

**Environmental and Social Impact Assessment
GNL-2 Quarry Development Project
Cañete - Peru**

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

Peru LNG SRL (Peru LNG) is a company incorporated in Peru, whose shareholders are Hunt Oil of the United States of America and SK of South Korea. The company's objective is to build and operate a natural gas liquefaction (LNG) plant and associated port on the coast of Peru in the province of Cañete. LNG will be exported to the international market in tankers specifically built for the purpose. In order to operate the port facilities safely, it is necessary to build a breakwater for protection of LNG tankers from the strong and constant swell in the area. This breakwater will be built with rocks extracted from a nearby quarry, hereinafter referred to as the GNL-2 Quarry.

The project will consist of three main components: the development of the GNL-2 quarry, the construction of an access road, and transportation of rock material. These activities will be conducted in accordance with the provisions set forth in the Environmental Protection Regulations for Mining - Metallurgical Activities – Supreme Decree No. 016-93-EM (as amended by Supreme Decree No. 59-93-EM).

In order to comply with Peruvian environmental legislation, international standards and internal environmental policies, Peru LNG has prepared this Social and Environmental Impact Assessment (ESIA) for the GNL-2 Quarry, located in the province of Cañete, department of Lima.

1.1 OBJECTIVE OF THE ESIA

The objective of the ESIA is to assess environmental conditions for the GNL-2 Quarry in compliance with environmental legislation of the Mining Sub-Sector and the General Bureau of Mining Environmental Affairs of the Ministry of Energy and Mines (DGAAM-MEM) and the policy guidelines and national and international standards related to the environmental and social aspects applicable to this project.

1.2 LEVEL AND SCOPE OF STUDY

The ESIA has been prepared for submittal to the MEM according to the rules and guidelines established by the Ministry. The MEM is the competent environmental authority for the project under the Master Law for the Growth of Private Investment (Leg. Decree No. 757).

The scope of the ESIA includes the following topics:

- Description of the legal framework applicable to the proposed project
- Description of the proposed project including development of the quarry, construction of the access road and transportation of rock material.
- Evaluation of the environmental and social characteristics of the project's area of influence.
- Identification and assessment of the environmental and social impacts within the area of influence of the project
- Preparation of an Environmental and Social Management Plan
- Preparation of a Contingency and Abandonment Plan

This EIS does not include activities associated with the construction and operation of the road crossing for the Pan American Highway, construction and operation of the access road from the Pan American Highway to the beach, or transportation of rock materials by sea to the breakwater. These activities are included in the ESIA for the LNG Plant.

1.3 STAGES OF THE ASSESSMENT

The following stages were undertaken in preparing this ESIA:

Stage 1: Document Review and Field Work

Peru LNG provided Walsh with the documentation required to determine the characteristics of the project, which were used to identify the environmental and social aspects that could result in impacts during the project. Based on the analysis of the information supplied, field work was performed to assess the physical, biological social and cultural settings of the area of influence.

Stage 2: Environmental and Social Analysis

Once project activities and the environmental elements which could be potentially impacted were defined, the environmental and social aspects of the project were identified. This preliminary identification allowed for comparison of project attributes with the appropriate standard of compliance contained in environmental legislation. Social aspects and potential impacts of this project were also identified through a similar process.

For purposes of the assessment, project activities with the potential to cause positive or negative impacts on the environment are considered an environmental aspect.¹ In this way, the environmental impact can be defined as the change occurring in the environment as a result of the environmental aspect. The environmental effect² is any disturbance to the environment resulting from the action of man, while the impact is significant disturbance of the environment.

¹ INDECOPI (PERÚ). 1998. Sistemas de Gestión Ambiental. Directrices Generales sobre Principios, Sistemas y Técnicas de Apoyo. NTP-ISO 14004. Lima, INDECOPI; p.12.

² ESCA. OACA. s.f. Guía para la Elaboración de Estudios de Impacto Ambiental. Lima, Esc. Sup. Cienc Amb. p.10.

In order to perform the environmental analysis, verification lists and interactive relationships were established. The evaluation of environmental impacts required the use of cause and effect matrices, favorable significance indices (positive effects) and adverse significance indices (negative effect); as well as an estimate of the probability of occurrence of the effects.

Stage 3: Final Report

The Final Report of the ESIA was completed using all the existing documentation and information compiled through field visits.

2.0 LEGAL ASPECTS

The Master Law for the Growth of Private Investment – Legislative Decree No. 757 establishes the jurisdiction for each government Ministry in connection with environmental matters as set forth in the Code on the Environment and Natural Resources. The GNL-2 Quarry involves activities that fall within the jurisdiction of the Ministry of Energy and Mines (MEM).

The second paragraph of Article 50 of the Master Law for the Growth of Private Investment (Legislative Decree No. 757) provides that *“for companies engaged in two or more activities that fall under the jurisdiction of different sectors, the competent sector authority will be the one corresponding to the company’s activity which generates most of its gross revenues per year.”* Under this consideration, the MEM is the competent authority to deal with the environmental matters related to the quarry development activities carried out by Peru LNG.

Pursuant to the Regulations on the Organization and Duties of the Ministry of Energy and Mines (SD No. 025-2003-EM), the departments directly related to the quarry development project are the General Bureau of Mining Environmental Affairs (DGAAM) and the General Mining Bureau (DGM). However, since the quarry will provide the necessary material to build the facilities of a project of a greater magnitude, the LNG Plant, the mining activity is complementary to an energy project. For this reason, the ESIA must be submitted to the General Bureau of Energy Environmental Affairs (DGAAE), who will be in charge of approval as provided in Legislative Decree No. 757, but assessing compliance with the requirements and guidelines contained in the mining legislation.

2.1 ENVIRONMENTAL LEGISLATION APPLICABLE TO THE PROJECT

2.1.1 MAXIMUM PERMISSIBLE LIMITS AND ENVIRONMENTAL QUALITY STANDARDS

2.2.1.1 National Environmental Quality Standards for Air

The Regulations under the National Environmental Quality Standards for Air (ECA-Air) approved by Supreme Decree No. 074-2001-PCM, establish limit values for environmental air quality.

The international air quality standards established in the Pollution Prevention and Abatement Handbook-PPAH) of the World Bank dated 1998, have also been considered.

2.2.1.2 Permissible Standards and Limits for Environmental and Occupational Noise

Regulations under the National Environmental Quality Standards for Noise (ECA-Noise) approved by Supreme Decree No. 085-2003-PCM, are aimed at protecting the health, improving the quality of life of the population and promoting sustainable development. This legal rule establishes standards according to zoning using residential, commercial, industrial or special protection area land uses.

International standards for environmental noise within the boundaries of the premises established in the Pollution Prevention and Abatement Handbook-PPAH of the World Bank, dated July 1998, have also been considered.

Noise levels generated within quarry concession boundary also fall under the noise exposure guidelines of NIOSH (National Institute for Occupational Safety and Health), which establishes a limit of 85 dBA for an 8-hour work day, also established in Supreme Decree No. 046-2001-EM, Mining Safety and Hygiene Regulations.

2.2.1.3 Solid Waste Management and Handling

Solid waste management and handling is regulated by Law No. 27314 (21-07-00), which approves the General Law on Solid Wastes and Regulations (Supreme Decree No. 057-2004-PCM). These rules regulate solid waste management and handling and are mandatory for every individual or legal entity, whether public or private, in Peru. Furthermore, Title II of the Regulations establishes competent authorities for solid waste management and handling, including Ministries, municipalities, and other entities.

2.2.1.4 Social and Environmental Aspects

Due to the fact that this ESIA is for mining activities, the social-environmental aspects fall under the Regulations for Consultation and Citizens' Participation for Approval of Environmental Assessments in the Energy and Mines Sector (Ministerial Resolution No. 596-2002-EM-DM, published on December 21, 2002), and not within the recently approved Regulations for Citizens' participation in the Conduct of Energy Activities within the Administrative Procedures to Evaluate Environmental Assessments (Ministerial Resolution No. 535-2004-MEM/DM).

2.2 RULES ON AUDITING AND SANCTIONS

The Law on Auditing of Mining Activities (Law No. 27474), provides that the auditing of compliance with the regulations of the sector will be entrusted to individuals or legal entities referred to as "external auditors," duly qualified by the General Mining Bureau. External auditors and officers of the MEM who are designated as auditors may enter the site at any

time³ in order to conduct an audit, recommend safety, hygiene and environmental measures, and determine compliance with environmental protection laws.

Title IV of the Environmental Protection Regulations for Mining-Metallurgical Activities - Supreme Decree No. 016-93-EM (as amended by Supreme Decree No. 59-93-EM) establishes the infringements and sanctions applicable in the event of non-compliance. Ministerial Resolution No. 353-2000-EM/VMM, establishes the scale of Fines and Penalties to be applied in the event of failure to comply with the Provisions contained in the Sole Revised Text of the General Mining Law and Regulations, published on September 2, 2000.

2.3 SAFETY AND HYGIENE RULES

The Mining Safety and Hygiene Regulations (SD No. 046-2001-EM), provides that an economic-administrative unit, mining concession, beneficial concession, general labor concession and mining transportation concession employing 50 or more workers, will organize themselves in order to establish their own Annual Mining Safety and Hygiene Program. Titleholders employing less than 50 workers will be organized in order to establish a common service, structuring programs to include all workers involved.

2.4 APPLICABLE INTERNATIONAL STANDARDS

2.4.1 WORLD BANK ENVIRONMENTAL POLICIES

The guidelines established by the World Bank Group in the Pollution, Prevention and Abatement Handbook⁴, and in its Safeguard Policies⁵ will serve as a framework for the development of this project.

Furthermore, the guidelines of the International Finance Corporation (IFC) and of the World Bank contained in the document entitled “Doing Better Business through Effective Public Consultation and Disclosure. A Good Practice Manual” dated 1998, which is applicable to projects with financing by international agencies, will serve as a framework to develop the public consultation projects.

³ Article 7 of the Mining Activity Audit Law.

⁴ Pollution, Prevention and Abatement. Handbook, 1998. Toward Cleaner Production (PPAH).

⁵ The International Finance Corporation - IFC, a member of the World Bank Group, promotes sustainable investment in the private sector in developing countries as a form to reduce poverty and improve the living conditions of people; for the process of assessing, approving and supervising an investment project such as the one we are carrying out, the following operational policies are applicable:

- OP 4.01, Environmental Assessment;
- OP 4.04, Natural Habitats;
- OP 4.30, Involuntary Resettlement

2.4.2 US EX IM BANK ENVIRONMENTAL POLICIES

The US Export-Import Bank (ExIm Bank) is the official export credit agency of the United States of America, which backs the acquisition of US goods and services by creditworthy international buyers who are unable to obtain loans through traditional sources of structured trade and finance.

ExIm Bank assumes the country risk and the credit risk that the private sector is not in the capacity to accept and assists in balancing conditions so that US exporters may provide financing equal to that provided by other governments to its exports.

