



Environmental, Social, and Health Impact Assessment (ESHIA) for Vista Onshore Operations

Executive Summary



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Executive Summary

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1. EXECUTIVE SUMMARY

1.1 Project Overview

This Environmental, Social and Health Impact Assessment (ESHIA) of the On-shore Non-Conventional Oil and Gas Development of the Bajada del Palo Oeste (BPO) block (the “Project”), located in western portion of the Province of Neuquén, Argentina, was prepared to address the environmental, social, and health and safety requirements of the Overseas Private Investment Corporation (OPIC) on behalf of the Project sponsors, Vista Oil & Gas Argentina S.A. (VOG) and Aleph Midstream S.A. (AM). VOG and AM are applying for a project loan from OPIC for drilling and completion of production wells to develop non-conventional oil and gas from Vaca Muerta shale formation, as well as midstream facilities to gather, process and transport production from BPO block.

The Project includes drilling and completion of 110 wells in the next 4 - 5 years, as well as the construction, installation, operation and maintenance of midstream facilities (i.e. gathering lines; early production facilities (EPFs) and early production systems; oil, gas and water pipelines; central processing facilities (CPFs); compressor stations; and lease automatic custody transfer units (LACT, etc.) to process and transport non-conventional oil and gas production from BPO, all of which will be developed over the next 8 - 9 years. Additionally, some of the existing facilities (i.e. crude treatment plant, Oil Treatment Plant (PTC), Gas treatment plant, Gas Treatment Plant (PTG), etc.) at Entre Lomas (EL), where VOG is currently operating, are to be revamped in order to support the new non-conventional production from BPO. VOG will be responsible for the upstream portion of the Project while AM in the near future will be in charge of the midstream component of the Project.

The BPO block is located adjacent to other blocks that have conducted successful pilot wells and have continued onto full development.

VOG is currently carrying out a fast track development of the BPO block, moving forward to drilling and completion ramp-up and to full-scale development in 2020. This is possible given the advanced geological understanding of the BPO block, with all the milestones of a typical delineation phase already achieved (e.g.: 3D seismic acquisition & interpretation, data gathered from vertical wells, petrophysical analysis to determine landing zones, etc.), as well as for most of the initial pilot phase milestones (e.g.: pad configuration, batch drilling and optimization, completion design optimization, etc.). In 2020, the project plans to enter the full-scale development phase leveraged on VOG’s Vaca Muerta leadership team proven track record in the basin, premium acreage position and legacy conventional facilities.

VOG commenced production of its first four-well pads (a temporary drilling site) in the BPO block during the first quarter of 2019. During that quarter, the well reached over 6,500 barrels of oil equivalent per day (“boed”) in production.

VOG is going forward with a CUBE development approach, which involves simultaneous development of adjacent areas. Each CUBE is projected to have approximately 6 PADS with 4-6 wells per PAD. By doing this, VOG can optimize rig and fracking pace, minimize parent-child effects (which reduces oil productivity per well), mitigate fracking hits and group PADS for oil, gas and water evacuation. The BPO block has been divided into 19 Cubes, of which the first 4 Cubes (#1, #2, #4, and #6) constitute the scope of the BPO Project.

The ESHIA was prepared by an independent international environmental consultancy, Environmental Resources Management, ERM, Buenos Aires, Argentina. It should be noted that a number of Environmental Assessments and/or Environmental and Social Impact Assessments (ESIAs) were conducted individually for different facilities comprising the BPO Project in mid and late 2018 by local environmental consulting firms, Confluencia and BIOSUM to obtain the national and provincial licenses for the Project. This ESHIA involved a site visit in order to validate some of the gaps identified in the previous phase and the extent of the ESHIA content in those aspects related to environmental, social and labor management and health and safety.

The purpose of this ESHIA is to provide OPIC with:

- a detailed overview of the physical, chemical, biological, and social aspects of the Project;
- an analysis of the potential social and environmental impacts associated with the Project; and
- details on the Project's planned environmental and social management and monitoring to protect workers, the public, and the environment.

The evaluation of Project activities included direct, indirect, cumulative impact analyses.

The study methodology comprised the following activities:

- Obtaining pertinent historical information on the Project from local and national sources;
- Conducting a review of existing literature and data for the Project area;
- Identification of VOG and AM corporate social and environmental policies and guidelines; Argentina government social and environmental regulations and legislative framework; and, international social and environmental standards with which the Project must comply or conform;
- Describing the overall Project with an emphasis on processes that potentially could impact the environment;
- Characterization of the physical, chemical, biological and social components of the environment potentially affected by Project development;
- Identification and ranking of social and environmental risks and impacts for each Project component for each phase of the project;
- Development of a social and environmental management program that describes mitigation measures designed to eliminate or minimize social and environmental impacts.

This ESHIA is presented in standard OPIC format and includes:

- an Executive Summary,
- Project Description,
- Area of Influence
- Legal Framework,
- Description of the Baseline (Existing) Environment,
- Analysis of Potential Impacts,
- Cumulative Impacts,
- Mitigation Measures and Controls
- Environmental and Social Management System (ESMS)
- Risk Management Plan

Environmental, Social and Health Management and Monitoring Plans have been prepared, which will meet Argentine laws and OPIC requirements (e.g. International Finance Corporation [IFC] Performance Standards on Environmental and Social Sustainability – 2012, and the applicable EHS Guidelines – 2007: EHS General Guidelines 2007, and EHS Guidelines for Onshore Oil and Gas Development - 2007), as well as good international practice industry standards that meet with VOG and AM corporate social and environmental policies.

1.2 Project Description

1.2.1 Project Location and Background

The Project is to be developed at the Bajada del Palo (BP) and Entre Lomas (EL) areas.

The BP area is located within Añelo Department in the eastern portion of the Province of Neuquén and has an approximate area of 449.88 km². It is divided into two blocks, Bajada del Palo Este (BPE) and Bajada del Palo Oeste (BPO), and includes the following ten oil fields: i) Aguada del Poncho (APo); ii) Bajada del Palo (BP); iii) Borde Montuoso (BMo); iv) Borde Montuoso Norte (BMoN); v) Jagüel de los Rosauros (JdR); vi) Jagüel Norte (JN); vii) Médano de la Mora (MdM); viii) Médano de la Mora Este (MdME); ix) Puesto Opazo (POp); and x) Puesto Sin Nombre (PSN).

The Project will be almost entirely developed in the BPO block, with only a few facilities to be installed at Bajada del Palo Este (BPE) block and the EL area.

The EL area is 740.58 km² in area and is in both the Provinces of Neuquén and Río Negro.

The portion of the EL area in the Province of Neuquén is in the Department of Añelo, and covers an area of 437.25 km². It comprises six deposits: i) Entre Lomas (EL); ii) Lomas de Ocampo (LO); iii) Borde Mocho (BoMo); iv) Los Alamos (LA); v) El Caracol (EC); and vi) Piedras Blancas (PB-NQN).

The portion of the EL area located in the Province of Río Negro covers a total area of 303.33 km² and includes three main deposits: i) Charco Bayo (CB); ii) La Pista (LP); and iii) Piedras Blancas (PB-RN).

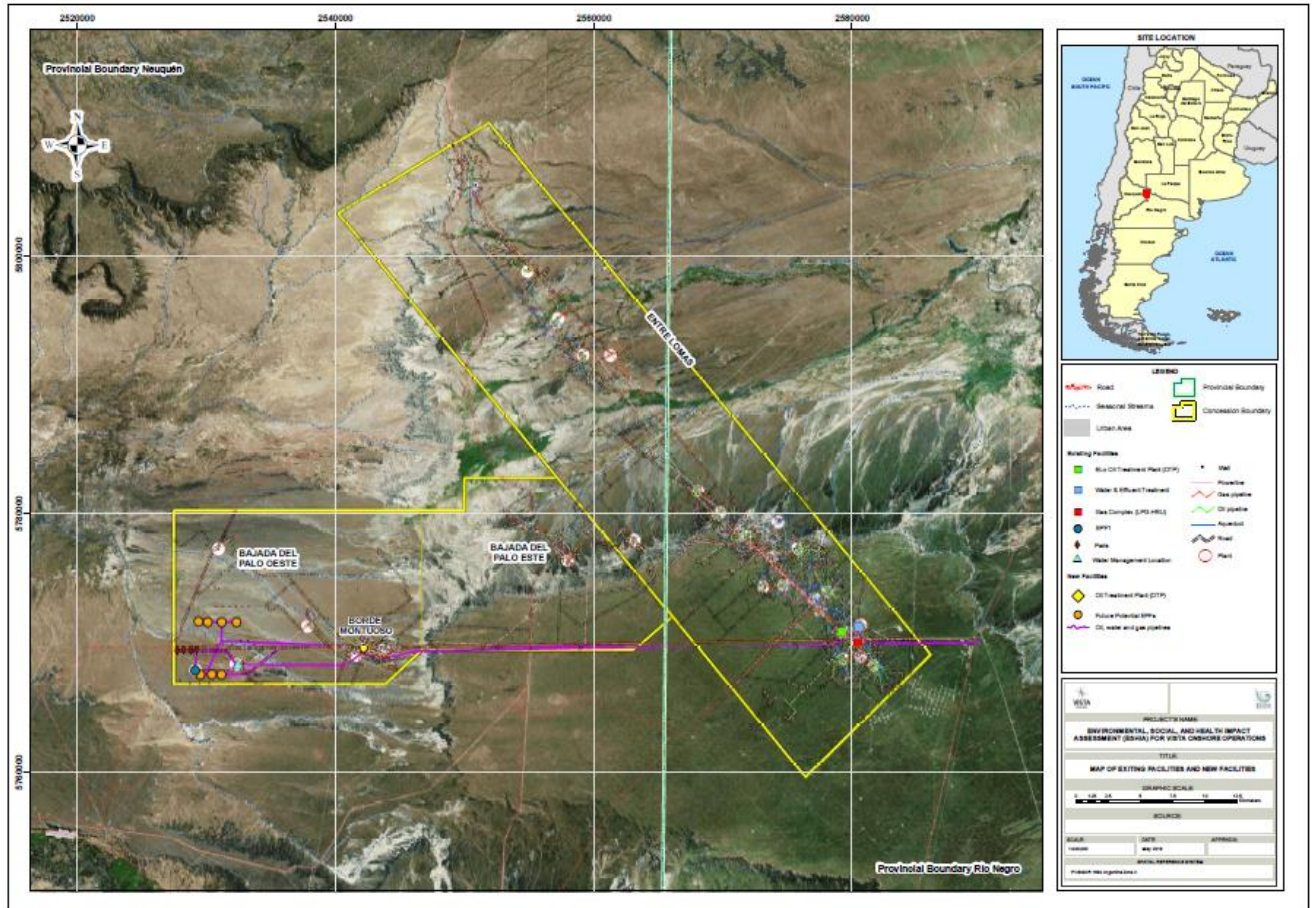
The non-conventional project wells will be entirely developed within the Province of Neuquén.

