

INTER-AMERICAN DEVELOPMENT BANK



ARGENTINA

***TRANSPORTADORA DE GAS DEL SUR S.A
AR-0235***

ENVIRONMENTAL AND SOCIAL IMPACT REPORT

August 1998

Project Team: Ana Maria Vidaurre (Team Leader, PRI), Jorge Rivas (PRI), Robert Montgomery (PRI), Jean-Daniel Borgeaud (Chief of Division 3, PRI), Craig Bowman (LEG), Brown & Root (Consultant)

TABLE OF CONTENTS

1.0 INTRODUCTION

2.0 PROJECT DESCRIPTION

- A. Site Location
- B. Project Components and Facilities
- C. Project Schedule and Costs
- D. Project Alternative Analysis

3.0 INSTITUTIONAL AND LEGAL FRAMEWORK

- A. Institutional
- B. Legal
- C. Project Compliance

4.0 ENVIRONMENTAL AND SOCIAL CONDITIONS

- A. Environmental
- B. Social-Economic

5.0 ENVIRONMENTAL AND SOCIAL IMPACTS

- A. Existing Facilities and Operations
- B. Future Projects
- C. Positive Impacts/Benefits

6.0 ENVIRONMENTAL AND SOCIAL MITIGATION AND MONITORING MEASURES

- A. Environmental Management System
- B. Environmental and Industrial Security Plan
- C. Environmental Protection for New Projects
- D. Contingency and Emergency Response
- E. Industrial Health and Safety
- F. Monitoring Programs
- G. Cost, Schedule and Responsibilities

7.0 PUBLIC CONSULTATION AND PARTICIPATION

ANNEX - TABLES AND FIGURE

1.0 INTRODUCTION

- 1.1 In the Argentine energy matrix (composed by natural gas, oil-by products, hydroelectricity, coal, and nuclear energy) gas consumption was 44% on energy consumption in 1996, almost double the average worldwide natural gas usage. Additional growth for the Argentine natural gas industry is expected for the next five to ten years. Natural gas in Argentina has a price advantage over competing residential and industrial energy sources. This fact, when coupled with a projected reserve life of approximately 20 years, fosters estimates of an annual 3.7% growth in Argentina's natural gas demand through the year 2010. A significant growth is also expected in the use of natural gas throughout the southern cone driven by the rapid growth in energy demand in Brazil, Argentina, Chile and Uruguay, as well as increases in petrochemical production served by natural gas. Argentina and Bolivia will become major natural gas exporters to Chile and Brazil, and, in the case of Argentina, to a lesser extent to Uruguay. There are various projects in different stages of development to connect Chile and Brazil to the Argentine and Bolivian gas basins.
- 1.2 Prior to the privatization of Gas del Estado (GdE), the Argentine gas industry was controlled by the Government of Argentina (GOA). Transportadora de Gas del Sur (TGS) has had since 1992 an exclusive license (the TGS License) from the GOA to operate the southern portion of the former GdE gas transmission mainline for an initial period of 35 years, which under certain terms and conditions can be extended by the Company for additional 10 years. TGS transports gas owned by its clients, mainly gas distributors in the province of Buenos Aires and in the western and southwestern pipeline network, which connects the gas producing basins of Argentina's southern and western regions to the country's largest consumption areas.
- 1.3 TGS is currently undertaking a 1998 to 2002 Gas Pipeline Expansion that will require investments in a range of US\$ 600-700 million and which will depend ultimately on the market opportunities. The IDB is considering financing a portion of funds required for this expansion program.
- 1.4 The controlling shareholder of TGS is Compañía de Inversiones de Energía S.A. (CIESA), which owns 70% of TGS outstanding common stock. The remaining 30% ownership includes 27% held by local and foreign investors and 3% held by an employee stock purchase program. CIESA is owned 50% by Perez Companc S.A. and one of its subsidiaries and 50% by subsidiaries of Enron Corp.

2.0 PROJECT DESCRIPTION

A Site Location

- 2.1 The existing TGS Gas Pipeline System and Facilities are located in the southern half of the Republic of Argentina. A map showing the location of TGS Gas Pipelines and Facilities is provided as Figure 2-1 (in annex). The only TGS industrial facility, the Cerri Gas Processing Complex, is located approximately 800 km southwest of Buenos Aires.

