agriculture will be established; when the soils are used continually for cultivation damages will be indemnified; topsoil will be separated and stored for reuse; erosion control measures will be implemented; the surface soil will be de-compacted to facilitate planting and water absorption; the construction works will be coordinated with landowners and lessees to avoid as much as possible damages to irrigation systems and cattle movement; there will be indemnification for crop losses.

- Deforestation

Loss of vegetation will be inevitable. Therefore the following measures will be taken: the right of way will be delimited to avoid damage in other areas; the soil will be restored to its original state and only the permanent right of way will be kept free of deep-rooted vegetation; a mitigation plan will be devised for cases in which the loss of species with ecological value cannot be avoided; reforestation will be in a 3:1 ratio.

- o Forests

The original alignment crossed through three forests: Bosque del Pueblo, Rio Abajo Forest and De La Vega Forest, which together comprise 10,515.85 square miles of forest. To prevent impacting those, the alignment was varied so as to avoid Bosque del Pueblo totally, the Rio Abajo Forest will not be impacted because the existing, already impacted RoW of PR-10 will be used. The only forest to be impacted will be De La Vega Forest. Its total area is 1.85 square miles and only 0.0086 square miles of it will be impacted temporarily, that is 0.47%. Once the construction is finished, 0.0043 square miles will be restored, whereby the permanent impact will be 0.235%. The impact to the total area of the three forests will be 0.0086 square miles or 0.000082%.

- Wetlands

Thirty-three percent (33%) of the alignment will cross through wetlands. The impact will be reflected on soil disturbances, which will increase the turbidity of the water, there will be temporal and permanent loss of vegetation and impact to resident and migratory species. To minimize the impact on wetlands the following measures will be taken: to avoid the accumulation and putrefaction of the removed vegetable cover, it will be removed outside of the area and disposed of as non-hazardous solid waste; the right of way will be delimited to avoid impact outside of this area; erosion and sedimentation control measures will be established; vehicles with leaks will not be allowed; special wetland construction techniques will be used; loss of vegetation will be mitigated on site; a Mitigation Plan will be prepared in coordination with the concerned agencies.

- Mangroves

This resource will not be impacted since measures have already been taken to avoid the same: the alignment was varied in the four mangrove areas so as to avoid crossing over the same or construction techniques will be used that will not impact them (HDD).

- Surface water bodies

Seventy-eight (78) bodies of water through which the project will cross were identified. The small ones will be crossed by open trench. The impacts include turbidity, sedimentation, diminution of dissolved oxygen, mortality of aquatic fauna and flora. The impact will be mitigated by reducing the construction time: bodies of water fewer than 10 feet wide will be crossed in 24 hours or less; from 10 to 100 feet wide, in 48 hours.

The more voluminous bodies of water will be crossed with HDD. Geotechnical studies will be made and construction plans specific for the site will be developed. The release of bentonite may affect the turbidity, diminish dissolved oxygen and affect the respiration of aquatic organisms. To avoid it a dye will be added to detect leaks and, should one occur, the flow of bentonite will be immediately stopped and the pertinent

Agencies will be notified. Another impact is the size of the construction right of way which will be 150 to 300 feet on both sides of the body of water. Erosion and sedimentation control measures will be established.

- Groundwater and aquifers

Thirty-one (31) aquifers were identified; the possibility of polluting groundwater is remote. To avoid oil and fuel spills a Spill Control Plan will be established.

- Water consumption

The hydrostatic test entails the greater water consumption (7 million gallons) whereby, to eliminate the impact on the public distribution system and the bodies of water, the water will be obtained from the wells for which the AEE has a water franchise. Bottled water from local suppliers will be used for consumption by employees. A local supplier will be hired to sprinkle the ground. He will be responsible for supplying the truck and the water.

- Water wells

Of 156 wells within a radius of 460 meters from the alignment, only five are inside the project's operation right of way. These will be identified in the project's drawings, their location will be marked on the ground to avoid impacting them and any breaks that may occur due to the construction will be repaired.

- Transportation and traffic

Barges will be used for the maritime transport of materials and machinery to the Port of the Americas and the San Juan port zone. To minimize the impact to maritime transport the following measures will be taken: all the requirements established by the receiving ports, the Ports Authority and Federal Customs will be complied with; a logistics plan will be submitted for endorsement by the pertinent authorities.

The roadways will be used as access to transport personnel, equipment, vehicles (light and heavy) and materials to the different project areas. Roads will be crossed using the open trench method or drilling. These roads are indicated in Addendum 1, Highway crossings. To minimize the impact to the integrity of the roadways and the interruption of, or increase in traffic the following measures will be taken: car pooling by employees will be encouraged; a Traffic Management Plan will be submitted to the Transportation and Highways Authority (in Spanish Autoridad de Carreteras y Transportación or ACT); if necessary and in coordination with the ACT and the local Police, detours will be established; the trenches will not be left uncovered.

- Archaeological finds and cultural and historic places

Three rock shelters with the presence of petroglyphs, possible farming terraces, remainders of two railroad bridges and the remainders of two haciendas were located. An archaeological study was conducted, Phase 1A which indicated the most important findings: Tallaboa Site, Salto Arriba Site, Bridges, Hacienda La Teresa, Hacienda Las Lisas, rock shelters, farming terraces, Paso del Indio, Punta Corozo, Dorado 15, Toa Baja 18, Hacienda La Candelaria, Warehouse 5. The recommendations the Institute of Puerto Rican Culture and other concerned agencies see fit to provide will be followed.

- Noise

Via Verde is a lineal project and the construction will move along day by day, therefore the noise will not be concentrated in any specific area. The noise levels of the machinery and the vehicles to be used are comparable to those established by the Environmental Quality Board's (in Spanish Junta de Calidad Ambiental or JCA) Noise Pollution Control Regulation. The following measures will be taken to minimize the effects of noise in populated areas: the work will be circumscribed to the time schedule established by the Regulation; the vehicles and machinery will have noise control equipment; inasmuch as possible, the newest equipment found will be used; the machinery will be turned off when not in use.

- Spills

In general, spills occur by human error: poor handling of the products, lack of maintenance of the equipment, and lack of adequate knowledge of the functioning and operation of the machinery. If spill occur, they will not be of a significant magnitude, because small quantities of the products will be used. The most significative event would be the total spill of a fuel truck, 2,500 gallons of diesel fuel.

The following measures will be established to avoid spills or minimize the impact of the same: a Spill Control Plan and a Spill Prevention, Control and Mitigation Plan for the use of bentonite will be prepared; Personnel will be trained (in: handling of chemicals; situations that might cause spills; how to avoid or minimize the impact; how to respond to a spill and who to inform; the correct functioning and operation of machinery); vehicles will have a Spill Kit; spills in water will be cleaned using absorbent pads and in case of spills on the ground, the contaminated soil will be removed; the collected material will be deposited in containers, identified, full RCRA tests will be conducted and it will be disposed of in an authorized place; vehicles with leaks will not be allowed in the work area; no chemicals will be stored outside the operation centers.

- Wastes

It is estimated that non-toxic solid wastes will be generated in amounts greater than 100 cubic yards weekly, approximately. This could increase the amount of waste received at the landfills because this waste will be collected and transported to the nearby landfills approved by the JCA. The impact will be minimized by reusing part of the soil

to backfill the trenches and restore the right of way, only the surplus soil will be disposed of in an authorized landfill. The vegetable cover and trees removed will be mechanically shredded and used as wood chips for erosion control in slopes. Measures will be established for the control of erosion and sedimentation. Handling of chemical products will be delegated on experienced personnel and it will be separated from the other waste to be disposed of in accordance with the pertinent regulations after being characterized with a Full RCRA analysis.

The following measures will be implemented to minimize the impact caused by used water: the water used in the hydrostatic test will be discharged in our power plants with a permit from NPDES and in coordination with the EPA; the contractor who provides the portable toilets will be in charge of providing maintenance and for disposing of the waste and for handling any spills, all in accordance with the regulations of the Department of labor and Human Resources.

- Socioeconomic impact

The project represents a temporary benefit for the local economy. Among the benefits are: the taxes paid to the municipalities if applicable; employment opportunities (between 1,000 and 1,200 temporary direct jobs and some 4,000 to 4,500 indirect jobs); and an increase in sales and the use of services (hotels, motels, restaurants, gas stations, fast food and articles of prime necessity businesses, hauling trucks, sprinkler trucks, heavy equipment, rental of cars, trailers, portable toilets, purchase of lumber, gravel and bottled water, among others).

The project's construction will not have a disproportionate environmental impact on any socioeconomic group and whatever impact there is will be of short duration because the construction is not stationary. Free access to communities and residences will be ensured; the work area will be delimited; special work areas will be located outside the quiet zone; the necessary measures to control fugitive dust, noise and increased traffic will be complied with. A public information program to educate the community prior to the construction will be established and will continue during the same.

One of the most important impacts will be the establishment of the maintenance right of way which encompasses 150 feet of the pipeline. Within this were located approximately 102 structures or residences. The properties will be appraised and the owners will be compensated (fair market value) for the appraised value. The general use of the soil will not be altered, however, the construction of buildings or structures or the planting of trees or vegetation with deep roots will not be permitted in the operation right of way (a width of 50 feet throughout the length of the pipeline).

- Protected, threatened or endangered species

The presence of the listed species was not detected during the field work, with the exception of the guabairo (Puerto Rican Nightjar, *Caprimulgus vociferus noctitherus*).

This species will be protected by the implementation of a protocol for its protection and conservation and by constructing the project outside of its nesting season. All permanent loss of habitat for the guabairo will be mitigated in accordance with a plan approved by the DNER and the United States Fish and Wildlife Service.

Regarding the species of fauna designated as vulnerable, the Puerto Rican boa and the white-cheeked pintail or Bahama duck were sighted. The Puerto Rican boa will be protected by the implementation of a protocol for its protection and conservation during the construction phase. The white-cheeked pintail prefers lagoons or ponds, which are not under the project's impact footprint. Other species such as the falcón de sierra (Puerto Rican Sharp-Shinned Hawk, *Accipiter striatus venator*), the guaraguaíto (Puerto Rican Broad-Winged Hawk, *Buteo platypterus brunnescens*) and the Puerto Rican Parrot (Puerto Rican Amazon, *Amazona vittata vittata*), should not be impacted as long as areas with characteristics similar to their habitat are not disturbed, especially during their mating and nesting seasons.

The species of flora designated as critical can be identified with some conspicuous method (printed marking ribbon, or "DO NOT CUT flagging tape") and thus avoid impacting them. If there is the possibility of impacting them, they will be transplanted to an adequate place, by personnel qualified for this practice.

- Air quality impact

The change to natural gas represents a substantial reduction in criteria pollutants air emissions. The percentage of reduction of criteria pollutants in pounds per year for each power plant, calculated according to the formulas of the Air Pollutants Emission Factors (AP 42), will be the following: 75.79% for the Palo Seco Power Plant, 69.30% for the San Juan Power Plant, and 66.75% for the Cambalache Power Plant. The only individual criteria pollutant that would see a slight increase in the percentage of emissions (6.04%) would be the Volatile Organic Compounds (VOC) in the Palo Seco Power Plant. In compliance with federal regulations, a Prevention of Significant Deterioration (PSD) permit will be obtained for this power plant.

The change to natural gas will also result in a significant reduction (between 25% and 30%) in carbon dioxide emissions. An increase in the concentration of carbon dioxide in the atmosphere results in an increase in global temperatures or global warming.

- Environmental monitoring program

As part of the efforts to avoid or minimize the impacts of the construction, the project will have an Environmental Coordinator who will be in charge of the project's environmental impact issues.

- Cumulative impact

The cumulative impact is the total effect on the environment resulting from a series of past, present or future actions of independent or common origin. No cumulative impact on mangroves and wetlands is expected.

There may be constructions going on in certain project areas which coincide with Vía Verde and contribute to increase the fugitive dust in the air. The cumulative effects on the air quality due to the operation of the units are contemplated in the current permits and those that will be obtained for the changes due to the use of natural gas. The cumulative impact of pollutant emissions will be a positive one, since there will be a reduction in the emissions of criteria pollutants and carbon dioxide.

The project's impact on traffic will be added to the impact due to private and public vehicles from other projects developed in the area. The cumulative impact will be temporary in each municipality.

During the project's construction there will be an increase in the demand for bottled water and water used for sprinkling which will be added to the demand from other construction projects and the demand from the general population. This will be temporary for the duration of the construction.

The impact to agricultural areas in certain areas is unavoidable and in those the project's impact will be added to the impact of past and future agricultural activities.

There will be a temporary noise increase during the construction that will be added to the noise impact of public and private vehicles and other construction equipment located in the area. Although the noise generated by the project will not be concentrated in one specific zone because the construction area will change daily, it will be temporary.

F. Socioeconomic study

Chapter 7 includes a socioeconomic study to determine whether the impact the proposed action will have is one of fair treatment for all groups of persons. To prepare this analysis data from the 2000 Census were used, which were obtained from the information supplied by the Puerto Rico Planning Board, Census Office.

The policy for the implementation of Environmental Justice in Region 2 of the Federal Environmental Protection Agency (EPA), established that a homogeneous population such as Puerto Rico's is identified in its totality as a minority, wherefore an analysis by ethnic groups is not applicable and must be substituted by an analysis of socioeconomic groups and other factors (United States EPA Region 2 Draft Interim Policy on Identifying EJ Areas, June, 1999).