The main entrance to the Project area is located at Km 89 of National Route No. 151 of the Province of Río Negro, although it can also be accessed from Añelo in the Province of Neuquén, by Provincial Route No. 8.

The Project area is included within the Monte biogeographical region, a semiarid region whose climate is a continental type, dry and warm in summer and wet and cold in winter, also described as Mesothermal Arid.

Regional topography has been sculpted by wind and precipitation which are the dominant erosion and transportation agents. Soils are described as being of low agricultural potential due to texture, drainage, marked hydric deficit, rocky characteristics and erosion risk.

Regional vegetation cover is dominated by sparse scrub, while fauna includes species from arid and semi-arid regions of Argentina.



1.2.2 Project Boundaries

As previously mentioned, the Project will be mainly developed at BPO block, with some few facilities to be installed at BPE block and EL area, although all activities are to be carried out within the Province of Neuquén. Therefore, the Project boundaries have been established to be coincident with the boundaries of the BP and EL areas. Geographical coordinates of the corners of the BP and EL areas are presented below:

Table 1-1 Geographical coordinates of the corners of the BP and EL areas

Area	Corner N°	Geographical Coordinates	
		Latitude	Longitude
Entre Lomas	1	38° 13' 28.018" S	68° 00' 57.467" W
Entre Lomas	2	38° 18' 37.358" S	68° 07' 32.388" W
Entre Lomas	3	37° 55' 12.000" S	68° 32' 31.200" W
Entre Lomas	4	37° 51' 22.914" S	68° 24' 34.155" W
Bajada del Palo Este	1	38° 13' 27.152" S	68° 27' 57.416" W
Bajada del Palo Este	2	38° 07' 36.895" S	68° 27' 59.731" W
Bajada del Palo Este	3	38° 07' 36.258" S	68° 25' 44.281" W
Bajada del Palo Este	4	38° 06' 14.369" S	68° 25' 44.918" W
Bajada del Palo Este	5	38° 06' 12.830" S	68° 20' 49.411" W

Area	Corner N°	Geographical Coordinates	
		Latitude	Longitude
Bajada del Palo Este	6	38° 11' 58.451" S	68° 14' 40.391" W
Bajada del Palo Este	7	38° 13' 23.558" S	68° 16' 45.065" W
Bajada del Palo Oeste	1	38° 13' 27.152" S	68° 27' 57.416" W
Bajada del Palo Oeste	2	38° 14' 51.988" S	68° 29' 53.798" W
Bajada del Palo Oeste	3	38° 14' 54.327" S	68° 41' 06.192" W
Bajada del Palo Oeste	4	38° 07' 39.739" S	68° 41' 08.062" W
Bajada del Palo Oeste	5	38° 07' 36.895" S	68° 27' 59.731" W

Source: Vista

1.2.3 Current Activities

Current activities developed by VOG at Entre Lomas (EL) and Bajada del Palo (BP) include exploratory and production well drilling, construction, operation and maintenance of pipelines, aqueducts, treatment facilities, injection plants, pumping and compression stations, and storage facilities.

Regarding BP operations, fluids from the BMo deposit are produced daily, which are dehydrated and sent to the dispatch tanks from where are pumped through a 38.5 km pipeline to the PTC at EL. The fluids produced by the BP deposit have two components. The first corresponds to the production of wells that join to the Early Production Facility 1 (EPF 1) and are then pumped through a 6 km long pipeline to NODE 1 of the Battery 1 BMo - PTC EL oil pipeline. The other component corresponds to the fluids that are piped to the loading dock and then transported by trucks and unloaded in the Battery 6 PB or in the Battery 2 PB.

The gas produced in the Battery 1 BMo is sent to the circuit of the Compressor Station (EMC-8) and later passes through a dehydration process. Gas coming from high pressure wells goes directly to the dehydration stage, together with the gas coming from the EMC-8. Once dehydrated, the gas is injected into the BMo – Tratayén gas pipeline owned by Pampa Energía.

On the other hand, the gas produced in the Battery 1 BP enters the Compressor Station (EMC-9), from where it is compressed from low to high pressure. As in Battery 1 BMo, the gas coming from wells producing high pressure goes directly to the dehydration stage. Once dehydrated, the gas is sent to the Gas Treatment Plant (PTG) at EL.

In relation to the development of non-conventional oil and gas production at BPO, current activities include the following facilities: i) 4 oil and gas production wells located at PAD 2; ii) Early Production Facility 1 (EPF 1); iii) gathering lines connecting PAD 2 and EPF 1; iv) oil, gas and production water pipelines connecting EPF 1 and Battery 1 BMo; and v) aqueduct Cruz de Lorena (CdL) – Médano de la Mora (MdM).

Oil, gas and production water extracted at wells PEL.Nq.MdM-1013(h), 1014(h), 1015(h) and 1016(h) are conducted through a pipeline to EPF 1, where they are separated and pumped separately through oil, gas and production water pipelines to Battery 1 at BMo block where they are treated and managed as described above.

PAD 1, 3 and 4 have already been constructed, and surface and intermediate sections of wells PEL.Nq.MdM-1025(h), 1026(h), 1027(h) and 1028(h) at PAD 3 have been drilled and are waiting for the drilling rig in order to be completed.

The EL area has a Crude Treatment Plant (PTC) and 18 oil fields. Its Gas Complex is constituted by the Gas Treatment Plant, the Compressor Stations and the Gas sales points. The Gas Treatment Plant (PTG) is located in the EL area, and consists of two processes: Dew Point Conditioning Plant (HRU) and Liquefied Petroleum Gas Separation Plant (LPG). The gas production of the different deposits is directed to the Compression Stations, called EMC, which are distributed within the EL, BP and Agua Amarga (AA) areas.

The LPG Plant separates Propane, Butane and Gasoline through the process of Refrigerated Absorption, with the use of a liquid absorbent. The gas separated from the oil in oil fields together with the free gas produced from rising wells is sent to the Compressor Stations. In units EMC-1, 2, 3, 4, 5, 7 and 9 the gas is compressed, dehydrated and sent to the Gas Treatment Plant. Compression Stations EMC-1, 2, 3 also have a sweetening process for the removal of sulphur compounds from gas, a process carried out in solid-bed towers. The compressed gas in EMC-8 is subsequently dehydrated and injected to the gas pipeline at the Gas Point of Sale PM-200. The compressed and dehydrated gas in the Jarilla Quemada Conditioning Plant, in which the EMC-10 is located, is injected into a gas pipeline for sale at the Jarilla Quemada Field at the Gas Point of Sale PM-530.

The EL distribution system consists of 16 gas discharge pipelines from oil fields to moto-compressor stations. The pipeline network of the area is composed of 19 oil pipelines. It also has fresh water and saltwater aqueducts.

1.2.4 Proposed Activities

Upstream

The objective of the upstream portion of the Project is to drill, complete and exploit 110 oil and gas unconventional production wells in the Vaca Muerta formation.

Four of these 110 wells, PEL.Nq.MdM-1013(h), 1014(h), 1015(h) and 1016(h), have been drilled and completed at PAD 2, and are currently operative. Additionally, another 4 wells, PEL.Nq.MdM-1025(h), 1026(h), 1027(h) and 1028(h), have their surface and intermediate sections drilled and are waiting for the drilling rig in order to be completed. These wells form part of PAD 3.

PADs for 24 of the 110 wells have already been constructed (PADs 1, 2, 3, 4, 5 and 6) considering that a total of 4 wells will be installed in each PAD. Construction of the remaining PADs will advance as long as the drilling program progresses.