B. Project Components and Facilities

- 2.2 TGS currently operates 6,672 km (4,146 miles) of gas pipelines, twenty-eight Compressor Plants (Stations) with 460,280 horsepower of compression capacity, and eight Maintenance Bases. The three main TGS gas pipelines are the General San Martin, the Neuba I (also called the Western Gas Pipeline and the Loop Sur), and the Neuba II. The General San Martin Gas Pipeline starts in Tierra del Fuego at the southern tip of Argentina, crosses the Straits of Magellan, passes through the General Cerri Gas Processing Complex, and ends at the Gutierrez Metering Station and Maintenance Base near the city of La Plata. The Neuba I and Neuba II Gas Pipelines start in the city of Neuquen area, pass through the General Cerri Gas Processing Complex, and end near Buenos Aires. All three pipelines are connected to the TGS High Pressure Loop Ring that serves TGS customers in the Buenos Aires area. The TGS Gas Pipelines have a gas delivery capacity of approximately 56 million standard cubic meters per day (MMscmd). Table 2-1 and 2-2 (in annex) provide a summary information on the existing TGS Gas Pipeline Facilities and Compressor Stations, respectively.
- 2.3 The TGS proposed 1998 to 2002 Gas Pipeline Expansion Program includes the addition of 2,498 km of gas pipeline loops to parallel existing pipelines and the addition of 183,250 horsepower (hp) of gas compression at existing Compressor Stations, comprised of a total of sixty-four (64) gas pipeline loops to parallel existing pipelines and eleven (11) Compressor Stations which will receive nineteen (19) new or relocated gas turbine driven compressors. The proposed Expansion Program is divided between three pipelines: San Martin (1,705 km of additional pipeline, 126,070 hp of new compressors), Neuba II (707 km of additional pipeline, 57,180 hp of new compressors), and High Pressure Loop (86 km of additional pipeline). The ultimate goal of this and future TGS Gas Pipeline Expansion Programs is to completely duplicate the San Martin and Neuba II Gas Pipelines with the new parallel pipelines. The new gas pipeline that will parallel the Neuba II Gas Pipeline will ultimately be called the Neuba III Gas Pipeline. The High Pressure Loop that serves Buenos Aires will also be eventually completely duplicated.

- 2.4 In addition to the Gas Pipeline Facilities, TGS operates the General Cerri Gas Processing Complex near Bahia Blanca and the Port Galvan Storage and Shipping Terminal Facility.
- 2.5 The General Cerri Gas Processing Complex consists of the McKee Lean Oil Absorption Plant to recover propane, butane and gasoline and a Cryogenic Ethane Extraction Plant to recover ethane, propane, butane and natural gasoline. The McKee Plant was originally built in 1969, and consisted of two parallel processing trains with each train designed for 2.5 MMscmd. TGS has correct input problems (“bottlenecks”) at the McKee Plant and can now process 6.5 to 7.0 MMscmd of inlet gas through the two process trains. The Cryogenic Ethane Extraction Plant was designed to process 18.0 MMscmd and was installed in 1984. This plant also consists of two parallel processing trains. The cryogenic plant was de-bottlenecked in 1996 and has a current nameplate capacity of 24.0 MMscmd. The Complex also includes three Compressor Stations and power generation and storage facilities. In 1997, TGS started a major expansion of the gas processing facilities at the Cerri Complex with construction of a New Cryogenic Plant and the upgrading of existing gas turbine driven compressors. This expansion will be complete in October 1998 and will add 16.0 MMscmd to the current gas processing capacity. This will bring the total Cerri Complex gas processing capacity to approximately 47.0 MMscmd.
- 2.6 The Cerri Complex and the Puerto Galvan Storage and Terminal Facility are currently capable of storing 29,340 metric tons of propane, butane and natural gasoline. Port Galvan is approximately 12 km from the Cerri Complex. Port Galvan includes truck loading facilities to load approximately 70 trucks per day and a pier with ship loading facilities. Propane, butane, and natural gasoline are transported to the storage facilities at Port Galvan via two eight-inch pipelines. Ethane from the Cerri Complex is piped via an 8-inch pipeline to the Petroquímica Bahia Blanca (PBB) Olefin Plant in Port Galvan, which is the sole outlet for ethane from the Cerri Complex.
- 2.7 As part of the current Cerri Complex Expansion Program, TGS is constructing two large refrigerated storage tanks at Port Galvan. The new refrigerated tanks will store the additional propane and butane produced by the expanded Cerri Complex. One tank has a capacity of 15,000 cubic meters and the other tank has a capacity of 30,000 cubic meters. While both tanks are designed to store liquid propane at -42°C, the smaller tank will be used to store butane and the larger tank will be used to store propane.
- 2.8 TGS has approximately 650 employees, consisting of approximately 160 in administration and headquarters, 390 in operations and maintenance, and 100 at the Cerri Complex.

C. Project Schedule and Costs

2.9 The estimated total cost for the 1998 to 2002 Gas Pipeline Expansion Program is in the range of US\$600-700 million. The IDB is considering financing a portion of funds required for this expansion program. TGS has planned investments related to Environmental and Industrial Security issues for approximately US\$ 10-15 million for the period 1998-2002, which consists of various environmental and safety improvement projects to eliminate, reduce or control environmental, health and safety impacts and risks associated with the TGS operations (see section 6 for details).