As the population of Puerto Rico is homogeneous, identified in its totality as a minority, we proceeded to measure the impact the project would have on other factors beyond

ethnicity. Among the factors considered were: geographical distribution, racial groups and socioeconomic groups. The socioeconomic factors considered were: gender, age, income, education, employment and housing. The condition for Puerto Rico was established for each one of the factors and it was compared with that of the 13 Municipalities where the construction will be made. From there, it was compared with the 48 specific wards through which it will cross, for the purpose of detecting if any of these areas would be disproportionately affected in any of the factors under consideration.

The following findings were made:

- Geographic distribution - The construction will be made in wards of diverse population density; fluctuating between 5.1 and 2,334.9 inhabitants per square kilometer. Even so, it does not represent a disproportionate burden because it will not require complete sectors or areas of a community to be moved or evicted. The mobilization or eviction of tenants or property owners of existing properties will be isolated. Ninety-one (91) structures or residences were observed within the maintenance right of way, which could be the equivalent of the relocation or compensation of some 263 persons. Addendum 5, Persons within the Maintenance Right of Way, gives an idea of the quantity of persons, by ward and municipality, which could be affected.
- Race - Homogeneity in the distribution of races was observed throughout the project's alignment, and a proportional relation is kept when the wards, the municipality and the island are compared. Only the Palo Seco community in the Palo Seco Ward of the Municipality of Toa Baja represents the black race, in percentage, in a greater proportion than that found in the other wards and municipalities. For this community, the analysis revealed that it is at a considerable distance from the project's area whereby it will not be adversely impacted. There will not be any expropriation of residences or land belonging to this group.
- Gender - The general pattern for Puerto Rico was maintained. The difference in the population by gender in the wards directly associated to the project, compared to that of the municipalities or with the totality of the island of Puerto Rico, is not significant wherefore the project will not have a disproportionate impact on any group in terms of gender.
- Age - The project will not have a disproportionate environmental impact on any group on account of age, or on the services or housing they require. The 18-65 years group will benefit temporarily, because close to 1,200 direct jobs will be created during the construction of the project and services will be used which will benefit these groups and create hundreds of indirect jobs.

- Income - Neither the median and per capita and family income, nor the poverty index will vary as a consequence of the project's construction and operation. The only impact will be on the working class, because close to 1,200 direct jobs will be created in the region, in addition to the indirect jobs, which will represent an increase in income. This increase, although positive, will be temporary, because the construction works will last approximately eleven months.
- Education - The population in areas where the project will be developed is in an average level similar to the rest of Puerto Rico. The schooling or education level attained by the population through which the pipeline will cross will not vary as a consequence of the project's construction and operation and there will not be any disproportionate impact on any group based on the classification of education.
- Employment - The project will not affect the employment and unemployment rates in Puerto Rico directly or indirectly. Nor will it affect the distribution of occupations of employed persons or of the classes of workers. The project's impact on the area will be a temporary increase in the labor force due to the direct and indirect jobs contemplated during the construction.
- Housing - The project will not affect the present housing availability in these municipalities during its construction or operation, because the majority of the land through which the pipeline will cross will not be residential but mostly in agricultural and industrial use, and part of the alignment will pass through government-owned land. In addition, there are housing developments in progress in the thirteen municipalities, which will increase the quantity of housing units in these areas, wherefore the project will not compromise the need for expansion in the housing area. As previously indicated, only 91 structures or residences were found within the maintenance right of way, which represented 0.08, 0.03 and 0.01% of the residences when compared with the total number of residences in the 48 wards through which the construction will be made, the 13 municipalities and the totality of the island, respectively.

We note that no group, based on the different classifications, will receive a disproportionate negative environmental impact on account of the project. Even so, the AEE will take the necessary measures to maintain the communities adjacent to the project and the population of the municipalities, informed of the project's scope, its impacts and benefits. This will be through a public education program developed by the AEE, which will comply with all the applicable state and federal regulations.

As part of this education program, the AEE will be in charge of preparing and

distributing all the necessary informative materials and will schedule meetings with the communities and other interested groups. In addition, the AEE is in communication with, and has presented the project to the mayors of the municipalities where the construction will be made and to the agencies called upon to ensure that projects of this magnitude do not create disproportionate burdens on particular groups.

G. Agencies consulted

Chapter 8 lists the municipalities and agencies consulted, state and federal, and to whom the Preliminary Environmental Impact Statement (in Spanish, Declaración de Impacto Ambiental Preliminar, or DIA-P) will be circulated. Addendum 4, Meetings with Agencies, summarizes the meetings held with them. The agencies to whom the document will be circulated are the following: Puerto Rico Aqueducts and Sewers Authority, Department of Transportation and Highways Authority, Public Lands Authority, Land Management Administration, Public Service Commission, Department of Natural and Environmental Resources, Institute of Puerto Rican Culture, Environmental Quality Board, Planning Board, Fire Department, Ports Authority, State's Historical Preservation Office, United States Corps of Engineers, US Fish and Wildlife Service, Environmental Protection Agency, National Marine Fisheries Service, Federal Highway Authority, and the Municipalities of Peñuelas, Adjuntas, Utuado, Arecibo, Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado, Toa Baja, Cataño, Bayamón and Guaynabo.

Part 4. Process for Developing a Stormwater Management Program

- Introduction
- Program Components
 - Governmental Coordination
 - Legal Authority and Comprehensive Planning
 - Funding and Staffing
 - Public Education and Participation
 - BMP Selection
 - Operation and Maintenance
- Stormwater Management Program Implementation
 - Self Analysis
 - Action Plan

Introduction

Most traditional approaches to stormwater management focus on efficiently collecting and conveying stormwater off-site. Such an approach may increase downstream property damage and necessitates expensive public works, such as enlarging and reinforcing channels or swales to provide an adequate outfall from the site and/or downstream channel stabilization projects. More recent approaches to stormwater management seek to retain natural features of drainage systems by providing on-site stormwater quantity reduction that also improves stormwater quality. This approach views stormwater as a resource that can be used to

- Recharge groundwater from areas of sites that are made impervious;
- Supply fresh water to surface water bodies both directly and as an enhancement to base flow;
- Increase recreational opportunities including hunting, swimming, fishing, and boating; and
- In some cases, augment drinking water supplies.

Properly managed stormwater also can help to minimize or avoid problems with erosion, flooding, and damage to natural drainage features such as streams, wetlands, and lakes, as well as provide wildlife habitat in these natural features.

The objective of the Phase II program is for Phase II municipalities to develop effective, site-specific stormwater management programs that reduce the discharge of pollutants from MS4s to the MEP. EPA has chosen this flexible regulatory approach because the nature of discharges from MS4s varies from region to region. You, as the operator of a small MS4, should consider incorporating the following elements into your stormwater management program:

- Governmental coordination;
- Legal authority and comprehensive planning;
- Funding and staffing;
- Public education and participation; and
- BMP selection.

Program Components

Governmental Coordination

Intragovernmental coordination of the municipal agencies and departments having purview over stormwater-related issues is fundamental to a successful stormwater management program. You should consider designating a "lead agency" within your municipality to facilitate the coordination of the various stormwater pollution control activities. Intergovernmental coordination is also important, especially when a number of small MS4s are partnering together to implement the minimum measures.

Legal Authority and Comprehensive Planning

Municipalities can use the legal authority of new and existing programs and ordinances, zoning rules, and the site plan review process to ensure that water quality concerns are addressed in new development and redevelopment. Municipalities should consider developing a comprehensive plan that incorporates both location-specific and watershed-wide goals. Also, both long- and short-term planning should be conducted to prevent or mitigate the impacts of cumulative loadings throughout the watershed. Assessing the impacts of cumulative loadings using indicators, trend data, and other means is an essential part of this process.

Many jurisdictions have ongoing programs and activities that are related, to some degree, to stormwater quality. Existing programs, state and local codes, and local ordinances should be reviewed to determine if requirements should be revised or strengthened. When no program or ordinance exists to address a specific stormwater issue, one should be developed. Examples include programs that address flooding, combined sewer overflows, infiltration and inflow (a contributor to sanitary sewer overflows), and erosion and sediment control. You should consider how these programs could be linked, expanded, or otherwise augmented to achieve additional stormwater quality enhancement and other measurable environmental benefits.

Because development almost always increases impervious surfaces (a good measure of land use intensity), recent development will, in most cases, lead to increased discharges of pollutants from MS4s. Urbanization causes fundamental modifications to the hydrological cycle, typically resulting in an increase in the volume of stormwater discharges and associated pollutant loadings. Chemical, physical, and thermal changes associated with new development can adversely affect receiving waters.

It is important to integrate stormwater management program elements with your community's land development process, including redevelopment. Therefore, you should have a working knowledge of the role that the site plan review and land use planning processes play in your municipality.

The site plan review process is typically the final stage of municipal review that occurs before development takes place. Water-related codes and ordinances, such as erosion and sediment controls, stormwater management, and prevention and removal of illicit connections, should be implemented through the site planning process and verified through the review process. Site plan review is often the only regulatory process of this type that a land developer must go through if the land use is compatible with the zoning for that land (or if there is no zoning).

Land use planning is an additional process that precedes (but does not replace) the site plan review process. The planning process typically involves the setting of land use goals and objectives for various parts of a municipality into a plan document or onto a plan map. These plans are usually termed Comprehensive Land Use Plans, Master Plans, or Comprehensive Zoning

Plans. In many instances, land has already been zoned for a certain category of land use. Such categorization may have resulted in a zoning category being designated based on the existing land use at the time the zoning process commenced, which in most areas occurred in the early part of the Twentieth Century.

In contrast, planning has generally evolved over the past 50 years, and in many cases far more recently than that. Where the planned land use (e.g., planned zoning category) is different than the existing zoning, a land developer may desire to have the zoning category changed to the planned category. This process is referred to as rezoning and can be one of the most important decision-making functions of local government officials. It is also the process by which some municipalities have required public facility improvements and other infrastructure improvements from land developers through the development process. Stormwater controls may be implemented by developers wishing to rezone (and develop) property.

For example, specific planned land use designations are usually identified on a parcel-specific basis as a zoning category. These categories may be limited to only one possible land use or may provide for a range of land use opportunities that often depend on a series of policy-based criteria. A common example of this is a higher range of residential density available to a developer that provides low- or moderately priced housing units as part of the development. Just as these types of land use decisions must be made early in the development process, so should provisions for stormwater quality management planning.

Regulated small Phase II MS4s will vary greatly in their stages of land use planning because of different state laws and regional requirements. If you have recently updated your land use plan, there is a good chance that water quality issues will have been incorporated into the process. In other instances, there may be no mention of a policy (or more specific criteria) to include water quality in guiding land use decisions. Still other municipalities may not even have comprehensive land use planning. You should consider incorporation of policies regarding stormwater quality your land use (planning and zoning) process by developing or strengthening ordinances. In summary, you should rely on existing land development requirements, consider strengthening or developing new stormwater codes and ordinances, and use the site plan review process to ensure that appropriate stormwater codes and ordinances are implemented.

Funding and Staffing

The development and implementation of an effective stormwater management program ultimately depends on adequate resources being made available for personnel and equipment. Therefore, your program should identify the resources that your municipality is committing to implement each program component. You should clearly establish program position descriptions and funding sources for administrative and field personnel to implement the program. You should try to identify the projected funding needs and sources accurately to allow the longest possible lead time for arranging program financing. You should also provide a schedule indicating changes in staffing and equipment if you propose phased implementation.

Public Education and Participation

You should be sure to provide adequate public education and ample opportunities for public participation in all aspects of your program. The goals of the education and public involvement program must be defined under the proposed stormwater management program. Generally, the

public should be involved as early as possible when considering major technical and policy issues of the development and implementation phases of the management program. Program element milestones should be included for public participation, particularly in the program development phase. In some cases the public involvement may simply be to receive information. Public participation can also be used to focus on education and awareness of major technical and policy issues in the implementation phase.

If time is available, conflict and confusion can often be minimized if the public involvement and education program includes a schedule for initial public contact and education and milestones for involvement throughout the development and implementation phase. Public education programs are expected to target specific audiences, including those regulated or affected by the program, such as developers, building contractors, and industrial operators, and those that can assist with program implementation (e.g., volunteers and citizens).

BMP Selection

You should propose a municipal stormwater management program that address activities and schedules for implementation of each of the 6 minimum measures identified in the regulations. Your emphasis should be on program components that reflect site-specific characteristics of the municipality (e.g., population density, land use and age of communities, soil type, and topography), the municipal storm sewer system, and the receiving waters. Implementation priorities can be set to target the sources of specific pollution problems from certain land uses or target the problems resulting from the land use activities of a specific geographic area.

It is important that you identify schedule for implementing various program components as part of the program itself so that expectations about the impact that the management program will be realistic. Continued support for any program will depend on meeting scheduled milestones and attaining results. Questions that should be considered when developing priorities include:

- What are the pollutant loadings from the source(s) that the program component addresses and could the program component reduce the pollutants in the discharges?
- Can existing municipal functions be modified to address water quality concerns and are municipal lands or rights-of-way available for retrofits?
- What is the current population of the municipality, and what is known about development patterns, projected growth rates, and demographics?
- What are the physical characteristics of the watershed and receiving waters?
- What are the climatic conditions, soil types, and watershed delineation criteria?
- Are the pollutants reduced to the MEP?