Midstream

Midstream portion of the Project includes the design, construction, installation, operation and maintenance of surface facilities to support the increase in non-conventional oil and gas production obtained from the 110 new wells comprising the BPO project within the Vaca Muerta shale oil formation. These facilities may include but will not be limited to gathering lines, early and/or temporary production facilities, oil, gas and/or production water pipelines, oil and/or gas treatment plants, compressor stations, etc.

As part of the Project, the following facilities are proposed to be constructed during the year 2019 and until the second half of 2020:

- EPF for gathering and processing fluids driven by the new non-conventional oil and gas production wells to be installed as part of the BPO project;
- Fluids gathering lines, connecting wells PADs and EPFs. It is projected that PADs will be initially connected to a main manifold which will be connected directly to the EPF;
- Oil, gas and production water pipelines connecting each new EPF and the current existing pipelines connecting EPF 1 and Battery 1 at BMo block;
- Oil pipeline connecting Battery 1 at BMo block and PTC at EL area; and
- Gas compressor station, EMC.

Although it will not require significant modifications, the revamp of the PTC at EL area is being considered to support the oil production increase. Revamp will include addition of filters and mass flowmeters, various interconnecting pipelines and accessories, and provision and installation of a plunger with greater diameter at the dispatch pumps. In addition, it has been considered that some changes will occur at the BMo's PIAS including:

- Provision of a transfer pump, a 320-m³ production water lung tank, two basket filters, two injections pumps, 6" carbon steel pipeline, valves and other accessories;
- Replacement of current pipeline connecting the PIAS with injection well BMo 2040;
- Conversion of production well BMo 10 and/or BMo 11 to injection wells and its connection to the PIAS; and
- Drilling and installation of new injection well BMo.(s) 3081 and its connection with the PIAS.

From the 2nd half of 2020 on, the following surface facilities are projected to be included as part of the Project:

- Early production facilities (EPFs);
- Oil treatment plant, PTC, at BMo oilfield;
- Gas treatment plant, PTG, at BPO oilfield;
- Power generation plant, CT, at BMo oilfield;
- Gas pipeline connecting PTG and CT;
- Oil, gas and production water pipelines connecting the EFPs with the PTC and PTG;
- Construction and operation of fluids gathering pipelines connecting the well PADs with the new EPFs;
- Second stage of gas compressor station 11, EMC 11;
- Oil, gas and production water pipelines connecting EPF with PTC and PTG;
- Lease automatic custody transfer unit (ULACT), connecting the PTC and the Oleoductos del Valle's (OLDELVAL's) sale oil pipeline; and
- Oil pipeline connecting PTC and ULACT.

1.2.5 Project Utilities

Water Supply

Fresh water to be used at the Project includes both surface water and groundwater.

An amount of 776,200 m³ of surface water supply from the Río Neuquén at the Añelo municipal facility was approved by the Secretariat for Water Resources (SRH) through a "Gathering Permit" ("Permiso de Captación") for the drilling and completion of production wells. Four the first four wells, 4,300 m³ of water from the Añelo municipal facility was transported by cistern truck to the Water Management Facility (CGA); however, VOG does not foresee continuing to take water from the Añelo municipal loading facility given the risks¹ associated with truck transportation of the water to the CGA.

Fresh water used for the completion of the first four wells, was obtained from Cruz de la Lorena (CdL) Reservoir, operated by *O&G Developments S.A (Shell)* and transported to the CGA by means of a temporary pipeline. This operation has been authorized by the SRH through a second "Gathering Permit" of 200,000m³.

Water to be used for well fracking will be stored in ten 5,000 m³ reinforced concrete or steel sheets ponds which will be connected with storage tanks/ponds at the Water Management Facility (CGA) by

¹ Traffic Safety

8" to 10" portable aqueducts. At CGA, flowback water is also treated to reduce fresh water consumption.

Lastly, groundwater will also be obtained from water production well YPF.Nq.BMo-4 located at the BMo oilfield. VOG has also been authorized by SRH to extract up to 800 m³/day of water for industrial use, from the same YPF.NqnBMo-4 reconverted water production well.

Power Supply

Power will be supplied to the Project through electrical installations linked to the 13.2 kV network of the EL area. Power at EL is obtained from two main sources: external, with connection to the line of Centennial AT - Medanito (132 kV); and internal, from its own generation by means of gas-fired generators at the EL power generation plant (CT).

Power for the drilling and completion rigs, and associated camps, is generated by their own diesel-fired portable generators.

The Project also considers the construction and operation of a CT at BMo oilfield as well as a 33 kV network for feeding surface facilities.

1.2.6 Employment and Labour

Currently, VOG employs 231 persons while AM staff employs 225 persons. VOG expects to increase its current staff by 10.4%, or 24 new employees, while AM considers growing its staff in 22.2%, or 50 new employees.

Regarding indirect employment, it has been considered that the construction phase of the upstream portion of the Project will employ 378 contractors, while the midstream portion of the Project will require of 680 contractors.

1.2.7 Alternatives

The process for determining the location of each of the facilities composing the Project is determined by three principal variables:

- Needs and restrictions for subsoil resource development (oil & gas);
- Interferences due to existing facilities; and
- Environmental sensitivity of the area and potential impact zones.

An integrated and interdisciplinary analysis of these three variables results in a technically feasible, economically possible, and environmentally and social compatible location for the evaluated facility.

According to local applicable regulations, there is no need for evaluating different project alternatives, in particular for those minor projects requiring only an environmental assessment for licensing. On the other hand, the low sensitivity of the area where the development of non-conventional oil and gas production Project is to be placed, did not require evaluation of alternatives for the location of minor facilities.

For medium to large facilities, however, an environmental impact assessment (EIA) is required to obtain a license, including a justification supporting the selected project's alternative. In the case of the Project, the current evaluated facility that required elaborating an EIA was the construction and operation of a 12" oil pipeline connecting the battery at BMo oilfield and the PTC present at EL area. The following paragraphs justify the alternative selected for the route of this pipeline.

From an **environmental** point of view, the advantages of the selected alternative include:

- **Lower Impacted Area:** the selected alternative will minimize impacts from land clearance for the future 12" oil pipeline. Taking into account the good conditions of the existing right of way, it will

only be necessary to reduce the impacts associated with land clearance for the construction of the right of way of the pipeline;

- *Lower Consumption of Materials and Services:* the minimization of soil movement and clearing will result in reducing the necessary disturbance area as well as the associated light and heavy vehicle movements. This will result in a lower consumption of fuels and lubricants and the consequent reduction of emissions of greenhouse gases and particulate matter;
- *Minimization of Habitats Alteration:* impacts to native flora and fauna habitats will be reduced given the reduction of clearing activities, vehicle and machinery movements, and consequently the reduction of particulate and noise emissions; and
- *Lower Contingency Risks:* risks for environmental contingency (leaks and/or spills of fluids from vehicles, dispersion of solid wastes, etc.) occurrence will be reduced.

From a **technical-economical** point of view, the following relevant factors can be mentioned:

- The route of the oil pipeline is oriented in straight line from the header of the pipeline at BMO's Battery 1 to the PTC at EL area, which means the minimum possible length and the reduction of impacts associated with construction, operation and abandonment of the pipeline;
- The current right of way for the existing pipelines has good accesibility allowing easy access to work fronts; and
- All the special crossings, both natural and infrastructure (pipes, internal or local roads, routes, etc.), are already identified, evaluated and monitored.

From a **safety** point of view, the following aspects are noted:

- Given the good accessibility conditions of the existing right of way and the easy access to the work fronts, in case of an environmental or other accident, the evacuation of injured people and/or the arrival of necessary resources will be facilitated;
- When minimizing the construction of a new right of way, the exposure to risks associated with these activities will be reduced;
- The knowledge and experience of the lookout working at the existing right of way will result in an optimization of the use of this resource given that they will monitor both pipelines simultaneously, minimizing their exposure to risks associated with these activities.

1.3 Project Investigations

An ERM team worked both in Buenos Aires and Neuquén Province from May 15 through May 21, 2019 to collect project information / data in support of the ESIA effort. The objectives of the work were to:

- Collect as much existing information as possible on the development of unconventional oil and gas production project in BPO;
- Collect as much existing information as possible on the environmental, social, and health and safety aspects of the Project; and
- Conduct a field trip to the Project area to become familiar with the region where BP and EL areas are located, and to validate some of the gaps identified in the previous gap analysis phase and the extent of the ESIA content in those aspects related to social and labour management, including limited interviews with key stakeholders.

1.3.1 Field Inspections and Surveys

Site-specific social data were obtained during the May 2019 field effort. ERM visited the Project area to understand the extent of the Project area, confirm social context and met with VOG's key representatives in order to fill some of the gaps identified in the previous gap analysis phase, which was a desk exercise, and to develop content for this ESIA related to social and labour management.

The site visit included interviews with landowners, suppliers, local government authorities and external consultants hired by VOG. Semi-structured interviews were conducted in order to better understand the socio-economic and cultural environment in which the BPO project is operating.

The social baseline was developed through the review and analysis of secondary information from official sources, including the National Institute of Statistics and Census of Argentina, the Provincial Government of Río Negro, and the Provincial Government of Neuquén. In addition, an external factors media review related to the Project was conducted.

No baseline fieldwork was conducted to gather primary site-specific information on environmental aspects, issues and impacts. The environmental baseline presented herein was elaborated based on information gathered from previous national ESIA's developed which were approved by local authorities for the Project, as well as the results of the environmental monitoring performed by VOG.