ExIm Bank has established an Environmental Program aimed at maintaining competitiveness in the global market, and making sure that the projects it supports are environmentally responsible. To this end, the Bank establishes procedures⁶ and guidelines including ten sector tables⁷ that establish qualitative and quantitative limits for elements such as air and water quality, which are used by the Engineering and Environment Division of ExIm Bank to assess the environmental impacts of investment projects.

3.0 ANALYSIS OF ALTERNATIVES

Peru LNG hired Walsh Peru S.A. to conduct an environmental, social and cultural comparison of the different quarry options to be selected to obtain rock material to build the LNG Plant breakwater.

Four quarry areas were evaluated: GNL and GNL-2, Los Molinos, El Sol-Punta Olleros and those collectively known as “Jatun” (Jatun, Huaya, Huaya II, Huarangal and Rinconada).

The GNL quarries, comprising areas of 300 ha (GNL) and 500 ha (GNL-2), are relatively close to the LNG Plant, approximately 20 km away in the Department of Lima. Los Molinos

⁶ US EXIM BANK Environmental Procedures:
Annex A - US EXIM BANK Environmental Guidelines
Annex B – Environmental Screening Document
Annex C – Exclusion List for Export Credit Insurance
Annex D – Illustrative list of sensitive sectors and areas (projects requiring an EIA)
Annex E – Environmental Impact Assessment Reports
Annex F – Environmental Exports Program

⁷ Sector Tables 1-10 are designed to cover the range of industrial sectors for which the financing of US EXIM BANK is traditionally required:
Table 1: Industrial Projects and General Infrastructure
Table 2: Pulp and Paper Mills
Table 3: Iron and Steel Mills
Table 4: Mining and Milling
Table 5: Oil and Gas Development
Table 6: Thermal, Gas Turbine and Engine Driven Power Plants
Table 7: Forestry Operations
Table 8: Petroleum Refineries and Petrochemical Facilities
Table 9: Hydropower and Water Resources Management
Table 10: Liquid Natural Gas (LNG), Liquefaction and Regasification Plants

has an area of 200 ha and is about 150 km southeast of the LNG Plant in the Department of Ica. El Sol-Punta Olleros, also with an area of 200 ha, is in excess of 200 km south of the LNG Plant, in the department of Ica. The Jatun quarries, are composed of 1,200 hectares located in the desert valley of the Rio Seco and Pampa Quadalupe gorge in the Department of Ica.

From the findings of this evaluation of alternatives, it was concluded that the environmentally and socially viable quarries were GNL, GNL-2 and Jatun.

4.0 PROJECT DESCRIPTION

The Project Description presents the activities to be carried out to obtain rock from the GNL-2 Quarry located in the Peru LNG concession. The concession consists of a total area of 500 hectares with a road access point located at Km 168 of the South Pan American Highway, in the Department of Lima.

The total volume of rock required for the construction of the breakwater will be 3.4 million metric tons, which will require the quarrying of a total of 7.6 million metric tons.

To develop the quarry it will be necessary to build an access road off of the South Pan American Highway with a total length of approximately 21.5 km. The locations of the GNL-2 Quarry concession coordinates is shown in Table R-1.

Table R-1 Location of the Mining Concession in UTM coordinates

Quarry	Vertex	UTM Coordinates	
		North	East
GNL-2	V 01	8549 000	376 000
	V 02	8549 000	378 000
	V 03	8547 000	378 000
	V 04	8547 000	377 000
	V 05	8546 000	377 000
	V 06	8546 000	376 000

Source: INACC Petition – February 2005

4.1 QUARRY DEVELOPMENT

Rock will be extracted from the GNL-2 Quarry using open pit mining procedures, since this is the only feasible way to obtain and handle rock with the required characteristics. Conventional surface mining methods will be used including drilling, blasting, loading and transport.

The rocky massif to be exploited corresponds to a graniodoritic crest running from north to south. The quarry is located at an elevation of 1,130 m with a proposed net quarry area of approximately 50 ha (500 m x 1 000 m).

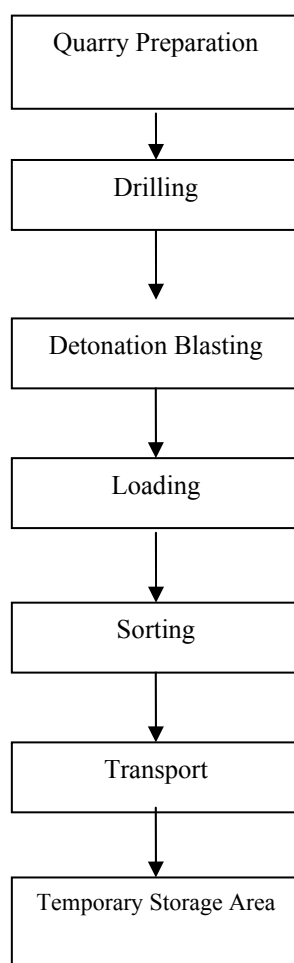
Rocks of different sizes and weights will be extracted for building the breakwater, according to the proposed breakwater design. First, a stratification layer will be placed directly on the sea bed. Over this layer will be filter and nucleus rocks in the form of a pile. Finally, heavy framing blocks will be placed in the form of an external armor.

The areas to be used for the development of the quarry also include:

- Access roads within the concession to the quarry, dumps, and explosives storage areas
- Accumulation and selection area (6 ha)
- Dump area (17 ha)
- Temporary facilities for the mining contractor (4 ha)

Quarrying will take place 24 hours per day, 7 days per week, in varying shifts (two 12-hour shifts or three 8-hour shifts). There will be three groups of operators so as to have one group on day shift, a second group on night shift, and a third group off. Crews will work a schedule of 10 days on and five days off.

The production process will have the following sequence of activities:



The demand for rock will require two permanent banks, each with a length of 200 m and with each of them being organized in two work faces with a length of 100 meters. The two work faces on each bank will alternate drilling-blasting and loading-transport cycles. The estimated drilling penetration rate is 15 m/hr. Two drills will be required to handle the daily production and one stand by drill will be available.

Blasting will be scheduled daily using a row blasting methodology. Typical blast time will be at mid-day (noon), following evacuation of all equipment and personnel from the area. Under certain circumstances up to two blasts could be performed in one day. The equipment required for this operation will be: one small 5 ton mixer truck to produce ANFO (ammonium nitrate and diesel number 2) or possibly heavy ANFO (emulsion and ANFO).

Rock selection will be done at the quarry and at the sorting platform. At the sorting platform, stationary and vibrating screens will be used.

4.2 CONSTRUCTION OF ACCESS ROAD

The access road to the quarry will start on the South Pan American Highway at Km 168, going northeast through Pampa “Cinco Cruces,” continuing on the right side of the “Cansa Caballo” gorge, through the basin of the Culebrillas gorge and to the extraction area. The road will have a length of approximately 21.5 km, with a starting elevation of 150 m and ending elevation of 900 m.

The access road will have a minimum width of 12 m, which includes 8 m of road surface width for two-way traffic and two meters on each side as a shoulder. Additionally, every 1,000 m and in areas with steep gradients, the road will be widened by 2 m on each side to allow for emergency stops or for rest zones for the vehicles on the road.

According to the design of the road, vehicles may travel at a maximum speed of 60 km/hr. The access road will have a top surface at the graded level, with an 8 m width, to permit vehicles to travel in both directions safely.

The pavement, taking into account design characteristics applicable to the type of road classification and design load, will consist of a structure with a thickness ranging between 5 and 30 cm of graded material.

Considering that the access road is classified as private, material specifications must comply with the physical and mechanical requirements indicated in the Peruvian Road Regulations.

The activities for the construction of the access road will consist of the following:

- Temporary structure works installation works
- Preliminary bed cleaning works
- Earth movement works
- Placement of the pavement

4.3 GROUND ROCK TRANSPORT

Dump trucks (15 m³ or 22 metric tons) and semi-trailers with 45 metric ton platforms will be used. The number of trucks used will range between 20 and 40 depending on transport needs.

Large rock blocks (armor and nucleus) will be loaded directly from the bank to semi-trailer trucks using cables or tongs at the end of a large CAT 992 front loader or CAT 365 excavator. These semi-trailer trucks with platforms will transport large rock directly from the quarry to the storage site at the beach. Rocks from 0.5 m³ to 1.5 m³ will be loaded onto 15 m³ dump trucks with a reinforced hopper.

4.4 SUPPORT FACILITIES

The following support facilities will be necessary within the quarry concession:

- Dining Room
- Workshop or Machinery Yard
- Offices
- Generators
- Warehouses
- Service Station
- Chemical Water Closets
- Lighting Services

The proximity of the quarry to the populated areas in Cañete and Chincha will make it possible to have lodging facilities for the personnel in those locations; therefore, no provisions will be made to have worker accommodations at the quarry.

4.5 EMISSIONS AND EFFLUENTS DURING THE QUARRY OPERATION

It is expected that a limited amount of dust will be generated during the operations of the GNL-2 Quarry. Dust will be carried by the predominant winds from the southwest and towards the mountains, away from the South Pan American Highway and populated areas. Approximately four water tank trucks outfitted with spray bars will be used to reduce the level of dust emissions on the access road. Furthermore, consideration will be given to the possibility of using other control measures, such as the use of sea water and surface hardening agents.

Since conventional equipment will be used for the open pit operation, the noise level will be within the parameters of any similar operation which may be presently being undertaken in Peru or under international standards. As prescribed in the legislation, the operators will wear ear protection devices to prevent hearing damage.

Gases originating from engines being operated may be classified into two types: that emitted from the small number of quarry extraction equipment units and that emitted from the fleet of

trucks and auxiliary equipment operating mainly on the roads within the concession. In total, the operating equipment will burn approximately 25,000 liters of diesel daily.

Domestic effluents (sewage) generated in the portable chemical toilets will be handled and removed by an authorized solid waste services firm. In the machinery yard, maintenance machinery and equipment activities during the construction and operation phases will generate liquid effluents such as water containing waste grease and other materials. A designated area will be prepared for washing of the machinery and equipment, which will be outfitted with a grease trap. In addition, there will be washrooms with showers and washing facilities for personal hygiene. The water produced in the machinery yard and the waste water from the washrooms will be collected in a retention pond and will be disposed of in percolation ponds or filtering beds. This water may be used for dust control following proper analysis. The water used in dust control will evaporate.

Solid waste from the extraction equipment will be collected and adequately disposed of by the equipment mechanics and operators, in accordance with the Waste Management Plan. Offices, the machinery yard, and workshops will produce food waste, paper, equipment parts, grease, and oily rags. All solid waste products will be collected and adequately disposed of in accordance with the Waste Management Plan. The final disposal of industrial solid waste will be performed by a duly authorized contractor.

