1. EXECUTIVE SUMMARY

The escalating energy demand and the changes that took place in the economic context of the last two years, have led to an increase in investments related to the commissioning , conduction and distribution of gas fields. The Acambuco exploitation area, the operation of which was awarded to a group of private companies, currently maintains significant energy reserves, which reactivation would considerably contribute to the domestic production. In this sense, in 2002, Pan American Energy started a significant development project consisting in the exploration of the area under concession, the drilling of wells and the transportation to the processing plant located in Piquirenda – Fatima. The investment in Macueta 1001 well was made in 2000.

Some time later, in 2001, the area was subjected to a geoseismic prospection in order to determine the potentiality of the well and the existing reserves, so as to establish the economic pre-feasibility of the productive exploitation of the field. Towards the end of 2003, beginning of 2004, tasks were begun to determine the appropriate route for transporting gas from the drilled Macueta 1001 well to the processing plant. After preliminary environmental studies, a trace of approximately sixty kilometers was chosen, running through varied ecosystems and a section of the Acambuco Fauna and Flora Natural Reserve.

At an initial stage, the project entails the construction of a pipeline to transport gas for processing and therefore the National Secretariat of Energy is established as the Enforcement Authority in charge, inter alia, of "performing any actions aimed at enforcing the applicable policy, by guiding the adjustment process of the new operators to the general interest, complying with a rational resource exploitation and environmental protection"; "Making the proposal and controlling compliance with the national policy on hydrocarbons, coal and other fuels, in all matters relating to the promotion and regulation of their exploration, exploitation, transportation and distribution stages, in coordination with other relevant areas" and "Promoting and supervising the rational exploitation of hydrocarbon resources and environmental protection in all stages of the oil industry". These functions are transferred to the Secretariat of Mining of the Province of Salta, acting as enforcement entity. The existence of a series of public property potentially affected by the works and, specially, that which forms part of the Acambuco Reserve under the jurisdiction of the Province of Salta, is also of concern to the Secretariat of Environment and Sustainable Development (SeMADeS) as enforcement entity.

Within this framework, the following main goals of the study are defined: a) to develop an environmental baseline for the direct area of influence (DAI) and indirect area of influence (IAI) based on the characteristic environmental elements of the regional area of the project; b) to characterize the investment project based on its environmental implications; c) to identify and describe the effects the project will cause on the environment; d) to conduct an environmental assessment through the use of two methods of analysis; e) to analyze any project impacting actions; assess the environmental sensitivity and work impacts with or without mitigation; f) to assess environmental impacts; propose mitigation and compensation measures; and, finally, g) to prepare an environmental management plan.

In order to meet the aforementioned goals, activities are started to develop an environmental baseline. Filed and survey activities of the environmental elements in the DAI of the trace are conducted between October and December 2004. From these field surveys, information was gathered on: 1) the vegetation, by applying forest inventory

techniques; 2) the fauna, through presence records throughout the route and in the IAI in areas deemed sensitive; 3) the soil, through exploration wells and prospecting pits in the DAI; 4) the surface hydrogeology through water sampling for analysis in populated areas near the route; 5) the geology, through field observation; 6) the environmental sensitivity index (ESI) and works impact index (WII), through the interdisciplinary survey of environmental variables throughout the trace in the DAI; and 7) the socio-economic effects, through polls with and interviews to local dwellers and important people from the local communities in the populated areas of Acambuco and Piquirenda – Fatima.

From these field surveys, coupled with a secondary data-gathering developed by several research teams, the information processed led to a baseline of the environmental elements deemed likely to be affected.

By interacting with the design technical teams and through interdisciplinary workshops, information was obtained on the pipeline's constructive philosophy, based on which the actions that might potentially cause environmental impacts were defined and described.

With all the information gathered, methodologies were applied to determine the extent of environmental impacts associated with the projected work. An efficient interdisciplinary method was used on the trace identifying the ESI – WII and establishing the potential environmental impact (PEI), as well as the Spanish environmental impact assessment method, based on the development of general qualitative and quantitative matrices. The different methods used allowed pinpointing a series of indicators that initially determined the status without a project and, based on this information and the data contributed by the project engineering in its pre-feasibility phase, the potential environmental effects of the works.

In broad terms, the proposed trace has an estimated total length of 60.7 kilometers. Of this planned trace, 39% is developed on existing tracks, paths, passable wood trails (PWT) and non-passable wood trails (NPWT), while the rest runs through sections of wood, secondary wood, grassland and others. The potential affected area taking into account the 14-meter wide right of way (RW) corresponds to 85 hectares. Considering the track width restricted to 7 meters where the removal of most of the vegetation and mold will be performed, the overall area affected is reduced to 42.49 hectares.

Strictly considering the area affected by the future trace of the pipeline, the environmental unit defined as the dry transitional forest with slopes is the largest, occupying 51.87%. The proposed layout for the pipeline is featured by sharp slope changes mainly due to the type of relief it cuts across. The sharper slopes are seen in areas crossed by ravines. However, the greatest percentage (33%) corresponds to areas having a leveled or almost leveled gradient (less than or equal to 3%). With this and other parameters, the Revised Universal Soil Loss Equation is applied to characterize the trace. In general terms, the assessed pipeline route cuts across sub-basins with an average actual erosion between 37 and 222 Ton/ha/year. Approximately 86.5% of the trace (52.53 km) runs through areas with actually high levels of soil loss. In the Acambuco Reserve area there is high erosion with average soil loss values normally not exceeding 100 Ton/ha/year.

