# Chapter 3

# Baseline

## EIA Photovoltaic Park Cielos DE TARAPACÁ


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# 3 CHAPTER BASELINE

## 3.1 PHYSICAL ENVIRONMENT

The description of the components of the physical environment is shown below.

### 3.1.1 Climate and weather

#### 3.1.1.1 Objectives

The OrBjectives Of this baseline are:

- The description and characterization of the different types of climates present at the regional level.
- A characterization of The Weather conditions of the project area.

#### 3.1.1.2 Methodology

For the development of the baseline of this environmental component The following activities were carried out In cabinet:

- Analysis of the climatic background of the study area at regional and local level.
- Review and analysis of the information of the monitoring stations.

The review of Information from of public and academic entities, such As Address MeteoralÓgica of Chile, General Directorate of Civil Aeronautics and Department of Geophysics of the University of Chile.

### 3.1.1.3 Results

*Climatic characterization of the study area*

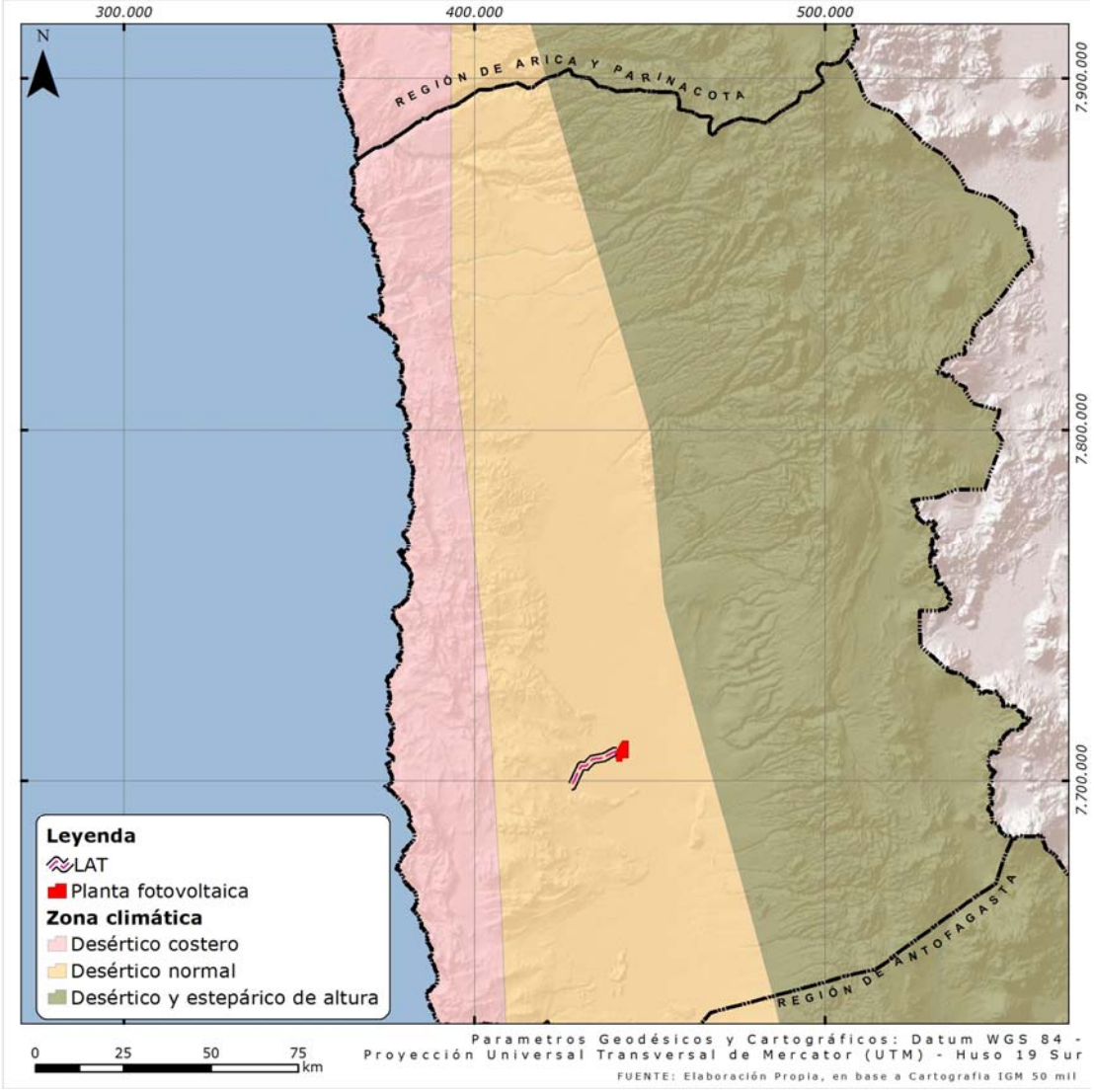
In climatic terms, the region of Tarapacá is composed of 4 climatic subtypes of desert characteristics, conditioned by the bioclimatic properties expressed there, typical of the north of our country.

This predominance in the desert conditions of the Tarapacá region is manifested in an important way in two climate factors, such as extreme aridity and high temperatures. In specific, the region is zoned in 4 sClimatic Ubtipos (see Figura 3.2 )Which define their variations primarily by their geo positionGraph and altitudinal gradient, which As it progresses through the region from west to east, it is demarcing the climatic subtypes regarding the topographical conditions of the territory, which generates Variations Important in the behavior of the climate, differentiating, for example, what happens on the coast, of what happens in the high mountain range of the Andes.

As stated above, the climates present at this scale of analysis are, according to the classification of Köppen (1948):

- Desert climate with abundant cloudy (BWn);
- Normal desert climate (BW);
- Marginal High Desert Climate (BWH); And
- High Steppe climate (BSH).

**Figura 3.1** Climatic classification subtype Normal desert.




Source: Self-elaboration

The first type of climate called "desert climate with abundant cloudy (BWn) ", has an important presence in the coastal sector of the region, and has great cloudiness of type Stratocumulus, which tend to dissipate in the morning. A particular characteristic this area is the manifestation of bedNChaca, which is defined as a coastal fog, very copious.

The As for the Subtype "normal desert climate (BW)", climatic zone In Where the project is located, Corresponds to the one who It is presented on the 1,000

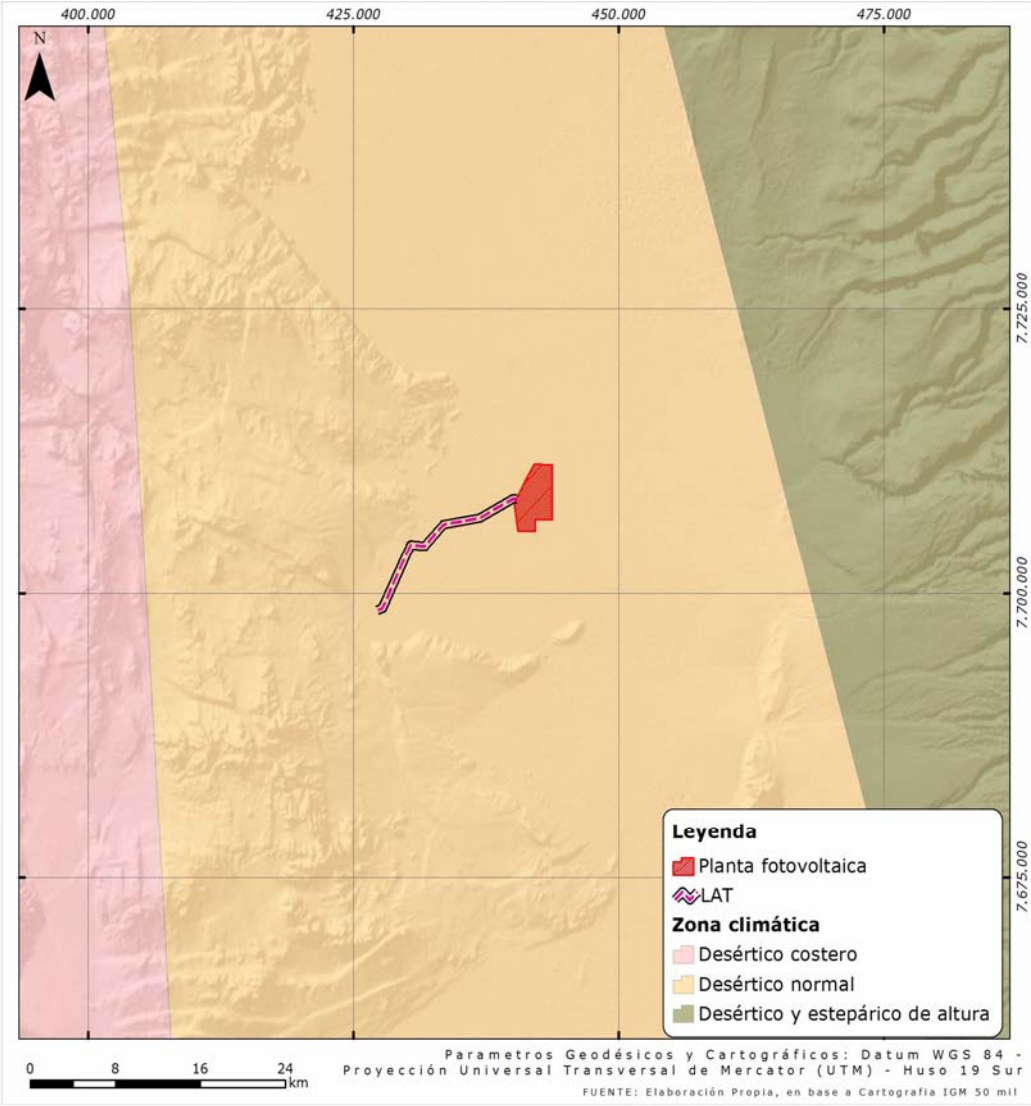
m S.N. m, in the relief unit Pampa del Tamarugal. It is characterized by a very stable and dry mass of air that causes great aridity, clear skies, low relative humidity and a great thermal oscillation (close to 25 °c), due in large measure to the high temperatures in the day and to the night cooling (DMC , 2014). In this Subclimate, the altitude and the geomorphological barriers exert great influence, in this case, the Cordillera de la Costa prevents the masses of humid air and the winds penetrating to the interior of the region, acting as a climatic screen that allows the development of a climate more Dry and arid. Likewise, when considered at a height from 1,000 M.a.s.l Temperatures are not extreme as in areas over 3,000 M.a.s.l where precipitation is more common.

You can specify that this type Subclimatic It has great distribution throughout the region, being the climate with the greatest presence in the interior areas (see Figura 3.1 ).

The third climatic subtype, corresponds to the "marginal desert climate of height (BWH)", which is expressed in the areas near the Cordillera de los Andes, over 2,000 m high, characterized, therefore, by the great cloudiness and rainfall occurred in the summer. In general, it is still considered a climate ofSérTico but with low temperatures not exceeding 10 º C.

The fourth and last climatic subtype is called "High Steppe Climate (BSH)", which is distributed over 3,500 m high, Cordillera de los Andes mainly, which is associated with low temperatures, which do not exceed 5 º C and a thermal amplitude Considerable.

**Figura 3.2** Climatic subtypes present in the region of Tarapacá




Source: Self-elaboration

Below are antecedents showing the atmospheric characteristics of the evaluated area[1].

## *Meteorological characterization of the study area*

- *Temperature*

[1] Datos obtenidos desde informe realizado por Poch Ambiental. DIA "Complejo Solar FV Pica 90MW" (2010).

The project area presents average temperatures, which VarFrom 14 ° C to 18 °c. LAs minimum temperatures are between-12 °c and-5 °c, while the maximums reach up to 35 °c, between 13:00 and 17:00 hours.

The evaluated area has an average of 250 clear days per year.

A table with the average temperatures of each month is then presented, according to the data of the Baquedano meteorological Station (Rioseco And Tesser, 2014).

**Tabla 3.1** Average monthly temperature for the region of Tarapacá.

| Jan | Feb | Sea | April | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18.9 | 18.6 | 18.4 | 16.8 | 15.1 | 14.2 | 14.0 | 14.7 | 15.3 | 16.4 | 17.6 | 18.1 |

Source: Rioseco And Tesser, 2014.

According to these data, the average annual temperature would reach 16.5 º C, which is conformed with the low thermal variability expressed in this type of climate.

- *Rainfall*

According to the data collected from the nearest meteorological stations (Huara, grime, Cerro Colorado, Mamiña And Guatacondo) (POCH, 2010), 85% of rainfall, are presented between December and March, with an average of 19 mm fallen per year.

**Tabla 3.2** PrecipitacioNes Annual According to monitoring stations.

| Station | Altitude | Precipitation (mm) | | |
|---|---|---|---|---|
| | | PP per year | December-March period | Period April-November |
| Huara | 1,000 | 0 | 0 | 0 |
| Grim reaper | 2,570 | 27 | 26 | 5 |
| Cerro Colorado | 2,630 | 15 | 12 | 3 |
| Mamiña | 2,730 | 36 | 29 | 4 |
| Guatacondo | 2,460 | 17 | 14 | 3 |

Source: Extracted from "Solar PV complex Pica 90MW" (POCH, 2010)

In the same way, according to the data presented by the authors Rioseco And Tesser (2014) It is possible to present the following table, with the monthly average rainfalls of the region of Tarapacá, corresponding to the Baquedano station.

**Tabla 3.3** Monthly average precipitation for the region of Tarapacá.

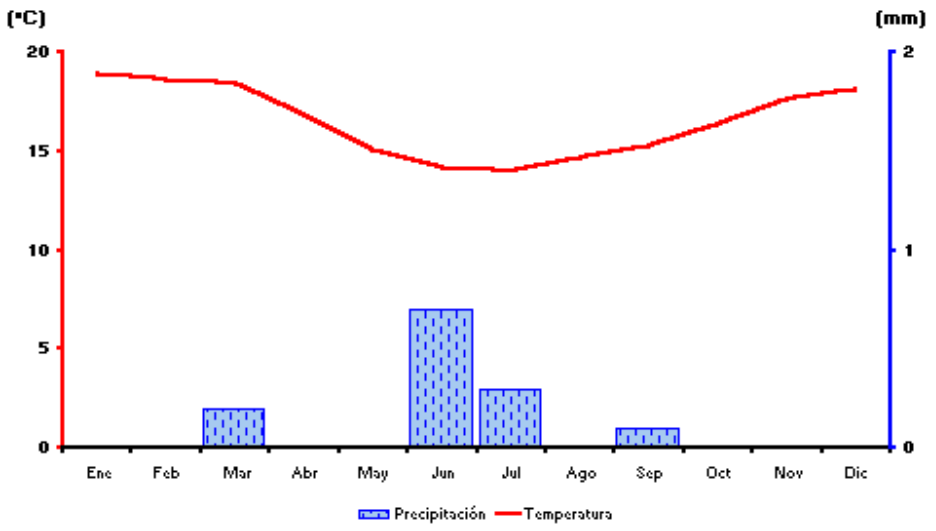
| Jan | Feb | Sea | April | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.2 | 0.0 | 0.0, | 0.7 | 0.3 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |

Source: Rioseco And Tesser, 2014.

These figures complement the above mentioned, in relation to the aridity that is expressed in the region and that has its manifesto in the inner zones of valleys and pampas, which do not receive influence of the coast and its masses of water, nor of the clouds orographic qu And they bring with them the precipitations in the Andes. The above implies that the average annual precipitation is 1.3 Mm.

A climatic diagram corresponding to the Normal desert climate will be presented, according to the data obtained from the Baquedano meteorological Station (Rioseco and Tesser, 2014)

**Figura 3.3** Climatic diagram, Normal Desert Station Baquedano




Source: Rioseco And Tesser, 2014.

As is evident in the previous figure, rainfall does not exceed 0.0 mm in most of the year.

- *Relative humidity*

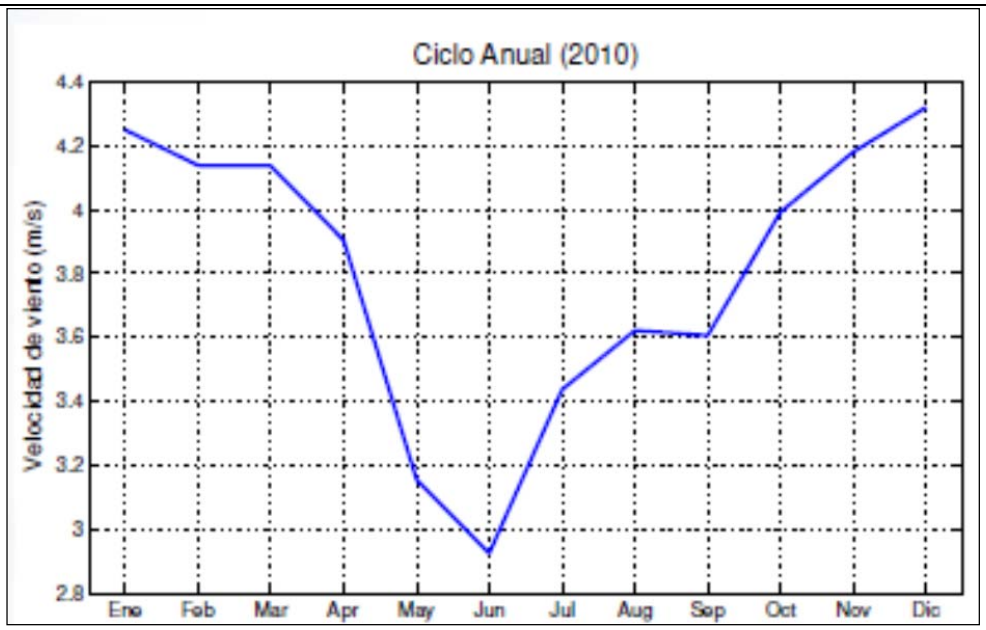
In the project area, relative humidity has the lowest records between 12:00 and 17:00 hours, fluctuating between 10 and 30%; While the highest values were presented between 4:00 and 8:00 hours, varying between 80 and 90% relative humidity.

- *Wind*

Based on the data provided by CER, using an online wind scanner (http://ernc.dgf.uchile.cl/Explorador/Eolico2/), a wind behavior modeling is analyzed for the project area.

In the figures to be presented below, the behavior of the wind will be plotted And their variations on a temporal, annual and daily scale.

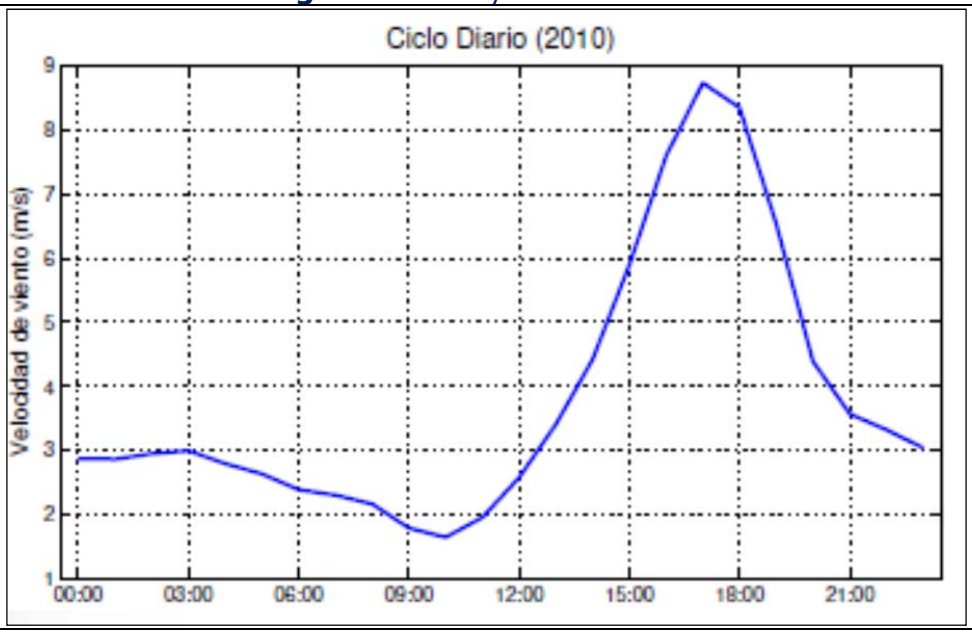
**Figura 3.4** Annual wind behavior.




Source: Wind Explorer University of Chile

As shown in the previous figure, it is possible to observe how the wind, has a strong change between the summer and winter months, since in summer, the winds reach speeds above 4.2 m/s, especially in the month of January and December. Different situation occurs in June, where the wind velocity descends so Abrupt, Reaching A figure less than 3 m/s.

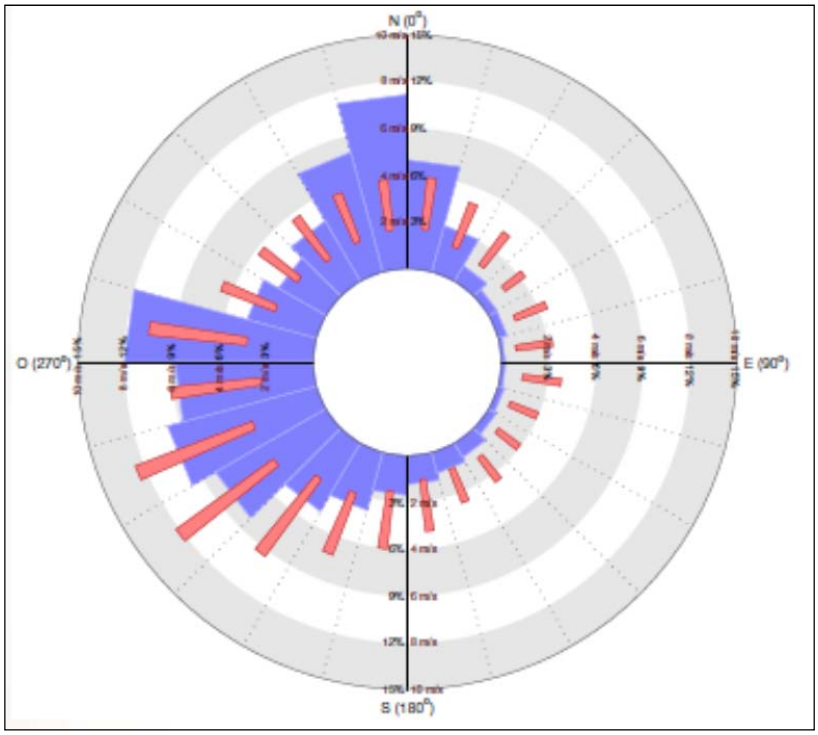
**Figura 3.5** Daily wind behavior.




Source: Wind Explorer University of Chile

In the graph above, the daily behavior of the wind is detailed, and compared to this factor, it is possible to observe a considerable variation when comparing what happens between 9:00 am and 12:00 pm since the wind has its lower speed levels , which border the 2 m/s Unlike what happens during 12:00 pm and 18:00 pm, where the wind begins an important ascent that positions it with speeds over 8 m/s almost at 18:00 pm, and then descend again in a sustained manner.

**Figura 3.6** Rose from the speed of the winds.




Source: Wind Explorer

As it is possible to appreciate in the previous figure, which exemplifies the direction of the winds in the study area, it can be established that much of the winds, have a tendency from the coast (west-southwest) followed by winds that come from Northwest. Although the project is not located in the coastal strip of the region, it reaches the winds coming from the coast.

To complement this analysis and to determine the contribution of information from nearby projects, The review of 9 Projects (See point 3.10 of baseline) Entered into the environmental assessment system Whose environmental resolutions (RCA) were approved between the years 1997 and 2014. QThe above were considered Investment projects located in the commune of Pozo Almonte.

In general, it can be mentioned that LThe projects analyzed present or lack information with respect to this component, However More information contains the projects "new Victoria Mine zone" and "Electrical distribution line

substations Lagunas", despite this It is possible to mention that the input of informationis less.

#### 3.1.1.4 Conclusions

The study Area is located in the climatic subtype Normal desert climate, with Average temperatures Ranging from 14 °c to 18 °c. And Whose precipitation levels do not exceed 0.0 Mm In several months of the year, Being the average annual temperature of 1.3 Mm. EIn addition to the massive influence of water masses from the coast Together with the non-existence of orographic precipitations establish the Condition of aridity in the area.

On the other hand the relative humidity suffers important variations during the day and the night being fluctuating between 10 and 30% at 90% during the morning. With respect to the winds, as well as relative humidity, these suffer strong changes between the summer and winter months being of 4.2 m/s in summer descending notTorially at 3 m/s in winter period.

According to the above LThe area's climatic antecedents indicate that both the local climate and the meteorological conditions (average 250 days clear per year) favour a favorable situation for the development of the project, manifesting characteristics of temperatures, humidity and Favorable precipitation.

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### 3.1.2 Geomorphology

#### *3.1.2.1 Objectives*

will be made The Description and analysis of existing geo-forms At the regional and local level.

#### *3.1.2.2 Methodology*

The methodology described below is based on the scope of environmental studies and methodological protocols that the National commission of the Environment (current Environmental assessment Service) proposes in the document "Methodologies for Environmental characterization "(CONAMA, 1996).

- *Field work*

For the characterization of this component a field visit was made during the 14th, 15th and 16th of April of 2014, in order to carry out Information gathering In the project site area. Product of the above, the physical characteristics of the study area were observed and determined according to the physiography of the site.

In addition, and through field work, it was possible to check the data obtained in the collection of antecedents, as well as to complement the generated maps and their description.

- *Work in Cabinet*

In the cabinet, bibliographic information was analyzed, complementing the information obtained in the field.

The information is presented from a regional scale to a local scale that allows to make a geomorphological description of the project area.

### *3.1.2.3 Results*

*Regional geomorphology*

From a geomorphological perspective, the region of Tarapacá is part of the first regional group, known as Northern region of the desert Pampas and Cordilleras Prealtiplánicas, which begins in the north establishing as a boundary the line of Concord with Peru and culminates towards the south, arriving at the Elqui River (Börgel, 1983), considering in addition, the border boundary with Bolivia in the northernmost section and with Argentina in the southernmost section, ending to the west the coastal zone of the Pacific Ocean.

This grouping comprises approximately an area of 291,100 Km², with heights that in its transversal profile, range from 0 M.A.S.L. in the coastal zones, up to 5,000 M.A.S.L. in the high peaks of the Cordillera de los Andes. (Börgel, 1983).

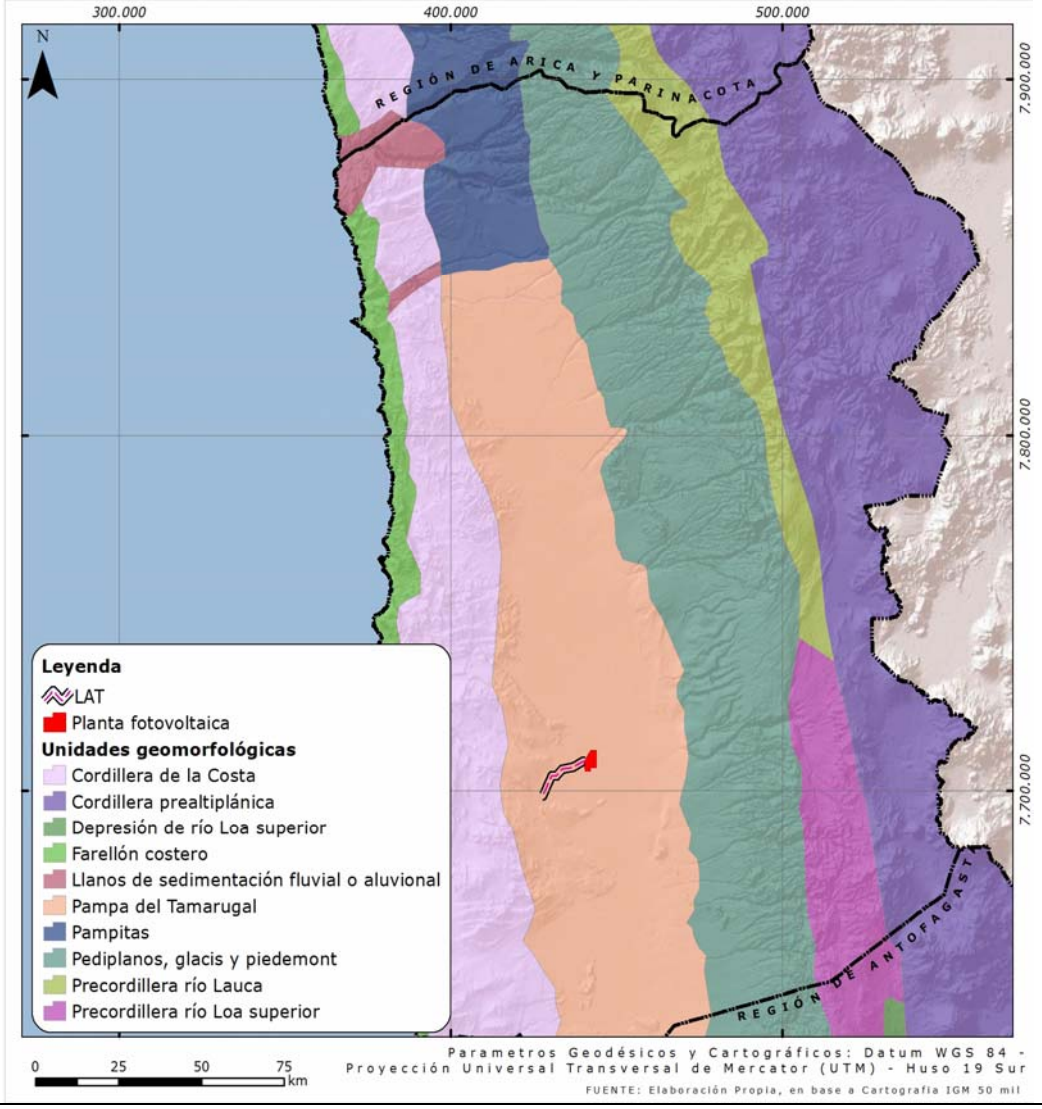
Geomorphology on a regional scale is defined by the presence of 5 Superunits or areas that Defi-NEN morphological structure, ÉStas are: Coast, Cordillera de La Costa, intermediate depression, Foothills And Cordillera de Los Andes. which have different altitudinal scope, modeling the landscape in various forms of relief, which allow the establishment of different climatic and biological characteristics.

On a more specific level, the region has 10 units Morfoestructurales (See Figura 3.7 ), which are defined according to local relief conditions (Börgel, 1983), Being éStas:

- Cordillera de la Costa;
- Mountain range Prealtiplánica;

- Río Loa Superior depression;
- Coastal Cliff;
- fluvial sedimentation plains or Alluvial;
- Pampa del Tamarugal;
- Pampitas
- Pediplanos, Glacis and Piedemot;
- Foothills Lauca River; And
- Foothills Upper River.

**Figura 3.7** Units Morfoestructurales




Source: Self-elaboration

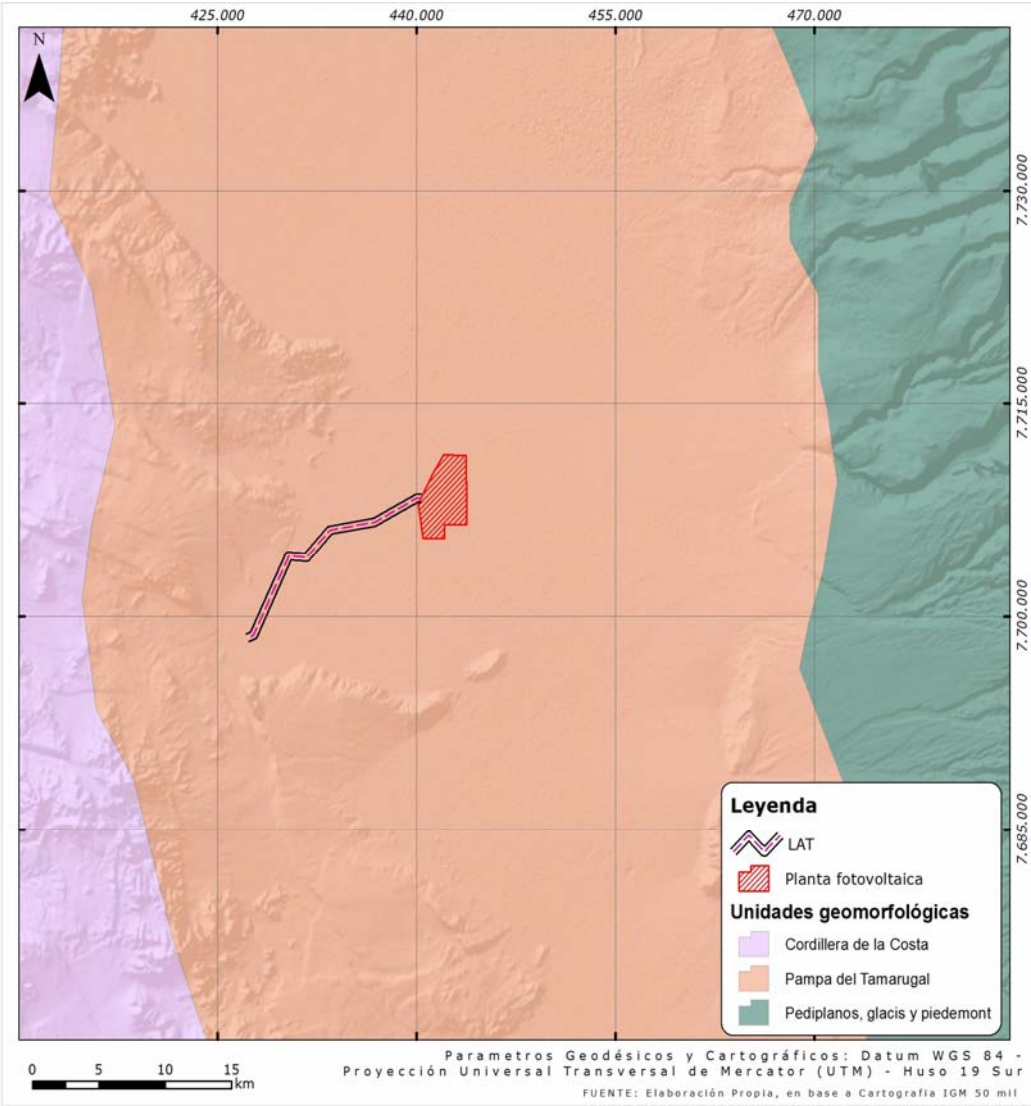
- *Local morphological units*

In specific in project area is located within the boundary of the unit Pampa del Tamarugal (See Figura 3.8 which has a surface Estimated of 17,253 km ² and presents characteristics of plateau, between dimensions of 600 and 1,500 m S.N. m., setting up a Territory GoingSTO, without major interruptions, one of the characteristic traits is that the ravines located east of the unit descend to

the West without crossing the Pampa (Börgel, 1983), forming arrays of sedimentation, with erosive traits.