When preparing your application for coverage under a NPDES permit, you should describe the proposed structural and source control measures to reduce pollutants from commercial and residential areas to the MEP. Common examples of potentially major sources of pollutants include commercial and retail parking lots, gasoline/service stations, and establishments with drive-through windows and other high-intensity vehicular uses. You should describe how the control measures address the interaction between pollutant sources and physical attributes, such as existing and planned land uses, soil types, and topography, from your MS4 into your receiving waters.

Structural controls include infiltration devices, detention and retention basins, vegetated swales, water quality inlets, screens and filters, channel stabilization, riparian habitat enhancement efforts,

and wetland restoration projects. You should be aware that CWA Section 404 permits might be required for certain types of structural controls (i.e., projects that discharge dredged or fill materials to waters of the United States, including wetlands). Also, some projects might require State permits that address water quality and quantity issues.

You are encouraged use appropriate guidelines and performance standards for identifying and implementing specific structural controls for the construction site and post-construction minimum measures. Your program should describe the criteria to be used to establish that a particular structural control is warranted and the circumstances under which the control will be required. New structural controls and proposed retrofits should be discussed separately because the opportunities for control selection are often quite different.

You should conduct an evaluation of major existing structural controls and municipally owned sites and rights-of-way where new controls can be installed. An inventory will allow you to develop a better picture of the capacity to reduce pollutants to the MEP of current and potential stormwater quality and quantity controls and will facilitate both long- and short-term stormwater master planning.

EPA recommends that you also follow a set of pre-established priorities for selecting, siting, and installing structural controls and implementing source control measures during the development process. EPA and the Center for Watershed Protection provided guidance in the form of a "Manual Builder" for this purpose. This tool is available on the Stormwater Manager's Resource Center EXIT Disclaimer. The process should begin at the initial planning and zoning stages and continue throughout the development and redevelopment processes.

Certain structural control measures are effective but may not be able to be implemented in previously developed areas due to unavailability of land; examples are:

- First flush diversion systems;
- Detention/infiltration basins;
- Retention basins;
- Extended detention basins;
- Infiltration trenches;
- Porous pavement;
- Grass swales; and
- Swirl concentrators.

The following nonstructural practices should be considered when land is limited or unavailable:

- Erosion control;
- Stream bank management techniques;
- Street cleaning operations;
- Vegetation/lawn maintenance controls;
- Debris removal;
- Road salt application management; and
- Public outreach, education, and awareness.

Operation and Maintenance

Proper maintenance plays a vital role in ensuring the proper operation of both structural and source controls. For example, reducing the frequency of inspections and cleanout of a structure may initially reduce program costs, but the effectiveness of the BMP can be diminished, which creates the need for additional controls and results in a deterioration in water quality, which has a cost associated with it. In addition, the perception that a given stormwater control BMP does not work (even though the reason is lack of maintenance) can be very damaging to a fledgling program as it seeks to establish its support base.

The section of your stormwater management program that describes your management practices should include a description of the maintenance activities and a maintenance schedule for structural controls.

Oftentimes the effectiveness of structural stormwater controls, especially detention and retention basins and infiltration devices, is limited by lack of maintenance. Other structures that require regular maintenance are catch basins and drainage channels. You can develop a schedule of regular maintenance of structural controls and infrastructure (e.g., removing sediment from retention ponds every five years, cleaning catch basins annually, removal of litter from channels twice a year) as part of your stormwater management program. You can use maintenance logs to track activities and develop a matrix of tasks, such as inspection, repair, replacement, and cleanout, on a timeline. GANT charts or other critical path analyses are readily available and are recommended as ways that you can organize a maintenance program and schedule.

In some cases, regularly scheduled maintenance might not be appropriate; rather, periodic inspections can be used to determine when maintenance is needed. If maintenance is to be based on the results of inspections or if maintenance is scheduled infrequently, you should provide an inspection schedule and identify the municipal department(s) responsible for the maintenance program. Because maintenance issues are critical to successful program implementation, measurable goals for maintenance should be considered throughout the term of the permit.

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Stormwater Management Program Implementation

The following information was taken, in part, from Stormwater Phase II Workshops sponsored by the American Public Works Association (APWA) in 2001 and from APWA's manual *Designing and Implementing an Effective Stormwater Management Program* (AWPA, 2000).

This guidance is intended to assist Phase II cities with understanding, organizing, and developing their stormwater management program in compliance with the Phase II requirements. Two major steps are necessary: a self analysis to help the Phase II city collect information and assess information, and an action plan to form goals and set a schedule for development of a Phase II stormwater management plan.

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Self Analysis

You should conduct a comprehensive self analysis to help you gain a better understanding of your current situation with respect to complying with the Stormwater Phase II Rule. The self analysis should consist, at a minimum, of the following components:

1. *Understand the stormwater regulations and your stormwater responsibilities.* EPA has developed a series of fact sheets to help explain the Phase II Rule, as well as the [Compliance Assistance Guide](#) [PDF - 1,430 KB - 97 pp] and the [Menu of BMPs](#). First you should obtain a copy of the Phase II Rule and your state's Phase II permits when they become available. Before you undertake the process to develop a Phase II program, you should have a clear understanding of what you're required to do. Begin by asking yourself the following questions:

- Am I in an urbanized area as designated by the 1990 Census?
 - Could I be included in an urbanized area as designated by the 2000 Census (final information to be released in Spring/Summer 2002).
 - If I'm not in an urbanized area, is my population greater than 10,000 people (potential designation by the permitting authority)?
 - Does my city government own or operate a facility with industrial activity as defined by EPA's stormwater regulations (e.g., wastewater treatment plants, vehicle maintenance facilities, etc.)?
 - Does my city government own or operate construction activity that disturbs greater than one acre?
 - Do I understand what the stormwater regulations require (the development of a stormwater management program that includes the six minimum measures and measurable goals)?
 - Do I understand the deadlines and when I am required to submit a permit application?
2. *Understand how your city currently manages its stormwater runoff.* Make an assessment of your city's stormwater management and conveyance system. Get copies of maps, inventories, or other assessments of the physical infrastructure in place. Begin by asking yourself the following questions:

- Do you have an inventory of stormwater inlets, pipes, ditches, and open channels?
- Do you know how many outfalls your city discharges to and where they are located?
- Do you know if someone else is discharging stormwater into your system?
- Do you know the major pollutant sources in your city (industrial, commercial, residential)?
- What types of flood control or water quality practices are currently in place in your city?

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3. *Know the condition of your receiving waters.* Stormwater programs should be designed to address the specific needs of the community and water resources they are intended to protect. If you haven't done so already, collect information on your city's receiving waters and what pollutants and sources are impacting those waters. You should also know the various uses of your receiving waters so you can design a program to protect those uses. Begin by asking yourself the following questions:

- Do you know the names and locations of the waters that receive a discharge from your MS4?
- Do you know the character and quality of these waters?
- Are any of these waters listed as impaired on your State's 303(d) list?
- What are the pollutants impacting these waters?
- Do you know the designated uses of these waters?

4. *Assess your current programs and practices to determine what needs to be changed.* The Phase II program provides an opportunity to identify and change programs and practices that are or could be impacting water quality. Begin by asking yourself the following questions:
 - What are your current practices that contribute to water quality problems?
 - What are your current practices that will help meet NPDES stormwater requirements?
 - Do you have an existing educational program on water quality?
 - Do you have an erosion and sediment control program established?
 - Do you have procedures to address illegal dumping and spills?
 - What legal authority do you already have and legal authority will you need to develop?
5. *Identify stakeholders who can help you develop and implement your stormwater program.* These can include people who are impacted by city ordinances, concerned citizens, and groups who would be expected to pay for stormwater management (as part of a stormwater utility, for example). Begin by asking yourself the following questions:
 - Are there other Phase II communities in your area willing to cooperate with you?
 - Is there a Phase I city in your area with which you can work?
 - Are there groups or associations, such as environmental, industry, or community associations, that can help you?
6. *Determine the overall objectives for your stormwater program.* These objectives could include improving water quality, decreasing flooding, increasing citizen awareness and cooperation, and increasing funding. You should develop an objective for each of the six minimum control measures to help guide you in selecting and targeting BMPs and measurable goals. Your stormwater management plan should be designed with these goals in mind.

Action Plan

Your next step will be to develop an action plan to help you determine what to do and when. An action plan is a tool to help guide you as you develop your stormwater management program, and is not required under the EPA regulations. The first step in developing an action plan is to complete the self analysis previously described.

1. *Assemble your team.* This will include stakeholders and city departments that may have a role in stormwater management.
2. *Develop a time schedule.* This would ideally identify the date your permit application is due, probably March 10, 2003, and work backwards from there. You should set interim milestones to assess your progress. Key dates could be included for public comment and review, local authority approval, stakeholder meetings, and acquiring funding. Your time schedule should also accommodate a stormwater management program plan approval process. Your stormwater management plan will probably need to be approved by local authorities, regulatory authorities, and stakeholders.
3. *Determine your strategy for compliance.* What does a good program look like? Try to determine what type of program your city managers want and what type of program you can realistically develop. Begin by asking yourself the following questions:
 - What benefits do you want to achieve?
 - What is your tolerance for risk? The Phase II program includes a lot of flexibility, but inherent in that flexibility is uncertainty. You will need to balance your tolerance for risk in developing a stormwater management plan.

- What is the best program approach for you? For example, you can develop a minimal program that meet legal requirements, an aggressive proactive program, a "the best we can afford program," or a "the best that the city council will approve" program.
 - What is realistically achievable? You should determine your financial resources and limitations by asking the following questions:
 - What is realistic given your current program and legal constraints?
 - What is realistic in terms of your receiving water quality?
 - What goals should I set? Setting clear goals for your stormwater program will help you set clear measurable goals and document your program's success to regulators and the public.
4. *Network with other local governments.* Talk to other cities in your area to find out what they're doing. Consider establishing regular meetings with these cities to share information, and, if your goals are compatible, consider partnering with some of these cities to share resources or join as co-permittees. If there is a Phase I community nearby, investigate what they've been doing and consider working with some of their ideas and using materials they have already developed.
5. *Determine the main elements of your program.* Using the information from your self-analysis and the items above, start to formulate the major elements of your program. Identify how you will address each of the six minimum control measures. First, identify the BMPs and measurable goals that will be used to implement the six minimum measures. Second, identify practices that will require on-going operation and maintenance. Finally, plan for developing and maintaining public support through education and outreach.
6. *Establish an implementation plan.* This plan will describe how would will develop your Phase II stormwater management program, including public participation components. The following are factors you should consider when implementing your stormwater management program:
- Determine program funding and staff requirements. Assess whether you will do the work in-house or contract it out.
 - Develop your institutional framework. Identify a lead city department or agency. Develop MOUs, if necessary, and consider designating or establishing a regional group, such as a council of governments, to help coordinate activities.
 - Identify your permitting approach. Will you choose a general permit or an individual permit? Will you join as a co-permittee with another city?

Assign an individual or group to be responsible for submitting the permit application, developing annual reports, etc.

ELECTRIC POWER AUTHORITY
Puerto Rico's Via Verde Project
Preliminary Environmental Impact Statement (DIA-P)

Field Code Changed

Summary

This project is one of the tools needed to address the emergency regarding the infrastructure for generating electric power decreed by the Hon. Luis G. Fortuño Buset in Executive Order OE-2010-034, under Law 76 of May 5, 2000. In addition, it is essential to comply with the commitment of his work program aimed to reduce the energy cost and to strengthen Puerto Rico's economy.

What is proposed is the construction of a 24" diameter steel pipeline to transport natural gas from the facilities of EcoEléctrica to the Cambalache, San Juan and Palo Seco Power Plants. The pipeline will be underground, it extends for some 92 miles and it will run through the municipalities of Peñuelas, Adjuntas, Utuado, Arecibo, Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado, Toa Baja, Cataño, Bayamón and Guaynabo. The works will include clearing the right of way, excavation of trenches and installation and testing of the pipeline. In addition, they include modifications to units of the Cambalache, Palo Seco and San Juan power plants to enable them to burn natural gas as well as liquid fuels. The estimated cost of the project will be \$447,000,000 dollars which includes the cost of design, purchase, conveyance of and delivery of materials, construction, payment of municipal licenses and taxes, if applicable, purchase of land, studies and permits. The cost for the conversion of the units to natural gas is estimated to be between \$50 to \$70 million dollars. Approximately between 1,000 and 1,200 temporary direct and 4,000 to 5,000 indirect jobs will be generated.

A. Project Rationale

Currently, 99% of the electricity generated by the Electric Power Authority (Autoridad de Energía Eléctrica or AEE, in Spanish) is obtained from petroleum. The excessive and unpredictable increase in the cost of liquid fuels makes us less competitive in a global economy. To control and reduce the high cost of electricity the AEE's Governing Board approved a General Strategic Plan for the Development and Expansion of Generating Capacity. This Plan established, as a quicker, more viable and environmentally safe alternative, that generating capacity would be added using natural gas as the main fuel, as part of the strategy to diversify fuel that would allow us to reduce the operating costs and to maintain sustained environmental compliance.

