PHASE II OF SAN JACINTO-TIZATE GEOTHERMAL POWER PROJECT
NICARAGUA

ENVIRONMENTAL AND SOCIAL STRATEGY[(1)]

I. PROJECT DESCRIPTION

A. Site Location

1.1 The San Jacinto-Tizate Geothermal Power Project is located in the Department of León (Western Nicaragua), in the Municipality of Telica, approximately 90 km from Managua and 20 km from the City of León **(see Figure 1)**. The Project site is approximately 2 km to the north of the village of San Jacinto, a small settlement (approx. 1200 inhabitants), which is isolated from the Project site by low hills (no part of the site is visible from the village). The operational area associated to the entire Project (including power plant and well platforms, pipeline corridors, access roads and right-of-way of 138 kV transmission line (approx. 12.5 km in length connecting to the national grid) encompasses approximately 4 km^2. The area is in great part unoccupied, except for sparse subsistence farming and livestock activity in some areas. It should be pointed out, however, that geothermal developments co-exist with relative success with other uses, such as agriculture and livestock grazing, even though the pipelines may constitute sometimes a barrier for livestock grazing and other agricultural activities.

B. Project Components, Facilities, Workforce, Schedule and Costs

1.2 Since June 2005, Polaris Energy Nicaragua S.A. ("PENSA" or "Company") has operated a 10 MW geothermal power project on this site, which sells its entire output energy under a long term power purchase agreement ("PPA") with affiliates of Union Fenosa S.A. ("Union Fenosa"), as operators of the national grid (the "National Grid").

1.3 The Company is expanding its operations in two phases. PENSA's current focus is to complete two identical power plants with a nameplate or nominal rating of 38.5 MWg (Megawatt gross) or 36 MWnet each - referred to as Phase I and Phase II. Upon completion, both Phases will be operated as a single integrated facility and will share a common geothermal resource steam gathering system, PPA, transmission line ("T-Line"), generation license, concession and environmental permit. The project under consideration for possible support by IDB encompasses only Phase II, but the due diligence will encompass other facilities at the site.

1.4 The International Finance Corporation ("IFC") is also considering financial support to Phase II and has already obtained eligibility for the project.

(1) This Environmental and Social Strategy (ESS) is being made available to the public in accordance with the Bank's Policy on Disclosure of Information. The ESS has been prepared based primarily upon information provided by the project sponsors and does not represent either the Bank's approval of the project or verification of the completeness or accuracy of the information. The Bank, as part of its due diligence on the feasibility of the project, will assess the environmental and social aspects.

1.5 Phase I involves installation of a single pressure, dual flow steam turbine power plant. This has a single flash steam/brine separation system, with steam directed to a conventional condensing steam turbine. Steam will be supplied from existing production wells. One additional injection well will be drilled during the Phase I drilling program.

1.6 Phase I is currently under construction and is expected to be completed in April 2011. No further resource development is required for Phase I. The US$151 million Phase I project is being funded through a combination of equity and cash flow generated by the existing 10 MW operations, and with construction and term loan facilities provided by the Central American Bank for Economic Integration ("CABEI"), Netherlands Development Finance Company (*Financierings-Maatschappij voor Ontwikkelingslanden N.V.* - "FMO"), Export Development Canada ("EDC") and Cordiant Capital ("Cordiant") (the "Phase I Lenders"). Phase I will include expansion of the transmission line to connect to the National Grid.

1.7 Phase II construction can be separated into four basic activities - resource development (drilling), construction of a steam-field delivery system (valves, pipelines, etc.), power plant installation, and the addition of a second 138 kV transmission circuit on the existing transmission line (no new transmission line will be necessary).

1.8 Phase II will require drilling of three additional production wells and two additional injection wells, but will utilize the identical power plant design and equipment as Phase I. Additional drilling is expected to commence in May 2010 and be completed in December 2010. Phase II completion is expected to occur in December 2011 and its total cost estimated at approximately US$ 154 million.

1.9 At the completion of Phase II, PENSA will remove from Commercial Operation the existing 10 MW plant and will redirect the steam supply to feed the Phase I and Phase II units and the plant will have a total net capacity of 72 MW.