5.0 ENVIRONMENTAL AND SOCIAL BASELINE

5.1 ENVIRONMENTAL BASELINE – PHYSICAL ENVIRONMENT

5.1.1 CLIMATE AND METEOROLOGY

The climate in the area of the project is arid desert type typical of the Peruvian central coast. The quarry area is located on the western slope of the Andean Mountain Range, at between 900 m and 1,200 m elevation, with an access road leading to the coast approximately 21.5 km from the quarry. This altitude difference creates two types of deserts in the area of the project: the coastal desert, which runs from sea level to 600 or 700 m elevation, and the interior desert above 1,600 m elevation. Both deserts are extremely dry with annual rainfalls rarely exceeding 20 mm.

In the coastal desert, precipitation occurs in the winter months (June to October), mainly in the form of saturated fog or rain droplets, whereas in the interior desert, precipitation occurs during the summer months (January to March) in the form of real, sporadic rain.

Due to the near equatorial location, and proximity to the ocean, temperature does not vary greatly from summer to winter or between day and night, and this creates a certain degree of regularity in the wind, with an almost total absence of strong winds. Average maximum and minimum temperature in the summer is 30° C and 12° C for both the quarry and coast locations. During the winter at the coast, maximum temperatures scarcely exceed 20° C under a semi-permanent layer of clouds, while the interior desert a permanently sunny area where the maximum temperature is nearly 30° C.

Wind reaches a maximum speed of a little more than 10 m/sec, with extended periods of weak, calm breezes blowing. The air mixing layer is also limited, with a maximum of 500 m for the summer, and 300 m for winter, when there is greater air stability.

5.1.2 GEOLOGY AND SEISMICITY

The area's geology presents a positive condition for the existence of intrusive, resistant and compact rock materials, which can be used for construction of the breakwater.

In the study area, seven different stratigraphic units have been identified with ages ranging between the Cretaceous to the recent Quaternary. The stratigraphic units identified are as follows:

- Quilmana Formation
- Pocoto Formation
- Cañete Formation
- Alluvial Deposits
- Torrential Deposits
- Colluvial Deposits
- Eolic Deposits

Due to the geological and topographical conditions of the area, any negative influence of the project on subsurface waters can be eliminated as they are only present far from the projected work areas of the quarry.

Because of the sporadic seismic activity, the area presents quite stable conditions in the rock formations; however, there is some instability in colluvial accumulations on the slope. The Culebrilla gorge, where the quarry is situated, may brief and weak seasonal runoffs of surface water.

5.1.3 GEOMORPHOLOGY AND PHYSICAL STABILITY

The area of the project has three main areas. The first area is where the quarry project is located and corresponding to mountains with hilly terrain in a desert area. The second area is the alluvial valley of the Topará gorge, with cultivated fields having a high agricultural value but location outside of the area of influence of the quarry. The third area is the desert plain, comprised of loose alluvial and eolic materials where the proposed access road will be located.

The physiography of the area presents conditions which are favorable for development and operation of the quarry. It is a dry, mountainous area, with low erosion potential and with relatively easy access where development should not generate significant risks for physical safety. The plains are likewise conducive to rock material transport activities.

There is good physical stability in all areas except for localized problems due to sporadic torrential runoffs which may potentially affect the access road.

5.1.4 SOILS AND CAPACITY FOR GREATER USE

The soils in the quarry area being evaluated present a physiography dominated by a mountainous landscape, with slopes exceeding 25 percent, and to a lesser extent, by an alluvial landscape. According to their origin, soils developed from residual material have been encountered, as well as colluvial-alluvial, alluvial, fluvial and marine soils. A total of 11 soil units have been determined, as well as three miscellaneous areas. Taxonomically, there is a domination of soils in the Torriorthents and Torripsamments sub-groups. Minor soils include the Torrifluvents and Haplosalids sub-groups.

Because of the arid climate conditions prevailing in the area, most of the soils are poorly developed. The soils with the best edaphic conditions for cultivation are in the area adjacent to the Topará gorge (Topará soil) and in some parts of the plains (Estación and Jaguay soils).

According to a classification by Capacity for Greater Use, three groups have been identified: Clean Cut Cultivation (A), Permanent Cultivation (C) and Protection (X).

5.1.5 LANDSCAPE

In the area of the quarry, the landscape has a low visual absorption capacity. This suggests low fragility of the landscape to anthropogenic activities and low impairment of the landscape as a result of the project. Therefore, the ability of the area landscape to visually absorb modifications or alterations without detriment to its visual quality is likely.

Landscape values obtained for the access road indicate a moderate visual absorption capacity, and this suggests susceptibility to modification under certain conditions. It is evident that such scenarios are more vulnerable to the change experienced by the impairment of its visual quality.

Based on the analyses made, it can be deduced that the landscapes under assessment do not have much intrinsic aesthetic value, they are not complex in their composition, and they are scenes which are very common and frequently found along the country's coast. Both in the area of the quarry and on the access road, considering the visual characteristics (especially space, scale and color), monotone attributes are accentuated, limiting its aesthetic potential.

5.1.6 CURRENT USE OF THE LAND

Most of the area being assessed consists of desert where natural vegetation is scarce, with agricultural activities only carried out along the Topará gorge. Below is a list of the land use categories identified in the area of assessment:

- Land with cultivated vegetation and idle,
- Land with natural vegetation, such as tillandsies, cactus, herbs, etc. and
- Land without vegetation.

5.1.7 AIR QUALITY AND NOISE LEVELS

The measurement of particles in suspension (PM_{10}) and combustion gases in the air (CO , NO_x and SO_2) and noise levels were carried out. Measurements in the GNL-2 Quarry area, access road and the upper part of the Topará stream were made in March 2005. In addition, for the purposes of this assessment, a monitoring point was established at Km 168 of the South Pan American Highway, with monitoring carried out in October 2004.

The PM_{10} particle concentration at the five monitoring points is lower than the ECA-Air ($150 \mu g/m^3$) and in four of them, below the World Bank international standard ($70 \mu g/m^3$). The station showing the lowest particle concentration PM_{10} is Monitoring Point P3 (GNL-2 Quarry – Pt. 1) with $33.7 \mu g/m^3$ and the one showing the highest concentration was Point P0 (at the beginning of access road to GNL-2 Quarry) with $97 \mu g/m^3$.

Carbon monoxide (CO) concentrations measured at the five monitoring stations were found to be less than the Quality Standard of $30,000 \mu g/m^3$ for one hour. The highest concentration of $10,475 \mu g/m^3$ was found at Station P4 (GNL-2 Quarry– Pt. 2). There is no World Bank parameter standard for CO for reference.

The average values of sulfur dioxide (SO_2) measured at the stations did not exceed the ECA-Air for 24 hours of $365 \mu g/m^3$ or the World Bank standard ($125 \mu g/m^3$). The concentration values of SO_2 fluctuate between 0.405 and $8 \mu g/m^3$. The highest concentration of $8 \mu g/m^3$ was recorded at Station P0 (Beginning of GNL-2 Quarry Access Road – October 2004), and the lowest concentration of $0.405 \mu g/m^3$ was measured at station P4 (GNL-2 Quarry – Pt. 2).

Nitrogen oxides (NO_x) showed values between 0.0 and $14.7 \mu g/m^3$. These concentrations were below the $200 \mu g/m^3$ standard established for this parameter in the ECA-Air and the World Bank standard of $150 \mu g/m^3$.

Lastly, the total of noise levels recorded at the different monitoring points was below the Environmental Quality Standards for Noise and that of the World Bank of 70 dB.

Only at Measurement Point P0, located at the start of the access road to GNL-2 Quarry, during the measuring period of 07:01 and 22:00 hours, there was an average value of 67.0 dBA and a maximum of 81.2 dBA; while in the measuring period 22:01 to 7:00 hours, average and maximum values of 67.4 and 88.8 dBA, respectively, were recorded.

5.2 ENVIRONMENTAL BASELINE – BIOLOGICAL ENVIRONMENT

The information presented in the chapter on biological baseline was compiled using existing bibliographic information and from two field visits. The first visit was in the winter season, also known as the wet season. The second visit was made in the summer dry season.

The area of influence of the project is a desert and semi-desert zone. The scarce xerophytes vegetation in the quarry area, comprise species highly adaptable to very dry conditions and species common to central coastal deserts.

The cacti recorded in the area correspond to *Neoraimondia arequipensis* var. *roseiflora* and *Haageocereus pseudomelanostele* var. *carminiflorus*. The species *Neoraimondia arequipensis* is endemic to Lima, Ica and Arequipa, but the variety recorded is characterized for having pink flowers and is distributed in Lima and Ica. Among the spread herb shrub species, the recording of two endemic grasses *Presliophytum incanum* (Loasaceae) and *Nolana weberbaueri* (Solanaceae) should be emphasized. The first is endemic to the Departments of Arequipa, Cajamarca, Lima and Piura, while the second is only in the Department of Ica. In the Tillandsiales, *Tillandsia latifolia* var. *latifolia* is prominent, is endemic to Peru, and is well known in the coastal desert areas of almost the whole country.

Regarding birds, recording the species, *Burhinus superciliaris* “Huerequeque” and *Speotyto cunicularia* “sand owl” are prominent. The importance of these species stems from the fact that they are representatives of arid, coastal settings. For their part, *Burhinus superciliaris* is a species endemic to coastal desert areas of the South Pacific of Ecuador, Peru and Northern Chile (Salinas et al., 2003). In addition, two Peruvian endemic species of the family Furnariidae stand out between Tumbes and Ica correspond to *Geositta peruviana* while *Asthenes cactorum peruviana* is found among two Endemic Areas for Birds (EBAs): EBA 32 (Pacific Coast, Southern Peru and Northern Chile) and EBA 20 (Tumbes Region, Western Ecuador and Peru).

With regard to mammals, the presence of three species of mammals is recorded: *Lycalopex sechurae*, *Phyllotis andium* and *Mus musculus*. Of the 20 species potentially present in the area, 12 are included in some of the following lists: INRENA, CITES and IUCN. With respect to the recorded species, only the “Coastal Fox,” *Lycalopex sechurae* appears on the list of IUCN and has a category of Deficient Data (DD). In addition, a species endemic to the coast and slopes, from Lambayeque to Arequipa, and present in the study area, was the mouse *Phyllotis amicus*. In general, there were no areas of high risk identified for mammal communities, where mammals could be affected in a severe or irreversible manner by activities related to the project development.

The results of sampling reptiles showed that three of the reptiles recorded are found to be in some category of endangerment as determined by INRENA (DS 034-2004-AG). *Ctenolepharis adspersa* “Big-headed lizard” and *Dicrodon heterolepis* “Red-headed lizard” are vulnerable while *Microlophus tigris* “Hill Lizard” is considered as near danger. The potentially present species *Bothrops pictus* “Coast Fat Boy” is included in the category of vulnerable. None of the species of amphibians and reptiles recorded are included in any protective category of IUCN and/or CITES.