2.10 The 1998 to 2002 Gas Pipeline Expansion Program Projects are scheduled for construction during the period from June 1, 1998 to June 1, 2003, sub-divided approximately as follows:

- from June 1, 1998 to June 1, 1999, eleven (11) gas pipeline loops to parallel existing pipelines are to be added and five (5) Compressor Stations are to receive seven (7) new or relocated gas turbine driven compressors;
- from June 1, 1999 to June 1, 2000, nineteen (19) gas pipeline loops to parallel existing pipelines are to be added and three (3) Compressor Stations are to receive four (4) new or relocated gas turbine driven compressors;
- from June 1, 2000 to June 1, 2001, twenty (20) gas pipeline loops to parallel existing pipelines are to be added and five (5) Compressor Stations are to receive seven (7) new or relocated gas turbine driven compressors; and
- from June 1, 2001 to June 1, 2002, fourteen (14) gas pipeline loops to parallel existing pipelines are to be added and one (1) Compressor Station is to receive one (1) new gas turbine driven compressors.

D. Project Alternative Analysis

2.11 The location of the gas pipeline loops and additional gas compressors is determined by technical and marketing analyses that considers the location of the requested gas supplies and the location of the additional markets. The scope of works may change based on those analyses. Alternative new pipeline routes are not being considered because following existing gas pipeline routes is the preferred method for gas pipeline expansion per Argentina's regulations. New or revamp gas compressors are to be added to existing Compressor Stations. Alternative gas compressor locations are not needed for the Proposed Gas Pipeline Expansion Program. All the projects planned for the June 1, 1998 to June 1, 2002 period are located along existing gas pipelines or at existing Compressor Stations and thus no specific site selection studies (e.g., alternative pipeline routing analysis) are required.

3.0 INSTITUTIONAL AND LEGAL FRAMEWORK

A. Institutional

- 3.1 The TGS facilities and operations are regulated by various national, provincial, and municipal authorities, consisting primarily of the following

- Republic of Argentina
 - ENARGAS (Ente Nacional Regulador del Gas)
 - Secretary of Energy (Secretary's Office of Combustibles)
 - Secretary of Transportation
 - Department of Labor and Social Security
 - Secretary of Agriculture
 - Secretary of Environmental Policy
- Province of Buenos Aires
 - Municipality of Bahia Blanca
- Province of Rio Negro
- Province of La Pampa
- Province of Neuquen
 - Municipality of the City of Neuquen
 - Municipality of Plottier
- Province of Chubut
 - Municipality of Comodoro Rivadavia
- Province of Santa Cruz
- Province of Tierra del Fuego

- 3.2 The Republic of Argentina's ENARGAS (Ente Nacional Regulador del Gas) has the primary governmental responsibility for the regulation and control of natural gas transmission companies. The principal governmental institutions with authority of TGS related to environmental matters are ENARGAS, federal Secretary of Environmental Policy, and provincial and municipal environmental authorities. The federal Department of Labor and Social Security is the principal authority related to health and safety.

B. Legal

- 3.3 The TGS operations must comply with various national, provincial, and municipal environmental, health and safety requirements. TGS has compiled a comprehensive listing of the regulations that impact TGS operations and includes the name of each requirement, a description of the requirement, and the name of the responsible regulatory authority. These regulations include: environmental mandates, civil penalties, criminal penalties, environmental impact assessments, environmental protection practices for pipeline construction and operation, air emissions, ambient air quality, waste water discharges, solid waste, hazardous waste, transportation, and water supply.
- 3.4 The ENARGAS Regulation No. 186–1995 is the most significant environmental requirement that applies to TGS. All pipeline projects are required to submit an Environmental Impact Assessment (EIA) per ENARGAS 186–1995 requirements.

The EIA must include an assessment of the following conditions (as a minimum): geology, topography, soils, climate, surface and sub-surface hydrology, vegetation, terrestrial and aquatic fauna, agriculture, forests, mining resources, land use, urban development, transportation, recreation, historic and archeological sites, right-of-ways (ROWs), and social factors. The EIA must also include an Environmental Protection Plan (mitigation measures and monitoring programs) and Environmental Auditing (procedures for supervision and quality control during construction and operation and performing environmental audit, as part of EIA, of existing operations).