1.10 The Company has hired different experienced international contractors to perform the drilling, civil works and equipment assembling activities. The construction workforce will employ a maximum of 300 people, the majority of it hired locally. The current operational workforce is approximately 120 people, (40 technical). more than 90% are local hires or from within the region. It is not anticipated that the construction or operation workforces will need to be significantly increased for Phase II.

II. ENVIRONMENTAL AND SOCIAL COMPLIANCE STATUS

2.1 The Minister of Natural Resources and the Environment ("MARENA") is responsible for the awarding of the Environmental Permit, however, other government institutions are involved as well, including the Ministry of Energy and Mines and municipalities.

- The first step is to request the Environmental Permit from MARENA.
- MARENA issues the terms of reference for the environmental impact assessment (EIA) of the project.
- The applicant has approximately six months to prepare the EIA. It is mandatory to hire a qualified third party consulting group to perform the study.

- The study would be submitted to MARENA for review. This review would take approximately one to two months. After this review, MARENA may provide comments, or request further clarification.
- If the MARENA technical group is not satisfied with the study, they will ask for some amendments, if not the document is ready for the public consultation.
- The document is required to be presented at a public meeting, after which any public comments must be included in the EIA.
- Following this stage, the Environmental Permit may be awarded.

2.2 An Environmental Impact Assessment report ("EIA") has been presented in 2008 for the entire 72 MW expansion of the power plant (Phase I and Phase II), and submitted to MARENA. The EIA has been made available to the local public and a public hearing was held for the local community in San Jacinto. The process involved consultation with: people from the community, representatives of government agencies, and with PENSA workers (many of whom are part of the local community). At the public hearing, a presentation was made covering the most significant environmental impacts of the projects and the mitigation measures being implemented to reduce the negative impacts on the environment; and after the presentation, there was a question and answer session, within which there was debate among various interested parties regarding the benefits of the Project. No major opposition or problems were noted from the part of the public at the public hearing, but the issue of potable water was a recurrent concern. The Project EIA has been approved and the environmental permit granted by MARENA for both Phase I and Phase II.

2.3 An analysis of the Project under the applicable directives of IDB's OP 703 Environment and Safeguards Compliance Policy have triggered the following directives: (B.4) Other risk factors associated with vulnerability to disasters and environmental or social liabilities related to the existing project; (B.5) Environmental Assessments have been performed; (B.6) Public consultations have been performed; (B.7) Bank will supervise compliance during supervision; (B10) Handling of hazardous materials; (B.11) Potential to cause air, soil or water contamination; and (B.15) As part of the investment or component(s) may be co-financed by IFC. The Project will also likely trigger the Natural Disaster Risk Management Policy. PENSA supports natural disaster relief efforts via local prevention committees. Taking into account this information and the potential environmental and social impacts and mitigation measures associated with the Project **(see Section V)**, the Team proposes that the Project be classified as a Category B operation.

2.4 It should be pointed out that IFC classified Phase II as a Category B project.

2.5 In 2009, FMO performed an Environmental and Social Appraisal of the San Jacinto-Tizate Geothermal Project with the assistance of a specialized environmental consultant. This appraisal included evaluation of compliance with IFC's Environmental, Health and Safety Guidelines for Geothermal Power Generation. The project has been found to be in general compliance; nevertheless, a few gaps were identified to be addressed in an action plan.

III. RELEVANT ENVIRONMENTAL AND SOCIAL CONDITIONS

3.1 The Project area does not encompass tropical rain forests, there is no evidence that it contains threatened or endangered species, no indigenous people live in the area and there has been no evidence to date of any historic or prehistoric archaeological sites finds. The closest designated protected zone is the volcanic complex Telica-Rota Natural Reserve. However, the Project will not directly affect the protected area, as it will be developed between 150 and 250 m contour lines and the lower limit of the Natural Reserve is at 300 m, and the boundaries of the Project site is about 2 km from the boundary of the Reserve.

3.2 A large part of the vegetation in the operational area of the Project and surroundings has been extremely modified by agriculture activities, cattle farming and wood cutting for fuel. A substantial part of the area is covered by pasture land. There is an abundance of grazing lands, vast prairies, thin forests with somewhat dense tree patches of 4 to 10 m in height, where *caducifolias* or *subcaducifolias* prevail, arboreal species are limited to more elevated zones of the volcanic complexes present. In the surroundings of geothermal manifestations no important vegetation is observed due to high temperatures and acidity of the soil.