There are traces of superficial water courses, but all of them intermittent, which usually drain their waters in some internal saline basins.

**Figura 3.8** Local morphological unit.




Source: Self-elaboration

In general the predominant morphological units are the salares and the Pampas, the latter are composed in surface, of clasts of type boulder and

metamorphic rocks, very meteorizadas, with cracks and fractures following the Termoclastía, caused by the constant exposure to the sun and the high temperatures in the day and low temperatures at night, generating the fragmentation of the rock by the changes of temperature.

Under these fragments of Termoclastos, deposited and arranged in the pampas areas, there is a lower layer of reddish clay, as sedimentary vestige located at the base of the mantles of Lichee (Börgel, 1983). This layer appears as a result of the wind transport exerted by one of the active geomorphological agents with great predominance in these zones, as it is the wind, which mobilises fine fragments of rocks Liparitas, common in inclined planes and deposits them in the pampas.

Like all national territory, this area of the North is strongly influenced by the action of plate tectonics, which has given a South orientation for the purposes of Deposition Clastic and Sedimentológica of the materials, since in the section Meriodional Of the Pampa, the condition of graben is exacerbated, which according to Börgel (1983) would have direct effects on the Deposition of materials.

Generally, the salares usually constitute as depressed morphological formations surrounded by portions of the highest territory, as is the case of the Pampa del Tamarugal, which in turn is constituted by sections with their own place names, such as: Pampa Partridge of the Salar de Pintado, Pampa Blanca, located between the Salar de The other By the west and the painted by the east; Pampa de las Vixens, north of the Salar Grande; Deceptive Pampa, between the Salar Grande and the Salar de Bellavista (Börgel, 1983).

In turn, the pampas are often interrupted by isolated hills, which change the topographical level of space, that is why you can consider hills with heights ranging from 1,200 to 1,500 M. Sn. M. Among the most altitude reliefs, we consider Cerro Steak (1,592 m.), Cerro Hurricane (1,527 M.) and Cerro Oyarbide (1,469 m.).

A local analysis scale, the project layout, is located On two morphological units:

- Glacis of sedimentation: the surface of the photovoltaic plant and the northern part of the path of LAT, are in this local unit, which It is set up as an erosion esplanade, low slope, which is lost on the flat part (Sanchez And Velozo, 2007). Area that receives the influence of sedimentation fans located in the Orient (see photo 3.1).

- Salar de Bellavista: corresponds to the morphological unit where the southern part of the path of LAT is located, this corresponds to a depressed desert area that is filled with saline materials, with high content of sodium chloride and other salts (Sanchez And Velozo, 2007), especially this salar is tapped, given the historical extraction of the Lichee (see photograph 3.2).

Photography 3.1. View towards local morphological unit Glacis sedimentation

Source: Own Elaboration.

Photo 3.2. View towards local morphological unit Salar de Bellavista.

Source: Own Elaboration.

- *Ranges of QMesh*

The slope ranges in the project path vary from slightly horizontal to moderate (0 – 4, 5). This is related to the morphological and relief characteristics of the evaluated area, from this point of view, the erosive processes vary from null to mild.

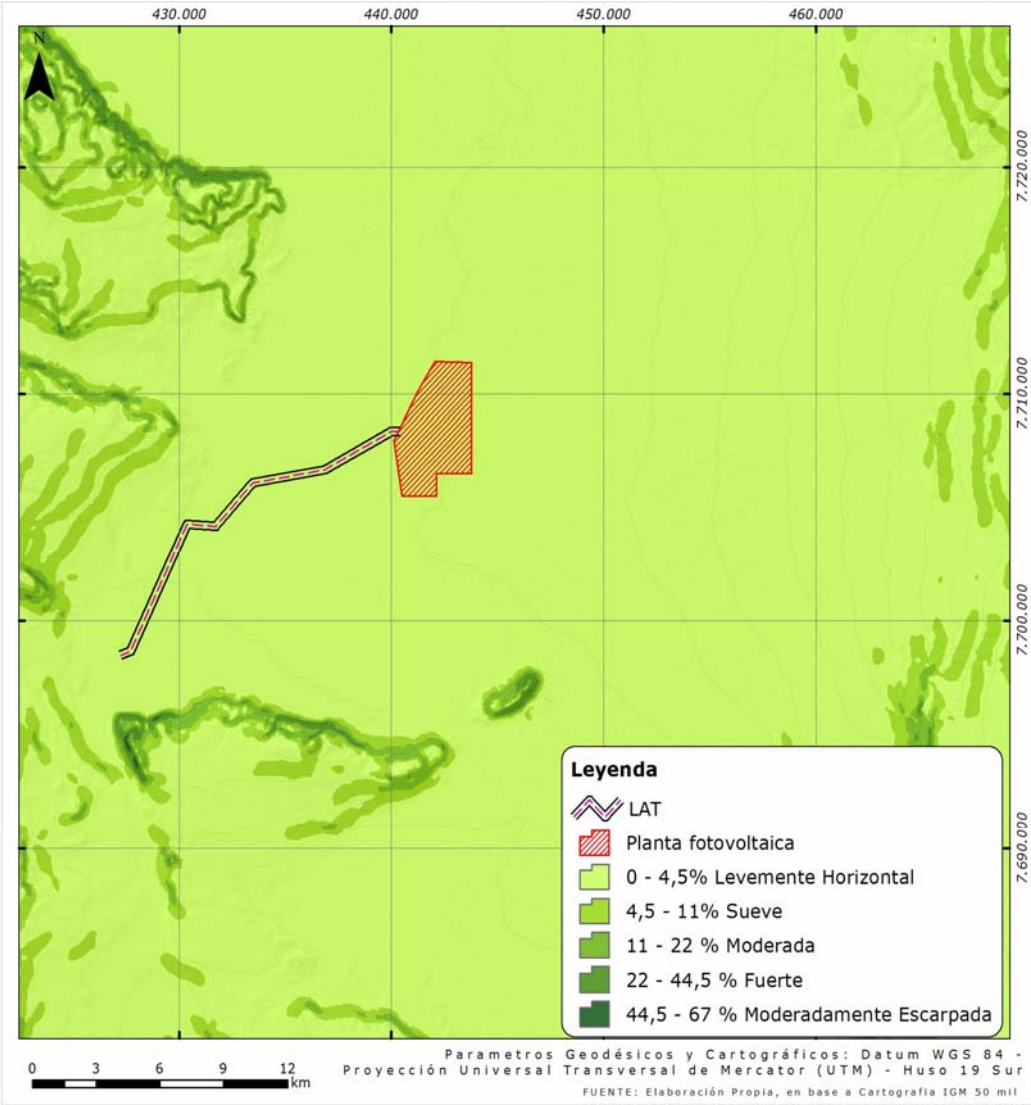
**Tabla 3.4** Slope Ranges

| Degrees (º) | Percentage (%) | Slope | Process |
|---|---|---|---|
| 0 – 2 | 0 – 4.5 | Slightly horizontal | zero or slight erosion |
| 2 – 5 | 4.5 – 11 | Soft | Weak, diffuse erosion (Sheet Wash), start of ditches, cold solifluction |
| 5 – 10 | 11 – 22 | Moderate | Moderate erosion to strong onset of linear erosion (Rill Wash) |
| 10 – 20 | 22 – 44.5 | Strong | Intense erosion, gullies insipientes |
| 20 – 30 | 44.5 – 67 | Moderately steep | Frequent gullies, mass movements, crawling |
| 30 – 45 | 67 – 100 | Very steep | Coluvamiento, Intense solifluction |
| 45 < | 100 < | Cliff | Landslides, landslides, debris corridors |

Source: Adapted, based on Araya Vergara and Börgel, 1972.

The slope in the project area has a low inclination, between ranges ranging from slightly horizontal to soft (0 to 11%). These characteristics are closely associated with the morphological unit in which the project is located, where the Depositing Sediments give way to low-inclination planes (VEr Figura 3.9 ).

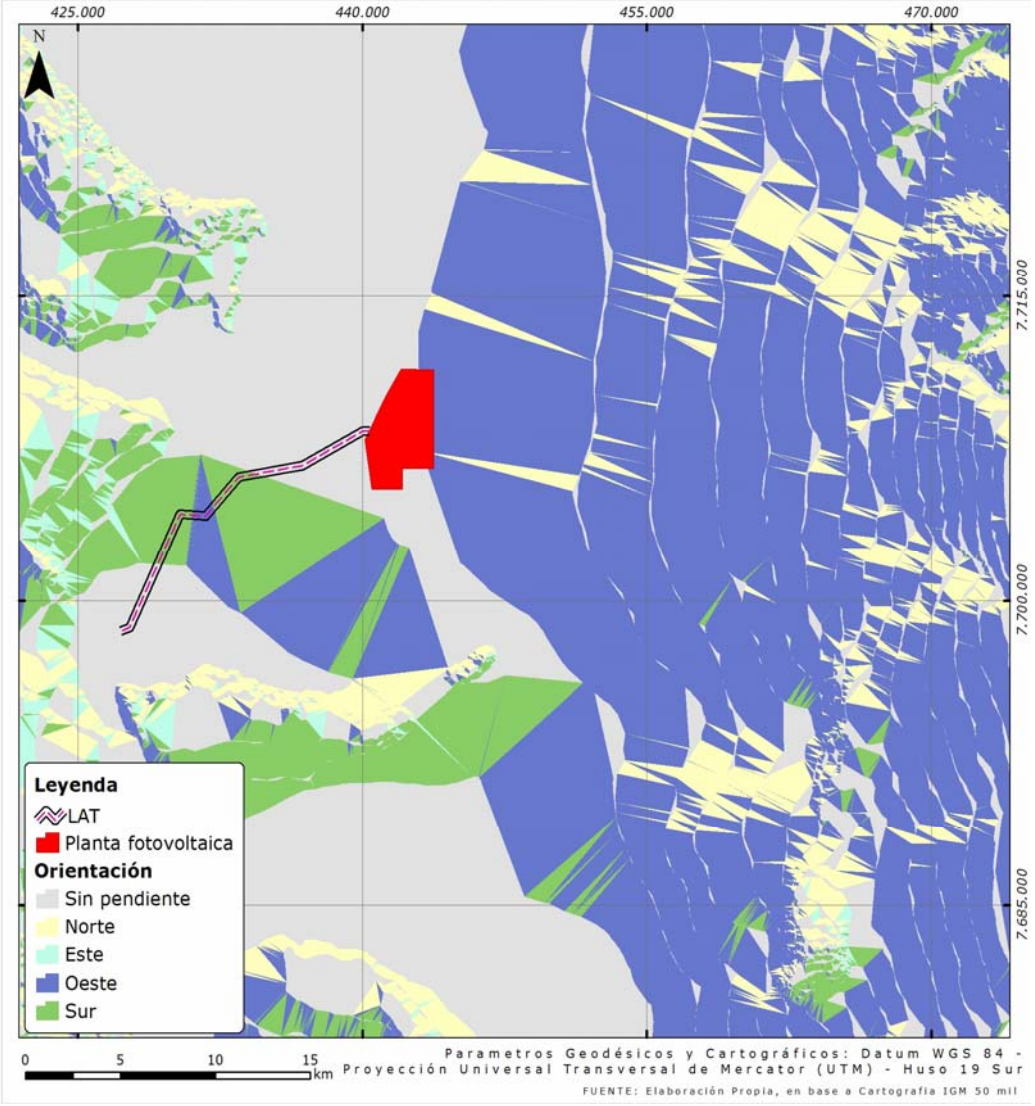
**Figura 3.9** Slope ranges in the spatial context of the project




Source: own elaboration on the basis of DEM ASTER and classification of Araya Vergara and Börgel, 1972

Based on the analysis of slopes, it can be established that within the area of the project are not located large steep slopes or strong slopes, and as can be seen in the following figure (See Figura 3.10 ) Much of the area is without slope, and only the area of the high-tension line is located on slopes with exposure to the south and less to the east.

**Figura 3.10** Slope exhibition in the project area.




Source: Self-elaboration

To complement this analysis, the review of 9 Projects (See point 3.10 of baseline) entered into the environmental assessment system whose environmental resolutions (RCA) were approved between the years 1997 and 2014. For the foregoing, investment projects were considered located in Pozo Almonte commune.

For the purposes of this study the contribution may come from the project "Solar Plant Painted"That presents a background of the study area. The projects Remaining as part of the analysis Present INformation with respect to TheS Geoforms Local No Constituting as a contribution to this baseline.

#### *3.1.2.4 Conclusions*

The project area is located on a regional scale in the Pampa del Tamarugal area, while at the local level the Geoforms On which it is based correspond to glacis sedimentation and salt Bellavista.

In general terms it should be noted that the terrain is homogeneous from the structural point of view and Most of the project area Consists of Slopes with low erosion manifestations.

Following the above It should be noted that according to the antecedents obtained the study area presents favorable morphological characteristics for the installation of the Photovoltaic Park as well as for The connection strip, being the structural conditions suitable for such purposes.

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### 3.1.3 Geology

#### 3.1.3.1 **Objectives**

The objective of this item is to describe and analyze The geological characteristics Quand define regional geology for the area of I am a student.

#### *3.1.3.2 Methodology*

Characterization of the geology component was based on the secondary information Review, published by SERNAGEOMIN Through the *"Geological map of Chile"* (2003).

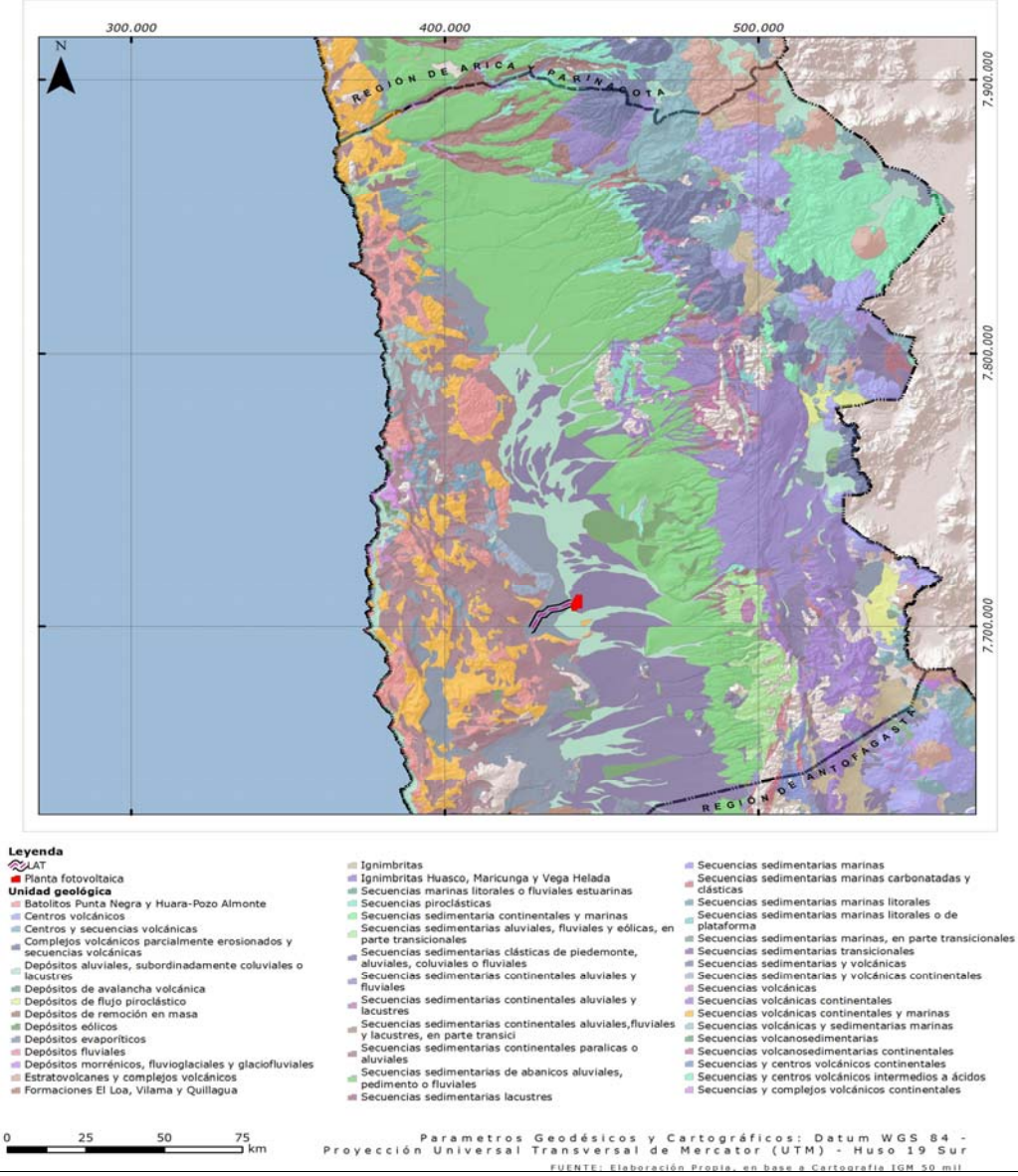
The information is presented from a regional scale to an average scale (meso) that allows to make a geological description of the project area.

#### *3.1.3.3 Results*

*Geological characterization of the study area*

The geological composition of the area and the regional territory where it is inserted, responds to the same pattern of composition given by successive sedimentary sequences and Depositacionales caused by the accumulation of materials in the sector, generating strata and fillings of sands, mainly (See Figura 3.11 ).

**Figura 3.11** CharacterizationGeológica




Source: Self-elaboration

As exposed by the SERNAGEOMIN on its map GeológChile's ICO (2003), the area Of the project, as well as much of the central girdle of the region, is characterized by two specific geological epochs in terms of type and composition called Miocene and Pleistocene (SERNAGEOMIN, 2003).

Both epochs are considered inside the era Cenozoic being this, the era in which plate tectonics shifts the continents to the positions where today they are, which on a national scale, gave way to the processes of folding called as of Orogeny alpina (Sanchez And Velozo, 2007), which formed within other mountain ranges, to the Cordillera de Los Andes.

From a more local scale, and responding to the territory where the project is located, it would be located on three geological units (See Figura 3.12 ), according to the definitions established by the Geo mapLogical of Chile (2003), being éStas:

- *Miocene-Quaternary (Mqx)*

Deposits Evaporitic: Sulphates, chlorides, carbonates and fine detrital levels, locally with borax and/or lithium. In the salares, regions I to III: Salares de Surire, Huasco, Copose, painted, Bellavista, Grande, Atacama, Pedernales and Maricunga.

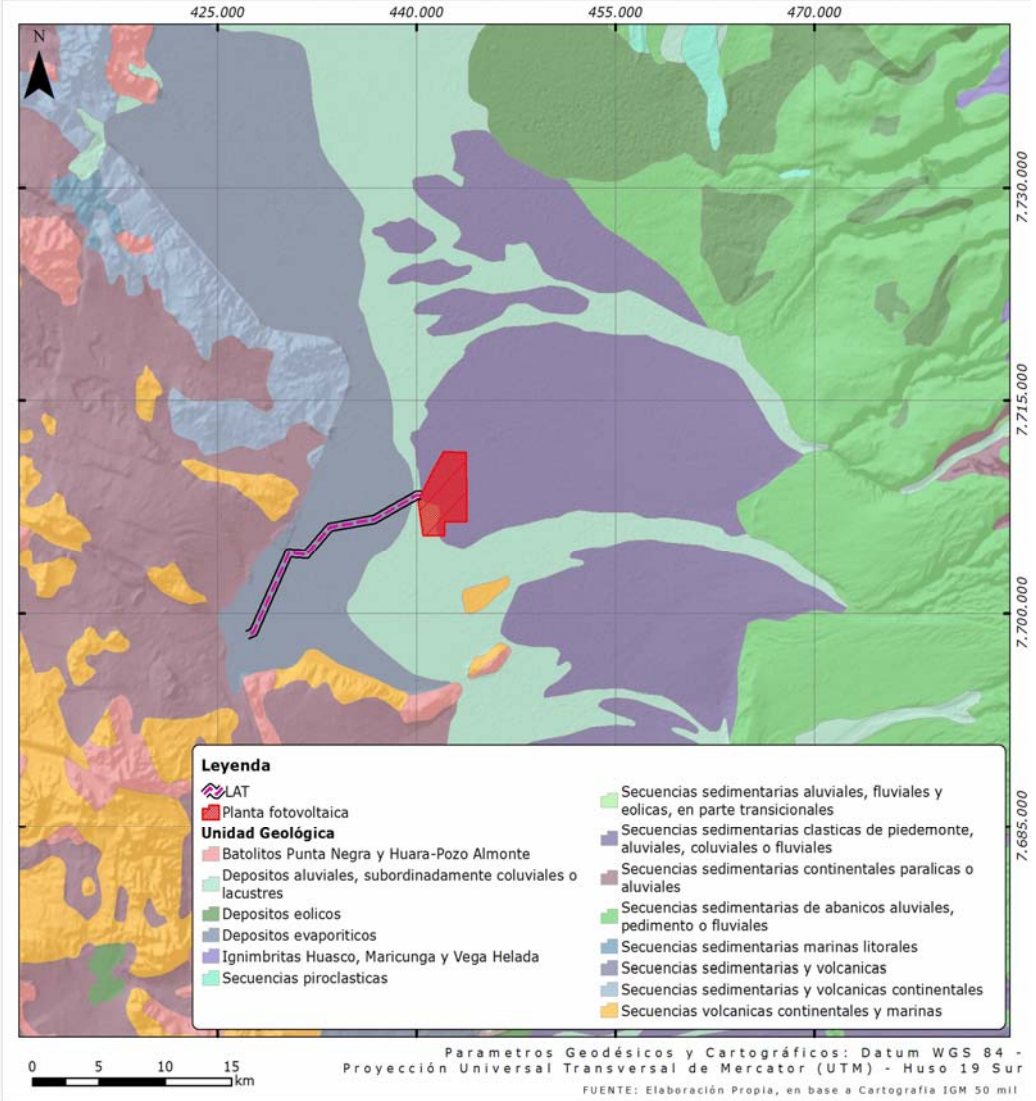
- *Upper Miocene-Pliocene (MP1C)*

Clastic sedimentary sequences of Piedmont, alluvial, Colluvial or fluvial: Conglomerates, sandstones and Siltstones. In regions I to IV: Huaylas formations, Lauca and small pastures, gravels of Copiapó; In region XI: Galleys formation.

- *Pleistocene-Holocene (Qa)*

Alluvial deposits, subordinated Colluvial or lake: gravel, sand and silt. In the Central depression, regions I to III: alluvial fans.

**Figura 3.12** Units Local geological




Source: Self-elaboration

The first geological unit called Mqx corresponding to the geological epoch of the Miocene-Quaternary is characterized by having deposits of mineral salts on the surface, generating plans with considerable extensions of these materials that in the area where the project is located, do not allow the Emergence of plant matter.

The second unit, classified as MP1C, corresponding to the upper Miocene-Pliocene is constituted by purpose of processes of Deposition Coming from the removals on the high Andean slopes, generating foothills of low slope, with materials of alluvial origin, Colluvial and fluvial.

Alluvial deposits are characterized by fluvial origin, which means that their distribution is allowed by the drag and sedimentation that generate the watercourses in their trajectory, likewise, many of the materials are transported by reason of the Rainfall.

The Deposition of type Colluvial, is caused by the action of gravity, where the soil material is moved by the slopes to areas of lesser slope. Generally its origin is local, that is to say, they are rocks and materials that comes from nearby mountain ranges, presenting in some cases, great angularity in the shape of the rocks.

Finally, the last geological unit identified corresponds to the Pleistocene-Holocene geological epoch (Qa), which resembles the unit described above since they share their sedimentary composition, however, ÉSTA possesses in turn a lake origin which implies that Sediments from lagoons and lakes were placed as vestiges of old bodies of water that evaporated.

On the other hand sE can establish that the sedimentary fillings of the Pampa del Tamarugal, would be given by a sequence of 5 or more levels of alluvial NAPAs, in the form of gravels and blocks. Also, the superficial materials that we find today, are of recent character and fine particle size, however, the processes Depositacionales It has a common origin, which is closely linked to volcanic activity in the region, since it is possible to foundTrar Cineritas Throughout the VAsto territory comprising the Pampa.

As for the contribution made by other projects located in the environment it should be noted that the revision of these (see Point 3.10 of the baseline) indicates that the geological analysis is very scarce and null in some cases therefore can be Consider As Of  Low contribution to this baseline.  The revised

projects were entered into the environmental assessment system and Have Environmental resolutions (RCA) approved between the years 1997 and 2014.

#### *3.1.3.4 Conclusions*

The geological units present in the project area correspond to Miocene-Quaternary (Mqx), Upper Miocene-Pliocene (MP1c) and Pleistocene-Holocene (Qa) which correspond to successive sequences of sedimentary character and Depositacional caused by the accumulation of materials in the sector generating mainly strata and fillings of sands That make up vast plains.

The origin of the detected materials Corresponds, in a general way, to Bowel movements Product Of the matter trawl either by river or lake cause.

According to the analyzed antecedents it is possible to infer that the geological conditions of the study area present adequate conditions for the implementation of the project.

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### 3.1.4 RIesgos NAturales

### *3.1.4.1 Objectives*

The objectOf this section is to describe the main situations Associated To the occurrence of natural phenomena in the area of the project.

### *3.1.4.2 Methodology*

The methodology considered a bibliographical review, compiling a history of natural hazards in the region and in the study area. The foregoing was complemented by the review of various ancillary sources, such as communal regulatory plans and scientific research conducted for the region.

### *3.1.4.3 Results*

For the development of this chapter has been considered as a general framework which establishes the regulation of the Environmental Impact Assessment System (SEIA), it is defined that the areas of contingency will be *"Areas where contingencies can be generated on the population and/or the environment, on the occasion of the occurrence of natural phenomena, the development of human activities, the execution or modification of the project or activity, and/or the combination thereof"*.

The fundamentals were also used According to the Guide analysis of natural risks for the territorial ordering (SUBDERE, 2011) The following will describe the main characteristics of these risks and in turn the possible implications that they have for the project in evaluation.

According to this, the natural risk will be defined as the probability of occurrence in a place and at a certain time, of a natural phenomenon that is highly dangerous for the community or for the works of art or the goods of the people. The degree of danger must be understood as the moment when a natural phenomenon exceeds its limits of intensity, therefore it must also define the periodicity of this danger, to be able to define its level of hierarchy. The risks associated with geomorphological processes are generated when the regulatory factors of the state Morphogenetic They are surpassed in their

synergy and break the state of dynamic equilibrium characteristic of each morphological unit. This dynamic state of equilibrium corresponds to a limit that when the factors regulating the state are exceeded Morphogenetic They are modified in their variables of intensity, sense, transmission of energy or of nature.

These risks are classified as Geodynamic And Morfodinámicos. The processes Morfodinámicos are presented as the action of external or exogenous agents, while the processes Geodynamic correspond to the actions carried out by endogenous agents.

- *Characterization of risk areas*

Based on the conditions and physical peculiarities of the study area, plus the interaction of endogenous and exogenous agents that can trigger the occurrence of a natural event; It is worth mentioning that the risk associated with the evaluated area would be related to mass movements, volcanism and seismic events.

- *Mass movements*

Mass movements correspond to displacement of material on hillsides, in favor of gravity. These processes are necessarily triggered by external agents that propitiate the conditions for the generation of movement, being able to be unleashed under the occurrence of heavy rainfall, melting of snow, ice or frozen soil, either by rising of temperatures or other factors. These movements displace large volumes of material along the slopes, which is affected by the characteristics of the evaluated area, influencing the coverage Vegetation, the degree of inclination and the structural characteristics of the soil.

Deposits by mass removal, are located in the plains by gravitational action, usually composed of rocks and soil detached from the slopes, often conditioned by agents Gatilladores such as earthquakes, heavy rains or volcanic eruptions (Sanchez And Velozo, 2007).

For the study sector, moderate slope ranges are seen (see section geomorphology), where the processes Erode them They are moderate and do not surpass linear erosion processes (Araya-Verga and Börgel, 1972).

- *Volcanism.*

Understood as the process by which the magma is expelled from the interior of the Earth to the outside, in conjunction with the violent exit of molten rocks and gases into the atmosphere, it matters in this section to identify the volcanoes that are present next To the project area and as a result, identify the possible risks associated with their proximity.

According to ONEMI (2006) The main risks associated with volcanic activity are the following:

**Tabla 3.5** Risks associated with volcanism.

| Risk | Features |
|---|---|
| Volcanic seismicity | Seismic activity by movement of magma, fractures, or volcanic explosions. |
| Flows Pyroclastic | Dry and hot masses of rubble Pyroclastic And gases that are rapidly mobilized flush with the surface. |
| Pumps | Expulsion of Rocky Materials (Pyroclastic) of dimensions greater than 64 millimeters. |
| Fall of Tephra | A combination of rocks and lava expelled by a volcanic eruption. |
| Lava flows | It is volcanic magma flowing through the outer walls of a volcano. |
| Lahar | A mixture of water-mobilized rock debris that flows rapidly and originates on the slopes of volcanoes. |
| Gases – Acid Rain | Gases Escape from the magma with toxic and/or poisonous properties for living beings. |

Source: Own elaboration based on ONEMI (2006).

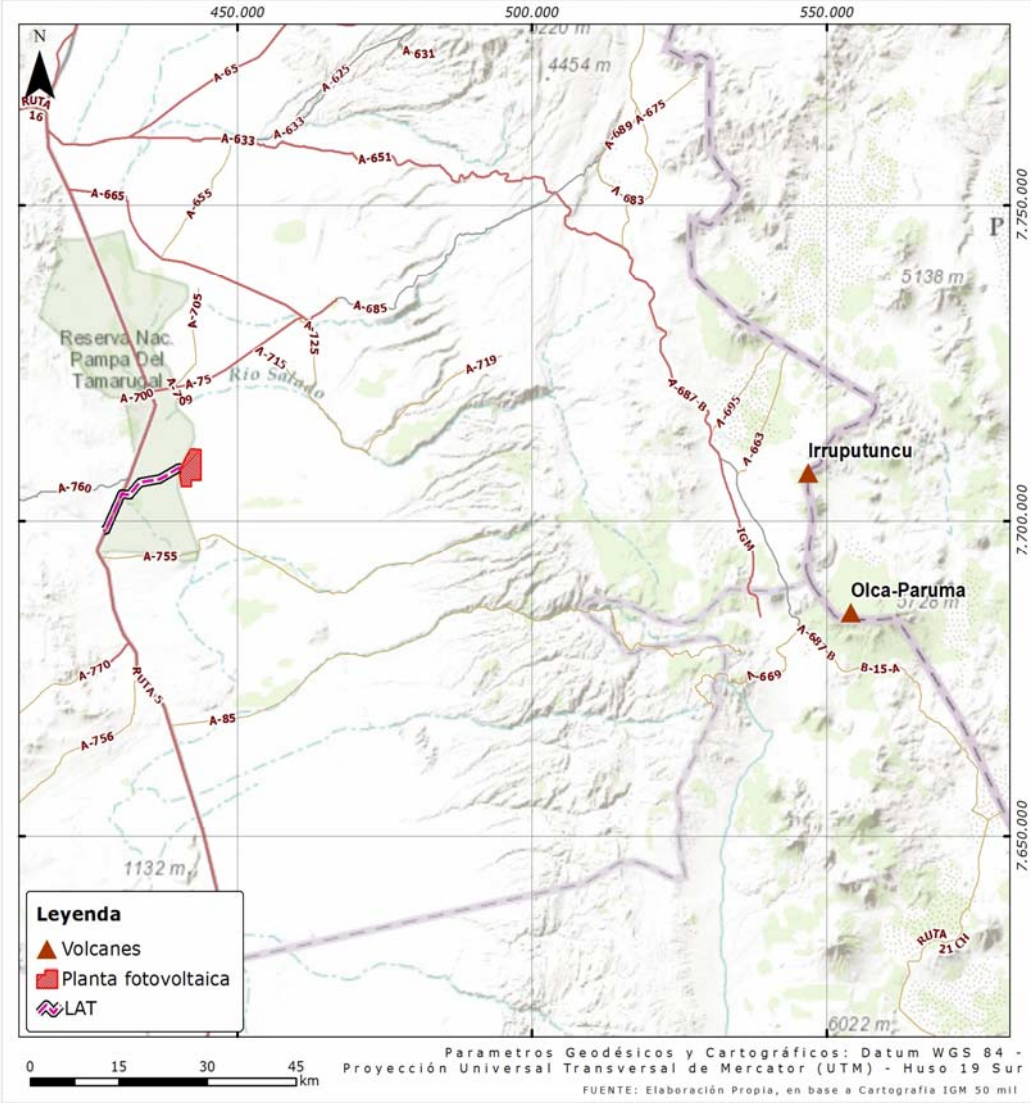
In the case of the project under study, the volcanoes closest to the project area are:

- Volcano Irruputuncu; And
- Volcano OlcaParuma.