- 3.5 The ENARGAS 186–1995 specifically requires various mitigating measures to be implemented during the construction, operation, and maintenance of all pipelines, regardless of pipeline location (province, municipality). The application of these measures ensures an adequate standard level of environmental protection for all new pipeline projects, regardless of location since environmental regulations may be lacking in a province or may vary between provinces.
- 3.6 The EIA must be reviewed and approved by both ENARGAS and the applicable authorities in all provinces, with the exception of the Province of Santa Cruz which does not presently specifically require approval of EIA. In addition, any pipeline projects or other compressor station projects that are located within municipality limits would also be review and approved by the municipal authorities. As part of the TGS Environmental Management System (see section 6 for detail), TGS has committed to perform an EIA for all projects and to obtain all required ENARGAS, Provincial, and Municipal approvals.
- 3.7 The Province of Buenos Aires Order 3395/96 is significant for Compressor Stations located in the Province and the Cerri Complex which is located in the Buenos Aires Province. Order 3395/96 establishes stack air emission standards and the ambient air quality standards and requires facilities with air emissions to obtain an air permit. The Municipality of Bahia Blanca Order No. 8862 is also significant for the Cerri Complex, since it establishes wastewater discharge standards and requirements.
- 3.8 The ENARGAS Regulation NAG 100 is the most significant gas pipeline safety regulation that applies to TGS, and establishes gas pipeline design and safety requirements (TGS has compiled a complete list of other pipeline safety regulations and worker health and safety regulations).

C. Project Compliance

- 3.9 TGS has reported in their Annual Reports and in their FORM 20-F filing to the USA's Securities and Exchange Commission that the Company's current operations are in substantial compliance with the applicable Argentine laws and regulations relating to the protection of the environment. This includes the necessary permits and authorizations for the Gutierrez Metering Station and Maintenance Bases located in the natural park located near the city of La Plata. Associated with the implementation

of the TGS Environmental Management System, environmental audits have been performed at the majority of existing facilities and operations (see section 6.1 for details). The only two material non-compliance's detected were the potential exceedence of Province of Buenos Aires nitrogen oxide emissions from the Cerri Complex and the occasional presence of oil and grease in the creek which runs through the Cerri Complex which is not in compliance with the Municipality of Bahia Blanca regulatory requirements. A regulatory procedure and a corrective action plan is being developed to resolve each of these identified regulatory non-compliance problems (refer to Section 6.2 for details).

- 3.10 TGS has prepared an EIA for all previous projects (e.g., ten for pipeline loops, two for compressor plants, and one for the expansion of the Cerri Gas Processing Plant) and obtained the required approvals before proceeding with project construction.

4.0 ENVIRONMENTAL AND SOCIAL CONDITIONS

- 4.1 The TGS operations are located in the following Provinces of Argentina: Buenos Aires, La Pampa, Neuquen, Rio Negro, Chubut, Santa Cruz, and Tierra del Fuego. TGS has over 6,600 km of gas pipelines, with the three main pipelines being the General San Martin, the Neuba I (also called the Western Gas Pipeline and the Loop Sur), and the Neuba II. The General San Martin Gas Pipeline starts in Tierra del Fuego at the southern tip of Argentina, crosses the Straits of Magellan, passes through the General Cerri Complex Gas Processing Plant, and ends at the Gutierrez Metering Station and Maintenance Base near the City of La Plata. The Neuba I Gas Pipeline and the Neuba II Gas Pipeline start in the City of Neuquen area, pass through the General Cerri Complex Gas Processing Plant, and end at the General Rodriguez Metering Station near Buenos Aires. All three pipelines are connected to the TGS High Pressure Loop that serves TGS customers in the Buenos Aires area. Figure 2-1 (in annex) presents the locations for TGS Gas Pipelines, Compressor Stations, Maintenance Bases, and the Cerri Complex. All the projects in the 1998 to 2002 Expansion Program are planned to be located along existing gas pipelines or at existing Compressor Stations. The large geographic area associated with the project operations results in a variety of environmental and social conditions, for which a generalized summary of important characteristics is presented below.

A. Environmental

- 4.2 The topography in the majority of areas is relatively flat with low elevations, with the principal exception of the Sierra de Ventana hills/mountains (approximately 1000 meters) located north of Bahia Blanca. The northern portion of the project area has relatively moderate levels of precipitation (e.g., approximately 1000 mm/year), with much drier or arid conditions to the south. The southern portion also has relatively high winds. Temperatures vary considerably seasonally, with relatively cold winters (i.e., May to August) especially in the southern areas. There are only a few major

rivers (e.g., Colorado) with various minor streams; the only major river or water body crossed by the TGS pipelines is the Straits of Magellan. Vegetation is typically sparse consisting of low lying grasses, shrubs or agriculture species. Trees are uncommon in most of the TGS service area. The Gutierrez Metering Station and Maintenance Base is located inside a National Park near the City of La Plata and has a large number of trees on the site.