The main reasons for this determination are the following: in Puerto Rico there already is a Liquefied Natural Gas Terminal; the historical and projected price of natural gas is lower than the distillate fuels and it will be cheaper than residual No. 6 fuel oil; reduces the maintenance cost of the units, which are prepared, or can be modified, for its use; the technology is developed and tested; and there exist confirmed reserves of natural gas in different parts of the world. The use of natural gas for the production of electric

energy increased during the last three years in the United States thanks to the implementation of an intensive domestic policy to promote the extraction of this fuel from non-conventional sources. This action was reflected in the international markets as a reduction in the price of the fuel, which permits Puerto Rico to buy this product at low and favorable prices.

In addition, when analyzing Puerto Rico's economic situation, and its relation with the sudden changes in the cost of liquid fossil fuels, it was concluded that Puerto Rico's economy is not viable, unless its vulnerability to the shocks of crude oil markets is reduced dramatically.¹ This reduction is achieved by diversifying the sources for generating electricity through the use of natural gas, as a transition to the effective use of renewable sources of energy in the future. The direct result will be the strengthening of our economy and, at the same time, the improvement of the environment, as demonstrated by the interpretation made by economists of the Environmental Kuznet's Curve.

Most of the electricity is produced in the south of Puerto Rico, but it is consumed in greater quantities in the north. Hence, the need for a geographical diversification with respect to the generation of electricity. With the construction of the Via Verde project, the AEE will be able to increase generation in the north and to improve the electrical system reliability.. This will give the AEE greater flexibility to choose the parameters to work on the point and with the fuel that will permit the most efficient and economical generation of electricity and with a lesser generation costs and impact on the environment.

On the face of the economic crisis confronting Puerto Rico, the AEE amended its Fuel Diversification Plan to accelerate the transition, through the use of natural gas, to the effective use of renewable energy sources. In the measure in which the use of natural gas cheapens the cost of electric energy and drives the country's economic recovery we will be in position to promote the development and establishment of generation from renewable energy sources. With this in sight the AEE signed several contracts to receive and acquire from private cogenerators a total of 295 MW in renewable energy projects and it is considering proposals to receive and acquire an additional 207 MW. In addition, internally the AEE is studying the viability of renewable solar thermal energy which would generate 50 MW.

B. Description of the Environment

A description of the environment in the zones through which the project will pass is

¹ Comments in reaction to the conference titled "Transition to an Energy Use and Production Structure that will Permit Efficiency and Growth at a Sustainable Rate" by Gerrit Jan Schaeffer, drafted by Dr. Elías R. Gutierrez, February 19, 2010.

discussed in Chapter 3. The project consists of the construction and installation of a natural gas transportation system through the municipalities of Peñuelas, Adjuntas, Utuado, Arecibo, Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado, Toa Baja, Cataño, Bayamón and Guaynabo. The same will have a longitude of 92 miles approximately and will require a maintenance right of way of 150' on each side of the pipeline. The construction will impact, within the right of way and throughout its length, a width of 100' (30.48 m) for the construction within which will be created a 50' (15.24 m) operational right of way and the remaining 50' in width will be restored to its original state once construction activities are completed. The total area impacted by the project will be 1,113.8 acres approximately. An additional area of 32 acres will be required for special and particular situations necessary in this type of construction.

The 48 wards (barrios) through which the pipeline will cross are: in Peñuelas, the wards of Tallaboa Poniente, Encarnación, Tallaboa Saliente, Tallaboa Alta and Rucio; in Adjuntas the wards of Saltillo, Portugués, Vegas Arriba, Vegas Abajo and Pellejas; in Utuado, the wards of Arenas, Salto Arriba, Pueblo, Salto Abajo, Río Abajo, Caguana and Caniaco; In Arecibo, the wards of Río Arriba, Hato Viejo, Carreras, Tanamá, Cambalache, Santana, Factor and Garrochales; in Barceloneta, the wards of Garrochales and Palmas Altas, in Manatí, the wards of Tierras Nuevas Poniente, Bajura Afuera, Río Arriba Poniente, Río Arriba Saliente and Coto Sur; in Vega Baja, the wards of Pugnado Afuera, Río Abajo and Almirante Norte; in Vega Alta, the wards of Bajura, Sabana and Espinosa; in Dorado, the wards of Higuillar, Maguayo and Mameyal; in Toa Baja, the wards of Media Luna, Candelaria, Sabana Seca and Palo Seco; in Cataño, the Palmas ward; in Bayamón the Juan Sánchez ward and in Guaynabo the Juan Sánchez ward.

The environmental document presents a general description of the different environmental aspects characteristic of each one of the municipalities through which the Via Verde pipeline will cross. In addition, the AEE has contracted Asesores Ambientales y Educativos (AAE) to conduct the project's environmental studies. They, in turn, contracted diverse firms to realize the same. The firms contracted were the following: for the flora and fauna study the firm of Coll, Rivera Environmental; for the geology study, the firm of Geo Cim, Inc; for the Jurisdictional Determination, Coll Rivera Environmental; for the archeological study Phase 1A, archeologists Marisol Rodríguez Miranda and Carlos Ayes Suárez. These studies are part of the appendixes that are presented together with the environmental document.

The most relevant aspects regarding the environment are summarized as follows:

- Flora and fauna

For purposes of the flora and fauna, the study area was divided into five sub-areas: subtropical dry forest, subtropical wet forest plains, mogotes of the subtropical wet forest, subtropical wet forest, and lower-montano subtropical wet forest.

For the subtropical dry forest, the total plant species found was 164, divided into 57 families, and the total animal species found was 65 divided into 33 families. Of these, the critical species of flora, regulated and in danger of extinction, according to the Department of Natural and Environmental Resources (DNER) were: palo de vaca (pigeon-berry), jayajabico (soldierwood), guayacán blanco (Hollywood lignumvitae), *Passiflora bilobata* Jussieu, palo de violeta (violet tree) and jusillo (*Henriettea squamulosum*). The species of fauna were: pato quijada colorada (White-cheeked Pintail or Bahama Duck), guabairo (Puerto Rican Whip-Poor-Will, *Caprimulgus vociferous noctitherus*), paloma perdiz áurea (Key West Quail Dove), calandria (Puerto Rican Black-Cowled Oriole) and bien-te-veo (Puerto Rican Vireo).

For the subtropical wet forest plains the plant species was 353, divided into 86 families, and the total animal species was 90, divided into 47 families. Of these, the critical flora species, regulated and in danger of extinction, according to the DNER were: higüerillo (white fiddlewood), cedro hembra (Spanish cedar), ceiba (Silk-cotton tree) and avispillo (Jamaica ocotea). The species of fauna were: culebra corredora (Puerto Rican Racer Snake), paloma cabeciblanca (White-crowned Pigeon), boa de Puerto Rico (Puerto Rican Boa), buruquena (Freshwater Crab), calandria (Puerto Rican Black-Cowled Oriole) and the bien-te-veo (Puerto Rican Vireo).

For the area of subtropical wet forest mogotes the total species of plants was 424, divided into 91 families and the total species of animals was 86, divided into 41 families. Of these, the critical species of flora, regulated and in danger of extinction, according to the DNER were: palo de vaca (pigeon-berry), doncella (*Brysonima coriacea*), ceiba (Silk-cotton tree), almez (*Celtis australis*), ortegón (*Coccoloba swartzii*), palma plateada (Tyre palm), jayajabico (soldierwood), palma de lluvia (Llume palm), corcho blanco (Water Mampoo), *Hyperbaena domingensis*, lebisa (*Licaria triandra*), *Maytenus ponceana*, *Passiflora Murucuja L.*, palo de violeta (Violet Tree), *Pristimera caribaea*, almendrón (Florida poison tree), palma de sombrero (Puerto Rico Palmetto), ortiga (*Ureca baccifera*), *Zamia amblyphyllidia*. The species of fauna were: culebra corredora (Puerto Rican Racer snake), boa de Puerto Rico (Puerto Rican Boa), calandria (Puerto Rican Black-Cowled Oriole) and the bien-te-veo (Puerto Rican Vireo).

For the area of the subtropical wet forest the total species of plants was 363, divided into 94 families, and the total species of fauna was 64, divided into 28 families. Of these, the critical species of flora, regulated and in danger of extinction, according to the DNER were: culantrillo, higüerillo (white fiddlewood), doncella (*Brysonima coriacea*), cedro hembra (Spanish-cedar), ceiba (Silk-cotton tree), plateado (*Exostema ellipticum*), *Hibiscus trilobus*, palo de peo (*Lasianthus lanceolatus*), laurel (Jamaica ocotea), almendrón (Florida poison tree), yagrumillo (*Schefflera gleasonii*) and ortiga (*Ureca baccifera*). The species of fauna were: culebra corredora (Puerto Rican Racer Snake), calandria (Puerto Rican Black-Cowled Oriole) and bien-te-veo (Puerto Rican Vireo).

For the area of lower-montano subtropical wet forest the total of plant species was 86, divided into 41 families and the total animal species was 20, divided into 12 families. Of

these, the critical flora species, regulated and in danger of extinction, according to the DRNA was cedro macho (*Hyeronima clusioides*). The fauna species was the bien-te-veo (Puerto Rican Vireo).

Although according to the consultation made with the United States Fish and Wildlife Service (F&WS), the project could affect habitat adequate to several species, none of these species was detected during the field work, with the exception of the guabairo (Puerto Rican Nightjar).

- Geology

According to the study of the geology, the area through which the project will cross is very diverse and it encompasses close to 90 million years of Puerto Rico's geological history. The geological report indicates that the alignment crosses two geological faults that cross in the general direction of east to west in the Juana Diaz outcropping, both of the normal type. These, like the other geological faults that cross the alignment, are considered inactive. The alignment enters the layer of rocks from the Eocene (40 to 55 million years ago) which is comprised in the Great Southern Puerto Rico Fault Zone. The layer, some 4.5 km wide, extends until the margin of the Utuado Pluton, an extensive mass of intrusive rock that is also within the alignment. Also, along a 14 km stretch, the alignment crosses two of the types of topographical zones that characterize the Karst Zone; which are not necessarily part of the protected Karst Zone, according to the DNER.

The report concludes with a discussion of the limitations that the alignment's geology can present to the Via Verde project. It indicates that none of them present a major impact to the project, since all of them are addressed with the geologic and geotechnical study that is the basis for the design and construction which minimizes or eliminates their possible impacts.

- Natural systems

The project will cross through a great variety of natural and artificial systems characteristic to the island. The most significant natural and artificial systems within a distance of 400 mt or less of the proposed project alignments were considered in the document.

Next to the project are five bays (the Tallaboa Bay in the Municipality of Peñuelas, the Guayanilla Bay in the Municipality of Guayanilla, the Toa Bay in the Municipality of Toa Baja, the San Juan Bay and the Puerto Nuevo Bay); one cove (Boca Vieja in the Sabana Seca ward of the Municipality of Toa Baja); three estuaries (the estuary of the Tallaboa Bay, the Cocal River estuary, and the San Juan Bay estuary); one beach (Punta Salinas Beach); three forests (Bosque del Pueblo, Rio Abajo Forest and Vega Forest); two quarries (in the municipalities of Peñuelas and Utuado); two salt mines (in the Tallaboa Poniente ward of the Municipality of Peñuelas); four marsh areas

(freshwater marsh in the Santana ward and the Caño Tiburones marsh, both in the Municipality of Arecibo; San Pedro marsh in the Sabana Seca ward of the Municipality of Toa Baja, and Las Cucharillas marsh between the municipalities of Guaynabo, Toa Baja and, for the most part, Cataño); 31 aquifer areas (two each in the municipalities of Peñuelas, Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado, Toa Baja and Cataño; three in the Municipality of Adjuntas; five in each of the municipalities of Utuado and Arecibo; and one each in the municipalities of Bayamón and Guaynabo); three springs in the Municipality of Arecibo; 18 canals (three in the Municipality of Peñuelas, seven in the Municipality of Arecibo, three in the Municipality of Manatí, one in the Municipality of Vega Baja, one in the Municipality of Dorado, two in the Municipality of Cataño, and one in the Municipality of Guaynabo); six lakes and lagoons (one artificial body of water in the Tallaboa Alta ward of the Municipality of Peñuelas; the Adjuntas lake, in the Juan Gonzalez ward; the Pellejas lake in the Pellejas ward, and the Garzas lake between the Garzas and Saltillo wards; the Matrullas lagoon in the Palo Seco ward of the Municipality of Toa Baja; and Secreta lagoon in the Palmas ward of the Municipality of Cataño); six cave systems (five in the Municipality of Arecibo and one in the Municipality of Vega Baja); a 3.91 lineal-mile crossing in the Carst Belt Region in the Municipality of Manatí; 156 drinking water wells and sampling stations; 117 creeks; 13 rivers (the Tallaboa river in the Municipality of Peñuelas; the Corcho river in the Portugués ward of the Municipality of Adjuntas; the Pellejas river in the Vegas Abajo ward of the Municipality of Adjuntas; the Río Grande de Arecibo in the Pellejas ward of the Municipality of Adjuntas, and in the Carreras, Hato Viejo and Tanamá wards of the Municipality of Arecibo; the Caguanita river in the Caguana ward of the Municipality of Utuado; the Caguanas river in the Caguanas ward of the Municipality of Utuado; the Tanamá river in the Tanamá ward of the Municipality of Arecibo; the Río Grande de Manatí in the Palmas Altas, Bajura Afuera and Río Arriba Poniente wards of the Municipality of Manatí; the Cibuco river in the Municipality of Vega Baja; the La Plata river in the Municipality of Dorado; the Cocal river in the Sabana Seca ward of the Municipality of Toa Baja; the Hondo river in the Palmas ward of the Municipality of Cataño; the Bayamón river in the Palmas ward of the Municipality of Cataño); four natural reserves (Tiburones Canal Natural Reserve, Hacienda La Esperanza Nature Reserve, El Indio Natural Reserve and the Las Cucharillas Marsh Nature Reserve); 128 sinkholes (3 in the Municipality of Utuado, 64 in the Municipality of Arecibo, 47 in the Municipality of Manatí, 9 in the Municipality of Vega Baja, 2 in the Municipality of Guaynabo and one each in the municipalities of Dorado, Toa Baja and Cataño - the alignment will cross over 21 of which 14 had already been impacted by PR-10).