The sauria *C. adspersa* and *M. tigris* would be the species that could be faced with some significant disturbance in its environment as a result of the quarry project. The effect on *D. heterolepis* “Red-headed Lizard” would be minor since the distribution of this saurian is restricted to coastal valleys. The impact of the quarrying activities on these habitats should be minimal, since they are found a long way away from the projected area for the quarry. This situation is similar for the “Lima frog” *B. limensis*, whose distribution is limited mainly to coastal valleys.

5.3 SOCIAL BASELINE

For the purposes of the social baseline, the direct area of influence includes the district of San Vicente de Cañete in the Lima Region and the District of Grocio Prado, which is in the Province of Chincha in the Ica Region. The indirect area of influence includes the District of Imperial in the Province of Cañete and the Districts of Chincha Alta and Pueblo Nuevo in the Province of Chincha.

The Province of Cañete, in the Lima Region, has a population of 177,925 inhabitants (as of 2005 - source INEI), representing 2.2 % of the total population of the Lima Region. It has a total area of 4,577 km², and is divided in to 16 districts. One of its districts is San Vicente de Cañete – included in the area of influence of the GNL-2 Quarry project.

The Province of Chincha, in the Ica Region, has a population of 184,349 inhabitants, which is 25.5 % of the total population of Ica. One of its districts is Grocio Prado, which is also part of the direct area of influence of the GNL-2 quarry. This district recorded a fall in population in 2005 and now has a total population of 17,388. This is equivalent to 9 % of the population of the province.

About 50 % of the homes in the province of Cañete are considered as poor, reaching up to 69% of the population in rural areas. The population of the District of Grocio Prado has been considered as being in a state of poverty⁸.

The educational level of the population interviewed in the areas of influence are primarily within the Completed Secondary classification in the District of San Vicente de Cañete and in the District of Grocio Prado, with 31.9 % and 27.1 %, respectively⁹.

In the District of San Vicente de Cañete, the distribution of health establishments is made through Networks and Micro-networks. The San Vicente Micro-Network includes two Health Centers and eight Health Posts which care for a population of 30,385 people under the responsibility of 80 Health Sector professionals¹⁰.

In the area of influence, the main reasons for death are acute respiratory infections (IRA) that account for 38 % of deaths and gastro-intestinal diseases that account for 14 % of deaths.

According to results obtained in the survey for homes in the direct area of influence, adobe is the most widely used material in the construction of walls for housing (50.2 %), Grocio Prado being the town where the people employ this material the most (72.6 %). In San Vicente de Cañete, bricks are the material most widely used (68.6 %). Only 3.1 % of the houses in Topará have walls of brick, they mostly use adobe and straw mats (both 34 %) for their buildings.

⁸ Source: National Social Compensation and Development Fund (FONCODES). Poverty Distribution Map 2000.

⁹ Source:

¹⁰ Source: Information MINSA, 2002

The Economically Active Population (EAP) in the districts which make up the areas of influence of the project represents 32.4 % of the total population. In the District of San Vicente de Cañete, the EAP is 31.9 % and in the District of Grocio Prado it is 32.8 %¹¹.

The income levels of the households show that 20.2 % of these have weekly earnings of less than or equal to S/. 100, the majority of this group belonging to the area of the Topará gorge (40.6 %). Some 40.4 % of the homes have weekly incomes between S/. 101 and S/. 200. Although the monthly amount can be as much as S/. 800, it is insufficient to cover the minimum needs of the home.

It was identified that 19 % of the family heads are workers, 18.5 % independent workers, and 13.3 % have farming as their main occupation¹².

With regard to the areas of crops, the district with the greatest cultivated area is San Vicente de Cañete with 23,405,59 ha cultivated, with 47.7 % concentrated in livestock units. Grocio Prado is in second place with 5,426,51 ha cultivated, representing 52.3% of livestock units, a fact that enables us to deduce that there is greater fragmentations of land in Grocio Prado¹³.

The local governments of the Provinces of Chincha and San Vicente de Cañete are represented by a Provincial Municipality, and district municipalities. The Province of Chincha is made up of eleven districts, and Cañete of 16 districts. In addition, in these governments there is a Mayors' Assembly in which all district Mayors participate.

In the Province of Cañete, there are NGOs working mainly in the farming area:

- The Professional Training Center for Women (Condoray).
- The Rural Valle Grande Institute.
- IPID.
- The Huayanay Institute.

In the Province of Chincha there are also NGOs including:

- The Association of Farming Promotion (ASPA).
- CIDE SUR: Research Center of Sur Medio.
- CEDECH: Technical Training Center.
- CIDEPORF: Research and Development Center for Rural Populations of Peru.

Certain human settlements have been established in territory located at Km 164 to Km 175 of the South Pan American Highway on property owned by the Ministry of Agriculture. There is an existing Court Resolution requiring the return of this land to the Ministry. These human settlements are:

- Association of Agro-Industrial Producers El Trébol Intersection.
- Farmers' Association Las Brisas de Concón (formerly called José María Escrivá).

¹¹ Source: INEI – III House Census and Population Census 1993.

¹² Source: Walsh Perú Social-Environmental Management Team. Social-Economic Poll –GNL 2 Baseline , April 2005.

¹³ Source: INEI- National Farming Census, 1994.

- Housing Association of Cañete Temporary Workers (CETEC), (known as Nuevo Cañete).
- Livestock Association Villa Apóstol Santiago.
- Association of Coast Colonizers (ACC).
- Five Crosses Human Settlement.
- Housing and Defense of Residents' Association of Peoples Center Nuevo Ayacucho (called Nuevo Ayacucho).

With respect to CETEC, it is known that there is a proposal to dividing the 3rd stage of Nuevo Cañete into lots, indicating a clear intention to expand the settlement.¹⁴

Information detailing the time periods when these settlements entered the area is presented in the Social Baseline of the ESIA. Map R-4 (M 5-11) shows the location of these settlements.

The reasons stated by people in these settlements for migrating vary. The inhabitants of the outskirts of San Vicente said that the main reasons were: to look for employment (46.8 %), obtain their own house (41.6 %) and avoid political violence (29.9 %). For the inhabitants of Topará, the main reasons were: to seek employment (74.1 %) and resolve housing problems (7.4 %)¹⁵.

Those interviewed think that in the future, the various locales will have all the services that will be necessary. Furthermore, they believe that they will have better opportunities for business and employment with the people of Cañete and Chíncha.

5.4 CULTURAL - ARCHEOLOGICAL BASELINE

The area of the GNL-2 Quarry has been assessed in the past five years as part of the archaeological assessment for the Camisea and Concón – Topará projects.

The archaeological assessment revealed that the Cinco Cruces desert pampa, Pampa Cañete and the southern part of Lomas Negras contain spread remains related to very old human groups. The sites include shell deposits, temporary hunter and collector camps, and even burial areas. A Pre-Hispanic trail has been identified in the GNL-2 Quarry concession which runs from the Topará gorge – from the Huaquina archaeological site - to the Culebrilla gorge, towards the Lunahuaná valley.

The sites identified are as follows:

- A. Windbreak:** This is comprised of the remains of a small construction site made of non-edged stone arranged on an unmortared wall.
- B. Pre-Hispanic trail:** This is comprised of an old pre-Hispanic trail, which, seemingly dates back to periods before the Late Horizon (Inca – 1,400 AD) and which has continued in use until the past century by the residents of the present Topará area and vicinity.

¹⁴ Source: Walsh Perú Social-Environmental Management Team. Social-Economic Poll –GNL 2 Baseline , April 2005

¹⁵ Social-Environmental Management Team Walsh Perú. Social-Economic poll – Base line GNL 2, April 2005

- C. Site 01:** This is comprised of a set of quadrangular and circular structures which are in poor condition. Ceramic fragments were observed on the surface as well as a modern circular structure at the foot of the hill.
- D. Rectangular Structure:** This is a rectangular structure plant with sides of approximately 4.80 meters by 3 meters. It has a possible opening towards the north. The structure is deteriorated, but may be associated with the pre-Hispanic trail going along the entire Culebrilla gorge.
- E. Geoglyph:** This is a geological glyph structure with a diameter of approximately five m, located approximately 100 m from the access road, but not affected by the access road.
- F. Possible Tambo:** This is comprised of the remains of a possible rectangular or quadrangular structure. It is assumed that this is a possible Inca *Tambo*. It is within the area defined as the development zone.
- G. Site 2:** This site is located at the initial part of a gorge. Construction works can be found adapted to the surface's steep terrain, comprised of small spaces of quadrangular shape, small terraces, a possible *chulpa* underneath a large rock and several retention walls to support the structures. It will be affected by the proposed quarry project.

Also identified was isolated evidence of fragmented ceramic materials, but in most cases, it is associated with the access road.

6.0 ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT

6.1 ENVIRONMENTAL AND SOCIAL IMPACTS DURING THE GNL-2 QUARRY DEVELOPMENT

Favorable Impacts

Generation of employment

Employment will be generated due to the hiring of local labor, depending upon the characteristics and nature of each activity of the project. Labor needs may be skilled or unskilled, but it is anticipated that most of the local personnel will be hired as unskilled labor. It is estimated that during the quarry development phase, approximately 231 people will be necessary, including workers for support facilities or in logistics. The local work force needed is estimated at a maximum of 75 people, representing 33 % of the total labor requirement.

Boosted Trade and Services

The increase in the demand for goods and services, associated with supply needs during the project's activities, will result in added commercial activity at the local and regional levels. It

should be noted that the time for execution of the project will be approximately 24 months and the demand for local products is expected to increase during this period.

Assurance and Improvement of the Physical stability of slopes

This positive impact is associated with reclamation of the affected areas, which can be used to improve the visual quality of the landscape. It will occur at the end of the project and will include profiling of bank slopes, reinforcement of safety berms, and diversion of water from possible runoffs, among others. This positive effect will assure a stable abandonment without risk of land slides or earth movements.

Adverse Impacts

Generation of Particles

The activities related to construction, quarry operation, and closure of the GNL-2 Quarry will generate particulate emissions of Total Suspended Particles (TSP) and particles of less than 10 microns (PM₁₀) which are easily transportable in air.

Dust generation will be greater during blasting operations and lower during drilling, collection, loading, transport and conditioning of material in the pad. The wind will carry the particulate material generated towards the mountains and away from the quarry concession and populated areas.

Generation of Combustion Gases

This potential impact is the emission of combustion gases (CO, NO_x, SO₂ and HC) associated with the operation of diesel-powered equipment and vehicles (trucks, motor graders, tractors, front loaders, hydraulic drills, tank trucks and dump trucks) during development and operation of the quarry. Gas emissions will be at ground level and they will be transported by the prevailing winds in the area. This effect will be specific and limited to the development area with a main influence on the workers (possible occupational risk).

Noise Generation

The noise level will be highly intense, although for a short period of time, localized mainly in the development area. Since the mining area is far away from populated centers and sensitive receivers (approximately 20 km), and due to the presence of mountainous terrain acting as an obstacle to noise, it is estimated that the impact will be of low significance for the population. Noise confined to the specific development area will be heard by the workers and this impact is considered to be occupational in nature.