B. Social-economic

- 4.3 The vast majority of the project area consists of rural sparsely populated areas with isolated small urban populations, with the exception of two major cities (Buenos Aires and Bahia Blanca). The Cerri Complex is located in an industrial area approximately 15 km from the City of Bahia Blanca, a city of approximately 300,000 persons. The nearest residence to the Cerri Complex is reported to be 2.5 km away from the site. The smaller cities of Neuquen and La Plata are also near TGS pipeline system and facilities. A residential community is reported to be located close to the Barker Compressor Station.
- 4.4 Land uses are primarily agriculture and livestock sheep grazing (especially in the south). The rural areas have low population densities, decreasing from the north to south. In general, per capita incomes are at moderate levels in comparison to other areas within Argentina. Most areas have access to basic infrastructure (water, electricity, roads, etc.).
- 4.5 TGS maintains safety records for all accidents and there have been no fatalities at TGS since the company was created in 1992. Accident records are kept and reported to ENER GAS. During 1996, there were 17 accidents and 434 days lost. During 1997, there were 15 accidents and 800 days lost. During 1998 through mid July, there were four (4) accidents and 73 days lost.

5.0 ENVIRONMENTAL AND SOCIAL IMPACTS

A. Existing Facilities and Operations

- 5.1 TGS has performed initial environmental audits on the majority of the existing facilities and operations (e.g., 21 of 27 Compressor Stations, 5 of 8 Maintenance Bases, and one Measurement and Control Facility), as part of the TGS Environmental Management System, in order to establish initial baseline condition. In addition, audits were performed on the San Martin, Neuba I, and Neuba II pipelines in conjunction with a pipeline risk analyses and on the Cerri Complex in conjunction with the EIA prepared to evaluate the Cerri expansion project. The principal identified environmental and social issues or impacts associated with the existing facilities and operations are listed below (refer to section 6 for planned corrective actions).

- Nitrogen oxide emissions from the Cerri Complex may occasionally exceed the allowable Province of Buenos Aires regulatory limits. This impact was identified in the EIA prepared to evaluate the Cerri expansion project, based upon very simplified air quality dispersion modeling. It is quite likely that the estimated nitrogen oxide levels from the plant's multiple sources, based on simple single-source screen modeling used in the EIA were over-estimated (i.e., higher than actual). This results from single source impacts not being additive when the sources are located at significant distances from each other as is the case with Cerri's 37 sources.
- The Cerri expansion project EIA also noted that there was soil contamination and water pollution due to leakage from the storage tanks for liquids to be burned in the plant's pit fire.
- Oil and grease has been occasionally observed in the creek which runs through the Cerri Complex, which apparently originates from the storm water discharge from the pit flare and containment pit areas.
- The Cerri Complex has a large pit flare system for burning heavy hydrocarbon from the process areas that cannot be sold or returned to the gas pipelines. There is some soil contamination and air emissions (smoke) associated with the pit flare system.
- Some limited areas in the TGS gas pipeline ROWs have soil erosion problems due to uncovered (i.e., non-vegetated) sections as a result of the soil composition and weather factors.
- Over the years, and before the privatization, a small number of people have encroached into the safety zone (e.g. within 15 meters on each side of the pipe) of the ROW of the older gas pipelines, in particular the San Martin Gas Pipeline, which represents a potential safety risk for these people. For example, some houses, one inn, farm buildings, animal pens and water storage tanks have been constructed within the safety zone of the gas pipelines.
- Most Compressor Stations lack adequate secondary containment for oil tanks and waste storage drums.
- Most TGS Compressor Stations were equipped in the past with fire pits where pipeline condensates, containing water and hydrocarbons, were drained and the hydrocarbons were subsequently burned. Associated with these pits, there is the potential for soil contamination and also shallow ground water contamination.
- Some oil spills have occurred in the past at some Compressor Stations.
- Noise emissions from the Barker Compressor Station results in off-site impacts due to the close proximity of people living near the station. Noise impacts are not a problem at other Compressor Stations because of their remote locations.
- There are small underground storage tanks at few Compressor Stations which may require corrective actions.
- The Port Galvan storage and shipping facility has a transportation related impact due to vehicle traffic associated with the seventy (70) trucks per day that are loaded with propane, butane, and gasoline at the facility.