The condition of the wood strongly depends on forest development and extensive livestock farming and forestry related activities that have been developing for years, which have reshaped the forest area. The selective extraction of the most valuable and best quality species has led to the loss of the best seed trees and to a reduction of adequate trees based on their size. In the Northern part of the trace, near Macueta 1001 Well, the environment is more humid with the following prevailing species: *laurel de la falda*, white laurel, Salta cheddar, *viraru*; there is a second environment marked by dry slopes and

ridges, approximately between stations 44500 and 32000, where the typical species are: red cebil, *palo amarillo* and *lanza blanca*; and a third environment, much like the previous one, differentiated by lower ridges, with similar species and the prevailing presence of the red cebil. A total of 57 (fifty-seven) of the most prominent arboreal and shrub-like species were identified along the trace. There is data on 25 inventory woodlots throughout the projected trace. As regards the fauna, a total of 166 species were observed during the sampling period, 60 of which were sighted while surveying specific areas and 106 were sighted during supplementary observations. The landscape mixture of the region offers a wide array of habitats which favor the existence of the multiple and diverse groups studied and of the fauna in general. The Mountain Forest of the Northern part of the region is one of the hottest spots from the point of view of Conservation in Argentina. Despite the constant human presence and of the livestock farming, forest and oil activities, the region is in good conservation conditions based on the results of the quick survey made, which coincide with the results of the prior study conducted by Proyungas (2004). For the socio-economic characterization of the area, surveys were made in the populations of Piquirenda – Fatima, El Chorrito, Acambuco and Bajo Macueta, and some important social referents such as the presidents of neighbor committees, health assistants, teachers and Indian chieftains, among others, were interviewed. The main economic activities are the extensive livestock farming, dry farming with downward gradient *rosado* techniques, to a large extent as a production of forage for livestock, and the intense forestry activity in the area.

After integrating the information compiled, highly sensitive sections of trace route were identified, mainly associated with soil movement in unstable geological and edaphic areas, or related to special crossings in basins of the Yacuy creek, the Quebrada de Las Latas ravine and other crossings not identified in the preliminary studies of the proposed trace.

As regards the work itself, the estimated length on a pre-feasibility assessment is approximately 61 kilometers. Taking into account an average construction works evolution of 100 meters per day with completed tasks, the total estimated time for work completion is 610 days. In order to meet the construction goals, three progress front-lines should be considered. The construction stage will begin on April 1, 2005, and stage completion should be achieved by October 30 that same year. This entails a task completion time of 210 days. The proposed period is related to the weather window period in order to minimize the risks in the construction tasks and the environmental impact.

The ESI values show a higher occurrence in average sensitivity values. However, the percentage of sensitivity values in the "very high" category (4.94%) doubles the one corresponding to the values of the "very low" category (1.65%) which, taken as a whole, reflects a high environmental sensitivity of the system in the area proposed for the route. An analysis along the trace shows a first portion (station 0 to 9400 meters) with particularly low values associated with the current track of San Pedrito – Piquirenda pipeline, where the prior disturbance of the area remarkably reduced the environmental sensitivity of the system. The rest of the trace is characterized by a pattern with strong fluctuations due to high value peaks associated with specific spots where the environment is specifically sensitive to the proposed works. The areas corresponding to the highest five peaks resemble in that they are characterized by steep slopes, wide plant coverage, manifest erosion and very low bank stability, which together account for their higher environmental sensitivity. The PEI values are primarily low; thus, the two lower categories (very low and low) jointly account for over 91% of the data. Considering all the 100-meter sections assessed (607 sections), five (0.82%) correspond to values between 80 and 100 of the

PEI, falling within the "Very High" category, while ten (1.65%) show values ranging between 60 and 80 of the PEI, falling within the "High" category.

A total of nine impacting actions were identified, seven of which are related to the construction stage and two to the operating stage. These actions were contrasted with a total of 34 environmental factors, 17 of them belonging to the physical system and 17 to the cultural system. The assessment of the qualitative impact matrix shows that the project action that generates the highest impact on the environment is the 'track opening', identifying serious impacts on stability factors of geological structure, soil features and plant coverage. The impact on the remaining the factors, that is to say the natural and the socio-economic-cultural factors, is moderate. On this basis this action was subject to a detailed analysis related to trenching movements along the trace. The results of this analysis appear in the EsIAyS (E&SIA). During the operating stage of the pipeline, moderate to major positive impacts are expected, mainly due to increases in public revenue, the availability of production and gas transportation infrastructure and the incidences in economy and life quality of the families that might access this service. All the factors of the natural system present absolute negative impacts. Actions related to erosion control and track recovery during the construction phase neutralize the impact of negative effects by reducing their level of significance. The Overall Environmental Impact of the Project (EI%) in the Acambuco – Piquirenda Area and in the Monte Area is approximately -27, which represents a moderate negative impact of the project on its immediate environment (IAI). Qualitative and quantitative matrices together with a mitigated impact analysis of the work are presented. The project economic impacts are qualitatively assessed and an analysis of the potential environmental risk on the projected pipeline is also presented.

The study concludes with a proposed Environmental Management Plan (EMP) aimed at reducing the identified impacts and controlling project development, both in the stages of construction and operation. The plan includes: a) an Environmental Protection Plan (EPP), b) an Environmental Surveillance Plan (ESP) and c) a Works Environmental Audit Plan (WEAP).