It is stressed that the project will not impact or affect coral reefs, cays, dunes, cisterns, dams, reservoirs, drinking water intakes or irrigation systems because none are in areas near the project.

- Determination of Jurisdiction

The determination of jurisdiction study concluded that of the 2,988,833.3 m² (738.6

acres) of wetlands under the jurisdiction of the United States Corps of Engineers delimited for this project, the project's construction right of way will cover some 369.3 acres.

The delimited wetlands are classified in the following categories: palustrine forested, palustrine herbaceous, palustrine herbaceous in agricultural use in the past or in the present, estuarine forested, estuarine forested canals and estuarine salt marshes. Approximately 2.0 acres of palustrine forested wetlands were delimited; 310.1 acres of palustrine herbaceous wetlands; 397.8 acres of palustrine herbaceous wetlands in agricultural use in the past or in the present; 23.6 acres of estuarine forested wetlands; 1.2 acres of estuarine forested canals; and 3.9 acres of estuarine salt marsh wetlands.

- Soil Classifications

The project is distributed in 419 plots of which 84.8% belong to the private sector and 15.2% to the public sector. The different types of use of the soils through which the alignment will cross were distributed approximately in the following manner: industrial area, 3.1%; public and recreational area, 2.8%; transportation area, 0.3%; commercial area, 0.1%; residential area, 1.0%; agricultural area, 56.2%; forest area, 35.3%; and hydrographic-hydrological area, 1.3%.

Of the 92 miles the project encompasses, 4.3% will be in a zone classified as having a 0.2% annual probability of risk of flooding, 0.43% will be in a zone classified as A (areas with a 1% annual probability of flooding and a 26% probability of flooding within 30 years), 38.9% will be in a zone classified as AE (areas with a 1% annual probability of flooding and a 26% probability of flooding within the next 30 years), 3.8% will be in a zone classified as VE (area with an annual probability of flooding equal to, or greater than 1% and a 26% probability of flooding within 30 years) and 54.5% will be in a zone classified as X (area with an annual probability of flooding of less than 1%).

- Highway crossings

Sixty three (63) state highway crossings are identified as intercepted by the project's alignment. These are indicated in Addendum 1, Highway Crossings.

- Proximity to the communities and quiet zones

The sectors or communities close to the project's alignment, approximately 400 meters or less from them, and each municipality's quiet zones closest to the project were determined. The findings are gathered in Addendum 2, Distance to the Communities and Quiet Zones.

- Archaeological and architectural findings and cultural and historic sites

The Phase 1A study identified the already known archaeological resources and

established the basis for discovering additional resources in the project's area. The following findings are worth highlighting:

In the Municipality of Peñuelas - vestiges of the railroad line and the Loyola Hacienda in the Tallaboa Poniente ward; a small shell heap with pottery and conch shell fragments from the chicoid taino period in the Encarnación ward; the Dolores and Coto Haciendas in the Rucio ward.

In the Municipality of Utuado: an archeological find near the cemetery and the river crossing.

In the Municipality of Arecibo: archaeological residues inside a cave with habitation remains and several in the Rio Arriba ward; archaeological finds in Refugio Salmón and in the Ventana cave, in the Hato Viejo ward; residues, a cave or rockshelter, petroglyphs and pictographs and historical material were found in Matos Cave in the Carreras ward.

In the Municipality of Barceloneta, in the Palmas Altas ward there are vestiges of the railroad line that intercept the alignment at mile 53.25. The Phase 1A Archaeological Study recommends a 1B Phase, with the exclusion of the mountainous areas and the Tiburones Marsh zone, for the whole area the project will traverse in this municipality.

In the Municipality of Manatí: two architectural structures, the Truss Bridge and Central Monserrate sugarcane mill.

In the Municipality of Vega Baja: an architectural structure, Hacienda Monserrate; the study recommends going ahead with Phase 1B in the Paso del Indio area.

In the Municipality of Vega Alta: architectural structure, a bridge; the Abra de los Perros Cave is considered an area of archaeological findings.

In the Municipality of Dorado: Casa Hernandez or the residence of Mrs. Antonia Ramírez; abundant dispersed materials were found of the Taino/Colonial period of the late 19th Century; material on the surface of the Taino, subtaino, late saladoid and colonial period in Punta Corozo; a multi-component site with Taino and late 19th century colonial period in the Mameyal ward.

In the Municipality of Toa Baja: Santa Elena dairy farm; fragments of 19th century historical ceramic dispersed on the surface; ruins of the Our Lady of Candelaria shrine in the ancient Hacienda El Plantaje, in the Sabana Seca ward of Toa Baja; an archaeological site under the gravel topping in the posterior part of land belonging to the Electric Power Authority, in the Palo Seco ward.

In the Municipality of Cataño: Hacienda Palmas in the Palmas ward.

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C. Study of Alternatives and selection of the alignment

Chapter 4 analyzes in detail the alternatives considered for the execution of this project. The following were considered among such alternatives: land alignments for a natural gas pipeline; the use of a system of barges and buoys to receive, re-gasify, store and provide natural gas; the construction of a liquified natural gas receiving and re-gasification terminal. In addition the utilization of renewable energie options technically and commercially proven and the No Action alternative were also considered.

- No Action

The No Action alternative was found to be not feasible given the transcendence, importance and public well-being sought by the project. It was considered that, although this alternative would avoid the impact related to the construction, installation and operation of a pipeline to transport natural gas, such impact can be minimized and mitigated. This alternative is not indicative of no impact, since it forces the continued burning of petroleum derived products which generate a greater amount of pollutinon and emissions into the air and at higher costs than the burning of natural gas, which would make the service of electric power more expensive and it would negatively impact Puerto Rico's economy.

The No Action option would not permit maintaining a structure of fixed costs that would avoid the abrupt peak changes in the cost of the fuel acquired. This can only be avoided by reducing the dependence on the use of petroleum and expensive fossil fuels. In addition, the limitations of the federal and state permits on the type of fuel that can be burned would lead us to one of two options: to cease generating electricity, which is not viable, or burn a cheaper fuel with higher sulfur content than that contained in said permits, which would expose us to fines and sanctions.

- Liquified natural gas receiving terminal in the San Juan Power Plant

Even though Puerto Rico has an Liquefied Natural Gas (LNG) Terminal with the capacity to supply our needs, at the EcoElectrica Cogenerator facility, the alternative of constructing a new LNG terminal near the San Juan Thermolectric Plant was considered because it would be near an existing dock for the receipt of fossil fuel. Three criteria were used determine whether this was a viable alternative: specific site factors, maritime operations, and environmental issues.

The analysis of these criteria leads us to the conclusion that this was not a viable alternative for the following reasons: we would need to dredge the navigational canal and the turning basin; the dredged material would present the problem of securing an adequate disposal location; the dredging and disposal operations would produce a high concentration of sediments, which would impact the benthic area and the water quality even more; maritime traffic would be adversely affected and as a consequence our economy and tourism because the San Juan Bay is the backbone of our tourist

economy; the increase in maritime traffic would affect marine life in the area; there would be an increase in the temperature of the Puerto Nuevo Bay waters, which would have a cumulative effect on the benthic community of the bay, water quality would be affected and, in consequence, the water quality parameters required in the environmental permits which govern the power plant; due to space limitations in the power plant and in areas near it, we would be unable to comply with the regulations that determine the space that must exist between the different elements within the terminal and the establishment of an exclusion zone or distance from populated areas; the environmental impact associated with the construction of the pipelines to transport natural gas in the North of the island would not be eliminated; the process of studies and permits together with the construction and commencement of the operation could take from 7 to 10 years, it would not satisfy our need for an immediate project to propitiate the transition from petroleum to renewable sources of energy; the project would be too onerous because it would surpass \$1,000 million.

- Systems of barges and buoys

The installation of a system of barges and monobuoy for the receipt, storage, re-gasification and transport of the natural gas was considered as one of the alternatives. The AEE evaluated the viability of the construction of these systems in three areas: San Juan, Toa Baja and Arecibo. The criteria considered in such evaluation were: costs, space, time to have it operational, permits, safety, environmental justice, past experiences in Puerto Rico and the United States.

The process for the design, construction and operation of the barges and buoy system would have an approximate cost for each power plant of between 70 and 80 million dollars yearly, subject to the signing of a contract with the company in charge of the process for a term of not less than 20 years. At the end of the 20 years the cost would be some 1.6 billion dollars for each power plant. The time period required to start the operation of the system would be between 5 and 8 years. In addition, an analysis for each power plant demonstrated that it is not a viable alternative in the short term.

The San Juan Power Plant does not have space available to locate the receiving terminal; the pipeline to the power plant would run through an area of intense maritime traffic; there are low-income communities near the project that would be affected; the proximity of CAPECO would influence the community's perception of the project.

The Palo Seco Power Plant does not have space to locate the receiving terminal; the permits process is complicated and costly; there are low-income communities near the project that would be affected, the proximity to CAPECO would influence the community's perception of the project.

The Cambalache Power Plant does not have space available to locate the receiving terminal; the permits process is complicated and costly; there are low-income communities near the project that would be affected.

The foregoing ruled out the construction of a system of barges and monobuoy for the receipt, storage, re-gasification and transport of natural gas within the time frame required for the action under consideration. Consequently, the supply of natural gas to this power plant will have to be through a gas transport pipeline, inevitably.

- Natural gas pipeline

In this analysis, some components of the study owned by the AEE and conducted under contract by *Power Technologies Corporation* (PTC) in 2006, titled: *Corridor and Alternative Routes Selection Study*. The two alignments suggested in the PTC study to carry natural gas from EcoEléctrica to Cambalache Power Plant were analyzed, together with a third alignment not considered in the study. The same was done with the alignments suggested in the study for the transport of natural gas from Cambalache Power Plant to the metropolitan area power plants, Palo Seco and San Juan.

For the selection of the alignment with the greater potential for development, the three alignments for each stretch were compared and the alignment that obtained the greater number of positive criteria in its favor was selected. Eight criteria were used to compare each stretch: land use; bodies of water impacted; miles of forest or natural reserves impacted; endangered species; archaeological findings; highway crossings; zoning or soil calcification and nearby residences. For each criterion, a positive (+) value was assigned to the most favored stretch, except for the criterion of nearby residences, which was assigned a value of two (++) positives since one of the primary goals of the project is to be as far away as possible from communities or inhabited areas.

The matrix created would indicate which alignment would have the greater potential for development for each stretch. The alignment selected for the project would be the union of the two favored segments. Necessary variances were incorporated into this selected alignment due to different reasons: minimal impact to the communities, avoiding or minimizing the environmental impacts, economic factors and factors associated to the construction. The total number of variances incorporated were 18, broken as follows: 12 variances to keep far away from communities; three variances to avoid or minimize environmental impacts; one variance for economic factors; and two variances for construction reasons. The incorporation of these variances resulted in the alignment presented in this environmental document.

D. Project Description

Via Verde will provide a natural gas transport system from EcoEléctrica in Peñuelas to the AEE's Cambalache, Palo Seco and San Juan power plants through some 92 miles of 24" diameter, underground steel pipeline.

The pipeline and the other construction materials will be ordered from companies outside of Puerto Rico and will be received by the Port of the Américas and the San

Juan Port Zone. Six operation centers will be established located adjacent to each port, plus in the areas of Utuado, Arecibo, Vega Alta and Toa Baja. Their locations are already impacted by industrial activity and their use will be temporary in nature while the project is under construction. They will serve as bases for the receipt, storage, inventory and dispatch of materials and equipment for the project.

The project will have a cost of \$447,000,000 dollars. This sum includes the items of design, purchase, hauling and delivery of materials, construction, payment of licenses and taxes, land acquisitions, studies and permits. The cost of the conversion to natural gas of the units is estimated at between 50 and 70 million dollars.

Before the excavation begins there will be coordination with the Public Service Commission or with the Permit Office (Oficina de Gerencia de Permisos), as applicable, so that the agencies or companies with underground infrastructure mark the location of said infrastructure. Whenever possible, a minimum distance of 24" from other underground infrastructure will be maintained.