3.3 Relative to the fauna, based on EIA information, the area has little presence of wildlife species due to the increasing deforestation resulted from wood extraction and slash and burn activities.

3.4 The Telica-Rota Natural Reserve was created in 1983, has an area of approximately 9080 ha and is ranked at Category IV of the IUCN (Categories go from I to VI, Category I being associated with more restrictive protective status). It includes the volcanoes of Telica, Santa Clara, San Jacinto, Cerro Agüero, Rota and Cerro Montoso among others. The entire volcanic complex constitutes a natural refuge for species present in the zone, even though it constitutes a combination of agriculture zones and natural forests. In the protected area, there are small hamlets or isolated farms with an approximate population of 3.8 thousand inhabitants. The protected area presents a high level of anthropogenic intervention. Wood extraction is common for consumption as well as for commercialization. The agricultural areas are constantly submitted to slash and burn as part of the soil preparation for planting.

3.5 Natural geothermal manifestations such as fumaroles, mud pools and hot springs are present in the area and contribute to introduce contaminants in the soil, water and atmosphere. Main contaminants usually associated with geothermal manifestations are the following: salt, metals (e.g., arsenic, strontium and mercury), boron, nitrates and hydrogen sulfide gas.

3.6 In the area of the project, most of the surface watercourses have a short path and are intermittent. Relative to groundwater, both phreatic and artesian aquifers are present in the area as well as hot and cold springs. It is important to point out that these groundwater aquifers and the geothermal production zones below are separated by a thousand or more meters of soil and rock.

3.7 The chemical composition of waters present in the area is variable, analysis performed indicate a calcium bicarbonate composition for springs and calcium bicarbonate and sulfates for the wells of the zone of El Tizate. Also, the analysis show natural contamination of geothermal origins, evidenced by abnormal values of mercury, silica, salinity and chloride found. However, it is important to mention that the values analyzed present values are below the limits admitted by the worldwide standards for human consumption. The chemical

3.8 The rural population in the area of the Project gets water for human consumption through bored wells or naturally occurring springs. As a way to improve the relationship with the community, PENSA supports the community by providing drinking water for some individuals from a well that has been drilled to provide water for geothermal well drilling and operation of the power plant.

3.9 The project is located in an area considered vulnerable to natural disasters, mainly in relation to volcanic and seismic hazards.

3.10 The Project site is approximately 2 km to the north of the village of San Jacinto, a small settlement (approx. 1200 inhabitants), which is isolated from the Project site by low hills (no part of the site is visible from the village). The population density in the village is very low (around 62 inhabitants per square kilometer) and census data indicate that about 26 percent of the population migrates to other places looking for a job. In terms of human occupation, the rural area where the Project is located is occupied by a few dispersed dwellings, sparse subsistence farming and low-scale non-intensive livestock activity in some areas. Also, there are a few houses that are or will be located not far from some of the Project's pipelines that transport geothermal fluid, but the implementation of the Project will not require the expropriation or demolition of any dwelling unit. The long experience with the existing 10 MW plant and many other geothermal developments throughout the world shows that geothermal projects can co-exist with relative success with other uses, such as agriculture and livestock grazing, even though the pipelines may constitute sometimes a barrier for livestock grazing and other agricultural activities.

IV. IMPACTS, RISKS AND CONTROL MEASURES

A. Construction Related

4.1 Potential negative environmental impacts during construction phase will be associated mainly with drilling and testing of new wells, installation of pipelines, construction of power plant buildings and installation of equipment. Some of the potential impacts are typical of a moderate size civil works such as: (i) vegetation loss and soil erosion; (ii) dust and noise emissions; (iii) water contamination by spills and effluent discharges; and (iv) indirect negative impacts on nearby communities from the influx of non-local workers. Others will be more specific to geothermal development, such as: (v) contamination of soil, and water by drilling mud (essentially a suspension of a natural clay material - bentonite - with some additives added), drilling mud with cuttings, or geothermal fluid (essentially a mixture of hot water and steam, at temperatures that can go up to 290°C, with dissolved salts and gases); (vi) impacts on other water uses related to utilization of water during construction; (vii) impacts related to disposal of drilling mud and solid wastes; (viii) impacts associated with noise and vibrations generated during drilling; and (ix) effects of drilling on groundwater aquifers, nearby hot springs, natural thermal features, and sensitive geological formations and ecosystems. PENSA's parent company (Ram Power, Corp.) has a vast experience in developing similar projects in the area and elsewhere, and the Company is adopting various

measures to mitigate and monitor relevant impacts during construction of the San Jacinto-Tizate Project.