- The older storage spheres at the Port Galvan facility are not provided with any spill containment which may present an added risk to the environment in the event of a major spill.
- 5.2 A pipeline risk analyses were performed during 1995 on the San Martin, Neuba I, and Neuba II pipelines and the gas storage facilities. The analysis included a detailed review of existing information, site reconnaissance, collection of field measurements, mathematical modeling of explosions and gas release from storage facilities, identification of potential deficiencies or problems, and development of recommended actions. The principal problems identified in the risk analysis were lack of complete written manuals, lack of historical data records, interference in the existing ROW, and lack of knowledge by people near ROWs in terms of potential risks. The risk analysis also identified specific segments of the existing gas pipeline of highest potential risk.
- 5.3 TGS has stated that polychlorinated biphenyls (PCBs) were never used at their compressor plants as a lubricant in the pipeline compressors or as an insulating oil in transformers. TGS has also stated that there is no mercury in the natural gas being feed into their pipeline system according to quality standards set by ENARGAS. The absence of PCBs and mercury in the TGS Gas Pipeline Systems significantly reduces the potential environmental risks associated with the TGS systems.
- 5.4 Wastewater flow rates from the Cerri Complex are low, and while improvements are planned, the impacts associated with the current quality and quantity of wastewater discharges are not considered significant. A summary of air emissions was performed on 37 sources at the Cerri Complex for nitrogen oxide (emission concentrations ranged from 2 to 2,304 mg/Nm³) and carbon monoxide (emission concentrations ranged from 5 to 642 mg/Nm³). While the Compressor Stations generate a small amount of nitrogen oxide emissions, ambient air quality impacts from individual Compressor Stations are relatively low since they only impact small localized areas located primarily located in remote and unpopulated areas. There are negligible impacts associated with the new Cryogenic Plant C at the Cerri Complex. There are negligible impacts associated with the new refrigerated storage tanks at Port Galvan.
- B. Future Projects
- 5.5 The principal anticipated environmental and social impacts associated with the planned pipeline expansions are:
- impacts on landowners associated with the expansion of the existing ROW (e.g., possible negligible land use changes);
 - dust generation and air emissions from earth-moving and construction operations;
 - temporary damage to vegetation;
 - potential increased soil erosion;
 - potential impacts on surface water quality due to soil erosion and storm water runoff;

- impacts from the use of explosives;
- environmental impacts associated with construction camps (e.g., sanitary waste disposal);
- potential short-term social impacts (e.g., noise, nuisance, etc.) on landowners and people along the pipeline ROW due to pipeline construction and on people living near construction camps; and
- potential risks associated with pipeline leaks or failures.

All of these environmental and social impacts are expected to be temporary, reversible and relatively minor, given the mitigation measures that will be implemented (refer to section 6).

5.6 The principal anticipated environmental and social impacts associated with the Compressor Plant expansions are:

- increased nitrogen oxide emissions and associated ambient air quality impacts;
- increased noise emissions;
- short-term social impacts (e.g., noise, nuisance, etc.) on people near the construction area and camps; and
- potential operational risks.

5.7 All the projects in the 1998 to 2002 Expansion Program are planned to be located along existing gas pipelines or at existing Compressor Stations. There is no resettlement anticipated with the project expansions. Also, there are apparently no significant cultural, historic or archeological sites within the directly affected project area.

C. Positive Impacts/Benefits

5.8 The principal positive impact of the project is to enhance the supply of natural gas to distributors, and thus households, and to power generating plants. Given natural gas is a clean burning fuel, especially in relation to other local fuel types, the project will indirectly results in reduced air emissions and improved ambient air quality, in addition to providing a more cost efficient and cost-effective fuel source.

6.0 ENVIRONMENTAL AND SOCIAL MITIGATION AND MONITORING MEASURES

6.1 The planned TGS activities to control and mitigate potential environmental, social, and health and safety impacts include: development and implementation of an Environmental Management System for all TGS facilities and operations which complies with ISO 14000 (see section 6.A), planned investments on Environmental and Industrial Security issues of approximately US\$ 10-20 million to resolve problems associated with existing facilities and operations (see section 6.B),

implementation of environmental protection procedures for new projects (see section 6.C), development and implementation of contingency and emergency response procedures (see section 6.D), implementation of industrial health and safety procedures (see section 6.E), and performance of environmental monitoring activities (see section 6.F). A summary of the related estimated costs, schedule and responsibilities is presented in section 6.G.

A. Environmental Management System

6.2 TGS is presently in the process of implementation of an Environmental Management System (EMS) in order to obtain ISO 14001 Certification (TGS anticipates certification by end of 1998 or early in 1999). The EMS is being designed to satisfy five formally adopted ISO 14000 series standards for environmental management (ISO 14001, Environmental Management Systems; ISO 14004, EMS - General Guidelines on Principles, Systems and Supporting Techniques; ISO 14010, Environmental Auditing - General Principles; ISO 14011, Environmental Auditing - Audit Procedures; and ISO 14012, Environmental Auditing - Qualification Criteria). The TGS EMS will be applied to all of the companies operations and will include various components, such as a company policy, numerous written procedures, environmental compliance strategy, procedures for performing Environmental Impact Assessments, performance of environmental audits, training, and reporting requirements.

6.2 The TGS company Environmental Protection and Industrial Safety Policy includes the following principles:

- Actions must be directed to a continuous improvement in operating procedures to prevent accidents and to eliminate pollution.
- Comply with the actual legislation requirements and with the requirements established by the Company.
- Determination of annual goals and objectives in accordance with this policy and the Company's vision, mission, and values.
- Each employee shall have training in accordance with their responsibilities and the risks involved with their work.
- The present policy shall be communicated to all Company personnel and it shall be published in newsletters that will be issued.