For the case of the first volcano (see Figura 3.13 ), this is considered more than 100 km east of the project. According to data delivered by the volcanic surveillance network, belonging to the SERNAGEOMIN (2014), the last recorded eruption dates from the year 1995 and currently only registers activity Fumarólica.

Similar situation occurs with the volcano Olca-Paruma, which is considered more than 110 km away from the study area. This volcano has not been active since the year 1990 and given its period of inactivity and Distance to the project, is that the risks are discarded isTipulados por la ONEMI (2006).

**Figura 3.13** Volcanoes close to the study area.




Source: Self-elaboration based on Smithsonian Istitution Used And World Imagery– ESRI server.

- *Seismicity*

The risks associated with seismicity are given against the possibility that a certain seismic action will be generated at some point in the territory. (SUBDERE, 2011). This action is generated by the release of energy from a point called hypocenter, inside the earth's crust, usually in areas of geological faults, contact of plaques or areas with volcanic activity.

The release of energy moves through the lithosphere in the form of waves, reaching some point of the surface, called as epicenter, from where its seismic intensity is calculated.

They are the materials of the Earth's surface, those responsible for absorbing this liberated energy, therefore the closer the install some infrastructure to the epicenter of the earthquake, the greater the risks of encrypting damage or displacement.

The following table will expose the threats generated by an earthquake, as stipulated by the SUBDERE (2011).

**Tabla 3.6** Threats by MOvimientos SÍsmicos.

| Risk | Features |
|---|---|
| Tsunami | Seismic waves caused by submarine sinking or earthquake with hypocenter in the sea or on the mainland[2]. |
| Mass removal/instability of Slopes | Movements in mass, correspond to displacement of Material on hillsides, in favor of gravity. |
| Liquefaction | process by which by cracking or presence of underground NAPAs the ground seat and sinks. |

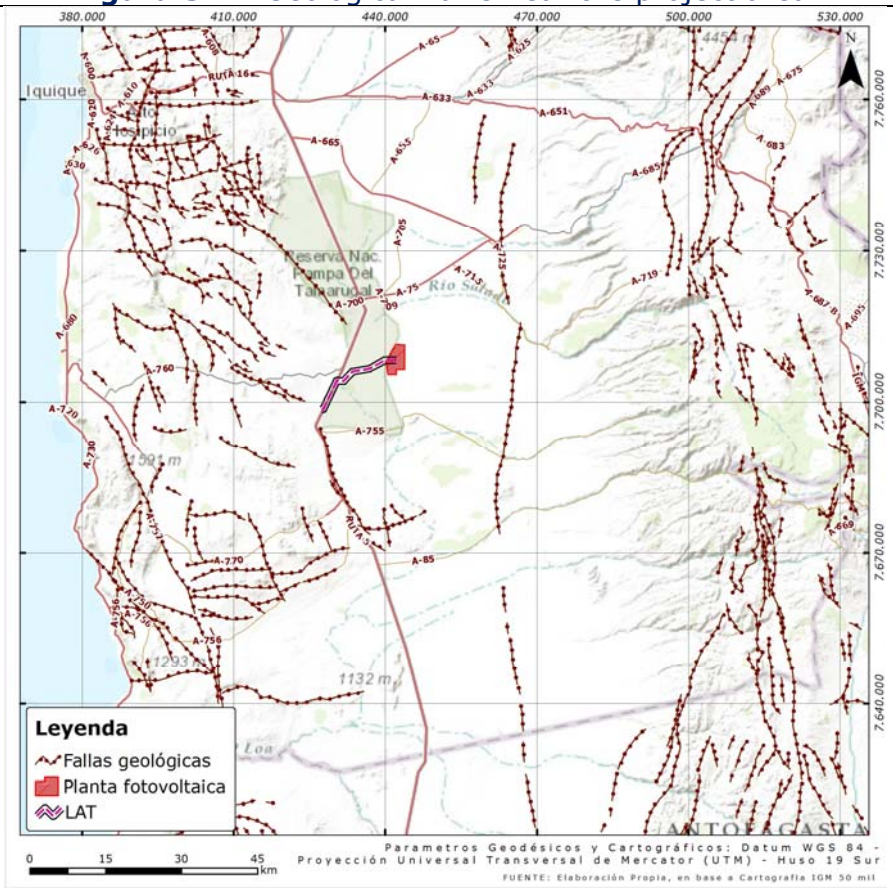
Source: Self-elaboration based on Subdere (2011)

It should be noted that EL  National territory Is Susceptible To seismic events product of plate tectonics and the board meeting South American and Nazca, which constantly initiate telluric events.

CuaNThe epicenter of an earthquake, it happens in a zone of geological fault, its consequences can be even more serious, since it is a zone of fracture of a tectonic block which speeds up the displacement of the waves and multiplies its damage in surface. It is therefore important to know if the project is considered on some geological fault (see Figura 3.14 ).

[2] Börgel, Reinaldo (2011) Análisis comparado de dos megaterremotos chilenos: Valdivia (1960) y Cauquenes (2010). Revista de Geografía, Espacios 1: 43-51. Universidad Academia de Humanismo Cristiano.

**Figura 3.14** Geological flaws near the project area.




Source: Self-elaboration based on Smithsonian Istitution Used And World Imagery– ESRI server.

As can be seen in the previous figure, the project is far from geological faults, therefore the risks associated with the seismic events in the study area.

In order to complement this study, 9 projects were reviewed (see Point 3.10 of this baseline), of which the information on areas of risk is scarce, only the project "painted Solar plant" Presents information about it, being useful for Complement This baseline.

### *3.1.4.4 Conclusions*

The local analysis indicates that there is no risk of mass movements due to the existence of moderate slopes to low, coupled with conditions of mainly level morphology and precipitations almost Nonexistent, indicating the low probability of To happen Phenomena of this nature.

Regarding volcanic activity Both the Distance Location DThe project As Registered inactivity, It is considered a low probability of volcanic risk, whereas for the seismic activity the probability of occurrence is higher Whose cause is due to plate tectonics, However the distance from the Line Can reduce the risk associated with it. In addition to this is the lack of geological faults in the project area which results in the low probability of seismic events that have this origin.

Given the above you can Infer That natural hazards in the Study Area Can manifest Low probability of occurrence Being presented as Area suitable for the location of the works.

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## 3.1.5 Hydrography

### *3.1.5.1 Objectives*

Characterize from the hydrographic perspective The study area analyzing the main basins and channels present.

### *3.1.5.2 Methodology*

The information compiled for the purpose of this study was analyzed by carrying out the hydrographic characterization of the watershed along with the description of the main channels Present in The project area.

### *3.1.5.3 Results*

#### *Caá hydrographic RacterizaciónStudy Area*

In the evaluated area, the dominant basins are of Andean type and Preandean, i.e. they have an origin in the Cordillera de Los Andes and in their subsequent cordilleranas foothills. The nature of these watersheds is endorheic, implying that the watercourses and causes that cross the basin do not culminate in the sea, due to the evaporation of the important action of the sun or the infiltration of the waters of these Courses can even be generated by both circumstances (Sanchez And Velozo, 2007).

Much of the water courses are sporadic and intermittent, since they are usually formed in the occasion of rains in the summer months because of the climatic influence of the winter Altiplánico which has an important action in the high Andean areas of the region, generating the recharge of the rivers and making possible the formation of superficial runoffs.

Specifically the layout of the project, is located in the Pampa del Tamarugal basin, in the Sub And Subsubcuenca Of the same name, more than 2 km south of the Quebrada de Tarapacá and more than 5 km north of Quebrada Los Tambos. The smaller basins have the characteristic of being closed and of

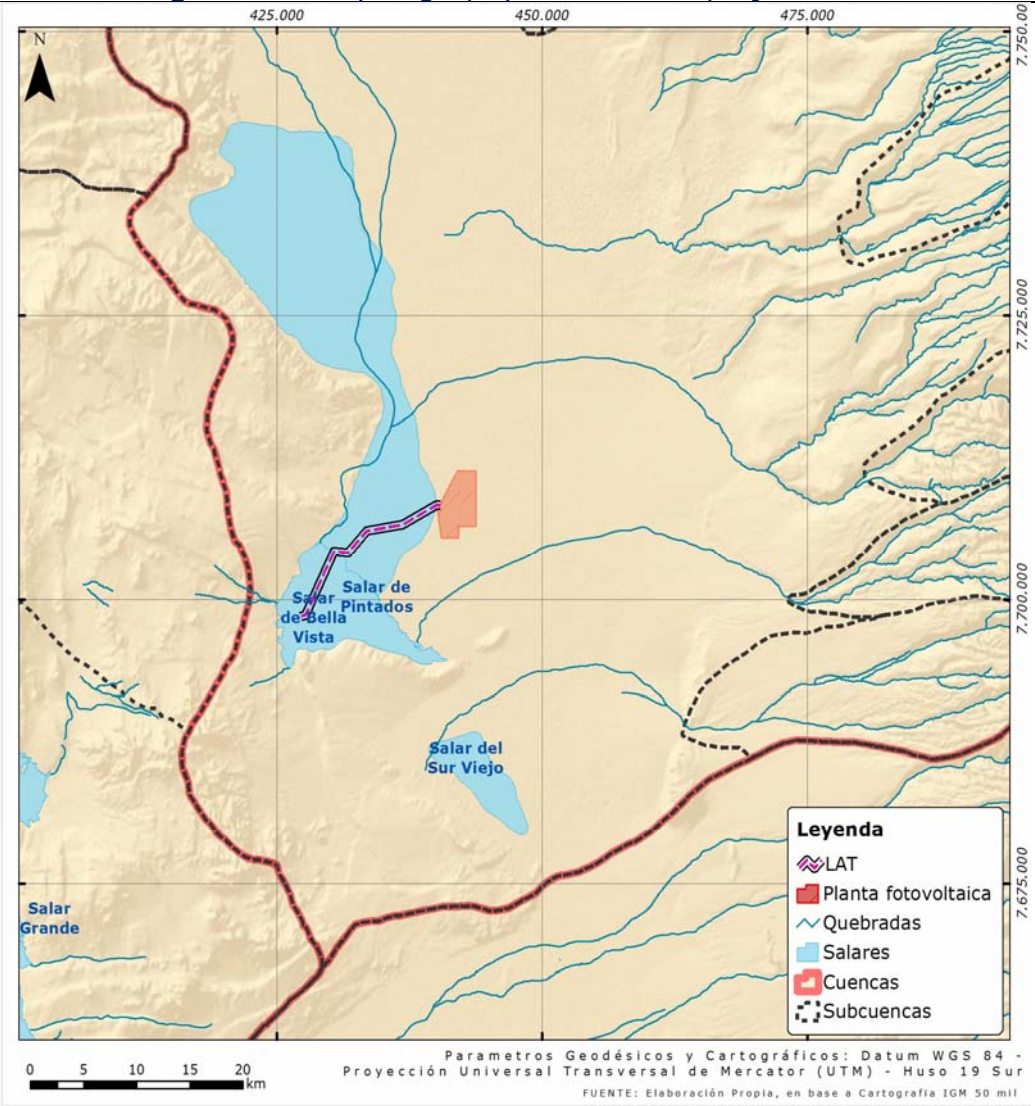
average elevations, which in the same way does not allow the water courses to pour their waters in the sea.

The above is understood when considering the effect generated by the Cordillera de la Costa, which emerges as a natural barrier that prevents watercourses, with little channel and sporadic regimes to cross the region from the Andes, to the sea , generating closed basins without connectivity to the coast.

It is important to note that there are no drains directly related to the project area, given the abiotic characteristics of the evaluated area.

To the south, the Pampa del Tamarugal culminates in meeting the river Loa, which differs from the previously named drains, since it has a regime throughout the year of permanent character. This river is the only one of these characteristics, besides being able to cross a diminished mountain range of the coast, taking advantage of a valley Epigenetic (Börgel, 1983) Very narrow, which allows it to flow into an estuary, almost to reach the boundary of the region of Tarapacá with the Antofagasta region.

**Figura 3.15** Hydrography close to the project area.




Source: Self-elaboration

For Complement The present I am a student resorted to Analysis of project informationWith RCA approved between the years 1997 and 2014. LRevised documents They do not incorporate data on hydrography being scarce the contribution of these, however It's possible Mention that The Project "New mine area expansion Victoria Sur "(SQM S.A., 2011), Contains hydrol informationÓgica Dand utility Related to the description of watersheds DL environment.

### *3.1.5.4 Conclusions*

EN EL Area under analysis, LAs Dominant basins are of Andean type and Preandean Presenting a endorheic character. In turn the Feature Of these water courses is that their regimes are Sporadic and intermittent Caused by rainfall in summer months To Cause of the influence of the winter Altiplánico Generating the recharge of the rivers and making possible the formation of superficial runoffs.

The main basin corresponds to the Pampa del TAmarugal, whose Sub And Subsubcuenca They receive the same name. The nearest ravines correspond to the Quebrada de Tarapacá More than 2 km south of the project area and Quebrada Los Tambos More than 5 km north of it.

In general terms the presence of permanent watercourses is not manifested and depending on this It is possible to infer that the hydrographic characteristics of the area associated with the project present appropriate conditions for the implementation of this one.

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## 3.1.6 Edaphology

### *3.1.6.1 Objectives*

The main objective of this baseline is to identify and characterize the existing soil environment in the project area, as well as to characterize the current state of the resource and its ability to use.

### *3.1.6.2 Methodology*

The working methodology includes the following stages:

- Information gathering.
- Information gathering on the ground.
- Analysis in Cabinet.

The following describes each of the stages that compose the working methodology.

- *Information gathering*

At this stage, all preliminary antecedents of the study area were compiled, and the following cartographic support bases were included:

- Plan of location of the project, which includes the site surface of the plant in general and roads. March 2014.
- Survey area through GPS Garmin e-Trex and Google satellite images Earth, year 2012, Georrefenciadas and a scale of 1:5, 000.
- *Information gathering on the ground*

For the determination of the morphological and physical characteristics of the soil, an information survey of the soil medium was carried out in a visit to Land

held on 15 and 16 April 2014. In this visit, a Agrológica observation was carried out with the support of four pits.

In each calicata we proceeded to describe the relevant characteristics of the environment, according to the soil study guideline of the Livestock Agricultural Service (SAG, 2001 and 2011), as well as the soil recognition Manual (USDA, 1999 and 2002), adopted by the Institutions and specialists conducting studies in the country. The above, it allowed determining certain physical and morphological parameters of the soil, such as, textural class, structure, consistency, percentage of thick fragments, depth, drainage, color and Rocky Surface, among other parameters.

In addition, the description included an interpretative evaluation of the soil in terms of its class of use capacity, drainage class, irrigation categories, erosion category and fruit aptitude, which was determined using the proposed classification criteria. by SAG (2011).

- *Analysis work in cabinet*

In the cabinet, the information obtained in the field was analyzed, supplementing with secondary information. On the basis of this work, a baseline report is given, with the recognition of the soil located in the area of the project and the associated cartography, on a scale commensurate with the field work.

### *3.1.6.3 Results*

*Soil characterization of the area of EStudio*

- *General context*

As Luzio *et al* (2010), the soils of the study area correspond to extensive areas of the desert zone of the intermediate depression of the I region of Tarapacá (between 18 ° and 29 ° LS), are soils belonging to *"Plains Soils Depositacionales"*. These soils are at heights between 900 and 2,800 masl, basically corresponds to a graben consisting of Mantles of tertiary volcanic

rocks that are sublying to important deposits of alluvial and/or lake Quaternary Tertiary sediments, as well as to floods Holocénicas.

The main features of this area are the large extensions with uniform slopes and the presence of soils with varying degrees of salinity. These plains have been heavily eroded and dissected by mainly alluvial phenomena, whose greater intensity seems to have occurred at the beginning of the Quaternary. These phenomena left as a consequence a landscape of hills and remnant planes (called Pampas), separated by valleys and ravines of diverse size.

The surface of these plains Depositacionales It is commonly constituted by gravels, as a pavement of large extensions similar to a stony desert, in which the phenomena of wind deflation have a limited expression.

In these broad sectors are those that could be considered as the "real desert soils", described very early by Diaz and Wright (1965) and are characterized by a very weak profile development, in which it is possible to find mixtures of Alluvial sediments and Colluvial And besides, they can be saline. The soils in these areas occupy positions of slopes or low hills, with slopes that are not more than 10%. Present abundant Rocky Superficial, consisting basically of angular fragments of mixed basic and acid composition. The soils are thin, developed on a tuff Rhyolitic, with a coarse texture on the superficial horizon, dark brown and without structure. In other cases it is possible to find soils with a higher degree of development, evidenced by the presence of a horizon B, of weak expression, with a moderately thick textural class and a structure of blocks Subangular.

Although the vegetation of these areas is very scarce, and in sectors, completely non-existent, many of the soils present a distribution of heterogeneous roots in depth and reaching up to the rocky substrate. This substrate (Horizon R) may present cracks, on the faces of which there is a coating of calcareous materials, which would demonstrate some process of translocation of components through the profile.

The physical and chemical characteristics of a soil belonging to the plains are presented below. Depositacionales, located near the village of Pica, near the area of I am a student of the project.

**Tabla 3.7** Physical Characteristics and Soil chemicals DepositsCIonales.

| **Depth (cm)** | | 0-20 | 20-31 | 31-105 |
|---|---|---|---|---|
| **Particle distribution by size (%)** | | A1 | 2B | R |
| 2-0.05 | | 70.6 | 42.6 | 64.6 |
| 0.05-0,002 | | 12.8 | 22.8 | 22.8 |
| < 0.002 | | 16.6 | 34.6 | 12.6 |
| Textural class | | Fa | Fa | Fa |
| Organic carbon (%) | | 0.12 | 0.16 | 0.52 |
| $Ph_{Water}$ | | 8.4 | 8.8 | 8.2 |
| Electrical conductivity (Ds $M^{-1}$) | | 0.6 | 0.7 | 4.0 |
| $Caco_3$ Equivalent (%) | | 0.0 | 0.0 | 4.51 |
| extractable cations ($Cmol_C Kg^{-1}$) | Ca | 6.5 | 30.0 | 27.0 |
| | Mg | 1.6 | 5.3 | 1.8 |
| | K:i | 1.6 | 3.9 | 1.3 |
| | Na | 0.9 | 2.4 | 4.0 |
| CIC (PH 7.0) ($Cmol_C$ $Kg^{-1}$) | | 8.8 | 3.3 | 13.7 |

Source: S.A. CORFO-UCH, 1982

taxonomicly, these soils correspond to the Entisols (Soil Survey Staff, USDA 2010). The ground Entisol, is a thin soil with less than 10 cm thick, with underlying material of calcareous and saline type. It is characterized by its lack of well developed horizons, with little evolution due to the High aridity of the area, its high saline content and high pH. They are "young" soils that have not had time to develop or "old" that have not developed horizons to correspond to materials resistant to the weathering In an arid climate.

- *Local context*

The soil where the project will be located was characterized from agrológicas observations, with the support of four pits (see Figura 3.16 ).

The Positioning of these pits is indicated in the following table.

**Tabla 3.8** Location of the pits.

| Calicata | UTM coordinates (Datum WGS84 – Zona 19) | |
|---|---|---|
| | North | This |
| 1 | 7,708,666 | 441,869 |
| 2 | 7,705,670 | 440,316 |
| 3 | 7,710,562 | 442,833 |
| 4 | 7,707,162 | 443,013 |

In the area of study, the soil resource is very scarce, because this area is in the so-called Absolute Desert (Gajardo 1994, Zizka 1992, Luebert and Pliscoff 2006), where the conditions of extreme aridity, with no rainfall, dryness and a marked thermal amplitude, make the presence of fauna and vegetation extremely difficult. Therefore, soil evolution or development is incipient and even non-existent, i.e. it could be described as a succession of layers of sediments.

This soil has no evolution of horizons or content of organic matter, It is very thin, with a weak development of structure (simple grain). Thick texture with the presence of "Chusca" on surface, coloration Pardo Reddish in the 5YR hue And Moderate Rocky Subsurface (See photo 3.3). It is located almost flat to gently undulating slope (which does not exceed 8%), is High saline content, permeability and excessive drainage.

### *3.1.6.4 Results*

#### *Biogeographical Framework*

According to Gajardo (1994), the area under study is located in the "Desert region", which extends from the end of the XV region, from the line of Concord, to the Elqui River, in the IV region. It constitutes the southernmost part of the desert on the Pacific coast of South America.

In more specific terms, according to the classification of the same author, the area under study is located in the sub-region of the absolute desert, which corresponds to that part of the desert in which rainfall is negligible and the water supply is of local character, Coming from the presence of groundwater or occasional alluvia that descend from the Cordillera de los Andes. It is described as absolute desert, because plant life is practically absent in much of its extent, except in very particular conditions.

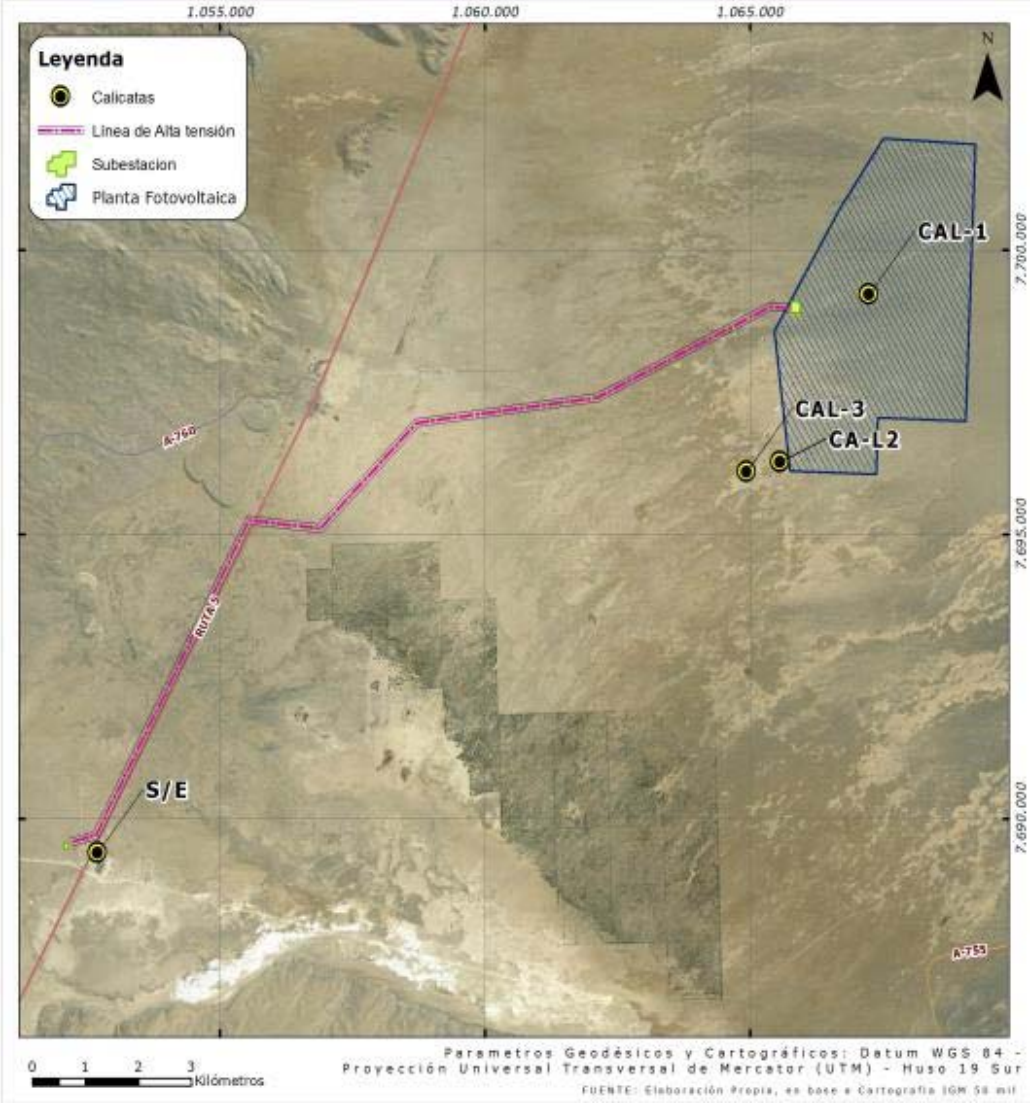
In this sub-region it is possible to recognize among others the vegetal formations "Interior desert" and "Desert of the Tamarugal", which are the formations that are in the area of the project and which are described below.

The "Interior Desert" plant formation is located in the regions XV, I and II, extending from the border with Peru to approximately 25 ° south latitude. It lacks almost completely plant life, except in very local conditions with the presence of groundwater. From the point of view Vegetation It has been little studied, finding few bibliographical references. The representative plant community of this training is *Tessaria Absinthioides - Distichlis Spicata,* Which is widely distributed, especially as Ruderal In places with human intervention or under the influence of high salinity waters.

On the other hand, the plant formation "desert of the Tamarugal", is in conditions in which the influence of the NAPAs groundwater is relatively Superficial, allowing the existence of highly adapted thorny trees or, in sectors where they occur periodically alluvia of Andean origin. The vegetation that it presents is very altered by the human influence and in its current form it corresponds mainly to the plantations of *Prosopis Tamarugo and Prosopis Alba*. The representative community of this training is *Prosopis Tamarugo Distichlis Spicata* (Tamarugo-salted gram), characterized by the presence of species such as *Distichlis Spicata* (Salted grass), *Prosopis Tamarugo* (Tamarugo) and *Tessaria Absinthioides* With the company of species such as *Cressa Truxillensis* (Chicken gut), *Euphorbia Tarapacana* (Pichona), *Tagetes Minutes* (Quinchin), *Atriplex Atacamensis* (Cachiyuyo), *Prosopis Strombulifera* (Retortón). The

following figure shows the distribution of plant formations in the area of the project.

**Figura 3.16** Spatial localization of the pits carried out in the study area




Source: Own elaboration based on DEM ASTER and classification of Araya Vergara and Börgel, 1972

In the area, deposits are They are accumulations near the surface of water-soluble saline minerals (halita and probably nitrates and/or sulphates). These deposits show characteristics that indicate the differential leaching during and after accumulation. The most notable is a stratification resulting from the dissolution and re-depositing of the minerals more soluble by the rare rains The desert. As a result, the following are generated, observed in the field visit:

**Tabla 3.9** Physical and morphological characteristics of the modal profile.

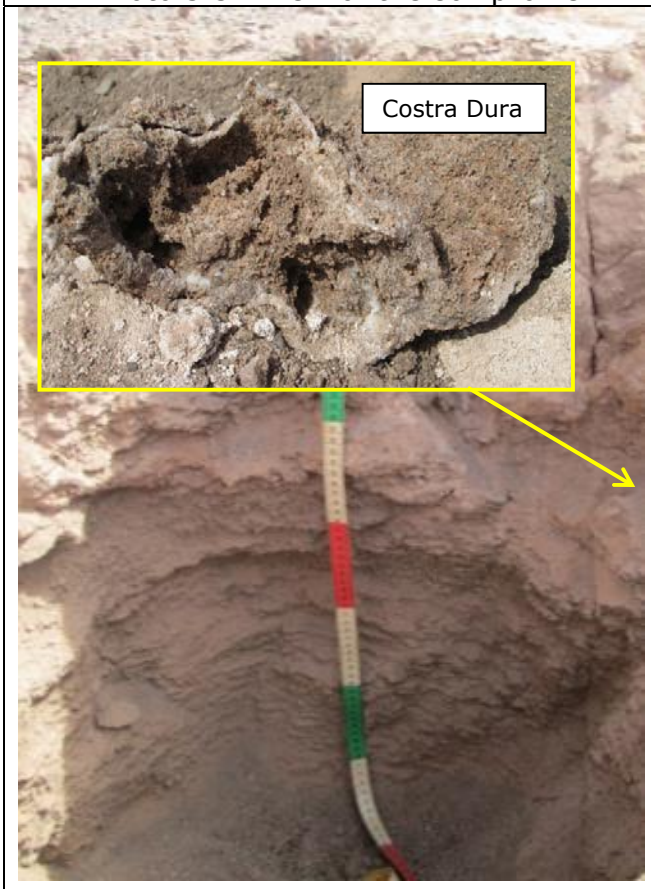
| **Depth cm** | **Gema** | **Features** |
|---|---|---|
| 0-10 | Chusca | It corresponds to powdery soil formed by gypsum, clay and fragments of rock; Part of this soil is of wind origin and another part of residual origin by the superficial meteorization of the upper portion of the "Lichee". Locally, the lower portion of this layer consists of small lenticular layers of white powdery saline material in which Na or gypsum sulfates predominate. |
| 10-18 | Sediments | It underlies the chusca, with an irregular thickness, of fine sandy texture, coloration Reddish brown in the 5YR hue And With 10% fine gravel. |
| 18-35 | Crust | Hard layer or crust that underlies the stratum of sediments, firmly cemented, between 15 to 20 cm thick, in which Halita and sulphates are abundant. |
| 35-80 and more | Sediments | They are found below the crust, with fine sandy texture and in some areas of silty texture, coloration Pardo Reddish in the 5YR hue And 10 to 20% fine gravel. |

The surface is covered by Aluvio-colluvial deposits, where there is stony pavement, formed by angular lithic fragments, which can cover up to 80% of the surface (see Photographs 3.4 and 3.5). It corresponds to a surface of deflation and wind corrasión with moderate erosion.

Considering the characteristics of the soil present in the area, which corresponds rather to physical and chemical processes product of the extreme rigorousness of the desert, where the biological processes in the genesis of the soil are almost null, these soils They correspond to class VIII, which indicates that they are soils without agricultural, livestock or forestry value, and their use is limited Only to the wildlife, recreation or protection of watersheds. This is because under a pedological point of view, there would be no proper soils,

because of the already described condition of extreme aridity and the presence of high levels of salts and nitrates (see photographs 3.6 and 3.7**).**

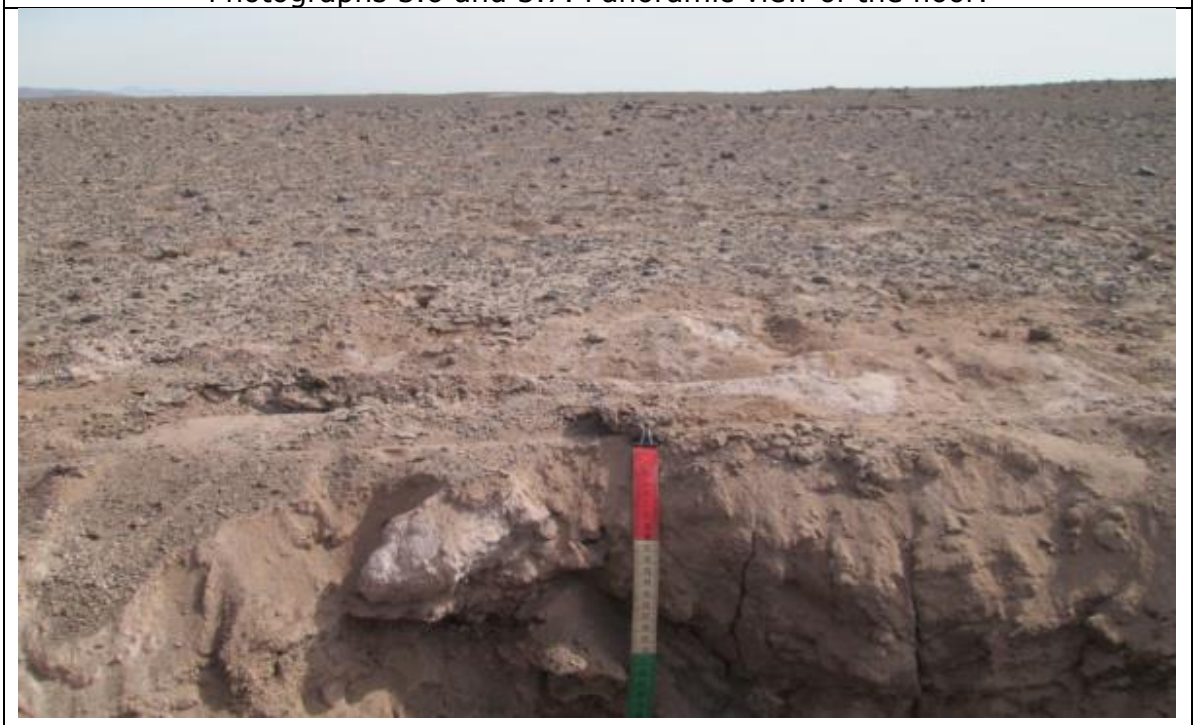
Photo 3.3. View of the soil profile.



Photographs 3.4 And 3.55. Panoramic view of the floor.

Photographs 3.6 and 3.7. Panoramic view of the floor.

Photographs 3.6 and 3.7. Panoramic view of the floor.



Finally and as for LTo review and Contribution to the baseline of The 9 Projects Analyzed (see point 3.10 of baseline) With RCA approved in the Environment Close to the project It is possible to indicate that a large part of the information provided by the surrounding projects and that could be used as secondary information for the development of the present physical-medium baseline does not provide sufficient background to the Components studied.

Depending on the foregoing, the above-mentioned projects should not produce changes This Component, so that a cumulative and/or synergic effect on the soil would not be generated.

### *3.1.6.5 Conclusions*

According to the present report, the land resource existing in the project area is generally characterized as a soil that has a limited change in the parental material due to the low climatic intensity, They remain dry for long periods of years and have very low plant cover.