1.3.2 ESHIA Contributors

The following individuals contributed to the preparation of the On-shore Non-Conventional Oil and Gas Development of Bajada del Palo Oeste (BPO) block Project ESHIA:

- Alfredo Wagner – Partner in Charge
- Andrea Fernandez Sanday– Project Manager
- Luis Dingevan - Senior Environmental Consultant
- Reed Huppman – Technical Director
- Yaneira Saud – Risk Technical Director
- Ricardo Flores – Risk Senior Consultant
- Patricia Diaz – Social Senior Consultant
- Natalia Delgado – Senior Environmental Consultant
- Veronica Villacis - Senior Environmental Consultant
- Lisset Saenz – Biologist
- Erick Chang – H&S Consultant
- Silvana Prado – Social Consultant
- Rodrigo Rojas – Social Consultant
- Rebeca Palomares – Environmental Consultant

1.4 Baseline Environmental Conditions

Highlights of the BPO Project ESHIA findings with respect to the existing environment are provided below.

1.4.1 Abiotic Components

Climatologic Aspects

The study area has a semi-arid climate, which represents a transition zone between the northern more humid climate and the Patagonian more arid climate to the south. It is characterized by a marked continental regime with water deficit conditions and a significant daily and annual temperature amplitude. Annual precipitation is less than 200 mm / year, with a water deficit that increases from west to east.

At La Higuera Station, the recorded annual average temperatures oscillate between 24°C and 7.2°C. The average annual temperature is between 15 to 16°C, which corresponds to a temperate or cool climate.

The high temperatures of January are influenced by the entry of warm air masses from the Atlantic Ocean. The low winter temperatures are related to the entry of cold air from the Pacific Ocean. The average temperature of January is high (more than 21°C), while the average temperature of July is less than 8°C. The rigorous nature of the climate is manifested in the fact that more than 30 frosts per year are registered in the region.

The pluvial regime is of Pacific type with maximums in autumn and winter, and with strong erosive effects. However, annual rainfall does not exceed 220 mm, which places the region within the dry belt of the Argentine Republic, with semi-arid or arid steppe climates.

The Project area is characterized by persistent and intense winds coming mainly from the West and Southwest throughout the year. The strongest winds occur during the months of August and September due to winds coming from the west, and in the months of January and February due to winds coming from the southwest. In addition, strong winds from the South are present during the months of November, December and January.

Geology

The area under study (BP and EL concession areas) is included in the morphostructural area called "Cuenca Neuquén", within the "extra-Andean" environment.

The term "Cuenca Neuquén" refers to a geological province developed mainly in the extra-Andean sector of Neuquén, South of Mendoza, Northwest of Río Negro and Southwest of La Pampa (Digregorio, 1972; Digregorio & Uliana, 1979). Its stratigraphy is characterized by the development of a thick upper Triassic sedimentary sequence overlain by Jurassic and Cretaceous formations. In addition, it includes continental deposits developed in a restricted environment, composed of alternating successions of sandstone and mudstone conglomerates.

In the BP concession area, the outcrops correspond to the south eastern flank of the Cuenca Neuquén, constituting sedimentary Cretaceous deposits. In the EL concession area, the Neuquén Basin sector corresponds to the Neuquino Engulfment. Much of the Jurassic and Lower Cretaceous that is represented in marine facies of different nature is associated with the Pacific Ocean.

Geomorphology

The study area (BP and EL concession areas) is located within the Eastern Region or the Neuquén Patagonian plateaus. The characteristic morphological feature of the regional relief is represented by broad discontinuous plateaus, whose surfaces are markedly flat, evidencing the structural control of the sediments on which they have been carved.

The relief "mesetiforme" predominates in all the extra-Andean area of the province. These are geofoms on a terrace with an eastward slope, strongly eroded. It is not a homogeneous relief. Rather, it alternates between low mountainous areas, such as Sierra Negra or Auca Mahuida in the extreme northeast of the province, and valleys and river terraces resulting from erosive action mainly from the Colorado, Neuquén and Limay river. The canyons are similar to the valleys, but are of smaller scale, and are generally formed in these arid zones by intermittent water currents within low and extensive depressions formed by the subsidence of the crust.

Topography

The BP concession area has the highest elevations on the eastern flank, with elevations ranging from 530 to 660 meters above sea level (masl). The lowest altitudes are in the extreme west of the area, with elevations between 325 - 390 masl. The general slope develops in an east-west direction. There are slopes in a northwest direction in the south sector and slopes in a southeast direction in the north zone. In the central zone, which has the highest density of oil wells and facilities, the elevation is between 566 in the west and 546 masl in the east. The topography in this area is largely irregular. Some sectors are flat, some are more elevated and alluvial transport is a dominant feature. In addition, isolated remnant blocks from erosion are present.

Most of the EL concession area is located between 300 and 600 masl. The sectors with higher elevation are in the central north of the study area. The North sector is the most extensive, has a flat to gently undulating relief with slopes of 1 to 2%, with of up to approximately 100 meters in the central north area. To the northeast, there is a lowland flooded sector, alluvial and colluvial deposits and deposits that cover dissected pediments which slope to the Colorado River. In these situations, the sediments are silty and sandy with low bearing capacities. The alluvial deposits culminate at the base of slopes (which geologically coincides with the El Palo Formation). In this sector the water courses are of little importance, but there is flood risk for the facilities located in the area. These watercourses are rain-fed and flash floods can occur after intense and / or prolonged rainfall.

Soils

The soils of the BP concession area correspond to environments with annual water deficit (edafoclimaaridic). The water balance of these soils is negative, which implies very little mobilization of constituents in their profile. Therefore, soluble salts accumulate very close to the surface, and soft and cemented forms of limestone and gypsum are frequently found.

In the area, the soil orders of Entisols and Aridisols are present. Entisols are soils from null to incipient genetic development. Therefore, they often lack diagnostic horizons. Most of its properties (colour, texture, etc.) are inherited from parent materials and have been little altered by the natural environment. Aridisols are characterized by sparse shrub steppe, so the organic matter content is very low, and they have a negative water balance that prevents or reduces the mobility of the constituents in their profile.

At the EL concession area Aridisols are predominant in "high places" and Entisols are predominant in "low places". Aridisols present greater pedogenetic development, with more horizons that are reddish in colour and structured with a higher percentage of clays. The texture is loamy clayey or sandy clayey and, in some cases, incipient varnishes are observed. The soils have a sandy layer of 15 cm due to wind accumulation, and below it another layer with a finer clay loam to sandy clay loam texture, whose thickness varies according to the depth of the petrocalcic horizon.

Regarding soils from the Entisols order, deposits of sand of wind origin and of variable thickness have masked the fluvial imprints. In turn, they present little to no pedogenetic development. In these, the petrocalcic horizon can be found at different depths, varying by several tens of centimetres to more than one meter. The Entisols also exhibit salinity in the first 50 cm of soil.

Hydrology

As a general description, the project area (BP and EL concession areas) is a desert plain in northern Patagonia. Only major rivers from the Andes East-SE to the Atlantic Ocean, located South and East of the project area. Some minor creeks cross the area, and while flow during sporadic rainfalls, and are dry most of the year.

Temporary watercourses are found within the BP concession area. Hydrologically, the most important feature is the Neuquén River, which flows between 20km south of the boundary area and Bajo de Añelo. Also, in the centre of the department of Añelo, a great depression called Bajo de Añelo, is located Northwest of the area. Many alluvial creeks (temporary streams), including those that begin in the western sector of the concession area, drain into this depression.

The permanent water courses closest to the EL concession area are the Negro River, the Neuquén River, the Colorado River and Pellegrini Lake. The Negro River is formed by the combination of the Neuquén and Limay rivers. It is the most important hydrographic system of the national territory. This river advances through arid plateaus with variable valley width and does not receive contributions from any tributary throughout its course. The Neuquén River drains an area of 30,000 km², with an average flow of 280 m³/sec. Its hydrologic regime is of pluvionival type, and it presents violent floods during the winter and at the end of the spring. The Ballester dam is located approximately 40 km upstream from the confluence with the Limay River. It enables the diversion of water for irrigation of the Alto Valle and diverts excess to Lake Pellegrini, a man-made reservoir.

Hydrogeology

In the description of the Inventory of Natural Resources of the Province of Neuquén, the BP concession area and the surrounding areas are located within the group of aquifers corresponding to plateaus. The Meseta (plateau) aquifers are developed in the flat and sub horizontal areas of gentle slope to the east that crown the plateaus that are located in the area of Patagonia Extrandina. These aquifers are typically covered by gravel and, eventually, by lava flows. The gravel levels are of variable thickness and decrease progressively towards the east. The contribution of water is local and comes directly from rainfall or the melting of seasonal snow. The movement of the water is initially vertical from the surface gravels until it makes contact with the sediments of lower permeability, which are usually related to the Tertiary are continental and marine sediments. In addition, the slope of the aforementioned stratigraphic horizons condition the movement of groundwater flow, which is generally to the east. In the case of plateaus with basaltic cover, the vertical percolation is governed by the vertical fractures that the lava flows present.