Four gas flow meters with their respective equipment, one bidirectional PIG launcher/receiver and one PIG receiver will be installed, and connections will be provided for a portable PIG launcher/receiver unit. The latter are to carry out inspections, measurements and cleaning inside the pipeline. In addition, isolation or security block valves will be installed to isolate segments in case of inspections, repairs or emergencies, the number and location of which will be determined by the class and location.

The equipment will have the capacity to operate at maximum pressure and temperature of 1,450-psi and 120°F, but the entry pressure will be 650 psi and it will be reduced to 400 psi before it enters the combustion turbines.

- Natural Gas

Natural gas is a fossil fuel formed by organic matter underground at high pressure for geological-scale times. It is a mixture of hydrocarbons whose principal component is methane (CH₄). It is colorless and odorless and it is lighter than air; its specific gravity fluctuates between 0.55 and 0.64; its explosive limit is 3-17%, outside of these limits there is no combustion. Natural gas is non-toxic, but it is a simple asphyxiant if it displaces oxygen, which could produce dizziness, deep breathing or, due to the need for air, nausea and unconsciousness in case of overexposure, which would require immediate medical attention. It is not classified as carcinogen or potentially carcinogen.

To address leakages the emergency response and rescue personnel must use a self-contained respirator (SCBA) and fire-resistant clothing, and they must have the training required by Law (29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*). All personnel must be evacuated from the affected area and if it is in a confined space, the area ventilation is to be increased.

One cubic foot of natural gas produces an average of 1,000 BTU. It represents one fifth of the world's energy consumption. It is one of the cleanest fossil fuels and better for the environment because the sulfur dioxide emissions are minimal and those of nitrous oxide and carbon dioxide are less than those of other fossil fuels. The natural gas industry is comprised of three segments: production, transmission and distribution. In Puerto Rico it is used in its entirety for the generation of electricity although natural gas has other domestic, commercial, industrial and transportation uses.

- Personal safety

The construction project will be contracted out. The contractor will be responsible for submitting a work plan which includes the health and safety aspects established in the Code of Federal Regulations, Title 29, *Labor*, Part 1910, *Occupational Safety and Health Standards* and Part 1926, *Safety and Health Regulations for Construction*.

- Construction stages

The construction will be done by segments and it will follow a specific sequence (production line style). Each construction stage will be described below.

- Identification of owners, Surveying I and Environmental Studies

The *New Star Acquisitions* company was hired for this stage. They identified the land owners; they were asked for an access permit to carry out the land surveying and the pertinent environmental studies and one was signed. In the first stage of the surveying the LIDAR aerial technology was used; with the alignment's coordinates the environmental studies were started.

- Clearance of the right of way

Once the land comprising the right of way has been acquired, heavy machinery will be used to clear and level. Although the construction right of way will be 100' in flat areas, on mountainous areas and in places where the horizontal directional drilling is made, it may range from 100 to 300 feet. It is estimated that 1,113.8 acres will be impacted and 687,760 cubic meters of soil will be removed. The soil removed will be stored to be used later in the restoration stage. The necessary measures will be taken to minimize sedimentation of the water bodies.

- Land surveying

The center points of the line will be checked and marked. Then the pipeline (in 40-foot long spreads) is laid throughout the alignment.

- o Trench Construction

Specialized machinery will be used for the construction of the trenches (*wheel ditcher*) or machinery with a mechanical arm, depending on the conditions of the area. The trenches will be 5 to 6 feet deep and 4 to 5 feet wide, so as to allow a 3-foot cap over the pipeline. The removed soil will be sifted and stored alongside the trench to cover the same later. The remainder will be disposed of in an authorized landfill. It is estimated that 494,206 cubic meters of soil will be removed.

The highway crossings will be made by boring and the pipeline will be at a minimum of 4 feet under the same highway. (See addendum 1, Highway Crossings). These segments will be designed to tolerate the weights associated to the highway and the vehicles that pass through it. The crossings of bodies of water and of some highways will be made by horizontal directional drilling (HDD). This is a "dry" crossing method because it does not interfere with the flow of the body of water, and it is made underneath the bed of the body of water. A dye will be added to detect small bentonite leaks. Ten bodies of water were identified that will be crossed by HDD. In addition, 66 crossings of bodies of water were identified to be crossed by open trench. Addendum 3, Crossings of Bodies of Water, contains the bodies of water and the coordinates where the project will cross.

- o Welding and bending

Once the pipeline is positioned, the necessary bending is made to couple it to the ground with machinery that exerts hydraulic pressure. Then it is laid on supports, the ends are cleaned, lined up and welded using the manual submerged arc welding method. The welded seams will be checked with non-destructive methods; if any flaw is detected, the weld is repaired or it is cut off and a new weld is made. Lastly, the ends are covered with a protective coating. Next a second inspection of the pipeline protective coating is made.

- o Lowering and backfill of the trench

The pipeline is lifted using specialized machinery (sidebooms) and it is lowered into the trench. Fine-particle sifted soil is used first to back-fill the trench to prevent damage to the protective coating. Then the remainder of the soil and small stones are deposited on the excavated trench and finally the top soil is placed within the construction area. In total the minimum cover will be 36 inches and 48 inches in agricultural areas. The recommendations of the Highways Authority with respect to the backfill material to be used will be followed in crossings of highways, roadways and roads where the open trench method was used.

- Hydrostatic testing

In compliance with 49 CFR 192.505, *Strength test requirements for steel pipeline*, hydrostatic testing will be conducted on the totality of the pipeline. The pressure will be higher than the operating pressure for at least eight hours.

- Pipeline right of way restoration

After passing the hydrostatic test, the right of way will be restored. Of the 100 feet width of the construction right of way, 50 will be restored to their original state; the remaining 50 feet will be a permanent or operations right of way, which will be restored only with wild vegetation or lawn without deep roots. In agricultural lands it may be used to plant crops that don't have deep roots. On wetlands, mitigation will be carried out "on site".

- Construction in special areas

- Wetlands and mangrove areas

In non-saturated areas the same equipment and procedure of open trench will be used. In saturated areas, the pipeline is welded outside the wetland area; the excavation and backfill of the trench is made with backhoes; the pipeline is installed by the push and pull method through flotation buoys; the buoys are removed and the pipeline is sunk by its cement coating or using weights.

To prevent the equipment from sinking or to avoid disturbing the soil or excessive turbidity of the water, timber mats or timber rip-raps will be placed. The organic cover extracted will be stored and used as backfill.

- Earthquake prone areas

Via Verde will be designed and constructed with similar specifications to those used in places with a higher incidence of intense earthquakes, like California and Alaska. The following measures will be incorporated to the design to guarantee the integrity and continuous operation of Via Verde: the relative alignment of the pipeline relative to the faults to diminish the impact of a slip in such fault; burying the pipeline in a wide trench, with long lateral slopes filled with compacted sand to allow for the deformation of the pipeline during a seismic event; including enough bends in the design of the pipeline to guarantee its flexibility; the results of the geotechnical studies that will be conducted to evaluate the properties of the soil.

- Karst zone areas

During the construction there will be a resident biologist at all times to evaluate the area carefully. Only light equipment will enter to minimize the possibility of harm. Adequate

erosion and sedimentation controls will be established. There will not be any operation centers or auxiliary spaces of the construction in this zone. The pipeline will be installed through the pulling method to minimize the heavy equipment. The backfill will be adequate to permit the hydraulic capacity of the soil. Once the trench is covered, vegetation will be immediately planted in the area surrounding the permanent right of way. The pipeline patrolling program during the operation will give special attention to the soil to detect any erosion.

- o Use of explosives

The use of explosives will not be necessary. Nevertheless, if any area were identified in which the use of explosives is indispensable, it will be made only by specialized personnel and in compliance with the applicable laws and regulations.

- Conversion of Units to natural gas

The units that will use natural gas for the production of energy will be: Units 1, 2 and 3 of the Cambalache Power Station; Units 3 and 4 of the Palo Seco Power Station; Units 7, 8, 9, 10 and Combined Cycle Units 5 and 6 of the San Juan Power Station. The units will be modified so they can burn natural gas, Bunker C or a combination of both. The minimum and maximum flow of natural gas each power station will need, respectively, will be: 5.5 and 61, 1.1 and 84, 1.1 and 180 MMSCFD. The systems that will require modifications, among others, will be: modifications to boilers and their gas supply system and modifications to turbines.

- Risk analysis and safety measures

The safety aspects of the gas pipelines are addressed by the Office of Pipeline Safety (OPS). It is in charge of carrying out inspections, establish regulations, promote research, issue compliance orders, apply civil and criminal penalties and educate the public, among other functions. The Pipeline Safety Improvement Act established an alliance between the Federal Department of Transportation, the Energy Department and the National Institute of Standards and Technology, to conduct research, make demonstrations and standardize procedures that guarantee the integrity of pipelines. Via Verde of Puerto Rico will be governed by the codes of the Federal Department of Transportation.

According to the OPS, the causes of incidents and accidents in the natural gas pipelines are, in order of probability of occurrence: corrosion, excavations, failure of the construction materials, action of the forces of nature, human error and unknown or miscellaneous causes. The OPS established preventive measures to minimize each one of these risks.

- o Information program

One of the most important factors of Via Verde is safety, for which reason keeping the public informed is vital to the success of the project. The AEE established a public information plan in two phases.

The first one already commenced and it covers the periods of time before and during the construction. We continue to present the project to the mayors and their legislative assemblies, to agencies with inherence in the project, professional forums and to the general communities. The presentations have the purpose of: conveying clear, concise and correct information; know and respond to the communities' concerns; and establish a point of contact between the community and the AEE. In addition, the different means of communication are used to convey the information.

The second phase will be during the operation of the project. A written Public Information Plan will be developed in accordance with 49 CFR 192.616, Public Awareness, and the American Petroleum Institute, Public Awareness, Recommended Practice 1162.

- o Class location

The different specifications for the manufacture of the pipeline are established in 49 CFR 192.5, Class Location, in accordance with its location or the population density. The regulated specifications that will depend on the classification are, among others: thickness of the pipeline, distance between valves, operating pressure, frequency of inspections and tests. The class unit by location extends to 220 yards (200 meters) on both sides of the line center of any continuous mile of pipeline. There are four classes defined in the following way: Class 1- area near the coast or which contains 10 or less buildings designated for human occupation; Class 2 - area which contains more than 10 but less than 46 buildings; Class 3 - area that contains more than 46 buildings or where the pipeline is within 100 yards of a well defined place (building, children's play area, recreational area, open air theater, or where the public congregates) and is occupied by 20 or more persons, at least 5 days in the week for 10 weeks in any 12 month period (the days and weeks don't need to be consecutive); Class 4 - area where there are four storey buildings or taller.

The classification of the class unit by location may vary by the increase in the population density after the pipeline is installed and in use. The federal regulation establishes that a study must be made to determine, among other things, the hoop stress and the yield strength. This study will determine whether there will be a need to vary the operational pressure so as to adapt to the new class by location. The applicable regulation is 49 CFR 192, sections 609, Change in Class Location: Required Study, 611, 553, General Requirements, and 555, Up rating to Pressures that Will Produce a Hoop Stress of 30% or more of SMYS (Specified Maximum Yield Strength) in Steel Pipelines.

- o Pipeline specifications

The life span of the Via Verde pipeline is fifty years. The same will be designed in accordance with federal regulation 49 CFR 192, sections 105, Design Formula for Steel Pipe and 111, 107, 113 and 115, Design Factor for Steel Pipe, Yield Strength for Steel Pipe, Longitudinal Joint Factor for Steel Pipe and Temperature De-rating Factor for Steel Pipe, and standard 5L of the American Petroleum Institute (API 5L). Among the tests to be conducted on the pipeline are: chemical analysis, impact, hardness, hydrostatic and weld tests.

- o Corrosion control

A Fusion Bonded Epoxy (FBE) external coating will be applied to the pipeline. A second coating, Tough Coat, will be applied over the FBE to the part of the pipeline that passes through bodies of water and under highways for protection when the pipeline is pulled from one side to the other. In addition, the pipeline will have cathodic protection to prevent corrosion. The pipeline will be evaluated annually to insure the functioning of the cathodic protection and the voltage will be monitored by monitoring stations that will check the functioning of the rectifiers. All the parameters of the federal regulations will be followed: 49 CFR 192, sections 463, External Corrosion Control: Cathodic Protection, 469, External Corrosion Control, Test Stations. During the operation, a PIG (pipeline inspection gauge) will also be used, a tool that runs the length of the pipeline and uses non-destructive methods to identify and document defects and anomalies in the same.