The use of heavy equipment and heavy duty vehicles will also generate noise in a low to moderate intensity. Therefore, personnel working in the quarries will need to abide by instructions set forth in the Peru LNG Industrial Hygiene and Safety Regulations, which prescribe specific measures with reference to hearing protection.

Changes to the Terrain

A change to the terrain resulting from the volume of rock material removed is the most common impact in non-metallic open pit mining operations. Moreover, quarry development activities and the disposal of material in waste rock pads will cause changes to the terrain, such as the generation of banks in the area with the effect being mainly a visual impact. A secondary effect of the changes to the terrain is alteration of surface drainage patterns in the quarry and waste rock pads.

Vibration

Detonation of explosives to produce rock will generate vibrations within the area of the project. These vibrations, depending on the area's geological structure, have a low probability of causing slope destabilization.

The effects of the vibrations on the local population would be negligible, because of their distance from the concession area. Local populations will also be insulated from sound by the presence of obstacle in the form of the mountainous physiography outside the concession. Within the quarry area, there would only be small one-story structures, therefore one can eliminate resonance effects such as the speed and magnitude of the vibrations as a significant impact.

Slope Destabilization

Drilling and explosives will generate vibrations, which, under specific conditions, may cause slope instability. Any possible effect on the stability of slopes is a risk which must be taken into account in all the mining operations, especially in drilling and blasting. As a preventive measure, Peru LNG will plan blasts considering a reduction in the weight of the explosive, using longer delays and a reduction in the confinement of the explosive to minimize vibration.

Generation of Waste Rock

Work involving the removal of the colluvial cover and eroded rock in the quarry prior to the exploitation and extraction of quality rock for the breakwater will generate waste rock which will be taken to designated dump areas that have been authorized by the competent authority. The thickness of the cut material is planned to be between 10 and 15 m.

Changes to the Soil

This impact will be caused by the removal of soil materials for the development of the quarry and auxiliary areas. The land surfaces currently have soil which is not considered to be very economically suitable due to the steep gradient and rocky character in the higher sections. According to the soil classification guidelines, this is considered protection land. It must be noted that this impact is associated to the potential use of the soil as a productive activity; however, there is no current productive activity within the concession.

Soil Contamination Risk

Hydrocarbon spills may be considered a possible source of soil contamination. In addition, there is a contamination risk from accidental discharges of effluents generated by the equipment cleaning and maintenance operations in the machinery workshop which will be built in the quarry concession.

The contamination risk will be minimized by placement of secondary containment walls around the workshop or machinery yard and the fuel storage area. Waste derived from hydrocarbons as a result of equipment maintenance works will be disposed of through a Solid Waste Service Company (EPS-RS), in compliance with the provisions of applicable legislation. Strict compliance with preventive measures will reduce the risk of soil contamination.

Changes to Surface Drainage

The concession covers considerable areas within dry gorges. During the field work performed, evidence was found of runoffs and bed formation, mainly linked to unusual rain events and exceptional climatic conditions.

Changes to the natural drainage will result from activities related to the construction of the quarry access ramp, construction of the drilling and blasting platform in the quarry's banks. In order to prevent water from infiltrating in the rock exploitation area, the primary preventive measure to be undertaken is the construction of diversion canals.

Low Risk of Changes to the Water Table

Since the development of the quarry will be on the surface (open pit mine), the risk of affecting the water table at greater than 70 m deep is minimal, with negligible risk of changes in the quality or capacity of the aquifer as a result of the blasting and extraction operations.

Reduction in the Water Level

The quarry development activities during the construction and operational phase (human consumption, extraction operations, maintenance of chemical water closets, vehicle cleaning) will require the use of 7,500 gallons of water per day. It is planned for the water to be supplied from Cañete and/or Chinchá, using tank trucks to transport the water to tanks located in the concession area. These trucks will have a capacity of 8,000 to 9,000 gallons. This amount of water consumption could produce a reduction in the water supply in the surrounding area. If required, the water supply will not be obtained from the vulnerable locations, but will be permitted to be taken from another supply.

Reduction of Top Soil

The xerophytes vegetation within the concession is scarce and it includes species which are highly adapted to the very dry environments commonly found in the desert of the central

coast. The species reported in the baseline consists of vegetation in the form of herbs, bushes and cactus, with prominence of the shrub *Heliotropium sp.* and the herb *Presliophytum incanum*.

The removal of top soil during the preliminary work for preparation of the site (drilling, construction of access ramp, starting platform, selection area and complementary installations) will cause the removal of some vegetation specimens as well as a limited loss of top soil.

Scaring or Disturbance of Wildlife

Earth moving activities during the preliminary work and extraction of rock material and the associated human presence will generate the loss of habitat and disturbance of wildlife. This effect together with the effects of increased noise (detonation or explosions) during the daytime hours, will have an influence on wild birds, small mammals (rodents), larger mammals (foxes) and reptiles, who will migrate to similar habitats in the areas surrounding the concession that are able to providing shelter and resources for the displaced animals. The effect will be greater on small invertebrate wildlife, especially those currently located in the area of development.

Health and Safety Risks

Health and safety risks may affect personnel working on the project as a result of noise (affecting hearing) and combustion gases and particulate material (affecting the respiratory system) in the development area. Such effects will be prevented and mitigated by applying certain measures, including the use of personal protective equipment (hearing protection, respiratory protection, hard hats, gloves, harness, etc.), depending on the level of risk of the activity being carried out as well as compliance with established health and safety procedures (safe work permit, training, etc.).

Risk of Affecting Archaeological Sites

Certain development activities within the quarry, such as blasting, could generate vibrations affecting the nearby archeological remains. Furthermore, transporting rock to the dumps and to the selection and accumulation areas may result in crossing these sites and having some effect on their condition. Construction of the access ramp, dump areas and complementary facilities could also affect certain archeological sites.

Alteration of the Visual Quality of Landscape

Changes to the terrain produced after the development of the quarry, waste rock dumps and from vehicular movement will change the landscape in the localized zone of the mining concession area. Since the project's activities are conducted in areas which are not in close proximity to populations and the project is temporary, a negligible impact is anticipated.

6.2 ENVIRONMENTAL AND SOCIAL IMPACTS DURING CONSTRUCTION AND OPERATION OF THE ACCESS ROAD

Favorable Impacts

Generation of employment

Construction of the access road will result in the generation of employment for skilled and unskilled labor. It is estimated that the work force required will consist of 91 workers during the construction stage. In the area of influence of the project, labor requirements will mainly be for unskilled workers. The use of local labor will make it possible to increase the income of the workers families and their well-being.

Boosting of Commerce and Services

The increase of the income of certain residents associated with the generation of employment, the demand for goods and services (inputs, equipment rentals, food supply, lodging facilities, etc.), during the construction and operation of the access road, will add production to the local economies (mainly Cañete, Chíncha and even Ica). This effect will be produced throughout the time (approximately two years) it will take to extract the material from the quarry.

Adverse Impacts

Generation of Particles

The impact is of moderate environmental significance during the operation of the access road as a result of movement of the dump trucks carrying rock material from the quarry. The amount of particulate material generated will depend directly on the frequency of the traffic or vehicle movement. It has been established that the maximum number of truck trips will be 440 per day, using a maximum total of 40 trucks.

To interpret the environmental effect on air quality, an Atmospheric Dispersion Model has been prepared. The modeled parameter is in particles of less than 10 microns (PM₁₀) as this is the most important polluting contribution related to particulate air quality. Table R-2 presents the maximum concentration of PM₁₀, according to the air quality model performed for the two scenarios described. According to the Table, the maximum concentration obtained is higher than the Peruvian Air ECA and higher than the standard set by the World Bank.

Table R-2 Maximum concentration of PM₁₀. Atmospheric Dispersion Model

Parameter	Maximum Concentration (µg/m ³), 24 Hour Average	ECA – Peruvian Air Standard, 24 Hour Average (µg/m ³)	World Bank Standard, 24 Hour Average µg/m ³ ,
PM ₁₀	574.4	150	70

To analyze the effect of the emission of PM_{10} on the populated zones located near the area of influence, a calculation has been made of the fourth average maximum concentration value in 24 hours. The highest concentration occurs in the Nuevo Cañete 3rd Stage Lot Classification Project, with a result of $194.46 \mu\text{g}/\text{m}^3$. It must be noted that, at present, there are no houses in this zone; and therefore, there are no residents, as all there is consists of parcels of land which are ready for building. It is expected that once the Project is executed, these plots will be gradually built.

To mitigate and control the generation of particles and their effects on air quality, the plan calls for the watering of the access road using tank trucks with a capacity ranging between 8,000 and 9,000 gallons. It has been established that the water required for this stage will be approximately 65,000 gallons per day.

Generation of Combustion Gases

The operation of equipment, machinery and other vehicles will generate combustion gas emissions, such as sulfur dioxide (SO_2), carbon monoxide (CO) and nitrogen oxide (NO_x). It is estimated that the emissions will be small and mainly spread along the access road stretch of approximately 21.5 km, and that they will not result in any significant degradation of ambient air quality. There are no nearby fragile elements which may be vulnerable to these emissions such as special communities or ecosystems.

Noise Generation

This will be produced during land preparation, earth moving, equipment and machinery movement during the construction of the access road, and by the travel of dump trucks carrying the rock material during the use of the road. The effect will be specific and confined to the area of construction and dump truck travel.

Changes to the Terrain

During the extraction of material from the quarry for the access road's base and using cut and fill techniques will produce slight changes to terrain. Deposits of surplus materials will be managed in order to comply with the designs established for this activity.

Disturbance to the Soil

During construction of the access road with a length of approximately 21.5 km and width of approximately 12 m, approximately 25.33 ha of soil will be disturbed. The soils affected are protection soils not meeting the minimum ecological conditions required for cultivation, pasturing or forest production.

Soil Contamination Risk

This potential impact on soils refers to possible spills of fuel, grease and oil that may take place in the areas where the machinery and equipment operates during the access road construction process. A requirement will be for the equipment and machinery used in the project is that it be in good operational condition, with adequate preventive maintenance in accordance with the manufacturer's specifications. Such preventive maintenance performed on the machinery and equipment prior to their operation will make it possible to substantially reduce and prevent the risk of spills.

Changes to the Surface Drainage

Soil compacting during the placement of road base material and the preparation of the grade of the access road and the barrier caused by its presence, may result in a change in the flow of rain water in the small gorges existing in the area (primarily the Culebrillas and Cansa Caballo gorges), through which the access road will run. It is estimated that the presence of the road (as in the proposed design) will not generate much perturbation of the local drainage.

Low Risk of Changing the Water Table

The aquifer in the area of construction of the access road is at a considerable depth (> 70 m); and this substantially reduces any possible changes to the water table, which may be associated with the operations for the construction of the road.