6.3 The following significant items have already completed by TGS associated with the development and implementation of the EMS:

- development of company environmental, health and safety policy (see paragraph 6.2);
- development and implementation of numerous written environmental, health and safety procedures, presently there are four volumes of safety and environmental

procedures (e.g., see Table 6-1 for listing of environmental procedures)(refer to sections 6.B and 6.C for information on health and safety procedures);

- implementation of personnel training and maintenance of training records;
- performance of initial environmental audits of the principal majority of the existing TGS facilities and operations (e.g., 21 of 27 Compressor Plants, 5 of 8 Maintenance Bases, and one Measurement and Control Facility) in order to establish initial baseline condition (e.g., summary of results presented in section 5) and to develop a corrective actions (see section 6.B)(note: all TGS facilities will be audited periodically);
- performance of pipeline risk assessments on TGS's three main pipelines (see section 6.D); and
- designation of responsibilities for the implementation of EMS components (e.g., see section 6.G).

B. Environmental and Industrial Security Plan

6.4 TGS will invest an estimated US\$ 10-15 million on an Environment and Industrial Security Plan for the period 1998 to 2002, which consists of various environmental and safety improvement projects to eliminate, reduce or control environmental, health and safety impacts and risks associated with the TGS operations.

6.5 Listed below are some of the planned corrective actions to specifically resolve the identified environmental problems associated with the existing operations and facilities.

- The installation of an API oil/water separator at the Cerri Complex to remove oil in storm water from process areas and from the pit flare containment area.
- The installation of a smokeless flare to burn waste gas and liquids from the Cerri Complex to allow the elimination of the pit flare system and the associated containment pit.
- Soil remediation at the pit flare containment area at the Cerri Complex.
- The installation of irrigation systems at the Cerri Complex to use reverse osmosis unit water and wastewater for irrigation. TGS also plans to plant trees at the Cerri Complex.
- Restoration work including trench filling, grading, and the installation of soil erosion control measures along the San Martin Gas Pipeline and the Neuba I Gas Pipeline.
- Pipeline condensate collection tanks at 24 Compressor Stations were installed replacing the existing fire pits.
- Secondary containment structures and drum storage facilities at most Compressor Stations were added.
- The installation of two liquid and solid waste incinerators, in addition to the two already installed, for the disposal of petroleum-based wastes from TGS Compressor Stations.
- The installation of noise attenuation measures at the Barker Compressor Plant.

- The modification of vent systems at several Compressor Stations to control air emissions.

C. Environmental Protection for New Projects

6.6 In terms of environmental and social mitigation (protection) for any new (future) projects, the following actions will be implemented/applied:

- compliance with all applicable Argentine federal and provincial environmental, health, and safety regulatory requirements;
- compliance with the ENARGAS Regulation 186-1995, which requires implementation of specific mitigation measures pipeline construction, operation, and maintenance (see Table 6-2 for example mitigation measures);
- development and approval by applicable regulatory authorities of a project specific EIA in concordance with ENARGAS Regulation 186-1995 and IDB guidance for EIAs
- implementation of the TGS Environmental Management System components (e.g., environmental procedures, etc.).

6.7 TGS has a well established and effective system to negotiate and obtain the necessary property ROW (e.g., over 90% of the easements are obtained through direct negotiation). Landowners are compensated, per ENARGAS requirements, for the land needed for the ROW and any other modifications required, including compensation if structures that have to be moved to outside of the ROWs. The principal approach consists of moving structures located in the new ROWs (or those which have encroached into existing ROWs) to areas immediately outside of the ROW. Any relocation of persons living in the ROW will comply with the Bank's policy on involuntary resettlement. In addition, TGS works with landowners along their ROW to educate them about the ROW safety requirements.

6.8 Specific requirements and procedures have been developed to ensure that the impacts associated with construction camps are minimal and short (temporary) duration.

D. Contingency and Emergency Response

6.9 Based on the detailed risk analyses performed and data from "smart pig" surveys run semiannually (refer to section 5.1 for details), TGS has developed a prioritized plan for improving the safety of their pipeline system. The plan consists of various actions to correct the identified problems in order to improve the overall safety of the pipeline systems; for example, establish and maintain a database system, implement electronic detectors and protection systems, implement a routine pipeline inspection program, continue to emphasize employee training related to pipeline risks, and implement and education program for people living near pipeline ROWs. The plan also includes the expenditure of over four million Pesos to properly move structures which are encroached into the ROW areas immediately outside of the ROW. Any relocation of

persons living in the ROW will comply with the Bank's policy on voluntary resettlement. In addition, based upon the pipeline audit performed as part of the pipeline risk analysis, and various pipeline restoration work (e.g., back-filling pipeline trenches where soil erosion has exposed the pipeline) is being implemented (as part of corrective actions presented in section 6.B) which will also reduce potential risks.