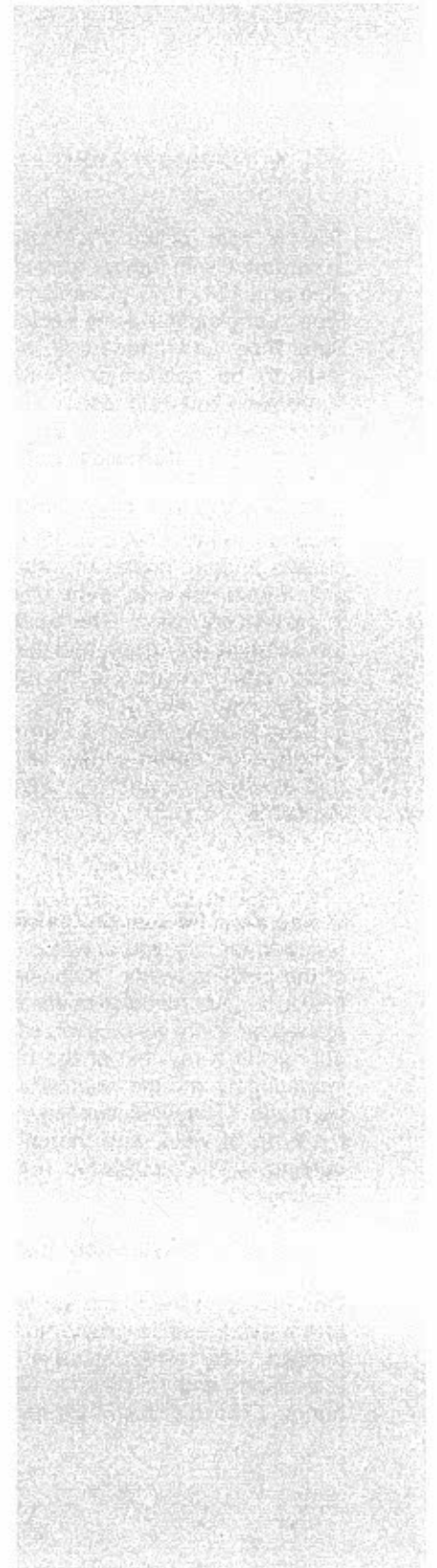
- o Welding

Welders will be qualified before the project starts; and all of them must pass the tests required for this type of welds. The destructive method will be used for the qualification of the pipeline welds. It consists in evaluating the weld measuring the force needed to break it. Approved welders will be assigned an identification number that must be placed on every welding job s/he performs. If any irregularities are detected in the weld during the X-ray test or the hydrostatic test, the welder will be removed from the job immediately and the weld will either be repaired, or it will be cut off and a new weld will be made. The weld inspections will be visual, by an inspector with specific expertise in the type of weld, and through X-rays. The welds will be covered with a protective coating. The applicable regulation is 49 CFR 192, section 243, Non-destructive Testing.

- o Hydrostatic test

Once the pipeline has been lowered into the trench and covered, it is filled with water and a test pressure greater than the maximum allowable operating pressure (MAOP) is applied. The test pressure is 1.1 times the MAOP in open spaces, 1.25 times in Class 2 locations and 1.5 times in Class 3 locations. The pressure applied is stabilized for 8 hours. The test helps locate areas in the pipeline (including the welds) that cannot

tolerate elevated pressures and which therefore fail.



- o Pressure control equipment, isolation valves

To prevent accidents caused by excessive pressure, monitoring and protection equipment to guard from harm caused by elevated pressures will be installed. In addition, valves will be installed that will isolate sections of the pipeline in case of emergency or to perform inspections and repairs. These will be placed by intervals as required by regulation, as a function of the Class by Location.

- o Precautions for excavations

The greatest risks to the integrity of the pipeline are excavation activities whereby any contact with the pipeline must be informed to the operator for the corresponding actions. Before excavating, every person must communicate with the Public Service Commission, or the Permits Office (OGP), as applicable. They will communicate with the operator who will mark the pipeline's alignment. Work will be done in conjunction with the municipalities to establish an excavation control mechanism. An inspector will be assigned to be present during the excavation.

- o Operator qualification

The OPS requires that the operator and personnel hired by him takes part in a formal personnel qualification program (Operator Qualification Rule, August 27, 1999), which must be in writing. This plan must start before the pipeline begins to operate. The personnel qualification program is governed by 49 CFR 192.805, Qualification Program, and it must be documented in accordance with 49 CFR 192.807, Recordkeeping, to demonstrate compliance with the written plan. The OPS established an inspection protocol for use by federal and state inspectors. In addition, the operation personnel must comply with the Regulations of the Testing Program to Detect Controlled Substances in Officers and Employees of the AEE.

- o Clearance distance from the pipeline

The regulation, for the purpose of protecting the underground pipeline, requires that it keep a distance of 12 inches from other underground equipment and infrastructure (49 CFR 192.325). Nevertheless, whenever possible a distance of 24 inches will be kept. The regulation does not provide distance requirements between the pipeline and buildings or dwellings.

- o Inspection and maintenance

A Pipeline Integrity Management Program will be developed and established pursuant to 49 CFR 192.911, which will discuss the specific risks for each high consequence area (HCA, or AAC for *Area de Alta Consecuencia* in Spanish) identified in accordance with 49 CFR 192.905. In addition, an Inspection and Maintenance Program will be prepared that will cover the pipeline, flow meters, valves and other equipment. Copies

of these will be kept in our Power Plants and in EcoEléctrica. In addition, pursuant to 49 CFR 192.709, Recordkeeping, a file will be kept for everything related to the repairs, patrolling, inspections and tests.

- o Patrolling

The AEE will establish a patrolling program to observe evidences of leakage and conditions in the right of way that may affect the integrity of the pipeline. The patrolling methods will be: walk through, drive through or helicopter flights. The frequency of patrolling is established in 49 CFR 192.705, Transmission Lines: Patrolling, and it depends on the class by location.

- o Markers

Once the line is constructed, markers will be placed throughout its length. The places, reasons and information the markers must have are regulated in 49 CFR 192.707, Line Markers for Mains and Transmission Lines.

E. Impacts

Every possible effort was made to avoid areas or habitats of ecological value and to avoid significant impacts. In places where it is unavoidable, measures will be taken to minimize the negative effects and mitigate the impact caused.

- Deforestation and soil movement

It is estimated that 1,113.8 acres of land will be impacted. All the trees and vegetation will be removed from that area. The movement of soil for the project's construction is 1,181,966 cubic meters, approximately. The impact caused by these activities will be soil erosion, sedimentation of bodies of water, emission of fugitive dust, possible reduction in the soil's absorption capacity due to compaction, increase in the potential for the introduction of invasive species and reduction of available habitat for fauna.

- o Emissions of fugitive dust

The following measures will be taken to minimize these impacts: a construction permit will be requested for fugitive dust emission sources; a Notice of Intent will be filed and a Storm Water Pollution Prevention Plan will be prepared; sprinkler trucks will be used to sprinkle the areas; dump trucks will use tarps.

- o Erosion and sedimentation

To minimize the impact the following measures will be taken: the work area will be demarcated to avoid removal from outside the area; an Erosion and Sedimentation Control Plan will be prepared; a Notice of Intent will be filed and a Storm Water

Pollution Prevention Plan will be prepared; the soil will be stored adjacent to the trenches or be reused as backfill (the remainder will be disposed of in an authorized landfill); the soil will be compacted; and the removed vegetable cover and trees will be mechanically shredded and reused as wood chips; in areas of marked slopes, terraces will be built and covered with wood chips.

- o Karst Zone

The protected karst zone in Puerto Rico covers some 151 square miles. Via Verde will cross over some 3.91 linear miles, or 0.08 square miles of these, which is equivalent to 0.05% of the protected karst zone. During the construction there will be a resident biologist available at all times to evaluate the area carefully. Only light equipment will enter the zone to minimize the probability of damage, for that reason the installation of the pipeline within said area will be using the push and pull method. Adequate erosion and sedimentation controls will be established. There will be no operation centers or auxiliary spaces to the construction in this zone. The backfill will be adequate to allow the soil's hydraulic capacity. Once the trench is covered, vegetation will be planted immediately in the area surrounding the permanent right of way. The pipeline patrolling program during the operation will pay special attention to the soil to detect any erosion.

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- Agriculture

The potential impacts on agricultural land will include: crop losses, interference with agricultural drainage, loss of top soil, soil compacting and impact to irrigation systems. Once the construction is finished, the use of the soil will continue as before, including planting as long as it doesn't include trees whose roots may interfere with the pipeline.

The following measures were evaluated to minimize or mitigate the impacts and the viable ones will be implemented: the time of less impact to agriculture will be established; when the soils are used continually for cultivation damages will be indemnified; topsoil will be separated and stored for reuse; erosion control measures will be implemented; the surface soil will be de-compacted to facilitate planting and water absorption; the construction works will be coordinated with landowners and lessees to avoid as much as possible damages to irrigation systems and cattle movement; there will be indemnification for crop losses.

- Deforestation

Loss of vegetation will be inevitable. Therefore the following measures will be taken: the right of way will be delimited to avoid damage in other areas; the soil will be restored to its original state and only the permanent right of way will be kept free of deep-rooted vegetation; a mitigation plan will be devised for cases in which the loss of species with ecological value cannot be avoided; reforestation will be in a 3:1 ratio.

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- o Forests

The original alignment crossed through three forests: Bosque del Pueblo, Rio Abajo Forest and De La Vega Forest, which together comprise 10,515.85 square miles of forest. To prevent impacting those, the alignment was varied so as to avoid Bosque del Pueblo totally, the Rio Abajo Forest will not be impacted because the existing, already impacted RoW of PR-10 will be used. The only forest to be impacted will be De La Vega Forest. Its total area is 1.85 square miles and only 0.0086 square miles of it will be impacted temporarily, that is 0.47%. Once the construction is finished, 0.0043 square miles will be restored, whereby the permanent impact will be 0.235%. The impact to the total area of the three forests will be 0.0086 square miles or 0.000082%.

- Wetlands

Thirty-three percent (33%) of the alignment will cross through wetlands. The impact will be reflected on soil disturbances, which will increase the turbidity of the water, there will be temporal and permanent loss of vegetation and impact to resident and migratory species. To minimize the impact on wetlands the following measures will be taken: to avoid the accumulation and putrefaction of the removed vegetable cover, it will be removed outside of the area and disposed of as non-hazardous solid waste; the right of way will be delimited to avoid impact outside of this area; erosion and sedimentation control measures will be established; vehicles with leaks will not be allowed; special wetland construction techniques will be used; loss of vegetation will be mitigated on site; a Mitigation Plan will be prepared in coordination with the concerned agencies.

- Mangroves

This resource will not be impacted since measures have already been taken to avoid the same: the alignment was varied in the four mangrove areas so as to avoid crossing over the same or construction techniques will be used that will not impact them (HDD).

- Surface water bodies

Seventy-eight (78) bodies of water through which the project will cross were identified. The small ones will be crossed by open trench. The impacts include turbidity, sedimentation, diminution of dissolved oxygen, mortality of aquatic fauna and flora. The impact will be mitigated by reducing the construction time: bodies of water fewer than 10 feet wide will be crossed in 24 hours or less; from 10 to 100 feet wide, in 48 hours.

The more voluminous bodies of water will be crossed with HDD. Geotechnical studies will be made and construction plans specific for the site will be developed. The release of bentonite may affect the turbidity, diminish dissolved oxygen and affect the respiration of aquatic organisms. To avoid it a dye will be added to detect leaks and, should one occur, the flow of bentonite will be immediately stopped and the pertinent

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Agencies will be notified. Another impact is the size of the construction right of way which will be 150 to 300 feet on both sides of the body of water. Erosion and sedimentation control measures will be established.

- Groundwater and aquifers

Thirty-one (31) aquifers were identified; the possibility of polluting groundwater is remote. To avoid oil and fuel spills a Spill Control Plan will be established.

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- Water consumption

The hydrostatic test entails the greater water consumption (7 million gallons) whereby, to eliminate the impact on the public distribution system and the bodies of water, the water will be obtained from the wells for which the AEE has a water franchise. Bottled water from local suppliers will be used for consumption by employees. A local supplier will be hired to sprinkle the ground. He will be responsible for supplying the truck and the water.

- Water wells

Of 156 wells within a radius of 460 meters from the alignment, only five are inside the project's operation right of way. These will be identified in the project's drawings, their location will be marked on the ground to avoid impacting them and any breaks that may occur due to the construction will be repaired.

- Transportation and traffic

Barges will be used for the maritime transport of materials and machinery to the Port of the Americas and the San Juan port zone. To minimize the impact to maritime transport the following measures will be taken: all the requirements established by the receiving ports, the Ports Authority and Federal Customs will be complied with; a logistics plan will be submitted for endorsement by the pertinent authorities.

The roadways will be used as access to transport personnel, equipment, vehicles (light and heavy) and materials to the different project areas. Roads will be crossed using the open trench method or drilling. These roads are indicated in Addendum 1, Highway crossings. To minimize the impact to the integrity of the roadways and the interruption of, or increase in traffic the following measures will be taken: car pooling by employees will be encouraged; a Traffic Management Plan will be submitted to the Transportation and Highways Authority (in Spanish Autoridad de Carreteras y Transportación or ACT); if necessary and in coordination with the ACT and the local Police, detours will be established; the trenches will not be left uncovered.

- Archaeological finds and cultural and historic places

Three rock shelters with the presence of petroglyphs, possible farming terraces, remainders of two railroad bridges and the remainders of two haciendas were located. An archaeological study was conducted, Phase 1A which indicated the most important findings: Tallaboa Site, Salto Arriba Site, Bridges, Hacienda La Teresa, Hacienda Las Lisas, rock shelters, farming terraces, Paso del Indio, Punta Corozo, Dorado 15, Toa Baja 18, Hacienda La Candelaria, Warehouse 5. The recommendations the Institute of Puerto Rican Culture and other concerned agencies see fit to provide will be followed.