Reduction in the Water Level

During the use of the projected access road, water will be used to irrigate the road, this being a measure to mitigate the generation of particulate material. It has been planned for the water to be supplied from Cañete and/or Chinchá, using tank trucks, taking the water to tanks located in the concession area. These trucks will have a capacity of 8,000 to 9,000 gallons. This level of water consumption could produce a reduction in the water supplies of the surrounding area. If required, water will be obtained from elsewhere using appropriate permits.

Reduction of Top Soil

During preparation of the land for the construction of the access road in the section near the rock quarry, it is expected that there will be losses of vegetation. Considering that the space to be occupied by the access road and the surplus material deposit will be relatively small, as well as the scarce top soil and spread distribution of the species potentially affected, it is estimated that the reduction in vegetation would be of very little environmental significance.

Scaring or Disturbance of Wildlife

The noise generated by the activities (land preparation, earth moving, material transport), during the construction of the access road, as well as the travel of dump trucks during its

operation, could disturb certain individuals of wildlife living in the desert environment near the project.

The most affected species could be the saurios *C. adspersa* y *M. tigris*, as they use the rocks and/or stones as microhabitats for feeding, thermo-regulation, and shelter (Pérez, 2003; Pérez *et al*, 2000); therefore, the movement of rocks and stones during material cutting for the building of the access road would result in a change of the habitat for these species.

Traffic Accident Risk

Traffic from dump trucks carrying material from the quarry on the access road implies a risk of traffic accidents. This risk could affect passersby and personnel responsible for the transport of the material from the quarry.

To minimize the accidents risk, the drivers will be trained and near populated areas there will be a reduced speed limit. Signs or boards will be placed, indicating the speed restrictions for the vehicles and warning of the risks possibly existing for passersby.

Perturbation to Populated Areas

Near the initial section of the proposed access road, the Nuevo Cañete 3rd Stage Lot Classification Project is present. This settlement still does not have houses or residents. The rest of the human settlements are far from the access road (4 km). Most houses are unoccupied, under the watch of certain guards and there is people movement only on weekends. Part of this informal population could feel affected by the activities during the construction of the access road and during the transport of the quarry material. The risk of social disturbances or of possible conflicts between the working personnel and the local residents is possible.

Health Risk

Emissions of gases, noise and particulate material during construction of the access road and transport of rock from the quarry could affect the future population of the Nuevo Cañete 3rd Stage Lot Classification Project, and any other settlement that expands near the access road. Dust generation will be reduced by irrigating fresh water or sea water, using agglomerating material and by reducing speed.

Risk of Affecting Archaeological Sites

Archaeological surveys determined that along the course of the proposed road there are several archaeological remains from very old human groups. These are in the form of a windbreak, rectangular stone plant structures and a geoglyph. There is also a Pre-Hispanic trail, which would be affected at least in four stretches by the projected access road. The current road design will be modified, or appropriate permission will be obtained from the INC prior to road construction.

Disturbance of Visual Quality of the Local Landscape

Clearing and grubbing during land conditioning and the placement of surplus materials will disturb the landscape in the areas of operation. The impact on the landscape due to the undertaking of these activities will be based on the dimensions and visual quality of the areas to affect, which are of a minimal variety in form, color, line and texture, and this defines a low intrinsic landscape quality.

7.0 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (PMA) contains measures aimed at preventing, correcting or mitigating the environmental and social impacts generated by the extraction of rock from the GNL-2 Quarry and by the construction and operation of the access road. The PMA also includes an environmental impact monitoring and surveillance program to ensure that the requirements in the PMA are abided by during the execution of the project.

Peru LNG, through the Department of Health, Safety and the Environment (SSMA), will oversee the implementation, surveillance and compliance with the plans and programs proposed in the ESIA during the execution of the project.

7.1 PREVENTIVE AND MITIGATION MEASURES

The prevention and mitigation program is based on the application of action lines with the purpose of protecting the environment which may be affected by the project's activities.

7.1.1 PREVENTION OF CONTAMINATION CAUSED BY FUEL SPILLS

Prevention of spills of fuels and lubricants will be based on an adequate control of their storage and use within the Concession, which will be supervised by Peru LNG. The following measures have been established:

- Storage of fuel and oil or their handling, will only be performed in places specifically designated and fitted for this purpose (Machinery Yard). Vehicles used in the transport of fuel will be periodically reviewed to identify any possible leaks.
- Storage tanks will be installed within containment berms with a minimum capacity of 110% of the largest tank's capacity.
- In the case of spills, liquid fuel will be recovered and the contaminated soil will be removed and stored in drums for subsequent remediation or disposal. In case of disposal, the transfer and final confinement will be performed by a service company (EPS-RS) authorized by DIGESA.
- Training, education, and spill response drills will be conducted.

7.1.2 ADEQUATE HANDLING OF SOLID WASTE

Different types of solid waste will be generated by the construction and operation of the quarry. The majority of this waste is expected to be generated by activities related to maintenance of operational equipment. However, solid waste would also be produced in the mess hall.

To achieve an adequate handling of this waste there will be a solid waste management program in place with emphasis on the selection and sorting of the waste prior to its disposal. As part of this program, each type of waste will be separated and placed in different color drums: blue drums for organic waste, green drums for recyclable inorganic waste and black drums for non-recyclable waste. The following is a description of the process of handling the waste to be generated, according to their classification:

Used Lubricants

The drums containing used lubricants must be placed in areas which have been specially created for the purpose. The drums will be placed on wooden grills (pallets), with a maximum of two levels. The storage area will have a floor which is impermeable with a containment dike or wall and a containment capacity of 110% of the total stored capacity. Used lubricants and oils will be placed in 55-gallon drums, with a non-detachable lid. The drums will be removed by a contractor for final disposal or recycling.

Industrial Waste

Full containers will be transported for final disposal to the nearest authorized sanitary landfill. If possible, plastics, glass and paper will be recycled. Used oil filters and other waste resulting from engine maintenance, will be stored in 55-gallon drums (with detachable lids). Solvents and paint containers will be kept separate in 55-gallon drums (with detachable lids). Hazardous waste will be stored and given to a service company (EPS-RS) authorized by DIGESA for treatment and final disposal. Scrap (clean) and wooden items will be stored in the industrial waste final disposal area for subsequent sale and/or donation to third parties.

7.1.3 ADEQUATE HANDLING OF LIQUID WASTE

The work area or the offices will use portable chemical toilets. The plan calls for the installation of a chemical toilet for every 20 persons. They will be operated by a supplier duly registered with DIGESA. Domestic effluents (sewer water) generated in the portable chemical water closets will be handled and removed by an authorized service company (EPS-RS).

The plan envisions the use of wash basins and showers for the personnel working in the project. A machinery yard and an area for equipment washing will produce liquid effluents at a quantity of approximately 7,000 gallons/day.

Water originating from the machinery yard will pass through a grease trap, and the water deriving from the showers and wash basins will be collected in a sedimentation pit to then be

forwarded to percolation wells or filter beds. This will not affect the water table, since it is located at a depth of more than 70 m, and because it is naturally protected by an impermeable igneous rock layer. Water will be used as an alternative to this arrangement for the irrigation of roads with the view to minimizing dust, with proper analysis.

7.1.4 ATMOSPHERIC EMISSIONS AND NOISE REDUCTION PROGRAM

Emission of Particulate Material

- Periodic watering of transit surfaces using tank trucks with the objective of keeping humidity levels at about 5%. The control of dust generation will be higher in the initial area of the access road, where the population lives closer to the road. It is estimated that for this activity, about 65,000 gallons of water will be used daily with greater use during the summer and less in winter.
- The quarry contractor must supply construction personnel with basic equipment, masks and protective goggles in areas where, for operating reasons, dust generation cannot be controlled.
- Vehicle speeds will be restricted in the quarry and on the access road. The maximum speed in the quarry will be 30 km/hr and in the access road it will be 60 km/hr for trucks, loaded or unloaded. This will reduce dust emissions.
- Blasting will be done, at most, twice per day at 12 noon and 4 p.m. With this time table it is sought to take advantage of the atmospheric dispersion available due to the fact that the strongest winds usually occur in the afternoon hours.

Emission of Combustion Gases

- Before the start of activities, the construction or operating machinery will be subject to an inspection for its correct functioning.
- All mobile sources of combustion used during the job must undergo continuous mechanical maintenance which will reduce excessive smoke emissions. A maintenance control sheet will be kept for each equipment or source. These control sheets will form part of the monthly report by the contractor.
- Any vehicle producing black smoke must be repaired or adjusted before restarting work. The contractor's report will contain this information.

Noise Generation

- All vehicles, internal combustion engines, generators and machinery in general, will be provided with noise reduction accessories.
- It will be prohibited to install or use any kind of noise producing mechanism or accessory designed to produce noise, such as valves or resonators for air braking systems, in any vehicle destined to be used on public roads.

7.1.5 PRESERVATION OF ARCHEOLOGICAL SITES

- Existing sites along the length of the road must be clearly marked by stakes or milestones for easy recognition by equipment operators.

- Personnel will be trained in the recognition and respect of signs placed for protection of such sites.
- If, during the construction and operation stage of the project, archeological evidence, or any other kind of evidence is detected below the surface not identified by the archeological study, work in that area will be suspended immediately and the authorities of the National Institute of Culture (INC) will be advised.
- The contractors must immediately report to Peru LNG, any discoveries of possible archeological evidence.

7.1.6 NATURAL RECOVERY OF VEGETATION COMMUNITIES

Vegetation is scarce in the quarry and access road areas. Nevertheless, to reduce vegetation losses, the most practical measure is to minimize earth moving to that which is strictly necessary and favor the natural recovery of vegetation in the areas where they were allowed to operate.

As part of the activities to encourage vegetation development in the quarry, the following measures will be carried out and applied during the exploitation or closing of the waste rock dumps from cleared areas:

- Maintain slopes with stable gradients.
- Coverage with sandy substrata (fill with colluvial-alluvial materials from the area.) on slopes having rocky surfaces in the cleared areas.
- Restriction of access to the areas with established vegetation.
- Once an area is abandoned, access to the same by machinery or pedestrians will be limited.

Given the semi-desert character of the area and the existence of vegetative species common to the coastal desert, it is not necessary to have continuous monitoring of the vegetation. The area has two species of cactus which are dispersed with thin coverage. Neither of them is under any protection category. Due to their adaptation to the arid and semi-arid conditions, the cacti contain valuable genetic information of resistance to water-imposed stress. In addition, in this ecosystem the cacti play a preponderant role, representing the main flora basis of the primary productivity.

Against the clearance of the vegetation in the quarry, vegetative material will be collected, to implement an experimental parcel and study the development of the cactus species existing in the quarry area. Adjacent habitats with appropriate characteristics will be identified for locating an experimental parcel of land which simulates the conditions to which the cacti would be exposed after closing down the quarry. During abandonment, the handling and planting of the cacti will be on the basis of the results obtained from this experimental parcel.