4.2 No expropriation or resettlement issues are anticipated in association with the Project. Some land acquisition may be required for well pads, plant facilities and some pipelines. However, the acquisitions are expected to be performed through negotiations, as has been done in the past for the existing facilities and Phase I, where there has been no case of resettlement and all but one case of land acquisition have been resolved through negotiations (in one instance the Company had to exercise their right of expropriation).

4.3 There is a full time professional Social and Environmental Manager located on site, supported by a trained agronomist responsible for reforestation work that is being implemented as a compensatory measure. The Social and Environmental Manager is responsible for overseeing all site activities (both construction and normal operations) to ensure compliance with the requirements of the Environmental Permit and overall good practice, including periodic monitoring of environmental impacts as they affect air and water quality and noise emissions. The Social and Environmental Manager is also responsible for local community relationship.

4.4 There is a full time Corporate Social and Environmental Manager (SEM) located in the Managua Corporate office. The employee is present on site approximately 50% of the time. The position serves as the Polaris company environmental authority to governmental agencies and other stakeholders; oversees those operational personnel who have responsibilities in the ESHS areas; and is responsible for the successful building and implementation of ESHS programs. The SEM reports to the Polaris CEO and the Corporate Vice President for Land and Permitting.

4.5 The corporate office of Polaris' parent company, Ram Power, Corp. provides the support services of the Environmental Health and Safety Manager and the Environmental Administrator. Both professionals oversee the application of corporate policy and procedures to the company's projects on and off shore. Both officials report directly to the Vice President for Land and Permitting.

4.6 The Environmental Permit includes a number of important requirements, such as:

(i) Hiring of an environmental professional at PENSA who will ensure proper oversight and follow-up with all of the requirements listed in this permit.
(ii) Covenants in the construction contract with main contractor that provide for dust control, proper disposal of wastes (including recycling of lubricants and a municipal permit for use of the town dump), and priority use of local hires from surrounding communities.
(iii) Monthly or bi-monthly monitoring of discharge of wastewaters to the surface to ensure compliance with Decree 33-95.
(iv) Proper management of rainwater and runoff.
(v) Use of non-PCB transformers.
(vi) Use of erosion control measures on stretches of road with more than 10% grade.
(vii) Construction of impermeable mud pits using geomembrane and clay liners.
(viii) Any accident or event that occurs and that threatens to affect the zone's environment and natural resources, even when the same has been controlled, must be immediately notified verbally (first notice) and also in writing, detailing the incident and the measures implemented for its control to the representatives authoritites.

(ix) A study to determine optimal process water reinjection temperature and assurance that all process water is disposed of by reinjection into the original formation.

4.7 The Company has in place some environmental and social, as well as health and safety procedures and plans to address relevant issues, as for instance: an Environmental Policy, a Health and Safety Policy, an Emergency Plan, a Solid Waste Management Plan, a Drilling Mud Management Plan, and regular collection of accident and incident data.

4.8 The lead construction company hired to expand the plant has an integrated quality, environmental, health and safety and social management system that is ISO 9001, ISO 14001 and OHSAS 18001 certified and they are currently implementing SA 8000. Based on FMO's appraisal, this contractor appears to have a good understanding of environmental and health and safety issues and the internal systems and controls needed to ensure that these impacts are correctly managed. This lead construction contractor is also required to submit an environmental compliance plan for approval by PENSA.

4.9 The construction workforce will employ a maximum of 300 people, the majority of it hired locally. The drilling company and its service providers will employ 80% local hires and that number can rise to 90+% after training. Most of the construction workers that are not hired locally are housed off-site in Leon. Therefore, the indirect negative impacts on nearby communities from the influx of non-local workers.

4.10 In terms of noise and vibrations, no significant impacts are expected as San Jacinto is located approximately 2 km from the Project site and isolated from it by low hills (no part of the site is visible from the village. In addition, the rural area where the Project is located is in great part unoccupied, except for sparse subsistence farming and low-scale non-intensive livestock activity in some areas. Noise measurements performed by the Company indicated that noise levels are generally within national and IFC limits.