In addition, the surface is covered by deposits Aluvio-colluvial, product of processes of deflation and wind corrosion, forming a stony pavement, constituted mainly by angular lithic fragments.

On the other hand, it has quite homogeneous edaphic characteristics, with a range of variation in its very narrow physical and morphological properties. The evolution or development soil is incipient and even nonexistent, calificándose as a succession of layers of sediments, qualifying as a soil class VIII of capacity of use, indicating that they are soils without value agricultural, livestock or forestry, and their use It is limited only to wildlife, recreation or protection of watersheds.

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## 3.1.7 Air quality

### *3.1.7.1 Objective*

The objective of this section is to present the baseline air quality in the area of the project directly involved.

### *3.1.7.2 Methodology.*

The methodology used to establish the baseline considered the following:

- Information from the air quality monitoring stations closest to the study area present in the National Air Quality Information System (since), which was obtained through its Website.
- Information from nearby projects entered into the environmental impact assessment system that has information obtained from air quality monitoring stations.
- Analysis and interpretation of the information collected: Of the information collected to select the stations that best represent the air

quality in the project area, the ones that meet the following criteria were selected: to find At a distance less than 10 km, tDatMP10 particulate matter and I said no Exists A topographic barrier between the projectCTO and the monitoring station. DEBido Not having information from nearby stations, we chose stations that characterize the area under study.

In order to establish the state of the baseline of the area, it is used as established in the primary air quality standards, the maximum and statistical concentration values for the MP10 and MP2 compounds, 5 What correspond to:

- Average annual concentration: corresponds to the average value resulting from the mean of 1 year diagnosed by the model during the year of simulation for each point of the domain considered.

- Twentieth percentile 3 : Corresponds to the value of the concentration variable that has below its value XX% of the time or daily values (depending on the contaminant) diagnosed by the model during the simulation year for each point of the domain considered.

The values for each one of the compounds are detailed in the following table.

[3] Se calcula el percentil 99 con aplicación sobre los resultados de $NO_2$ para poder evaluar en caso de que existan el número de superaciones del valor límite máximo horario diario de este contaminante.
Se calcula el percentil 98 con aplicación sobre los resultados de $MP_{10}$ y $MP_{2,5}$ para poder evaluar el número de superaciones del valor límite diario de este contaminante en caso de que existan.

**Tabla 3.10** Air quality standards.

| Compound | Quality Standard | Statistical | Application Period | Concentration |
|---|---|---|---|---|
| MP10 | D. S N º 59/1998. | $Mp_{10}$ 24h percentile 98 | Concentration 24 Hrs | 150 M G/$M^3$ |
| | | $Mp_{10}$ Annual average | Annual concentration | 50 M G/$M^3$ |
| MP 2.5 | D. S N º 12/2011. | $Mp_{2.5}$ 24h percentile 98 | Concentration 24 Hrs | 50 M G/$M^3$ |
| | | $Mp_{2.5}$ Annual average | Annual concentration | 20 M G/$M^3$ |

### *3.1.7.3 Results*

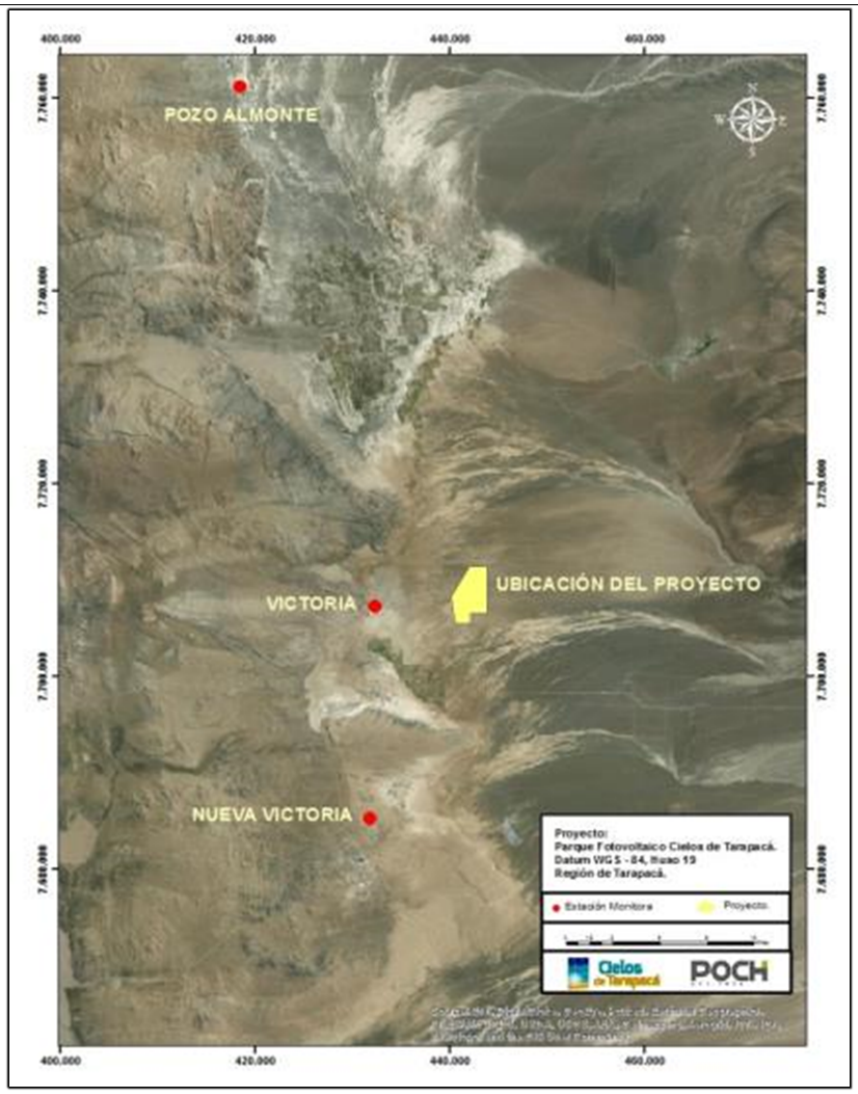
The Cielos de Tarapacá Photovoltaic Park project is located within the boundaries of the Pozo commune Almonte, close to the National reserve Pampa del Tamarugal. The characteristics of the area in which the project will be located correspondsN To an area considered as rural, according to the regulatory plan of the commune. The population closest to the project is the towns of: Colonia de Pintado, Office-Victoria, Pica and Pozo Almonte, these locations are at an average distance of 7.5, 8.5, 31 and 55 kilometres respectively. Given the desert climate and the use of soil in the sector, the main emissions are associated with the particulate matter MP10, MP2, 5 And PTS, so the analysis and collection of information was focused on these compounds.

Air quality monitoring stations that were used by projects near the study area, which have been entered into the environmental impact assessment system, were 3: Victoria Station, Nueva Victoria and Pozo Almonte. Of these stations that meet the selection criteria mentioned in the methodology is the Victoria station, without prejudice to the above, the 3 monitoring stations will be used to supplement information and represent the area of study in General terms.

- *Project location and monitoring stations*

The following is the location letter of the project site and the air quality monitoring stations used for the elaboration of LBCA.

**Figura 3.17** Location of the project Cielos de Tarapacá and air quality monitoring stations.




Source: Self-elaboration

The following table gives information about the air quality monitoring stations used in the LBCA, geographical location, approximate distance to the project and the variables measured at each station.

**Tabla 3.11** References of air quality monitoring stations.

| Monitor Station | South (M) | East (M) | Approximate distance to the project (km) | Measured Variables |
|---|---|---|---|---|
| Victory | 7,706,672 | 431,655 9 | 8.5 | MP10 (2004-2007) |
| New victory | 7,684,614.30 | 431,089.66 | 23 | MP10 (2003) |
| Pozo Almonte | 7,760,605 | 417,709 | 54 | MP10 and SO2 (2012) |

The values considered as baseline air quality for the period between 2003 and 2012 are presented below.

- *Monitoring of MP10 particulate matter.*

*New Victoria Station*

The new Victoria station is located on the side of Route 5, at a distance of approximately 23 kilometers from the area of the project site This station contains records of environmental concentration of MP10 corresponding to the year 2003, having been realized Measurements every three days, the QThe EU are presented in the following Tabla 3.12

**Tabla 3.12** Concentrations of particulate matter MP10 in Nueva Victoria station.

| Date | Concentration (µg/m3N) | Date | Concentration (µg/m3N) | Date | Concentration (µg/m3N) |
|---|---|---|---|---|---|
| 04-Jul | 43 | 02-Nov | 25 | 06-Dec | 32 |
| 07-Jul | 29 | 05-Nov | 44 | 09-Dec | 21 |
| 10-Jul | 27 | 08-Nov | 31 | 15-Dec | 18 |
| 13-Jul | 18 | 11-Nov | 39 | 18-Dec | 14 |
| 16-Jul | 45 | 14-Nov | 63 | 21-Dec | 28 |
| 19-Jul | 36 | 17-Nov | 11 | 24-Dec | 21 |
| 22-Jul | 27 | 20-Nov | 62 | 27-Dec | 10 |
| 25-Jul | 21 | 23-Nov | 37 | 30-Dec | 11 |
| 28-Jul | 26 | 26-Nov | 44 | 02-Jan | 11 |
| 31-Jul | 12 | 29-Nov | 23 | | |
| Jul Average | 28 | Average Nov | 38 | Average Dec | 18 |

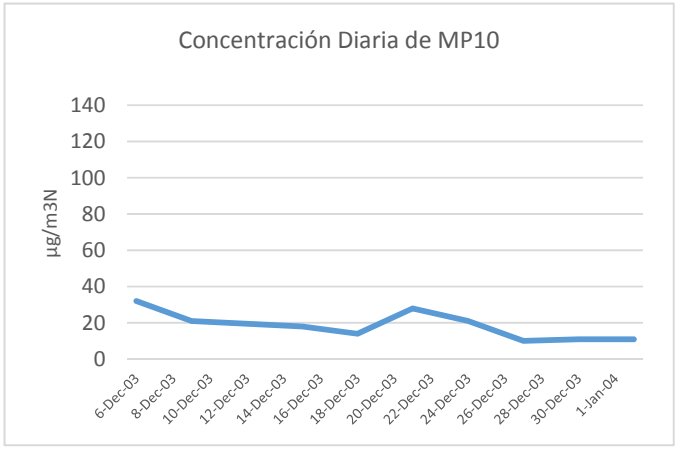
In the Previous table It is observed that the daily concentrations vary in the range of 10 µg/m3N to 63 µg/m3N, being the month of November that presents the highest values of concentration of MP10. No values on the daily standard of 150 µg/m3N are observed in the analyzed records.

*Victoria Station*

Victoria Station is also located on the side of Route 5, and is approximately 8.5 kilometres from the project's site area. The station contains records of the monitoring period between December 6, 2003 to January 2, 2004 and between May 7 to June 6, 2007. This station will be taken as a reference due to the age of the data.

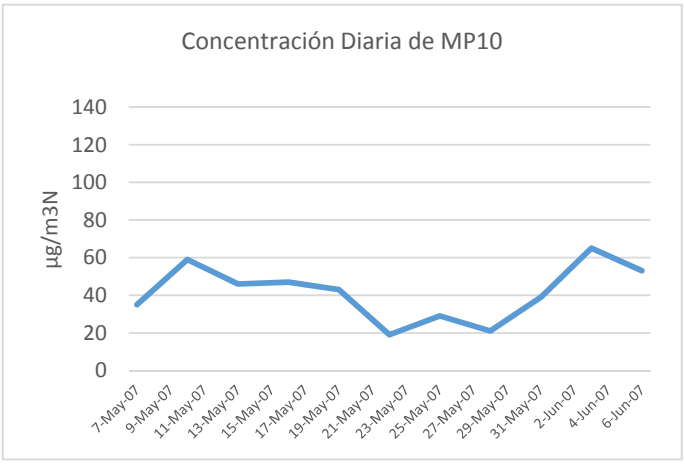
The results of both records are presented in the Figura 3.18 And Figura 3.19 :

**Figura 3.18** Daily concentration MP10 Victoria Station, December 2003-January 2004.




Source: Self-elaboration

**Figura 3.19** MP10 concentration station Victoria, May-June 2007.



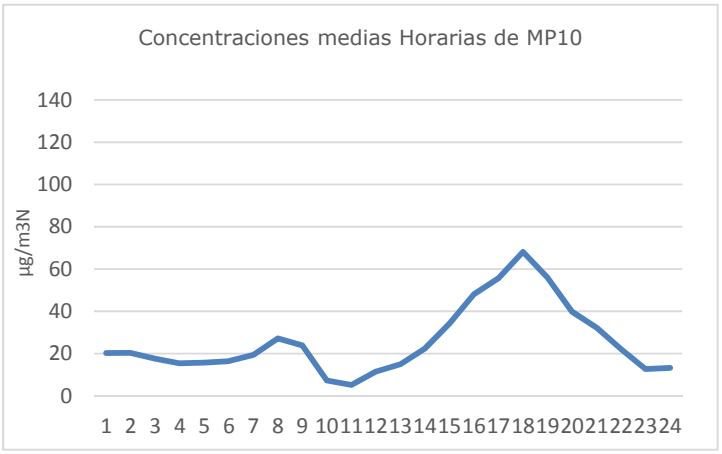

Source: Self-elaboration

In the Previous figures It can be observed that the daily concentrations are distributed in a range of 10 to 32 µg/m3N, records of 2003-2004, and between 19 to 65 µg/m3N, records of 2007. No values on the daily standard corresponding to 150 µg/m3N are observed in the analyzed records.

*Station located in Pozo Almonte*

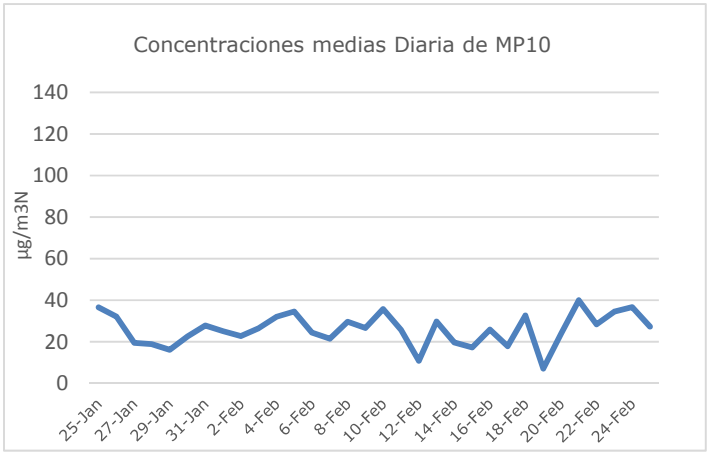
Pozo Almonte Station is located in the interior of Pozo Almonte, at a distance of approximately 55 kilometers from the project site area, this station has records of MP10 particulate matter from January 25th from 2012 to 25 February 2012.

**Figura 3.20** Average time concentrations of MP10, station in Pozo Almonte.




Source: Self-elaboration

**Figura 3.21** Average time concentrations of MP10, station in Pozo Almonte.




Source: Self-elaboration

In the figures Previous It is observed that the daily average concentrations of particulate matter has a maximum concentration of 40 µg/m3N on February 21, 2012, not exceeding the daily standard of 150 µg/m3N.

#### *3.1.7.4 Conclusions.*

According to the records of the air quality monitoring stations Nueva Victoria, Victoria and Pozo Almonte, the average daily monitoring campaigns from the year 2003 to 2012, would be of the order of 28.3 µg/m3N which would not have Superac Ion of the limit value established as primary air quality standard of 150 µg/m3N for the MP10 compound

In relation to the particulate matter MP 2.5, although no monitoring data are recorded near the project, the MP10 particulate matter can be distinguished in a coarse fraction and a fine fraction, where the latter considers the particles of size less than or equal to 2.5 Micron called MP2, 5 (N ° 59/1998), so this compound would be represented by the records of the monitoring campaigns for MP10.

Given that in the area near the site where the project will be located, the implementation of major projects between the years 2013 and 2014 which may cause significant alterations to the baseline presented, it is possible to infer that this Baseline would not present significant changes, so the representativeness of the data obtained in the monitoring campaigns of the year 2003 to year 2012 could explain the current condition in the air quality in the area directly involved with the project.

## 3.1.8 Noise

### *3.1.8.1 Objective*

The objective of this baseline Will be EFectuar measurements of baseline noise levels in the receivers listed as sensitive, both For the daytime as a nocturnal period.

### *3.1.8.2 Methodology*

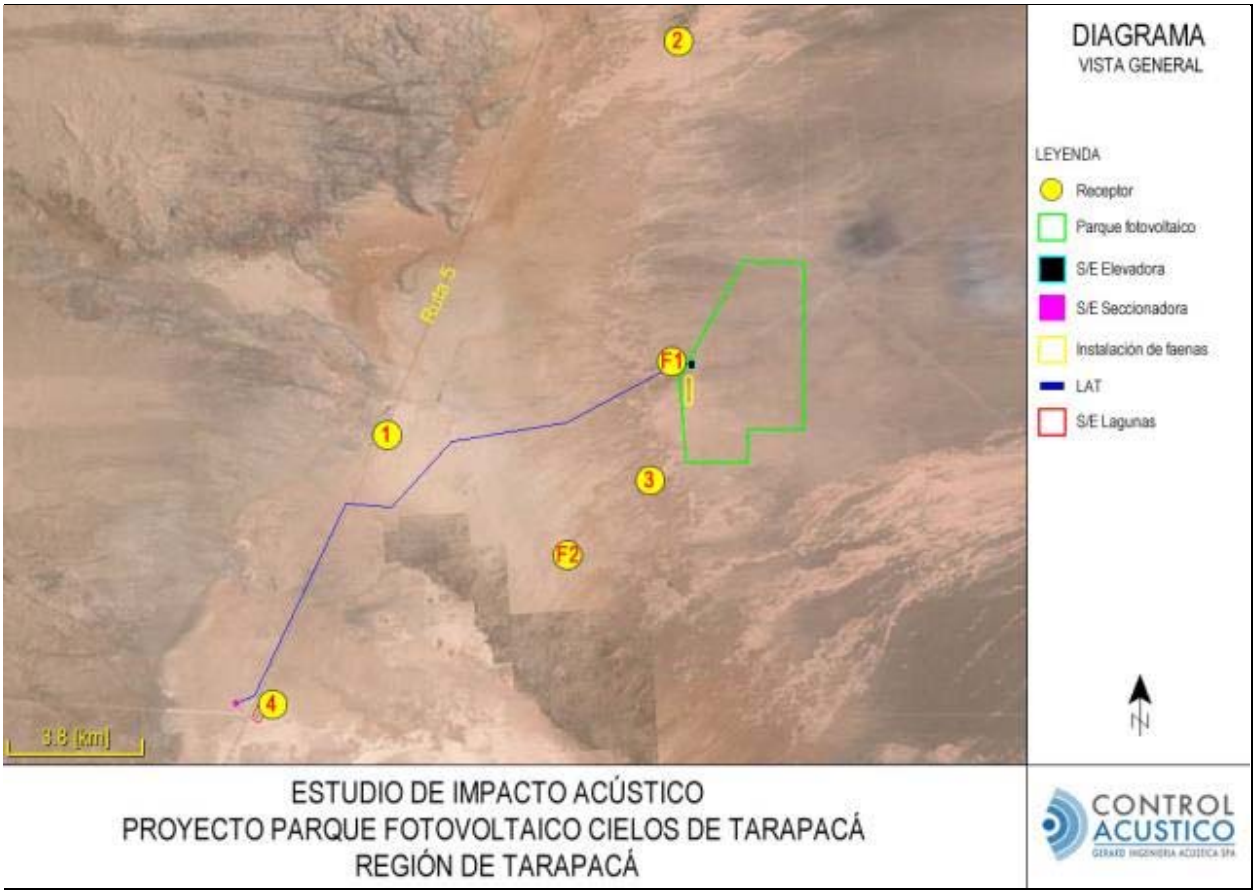
For the development of the baseline of this environmental component, the following activities were carried out:

- *Location of measuring points*

The noise assessment points were selected according to their proximity to the facilities and layout involved in the project.

The locations associated with sensitive receivers are detailed through the Figura 3.22 And Tabla 3.13 . For a better understanding the points associated with sectors of sensitive fauna will be called with a letter F.

**Figura 3.22** Evaluation points




**Development**: *Gerard Engineering Acoustics SpA 2014.*

**Tabla 3.13** Location and description of measuring points.

| Point | Description | Height [m] | Effective use | UTM coordinates Datum WGS 84 Spindle 19K | |
|---|---|---|---|---|---|
| | | | | This | North |
| 1 | 2-storey house located in the town of Victoria | 1.5 | Residential | 431606 | 7706302 |
| 2 | 1-storey apartment located in the town of Pintado | 1.5 | Residential | 440067 | 7717917 |
| 3 | 1-storey abandoned housing belonging to Conaf | 1.5 | Referential | 439233 | 7704795 |
| 4 | Electrical substation Gaps | 1.5 | Industrial | 427953 | 7698242 |

Note: coordinates obtained in terrain.

It is important to mention that point 3 does not present habitability. PoR This motive will only be presentedn Referential values.

**Tabla 3.14** Location and description of fauna measuring points.

| Point | Description | Height [m] | Effective use | UTM coordinates Datum WGS 84 Spindle 19K | |
|---|---|---|---|---|---|
| | | | | This | North |
| F1 | Point selected for sensitive fauna, located on the west side of the project area. | 1.5 | Fauna | 440186 | 7708313 |
| F2 | Point selected for sensitive fauna, located on the south west side of the project area. | 1.5 | Fauna | 436888 | 7702837 |

Below are photographs of the measuring points obtained in the baseline campaign.

Photographs of the noise measuring points inhabited sector.

**Point 1**

**Point 2**

| Point 3 | Point 4 |
|---|---|

Photographs of the noise measuring points of the Fauna sector.

| | |
|---|---|
|  |  |
| **F1 Point** | **Point F2** |

- *Zoning measuring points*

LA zoning was carried out According to D. S No. 38/11 of the Ministry of the Environment (MMA), related to the points listed as sensitive receptors.

All the measuring points are outside the territorial planning instruments (IPT) of the villages near these, thus it is approved to Rural area according to D. S N º 38/2011 of the MMA.

The Tabla 3.15 It presents a summary of the homologations corresponding to each measuring point:

**Tabla 3.15 :** Zoning and maximum permissible levels of NPC, according to DS N º 38/2011 of the MMA, for each point.

| Measuring point | Zoning according to DS N º 38/11 of the MMA | Daytime period | Night Period |
|---|---|---|---|
| | | Maximum NPC allowed [DB (A)] | Maximum NPC allowed [DB (A)] |
| 1, 2 and 4 | Rural Area | Lower level between background noise level + 10 [DB], and maximum NPC allowed for zone III | |

The table above shows that for both evaluation periods the maximum levels allowed will be established according to the lowest value Between background noise level + 10 [DB], or the maximum allowed value for zone III. These

values apply to the sources of noise defined in article 6, point 13 of DS No. 38/11 of the MMA.

It is important to remember that the F1 and F2 points do not maintain human settlement presence, so that the D. S No. 38/11 of the MMA does not apply at this point.

- *Noise measurements*

Between 23 and 24 October 2014, measurements of background noise in slow [DB] were carried out, during daytime and nocturnal hours, according to the applied norms.

This was done at the points established as sensitive receptors close to the future project.

To define the area of influence is considered the surface where you can see the population affected by the future emissions of the project, then select the closest points and determines a sufficient amount of them to cover the whole of the evaluated sector. In this way, six (6) measuring points were determined, of which two (2) of them were selected by the presence of fauna. All these correspond to the sectors closest to the site of the project.

The duration of each background noise measurement was subject to the difference of the values recorded every 5 minutes, until the reading is considered as stable (difference less than or equal to 2 [DB (a)] between each reading), according to the procedure of Measurement established in DS No. 38/2011 of the MMA. In the case of points related to sensitive fauna, the measurement is carried out until it is considered equally stable.

The Sonometer was located at 1.5 [m] on its vertical axis of the ground and, where possible, at 3.5 [m] of any reflective surface on its horizontal axis (walls, walls, windows).

For measurements we used a Sonometer integrator-averaging Rion brand, model NL-22 configured as Class 2 according to IEC 61672-1:2002. The instrument was properly calibrated on site by the operator. In annex II to the noise study (see **Annex 1.5** of EIA) The calibration certificates of each equipment used are delivered.

### *3.1.8.3 Results*

*Daytime period*

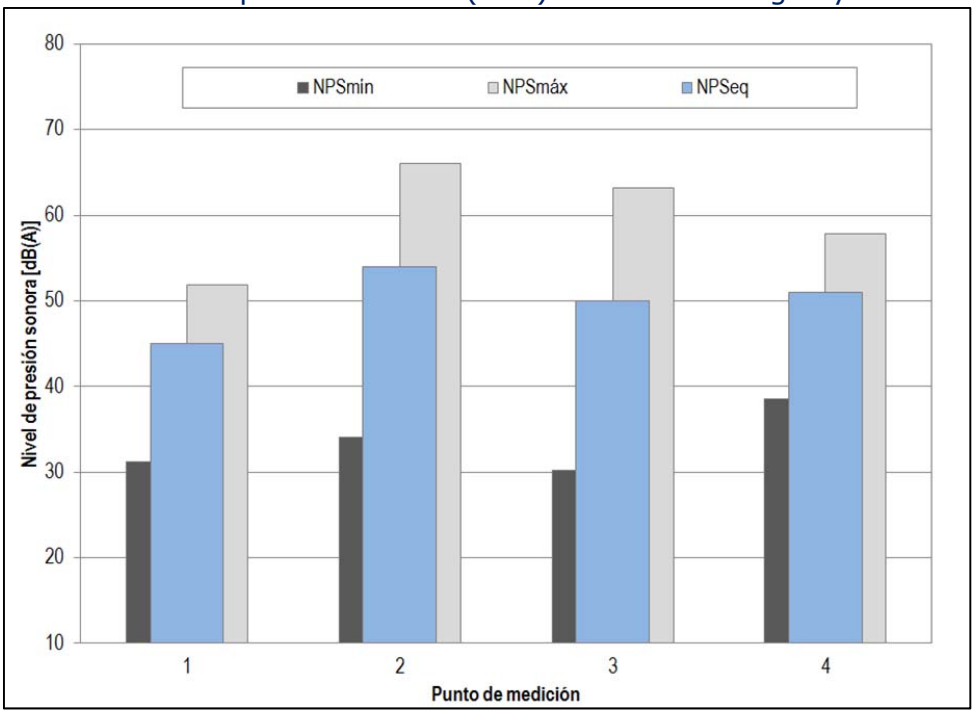
The NPSEQ values for the daytime period recorded during the basal measurements campaign are given below, and the noise sources associated with them are described. At the time of the measurements the meteorological conditions were stable where the average temperature was 35 [º C] and wind velocities no greater than 6 [m/sec]. In annex I Of the Noise study (See **Annex 1.5** of EIA) The detail of each measurement carried out is given.

**Tabla 3.16** NPS values, in [DB (A)]-Slow and noise sources present in the measurement. Daytime period.

| Point | Daytime period | | | Noise sources | Measuring time |
|---|---|---|---|---|---|
| | $Nps_{Eq}$ [DB (A)] * | $Nps_{Min}$ [DB (A)] | $Nps_{Max}$ [DB (A)] | | |
| 1 | 45 | 31.2 | 51.8 | Vehicular transit by Route 5 and wind product noise | 13:20 |
| 2 | 54 | 34.1 | 66.0 | Wind Noise Product | 14:40 |
| 3 | 50 | 30.2 | 63.2 | Wind Noise Product | 16:10 |
| 4 | 51 | 38.6 | 57.8 | Vehicular transit by Route 5 and electrical substation noise | 13:50 |

* Approximate value to the nearest integer.

**Figura 3.23 :** Sound pressure levels (NPS) recorded during daytime hours.




**Development**: *Gerard Engineering Acoustics SpA 2014.*

As you can see in, The background noise levels for points related to inhabited sites vary between 45 and 54 [DB (a)], where differences between them are the product of the wind conditions present in each of the points at the time of the measurements, it is also appreciated that the P Points near the road present vehicular traffic as the main source.

At all points the minimum records are given by Periods of absence of wind, Unlike the maxima that are detected at the time of higher streaks of The wind or the passage of vehicles associated Points 1 and 4.

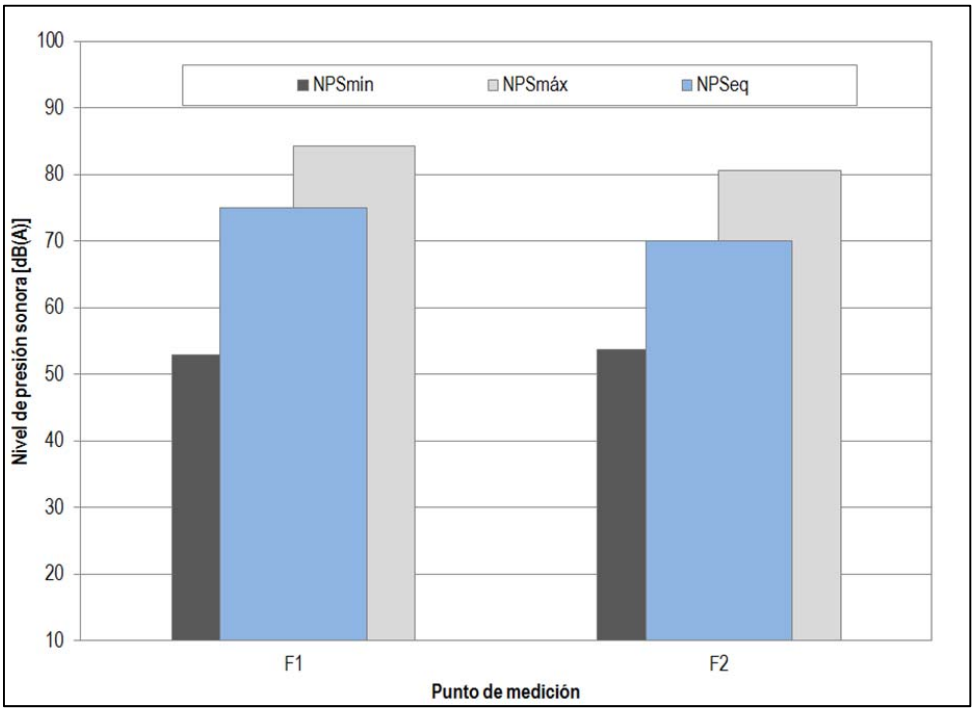
The following are the values recorded during the daytime period for the points associated to sectors with sensitive fauna. These values were obtained by the PLA responseNa, ie without weighting in frequency, in order to maintain the descriptor mentioned in the regulations used.

**Tabla 3.17** NPS values, in [DB]-Slow and noise sources present in the measurement. Diurnal period, sensitive fauna sector.

| Point | Daytime period | | | Noise sources | Measuring time |
|---|---|---|---|---|---|
| | $Nps_{Eq}$ [DB] * | $Nps_{Min}$ DB | $Nps_{Max}$ DB | | |
| F1 | 75 | 53.0 | 84.3 | Wind Noise Product | 15:22 |
| F2 | 70 | 53.7 | 80.6 | Wind Noise Product | 16:50 |

* Approximate value to the nearest integer.

**Figura 3.24** Sound pressure levels in [DB], recorded in daytime, sensitive fauna sector.




**Development**: *Gerard Engineering Acoustics SpA 2014.*

As Is Can appreciate That the values obtained for The points related to fauna are relatively similar between the two, reGistrándose a difference of sóThe 5 [DB] between them. The main sound source corresponds to the noise produced by the wind present in the sector, Where The different conditions of the latter are responsible forS Of the differences recorded in both points.

*Night Period*

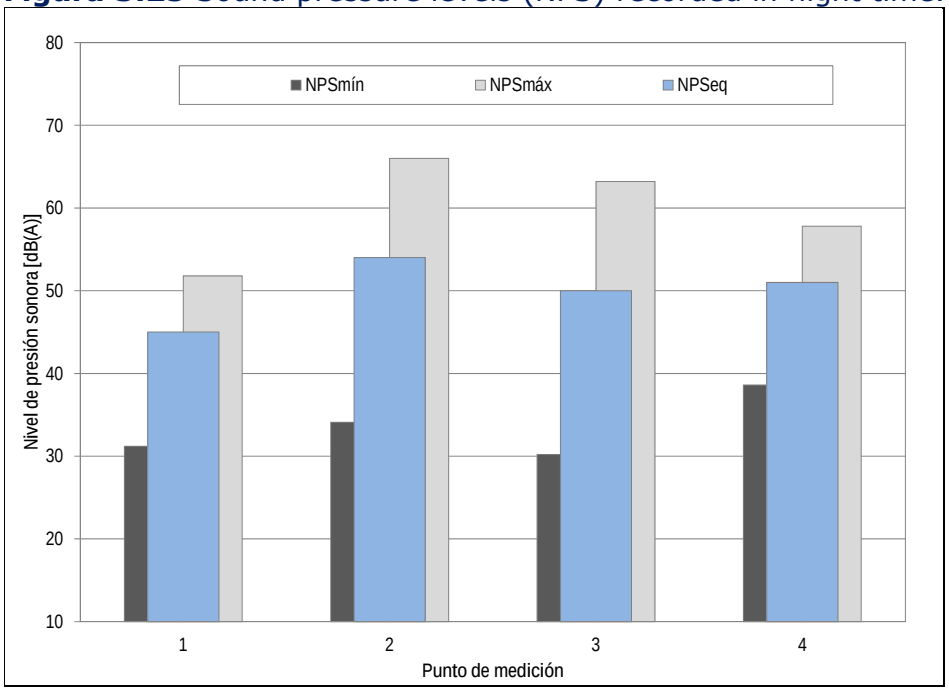
LTo Table and Next figure they show the values for the night period of NPSeq recorded during the measurement campaign and the noise sources associated with them. At the time of the measurements the meteorological conditions were stable having an average temperature of 15 [º C] and wind velocity of 1 [m/sec] during the nocturnal period. In annex I (see **Annex 1.5** of EIA) The detail of each measurement carried out is given.