Tillandsias are bromeliads that are found in areas exposed to the mists which were found in the area of the access road to the quarry. This vegetation has no roots and grows in clumps. The access road crosses places where it could affect this vegetation community. To reduce the effect on these species, once the area for earth movement for the access road is marked

out, the tillandsias that were within the limits will be removed. This vegetation will be transferred to zones with similar characteristics in order to continue development.

7.1.7 MITIGATION MEASURES FOR THE DISPLACEMENT OF WILDLIFE

The displacement of wildlife will be prevented by minimizing the areas used for the extraction and transport of materials and the measures for re-establishment of the vegetation. The topsoil and the rocky, desert areas adjoining the development area will absorb part of the small population of vertebrates from the areas affected by noise, dust and transit of vehicles.

7.1.8 IMPROVEMENT OF THE VISUAL QUALITY

The development of the concession will generate a depression, accumulation of materials in the waste rock dumps and the conditioning of access roads to the interior of the development area. The improvement of the visual quality will consist of favoring the natural vegetation in the areas where this is possible.

7.1.9 EXPLOSIVES HANDLING

Explosives will be stored in a magazine constructed in a zone away from other installations within the Concession. This will be kept shut and under supervision 24 hours a day, by private security personnel. The handling and use of explosives will be carried out under the rules of the Ministry of Interior and the General Bureau for the Control of Security Services, Arms, Ammunition and Explosives for Civil Use (DICSCAMEC). Only trained and authorized personnel will be in charge of handling explosives. Personnel will be evacuated 500 m around the firing areas. Procedures will be in place for the transporting of explosives from their place of origin to the project (escorted).

7.1.10 IMPLEMENTATION OF A PERSONNEL CONDUCT CODE

The Community Relation Guides will provide an Internal Regulation or Code of Conduct for workers contracted directly by Peru LNG or by contracting companies. It will be necessary for all workers to be acquainted and familiar with the Guide and the Code.

7.1.11 SAFETY OF PERSONNEL ON THE JOB

- The contractor will comply with the instructions on occupational health, safety and prevention of accidents issued by the Ministry of Labor.
- The contractor will train all personnel by means of 5-minute daily briefings, specific briefings on the more sensitive and risky matters in the daily work and others related to daily occurrences. Minutes will be taken of all briefings in the format of training by Peru LNG who will supervise compliance with the same.

- The contractor's personnel will have personal and collective protective equipment according to the associated risks (uniform, hard-hat, gloves, boots, goggles, ear plugs, etc.). These elements must be of good quality and will be checked periodically to guarantee that they are in good condition.
- All vehicles must be checked by the driver before operating and a "Check List" type form will be filled in, noting the condition of the vehicle and any possible failures its operation and any leaks detected.
- Working sites will be adequately illuminated where required to ensure activities are carried out safely. The lighting source must not limit the field of vision nor produce glare or dazzling effects.
- Preventive and informative signals will be installed to avoid accidents in the access areas, dangerous slopes and in general, places that represent any kind of danger.

7.1.12 PREVENTION OF OCCUPATIONAL DAMAGES

The contractor will comply with the maximum exposure limits of 85 dB (A) for a period of 8 hours established in the Mining Safety and Hygiene Regulations of the Ministry of Energy and Mines (Supreme Decree No. 046-2001-EM). The use of ear plugs in the areas of greater exposure to noise (close to drills, electric generators, engines), will be permanent and compulsory.

In the case of exposure to gases and dust, workers must use protective breathing equipment with special filters for gases and dust.

- All personnel will have hard hats, safety shoes and protective goggles.
- In the blasting areas, only personnel trained to carry out such work will be allowed. In addition, they will carry their respective permits for handling explosive material, issued by DICSCAMEC.
- All personnel will undergo an annual, pre-occupational, and post-project medical examination.
- Before each primary or secondary firing, quarry personnel will retire to a distance of at least 500 m from the firing point.

7.1.13 PROTECTION OF SLOPES IN QUARRIES AND WASTE ROCK DUMPS

A list of measures to be implemented include:

- Maintain slopes in accordance with the design parameters specified, duly relying on angles which guarantee the stability of the same.
- Construct infiltration and crowning ditches.
- Carry out controlled blasting and reduce the charge in unstable segments or with known faults.

- Clearly mark the possible areas where the slopes are not stable, as a preventive measure against a possible collapse.

7.1.14 HANDLING OF BORROW AREAS AND DISPOSAL OF SURPLUS ROAD MATERIAL (DME)

The following prevention and mitigation measures will be implemented in borrow areas:

- The top soil (5 to 30 cm), together with the vegetation must be removed carefully and deposited beside the borrow area in order to be used in the restoration of the affected area.
- The extraction of material will be done in such a way as not to produce unexpected landslides.

7.1.15 TRAFFIC SIGNS AND ROAD MAINTENANCE

Traffic signs will comply with the Manual of Instructions and Traffic Control for streets and roads approved by Ministerial Resolution No. 210-2000-MTC/15.02.

Preventive signs will be designed and located according to the road alignment, in the areas where there is actual or potential danger (blind curves, foggy areas, gradients) and they should indicate a reduction of speed and taking other precautions.

Informative signs are used mainly to guide drivers via a determined route and directing them to their destination.

7.2 ENVIRONMENTAL MONITORING PROGRAM

The environmental Monitoring Program measures the effects that construction and operating activities on the access road and in the quarry, have on environmental components, by means of periodic recording of data. The information obtained is compared with information obtained on the base line and various effects identified in the section, Environmental Impacts.

7.2.1 MONITORING OF AIR QUALITY AND NOISE

The monitoring of air quality will measure the concentration of particles and combustion gases. The results will be compared with the National Standards of Air Quality in Peru (Supreme Decree No. 074-2001-PCM, 24-06-2001) and the World Bank's Pollution Prevention and Abatement Handbook. For noise monitoring, the values obtained will be compared with the maximum permissible values established by the National Standards of Environmental Quality of Noise (Supreme Decree No. 085-2003-PCM, 30-10-03) and the World Bank General Environmental Standards.

Table R-3 shows the parameters and frequency of monitoring.

Table R-3 Air Quality Monitoring Parameters and Frequency

Parameter	Period	Standard		Analysis Method
		Supreme Decree No. 074-2001-PCM	PPAH WBG	
Particles of less than 10 micrometers (PM10)	Monthly for 6 months, then Quarterly	150 µg/m ³ 24 hr	70 µg/m ³ 24 hr	Inert separation / filtering (Gravimetry)
Carbon monoxide (CO)	Quarterly	10 000 µg/m ³ 8 hr	*	Non-Dispersing Infra-Red (NDIR) (automatic method)
	Quarterly	30 000 µg/m ³ 1 hr	*	
Sulfur dioxide (SO ₂)	Quarterly	365 µg/m ³ 24 hr	125 µg/m ³ 24 hr	UV fluorescence (automatic method)
Nitrogen dioxide (NO ₂)	Quarterly	200 µg/m ³ 1 hr	150 µg/m ³ 24 hr	Quimiluminiscence (automatic method)

* The Pollution Prevention and Abatement Handbook (PPAH) does not indicate a value for CO.

Table R-4 presents the noise measurement frequency and comparison standards. The quarry and the access roads are in places which are far away from the population; therefore, only industrial areas will be measured.

Table R-4 *Noise Measurement Frequency and Comparison Standards* stated in LAeqT (Noise Equivalent Level)

Application Zones	Frequency	D. S. No. 085-2003-PCM		PPAH – WBG	
	Measurement	Day Time ⁽¹⁾	Night Time ⁽²⁾	Day Time ⁽¹⁾	Night Time ⁽²⁾
Special Protection Zone	Not Applicable	50	40	Not Applicable	Not Applicable
Residential Zone	Not Applicable	60	50	55	45
Commercial Zone	Not Applicable	70	60	70	70
Industrial Zone	Quarterly	80	70	70	70

⁽¹⁾ De07:00a22:00

⁽²⁾ from 10 p.m., to 7 a.m.

7.2.2 MONITORING OF EFFLUENT IN CASE OF RE-USE

The PMA proposes the possibility of re-using water originating from the washing of the equipment, after treatment for oils and greases. This being the case, the water will be analyzed during two consecutive periods, for oils and greases; and, if they meet the standards, monitoring will be performed every two months. The water must meet the 10 mg/L value for oils and greases established for discharges to water courses, by the World Bank's Pollution Prevention and Abatement Handbook, of July 1998.

7.2.3 WILDLIFE MONITORING

Because of the condition of the *Microlophus tigris* reptile (near endangered, according to Supreme Decree 034-2004-AG), monitoring of reptiles will be performed at two stations; one in the quarry, and the other, in a nearby area (non-impacted area) so that it will serve as a control area.

Because of the permanent fog in the central and southern parts of Peru, a proposal is made for monitoring to take place in the months of February (being one of the driest months) and August (being one of the wettest months).

7.2.4 FOLLOW UP ON THE SURVIVAL OF CACTI

Because the area's characteristics do not warrant continuous monitoring of the vegetation, during the first year following the development activities carried out in the quarry, a follow up will be performed on the percentage of survival of representative samples of cacti assessed in the experimental parcel.

7.2.5 ARCHEOLOGICAL MONITORING

Peru LNG will assess the possibility of considering on-going archeological monitoring during the construction of the access road and GNL-2 Quarry.

One of the recommendations put forth by the INC Supervisor in the field visit was to appoint an INC archeologist one year after quarry operations, to carry out the monitoring and supervision of the quarry development works, making sure they are being conducted without detriment to the Cultural Heritage.

7.3 ENVIRONMENTAL FOLLOW UP AND/OR MONITORING PROGRAM

The Environmental Follow Up and/or Monitoring Program (PVA) represents a technical environmental control document, which will allow for compliance with the measures prescribed in the Prevention and Mitigation Programs. The technical environmental control document will secure the preservation and sustainable use of the natural resources and the environment during the development of the quarry and the construction and use of the proposed access road.

Environmental Monitoring Operations

A follow up will be performed on the aspects below:

- Location of the machinery yard facilities in areas with scarce vegetation.
- Earth movement works along the proposed access road, in the quarry and deposits of the surplus material, will be monitored which will affect the terrain and landscape of the zone, as well as the continuous generation of dust.

- The closing stage, including works which will permit the conclusion of a given operation of the works.
- The management of solid waste and used lubricants. These must be stored in the places previously selected to that effect.

The execution of the PVA will be accomplished through the environmental coordinators appearing in the SSMA organization chart.

8.0 SOCIAL MANAGEMENT PLAN

There are a number of impacts that are common and specific that could arise during the operation activities of the GNL-2 Quarry Development Project – Cañete – Perú. These impacts need to be adequately managed, through a Social Management Plan (PMAS).

The PMAS was prepared in accordance with the “Environmental Protection Regulations”, S.D. 016-93-EM and other regulations currently in force. It includes measures to be implemented in the different Project construction or operation stages, with the aim of enhancing positive effects and impacts and decreasing and controlling aspects that are considered to be negative.