The hydrogeology of the EL concession area is local and comes directly from rainfall or snow-melting. Only along the main rivers is infiltration into the banks observed. The study area is located in a mesetiforme environment with an arid climate and steppe vegetation, which leaves the soil directly exposed to precipitation and convective storms. On the surface of the plateaus, it is common to find isolated or partially aligned endorheic basins. In the lowlands there are brackish and/or salt-water bodies of seasonal regime that largely influence the composition of groundwater to which they transfer similar chemical characteristics. The dissected Pedemontana alluvial plain is present in much of the area. Its low slope (< 2%) and low coefficient of runoff favours infiltration over surface runoff. In the Pedimentadas units, there is a dendritic drainage network of important collecting channels that drain into both the Colorado River and into the reservoir Embalse Casa de Piedra east of the area, as well as into the Barreales de la Amarga to the South.

The first aquifer in the Project area (BP and EL concession areas) has a potential of approximately 100 mbgl or more, and needs to be protected from drilling activities.

Air Quality

According the air quality monitoring results for several facilities, some of the parameters in sampling points are below the detection limits of the laboratory's analytical methods. It should be noted that in some cases (Styrene, Naphthalene and Hydrogen Sulphide), the detection value is greater than the value established in the national Argentina guideline values. As such, it cannot be determined the results exceed the national standard.

Particulate material was evaluated in six stations. In one of these stations, the registered value (0.88 mg/m³) surpasses the guideline values of the IFC std (PM₁₀ = 0.05 and PM_{2.5} = 0.025).

Emissions

Considering that the power generators present at the Entre Lomas Power Generation Plant are engines with compression ignition and that for this type of sources the Ambient Air Quality of the IFC General EHS Guideline (2007) has only established a NO_x emission guide level of 1,600 mg/Nm³, it can be assessed that all NO_x results are in compliance with the guide level set by IFC.

In Neuquén province, there are regulations that prohibit gas venting in exploration wells and during production operations at gas wells, as well as limits on air emissions at oil wells. Provincial Law N° 2.175 and National Resolution SE N° 143/98 are the regulations specific to flaring and venting. These regulations establish the mechanisms to request an exception for flaring/venting for exploratory and completion activities. Flaring during well testing will require approval by the enforcement authority (Undersecretariat of Energy). Exceptions for venting are considered in some cases, for example: well testing, gas treatment plants, and maintenance activities.

Water Quality

Deep Wells

According to permit Disposition SRH N° 281/18, VOG is authorized for extraction of up to 800 m³ / day water flow from the converted water producing well called BMo-4, destined to satisfy water requirements for industrial use, injection for secondary recovery, fracking, and other industrial uses in the Bajada del Palo area.

The converted deep well BMo-4 has a total depth of 3,375 meters, and was converted to water abstraction well, punctured between 312 and 619 meters (Grupo Neuquen) for fresh / brakish water abstraction. .The extracted water was tested for water quality and high concentrations of residual Aluminum and Total Iron were observed, so it does not meet the potability conditions established by the Argentine Food Code; also according to the values of electrical conductivity and the Na, Mg, and Ca cations to determine the RAS, the permit concluded that the salinity did not allow the use for irrigation water. Based on this, the authorities allowed the use for industrial application for hydrocarbons exploitation.

Considering that there is no national standard for groundwater quality, the following guide values have been considered as a reference guideline:

- The guide values used for the environmental water quality are those indicated in Annex II of National Decree 831/93, Table 1 (Water for Human use with conventional treatment)
- Argentinean Alimentary Code (drinking water parameters).
- The guide values used for the environmental water quality are those indicated in Annex II of National Decree 831/93, Table 5 (Irrigation water)
- DPA N°886/15 (Rio Negro) Maximum limits allowed for discharges
- Decree N°790/99 (Neuquen) Maximum limits allowed for discharges

According the deep wells monitoring results for water quality, they do not meet the potability conditions established by the Argentine Food Code, nor the Guidelines for Human use with conventional treatment, nor the Guidelines for Irrigation use.

Based on this, the authorities allowed the use for industrial application for hydrocarbons exploitation.

Produced Water

Produced water is the high salty water associated to the exploitation of hydrocarbons (oil and gas).

Monitoring was conducted at Battery 1 BMo to determine produced water quality.

The produced water in the VOG project is being reinjected (previous treatment) to deep well.

The guideline values used for evaluating produced water quality are those outlined in Disposition N° 0372/15 from the SRH of the Province of Neuquén, in which VOG is authorized to deep injection of fluids originated during the exploration and/or operation of Bajada del Palo oilfield (including flow back fluids from the exploration and/or exploitation of non-conventional hydrocarbons) with previous treatment at disposal well BMo.s 2040.

Analytical results were also compared against the Emissions, Effluent and Waste Levels from Onshore Oil & Gas Development included in the IFC EHS Guideline for Onshore Oil and Gas Development (2007) for discharging treated produced water to surface water stream or to the land. These parameters do not apply given the deep reinjection process used.

Concentrations for total petroleum hydrocarbons, mercury, cyanide and phenols are in compliance with guidelines levels established for deep well injection as established in the SRH injection permit. Given that detection limits for hexavalent chromium, cadmium and arsenic are greater than the value established in Disposition SRH N° 0372/2015, it is not possible to assess whether concentration of these parameters in treated produced water comply with guidelines levels established for deep well injection. Lead concentration resulted in a higher value than the established by Disposition SRH N° 0372/2015.

Given that treated produced water is injected in disposal deep wells and that IFC EHS Guideline for Onshore Oil and Gas Development are established for discharging treated produced water to surface water stream or to the land, evaluation of the compliance of the results for the treated produced water with IFC EHS Guideline. is not applicable.

Taking into account the results of the monitoring, it will be necessary to adjust the laboratory's detection limits in order to allow assessing whether treated produced water comply with guidelines levels established for deep well injection. Additionally, once compliance (or not) is determined, it will be necessary to adjust the produced water treatment in order that those exceeded parameters reach the guideline levels set by Disposition SRH N° 0372/2015.

Effluents

All the parameters analysed in treated sanitary wastewater are below the guideline values established in Disposition SRH N° 0084/2017.

With regards to IFC standards, all results for pH, BOD, COD and total phosphorus, are below the guide levels, while all oil and fats results are not in compliance with guide levels. In addition, the result for total nitrogen at the WWTP present at drilling rig H-103 is below the correspondent guide level established by IFC, while results obtained for WWTP present at drilling rigs NB F-19 and Q-12 do not comply with IFC guide levels. Lastly, it is not possible to assess compliance with IFC guide levels for total suspended solids and total coliform bacteria, given that sedimentable solids and fecal coliform bacteria were analyzed instead of these.

1.4.2 Biotic Components

Flora

The Project area (BP and EL concession areas) is in the Argentine Monte Ecoregion as defined by WWF². This biogeographic province is characterized as shrub land steppe. The jarillal is the climax community dominated by species of the family Zygophyllaceae (*Larrea cuneifolia* and *Larrea divaricata*). The vegetation is of low height and sparse coverage, not exceeding three meters and 50% ground cover. Five vegetation communities were found and classified into the following coverage units: lute vegetation, hydrophilic vegetation, jarillal, monte de zampa, and psammophilous vegetation. In a lower scale, three types of floristic associations were found: vegetation of "huayquerias" and "bardas"³, *Atriplex lampa-Sueda divaricata* association and *Larrea divaricata-Larrea cuneifolia* association. A total of 36 species of plants, belonging to 15 families were registered

² <https://www.worldwildlife.org/ecoregions/nt0802>

³ Las "bardas" are the steep and cut edges of the plateaus or fragments of plateaus, while the "huayquerias" are soils of fine clay dust soils, very poor in organic matter, of fine material, of clayey type

in the EIAs⁴ and the Environmental Reports⁵. The richest family was Asteraceae with 12 species. *Atriplex lampa* and *Pappostipa* sp. were the most abundant species. Most of the species reported are native, only one being exotic (*Tamarix gallica*).

Fauna

Presence of wild species adapted to arid environments and large daily temperature variations were registered in the EIA and Environmental reports. Presence of domestic fauna (cattle, sheep, goats and horses) in the surrounding of the Project site is sporadic. Line transect sampling was used to survey the wild fauna. A total of 31 species were recorded consisting of 16 birds, 8 mammals and 7 reptiles. Most of the records consists of indirect evidence as feces, footprints and burrows. Direct sighting of *Lycalopex griseus* and *Zaedyus pichiy* was reported. There is potential for the presence of additional species in the project area due to their occurrence in the region. These include 4 birds, 4 mammals and 4 reptiles.

Threatened and Endangered Species, Endemic Species

No threatened or endangered species were identified for flora; however, two endemic species were reported, *Ephedra ochreatea*, an Argentine endemic, and *Menodora robusta*, a Patagonian endemic.

Most of the fauna species reported in the Project area are considered Least Concern and none are Endangered or Critically Endangered according to the International Union for Conservation of Nature (IUCN) and to Argentinian legislation respectively. However, national legislation recognizes conservation status for five species, the IUCN for one species and CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) for four. These species are: *Pterocnemis pennata* (bird), *Puma concolor* (mammal), *Lama guanicoe* (mammal), *Zaedyus pichiy* (mammal) and *Chelonoidis donosobarrosi* (reptile). In addition, four endemic species were identified: *Liolaemus darwini* (reptile), *Liolaemus gracilis* (reptile), *Liolaemus grosseorum* (reptile) and *Philodryas trilineata* (reptile).