**Tabla 3.18** NPS values, in [DB (A)]-Slow and noise sources present in the measurement. Night period.

| Point | Night Period | | | Noise sources | Time to Measurement |
|---|---|---|---|---|---|
| | $Nps_{Eq}$ [DB (A)] * | $Nps_{Min}$ [DB (A)] | $Nps_{Max}$ [DB (A)] | | |
| 1 | 40 | 29.5 | 50.5 | Vehicular Transit by RUta 5, wind product noise and far away dogs. | 1:05 |
| 2 | 37 | 22.6 | 53.1 | Noise Wind product very slight | 2:00 |
| 3 | 40 | 33.3 | 45.7 | Noise Wind product very slight | 23:48 |
| 4 | 48 | 31.3 | 57.7 | Vehicular Transit by RUta 5. | 23:10 |

* Approximate value to the nearest integer.

**Figura 3.25** Sound pressure levels (NPS) recorded in night time.




**Development:** *Gerard Engineering Acoustics SpA 2014.*

LThe background noise levels vary between 37 and 48 [DB (A)], where point 4, located on the side of Route 5, Presents The highest levels of the period Mainly due to the passage of vehicles. Point 1, although close to the route, PREsenta Lower Noise levels Due to being in a populated place, Where vehicular traffic Presents Lower speed And Thus it emits less noise. Points 2 and 3 are influenced almost exclusively by the noise caused by the wind, being the difference between them attributed to the present wind condition at the time of the measurements.

*Sensitive Fauna*

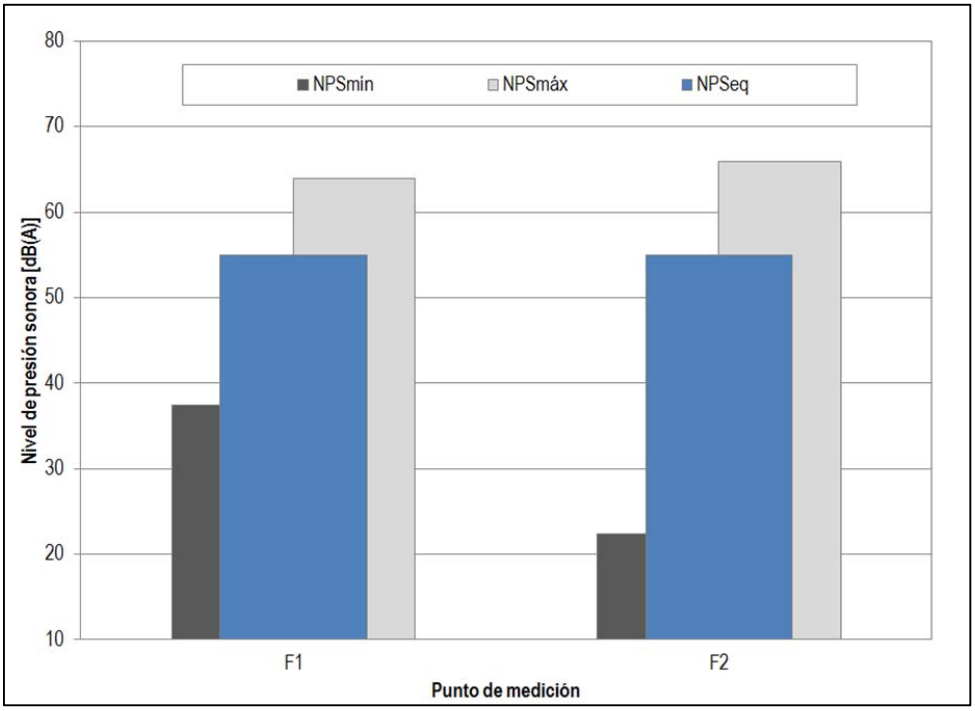
Below are the values obtained during the night period for the points associated to sectors with sensitive faunaWhere It shows the values obtained for the points related to fauna during the nocturnal period, where there is a great stability in the values not presenting a difference between the two points

**Tabla 3.19** NPS values, in [DB]-Slow and noise sources present in the measurement. Nocturnal period, sensitive fauna sector**.**

| Point | Daytime period | | | Noise sources | Measuring time |
|---|---|---|---|---|---|
| | $Nps_{Eq}$ [DB] * | $Nps_{Min}$ DB | $Nps_{Max}$ DB | | |
| F1 | 55 | 37.4 | 63.9 | Very light wind product noise and far away truck traffic | 2:55 |
| F2 | 55 | 22.4 | 65.9 | Noise Wind product very slight | 0:41 |

Approximate value to the nearest integer.

**Figura 3.26** Sound pressure levels in [DB], recorded in night time, sensitive fauna sector.

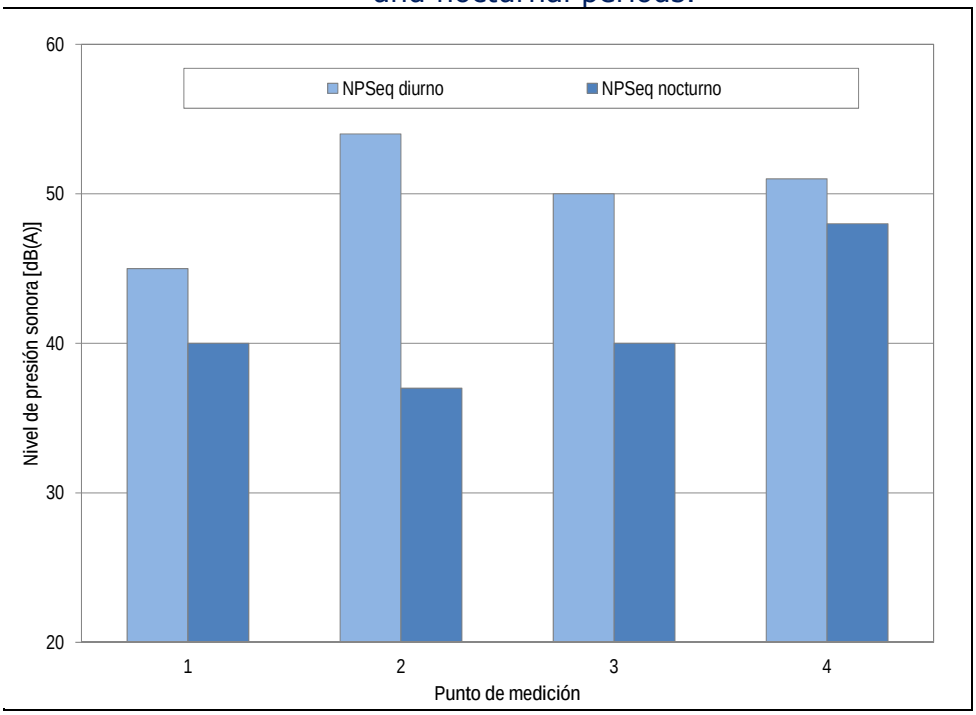



Elaboration: Gerard Ingeniería Acoustics SpA 2014.

*Comparison between measurement periods*

In The Next figure There is a comparison between the levels of sound pressure obtained for the daytime and nocturnal periods, where differences in levels between both periods are appreciated.

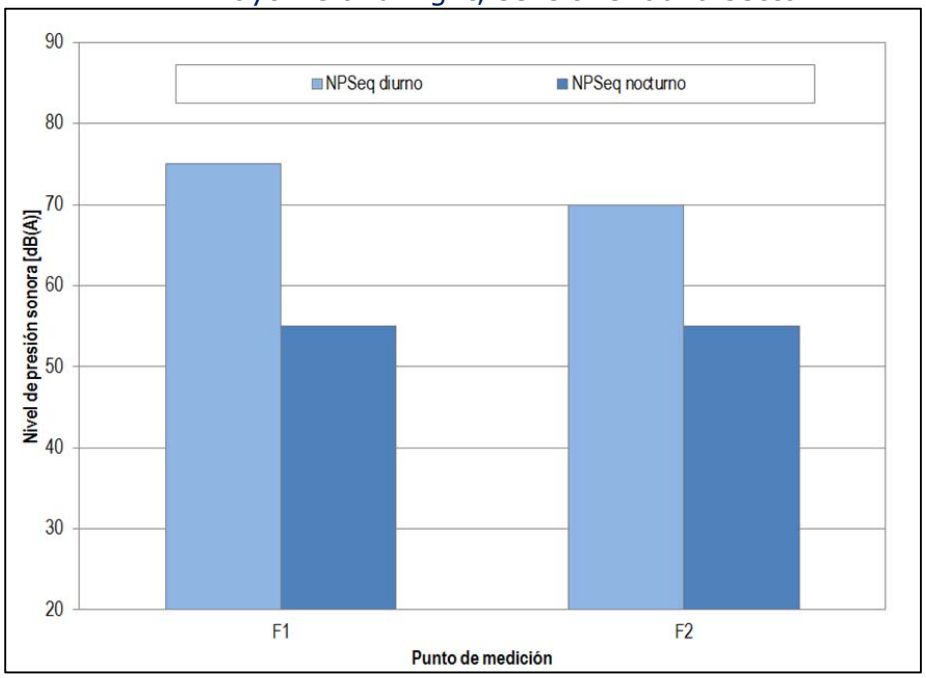
**Figura 3.27** Comparison of sound pressure levels obtained during the daytime and nocturnal periods.




Elaboration: Gerard Ingeniería Acoustics SpA 2014.

Below A decrease is seen Between the two periods, product of the least wind condition and a drop in vehicular flow that circulates along Route 5.

**Figura 3.28 :** Comparison of sound pressure levels obtained during periods Daytime and night, sensitive fauna sector




**Development**: *Gerard Engineering Acoustics SpA 2014.*

## *Maximum Allowed*

### *Supreme Decree No. 38/2011 of the Ministry of Environment (MMA)*

Then SE present the maximum limits defined for each sampled point. These values are determined according to the Limits established in D. S. N º 38/2011 of the MMA.

It should be recalled that point 3 is a CONAF housing, which is abandoned, so no evaluation values are presented for this point.

In the 0The maximums allowed for each sampled point are delivered.

**Tabla 3.20** Maximum permissible levels of NPC, according to DS N º 38/2011 of the MMA.

| Measuring point | Zoning according to DS N º 38/2011 of the MMA | Daytime period | | Night Period | |
|---|---|---|---|---|---|
| | | Baseline level $Nps_{Eq}$ [DB (A)] * | Maximum NPC allowed [DB (A)] | Baseline level $Nps_{Eq}$ [DB (A)] * | Maximum NPC allowed [DB (A)] |
| 1 | Rural Area | 45 | **55** | 40 | **50** |
| 2 | Rural Area | 54 | **64** | 37 | **47** |
| 4 | Rural Area | 51 | **61** | 48 | **50** |

* Approximate value to the nearest integer.

SE appreciates that for the daytime period the maximum allowed varies between 55 and 64 [DB (a)], while for the night period these vary between 47 and 50 [db (a)], leaving the latter established by permitted maximums defined for zone III.

It is important to mention that the values obtained during the baseline campaign are not evaluated by this regulation, and are only used to obtain the maximum permissible as stipulated in article 9 of chapter IV of this regulation.

### *Environmental Assessment Guide: Wildlife Component G-PR-GA-03 – Livestock Agricultural Service (SAG)*

For the points of interest of fauna applies the guide of environmental assessment: component wildlife. G-PR-GA-03 published by the Agricultural Livestock Service (SAG) of the Ministry of Agriculture in 2012, where in point 5.2, letter (g) recommends using as reference the EPA that establishes as a criterion A maximum of 85 DB for non-effects on wildlife

The following are the Values Maximum set for the selected point for wildlife protection.

**Tabla 3.21** Permissible maximum levels of NPS for fauna, according to the Environmental Assessment Guide: Wildlife Component – SAG.

| Measuring point | Daytime period | | Night Period | |
|---|---|---|---|---|
| | Baseline level $Nps_{Eq}$ [DB] * | Maximum Allowed DB | Baseline level $Nps_{Eq}$ [DB] * | Maximum Allowed DB |
| F1 | 75 | **85** | 55 | **85** |
| F2 | 70 | | 55 | |

* Approximate value to the nearest integer.

As shown in the preceding table, the points related to sensitive fauna, maintain a maximum permissible of 85 [DB], independent of the period in which it is evaluated.

### *3.1.8.4 Conclusions*

The main sources of noise detected at the time of the measurements correspond, for points 1 and 4, to the noise generated by the vehicular traffic that circulates on Route 5. In point 2 and 3, the wind was presented as the main source of noise during both periods.

In the case of points related to sensitive fauna, the wind was presented as the main source of noise at the time of the registers, being the different speed conditions of this one the causality of the variations obtained between both periods.

The values obtained for the points located in inhabited sectors varied between 45 and 54 [db (a)] for the daytime period and between 37 and 48 [db (a)] for the nocturnal period. The points related to sensitive fauna present records that vary between 70 and 75 [db] for the daytime period and during the night it is stable in 50 [db] for both points. It is important to note that the values given for inhabited sectors and with the presence of sensitive fauna are delivered in different descriptors, weighted in A and without weighting respectively, so these values cannot be compared between them.

It should be recalled that point 3 is referential, since being uninhabited is not possible to consider it as a receiver by the norm applied.

According to the values obtained from baseline and to the limits established in DS No. 38/2011 of the MMA for each inhabited evaluation point, the maximum allowed levels vary between 55 and 64 [DB (a)] for daytime and between 47 and 50 [db (a)] for night period. In the case of selected points for sensitive fauna, the maximum is 85 [DB] in both PERiodos.

## References

BS 5228: Part 1:1984 (2004)-Noise control on construction and open sites.
Supreme Decree No. 38/2011 of the Ministry of the Environment: noise emission standard, drawn up from the revision of the Supreme Decree No. 146/97, of 1997 of the Ministry Secretary General of the Republic.
IEC 61672-1:2002, Electroacustics – Sound Level meters – Part 1: Specifications.
ISO 9613-2:1996, Attenuation of sound during propagation outdoors.
Software Designers & Consulting Engineers for Noise Control and Environmental Protection SoundPLAN v 7.3 – User Manual.
Environmental Assessment Guide: Wildlife component. G-PR-GA-03 published by the SAG of the Ministry of Agriculture, government of Chile in 2012.
"Engineering Noise Control – Theory and practice". Bias and Hansen. Third Edition 2003.
ENC Software; Qiu & Hansen

## 3.2 TERRESTRIAL ECOSYSTEM

### 3.2.1 Terrestrial Flora and vegetation

#### *3.2.1.1 Objectives*

The general objective of this section is to characterize the current situation of the elements that constitute the environmental component the flora and terrestrial vegetation that develops in the area where the works of the project are inserted.

The specific objectives established are:

- Characterize the FLora and terrestrial vegetation Of Area of the Project, in terms of its composition, level of endemism in Chile and state of conservation.
- Identify the plant species present in the terrestrial ecosystems in the project area, defining their distribution and abundance, giving emphasis to sites of vegetational singularity that include those species that are in some category of Conservation.
- To generate the cartography that represents the aforementioned variables. Based on these objectives, compliance with the provisions of article 6 of title II of the regulation of the Environmental Impact Assessment System (DS 40/2012), of the Ministry of the Environment will be complied with.

#### *3.2.1.2 Methodology*

The methodology used for the characterization of the flora and terrestrial vegetation was based on the methodological protocols that the National commission of the Environment (current environmental assessment Service) It proposes in the document "Methodologies for the characterization of

Environmental quality" (CONAMA, 1996), in addition to those proposed by the Ministry of Agriculture in The document "Environmental Assessment Guide: Vegetation and Wild Flora" (MINAGRI, 2010).

Characterization in the field of flora and vegTerrestrial Etación in the area Of the project was materialized through a field campaign, held between 30 September and 2 October in the year 2014.

In addition, a review of existing bibliographic antecedents for flora and vegetation was performed tErrestre present in the area Of the project, which allowed to establish the biogeographical framework of the same.

The following describes the specific methods of analysis for flora and terrestrial vegetation.

*Terrestrial vegetation*

The description of the terrestrial vegetation is carried out through the application of the cartography of land Occupation (COT) developed by the Center for Fitosociológicos and Ecological studies L. Emberger, ECE of Montpellier, France, and adapted in Chile by Etienne and Prado (1982).

For these purposes the following activities are carried out:

- Bibliographical review
- Interpretation
- Field campaign
- Systematization of information

The above activities are described below:

- *Interpretation*

In the cabinet, the photointerpretation of the area under study was performed with the purpose of identifying homogeneous units of vegetation existing in the area of I am a student. Photointerpretation was made from Google Earth images available, georeferenced in WGS84.

This information was used to allocate sampling points in the field, for which the following criteria were considered:

- Sampling in the area Of the project, in order to cover the existing vegetation variability in the area.
- Representativeness of homogeneous vegetation units. All homogeneous vegetation units identified in the photointerpretation are incorporated into the field sampling.
- *Field campaign*

In the field, 25 sampling stations were prospectaron, where according to the COT the following parameters were evaluated: Plant formation, dominant species and degree of artificialization.

The plant formation corresponds to that group of plants, belonging or not to the same species, which have converging characters both in their form and in their behaviour. According to this, it constitutes a fisonómico approach, based on the concepts of stratification and coverage that allow to give an image of the vertical disposition and HorizoIn situ vegetation. ÉSTA can be classified into four fundamental biological types:

- Are those species whose tissues are notStan Lignified (not Woody), with chlorophyll-rich stems and photosynthetics (herbs).
- Low Woody (shrubs): These are those species of lignified or woody tissues, the size of which does not exceed two metres in height.
- Tall Woody (arboreal): sOn those species of lignified or woody tissues whose size exceeds two meters of height.

- Succulent (cacti and bromeliads): Under this denomination are mainly grouped cacti and bromeliads, species that They present a very particular physiology, especially with regard to the fixation of carbon dioxide.

The concept of stratification refers to the vertical disposition of the vegetation, i.e. it constitutes a vertical profile or cut in the community, allowing to distinguish and to classify the different levels of height in which the biological types are located. With regard to the representation in the COT, stratification is given by biological types present in the community (see Tabla 3.22 ).

**Tabla 3.22** Stratification categories for different biological types

| Biological type | Stratum |
|---|---|
| Arboreal type (tall woody) | 2 – 4 m |
| | 4 – 8 m |
| | 8 – 16 m |
| | 16 – 32 m |
| | More than 32 m |
| Shrub type (low woody) | 0 – 25 cm |
| | 25 – 50 cm |
| | 50 – 100 cm |
| | 1 – 2 m |
| Herbaceous type | 0 – 25 cm |
| | 25 – 50 cm |
| | 50 – 100 cm |
| | 1 – 2 m |
| | More than 2 m |
| Succulent type | 0 – 25 cm |
| | 25 – 50 cm |

| Biological type | Stratum |
|---|---|
| | 50 – 100 cm |
| | 1 – 2 m |
| | More than 2 m |

Source: Etienne and Prado (1982).

Coverage or coating represents the proportion of the terrain that is occupied by vegetation or its vertical projection. This criterion gives an idea of the abundance of the different biological types and is expressed in a global percentage or by strata. The overlay categories used in this work are shown in The Tabla 3.23

**Tabla 3.23** Categories of coating of different biological types

| Index | Coverage | Density |
|---|---|---|
| 1 | 1 – 5 | Very scarce |
| 2 | 5 – 10 | Scarce |
| 3 | 10 – 25 | Very clear |
| 4 | 25 – 50 | Clear |
| 5 | 50 – 75 | Little Dense |
| 6 | 75 – 90 | Dense |
| 7 | 90-100 | Very dense |

Source: Etienne and Prado (1982).

The dominant species correspond to those plants whose morphological characteristics mark physiognomically vegetation, determined based on the biological types of greater representativeness in each plant formation.

As for the degree of artificialisation, it corresponds to the index that represents the degree of alteration of the vegetation.

- *Systematization of information*

Finally, the synthesis of the information collected in the previous stages is made. Thus, the classification of the plant formations identified in defined vegetation units is carried out, from the biological types and the dominant species in each one of them. This classification, allows analyzing and comparing the existing vegetation in the area of the project with the results of classifications of the vegetation of Chile most used in the country (Gajardo, 1994; Luebert and Pliscoff, 2006). As well as the necessary cartography of the project is elaborated, identifyProperly based each unit of VEGetación present in Area DThe project.

*Terrestrial Flora*

The characterization methodology of the terrestrial Flora considers the registration of all the vegetal species present in each one of the sampling points in the area of the project.

In cases of unrecognized species in the field, samples are collected, which are then analyzed and determined with certainty in the cabinet, with the support of literature of the specialty. In most cases, the species nomenclature follows Marticorena and Quezada (1985), with the exception of subsequent updates.

With respect to the species of singular flora identified, the UTM coordinates are recorded, in spindle 19 and Datum WGS84.

The floristic listing of the area under study is characterized according to the following attributes: Richness, phytogeographical origin, way of life and the state of conservation. The conservation status of these species is analyzed in accordance with the classification processes of species (ds N ° 151 of 2007; DS N ° 50 of 2008; DS N ° 51 of 2008, DS N ° 23 of 2009, of the MINSEGPRES; and DS N ° 33, ds N ° 41, D. n ° 42 of 2011, DS N ° 19 of 2012, D. N ° 13 of 2013 and DS N ° 52 of 2014 of the Ministry of the Environment (MMA)) and according to the Red Book of the terrestrial Flora of Chile(Benoit, 1989), as

well as its endemism at the national level. It also analyzed the origin of plant species and their eventual inclusion in Decree No. 68/2009 of the Ministry of Agriculture.

### *3.2.1.3 Results*

*Biogeographical Framework*

According to Gajardo (1994), the area under study is located in the "Desert region", which extends from the end of the XV region, from the line of Concord, to the Elqui River, in the IV region. It constitutes the southernmost part of the desert on the Pacific coast of South America.

In more specific terms, according to the classification of the same author, the area under study is located in the sub-region of the absolute desert, which corresponds to that part of the desert in which rainfall is negligible and the water supply is of local character, Coming from the presence of groundwater or occasional alluvia that descend from the Cordillera de los Andes. It is described as absolute desert, because plant life is practically absent in much of its extent, except in very particular conditions.

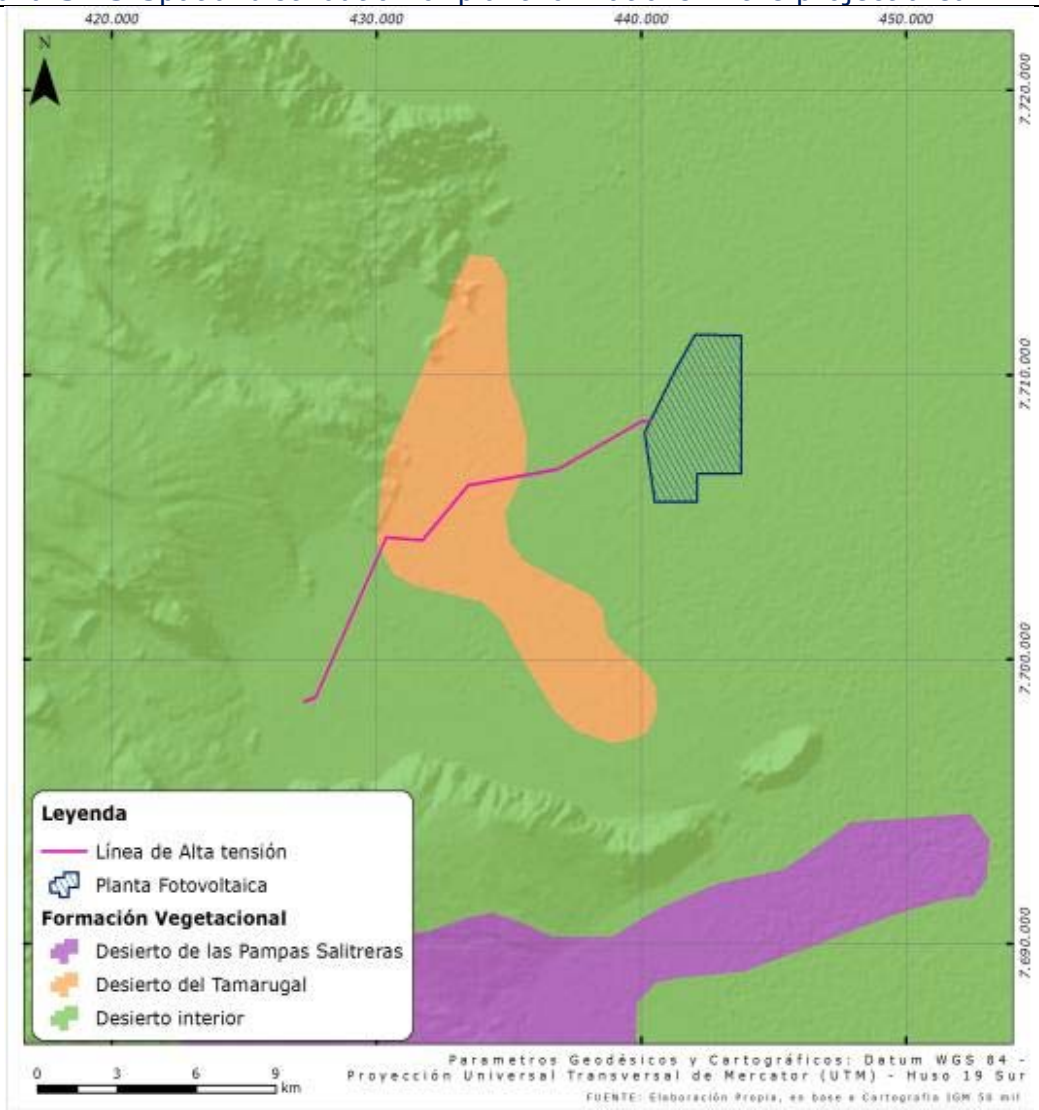
In this sub-region it is possible to recognize among others the vegetal formations "Interior desert" and "Desert of the Tamarugal", which are the formations that are in the area of the project and which are described below.

The "Interior Desert" plant formation is located in the regions XV, I and II, extending from the border with Peru to approximately 25 ° south latitude. It lacks almost completely plant life, except in very local conditions with the presence of groundwater. From the point of view vegetation has been little studied, finding few bibliographical references. The representative plant community of this training is *Tessaia absinthioides-Distichlis spicata,* Which is widely distributed, especially as ruderal in places with human intervention or under the influence of high salinity waters.

On the other hand, the plant formation "desert of the Tamarugal", is in conditions in which the influence of the NAPAs groundwater is relatively Superficial, allowing the existence of highly adapted thorny trees or, in sectors where they occur periodically alluvia of Andean origin. The vegetation that it

presents is much altered by the human influence and in its current form it corresponds mainly to the plantations of *Prosopis tamarugo and Prosopis alba*. The representative community of this training is *Prosopis Tamarugo-Distichlis spicata* (Tamarugo-salted gram), characterized by the presence of species such as *Distichlis spicata* (Salted grass), *Prosopis Tamarugo* (Tamarugo) and *Tessaia Absinthioides* With the company of species such as *Cressa truxillensis* (Chicken gut), *Euphorbia Tarapacana* (Pichona), *Tagetes minuta* (Quinchin), *Atriplex atacamensis* (Cachiyuyo), *Prosopis Strombulifera* (Retortón). The following figure shows the distribution of plant formations in the area of the project.

**Figura 3.29** Spatial distribution of plant formations in the project area




Source: Self-elaboration

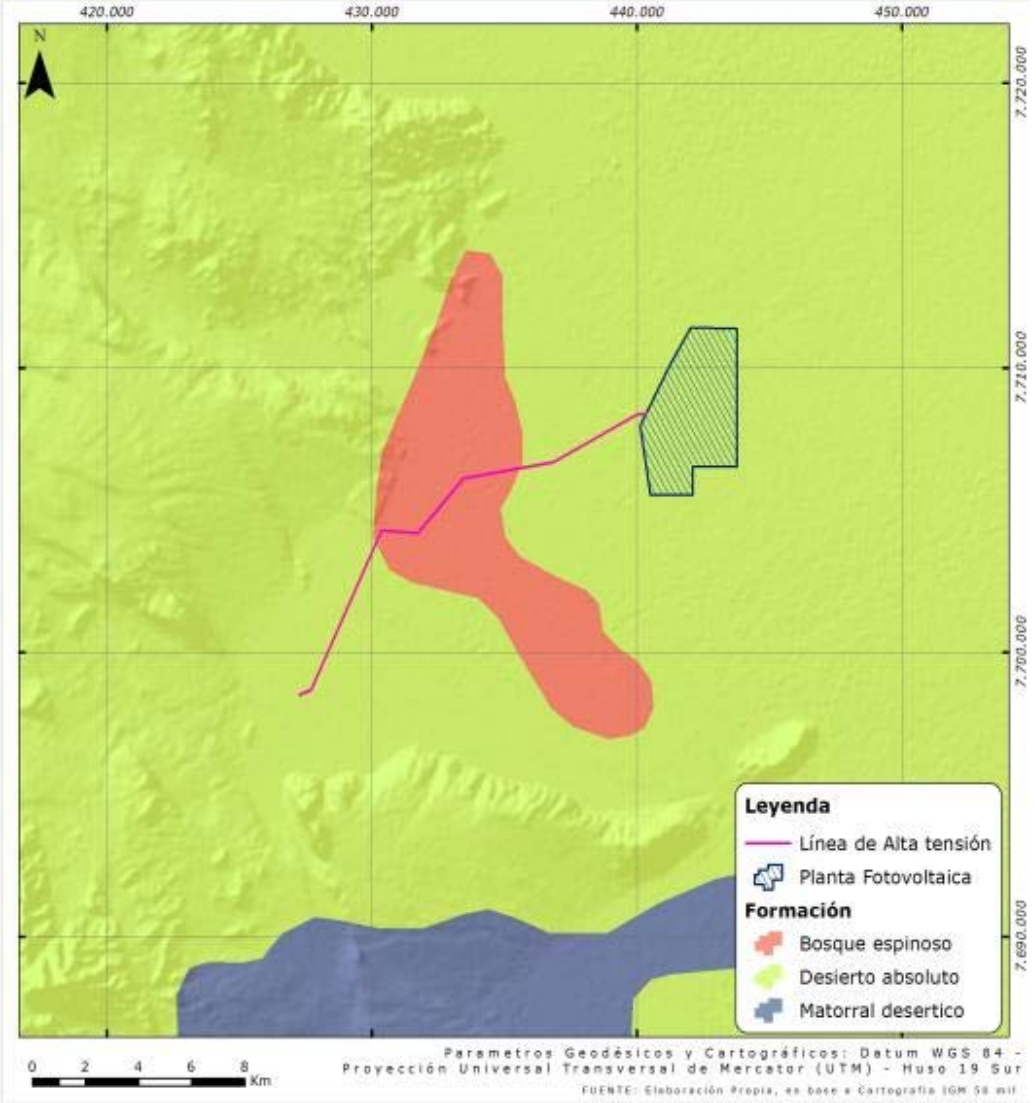
Considering more recent bibliography, Luebert and Pliscoff (2006) in its bioclimatic and vegetational synopsis of Chile, include the area of influence of the project, within what they call the Vegetational floor: "Tropical desert Interior with vegetation Scarce, "and the vegetational Floor" Tropical Thorny forest inside of *Prosopis Tamarugo* And *Tessaia Absinthiodes*".

The vegetational Floor "Tropical desert Interior with sparse vegetation", is described as an area that almost completely lacks plant life, Except in some sectors with the presence of brackish groundwater where it is observed a

halófilo thicket dominated by *Tessaia Absinthioides*. There may be more plant communities, but the botanical knowledge for these areas is very little developed in Chile, so there is no information on the floristic composition. This vegetational floor is distributed mainly in the desert pampa inside the regions of Tarapacá and Antofagasta, between 200 and 2,000 meters of altitude, in the bioclimatic mesotropical ultrahiperárido and supratropical lower floors Ultrahiperárido Hyperoceanic Bottom.

The vegetational floor "Tropical Thorny forest inside *Prosopis Tamarugo and Tessaia absinthiodes*", is characterized by presenting an open forest in which he dominates *Prosopis Tamarugo* in the upper canopy, which can reach between 15 and 20 meters high, and in which also is present *Prosopis Alba*. The shrub is composed mainly of *Tessaia Absinthioides*, *Atriplex atacamensis*, *Caesalpinia Aphylla*, *Prosopis Strombulifera* And *P. burkartii*, while the herbaceous herb is almost completely dominated by *Distichilis spicata*. It is not possible to differentiate between zonal and intra-zonal communities within this vegetation floor, as all is of a freatófilo character. The natural dynamics of communities dominated by *Prosopis Tamarugo*, it seems to be controlled by large floods of the pampa, caused by avenues coming from the Andean cordillera, product of exceptional summer rainfalls, which occur with a periodicity of 30 to 40 years. The water remains bold on the surface for long enough to allow the infiltration at great depths, which favors the regeneration of the main species. Many of the existing specimens were planted in artificial form. This vegetational floor is distributed mainly in the desert pampa of the region of Tarapacá, between 90-1150 m, bioclimatic floor mesotropical inferior hyperoceanic inferior ultrahiperárido.