- Noise

Via Verde is a lineal project and the construction will move along day by day, therefore the noise will not be concentrated in any specific area. The noise levels of the machinery and the vehicles to be used are comparable to those established by the Environmental Quality Board's (in Spanish Junta de Calidad Ambiental or JCA) Noise Pollution Control Regulation. The following measures will be taken to minimize the effects of noise in populated areas: the work will be circumscribed to the time schedule established by the Regulation; the vehicles and machinery will have noise control equipment; inasmuch as possible, the newest equipment found will be used; the machinery will be turned off when not in use.

- Spills

In general, spills occur by human error: poor handling of the products, lack of maintenance of the equipment, and lack of adequate knowledge of the functioning and operation of the machinery. If spill occur, they will not be of a significant magnitude, because small quantities of the products will be used. The most significative event would be the total spill of a fuel truck, 2,500 gallons of diesel fuel.

The following measures will be established to avoid spills or minimize the impact of the same: a Spill Control Plan and a Spill Prevention, Control and Mitigation Plan for the use of bentonite will be prepared; Personnel will be trained (in: handling of chemicals; situations that might cause spills; how to avoid or minimize the impact; how to respond to a spill and who to inform; the correct functioning and operation of machinery); vehicles will have a Spill Kit; spills in water will be cleaned using absorbent pads and in case of spills on the ground, the contaminated soil will be removed; the collected material will be deposited in containers, identified, full RCRA tests will be conducted and it will be disposed of in an authorized place; vehicles with leaks will not be allowed in the work area; no chemicals will be stored outside the operation centers.

- Wastes

It is estimated that non-toxic solid wastes will be generated in amounts greater than 100 cubic yards weekly, approximately. This could increase the amount of waste received at the landfills because this waste will be collected and transported to the nearby landfills approved by the JCA. The impact will be minimized by reusing part of the soil

to backfill the trenches and restore the right of way, only the surplus soil will be disposed of in an authorized landfill. The vegetable cover and trees removed will be mechanically shredded and used as wood chips for erosion control in slopes. Measures will be established for the control of erosion and sedimentation. Handling of chemical products will be delegated on experienced personnel and it will be separated from the other waste to be disposed of in accordance with the pertinent regulations after being characterized with a Full RCRA analysis.

The following measures will be implemented to minimize the impact caused by used water: the water used in the hydrostatic test will be discharged in our power plants with a permit from NPDES and in coordination with the EPA; the contractor who provides the portable toilets will be in charge of providing maintenance and for disposing of the waste and for handling any spills, all in accordance with the regulations of the Department of labor and Human Resources.

- Socioeconomic impact

The project represents a temporary benefit for the local economy. Among the benefits are: the taxes paid to the municipalities if applicable; employment opportunities (between 1,000 and 1,200 temporary direct jobs and some 4,000 to 4,500 indirect jobs); and an increase in sales and the use of services (hotels, motels, restaurants, gas stations, fast food and articles of prime necessity businesses, hauling trucks, sprinkler trucks, heavy equipment, rental of cars, trailers, portable toilets, purchase of lumber, gravel and bottled water, among others).

The project's construction will not have a disproportionate environmental impact on any socioeconomic group and whatever impact there is will be of short duration because the construction is not stationary. Free access to communities and residences will be ensured; the work area will be delimited; special work areas will be located outside the quiet zone; the necessary measures to control fugitive dust, noise and increased traffic will be complied with. A public information program to educate the community prior to the construction will be established and will continue during the same.

One of the most important impacts will be the establishment of the maintenance right of way which encompasses 150 feet of the pipeline. Within this were located approximately 94-102 structures or residences. The properties will be appraised and the owners will be compensated (fair market value) for the appraised value. The general use of the soil will not be altered, however, the construction of buildings or structures or the planting of trees or vegetation with deep roots will not be permitted in the operation right of way (a width of 50 feet throughout the length of the pipeline).

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- Protected, threatened or endangered species

The presence of the listed species was not detected during the field work, with the exception of the guabairo (Puerto Rican Nightjar, *Caprimulgus vociferus noctitherus*).

This species will be protected by the implementation of a protocol for its protection and conservation and by constructing the project outside of its nesting season. All permanent loss of habitat for the guabairo will be mitigated in accordance with a plan approved by the DNER and the United States Fish and Wildlife Service.

Regarding the species of fauna designated as vulnerable, the Puerto Rican boa and the white-cheeked pintail or Bahama duck were sighted. The Puerto Rican boa will be protected by the implementation of a protocol for its protection and conservation during the construction phase. The white-cheeked pintail prefers lagoons or ponds, which are not under the project's impact footprint. Other species such as the falcón de sierra (Puerto Rican Sharp-Shinned Hawk, *Accipiter striatus venator*), the guaraguaito (Puerto Rican Broad-Winged Hawk, *Buteo platypterus brunnescens*) and the Puerto Rican Parrot (Puerto Rican Amazon, *Amazona vittata vittata*), should not be impacted as long as areas with characteristics similar to their habitat are not disturbed, especially during their mating and nesting seasons.

The species of flora designated as critical can be identified with some conspicuous method (printed marking ribbon, or "DO NOT CUT flagging tape") and thus avoid impacting them. If there is the possibility of impacting them, they will be transplanted to an adequate place, by personnel qualified for this practice.

- Air quality impact

The change to natural gas represents a substantial reduction in criteria pollutants air emissions. The percentage of reduction of criteria pollutants in pounds per year for each power plant, calculated according to the formulas of the Air Pollutants Emission Factors (AP 42), will be the following: 75.79% for the Palo Seco Power Plant, 69.30% for the San Juan Power Plant, and 66.75% for the Cambalache Power Plant. The only individual criteria pollutant that would see a slight increase in the percentage of emissions (6.04%) would be the Volatile Organic Compounds (VOC) in the Palo Seco Power Plant. In compliance with federal regulations, a Prevention of Significant Deterioration (PSD) permit will be obtained for this power plant.

The change to natural gas will also result in a significant reduction (between 25% and 30%) in carbon dioxide emissions. An increase in the concentration of carbon dioxide in the atmosphere results in an increase in global temperatures or global warming.

- Environmental monitoring program

As part of the efforts to avoid or minimize the impacts of the construction, the project will have an Environmental Coordinator who will be in charge of the project's environmental impact issues.

- Cumulative impact

The cumulative impact is the total effect on the environment resulting from a series of past, present or future actions of independent or common origin. No cumulative impact on mangroves and wetlands is expected.

There may be constructions going on in certain project areas which coincide with Via Verde and contribute to increase the fugitive dust in the air. The cumulative effects on the air quality due to the operation of the units are contemplated in the current permits and those that will be obtained for the changes due to the use of natural gas. The cumulative impact of pollutant emissions will be a positive one, since there will be a reduction in the emissions of criteria pollutants and carbon dioxide.

The project's impact on traffic will be added to the impact due to private and public vehicles from other projects developed in the area. The cumulative impact will be temporary in each municipality.

During the project's construction there will be an increase in the demand for bottled water and water used for sprinkling which will be added to the demand from other construction projects and the demand from the general population. This will be temporary for the duration of the construction.

The impact to agricultural areas in certain areas is unavoidable and in those the project's impact will be added to the impact of past and future agricultural activities.

There will be a temporary noise increase during the construction that will be added to the noise impact of public and private vehicles and other construction equipment located in the area. Although the noise generated by the project will not be concentrated in one specific zone because the construction area will change daily, it will be temporary.

F. Socioeconomic study

Chapter 7 includes a socioeconomic study to determine whether the impact the proposed action will have is one of fair treatment for all groups of persons. To prepare this analysis data from the 2000 Census were used, which were obtained from the information supplied by the Puerto Rico Planning Board, Census Office.

The policy for the implementation of Environmental Justice in Region 2 of the Federal Environmental Protection Agency (EPA), established that a homogeneous population such as Puerto Rico's is identified in its totality as a minority, wherefore an analysis by ethnic groups is not applicable and must be substituted by an analysis of socioeconomic groups and other factors (United States EPA Region 2 Draft Interim Policy on Identifying EJ Areas, June, 1999).

As the population of Puerto Rico is homogeneous, identified in its totality as a minority, we proceeded to measure the impact the project would have on other factors beyond

ethnicity. Among the factors considered were: geographical distribution, racial groups and socioeconomic groups. The socioeconomic factors considered were: gender, age, income, education, employment and housing. The condition for Puerto Rico was established for each one of the factors and it was compared with that of the 13 Municipalities where the construction will be made. From there, it was compared with the 48 specific wards through which it will cross, for the purpose of detecting if any of these areas would be disproportionately affected in any of the factors under consideration.

The following findings were made:

- Geographic distribution - The construction will be made in wards of diverse population density; fluctuating between 5.1 and 2,334.9 inhabitants per square kilometer. Even so, it does not represent a disproportionate burden because it will not require complete sectors or areas of a community to be moved or evicted. The mobilization or eviction of tenants or property owners of existing properties will be isolated. Ninety-one (91) structures or residences were observed within the maintenance right of way, which could be the equivalent of the relocation or compensation of some 263 persons. Addendum 5, Persons within the Maintenance Right of Way, gives an idea of the quantity of persons, by ward and municipality, which could be affected.
- Race - Homogeneity in the distribution of races was observed throughout the project's alignment, and a proportional relation is kept when the wards, the municipality and the island are compared. Only the Palo Seco community in the Palo Seco Ward of the Municipality of Toa Baja represents the black race, in percentage, in a greater proportion than that found in the other wards and municipalities. For this community, the analysis revealed that it is at a considerable distance from the project's area whereby it will not be adversely impacted. There will not be any expropriation of residences or land belonging to this group.
- Gender - The general pattern for Puerto Rico was maintained. The difference in the population by gender in the wards directly associated to the project, compared to that of the municipalities or with the totality of the island of Puerto Rico, is not significant wherefore the project will not have a disproportionate impact on any group in terms of gender.
- Age - The project will not have a disproportionate environmental impact on any group on account of age, or on the services or housing they require. The 18-65 years group will benefit temporarily, because close to 1,200 direct jobs will be created during the construction of the project and services will be used which will benefit these groups and create hundreds of indirect jobs.

- **Income** - Neither the median and per capita and family income, nor the poverty index will vary as a consequence of the project's construction and operation. The only impact will be on the working class, because close to 1,200 direct jobs will be created in the region, in addition to the indirect jobs, which will represent an increase in income. This increase, although positive, will be temporary, because the construction works will last approximately eleven months.
- **Education** - The population in areas where the project will be developed is in an average level similar to the rest of Puerto Rico. The schooling or education level attained by the population through which the pipeline will cross will not vary as a consequence of the project's construction and operation and there will not be any disproportionate impact on any group based on the classification of education.
- **Employment** - The project will not affect the employment and unemployment rates in Puerto Rico directly or indirectly. Nor will it affect the distribution of occupations of employed persons or of the classes of workers. The project's impact on the area will be a temporary increase in the labor force due to the direct and indirect jobs contemplated during the construction.
- **Housing** - The project will not affect the present housing availability in these municipalities during its construction or operation, because the majority of the land through which the pipeline will cross will not be residential but mostly in agricultural and industrial use, and part of the alignment will pass through government-owned land. In addition, there are housing developments in progress in the thirteen municipalities, which will increase the quantity of housing units in these areas, wherefore the project will not compromise the need for expansion in the housing area. As previously indicated, only 91 structures or residences were found within the maintenance right of way, which represented 0.08, 0.03 and 0.01% of the residences when compared with the total number of residences in the 48 wards through which the construction will be made, the 13 municipalities and the totality of the island, respectively.

We note that no group, based on the different classifications, will receive a disproportionate negative environmental impact on account of the project. Even so, the AEE will take the necessary measures to maintain the communities adjacent to the project and the population of the municipalities, informed of the project's scope, its impacts and benefits. This will be through a public education program developed by the AEE, which will comply with all the applicable state and federal regulations.

As part of this education program, the AEE will be in charge of preparing and

distributing all the necessary informative materials and will schedule meetings with the communities and other interested groups. In addition, the AEE is in communication with, and has presented the project to the mayors of the municipalities where the construction will be made and to the agencies called upon to ensure that projects of this magnitude do not create disproportionate burdens on particular groups.

G. Agencies consulted

Chapter 8 lists the municipalities and agencies consulted, state and federal, and to whom the Preliminary Environmental Impact Statement (in Spanish, Declaración de Impacto Ambiental Preliminar, or DIA-P) will be circulated. Addendum 4, Meetings with Agencies, summarizes the meetings held with them. The agencies to whom the document will be circulated are the following: Puerto Rico Aqueducts and Sewers Authority, Department of Transportation and Highways Authority, Public Lands Authority, Land Management Administration, Public Service Commission, Department of Natural and Environmental Resources, Institute of Puerto Rican Culture, Environmental Quality Board, Planning Board, Fire Department, Ports Authority, State's Historical Preservation Office, United States Corps of Engineers, US Fish and Wildlife Service, Environmental Protection Agency, National Marine Fisheries Service, Federal Highway Authority, and the Municipalities of Peñuelas, Adjuntas, Utuado, Arecibo, Barceloneta, Manatí, Vega Baja, Vega Alta, Dorado, Toa Baja, Cataño, Bayamón and Guaynabo.