1.4.3 Social Components

The social baseline was developed through the review and analysis of secondary information from official sources. Additionally, a site visit was carried out on May 16 and 17, 2019. The main limitation was the lack of updated data, since last national census was in 2010.

The Project is located within two provinces. First, the Province of Neuquén is divided into 16 departments, one of them being the Department of Añelo, in which the Municipality of Añelo is located. Second, the Province of Río Negro is divided into 13 departments. The Municipality of Catriel is located within the Department of General Roca. According to the 2010 Census, the population of Añelo was 2,689. Since the 1991 census, Añelo's population has more than doubled. Similarly, the population of Catriel was 17,584. Between census periods, the population of Catriel grew by 19.46%. In 2018, Catriel had an estimated population of 19,956 people⁶. According to demographic projections, by 2018, the population of Añelo had tripled to approximately 8 thousand people⁷, due to the development of the "Vaca Muerta" Hydrocarbons Project and the high employment expectations that the sector generates.

4 EIA "Tendido de Oleoducto 12" desde su Cabecera en BMO, sita en zona aldeaña a futura EMC-11, Área Bajada del Palo – NQN; hasta la PTC Charco Bayo, Área Entre Lomas – RN

5 Informe Ambiental: "Perforación de 16 pozos productores de petróleo y/o gas. Yacimiento Médano de la Mora - Área Bajada del Palo. Petrolera Entre Lomas S.A. - Provincia de Neuquén".

Informe Ambiental: "Perforación de 32 pozos en 6 locaciones (PAD 5,6,7,8,9 y 10) Yacimiento Médano de la Mora. Área de Concesión Bajada del Palo".

Informe Ambiental: "Tendido de acueducto, oleoducto y gasoducto. Área de Concesión Bajada del Palo – Provincia de Neuquén".

Informe Ambiental: "Construcción y montaje de EMC11. Área de Concesión Bajada del Palo – Provincia de Neuquén"

⁶ Estimated population based on sex, age and area, Río Negro, 2018. Health Ministry, Río Negro.

⁷ <https://www.lmneuquen.com/por-trabajo-llegan-anelo-unas-7-familias-semana-n599544>

According to an article published in the newspaper Río Negro, Añelo forecasts further growth in the future and 25,000 inhabitants by 2023-2024.⁸

According to official sources, Añelo has educational infrastructure for preschool, elementary and secondary school levels (01 preschool, 03 elementary schools, and 02 secondary schools). Similarly, Catriel has 08 preschools, 10 elementary schools, 04 secondary schools and 02 non-university higher education schools. There is one university (Universidad Nacional del Comahue) within the study area. Regarding public health services, in 2017, there was 5.8 medical personnel per 1,000 inhabitants in Catriel⁹. Nowadays, Añelo has one health center plus the new Añelo hospital, while Catriel has one hospital and seven health centers.¹⁰

The oil and gas industry is central to the economy of the province of Neuquén. In 2015, a total of 218 oil and gas extraction establishments were registered.¹¹ Primary activity is the main source of investment within the Department of Añelo's economy (55%), which has been growing considerably in recent years. In addition, in the last decade there is an incipient agricultural activity, highlighting the horticultural and fruit production, as well as the forestry and wine industry. The secondary sector corresponds to the 15% of the economy; this is a symptom of the limited industrial development. The tertiary sector has a 30% share, with a strong dependence on the primary sector. In terms of economic activities, the main occupation in the study area is related to the oil industry and its associated services, as well as extensive livestock farming.

The inhabitants in the project area are owners of ranches for animal grazing and ranch workers. The land in the Project's area of influence is located in the semidesert climate domain, known as arid diagonal, and characterized by its scarce precipitation, its orographic features and an arid temperate climate¹². An incipient livestock activity is developed in some extent in the Project area, by landholders who maintain subsistence economies based on cattle. This is characterized by the development of extensive mixed livestock, based on traditional practices with low investment in infrastructure and technology. There are no fruticulture in the Project area of any other type of crops. In general, the animal load is causing a negative environmental impact due to overgrazing. The degradation of natural pastures and the disappearance of species valued by livestock, with evidence of soil erosion, is one of the oldest and most widespread environmental impacts in the region. Thus, it is assumed that most Project landowners used to be very vulnerable actors, at least in terms of income and lack of access to basic services, as observed during the site visit. VOG, through its Land Access area, is committed to establishing transparent economic agreements based on real compensation in respect to the legislation, in order to break with the practices of the past.

Companies are entitled to occupy and pass through third parties' real property to develop their activities. In such regard, a compensation must always be paid to the landowner for such occupation. National and provincial authorities understand that oil & gas exploitation activities are considered of public interest, so landowner's objection to the occupation or failure to agree with respect to compensation does not constitute a reason to suspend or prevent oil companies' works. However, companies are incapable of expropriating landowners' real property, as this is an exclusive power of the State and there is no antecedent of the State expropriating real property in the region due to lack of an agreement between the parties

Following citizen participation legislation, a public audience was held in Añelo on May 3, 2019. Despite the wide call deployed by the Environmental Authority, citizen participation was scarce. As part of the stakeholder engagement program (chapter 9), it is planned to hold complementary communication meetings with stakeholders around technical issues. As indicated in Chapter 9, Vista is working on

⁸ <https://www.rionegro.com.ar/anelo-se-prepara-para-una-ciudad-de-25-000-habitantes-MH5867952/>

⁹ Estadísticas de Servicios de Salud, Ministerio de Salud de la Provincia de Río Negro, 2017. Pg.36.

¹⁰ <http://programasumar.com.ar/efectores/neuquen.php>; <http://programasumar.com.ar/efectores/rionegro.php>

¹¹ Basic Municipal Information, Volume 17, Year 2015, Provincial Directorate of Statistics and Census, Province of Neuquén. <http://www.rionegro.gov.ar/index.php?contID=15965>

¹² COPADE, Estudios estratégicos para el desarrollo territorial de la región Vaca muerta, 2012.

systematizing the documentation regarding meetings with local stakeholders and elaborating a stakeholder mapping. Project's main stakeholders are:

- Landholders ("superficiarios"), with whom a series of agreements have been established for access to their lands through easement contracts. Vista has identified 16 housing facilities in the area, 03 of which were uninhabited. However, as part of the mitigation measures proposed in chapter 8, a complete characterization of residence in the project area is included in the action plan. This characterization must contain specific information on residence (temporary or permanent) and socio-economic conditions of landowners and caregivers.
- Local companies of services and goods with potential to be suppliers of the Project, such as CASEPE (Chamber of oil services of Catriel), PIMA Center, and CEIPA, CAPESPE, ACIPAN in Neuquen. Many companies are struggling to adapt to the standards required by O&G companies in Vaca Muerta.
- Municipalities of Añelo and San Patricio de Chañar (Province of Neuquen) and Catriel (Province of Rio Negro). With these three municipalities, Vista has maintained biweekly meetings in order to define the specific intervention lines of cooperation, as it is the case with RIL (Red de Innovacion Local).
- Workers unions: The *Union of Petroleum and Private Gas of Rio Negro, Neuquén and La Pampa* represent base workers. The agreement that binds them and under which the entire industry in the region is organized, is 644/2012. All the operators Vista hires are under this agreement. Additionally, the *Hierarchical and Professional Personnel and Private Gas of Neuquén, Rio Negro and La Pampa* represents supervisors. The Collective Agreement that binds them is 637/2011. Vista has a large part of its supervisors under this agreement; however, those considered as "trusted personnel" and administrative are excluded. Vista's Labor Relations area is in charge of permanently coordinate with unions participate in meetings and apply all new regulations that are agreed collectively.
- Local institutions: Vista has been supporting various sports, cultural and social organizations of Catriel and Añelo in specific demands.

Neuquen is the third province of the country that concentrates indigenous population.¹³ In the Province of Neuquen there are currently 57 Mapuche communities settled in rural areas.¹⁴ However, based on the list of Indigenous Communities with registered legal status, there are no legally recognized indigenous reserves in the direct Project area.¹⁵ According to the land access process implemented by VOG, the Environmental Impact Assessment studies, and interviews with local stakeholders, no indigenous people settlements were found within the Project area either; thus, no formal contact was made with Mapuche communities.

When it comes to the archaeological background of the area, EIA and IA assessments approved by the local environmental authorities concluded that: "*There are no previous studies that record evidences of sites of historical interest, archaeological and / or paleontological in the study area (BPO and AEL)*".

In case of any chance finding that may occur during the execution and operation of the project, the developer should proceed in accordance with the provisions set forth by the Environmental and Social Management Plan, according to the legal requirements of Law 2184 Protection of the archaeological and paleontological historical heritage; and the IFC PS8 which aims to ensure that clients protect cultural heritage in the course of their project activities

¹³ Basic Municipal Information, Volume 18, Year 2016, Provincial Directorate of Statistics and Census, Province of Neuquen.

¹⁴ <https://www.argentina.gob.ar/derechoshumanos/inai/mapa>

¹⁵ <http://datos.jus.gob.ar/dataset/listado-de-comunidades-indigenas>

1.5 Potential Impacts

1.5.1 Physical Environment

Geology and Geomorphology

Impacts related to geology and geomorphology refer to the possible changes resulting from surface activities, oil drilling and construction activities that include clearing, soil movements, changes to slopes and embankments, seismic tracks (if applicable), and underground drilling.