4.11 Well drilling can use a significant amount of water when drilling some geological formations or for safety reasons, and this water (along with residues of drilling fluids) is reinjected into the formation after having been recycled during the drilling process. PENSA will use water saving technologies such as aerated drilling and cuttings de-watering. The average water consumption will be approximately 12,000 gallons per day (<10 gpm). Water for drilling of wells comes primarily from separate freshwater wells specifically bored to provide water for drilling and to meet the water-demand of the power plant.

4.12 It is important to point out that the groundwater aquifers present in the area and the geothermal production zones below are separated by a thousand or more meters of soil and rock. Drilling in the first several hundred meters is also done only with water (no drilling fluids) and casings are carefully cemented to prevent any contamination of aquifers.

4.13 According to FMO's appraisal, PENSA conforms to best management practices by recycling drilling mud and fluids during drilling operations and then reinjecting residual fluids, along with spent water from the plant, back into the formation. In addition, they use only water-based drilling fluids.

4.14 PENSA has a solid waste management plan that includes principles of reuse and recycling and addresses at least two of the principal conventional and hazardous wastes produced by the company: lubricants and plastic bags (both from drilling). A separate plan for managing

drilling mud and cuttings describes the procedures used in “land farming” of these wastes and provides some chemical analyses pre- and post-treatment.

4.15 It is not clear from the information provided what procedures the Company and\or contractors adopt to monitor impacts during construction, such as on water supply of the local population. This needs to be further explored and clarified during due diligence.

B. Operation Related

4.16 The most relevant potential negative environmental impacts associated with the operation of the Project will be: (i) contamination of soil and water by spills and accidental discharges of hot and salty geothermal fluid and/or brine (non-accidental discharges of geothermal fluid and brine to the environment are practically eliminated as they are reinjected back into the reservoir after use); (ii) effects of geothermal fluid extraction and reinjection on yield of groundwater aquifers, nearby hot springs and natural thermal features; (iii) implications on land subsidence and microseismic activity; (iv) impacts of gaseous emissions on ambient air (non-condensable gases will essentially be composed of 95% carbon dioxide - CO_2, 2% hydrogen sulfide - H_2S, and 3% other trace gases), and on plant workers (H_2S); and (v) impacts of noise generated at the power plant. It should be pointed out, however, that these impacts will be in general proportional to the relative modest size of the geothermal project, that natural sources, such as hot springs, fumaroles and other thermal manifestations already exist, the area is sparsely populated and there are factors, such as vegetation cover and topography, that provide natural attenuation to some of the impacts. Furthermore, the Company is proposing a series of measures to mitigate and monitor relevant impacts (air, noise, water, microseismicity and subsidence) associated with the operation of the Project, the adequacy of which will be carefully reviewed during the due diligence. Some of the measures adopted are: reinjection of geothermal fluid and brine, H_2S detectors at wells and power plant, water/oil separators, holding basins and controlled storage areas for chemical substances and wastes.

4.17 Relative to indirect impacts on the volcanic complex Telica-Rota Natural Reserve, these are not expected to be significant because of the distance that separates the plant from that area, and the relative low concentrations of contaminants that will be present in the air emissions generated at the plant. The prevailing winds and natural atmospheric turbulence will provide favorable conditions for dispersion of the air emissions. However, because geothermal well drilling and geothermal field operation are complex activities, it is recommended that potentially relevant indirect impacts associated with the construction and operation of the project are further evaluated during due diligence..

C. Associated with other Facilities

4.18 Other environmental and social risks associated with the Project may be related to potential environmental and social liabilities in association with possible improper mitigation of impacts related with the existing plant facilities, wells and pipelines, as well as with the decommissioning of the existing 10 MW plant. The EIA mentions that at least two years prior the closing stage of any of the facilities at the site (existing 10 MW, Phase I, or Phase II), pursuant to the legislation in effect, PENSA shall submit the respective Closing Plan and Execution Program for environmental recovery of the site to MARENA for approval.

4.19 Relative to environmental and social liabilities associated with Phase I, these are expected to be limited in view of the procedures and plans adopted by the Company and contractors **(as described in see Section IV.A and IV.B)**. However, this needs to be confirmed during due diligence.