**Figura 3.30** Spatial distribution of vegetation floors in project AID.




Source: Self-elaboration

*Vegetation Terrestrial*

As a result of the application of the methodological protocol, in the photointerpretation phase of the homogeneous vegetation units (UHV) and the installation of the sampling stations, it can be seen in the Tabla 3.24 . The distribution and correspondence between the UHV defined a priori and the number of sampling stations for their characterization, according to the methodological protocol defined for the application of the COT. It should be

noted that these UHV do not represent a final result, but are finally confirmed in the field by the application of the methodological protocol.

**Tabla 3.24** Distribution of sampling stations according to homogeneous vegetation unit

| Homogeneous vegetation Unit | Number of sampling stations |
|---|---|
| Scrub or Pajonal | 1 |
| No vegetation | 24 |
| **Total** | **25** |

Source: Own Elaboration.

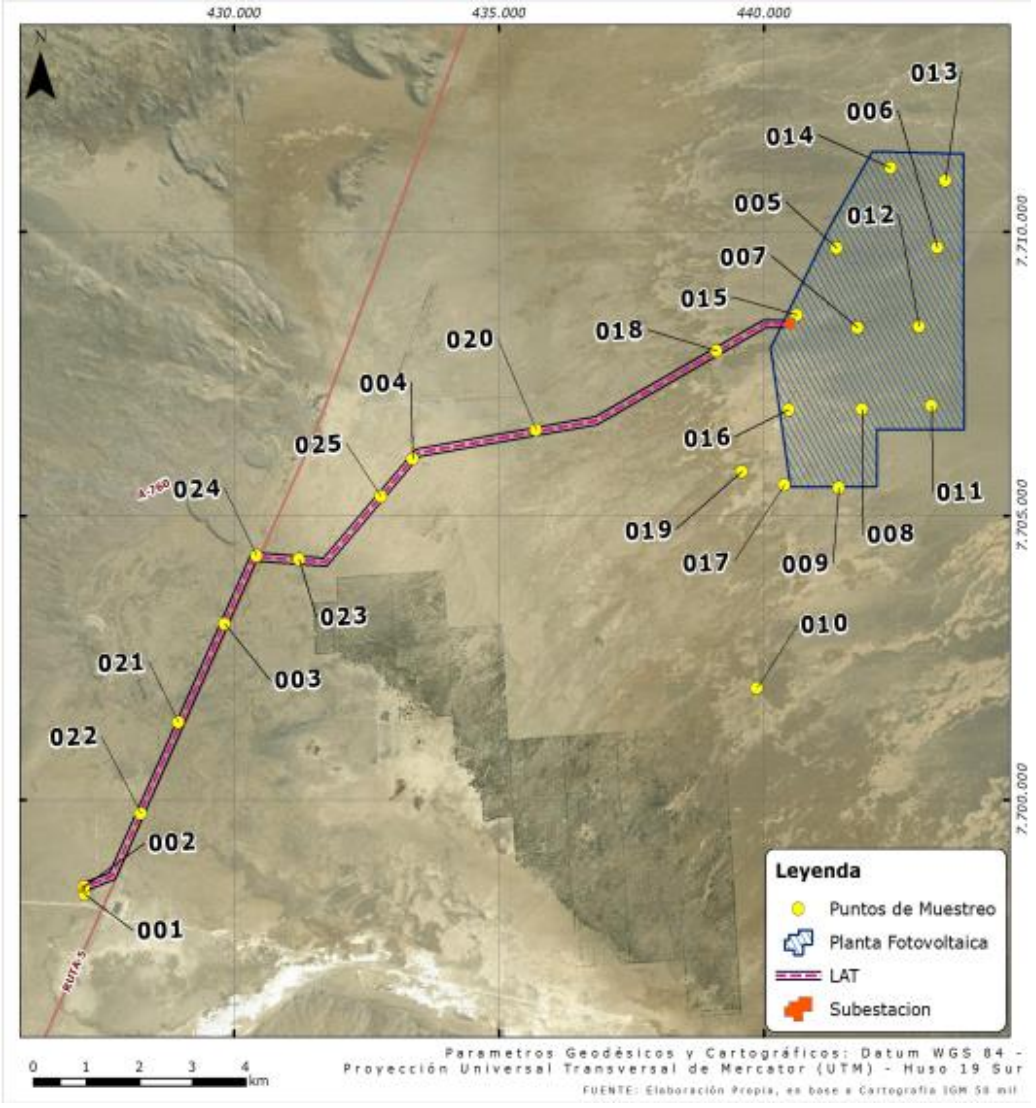
In the Following Table, the UTM coordinates of the sampling stations carried out in the field campaign are shown.

**Tabla 3.25** Spatial location of sampling stations in the projects included in the project

| Sampling stations | UTM coordinates | | Sampling stations | UTM coordinates | |
|---|---|---|---|---|---|
| | This | North | | This | North |
| COT 01 | 427,189 | 7,698,351 | COT 14 | 442,380 | 7,711,133 |
| COT 02 | 427,179 | 7,698,481 | COT 15 | 440,619 | 7,708,541 |
| COT 03 | 429,831 | 7,703,101 | COT 16 | 440,468 | 7,706,875 |
| COT 04 | 433,369 | 7,706,009 | COT 17 | 440,383 | 7,705,556 |
| COT 05 | 441,372 | 7,709,717 | COT 18 | 439,106 | 7,707,907 |
| COT 06 | 443,264 | 7,709,731 | COT 19 | 439,578 | 7,705,785 |
| COT 07 | 441,769 | 7,708,318 | COT 20 | 435,704 | 7,706,523 |
| COT 08 | 441,842 | 7,706,888 | COT 21 | 428,951 | 7,701,376 |
| COT 09 | 441,406 | 7,705,502 | COT 22 | 428,246 | 7,699,772 |
| COT 10 | 439,869 | 7,701,973 | COT 23 | 431,227 | 7,704,240 |
| COT 11 | 443,151 | 7,706,947 | COT 24 | 430,429 | 7,704,305 |
| COT 12 | 442,920 | 7,708,339 | COT 25 | 432,769 | 7,705,351 |
| COT 13 | 443,416 | 7,710,910 | | | |

Source: Own Elaboration.

**Figura 3.31** Spatial distribution of the show units made in the project area




Source: Self-elaboration

Source: Own Elaboration.

In the area 2 Homogeneous vegetation units (UHV) were recognized from the project, and correspond to a small area covered by a *Baccharis Juncea* and a unit without vegetation. In comparable terms, the unit that dominates the landscape is the one that lacks vegetation, since no other species of vascular flora or other plant formations have been identified in the area as expected according to what is indicated in the biogeographical framework. The unit without vegetation has a 99.998% of the Total area of influence, the other unit

identified as *Baccharis Juncea* It has a 0.002%, in The following table The surface contribution of the UHV present in the project area is given.

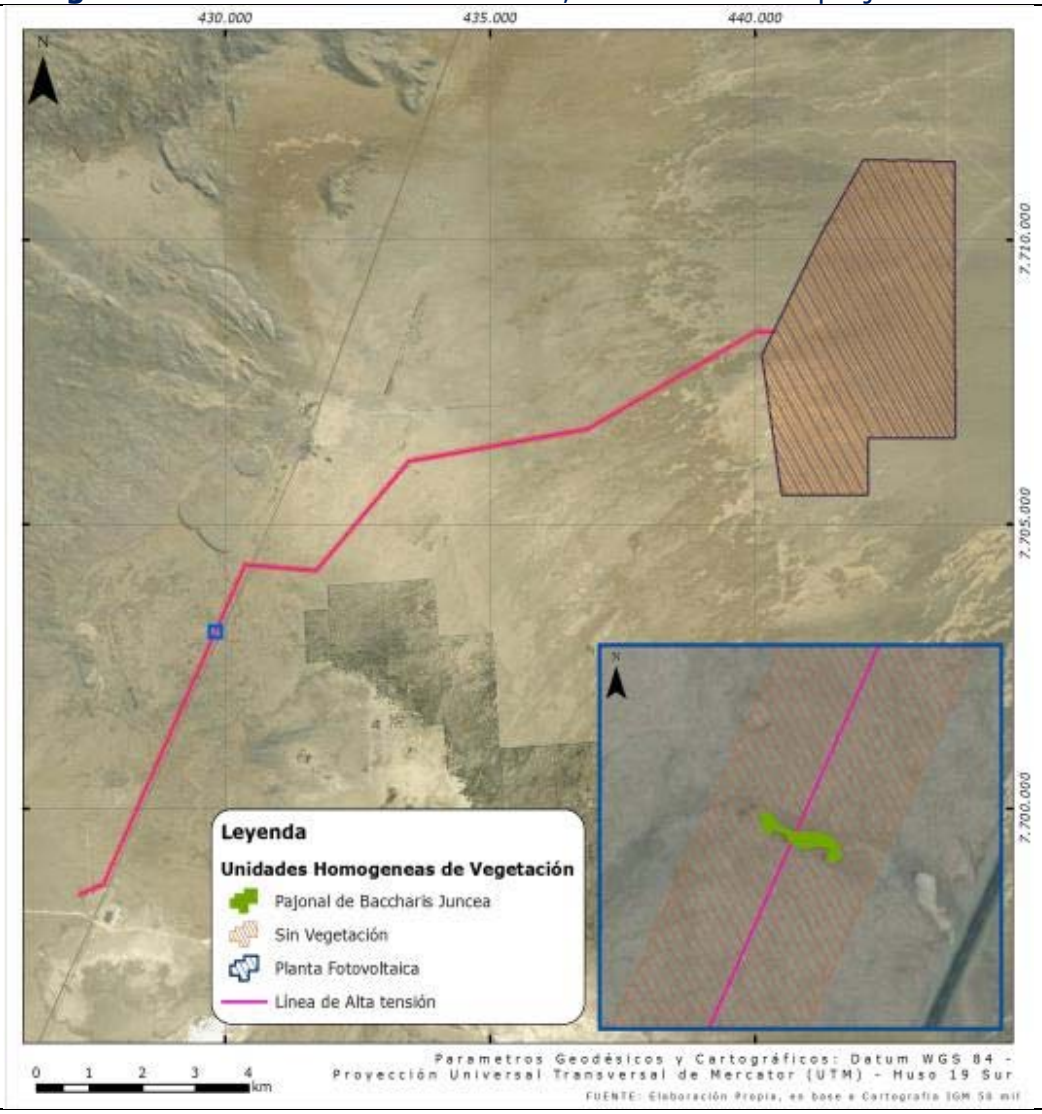
**Tabla 3.26** Surface according to homogeneous unit of vegetation in the Area of the project

| Vegetation Unit | Surface (HA) | Percentage of TOTAL (%) |
|---|---|---|
| Pajonal de *Baccharis Juncea* | 0.03 | 0.002 |
| No vegetation | 1,925.97 | 99.998 |
| **Total** | **1,926** | **100** |

Source: Own Elaboration.

In the Next figure Homogeneous vegetation units identified within the framework of the project are spatially identified.

**Figura 3.32** Distribution of the UHV, identified in the project area.




Source: Own Elaboration.

The homogeneous vegetation units identified in the project area are described in detail. It is emphasized that, strictly speaking, only a small homogeneous unit of vegetation has been identified, which has species of vascular flora which is characterized as a monospecific formation, the rest of the area Analyzed It lacks vegetation or isolated species of flora.

- *Pajonal by Baccharis Juncea*

This small homogeneous unit of vegetation is characterized by vegetation formation dominated by the herbaceous species *Baccharis Juncea* (Suncho), which is presented exclusively in a small sector located in the sample unit "Cot003" in the band of servitude defined for LAT, which coincides with an area showing signs of surface runoff last product of precipitation Outstanding occurring in the area.

The pajonal of *Baccharis Juncea* Presente in the area of the project, It is characterized by presenting an herbaceous stratum of a height that is between 0.5 and 1 m. of height with a variable coverage that in some central sectors of the formation is dense (75-90%), and in the periphery of the formation is very clear (10-25%) , without finding any accompanying species. It is emphasized that the state of this vegetation formation, presents a water stress evident by the lack of generalized turgor of the individuals that form this vegetational unit.

Photography 3.8: Pajonal de *Baccharis Juncea*.

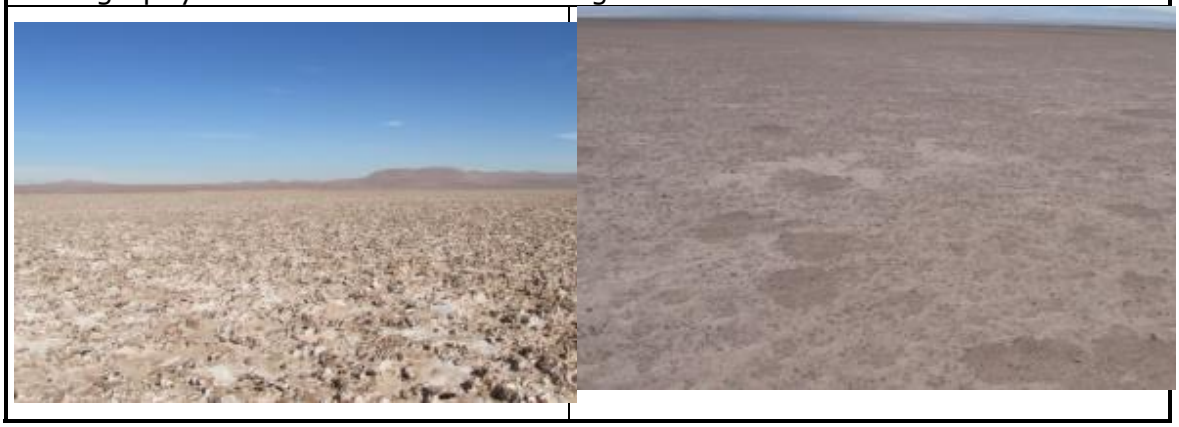
Source: Own Elaboration.

*No vegetation*

This unit is characterized by extensive areas devoid of vegetation, without any presence of individuals isolated from some species of vascular flora, as indicated in the Biogeographic framework, due to high salinity soils and conditions Extreme climatic conditions that hinder the development of vegetation. It stands out that despite the relative proximity of Forests of

*Prosopis Tamarugo* (Tamarugo), no individual has been identifieds of this species in the area of the project.

Photography 3.9: UHV called without vegetation



Source: Own Elaboration.

*Flora*

In the tours carried out in the Area Of the project, only one species of vascular flora was detected, represented by the family of the Asteraceae.

With regard to the form of growth of the species of vascular flora identified, this corresponds to a perennial herbaceous species.

In the エラー! 参照元が見つかりません。It shows the list of species of the vascular flora identified in CAmpaña of land in the area of Project. For the species identified, its taxonomic classification, scientific name, common name, origin, form of growth and conservation state is indicated.

**Tabla 3.27** List of species of vascular flora identified in the study area of the project

| | Scientific name | Common name | Family | form of growth | Origin | State of conservation |
|---|---|---|---|---|---|---|
| 1 | *Baccharis Juncea* | Suncho | Asteráceae | Perennial Herb | Native | Or |

NI = Not indicated

Source: Own Elaboration.

As for the phytogeographical origin of *Baccharis Juncea* It is noted that this species is native to Chile (autochthonous).

The state of conservation of the registered species was established considering the official results of the classification processes of species regulated by the Regulation for the classification of wild species. In this sense, the Supreme Decrees were revised (DS N ° 151 of 2007; DS N ° 50 of 2008; DS N ° 51 of 2008, DS N ° 23 of 2009, of the MINSEGPRES; and DS N ° 33, ds N ° 41, DS N ° 42 of 2011, DS N ° 19 of 2012, D. N ° 13 of 2013 and DS N ° 52 of 2014 of the Ministry of the Environment (MMA)) and according to the Red Book of the terrestrial Flora of Chile (Benoit , 1989).

In accordance with the information sources indicated in the preceding paragraph, the species is not identified *Baccharis Juncea* In some conservation category.

In order to complement this study, with a history of terrestrial vertebrate fauna previously described in the area near the project area, information was reviewed of 9 projects whose environmental resolutions (RCA) were approved between the Years 1997 and 2014. In making this review, only the investment projects located in Pozo Almonte's commune, both south and north of the project, were taken into account.

Among the documents reviewed, is the EIA of the project "Mina New Victoria Zone" (SQM S.A. 2008), located in the commune of Pozo Almonte, has not identified species of vascular flora in the area of influence of its project, nor plant formations of any Type.
On the other hand, the project "Painted solar plant" (Solar Pintado S.A. 2012) does not register information about vegetation.

#### *3.2.1.4 Conclusions*

In the area Of the project, two vegetation units were recognized, which correspond to: *Baccharis Juncea* And without vegetation, being this Last the

unit that covers almost the entire area of influence of the project with a 99.998%.

In the routes carried out in the area of influence of project, only one species was identified (*Baccharis Juncea*) of vascular flora native to Chile.

The state of conservation of the registered species was analyzed in conformity with the listings of species of the classification processes of species according to Supreme decrees (DS N ° 151 of 2007; DS N ° 50 of 2008; DS N ° 51 of 2008, DS N ° 23 of 2009, of the MINSEGPRES; and DS N ° 33, ds N ° 41, DS N ° 42 of 2011, DS N ° 19 of 2012, D. N ° 13 of 2013 and DS N ° 52 of 2014 of the Ministry of the Environment (MMA)) and according to the Red Book of the terrestrial Flora of Chile (Benoit , 1989), without identifying any category of conservation.

It should be considered that the intervention of the *Baccahris Juncea* It is not subject to any of the regulations established by any applicable environmental regulations, such as the Native Forest Law (law 20,283).

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## 3.2.2 Terrestrial Fauna

### *3.2.2.1 Objectives*

The general objective of this section is to describe the current situation of the elements that constitute the terrestrial vertebrate fauna component, present in the area of influence of the project "Cielos de Tarapacá", located in the province of Tamarugal, Región de Tarapacá.

As specific objectives, they have been considered:

- Determine the specific richness of the fauna of the project.
- To determine the abundance of wildlife species recorded in the Area of the project.
- To determine the conservation status of the species registered in the project area.
- To determine the proportion of fauna species of native, exotic and endemic vertebrates recorded in the project area.

This chapter will allow you to know the current status of vertebrate fauna present in the study area, and its sensitivity in relation to the activities planned in the project. In this way, the characterization of the component will be carried out according to the requirements of the environmental impact assessment system, within the framework of article 6 (f) of DS 40/2012, of the Ministry of the Environment.

### *3.2.2.2 Methodology*

The methodology described below is based on the scope of environmental studies and methodological protocols that the National commission of the Environment (current Environmental assessment Service) proposes in the document *"Methodologies for environmental characterization"* (CONAMA, 1996).

Additionally, and in a complementary manner, it considers several of the guidelines proposed by the Ministry of Agriculture in the document *"Environmental Assessment Guide: Wildlife component*"(MINAGRI, 2012).
In other words, the methodological protocol planned within the framework of this study fully complies with the requirements established by the Authority. The characterization of the biotic medium was carried out by means of a qualitative and quantitative sampling in the whole studied area. This type of sampling allows to cover a large area, gather as much information as possible and finally establish trends or patterns of richness and specific abundance on a spatial and temporal scale.

*Sampling of terrestrial vertebrate fauna*

To make the characterization of the terrestrial fauna of the area of Project, two field campaigns were carried out, the first campaign took place between the 14th and 16th of April of the 2014, and the second campaign was carried out between September 29 to October 1, 2014. In this way, both campaigns are representative of the fall and spring climatic seasons respectively. During the field work an intensive sampling was carried out in the area of influence of the project.

The presence of terrestrial vertebrates was recorded by observing direct evidence, such as sightings and/or listening to vocalizations, as well as indirect evidence (e.g.: feces, traces, pellets and body remains).

The methodology developed was specific for each taxonomic group, as explained below:

Herpetozoos (Amphibians and reptiles): The presence of amphibians and reptiles was determined by direct observation of individuals. For this purpose, an active and exhaustive search was carried out, which covered the entire area of influence of the Project. In particular, in order to obtain the relative abundance of herpetozoos species, two search transects of 150 m long and 4

m wide were carried out in each of the sampling stations. The taxonomic classification of registered animals was made on the basis of Cei (1962), Donoso-Barros (1966), Veloso & Navarro (1988), Núñez & Jaksic (1992), Pincheira-Donoso & Núñez (2005), Vidal & Díaz-Páez (2011) and Uetz & Hošek (2014).

Birds: Each individual sighted and/or heard within the area of the project. In particular, to determine the relative abundance of species, a transect of 150 m long and 140 m wide was performed at each sampling station, where all the individuals heard or sighted in a strip of approximately 70 m were recorded at each Side of an imaginary central axis. The taxonomic determination of the identified birds was performed using the descriptions of Jaramillo (2005) and Martinez & González (2005). Following the specific nomenclature published by Remsen *et al.* (2013)

Mammals: The determination of the presence of species of this taxonomic class was carried out by the active search for indirect evidence, such as traces, feces, burrows and body remains, following the proposed by Muñoz-Pedreros (2008). The foregoing was complemented with eventual direct sightings.
In the case of the micromammals, during the second company of land, the in vivo capture of animals was implemented, using lines of traps type Sherman, installed in a way directed every 10 to 15 m. These traps were activated during the night, being barley with oats to be checked during the morning of the following day. The sampling effort for the micromammals in the project area was 300 traps-night. The taxonomic classification of the detected animals was carried out according to Contreras & Yáñez (1995), Muñoz-Pedreros & Yánez (2000) and Iriarte (2008).

### *State of conservation, origin and endemism of the species registered*

For each of the taxa identified, their state of conservation was analyzed according to the rules of the Hunting law (SAG 2012, MINAGRI 1998), specifically for the Northern Zone (regions of Arica and Parinacota, Tarapacá,

Antofagasta and Atacama) and in the Classification processes of species led by CONAMA (MINSEGPRES 2007, 2008a, 2008b and 2009) and currently by the Ministry of Environment (MMA 2011a, 2011b, 2011C, 2012, 2013 and 2014).
In addition, the origin of the registered species was analyzed, determining the proportion of native, endemic and exotic species, consulting different bibliographic sources according to each taxonomic group. In this sense, the following bibliographical sources stand out: Mella (2005), Uetz & Hošek (2014), Pincheira-Donoso & Núñez (2005) and Ortiz & Díaz-Páez (2006), para Herpetozoos; Araya *et al.* (1995) and Jaramillo (2005), and the updated information available at www.avesdechile.cl, for birds; and Contreras & Yánez (1995) and Iriarte (2008), for mammals.

#### *3.2.2.3 Results*

##### *Biogeographical framework of the study area*

Within the variables that make up and define the desert ecosystems present in Chile, climatic conditions have the greatest relevance. At the ecosystem level, deserts are characterized by low productivity and low species richness, even more, both are correlated and are dependent on rainfall and nutrient availability (Noy-Meir (1973), Marquet *et al.* (1998)). In this sense, the region in which the project is located presents climatic characteristics of Hyperdesert, being the northern distribution boundary of plant and animal species from other more productive regions of the south of the Territory ( Veloso & Nuñez, 1998).

According to Duellman (1979), regarding the Herpetofauna the area of the project is located within the faunal region of the Atacama desert, It is one of the regions with the lowest diversity at the South American level, but with the highest levels of endemism, along with Patagonia and the southern temperate forests. However, this author suggests that the distribution of amphibians and reptiles is more limited by the availability of habitat (or perhaps food availability) than due to the altitude and its associated stress conditions.

As for birds, Stotz *et al.* (1996) Classify the area in which the project is located as a faunistic region of the southern Andes. Martinez & González (2004), in turn, describe the area of the absolute desert as "an area where life is absent in large extensions and only red-headed vultures appear (*Cathars Aura*) that cross the area taking advantage of the thermal currents. " However, Gantz *et al.* (2009) Comments that the total wealth of terrestrial bird species resident in the Atacama desert is comparatively greater than in other arid areas of the world. In addition, it concludes that habitat heterogeneity and species dispersion from nearby areas would be important factors that would enable local bird wealth to be sustained in ecosystems.

In the case of Mammals, Osgood (1943) describes the area of study in the district called "Northern Desert or Atacameño" which extends from the border with Peru to the vicinity of the city of Coquimbo. In spite of its great extension, the animal and vegetal life is limited by the lack of water, finding species typical of the zone Puneña,-with great geographical distributions-like for example the Guanaco (*Lama Guanicoe*). Like Osgood (1943), several modern authors agree that the Atacama Desert is the area that presents the smallest richness of terrestrial vertebrates in Chile (Mann, 1960; Iriarte, 2008). Moreover, Samaniego & Marquet (2009) affirm that the richness of mammals found in the Atacama Desert is determined by the heterogeneity of the landscape, with vegetation being the only significant variable that would best explain the richness of mammals In this ecosystem.

*Sampling stations*

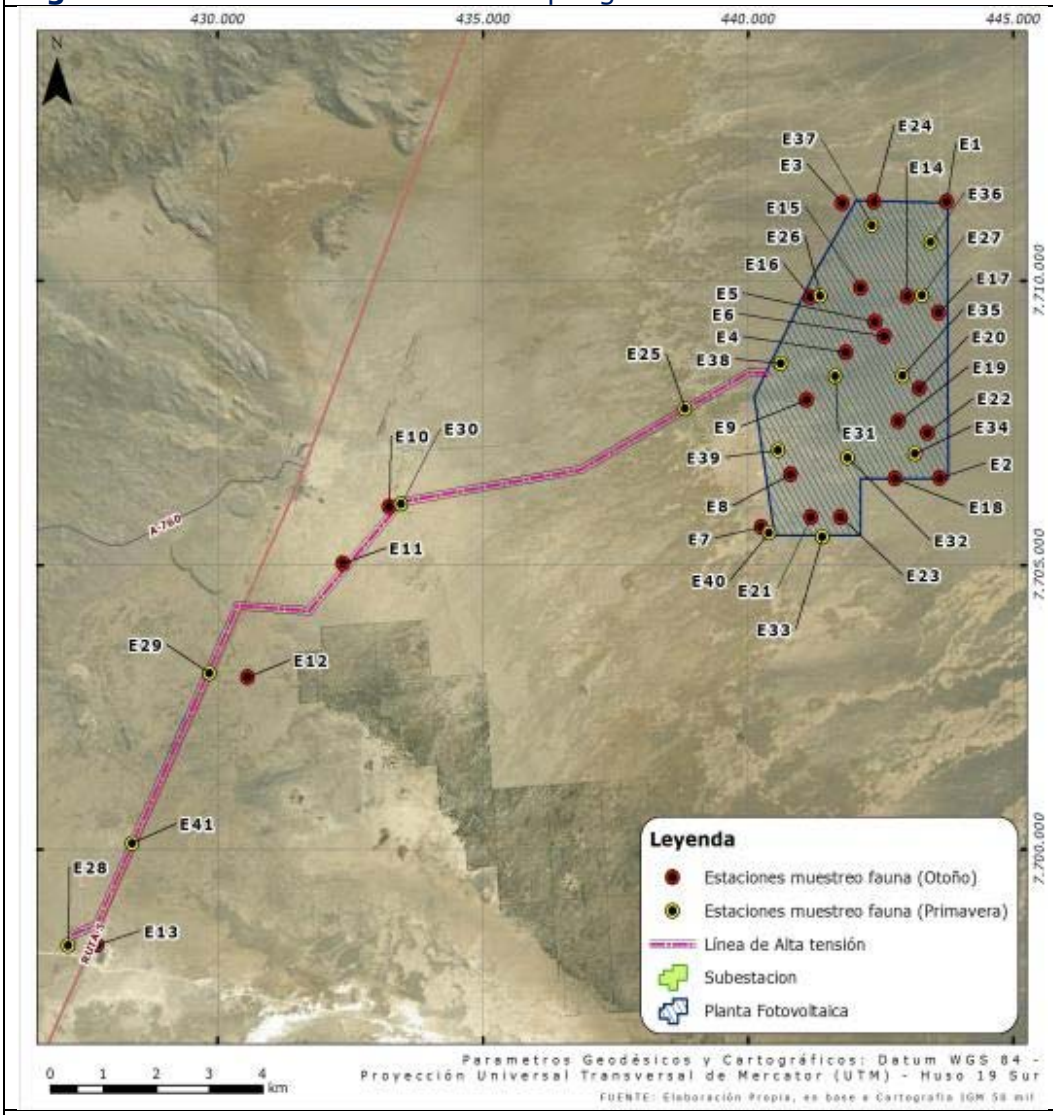
The number and location of the fauna sampling stations were selected according to the representativeness of the habitats or homogeneous vegetation units (UHV) described in the baseline of the Flora and Vegeta componenttion of the project (see エラー! 参照元が見つかりません。).

With regard to the distribution of the 41 fauna sampling stations in the homogeneous Vegetation units (UHV) defined in the present study, 40 were

located in areas without vegetation, and only one is located in the UHV called "Pajonal de *Baccharis Juncea*".

In relation to the distribution of the sampling stations in the described works of the project, 32 of them were located in the photovoltaic plant and nine are associated to the high voltage line. During the 2014 autumn campaign, 24 fauna sampling stations were implemented, while 17 sampling stations were implemented during the spring 2014 campaign.

**Figura 3.33** Location of wildlife sampling stations.




Source: Self-elaboration

In the エラー! 参照元が見つかりません。The location of the sampling stations in relation to the area of influence of the project is detailed.

**Tabla 3.28** Geographical location, homogeneous vegetation unit and methodology used in the fauna sampling stations carried out in the area of influence of the project

| Wildlife sampling Stations | UTM Coordinates (WGS 84 spindle 19 S) | | Homogeneous vegetation Unit (UHV) | Work | Methodology |
|---|---|---|---|---|---|
| | This | North | | | |
| **E1** | 443,748 | 7,711,392 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E2** | 443,622 | 7,706,535 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E3** | 441,776 | 7,711,355 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E4** | 441,849 | 7,708,738 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E5** | 442,399 | 7,709,275 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E6** | 442,571 | 7,709,023 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E7** | 440,257 | 7,705,665 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E8** | 440,801 | 7,706,598 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E9** | 441,106 | 7,707,907 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E10** | 433,240 | 7,706,024 | No vegetation (absolute desert) | High Voltage Line | Herpetozoos, birds and mammals |
| **E11** | 432,357 | 7,705,033 | No vegetation (absolute desert) | High Voltage Line | Herpetozoos, birds and mammals |
| **E12** | 430,568 | 7,703,027 | No vegetation (absolute desert) | High Voltage Line | Herpetozoos, birds and mammals |
| **E13** | 427,733 | 7,698,328 | No vegetation (absolute desert) | High Voltage Line | Herpetozoos, birds and mammals |
| **E14** | 443,007 | 7,709,726 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E15** | 442,128 | 7,709,877 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |

| Wildlife sampling Stations | UTM Coordinates (WGS 84 spindle 19 S) | | Homogeneous vegetation Unit (UHV) | Work | Methodology |
|---|---|---|---|---|---|
| | This | North | | | |
| **E16** | 441,175 | 7,709,713 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E17** | 443,603 | 7,709,443 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E19** | 442,779 | 7,706,522 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E20** | 442,835 | 7,707,530 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E21** | 443,228 | 7,708,111 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E22** | 441,189 | 7,705,847 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E23** | 443,382 | 7,707,322 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E24** | 441,744 | 7,705,847 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E25** | 442,380 | 7,711,386 | No vegetation (absolute desert) | High Voltage Line | Herpetozoos, birds and mammals (micromammals) * |
| **E26** | 438,817 | 7,707,756 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |
| **E27** | 441,364 | 7,709,735 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |
| **E28** | 443,286 | 7,709,742 | No vegetation (absolute desert) | High Voltage Line | Herpetozoos, birds and mammals (micromammals) * |
| **E29** | 427,181 | 7,698,315 | Pajonal de *Baccharis Juncea* | High Voltage Line | Herpetozoos, birds and mammals (micromammals) * |

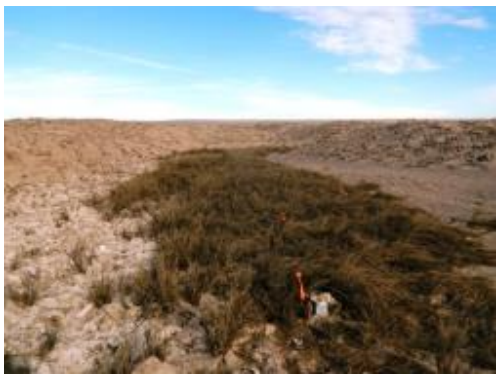
| Wildlife sampling Stations | UTM Coordinates (WGS 84 spindle 19 S) | | Homogeneous vegetation Unit (UHV) | Work | Methodology |
|---|---|---|---|---|---|
| | This | North | | | |
| **E30** | 429,839 | 7,703,097 | No vegetation (absolute desert) | High Voltage Line | Herpetozoos, birds and mammals (micromammals) * |
| **E31** | 441,652 | 7,708,321 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |
| **E32** | 441,883 | 7,706,891 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |
| **E33** | 441,408 | 7,705,496 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E34** | 443,155 | 7,706,958 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |
| **E35** | 442,915 | 7,708,333 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |
| **E36** | 443,445 | 7,710,677 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |
| **E37** | 442,342 | 7,710,970 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |
| **E38** | 440,619 | 7,708,542 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |
| **E38** | 440,570 | 7,707,021 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E39** | 440,393 | 7,705,568 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals |
| **E40** | 428,394 | 7,700,116 | No vegetation (absolute desert) | Photovoltaic plant | Herpetozoos, birds and mammals (micromammals) * |

| Wildlife sampling Stations | UTM Coordinates (WGS 84 spindle 19 S) | | Homogeneous vegetation Unit (UHV) | Work | Methodology |
|---|---|---|---|---|---|
| | This | North | | | |
| **E41** | 441,652 | 7,708,321 | No vegetation (absolute desert) | High Voltage Line | Herpetozoos, birds and mammals (micromammals) * |

Source: Self-elaboration
(*) To determine the presence of Micromammals In the study area, 10 Sherman traps were set up at 15 sampling stations all night

Next, there are panoramic photographs of the area studied, where you can see the offer of habitats within the area of influence of the project (see エラー! 参照元が見つかりません。).