- 6.10 All new projects, such as the expended gas storage at the Cerri Complex and Port Galvan facility will incorporate extensive risk reduction equipment (e.g. containment system, tank designs, leak detection, etc.) and emergency response equipment.
- 6.11 A Spill Prevention, Control and Countermeasures Plan (SPCC) for both the Cerri Complex and the Port Galvan facilities is being developed. In addition, the TGS Environmental Management System includes the following emergency procedures in the Manual of Security Operations (MSO): Emergency Spills and Losses, Spill Clean-up, and Soil Recovery (Restoration).

E. Industrial Health and Safety

- 6.12 The TGS Environmental Management System (see section 6.1) specifically includes in area of industrial health and safety, as evident by the title of the Company's policy "Environmental Protection and Industrial Safety." TGS has developed and implemented numerous (over two volumes) specific written health and safety procedures as part of the EMS.
- 6.13 The TGS Environment and Industrial Security Plan for the period 1998 to 2002, consists of various safety improvement projects to eliminate, reduce or control health and safety impacts and risks associated with the TGS operations (see Table 6-1 for list of projects).

F. Monitoring Programs

- 6.14 TGS has been actively auditing and monitoring their facilities to address environmental, safety, and operational issues. TGS is committed to continue auditing their facilities every three years as required by their Environmental Management System.
- 6.15 TGS routinely monitors air emissions and waste water discharges from their Cerri Complex to satisfy Provincial environmental requirements.
- 6.16 During 1994, TGS prepared a report on hazardous wastes, wastewater discharges, and solid wastes generated at their facilities. The report noted waste type and quantities for the used lubricating oil wastes, oil filters, oily rags, gas separator condensates, and solid wastes generated at the TGS Compressor Plants and the Cerri Complex. The report also noted air emissions, sanitary wastes that are treated in

septic systems, and mercaptans that are stored at the plants to add odor to the gas used in the plants.

- 6.17 The TGS Environmental Management System includes the following monitoring-related procedures in their Manual of Security Operations (MSO): sampling procedure, disinfection of water wells, tanks and pipelines, potable water, process water discharge, control of discharge water, treatment of water, control of gas emissions, underground storage tank, and aboveground storage tank.
- 6.18 TGS collects and maintains safety records for all accidents and reports this data to ENARGAS. Accident records are kept on the frequency (number of accidents x one million ÷ actual hours worked) and the severity (days lost x 1,000 ÷ actual hours worked). TGS records are currently based on all injury and non-injury accidents.

G. Cost, Schedule and Responsibilities

- 6.19 TGS funds an Environmental Management Program that is used to address environmental issues at their facilities and along their pipelines. During the period from 1993 to 1997, over One Million Pesos were spent on environmental projects. The main expenditures were for providing condensate tanks at compressor plants to replace the existing fire pits and for building four incinerators for burning oil filters and oily waste from Compressor Station maintenance activities.
- 6.20 TGS has budgeted approximately US\$ 10-15 million to invest in Environmental and Industrial Security issues for the period 1998-2002, consisting of environmental projects, pipeline erosion control and safety related projects, and Cerri Complex and Port Galvan safety/industrial security and maintenance projects.
- 6.21 In terms of schedule, Table 6-1 provides a preliminary, and subject to changes, year by year summary of the TGS 1998 – 2002 Environmental and Industrial Security Plan. The Environmental Management System is planned to be completed in 1998 with ISO 14001 certification anticipated for end of 1998 or early 1999.
- 6.22 As part of the Environmental Management System (described in Section 6.1), specific responsibility for the management and implementation of individual environmental, health and safety components has been defined. For example, the EMS assigns the responsibility for the supervision and control of project mitigation and monitoring to the Project Manager during the construction phase and to the Area Environmental Coordinator during the operating phase of the project. Headquarters Environmental Management staff provide project over-site. Environmental/Safety Coordinators have been designated for the principal TGS facilities (e.g., Cerri Complex, Port Galvan facilities).

7.0 PUBLIC CONSULTATION AND PARTICIPATION

7.1 TGS performs the following public consultation activities associated with the company's operations:

- public disclosure of Environmental Impact Assessment (EIA) and associated project information when required by Provincial or Municipal authorities;
- performance of public hearings associated with new projects when required by Provincial or Municipal authorities;
- project specific programs to contact all property owners along new project ROW in order to obtain the easements necessary to construct the new pipeline loops, contact with property owners occurs well in advance of project construction and environmental and safety information is provided and a copy of the EIA is provided if requested;
- information related to almost all expansion projects are typically reported in the local newspaper;
- included in the company's emergency response plan are procedures for contacting and disseminating information to the public in case of accidents or emergencies; and
- the Environmental/Safety Coordinators at the Cerri Complex and Port Galvan facilities attend monthly meetings with municipal authorities and personnel from other petrochemical facilities in the area to discuss emergency planning and environmental issues.