D. Positive Impacts and Climate Change

4.20 On the other hand, development of geothermal energy can have a large net positive impact on the environment compared with development of conventional energy sources, major factors being: (i) it is renewable; (ii) energy can be produced without burning fossil fuels such as coal, gas, or oil; (iii) geothermal developments generate only about one-tenth to one-sixth of the carbon dioxide that a coal-fired and natural-gas-fueled power plant generates respectively; (iv) geothermal power plants have sulfur emissions rates that average only a few percent of those from fossil-fuel alternatives, and nitrogen oxide emissions are much lower in geothermal power plants than in fossil-fueled power plants; (v) geothermal power plants require very little land, taking up only a fraction of that needed by other energy sources; (vi) other land uses can mingle with geothermal developments with little interference or accidents; and (vii) use of geothermal energy can contribute to reduce import and transport of oil and other fuels; thus improving energy independence (Nicaragua is a net energy importer and oil is the primary import), and diminishing the risks of transport accidents that may have deleterious consequences to the environment.

4.21 Relative to the issue of climate change, the use of geothermal energy contributes to reduce the emissions of greenhouse gases. Geothermal projects are eligible to earn carbon credits. PENSA registered the San Jacinto-Tizate Project with the United Nations Framework Convention on Climate Change (UNFCCC) in 2006 and has already sold and delivered hundreds of thousands of tons of certified emission reductions (CERs) in association with the 10 MW plant. On the other hand, estimates obtained by using UNFCCC methodology indicate that by utilizing the existing geothermal resources of San Jacinto-Tizate to generate electricity, the proposed expanded project (Phase I plus Phase II) will displace 72MWe (approximately 580 thousand MWh) of electricity produced by a fossil-fuel intensive electricity grid, which has a carbon emission factor (CEF) on the order of 0.754 tCO2/MWh. Expected net emission reductions from the proposed expanded project (Phase I plus Phase II) are approximately 390 thousand tons of CO_2 per annum. The CO2 emission factor associated with the Project is about 0.0736 tCO2e/MWh and, therefore, the emissions related to Phase II only will be approximately 21.3 thousand tons of CO_2 per annum.

E. Natural Disaster Risks

4.22 Taking into account the geographic location and the nature of the project, there are two possible types of disaster risk scenarios to consider:

(i) Type I: The project is likely to be exposed to natural hazards due to its geographic location. The San Jacinto-Tizate Project is located in an area considered vulnerable to natural disasters, mainly in relation to volcanic and seismic hazards.

(ii) Type II: The project itself has a potential to exacerbate hazard risk to human life, property, the environment or the project itself. Most geothermal projects may potentially induce microseismic events and ground subsidence.

4.23 Relative to volcanic hazards, the analysis performed by the Company indicates that Vulcan Telica presents a variety of potential volcanic hazards to geothermal development within the San Jacinto-Tizate concession area. The area of the Project, which is in close proximity to Vulcan Telica, could be potentially impacted by eruptions of *tephra* and lavas from Telica. However, the majority of ash eruptions from the current Telica eruptive center are more likely to be blown to the southwest and more rarely to the northeast rather than being blown to the east onto the area of the project. Similarly, considering current topography, lava flows from the Telica center are likely to be directed toward the north and away from the Project area. If other eruptive centers were to be developed, risks could change, but there is a much lower risk of this happening in comparison to further ash eruptions from the currently active Telica volcanic center. The possible area affected by phreatic eruptions would be confined to the area around the current eruptive center. A large column collapse eruption could affect the area of the Project and there is evidence that these have previously occurred from older centers in the Telica complex; however, the probability of one of these occurring during the lifetime of the project is very low. In conclusion, the major form of volcanic risk at the Project area is an ash shower from the Telica eruptive center and this can be allowed for in the design of the field equipment and buildings.

4.24 Concerning seismic hazards, historical data for the region indicate the occurrence of several events of moderate to high intensity in the alignment formed by the volcano craters. Therefore, this type of hazard needs to be taken into account in the design of the Project. The Company indicates that all designs are carried out to resist seismic events and their standard design code requirement identifies and applies suitable acceleration levels for structures, buildings and pressure pipelines.