Photography 3.10: HÁbitats Present in the project area.

| | |
|---|---|
|  |  |
| Absolute Desert (area without vegetation, sandy-stony) | Absolute Desert (area without vegetation, saline crust) |
|  |  |
| Pajonal de *Baccharis Juncea* | Absolute Desert (area without vegetation, |

| | |
|---|---|
| | saline crust) |

Source: Own Elaboration.

*Wealth and abundance of terrestrial vertebrates in the project area*

Considering the two wildlife sampling campaigns in the area of influence of the project, a total of four species of wild terrestrial vertebrates were recorded, which corresponded to two species of birds and two species of mammals (see エラー! 参照元が見つかりません。). The location of each of the findings at the wildlife sampling stations in the EL Annex 3.2 Baseline, Fauna Terrestrial The results are presented.

**Tabla 3.29** Taxonomic list of terrestrial vertebrate species registered in the total area of influence of the project and its origin

| Class | Family | Scientific name | Common name | Origin |
|---|---|---|---|---|
| **Birds** | Cathartidae | *Cathars Aura* | Red-headed Jote | Native |
| | Tyrannidae | *Ground Rufivertex* | Reddish-naped Sleepyhead | Native |
| **Mammals** | Canide | *Lycalopex* Sp. *(*)* | Zorro squeals or blames (*) | Native |
| | Muridae | *Rattus* Sp. (**) | Rat | Exotic |

Source: Own Elaboration.

(*) Species detected through the discovery of fingerprints, it is not possible to determine it at a specific level. In this case it may be *Lycalopex griseus* Or *L. Culpaeus (*Fox squeals or Fox blames)

(**) Species recorded through skeletal remains, could be any of the two species of the same genus, *Norvergicus Rat* Or *Rattus rattus*.

With respect to the specific richness recorded in each of the field campaigns, fall and spring of 2014, a similar number of species were recorded, with two and three species of terrestrial vertebrates respectively. In addition, one of the bird species was recorded during both campaigns.

As for the total abundance of species, considering those species recorded by direct sightings, during the first and second terrain campaign in the fauna sampling transects, three and nine individuals were recorded in total. respectively (see エラー! 参照元が見つかりません。).

**Tabla 3.30** Total abundance (number of individuals) recorded in each field campaign.

| Scientific name | Common name | April 2014 | September 2014 |
|---|---|---|---|
| *Cathars Aura* | Red-headed Jote | | 5 |
| *Ground Rufivertex* | Reddish-naped Sleepyhead | 1 | 4 |
| *Rattus* Sp. | Rat | 2 | |
| *Lycalopex* Sp. | Zorro squeals or blames | | Presence |

Source: Own Elaboration.

In relation to the relative abundance of mammals, specifically for Zorro, it was not possible to estimate it, because the registration was only through indirect sightings, in this particular case, the record corresponded to traces. However, and based on distribution, it is *Lycalopex griseus* Or *L. Culpaeus* (Fox squeals or Zorro blames respectively).

In relation to the presence of rats of the genus *Rattus* Sp. In the project area, it is indicated that these are exotic species, harmful to ecosystems (DS N ° 5 MINAGRI 1998), the extension of its presence is mainly related to human activity (Iriarte 2008). Given the environmental conditions in the project area, which favor the conservation of animal remains, it is probable that the two rat carcasses found correspond to individuals related to the transit associated with caravan footprints (finding Historical). In relation to this, in addition to rats, in the area of the project was found a dog casing (*Canis Lupus familiaris*) and several equine housings in the project area, these correspond to domestic and non-wild species, so they are not included in this baseline.

Regarding the success of capture obtained in the lines of traps type Sherman, it is important to note that it was obtained zero catches in 300 traps-night. In Other words, micromammals were not registered during the second monitoring campaign.

*Origin, state of conservation and endemism of the species registered*

In relation to the origin, 75% of the species recorded are native to Chile and 25% correspond to an exotic species. With regard to endemism, endemic species were not registered in the study area of the project.

As for the state of conservation, of the four species registered in the study area, only one species has a conservation category (see エラー! 参照元が見つかりません。).

**Tabla 3.31** A species of terrestrial vertebrate considered within some conservation category.

| Scientific name | Common name | State of conservation | Decree indicating it |
|---|---|---|---|
| **Mammals** | | | |
| *Lycalopex* Sp | Fox squeal and/or Fox blame | Minor concern | DS N ° 33 MMA 2012 |

Source: Own Elaboration.

In order to complement this study, with a history of terrestrial vertebrate fauna previously described in the area near the area of influenceOf the project, information was reviewed 9 Projects Whose environmental resolutions (RCA) were approved between the years 1997 and 2014. In making this review, only the investment projects located in Pozo Almonte's commune, both south and north of the project, were taken into account.

Among the revised documents, two projects are highlighted: "Electrical distribution line substations of the ACF Mining Lakes" (Compañía Electrica Tarapacá, 1998) and the "expansion of Mina zone Nueva Victoria Sur" (SQM S.A., 2011) whose characterizations of terrestrial fauna did not have records, because they are sites deprived of vegetation.

On the other hand, other characterizations of projects such as "Zona de new Mina Victoria" (SQM S.A., 2007) and "Painted solar plant" (solar plant painted

S.A., 2013) recorded only the species *Cathars Aura* (Red-headed Jote) in the case of the first project and, in the case of the second, in addition to this species of bird, dead specimens of other species were found: case of *Leptasthenura striata* (Scissors listed) and *Liolaemus Pantherinus* (Panther Lizard), as well as indirect records of *Lycalopex* (FOX). Also, other revised projects found also deceased individuals of bird and mammal species, which gives evidence of the extreme characteristics of the climate for the development of the fauna in the project area.

#### *3.2.2.4 Conclusions*

In The area of influence of the project was recorded four species of terrestrial vertebrates corresponding to two species of birds and two species of mammals.

With respect to abundance, low abundances of species were recorded in the project area. In this sense, the taxonomic class that presented a greater abundance were the birds. of which 9 individuals corresponding to two species of birds (reddish-naped sleepyhead and Red-headed Jote) were recorded in a single sampling station (E30).

Thus, the results found in this baseline study are coincident with what is described by the literature, since the area of the project corresponds to an area of absolute desert, with scarce presence of fauna.

As for the origin and endemism of the species, three species are native to Chile, however, none of these species is endemic to Chile. In terms of the state of conservation, of the four species registered in the area of Study, only one species presents conservation category and it is a kind of fox (*Lycalopex* Sp.).

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## 3.3 CULTURAL HERITAGE

### 3.3.1 Objectives

#### *3.3.1.1 General Objective*

The general objective of this study is to elaborate the baseline of the cultural historical heritage in the area of site of the project, according to the definitions established in the new regulation of the system of Environmental impact Assessment DS No. 40/2013, modified by the Ministry of the Environment (d. n ° 8/2014).

#### *3.3.1.2 Specific objectives*

To meet the overall objective, the following specific objectives are planned:

- To identify and characterize preliminary all the patrimonial resources existing in the area of the project that may have archaeological, historical, artistic or scientific value.

- To define and evaluate the location of each patrimonial element recorded in the study area, in order to establish its spatial relationship with the project.
- To make a chronological, functional and cultural affiliation tentative of the possible archaeological sites that could exist in the area of site of the project.
- To propose basic measures for the protection of the archaeological sites that could be found in the area of the project.

### 3.3.2 Methodology

The development of the present study, saw the application of two activities typical of the archaeological discipline. The first, related to the work of cabinet for the review of Antecedents and the subsequent analysis of results, and the second with the field visit.

#### *3.3.2.1 Background check*

The background checks corresponded to the investigation and registration of specialized bibliographical sources such as scientific journals, reports of Research and conference proceedings referring to the pre-Hispanic and historical themes of the region of Tarapacá. In addition, we visited the website of the Council of National Monuments (www.monumentos.cl), SEA (www.sea.cl) and consulted the National Monuments (Montandón and Pirotte 1998), as well as the cadastre of sites in the I region of Tarapacá (UTMA-MOP 1994), for preliminary detection of site registration in the project area or in sectors close to it.

#### *3.3.2.2 Visual inspection*

The visual inspection consisted in the exploration of different sectors previously established, with the aim of discovering the eventual existence of cultural

remains of the past, from the observation of the surface of the terrain. Basically this technique was applied to detect, locate, delimit and characterize the patrimonial elements in surface. The methodology used to inspect the areas in question consisted of the application of the archaeological prospecting technique, walking through the study areas. The exploration of the area was carried out in three campaigns, parIcipando in the three cases archaeologists of the staff of Poch Ambiental. The first was developed between March 31 and April 2, 2014, by the graduates in archaeology Francisco Fernandez, Rodrigo Iglesias, Alberto Duarte, Bruno Jiménez, Edgar Bugueño and archaeologists Felipe Fuentes and Sebastián Avilés, in addition to Alvaro Delgado (Advanced course student). The second between the 14th and 17th of April of 2014 in which Francisco Fernandez, Alberto Duarte, Edgar Bugueño and Alvaro Delgado participated; And the third during the 29th and 30th of September with the participation of Edgar Bugueño.

The foresight area comprises two sectors. The first one, represented by the photovoltaic plant, is located approximately 9 km to the east of the Panamerican Highway, close to Victoria's office (current Truckers ' stop), with an area of 1634.13 hectares. The second corresponds to a LAT and substation, which begins its layout in the photovoltaic plant, intersecting then with the Pan-American, and then heading parallel to it (side To the Lagunas substation, covering an area of 189.78 hectares.

In both areas transects were parallel, spacing 50 meters, varying according to the characteristics of the area (e.g., gullies presence).

For the recording of the possible patrimonial elements, a standard sheet was elaborated according to the different attributes proposed in "The minimum standards of registration of the Archaeological Heritage" (CNCR et al. 2010), thus building a Complete primary information base.

During the inspection of the cultural historical heritage in situ, the characteristics of the study area were also recorded in terms of the following conditions (sensu Gallardo and Cornejo 1986):

- •Visibility: corresponds to the degree of difficulty that the environment presents so that an observer can detect cultural materials on or under the ground.
- •Accessibility: corresponds to the conditions of the area of study that facilitate or restrict the mobility of the observer to reach a certain place.
- •Obstrusividad: Corresponds to characteristics of the archaeological materials that make them more "sensitive" to be discovered by a specific technique.

It should be noted that the probabilities of discovery of cultural materials depend on several factors, including their superficial presence, in such a way that during the work of removal of land can eventually emerge cultural resources That are deposited in the subsoil, and therefore invisible to superficial observation. In this way, it is necessary that the results of the visual inspection only give an account of the detectable evidences in surface.

## 3.3.3 Results

### *3.3.3.1 Legal Framework*

Any work (road, construction, industrial, tourist, etc.) involving the intervention of the soil and/or subsoil of the national territory, may affect part of the Cultural patrimony. It should be noted that, as part of the Cultural heritage, the archaeological sites in Chile, mostly, are made up of remains that may seem, at first glance, of little significance, but possessing great scientific and Cultural value for the study of the Prehistory of the country.

The protection and study of cultural heritage is subject to a number of Legal provisions framed in three legal bodies. Firstly, the National Monuments Act (No. 17,288, February 4, 1970) and its Rules of procedure (2 April 1991). This law states that *"They are national monuments and are left under the tuition and protection of the state, the ruins, constructions or objects of historical or artistic character; Burial grounds or cemeteries or other remains of the Aborigines; The pieces or objects Anthropo-archaeological, paleontological or of natural formation, that exist under or on the surface of the national territory or in the underwater platform of its jurisdictional waters and whose conservation interests to the history, to the art or to the Science;... Its tuition and protection shall be exercised through the Council of National Monuments in the manner determined by this law. "* (Title I, article 1). In its articles 11 and 12 it is determined that *"National monuments are under the control and supervision of the Council of National monuments, whether public or private property and all conservation work must be previously authorized"*. In the specific case of the archaeological sites, article 21 states that *"By the only Ministry of the Law are archaeological monuments of State property The places, ruins, deposits and antropoarqueológicas pieces that exist on or under the surface of the national territory"*, No prior declaration.

Every national monument is part of the Cultural patrimony of the country, and therefore any activity that causes any effect on it, must be notified to the

Council of National Monuments, and evaluated by it. By virtue of the foregoing, the law states that *"Any natural or legal person who, in digging at any point in the national territory and for any purpose, will find ruins, deposits, pieces or objects of historical, anthropological, archaeological or paleontological character, is obliged to Immediately denounce the discovery to the governor of the department, who will order the police to be responsible for their vigilance until the Council takes care of it "* (Title V, article 26º).

A second legal body corresponds to the law of General Bases of the environment, that in its article 2 letter K, defines the environmental impact like: *"Alteration of the environment, provoked directly or indirectly by a project or activity in a given area."*. In reference to the project under evaluation, article 10 of this law lists the projects or activities that can cause impact, among which is "*L) high voltage electrical transmission lines and their substations "; Energy-generating power plants greater than 3 MW*". In addition, article 11 states that "the projects or activities listed in the preceding article shall require the elaboration of an environmental impact study, if they generate or present at least one of the following effects, characteristics or Circumstances: a) risk to the health of the population, due to the quantity and quality of effluents, emissions or residues, b) significant adverse effects on the quality and quantity of renewable natural resources, including soil, water and air, c) Resettlement of human communities, or significant alteration of the sStems of life and customs of human groups, D) location in or near to population, resources and protected areas, priority sites for conservation, protected wetlands and glaciers, susceptible to be affected, as well as the environmental value of the Territory In which it is intended to place, e) significant alteration, in terms of magnitude or duration, of the scenic or tourist value of a zone and, f) alteration of Monuments, sites with anthropological, archaeological, historical value and, in general, those belonging to the cultural patrimony. "

The third legal body that governs this type of studies is the law on indigenous peoples, n ° 19,253, which in its article 28 establishes that "the recognition, respect and protection of the indigenous cultures and languages will contemplate... F. The promotion of artistic and cultural expressions and the protection of indigenous architectural, archaeological, cultural and historical heritage.

#### *3.3.3.2 Review of the general bibliographic background of the study area*

##### *Study Frame*

The I region of Tarapacá corresponds to an extensive area of the large north of our territory, in which we can see reflected the presence of human communities since times when the man with a high degree of mobility took advantage of the resources without generating surpluses, Through the establishment of small seasonal camps, to community life with the establishment of villages and differentiation within society. In front of this scenario, there are a lot of vestiges left by these people as the economic and political systems were modFicando. If we add to this the environmental conditions that prevail in this area, the conservation of these material remains is optimal, and we can have a record of various elements with patrimonial value.

To understand how these human communities have settled in these places, it is necessary to articulate as much information as possible, both spatial and temporal, that allows us to establish how these populations can access the diversity of resources Present in the archaeological sites and their strategic places of transit as well as their different ways of occupying the spaces.

For the study area, there are a lot of archaeological sites that have different degree of systematization when approaching them as integral units. They emphasize places of housing camps, sites of tasks, sites with rock art, sites with geoglyphs and sites of funerary practices, being the latter on which have developed the greater quantity of studies and have established the periods of

occupation For the different communities that occupied the space between the coast and the Altiplano (Núñez 1965, Núñez 1979, Zlatar 1984). In addition, there is a significant amount of these coming from industrial processes and life in villages, originated by the exploitation of saltpeter in the late nineteenth and early twentieth Century (Seelenfreund 2008, 2010; Vilches and Cabello 2011).

The first records of human communities that occupied the space of the salt Puna belong to groups of hunters with high degree of mobility, which are mainly supplied with hunting and harvesting, corresponding to the Tuina phase, between 10,000 and 8,000 Before present (A.P.), period called Early Archaic (Santoro 1989). Later, the man begins to occupy various ecological niches with a certain degree of specificity and seasonal use of the available resources, establishing semi permanent camps among the different ecological flats that can beIn finding between the middle depression and the Highlands. This process in which the man begins to take advantage intensively the various places in a modality of circuits is known as periods archaic middle and archaic late, phase Tulán-Puripica, between 7,000 and 4,000 a. P. (Santoro 1989), where it is even possible To glimpse the beginnings of the domestication of some species of grasses and animals (Núñez 1981). In parallel to the development of these groups of the interior, in the coast also generated adaptive strategies focused on the extraction of resources of the sea, generatingParticular technology for the various hunting and harvesting activities (Llagostera 1979).

At the end of 3,000 a. P., the bases begin to be created for the man to occupy and take advantage of the resources in a systematic way, settling in permanent camps and taking advantage of the traffic circuits. This period is known as formative, and within it it is possible to study the bases of the domestication of animal and plant species (Núñez 1981). It is in this period when man begins to live in small villages and the society begins a process of complexity (Núñez 1982).

At the beginning of these training communities, the identification of these groups is carried out through local tradition, both in the Ariqueña region, and in the Tarapaqueña and Atacama. For our area of study, the region of Tarapacá, were developed groups of maritime tradition essentially to the south of Iquique, and the area in which flows the Quebrada de Tiliviche to Pisagua. In Pisagua the development of the training communities coincides with the period of greatest influence of the Tiwanaku Empire (Berenguer 1985). There are local developments in the sector of the village of Caseros DESD An early phase until a late (Núñez 1981) while in the oasis of Pica develops a later phase of the Tiwanaku Empire (Berenguer 1985).

The oldest evidence recorded for the formative period (1,000 BC to 500 A.D.) is observed in the Inhumada population in the Pica-Tenancy Cemetery (Sanhueza 2005), which shows elements that indicate an ancestral formative group with cultural roots Regions in the oasis, probably associated with archaic and early-training traditions of the coast. Characteristic traits are bodies buried in semi-seated position, large turbans, cranial deformations, coarse-beamed wool textiles, important presence of carob fruit collection and har deposits.Vegetable na in large baskets. There is also the presence of small ceramic pots with simple invoice, collar beads and seashell shells used as paint deposits. This population is located within a village stage that passes from the specialized collection and horticulture to the production of food, and presents in general a precarious state of health Associated with daily work of much effort and poor oral health product of a diet rich in carbohydrates (Sanhueza 2005).

Along with the above during the formative period would have begun with the process of domestication of animals, emerging the first "shepherds", which in turn are associated with moments when, pottery, social complexity and sedentary, are expanded by All the southern Andes. This is also demonstrated by various activities that give account of the Union of the Pampa del Tamarugal with the Chilean highlands, showing early hunting and caravaning activities in

sectors of Quebrada, captured through trails, and associated structures, such As circular enclosures andAchetas, materiality that is still used by pastors today (Briones 1996). In the case of the caravan groups, it is postulated that they mobilize various products between the Loa basin, the Altiplano of Tarapacá, the ravines and oasis of the intermediate depression and the Andean Plateau (Salazar 2008).

In the case of the Pica sector, adjacent to the study area, there is no evidence of more ancient human occupation to the formative period probably due to lack of systematic research (Sanhueza 2005). For its part Núñez (1965) reports several sites in the oasis of Pica numbered from one to eight, of which five are cemeteries corresponding to the late period of the Agroalfarera sequence. Two of these cemeteries, Pica 8 and Santa Rosita or Pica 3, also excavated by Niemeyer (1959, 1963), stand out for their magnitude and cultural contexts. These funerary contexts plus those of the CMentos Pica 1 and Pica 7 are the basis on which the author defines the so-called Pica-Tarapacá complex (Núñez 1966) which was developed during the late Intermediate Period and had an influence between Camiña and the Loa from the middle ravines to the coast. The definition of this complex is based on the identification of various types of sites with similar local material culture, in a territory crossed by Ariqueños components, coastal, Serrano, Altiplanic and Atacameños, a product of intense interregional traffic (Agüero 2005).

The Pica 8 Cemetery corresponds to one of the largest pre-Hispanic cemeteries in the region of Tarapacá and would have been in use for a long period that would span from the beginning of the late Intermediate Period to the end of that period, presenting In addition in minority formations, Inca and early colonial traits. It has radiocarbon dating that on average it is located chronologically in the year 1,000 A.D. (Zlatar 1984). Pica 8 was excavated by L. Núñez in the decade of 1960, while the registration and publication of the materials was made twenty years After Zlatar (1984) who produced a catalogue of the collection.

Apart from these cemeteries, Núñez (1965) recorded other types of sites such as Pica 4 consisting of geoglyphs elaborated by rasping located on the east slope of Cerro Longacho, associated with the Santa Rosita Cemetery. For its part, Pica 5 is a site with pictographs or white paints located in a rocky walled corridor and sand bottom, located in the Quisma Valley, near Chintaguay.

Subsequently, the so-called Pica-Tarapacá cultural complex for the late Intermediate Period (PIT) was developed (Schiappacasse *et al.* 1989), which has traditionally been divided into phases, recognizing an initial phase called the Tarapacá phase (1,100-760 a. P.) and a classical phase called Camiña (760-560 A. P.). It is suggested that this place originated a ceramics of local tradition, which then suffered the influence of the Tiwanaku Empire, so that local and foreign identities are recognized, and then receive influences from the Southern Highlands, staying until the arrival Del Inca (Uribe 2006).

The above described begins to be glimpsed from 950 d. C. Where the so-called Pica-Tarapacá complex was developed in multiple axes of mobility, based on the regular and long distance caravans that would concentrate multiple complementary axes (nodes) that They consolidated through villages Stable in valleys and rural settlements scattered in the Highlands (Núñez and Dillehay 1979).

Around 1,200 d. C., there are some changes in the area produced by the introduction and circulation in the interior (valleys and oases) of foreign ceramics, of diverse origins, mainly of the southern Altiplano, western valleys, and also of the river Loa and San Pedro de Atacama. Also, during this period (PIT), there is an intensification of the occupation of the high ravines (P. E. Camiña, Jamaguja, Mocha and Nama), becoming more responsive, and in turn extending their networks of interaction and ties with the southern Altiplano (Contreras *et al*. 2007).

High mobility would have been an important factor for the increase of geoglyphs in the area, interpreted as a form of "signposting" of routes and

troperos pathways; What is also evidenced by the presence of pictographs, with representations of figures anthropomorphic and zoomorphic, such as those of Quebrada de Tambillo (Moraga 1999).

Later, towards the year 1,400 d. C., one observes, as in all the Andean region, the Inca presence; With an important variety of sites, such as roads, cemeteries (P. E. The Tojo), complexes Agrohidráulicos, settlements (P. E. Tarapacá Viejo), mines, Tambos and sanctuaries of height (p. E. Cerro Esmeralda). Thus, most of the research at this time has focused on the registration and analysis of settlement patterns, as well as on the architectural characteristics of the various sites. In the case of the Inca road network, a section of this is observed in L Community to which the study area belongs (Contreras *et al*. 2007), which is associated with a path (50 cm wide) and the presence of troop footprints. The aforementioned records are manifested continuously, sequentially and without causing variations in the "path" unidirectional. The conformation of this section shows evidence of road markers at each end of the road, which reaffirms the Inca character of the same, also observed in the presence of two platforms (possibly ceremonial), along with a series of structures Nearby (Contreras *et al*. 2007) that are framed within the Incan materiality.

At the arrival of the Spaniards, some sectors of the area are still used marginally by indigenous groups, working on outcrops of artisanal and low-volume production, which are maintained until the end of the nineteenth century, when the area It begins to be exploited in semi-industrial form by national and foreign groups (Millán 2006).

During the historical period following the Spanish invasion, the town of Pica sustained a considerable population. Larraín (1975) examines the demographic development of indigenous communities in the present province of Tarapacá from existing documentation, reports of chroniclers and titles of parcels granted by Pizarro. It thus establishes that three villages stand out where the armies of Almagro and Valdivia rested for long seasons, able to supply a large

contingent of soldiers and Indians yanaconas for long periods. These towns are Tarapacá, Pica and San PDro de Atacama, also called Atacama La Grande. The author also notes that several of the soldiers stayed in Pica and Tarapacá.

As for the entrust of Pica and Loa (Larraín 1975), this was assigned to Andrés Jiménez in 1540, who apparently never visited her personally dying two years later. After this his parcel passes to Marín Pérez de Lezcano who dies in 1556 so the concession passed to his widow. Then, Juan de Castro obtains this parcel from the viceroy himself and by marrying the widow. With the death of this one requests a reconfirmation of the concession of the parcel and then in 1559 it transfers it in barter to Lucas Martínez de Begazo, who already possessed the entrust of Tarapacá. In 1560 Pica with allIts annexes and dependencies including Guatacondo, Quillagua and probably Mamilla and Tocopilla on the coast, are left to the charge of Martínez Begazo, which promotes the mining in Pica and Guatacondo, as it had previously done in Tarapacá and its Vicinity.

On the other hand, in the last decade has emphasized the relevance of the role of the caravan pre-Hispanic movement, from the early proposals of the Decade of 1960, Opportunity in which the relationships between fixed settlements and travel (Paskanas), routes, Rituality and macrorregional intervention, gave rise to non-diffusionist explanations of various modalities of interethnic and spatial contacts within networks of complementarity (Berenguer 1994, 2006; Núñez 1976, 1985 A and B; Núñez and Dillehay 1979). The caravan model has broadened its spatial analysis framework toThe Peruvian South (Gordillo 1992), surrounding Altiplano (Flores and MacQuarrie 1994) and Circumpuneña area (Nielsen 1997-98; Yacobaccio 1979).

According to Briones and collaborators (2005), and continuing with the discussion around the model caravan, "the analogy observed between sets of geoglyphs, located along the transect that connected the oasis of Pica and its surroundings, with the coast of the ocean Pacific, associated with routes and Paskanas (refuges caravan), have allowed to postulate a road route that

articulated to the different environments of the desert. So far, the correlation between styles of geoglyphs, temporal phases and more specific cultural affiliations has been tentatively raised fromIlísticas and approved designs identified in ceramics and textiles, derived from regional archaeological contexts. These approximations have correlated to most geoglyphs with the Regional development period (900-1.450 years D. C.) (Briones and Chacama 1987; Muñoz and Briones 1998; Núñez and Briones 1967). However, some earlier, even tentative, temporal approximations of geoglyphs of "circles" associated with training settlements have been established, such as the case of Drywall (Núñez 1984), including unique and highly complex designs such as the character Del Cerro UniAs, corresponding to an anthropomorphic icon with radiated head, possibly also of formative data (Núñez *et al.* 1997; Santoro and Dauelsberg 1985). Thus, it has been possible to Hipotetizar that the geoglyphs were developed, in sequence between the 400 years BC until the Inca time, with a stylistic climax during the period of the Regional development before referred to "

With respect to Geoglyphs, Briones (2008) notes that in the region of Tarapacá and specifically in the province of Tamarugal, archaeological evidence shows an early use of this space and its natural resources; Later, with the intensification of regional caravan traffic, travelers and users of this extreme environment were identified and fully involved with this space, integrating in their everyday and transcendental way of life. The geoglyphs would be a demonstration of the maturity and complexity developed by the various communities that inhabited ESTS landscapes.

The strategic situation of the different Piqueños oasis, with its climatic and resource benefits, especially its waters, were sufficient to generate a favorable space as a term or nexus between other areas of the region. Not only in the east-west Transect but also north-south, in a close interrelation with neighboring communities. Pica and its surroundings are characterized by the presence of numerous routes some of which are still in force. The intense

caravan traffic led to the presence of geoglyphs among which the sites of La Calera, Santa Rosita, InIernillo, Los Tambos and Cerro landfill. The relationship between these sites and Cerro painted by the east, Tarapacá by the north and Guatacondo and Quillagua by the South gives rise to the author to raise the importance of Pica as a center agglutinating meetings since very remote times (Briones 2008).

Without prejudice to the above, most of the sites with Geoglyphs are located in the communes of Pozo Almonte and Huara that meet between the two 70% of the findings (Briones 2008), emphasizing high Ariquilda north, Unitas Hill and hills painted by its monumentality , the scale of the sites and the variability, design and elaboration of the motifs represented.

### *Historical background (South Canton)*

The nitrate exploitation in the Tarapaqueña area is divided into a north, central and South sector (on some occasions assimilated to the territorial unit of the "Canton"), a circumstance that derives from temporal considerations and technological developments, which advanced from the northern end to its southern base. In this area, at least three systems of exploitation are distinguished, represented by the "stops", Skanks and Guggenheim, often coexisting (Bermúdez 1963; PRAMAR Environmental Consultants 2007).

Since the beginning of the nineteenth century, the exploitation of saltpeter was articulated in the northern section, starting from the system of "stops", represented by the boiling of the crushing nitrate, on spaces defined for the preparation of bonfires. This primitive system would have involved the occupation of indigenous labor, reoccupying old mining settlements oriented to the processing of silver. The process also involved the implementation of enclosures, geared to the storage of materials and the Workers ' Hostel (Bermúdez 1963; PRAMAR Ambiental Consultores 2007).

The exploitation in Tarapacá sur-Central was characterized by the propitious development of the so-called Canton La Noria, in whose area a number of

other offices operated, of marked influence between the years 1850 and 1860. Towards the year 1840 it is detected with the incorporation of the company Williamson y Cía, corresponding to English capitals, exploiting the area between the painted and Bellavista salares, starting from the system of stops, connecting to the west with Caleta Patillos, Where the shipment of the production was carried out (Bermúdez 1963; PRAMAR Ambiental Consultores 2007).

The economic upturn lived towards 1870 facilitated the awakening of the saltpeter, and among other things, the extension of the railway line towards the southern end of the area Tarapaqueña, reached nitrate offices like Bellavista and further to the south to lagoons. During this time, the incorporation of steam technology, incorporated into offices such as Alianza or Pampa Alianza, was included, supplying the old "stops". The boarding areas are reorientated, as option Caleta Chucumata (Bermúdez 1963; PRAMAR Environmental Consultants 2007).

The supply and communication networks were a relevant topic during the nitrate Century (Araneda 2012), in this way, Tarapacá sur was nourished from different locations, highlighting for the segment between the Salar Pintado and Bellavista, the transit from the Guatacondo Valley, Pica and Quillagua. This flow of food and goods, developed largely by carriers, also allowed the acquisition and recovery of the cattle of draught, which sometimes rested in the inner valleys until their new reinstatement in the tasks Saltpeter. It should be pointed out that Also is affirmed as significant the flow of cattle beyond the Andes (Bermúdez 1963; PRAMAR Ambiental Consultores 2007).

Towards 1890 a third nitrate period is identified, distinguishable from the complete integration of the Skanks system, reached until the Third decade of the twentieth century. It also warns of a broad development of the railroad and the use of diesel fuel. In the exploitation of nitrate begins the boom of iodine (Bermúdez 1963; PRAMAR Environmental Consultants 2007).

As far as the southern sector of the Tarapaqueña nitrate area is concerned, there are offices such as Alianza and Buenaventura, of which there is the antecedent of a map that specifies its location and existence towards the year 1908. Offices such as Bellavista began production during the year 1912, while the Victoria office, corresponding to the nitrate company of Tarapacá and Antofagasta, located on the old offices Brac and Franka, operates between the years 1941 and 1944. It is necessary to underline in this last case the implementation of the Guggenheim system, in the same way as in Hamberstone and Santa LauA. Close to the previous offices the existence of the La Granja office, located at 11 km from LA Cumbre station, exists towards the second decade of the Twentieth Century (Valenzuela 1920).

### *Specific antecedents of the commune Pozo Almonte*

The review of background associated with projects developed in the commune of Pozo Almonte, and particularly close to the location area of the Project, report the existence of pre-Hispanic and historical elements (Lucero 2010; Galician 2010; Poch Ambiental 2013), represented in the first case, for the most part, by ceramic or lithic dispersions of different eras; While the historical contexts would correspond to remains derived from the productive and domestic tasks of saltpeter (XVIII-XIX).