The following potential direct and indirect impacts have been contemplated for the Construction of the Quarry Access Road– GNL-2 Quarry Development Project and the following control plans are summarized:

The labor demand will be addressed by providing guidance to contractors on the selection criteria for the hiring of workers, and by providing enough information to the community within the area of influence on the jobs required, identifying the number of jobs offered and requirements to apply.

Employment generation as well as the demand for goods and services (consumables, rental of equipment, food supply, accommodation, etc.) may be addressed by preference for the acquisition of local products and encouraging the development of small and micro enterprises by training economic agents.

To face the possible presence of foreign workers in the area, it is necessary to broadly disseminate and respect the Code of Conduct for the Project Workers, in addition to documentation and dissemination of education and training activities .

The difficulties arising from the exposure of workers to dust must be monitored by prior diagnostics and a full medical examination before commencing work. Furthermore, personnel must be trained and kept informed on sanitary and health aspects and on emergency evacuation procedures and measures to prevent contagion of sexually transmitted diseases.

The risk of traffic accidents may be reduced through adequate signaling of the critical project areas and informative briefings to the local inhabitants on safety measures to reduce the risk of accidents. Furthermore, traffic risk may be reduced by establishing and disseminating the

speed limits of vehicles used to transport materials and by specifying in the Employee Conduct Code the sanctions applicable to the non-observance of said provisions.

In order to reduce the potential disturbance of population groups, particulate material emission and noise reduction measures will be applied.

9.0 CONTINGENCY PLAN

The Contingency Plan establishes the response procedures and actions that are timely, adequate and effective to address an accident and/or emergency situation during the construction and operation of the Quarry. This plan also describes the organization, procedures, types and number of equipment, materials and labor, required to respond to the different types of emergencies.

As a prevention strategy during the performance of the Project, the following should be taken into account:

- Acknowledgement of areas and sites of higher risk, vulnerability areas and critical areas.
- Specifications of safety areas and their identification.
- Preventive signaling of strategic places and areas, both in the quarry and on the access road.
- Ongoing assessment of preventive measures.
- General evacuation plan in the case of accidents, disasters, etc.
- Identification and registration of internal and external contacts.
- Timely communication.

9.1 GENERAL ORGANIZATION FOR CONTINGENCIES

All operations, maintenance and administration staff of the Quarry form part of the Contingency Organization. Also included are the Security personnel. This organization must remain in coordination with the Voluntary Fire Fighters and the National Police, which provide External Support, as well as with other external entities.

The main duties of the Contingency Organization members will be established in the Quarry Contingency Plan. The following are among the members of the Organization:

- General Coordinator,
- Head of Emergency,
- Local Chief,
- Public Safety Coordinator,

- Logistics Coordinator,
- Internal Support Group,
- External Support Group,
- Communications Coordinator and
- Contractor's General Coordinator.

9.2 RESPONSE PLAN FOR OPERATIONAL CONTINGENCIES

This Plan contains the basic recommendations and procedures to manage emergencies during the GNL-2 Quarry operations, as well as an internal and external contact list. It is important to implement, develop and revise the Contingency Plan in order to improve it and evaluate its performance.

The Response Plan considers procedures and actions to address the following operational contingencies:

- Medical Evacuation Contingencies (MEDEVAC),
- Hydrocarbon spill contamination contingencies,
- Contingencies resulting from accidents in the use of explosives,
- Contingencies in the event of Earthquakes,
- Contingencies in the event of fire,
- Contingencies resulting from torrential events,
- Contingencies resulting from labor absenteeism, epidemic outbreak or occupational accidents,
- Contingencies resulting from conflicts with employees,
- Contingencies in the event of Social Disturbances,
- Contingencies resulting from the disturbance of the development and/or construction procedures due to structural failure.

9.3 NOTIFICATION - COMMUNICATIONS

As soon as the occurrence of an Accident / Loss has been reported, all internal and external communications will be suspended, leaving fixed and cellular telephone lines free. All communications will be answered by the Telephone Switchboard or direct telephones. The Head of Emergency is responsible to issue internal and external communications.

9.4 EDUCATION AND TRAINING

Peru LNG must have a training plan for all personnel involved in the solution of emergency situations through periodic briefings. These briefings will describe the existing risks, analyze the assessment systems, indicate the steps to solve risks, describe the mitigation measures that may be adopted and describe the monitoring to be implemented in order to control the attainment of purposes and methods in order to minimize the effects implemented.

10.0 CLOSURE PLAN AND ABANDONMENT OF OPERATIONS

The closure plan constitutes a planning instrument that will incorporate measures aimed at restoring the environment, to the extent it is technically feasible, in compliance with the requirements contained in the environmental legislation .

Peru LNG S.A. will carry out the abandonment plan as part of its environmental protection commitment and will take on the responsibility of adopting the measures required to close the operations in the Concession by applying adequate practices, including the future use of the land, in accordance with the technology existing at the time the closure takes place.

10.1 CLOSURE CRITERIA

Since the quarries will be developed using the “open pit” method, the closure measures mainly refer to the physical stability of slopes in the quarries and waste rock pads. The main criteria used are:

- Physical stability criteria: Considers the importance of both the geodynamic and geotechnical stability of the site.
- Rainwater criteria: At the time of closure, measures must be considered that will take into account climate aspects, such as the construction of ditches and drainage crowning.

10.2 CLOSURE MEASURES FOR PHYSICAL STABILITY

Closure measures for physical stability will be applied both in the rock extraction quarry as well as in the material quarry for the construction of the access road, as well as for the waste rock pads.

Upon completion of the operation, at the close of the quarries, the slopes will be stable and there will be no destabilized blocks. The following measures are considered:

- Waste rock pad slopes will be conditioned to repose gradients.
- The general work slope in those areas with plane failures will be studied on the basis of the original design parameters sought.

- The weight of the upper part of slopes will be removed in existing cases. This will require the inspection of “crests” and “*desquinchado*” (removal of ridges and any supporting rock structures).
- Access to areas where there is a risk of landslides will be limited.
- Post-closure assessments of slope stability will be implemented to take into account the results obtained by the measures adopted.

The waste rock resulting from the development of the quarry and construction of the access road will be disposed of in waste rock dumps. The waste rock will be disposed of in successive compacted layers, which ensure the stability of slopes. The surface will be leveled with a slight slope.

10.3 ABANDONMENT OF ACCESSORY STRUCTURES

Structures and buildings will be dismantled and removed from the area, as in the case of concrete slabs. Access and transportation routes to the Concession will be delivered in good maintenance condition so that they may be used in the revegetation and monitoring of the site; after which they will not be maintained or closed. The closure and abandonment of the following is considered:

- Facilities inside the Concession: Removal of all facilities used (offices, workshops, warehouse, mess hall, etc.) and cleanup of the disturbed area, closure of the septic pond and grading of the land in order to reintegrate it with the original landscape.
- Machine room: Removal of structures implemented for the maintenance and repair of machinery and equipment used in the construction work. In the event of the existence of soil contaminated with oil, petroleum and grease, they must be removed to a depth of 10 cm under the lower level of contamination and disposed of with an authorized Service Provider (EPS).

10.4 CLOSURE ACTIVITIES

The disposal of waste rock in the waste rock dumps is part of a concurrent closure procedure. The material accumulates by gravity forming ascending banks. As these banks are filled, they pass to the next level of accumulation.

At the end of the mining work, the following measures will be implemented: cleanup of slopes and crest stabilization; decontamination or removal of soil due to occasional fuel spills (if necessary) and slope stability monitoring.

10.5 POST CLOSURE MONITORING

For purposes of evaluating the efficiency of the measures implemented in the closure stage, a follow-up of actions and results of measures will be carried out. The monitoring of closure measures will comprise the physical stability of slopes.

10.6 RESPONSIBILITIES DURING THE CLOSURE AND ABANDONMENT PLAN

HEAD OF THE QUARRY

- Oversee compliance with the Abandonment Plan.
- Coordinate abandonment work of facilities and other activities as established in the Plan.
- See that the work is supervised as described in the Plan.
- When necessary, coordinate waste disposal with the person responsible for management.

CONTRACTORS

- Comply with the provisions contained in the Closure Plan and with the safety guidelines established by Peru LNG.
- Conduct the disassembly or demolition of structures observing the requirements established in the Plan.
- Manage wastes generated as established in the Plan.
- Supervise the activities seeing that subcontractors act in accordance with the principles and procedures set forth in this document.
- Keep documentation control as established in the procedures, informing the responsible parties of Peru LNG thereof.

ENVIRONMENTAL SUPERVISOR

- Supervise compliance with Peru LNG environmental protection measures and environmental policy.
- Promote the spirit of prevention, minimization and continuous improvement within the organization of Peru LNG.
- Supervise the cleanup and final condition of the areas affected by the abandonment.

11.0 COMMUNITY RELATIONS PLAN (PRC)

The Community Relations Plan (CRP) for the GNL-2 Quarry Development Project – Cañete, Peru, is designed and implemented within the framework of Peru LNG's corporate responsibility policy. The CRP defines the responsibilities in taking prevention and management measures dealing with the social aspects related to the project. The CRP is a social and environmental tool aimed at implementing processes that allow for adequately socially managing the company's activities and operations in the area, through an efficient

and transparent relationship with the stakeholders and local population present in the project's area of influence.

The area of influence is dynamic and varies depending on the phase of the project. The construction phase usually generates a larger area of influence due to the logistics, labor force and construction activities involved; while during the operation phase of the project, the area of influence is reduced to a smaller area surround the facilities.

During the construction stage, the Districts of San Vicente de Cañete and Grocio Prado will be considered as zones within the direct area of influence. The indirect area of influence consists of the Imperial District in the province of Cañete and the Chíncha Alta and Pueblo Nuevo districts in the Chíncha province.

As part of the strategies of the CRP, the company will establish a proactive communication with the project stakeholders, in respect of the management of key issues and concerns of the population. Furthermore, internal arrangements will be made so that other areas within the company will be informed of the actions being carried out by the Community Relations Management.

For purposes of the implementation of the CRP, Peru LNG will have a special team devoted to this task, which will act as valid interlocutor between the company and the local population.

Peru LNG will prepare a Training Program for its workers and contractors on the company's policies and actions with regard to social matters, including the environmental education component. This Program is complemented by the scope of the Environmental Management Plan, which forms part of the ESIA and applies to all Peru LNG employees or contractors involved in any field activity associated with the project.

Furthermore, the following specific projects will be available for the implementation of the CRP:

- Program for the temporary hiring of local staff,
- Communication and consultation program,
- Negotiation Program for the use of land, when necessary,
- Health Program and
- Training and Education Program.

Finally, Peru LNG has designed a Code of Conduct for Workers in order to minimize and, whenever possible, eliminate the negative aspects associated with the project's labor force.