Soils

Impacts to soil include loss of, or damage to, terrestrial habitat, creation of barriers to wildlife movement, soil erosion, and disturbance to water bodies including possible sedimentation, the establishment of non-native invasive plant species and visual disturbance. The extent of the disturbance will depend on the activity along with the location and characteristics of the existing vegetation, topographic features and runoffs. Soils will be impacted by clearing, land conditioning, movement of soil, and compaction where the facilities will be built (temporary and permanent facilities during construction stage), and potential solid waste generation due to construction and operation activities.

Surface Water and Groundwater Hydrology (Quantity)

Impacts to surface water and ground hydrology are linked to the Project's construction and operation stages. These impacts refer to potential physical effects on surface water by modification or alteration of channels, runoff, and use of water resources. Groundwater hydrology could also be affected during drilling operation if proper measures are not taken during drilling or reinjecting of wastewater, or could be affected by indirect impact from water or wastewater discharges.

Soil Quality

The main potential impact to soil is soil chemistry alteration, which refers to possible changes in the chemical properties of the soil such as pH, Cation Exchange Capacity, salinity, nutrient content and organic matter or a reduction of the possibilities of life in the soil due to waste concentrations (cement, iron, resins, lubricants, fuel, etc.). In addition, the physico-chemical characteristics of the soil could be affected during construction stage, as well as during the perforation and termination stage, by wastes, effluents, or leaks coming from surface activities, temporary camps, construction of roads, transport of materials, construction fronts, hydraulic tests, well tests and location of facilities, drilling and operational activities. Depending on the contingency that may arise, impacts to the soil will be moderate and probably of isolated occurrence, especially considering the use of lubricants, fuels, chemicals and solid waste to be used in the Project and their potential spills.

Air Quality

The most important impact in terms of air quality is the increase in Atmospheric Emissions and Particulate Matter. This refers to the concentration of suspended particles, NO_x, SO_x, CO. Other pollutants including: hydrogen sulfide (H₂S); volatile organic components (VOC); methane and ethane; benzene, ethylbenzene, toluene, and xylenes (BTEX); glycols; and polycyclic aromatic hydrocarbons (PAHS) present in the Project area that may produce risk, harm or discomfort to people; during installation or operation. Greenhouse gas emissions (GEG) from facilities and support activities, will generate annually aggregated emissions and impacts on air quality will be also indirectly related to energy efficiency standards.

Surface Water and Groundwater Quality

These impacts refer to potential effects on the physical, chemical properties of surface water by potential toxic substances, sediments, solids, or waste water produced by the Project.

Aesthetics Quality

The main aesthetic impact corresponds to landscape visual alteration. The most important alterations on the landscape will result during the construction phase of pipelines or enhancement of facilities within this area, where the movement of people and vehicles, added to the tasks of access road openings and transportation of pipes and materials will contrast with the natural landscape. Operation of oil & gas facilities, aqueducts, pipelines, wells, treatment facilities, injection plants, pumping and compression stations, storage facilities, mobilization of equipment and personnel for the project, as well as the use of machinery and heavy equipment were also considered as impacting landscape because presence of such facilities/activities will remain in place and the prior landscape of ranches and valleys will be altered during a long-term operation.

Noise Quality

Noise impacts will include variations in the acoustic pressure levels (L) measured in decibel units (dB), that are represented by (Leq), (Lmin), and (Lmax). The greatest impact will be in areas with no previous or minor current noise impacts. Construction stage will definitely generate noise during all activities, and during the operation stage, potential noise impacts would be related to noise coming from drilling activities, transportation, energy generation system or gas-fired/power generators, workshops, air traffic, gas burning during well tests, among other operational activities.

1.5.2 Biological Environment

Terrestrial Flora

Decrease of the vegetation cover and floristic composition will occur due to clearing and soil removal activities in the areas where the temporary facilities will be installed such as access roads and areas where the new drilling platforms will be located.

Loss of soil quality due to compaction as a consequence of the circulation of vehicles, potential spills of hazardous substances and erosion processes due to the reduction of vegetation cover, will affect the settlement of new plant recruits and subsequently the regenerative capacity of the vegetation. Also, impacts to air quality due to gaseous emissions or deposition of particulate matter on leaves could prevent normal development and diminish vitality.

The restoration activities will have a positive effect on the floristic composition and vegetation cover. The purpose of this process is to give the revegetated area the capacity to return to ecological conditions equivalent to original conditions. The decompaction of the soil should be considered, which will allow its aeration and oxygenation, allowing the regeneration of the physical - chemical conditions for growth of microorganisms, rooting, germination and root penetration. The reestablishment of soil morphology conditions will allow the minimization of erosive processes and promote the regeneration of water balance. As a result, the final revegetation activities will tend to contribute to the restoration of the total area impacted by the project. Which means that, performing cleaning, restoration, and scarifying of lateral surfaces will affect in a positive, synergistic way to soil, flora, fauna and landscape factors, generating at the level of vegetation management the necessary conditions for the revegetation and natural succession of native species. These native species will help complementarily to reduce erosion, improve runoff surface, and improve soil capacity of water absorption, among some other positive properties.

Terrestrial Fauna

Fauna displacement is the modification of the distribution area of the population of one or more species. This displacement may imply abandonment of nesting sites and habitat. The displacement of terrestrial endemic or local fauna is directly related to activities of clearing because it involves the loss of habitat. Likewise, in the construction stage the presence of vehicles, machinery, heavy equipment (for the formation of the drilling platform and the construction of drilling facilities), noise, as well as the presence of workers in the area may cause a significant disturbance to local fauna. Nonetheless, it is expected that, during operation the native fauna will be scarcely affected in its natural habitat by the activity of drilling and subsequent exploitation because there will not be limited

human activity as during operation, worker presence will be limited to one or two employees and a vehicle for a few hours.

The reduction of the number of individuals of terrestrial fauna during the construction phase of the Project is mainly related to the loss of habitat and ecological niches caused by the clearing activities and personnel presence, which will generate a disturbing effect on fauna behavior and may alter the ecological niche. The reduction of the number of individuals of terrestrial mammals and the change in their composition during the construction, operation and abandonment stages of the project will be affected and impacts will be mainly related to noise. The circulation of vehicles will also be a disturbance factor for mammals, potentially affecting their behavior. Clearing and soil removal may generate loss of ecological niches especially of the small and medium mammals as it will impact nesting sites and food sources for some species, affecting species' ecological niches. Other aspects in the drilling stage that could disturb fauna, causing its displacement to other areas, include the presence of workers and night lighting, which may drive birds away. Herpetofauna may be the most sensitive group to be affected by the Project activities, especially in the construction stage due clearing and soil removal due to their relatively slow mobility. Herpetofauna rely on the shrubs for shade in the arid environment of the Project, and also use shrubs to scape predators. Consequently, considering their mobility and small distribution range, individuals of the herpetofauna group may not be able to escape on time from clearing or soil removal activities.

1.5.3 Social Environment

Change in land use and landowners livelihoods

As mentioned in the social baseline section, the use of land in the direct area of influence is mainly for cattle ranching. VOG and AM guarantee Project access to land through right of way agreements between VOG or AM and landowners. Once the agreements are completed, the landowners are converted into landlords who receive an income from easement agreements that typically far exceed their revenue from livestock activity, which may increase rural uprooting (mainly among the younger generation) and migration to other places (the majority of landowners do not live in the Project area any longer, although there are landowners interested in working or providing services to the Project) and/or economic activities (creating a risk of easement dependency).

Local employment generation

Currently, VOG employs 231 persons while AM staff is composed by 225 persons. VOG expects to increase its current staff in about 10%, while AM considers growing its staff in approximately 22%. Regarding indirect employment, approximately 2,000 contract workers, mainly supply chain workers, benefit from VOG and AM operations, many of which are local. It has been considered that the construction phase of the upstream portion of the Project will employ 378 contractor's staff, while the midstream portion of the Project will require 680 contractors.

Increased Demand of Local Goods and Services

It is expected that in the urban areas near the Project, during the construction and operation phases, demand for local goods and services (engineering, maintenance, warehouses, attention to camps, catering, cleaning, security, etc.) and indirect jobs are going to rise in the municipalities that will host most of the new oil and gas extraction-related workforce. These workers will require goods and services to satisfy their basic needs and will benefit existing and new businesses that will provide those goods and services, increasing their commercial activity. In addition, the Project will require extra labor to provide goods and services and harness the increased commercial activity.

Community health, safety and security

There are dispersed and temporary residents of ranches dedicated to livestock within the Project area. Although not expected, there is a potential risk of affecting one of these landowners' families who use an access roads to their properties that is shared with the Project. Given the distance

between the Project's area and nearest communities, no significant risks related to physical hazards affecting nearby communities are expected.

Increase of vehicular traffic would manifest in temporary greater vehicular congestion and in the increase of the time of transfer, both pedestrian and vehicular; as well as in the increased risk of vehicular accidents (traffic safety) due to ongoing construction works in several locations, regular presence of loose cattle or domestic animals, and potholes; increased particulate matter and other emissions and noise, particularly for RP7, RP8, and RP51, the main and busiest routes that provide access to the Project. The distance between site facilities and communities prevents pedestrian interaction with vehicles engaged in Project's activities. The impact to traffic safety is mostly foreseeable during the construction phase.