4.25 Because many geothermal resources are located in seismically active zones, there are sometimes problems of instability in association with geothermal energy utilization. In some circumstances, the extraction of the geothermal fluid and reinjection of the spent fluid may induce microseismic events. This can be minimized by controlling the rate of extraction and keeping reinjection pressures to a minimum.

4.26 Ground subsidence may occur when geothermal fluid is withdrawn from a reservoir at a rate greater than natural inflow back into the reservoir. This may cause compaction of the rock formations at the site and lead to surface subsidence. Ground subsidence may be reduced by controlling the rate of reinjection in relation to that of extraction. Information contained in the EIA suggest that subsidence is expected to be minimum in the area of the geothermal field associated with the Project in view of the following factors: (i) with the exception of slightly thick shallow layers, geological formations are well consolidated (fluid extraction zones are at depths comprised between 700 and 3000 meters); (ii) extraction from the geothermal reservoir will marginally affect the pressure in the shallow aquifer, due to limited interconnection between both aquifer; and (iii) most of the fluid extracted will be reinjected to maintain the hydrological balance of the aquifer.

4.27 PENSA has in place an Emergency Plan and it is necessary to confirm during due diligence if the types of events described above are taken into consideration. In addition, it is not clear, based on the information received, if there are procedures or programs to monitor microseismicity and ground subsidence.

V. ENVIRONMENTAL AND SOCIAL STRATEGY FOR DUE DILIGENCE

5.1 The proposed Environmental and Social Strategy (ESS) calls for the performance of an Environmental and Social Due Diligence (ESDD) by the Bank in order to confirm that all Project relevant impacts and risks have been, or will be properly and adequately evaluated and mitigated. The ESDD will specifically address the following assessments or evaluations:

(i) Assessment of Project and Company compliance status with the applicable country regulatory, particularly the environmental permit requirements, and any applicable IDB environmental and social policy or guideline, as well as IFC's Environmental, Health and Safety Guidelines for Geothermal Power Generation.

(ii) Evaluation of Project and Company environmental, health and safety management systems, including plans and procedures, and in particular assess the mechanisms that are in place to insure clear assignment of accountability and responsibility among the different contractors involved in the implementation of the Project.

(iii) Assessment of procedures the Company and\or contractors adopt to monitor impacts during construction, such as on water supply of the local population.

(iv) Evaluation of potential impacts and their mitigation on surface and groundwater, including impacts on local water supply during construction and operation, and appropriate management of spent geothermal fluids (i.e. impacts of reinjection).

(v) Assessment of potential impacts from the project on tourism, traditional or other activities in the area related to geothermal properties.

(vi) Assessment of potential impacts and their mitigation/compensation on the current land users (sparse subsistence farming and low-scale non-intensive livestock activity).

(vii) Evaluation of potential right-of-way or expropriation issues.

(viii) Assessment and management of potential ground subsidence, and potential impacts on local population.

(ix) Evaluation of management of drilling fluids and cuttings (including appropriate treatment and/or disposal).

(x) Assessment of management of air emissions during drilling and operation.

(xi) Evaluation of potential indirect impacts and their mitigation on the nearby Telica-Rota Natural Reserve, both during construction (*e.g.*, additional pressure from construction force on natural resources) and operation.

(xii) Evaluation of measures and procedures adopted by the Company to address volcanic and seismic hazards, as well as induced microseismicity and ground subsidence. This evaluation shall try to clarify also what types of natural disaster risks are taken into consideration in PENSA's Emergency Plan, and what procedures or programs are in place to monitor microseismicity and ground subsidence.

(xiii) Assessment of potential environmental and social liabilities in association with possible improper mitigation of impacts related with the existing plant facilities, wells and pipelines, as well as with the decommissioning of the existing 10 MW plant.

(xiv) Assessment of the appropriateness of the decommissioning plan for the existing 10 MW facility.

(xv) Evaluation of potential environmental and social liabilities associated with the ongoing construction of Phase I.

(xvi) Assessment of the appropriateness of the consultation process.

(xvii) Evaluation of the scope and appropriateness of alternative analysis prepared as part of the EIA process.

5.2 As the IFC is also considering financial support to Phase II and has already obtained eligibility for the project, the Team proposes to develop the due diligence in close coordination with IFC.

FIGURE 1
Map of Project Location