Given the large distance between the Project's facilities and nearest communities, the risk of community exposure to hydrogen sulphide and/or other hazardous compounds in air emissions is unlikely to occur.

It has been considered that all Project facilities have full time security presence as well as controlled access points (guarded gates). In addition, adequate signs and closed areas establish the areas where security controls begin at the property boundaries. Therefore, security risks are not foreseen.

In sum, given the distance between the Project site and local communities, dispersed and temporary residents (landowners), and the restricted access to the Project area, it is considered unlikely that community members will be exposed to community health, safety and security risks.

1.6 Cumulative Impacts

1.6.1 Construction Phase

Incremental contribution of pollutant emissions and discharges

If suspended dust and combustion gases, as well as noise and liquid discharges from the construction phase activities are jointly evaluated with the current operations in neighbouring oilfields, emissions and discharges could be considered a cumulative impact.

Increased erosion

The increase of erosion in the Project area due to construction phase's activities (removal of vegetation, excavation, grading or other interventions, transit of vehicles and heavy machinery, etc.) and the parallel activities of other developments in the nearby areas of the Project will be cumulative.

Reduction of water flow in the Rio Neuquén Basin due to multiple withdrawals

Water reduction due to Project's water consumption in the long term plus multiple withdrawals by the Project and other developments in the area may result in a reduction of water availability in the region from both the Neuquén River and underground wells, and therefore constitutes a cumulative impact.

To minimize this impact in the long term VOG is considering in the project to build a future flow back water treatment plant to maximize recycling of this water and minimize new water abstraction.

The impact of reduction of water availability in the basin due to multiple withdrawals has been considered as High Priority. Therefore, efficient use of water and on prevention of available freshwater resources depletion in the short term is being administrated by the local Secretariat of Hydric Resources and permits for fresh water abstraction need to be approved by the local authorities. In the long term, water reduction impacts are being addressed/ mitigated by the Project and other water users in the region by strategic actions (i.e.: water use reduction, recycling of flowback water, etc.)

Interference with wildlife movement or biodiversity in general

Construction activities will likely reduce the carrying capacity and wildlife movement in the ecosystem, not only because of vegetation clearance and soil removal—considered as direct impact—but also

because of noise, emissions and effluent discharge, soil compaction, lighting, and human presence—indirect impacts—that will be generated during the construction stage of the Project. Given that the region is being affected by the BPO Project and other development activities, the impacts on biodiversity could be cumulative.

Regarding flora aspects, the local vegetation will be impacted by the Project activities referred to previously, but it is also important to consider a current socio-economic aspect that also impacts the region. It is that the natural shrub vegetation is randomly exploited for fuelwood extraction, an unsustainable and uncontrolled activity that may cause environmental impacts. Thus, a potential decrease of the floristic composition and the vegetal cover entails in turn the following main effects aggravation: changes in habitat conditions for the wildlife; alteration in vegetation distribution patterns; microclimatic modifications; by all actions from the project and from other cumulative, synergic impacting-actions.

Saturation of basic human services due to in-migration

The rapid growth of Añelo triggered by all projects related to the development of the Vaca Muerta shale oil field (including VOG and AM), has generated employment and business development expectations. This not only means an increase in the number of inhabitants in the community, but also an increase in the demand for local services such as education and health and can be considered a cumulative impact.

Transit of vehicles

The cumulative effect of the expected the increase in vehicular traffic could manifest itself in temporary greater vehicular congestion and in the increase of the time of transfer, both pedestrian and vehicular, as well as in the increased risk of vehicular accidents, increased particulate matter and other emissions, and noise due to the increased presence of vehicles, particularly for RP7, RP8, and RP51, the main and busiest routes that provide access to projects (including VOG and AM) developing the Vaca Muerta shale oilfields.

Economic Dynamics

Several non-conventional oil and gas extraction projects are currently being developed or are in the process of being developed between Neuquén and Rio Negro provinces. In the urban areas near these developments, demand for local goods and services and indirect jobs are going to rise in the municipalities that will host most of the new oil and gas extraction-related workforce. These workers will require goods and services to satisfy their basic needs, which will benefit existing and new businesses that will provide those goods and services by increasing their commercial activity. Therefore, the increase in the demand for local goods and services will constitute a cumulative impact for the Project.

In addition, current and/or new projects for developing non-conventional oil and gas production (including VOG and AM) will require extra labor to provide goods and services and harness the increased commercial activity. These new jobs are referred to as indirect, arising from the direct demand created by the oil and gas projects, and will generate a cumulate impact to the area.

1.6.2 Operation Phase

During operational activities, the remaining wildlife species in the area could be affected by noise, discharges, soil compaction, and air emissions—indirect impacts—that will be generated during this stage. Considering that effects on carrying capacity and wildlife movement in the ecosystem are to be generated not only by the BPO Project, but also by other conventional and non-conventional development projects in the nearby areas of the Project, the interference with migratory routes, wildlife movement or biodiversity can be considered as cumulative.

It is generally known that the increase of carbon in the atmosphere, generated by the burning of fossil fuels, will likely cause dramatic ecological changes in forests, extinction of plants and animals, disappearance of glaciers, decrease of sources of fresh water, changes in crops, floods, loss of coral

reefs, famines, landslides, storms, diseases, among other cumulative impacts to both the physical and biotic receptors. Taking into account the oil activity developed at the Project area, and that includes not only VOG and AM's projects but also all the other conventional and/or non-conventional development projects in the region, it is considered that the increase in pollutant emissions impacting global climate change represents a synergistic and cumulative impact.

According to the information provided by of the Secretariat of Energy of Rio Negro Province as well as the Neuquén Provincial Government, royalties related to oil and gas exploitation have been increasing over the last 10 years given the continuous growth of the oil and gas development projects. Based on the current level of development of Vaca Muerta (approximately 4%of the total surface of the basin) and the projected future development, the public revenues are expected to continue increasing, hence the increase in royalties and taxes should also be considered as a cumulative impact.

1.7 Environmental and Social Management Plan and Action Plan

The mitigation measures defined for construction and operational stages of Vista' Project will consider a wide range of specific environmental, biologic and social components. These measures have been developed in alignment with national regulation, Vista corporate standards, and the IFC Performance Standards and Applicable EHS Guidelines, specifically the EHS General Guidelines and the EHS Guidelines for Onshore Oil & Gas Guidelines (2007). Defined measures will be reviewed and updated as required as the Project progresses as part of the continuous improvement process.

1.7.1 Environmental Mitigation Measures

The aim of the environmental mitigation measures are to prevent, mitigate, control and/or protect the environment by stablishing guidelines develop in eight Management Programs:

- Air and Noise Management Program
- Soil Management Program: Construction material management program, Landscape management program, Runoff and Erosion control management program.
- Surface and Groundwater Quality Management Program
- Drilling Muds Management Program
- Waste Treatment and Disposal Facilities: solid Waste, liquid waste.
- Hazardous Substances Management Program
- Structural Stability Management Plan
- Transit Management Program

1.7.2 Biological Mitigation Measures

The aim of the biological mitigation measures is To establish the guidelines regarding the proper management of the flora and fauna in order to avoid and / or minimize the alteration of the wildlife population during the different stages of the project, for that purpose, three Management Programs will be develop:

- Flora Management Program
- Fauna Management Program
- Revegetation Program

1.7.3 Monitoring Program

The aim of the monitoring program is to validate the accuracy of the predicted impacts and risks to environment values posed by the project and the predicted effectiveness of management actions. Three monitoring programs will be developed:

- Water and Effluent Monitoring
- Air and Emissions Monitoring
- Biodiversity Monitoring Program: Large mammals monitoring, Birds monitoring, Herpetofauna monitoring, Revegetation monitoring.

1.7.4 Social Mitigation Measures

- Land Access Program
- Local Capacity-Building Program: Support to local governments Sub Program, Supplier Development Sub Program, Job Training and Employability Sub Program
- Archaeological, Historical and Cultural Resources

1.8 Environmental and Social Management System

In alignment with the International Finance Corporation (IFC) Performance Standard 1 (PS1) Vista will establish an Environmental and Social Management System (ESMS) including the following elements:

- Policy
- Identification of risks and impacts
- Management programs
- Organizational capacity and competency
- Emergency preparedness and response
- Stakeholder engagement; and
- Monitoring and review.

1.9 Risk Management Plan

In regards to operational risk (occupational health, safety, and environment risk) at the workplace, Vista is implementing a Risk Management Plan and an Occupational Health and Safety (OHS) Plan that complements the existing hazard identification and contingency plan documents developed for the project. For the remaining risk studies required by OPIC, Vista has developed a comprehensive set of terms of reference that covers the following:

- Hazard and Operability (HAZOP) Analysis (including a risk register)
- Blow-out Risk Assessment
- Fire Safety Analysis
- Spill Prevention and Countermeasures Control (SPCC) Plan
- Occupational Health and Safety (OHS) Plan
- Emergency Response Plan (ERP)

Given the preliminary status of the ESMS and the additional data needs, an Action Plan has been developed to guide the necessary studies and analysis to fully inform the measures necessary to comprehensively manage potential risks and impacts of the Project. Please see Annex 1.1, Action Plan

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