**Tabla 3.32** Patrimonial elements identified in the commune of Pozo Almonte

| Id | UTM coordinates, Datum WGS84, spindle 19 S | | Chronology | Description | Source |
|---|---|---|---|---|---|
| | East (M) | North (M) | | | |
| Site 1 | 470,672 | 7,737,414 | Prehispanic | Isolated find | Lucero 2010 |
| Site 2 | 470,768 | 7,737,278 | Prehispanic | Scattering ceramic fragments | Lucero 2010 |
| Site 3 | 470,773 | 7,737,284 | Prehispanic | Scattering ceramic fragments | Lucero 2010 |
| Site 4 | 470,789 | 7,737,259 | Prehispanic | Scattering ceramic fragments | Lucero 2010 |
| Site 5 | 470,726 | 7,737,437 | Prehispanic | Scattering ceramic fragments | Lucero 2010 |
| Site 6 | 470,832 | 7,737,255 | Prehispanic | Scattering ceramic fragments | Lucero 2010 |
| Site 7 | 470,808 | 7,737,290 | Prehispanic | Scattering ceramic fragments | Lucero 2010 |
| Site 8 | 470,715 | 7,737,328 | Prehispanic | Isolated find | Lucero 2010 |
| Site 9 | 472,005 | 7,737,263 | Prehispanic | Isolated find | Lucero 2010 |
| Site 10 | 470,579 | 7,737,336 | Prehispanic | Petroglyph and archeological remains | Lucero 2010 |
| Site 11 | 470,530 | 7,737,346 | Prehispanic | Structure | Lucero 2010 |
| Site 12 | 470,624 | 7,737,270 | Prehispanic | Petroglyph and archeological remains | Lucero 2010 |
| Site 13 | 470,585 | 7,737,078 | Prehispanic | Stone structure and dispersion of ceramic fragments | Lucero 2010 |
| Site 14 | 470,589 | 7,736,680 | Prehispanic | Stone structure and dispersion of ceramic fragments | Lucero 2010 |
| Site 15 | 470,661 | 7,736,669 | Prehispanic | Stone structure and dispersion of ceramic fragments | Lucero 2010 |
| Site 16 | 470,740 | 7,773,642 | Prehispanic | Structure of stones | Lucero 2010 |
| Site 17 | 470,812 | 7,736,975 | Prehispanic | Structure of stones | Lucero 2010 |

| Id | UTM coordinates, Datum WGS84, spindle 19 S | | Chronology | Description | Source |
|---|---|---|---|---|---|
| | East (M) | North (M) | | | |
| Site 18 | 470,684 | 7,737,019 | Prehispanic | Structure of stones | Lucero 2010 |
| LAGU SA-1 | 443,741 | 7,694,245 | Prehispanic | Lithic Workshop | Galician 2010 |
| LAGU SA-2 | 443,614 | 7,694,364 | Prehispanic | Lithic Workshop | Galician 2010 |
| LAGU SH-1 | 443,056 | 7,694,708 | Historical | Mining operations | Galician 2010 |
| LAGU SH-2 | 432,147 | 7,697,033 | Historical | Mining operations and structures | Galician 2010 |
| HA01 | 452,326 | 7,686,081 | Prehispanic | Ceramics and Lithics | POCH Ambiental 2013 |
| HA02 | 448,588 | 7,689,708 | Historical | Fragmented ceramic vessel | POCH Ambiental 2013 |
| HA03 | 446,354 | 7,691,833 | Historical | Canned tin | POCH Ambiental 2013 |
| HA04 | 444,948 | 7,693,187 | Historical | Bottle fragments | POCH Ambiental 2013 |
| HA05 | 444,480 | 7,693,671 | Historical | Metal Cap | POCH Ambiental 2013 |
| HA06 | 444,407 | 7,693,794 | Historical | Historical bottles | POCH Ambiental 2013 |
| HA07 | 444,374 | 7,693,772 | Historical | Canned tin and nail | POCH Ambiental 2013 |
| HA08 | 444,336 | 7,693,834 | Historical | Historical bottle fragments | POCH Ambiental 2013 |
| HA09 | 444,281 | 7,693,861 | Historical | Top can with embossed decoration | POCH Ambiental 2013 |
| HA10 | 444,199 | 7,693,938 | Historical | Horseshoe and Nail | POCH Ambiental 2013 |
| HA11 | 442,256 | 7,694,989 | Prehispanic | Projectile tip | POCH Ambiental 2013 |
| HA12 | 441,425 | 7,695,215 | Historical | Milestone and well | POCH Ambiental 2013 |
| HA13 | 440,722 | 7,695,290 | Historical | Bottle fragments | POCH Ambiental |

| Id | UTM coordinates, Datum WGS84, spindle 19 S | | Chronology | Description | Source |
|---|---|---|---|---|---|
| | East (M) | North (M) | | | |
| | | | | | 2013 |
| HA14 | 440,273 | 7,695,411 | Prehispanic | Size Event | POCH Ambiental 2013 |
| HA15 | 440,219 | 7,695,415 | Prehispanic | Size Event | POCH Ambiental 2013 |
| SA01 | 444,259 | 7,693,786 | Prehispanic | Lithic Workshop | POCH Ambiental 2013 |
| SA02 | 444,088 | 7,694,090 | Prehispanic | Lithic Workshop | POCH Ambiental 2013 |
| SA03 | 443,432 | 7,694,782 | Prehispanic | Lithic Workshop | POCH Ambiental 2013 |
| SA04 | 443,228 | 7,694,847 | Prehispanic | Lithic Workshop | POCH Ambiental 2013 |
| SA05 | 440,351 | 7,695,407 | Prehispanic | Lithic Workshop | POCH Ambiental 2013 |
| SA06 | 440,052 | 7,695,431 | Prehispanic | Size Event | POCH Ambiental 2013 |
| SH01 | 446,877 | 7,691,389 | Historical | Historical rubbish | POCH Ambiental 2013 |
| SH02 | 443,857 | 7,694,264 | Historical | Historical rubbish | POCH Ambiental 2013 |
| SH03 | 442,827 | 7,694,888 | Historical | Mining bites | POCH Ambiental 2013 |
| SH04 | 435,557 | 7,696,130 | Historical | Licher Area | POCH Ambiental 2013 |
| RL01 | 444,335 | 7,693,842 | Historical | Tropera Footprint | POCH Ambiental 2013 |
| RL02 | 444,096 | 7,694,142 | Historical | Tropera Footprint | POCH Ambiental 2013 |
| RL03 | 443,831 | 7,694,289 | Historical | Wagon Track | POCH Ambiental 2013 |
| RL04 | 443,615 | 7,694,761 | Historical | Iron line with associated garbage | POCH Ambiental 2013 |
| RL05 | 443,742 | 7,694,533 | Historical | Tropera Footprint | POCH Ambiental |

| Id | UTM coordinates, Datum WGS84, spindle 19 S | | Chronology | Description | Source |
|---|---|---|---|---|---|
| | East (M) | North (M) | | | |
| | | | | | 2013 |
| RL06 | 443,692 | 7,694,636 | Historical | Wagon Track | POCH Ambiental 2013 |
| RL07 | 443,659 | 7,694,742 | Historical | Wagon Track | POCH Ambiental 2013 |
| RL08 | 443,616 | 7,694,761 | Historical | Wagon Track | POCH Ambiental 2013 |
| RL09 | 443,284 | 7,694,833 | Historical | Telegraph posting | POCH Ambiental 2013 |
| RL10 | 443,135 | 7,694,822 | Historical | Wagon Track | POCH Ambiental 2013 |
| RL11 | 442,417 | 7,694,965 | Historical | Path | POCH Ambiental 2013 |
| RL12 | 439,217 | 7,695,674 | Historical | Tropera Footprint | POCH Ambiental 2013 |
| RL13 | 436,779 | 7,695,904 | Historical | Railroad | POCH Ambiental 2013 |
| RL14 | 436,728 | 7,695,873 | Historical | Railroad | POCH Ambiental 2013 |
| RL15 | 436,685 | 7,695,938 | Historical | Railroad | POCH Ambiental 2013 |
| RL16 | 436,401 | 7,695,988 | Historical | Railroad | POCH Ambiental 2013 |
| RL17 | 436,348 | 7,695,954 | Historical | Railroad | POCH Ambiental 2013 |
| RL18 | 435,809 | 7,696,112 | Historical | Railroad | POCH Ambiental 2013 |
| RL19 | 435,771 | 7,696,068 | Historical | Railroad | POCH Ambiental 2013 |
| RL20 | 435,648 | 7,696,104 | Historical | Railroad | POCH Ambiental 2013 |
| RL21 | 429,051 | 7,697,443 | Historical | Railroad | POCH Ambiental 2013 |
| RL22 | 428,214 | 7,697,547 | Historical | Railroad | POCH Ambiental |

| Id | UTM coordinates, Datum WGS84, spindle 19 S | | Chronology | Description | Source |
|---|---|---|---|---|---|
| | East (M) | North (M) | | | |
| | | | | | 2013 |

These elements are outside the area of influence of this project.

On the other hand, the revision of national monuments for the commune of Pozo Almonte, allowed to determine the existence of four historical monuments and a typical area (see エラー! 参照元が見つかりません。).

**Tabla 3.33** Monuments with declarations for commune of Pozo Almonte

| Name | Location | Decree | Category | Subcategory |
|---|---|---|---|---|
| Painted geoglyphs | Immediate hills to the painting station | DS 5591, 1969. | Historical monument | Archaeological site declared a historical monument |
| Humberstone Nitrate Office | 47 km east of Iquique, by route A-16, road of intersection Iquique/Panamericana Norte | DS 320, 1970. UNESCO World Heritage List. List in danger. | Historical monument | Mining industry |
| Santa Laura saltpeter Office | 50 km to the E of Iquique, at the intersection of the access road to Iquique with the Panamericana Norte. | DS 320, 1970. UNESCO World Heritage List. List in danger. | Historical monument | Mining industry |
| Properties of the Ex nitrate Office Iris (House of | 77 km south east of Iquique, by the Panamericana Norte 8 | DS 706, 1990. | Monument Historical | Mining industry |

| Name | Location | Decree | Category | Subcategory |
|---|---|---|---|---|
| Administration, Kiosk and Chapel) (3 monuments) | km north of the intersection with Route A-770. | | | |
| Pueblo of La Tirana | Town of La Tirana | DS 1752, 1971. | Typical area | Traditional people |

Source: Council of National Monuments

It should be noted that all these sites are outside the project site area.

#### *3.3.3.3 Results*

The area where the "Cielos de Tarapacá Photovoltaic project" will be located, corresponds to a semiplane terrain, associated with narrow depressions and small natural mounds, intercalándose faint layers of salting with the abundant chusca of the place. The results of the archaeological prospection allowed the identification of 85 patrimonial elements, between pre-Hispanic evidences (n = 11) and historical (n =: 74), detected in the two supersectors of the project, represented in operation by the plant Photovoltaics and LAT, going to be commented below. in annex 3.2 BaselineHeritage, They present the plans with the site of the patrimonial elements.

- *Photovoltaic Plant Sector*

The Sector corresponding to the photovoltaic plant is located east of the Panamerican Highway, and is distinguished as a semiplane space, with sporadic presence of salt and abundant chusca (see photograph 3.11).

Photography 3.11: View to the North Photovoltaic plant area.

Source: Own Elaboration.

The results of archaeological exploration in the sector allowed to identify patrimonial elements of pre-Hispanic and historical chronology. Pre-Hispanic contexts mainly correspond to lytic dispersions which are isolated sites and finds (see エラー! 参照元が見つかりません。), which include waste (laminas and slices), andesite and exceptionally silica. These evidences give an account of initial phases of lithic roughing, reflecting local procurement tasks.

**Tabla 3.34** Pre-Hispanic heritage elements identified in the site area of the photovoltaic plant.

| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| | North | This | | |
| SA01 | 7709346 | 441132 | Prehispanic | Lithic carving event. Represented from core roughing and detachment of primary size debris and laminae. All of the above in Base to Andesite. |

| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| SA02 | 7709559 | 441300 | Prehispanic | Size event detected from slices of andesite. |
| SA03 | 7710964 | 442381 | Prehispanic | Size event detected from slices of andesite. |
| SA04 | 7709926 | 442247 | Prehispanic | Size event identified from primary waste in andesite. |
| HA01 | 7705557 | 440436 | Prehispanic | Secondary Lasca in white silica. |
| HA08 | 7710196 | 442288 | Prehispanic | Depleted nucleus of andesite. |

The historical evidence corresponds to eight isolated findings and 54 linear traits (see エラー! 参照元が見つかりません。And エラー! 参照元が見つかりません。). The isolated findings are represented by traces of historical rubbish, essentially represented by metal containers adapted for cooking, bottle fragments, and housing of domestic animals. These contexts are associated with linear traits, which distinguish traces of the passage of wagons, footpaths related to pedestrian traffic, and troop footprints, linked to the transfer of livestock.

**Tabla 3.35** Historical findings identified in the site area of the photovoltaic plant.

| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| | North | This | | |
| HA02 | 7706496 | 440617 | Historical | Historical bottle, on the basis of which the inscription "HERMANN HEYE HAMBURG" is read. |
| HA03 | 7706401 | 440691 | Historical | Scattering of historical material associated with tropera footprint. |
| HA04 | 7707966 | 440127 | Historical | Landmark of IGM, associated with previous historical occupation, represented by metals and historical shoes. |
| HA05 | 7706434 | 441626 | Historical | Scattering of historical remains. |

| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| HA06 | 7708123 | 441217 | Historical | Scattering of historical materials Associated with Tropera footprint. |
| HA07 | 7710541 | 441631 | Historical | Semi-buried goat casing. Partially Esqueletizada. |
| HA09 | 7707405 | 443315 | Historical | Esqueletizados remains of mule. |
| HA10 | 7707433 | 443387 | Historical | Telegraph line posting Base. |

**Tabla 3.36** Historical linear traits identified in the site area of the photovoltaic plant.

| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| | North | This | | |
| RL01 | 7711256 | 443717 | Historical | Simple path. |
| RL02 | 7711240 | 443567 | Historical | Secondary footprint, along with Tropera footprint in regular state of preservation. |
| RL03 | 7708287 | 443579 | Historical | Main footprint. |
| RL04 | 7710724 | 442905 | Historical | Single footprint with treads on both sides, Route N-S. |
| RL05 | 7701037.3 | 443245 | Historical | Simple path. |
| RL06 | 7701018.8 | 443375 | Historical | Simple path with animal treads inside and on the sides. |
| RL07A | 7707615 | 443520 | Historical | Secondary footprint in conjunction with simple path. |
| RL07B | 7708264 | 443754 | Historical | Simple path in regular state of preservation. |
| RL08 | 7710125 | 442575 | Historical | Secondary footprint and Tropera footprint in regular state of preservation. |
| RL09 | 7706618 | 441229 | Historical | Simple path. |
| RL10 | 7709291 | 442927 | Historical | Tropera footprint with animal treads. |
| RL11 | 7709226 | 442551 | Historical | Secondary footprint and Tropera footprint in regular state of preservation. It shows traces of light vehicles in its east portion. Associated with a historic bottle labeled "DRY... LE... IRELAND ". |
| RL12 | 7707330 | 442701 | Historical | Secondary footprint and Tropera footprint in |

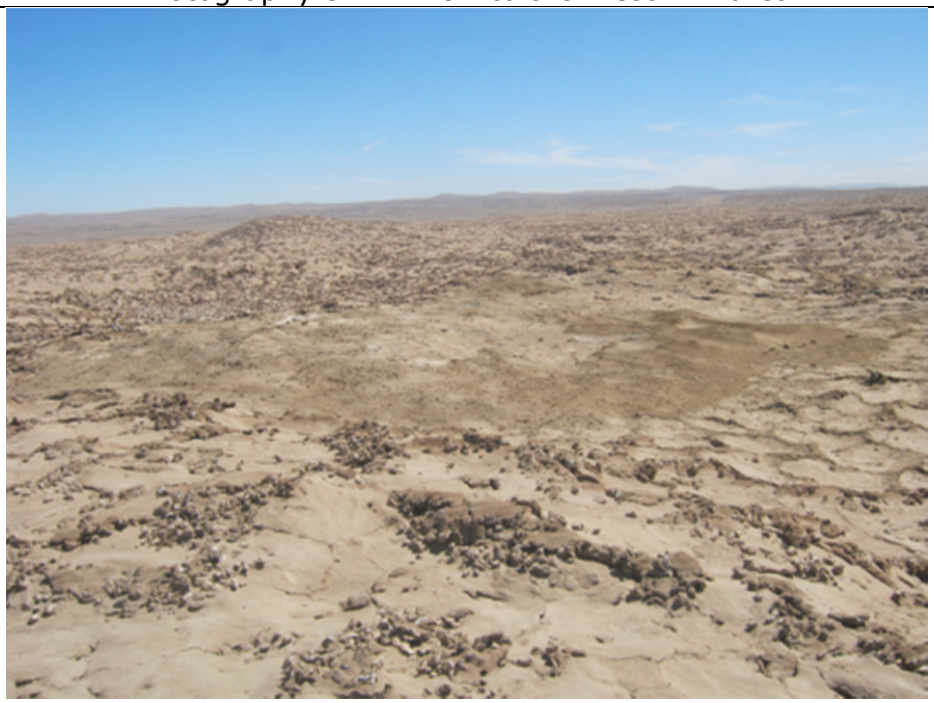
| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| | North | This | | |
| | | | | regular state of preservation. |
| RL13 | 7707783 | 442152 | Historical | Simple path. |
| RL14 | 7707843 | 442101 | Historical | Secondary footprint in regular state of preservation. |
| RL15 | 7707235 | 442178 | Historical | Tropera footprint. |
| RL16 | 7706635 | 442778 | Historical | Tropera footprint in regular state of preservation. |
| RL17 | 7711042 | 442228 | Historical | Simple path. |
| RL18 | 7709396 | 442176 | Historical | Footprint for people transit, no evidence of animal footprint. |
| RL19 | 7706728 | 442994 | Historical | Tropera footprint with 3 well defined furrows and abundant animal footprint. |
| RL20 | 7707929 | 442728 | Historical | Secondary footprint. |
| RL21 | 7710138 | 442127 | Historical | Tropera footprint. |
| RL22 | 7708274 | 442078 | Historical | Tropera footprint. |
| RL23 | 7708118 | 441682 | Historical | Simple winding path. |
| RL24 | 7708144 | 441615 | Historical | Secondary footprint. |
| RL25 | 7708276 | 441632 | Historical | Simple path. |
| RL26 | 7708380 | 441639 | Historical | Simple path. |
| RL27 | 7708638 | 441603 | Historical | Simple path. |
| RL28 | 7701018.6 | 441438 | Historical | Multiple footprint (main). |
| RL29 | 7709294 | 441074 | Historical | Secondary wagon footprint, associated with historical metal |
| RL29B | 7706830 | 441376 | Historical | Multiple footprint (main), associated with equine casing. |
| RL30 | 7706506 | 440966 | Historical | Simple footprint. |
| RL31 | 7706429 | 440678 | Historical | Secondary footprint. associated with historical material (jar with wire handle with shoe advertising paper, cans). |
| RL32 | 7706047 | 440824 | Historical | Secondary wagon footprint. |
| RL33 | 7708934 | 442096 | Historical | Secondary wagon footprint. |
| RL34 | 7707606 | 441527 | Historical | Caravan footprint in regular state of preservation. |
| RL35 | 7707755 | 441576 | Historical | Tropera footprint. |

| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| | North | This | | |
| RL36 | 7707904 | 440991 | Historical | Simple path. |
| RL37 | 7706434 | 441626 | Historical | Caravan footprint. |
| RL38 | 7706333 | 441621 | Historical | Secondary wagon footprint. |
| RL39 | 7706460 | 441199 | Historical | Secondary footprint. |
| RL40 | 7706662 | 440975 | Historical | Secondary footprint. |
| RL41 | 7705663 | 440696 | Historical | Secondary wagon footprint. |
| RL42 | 7707273 | 440527 | Historical | Simple footprint. |
| RL43 | 7710175 | 441622 | Historical | Caravan footprint. |
| RL44 | 7710023 | 441631 | Historical | Simple footprint. |
| RL45 | 7706497 | 440579 | Historical | Secondary wagon footprint. |
| RL46 | 7706478 | 440521 | Historical | Secondary footprint. |
| RL47 | 7706434 | 440535 | Historical | 2 parallel secondary footprints of 1.5 meters and 0.5 meters wide. |
| RL48 | 7706334 | 440574 | Historical | Caravan footprint. |
| RL49 | 7705894 | 440545 | Historical | Footprint of secondary wagon, associated with remains of earthenware. |
| RL50 | 7705868 | 440530 | Historical | Secondary wagon footprint. |
| RL51 | 7709262 | 440949 | Historical | Secondary footprint. |
| RL52 | 7707772 | 442740 | Historical | Secondary wagon footprint. |

- *LAT Sector and Electrical substation*

The area corresponds to a linear strip that departs from the polygon of the photovoltaic plant towards the west, splices with the Panamerican Highway and extends parallel to the latter towards the south, until the substation Lagunas. The terrain is semiflat and irregular, with PredomiNot the salt on the Chusca.

Photography 3.12: View to the West LAT area.



Source: Own Elaboration.

Pre-Hispanic and historical evidence was recorded in the area (see エラー! 参照元が見つかりません。). The first ones correspond to lytic dispersions, with predominance of andesite wastes, represented by slices, a fragment of projectile tip and a possible scraper. In four of these elements, historical evidence is also recorded, thus marking a bicomponent condition.

The historical evidence corresponds to five sites, two isolated findings and five linear traits. The former correspond to historical remains from productive and domestic activities, probably associated with nitrate offices. Within the linear traits are recorded traces of wagon, railroad and telegraph, which would also be associated with the nitrate activity.

**Tabla 3.37** Sites and historical findings identified in the location area of LAT.

| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| | This | North | | |
| SA01/LAT | 429921 | 7703320 | Prehispanic Historical | Dispersion of historical material corresponding to shoes, metal parts, glass, animal bone. A possible nucleus of andesite is also associated. |
| SH01/LAT | 429737 | 7702969 | Historical | Dispersion of historical material corresponding to nails, glass, burlap sacks. Next to this two wells are associated possibly for the extraction of water. |
| SH02/LAT | 429693 | 7702790 | Historical | Scattering of wood residues on the surface. |
| SA02/LAT | 429594 | 7702655 | Prehispanic Historical | Dispersion of historical material, represented by traces of metal, a chuzo with high degree of oxidation and glass. Two slices of quartz are also distinguished. |
| SA03/LAT | 429547 | 7702523 | Prehispanic Historical | Dispersion of pre-Hispanic and historical material. The first case corresponding to lithic fragments, corresponding to secondary slabs of chalcedony, quartz, andesite and basalt. The historical evidence corresponds to remains of glass, metals, burlap sacks, shoes, purple glass and ceramic stoneware possibly for beer bottling (early twentieth century). |
| SA04/LAT | 429451 | 7702448 | Prehispanic | It corresponds to a dispersion of superficial lithic material, it represents by nuclei of andesite and basalt, a possible basalt scraper and secondary roughness of andesite. |
| SA05/LAT | 429393 | 7702263 | Prehispanic Historical | Dispersion of pre-Hispanic and historical materials. In a first case represented by a fragment of projectile tip in quartz. While the historical evidence corresponds to traces of metal and wood burned. |
| SH03/LAT | 429325 | 7702091 | Historical | Grouping of historical remains corresponding to a piece of metal and fragments of burned wood. |
| SH04/LAT | 429123 | 7701740 | Historical | Collection of historical remains corresponding to |

| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| | This | North | | |
| | | | | metallic girths and jars. |
| SH05/LAT | 429070 | 7701597 | Historical | It corresponds to a set of historical remains represented by purple glass from the beginning of the twentieth century and a metal piece. |
| HA01/LAT | 439761 | 7708255 | Historical | Historical bottle. |
| HA02/LAT | 435868 | 7706514 | Historical | A demarcation feature composed of a train rail arranged in vertical, with base of stones. Other metal remains are detected on the surface. |

**Tabla 3.38** Historical linear traits identified in the location area of LAT.

| Element | Coordinates (WGS84, spindle 19) | | Adscription | Description |
|---|---|---|---|---|
| | North | This | | |
| RL001/LAT | 7707747 | 438930 | Historical | Railway line, orienting southeast Northwest. It is located on an embankment of at least 1 m in height. The surface shows historical material. |
| RL002/LAT | 7707838 | 439124 | Historical | Multiple wagon track, associated with historical remains. |
| RL003/LAT | 7707942 | 439160 | Historical | Wagon track. It is associated with fragments of bottles. |
| RL004/LAT | 7705984 | 433369 | Historical | Posting with east-west orientation, possibly telegraph. It materializes in wood poles and fragments of glass and ceramic stoneware. |
| RL005/LAT | 7698610 | 427438 | Historical | North-South Orientation railway line. associated with nails of the railway line, Jars, Woods, and presence of stoves |

The tabs associated with the findings are presented in Annex 3.2 baseline, Cultural heritage.

### *3.3.3.4 Conclusions*

The archaeological inspection carried out during the months of March-April and September of 2014, in the framework of the "Photovoltaic Project Cielos de Tarapacá" allowed to detect 85 patrimonial elements, between pre-Hispanic evidences (n = 11) and historical (n = 74).

Pre-Hispanic contexts recorded in the area correspond to events of varying magnitude size. In these sites and isolated finds is represented the initial state of roughing of lithic nodules, detected after the finding of primary slices, with predominance of andesites, allowing to think the area of the project site as a space of Appropriation and proof of lithic raw materials.

On the other hand, the sites and isolated finds of historical affiliation essentially correspond to dispersions of fragments of glass bottles, containers of tin and remainders of wood. They add to the above different types of linear traits, identified from Telegraph posts, railway lines, trails, wagon tracks and Troop, which articulate with the aforementioned historical elements, favoring communication and Transport between immediate and remote spaces, as is the case of Pica and the nitrates near the project.

It should be noted to the project holder that, in the event of the eventual emergence of new archaeological and/or paleontological remains not foreseen during the execution of the works, it must give notice to the competent authorities, proceeding as established in the articles 26º and 27º of Law n ° 17,288 on national monuments and articles 20 ° and 23 ° of the Regulation on archaeological, anthropological and paleontological excavations and surveys.

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## 3.4 LANDSCAPE AND SCENIC RESOURCES

### 3.4.1. Objectives

- Identify, characterize and assess the landscape and the scenic resources present in the territories involved in the project.
- To establish the implications that, from the viewpoint of the landscape and scenic resources, could bring the materialization of the activities of the project.

In a specific way it was characterized the landscape in accordance with the three concepts stipulated in article 18 (e 7) of title III of the Environmental Impact Assessment System Regulation (DS No. 40/12) of the Ministry of the Environment. In this way, the provisions of article 19 (b) of title III of the same regulation shall be complied with. The concepts are:

- Visibility or visual basins[4]
- Visual quality of the landscape[5]
- Type[6]

It poses as an additional objective, to calculate the visual fragility[7] for the site under study, depending on the uses and/or activities proposed by the project.

[4] Porción de paisaje visualmente autocontenida, que abarca toda el área de visualización que un observador tiene del paisaje.
[5] Se refiere a la calidad estética del paisaje.
[6] La tipología de paisaje está definida por el carácter del espacio geográfico evaluado, este puede ser natural, rural, urbano, industrial entre otros.
[7] La fragilidad es la es la susceptibilidad del paisaje al cambio cuando se desarrolla un uso el territorio.

### 3.4.2. Methodology

The methodology used to determine the visual evaluation of landscape was established in three stages, which are detailed in the methodological diagram shown below:

#### *3.4.1.1 Basic characterization of the landscape*

In the same way, the areas of visibility were spatially defined, which correspond to the visually self-contained portions of the landscape, which encompass the whole area of visualization that an observer has of the landscape from a certain point, which It allowed to determine the visibility from the main observer routes to the area where the project would be implemented.

**Figura 3.34** Methodological outline for landscape assessment

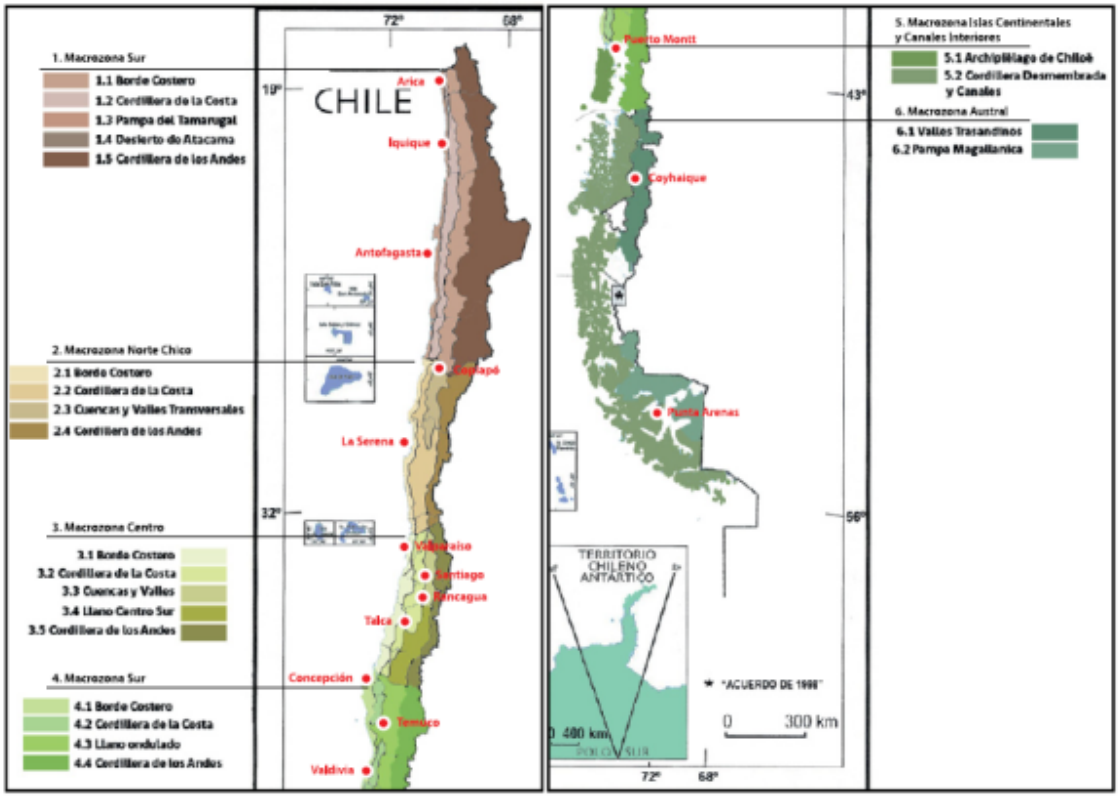

* PO: Observation points

Source: Self-elaboration based on SEA (2013)

### *3.4.1.2 Background and cadastre*

This stage corresponded to the work in the cabinet prior to the field trip. A bibliographical review was carried out on landscape aspects of the evaluated area, including a landscape zoning and the identification of assumptions, based on the environmental Impact Assessment Guide, landscape value in the service of Environmental assessment (SEA, 2013).

**Figura 3.35** Landscape Zoning




Source: Environmental Impact Assessment Guide, Landscape Value (SEA, 2013).

Additionally, it was developed through automatic methods, a visual watershed analysis in the software © Arcgis 10.1, 3d Analyst module, with the purpose of identifying preliminary and theoretically the potential points of concentration of observers, Which were based on the following aspects:

- Selection of current observer routes and from where you could have visual access to the project area. In this case, the selected routes are those that allow to have access to each one of the pregod; Visual corridors with the greatest flow and/or presence of potential observers; And

- Selection of points on populated locations, concentration points of observers, corridors or current or potential tourist viewpoints.

### *3.4.1.3 Ground stage*

A field campaign was held, which took place between 14 and 16 April 2014, where a complete tour of the study area was carried out. The characterization of the landscape and the scenic resources, was executed by a professional of the area of natural resources, specialist in landscape.

As indicated, a complete tour of the territories involved in the project was carried out, compiling all the necessary data for the study. In different sectors and according to the method of "direct observation *In situ*"(Litton, 1973), the following works were carried out:

- Determination of the points of observation, selecting those that were habitually guided by a common observer, and those that could be considered possible viewpoints, for their panoramic characteristics and of visibility.
- Basic characterization of the landscape, through the geozoning of the territory from hierarchical levels. Identification of the area where the project is located. The first hierarchical level of the landscape shall be understood as a subregion. Subsequently identification: subzone; Homogeneous zones; Landscape units; singular areas; and landscape site (or local landscape unit). These allow recognizing the character of the landscape and are defined according to morphological, vegetational and spatial characteristics in common.
- Definition of the visual watershed (s) or visibility for each observation point. It is necessary that the visual basin of an observation point is defined as the terrain surface that is visible from that point.
- Inventory of the biophysical, structural and aesthetic attributes of each defined landscape unit, all observations being recorded in a field form. Being the following:
    - Relief: It is defined as the particularities of the area associated with the type of slope and its morfoestructurales characteristics.
    - Soil: Refers to the roughness of the soil, if it is low, medium or high. That is to say smooth to rugged soil.
    - Bodies of water: it refers to the presence of water and its

abundance in the landscape, in any of its forms (sea, lakes, rivers, etc.).

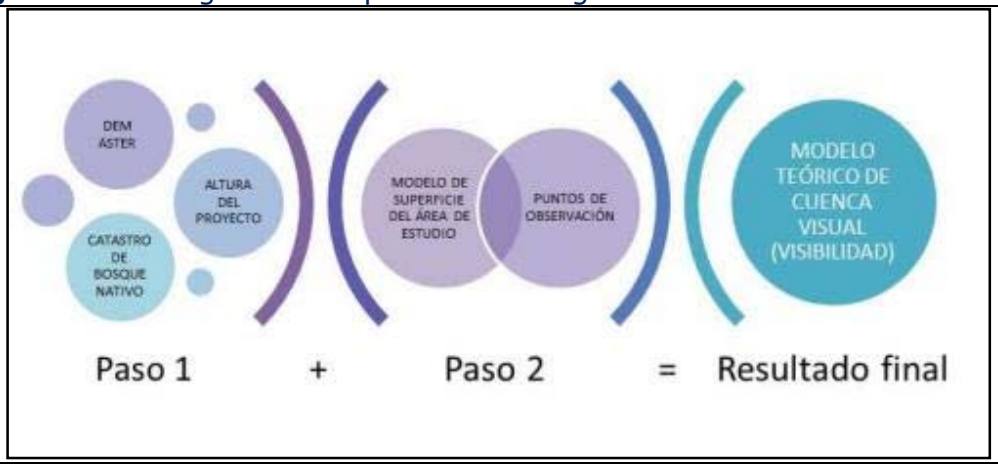
- Dominant vegetal cover: refers to the vegetal formations that are relevant within the landscape (forests, thickets, steppes, briery, etc.).
- Presence of Fauna: it refers to all the animal populations, exotic or autochthonous, that generate an interesting dynamic and that contribute to the scenic quality of the landscape.
- Snow: is defined as the presence of snowy surfaces in the landscape, either temporarily or permanently.
- Form: It is described from the diversity of forms present in the landscape, these can be from two-dimensional to complex.
- Colour: It is evaluated based on the diversity and contrast of the landscape's chromatic range.
- Texture: It is defined as the particle size, density and regularity of the landscape surface.
- Landscape Diversity: It refers to the variety of attributes in the landscape, it is evaluated according to its heterogeneity and singularity. Here we describe the singular areas and landmarks of interest.
- Human intervention or naturality: are the various types of structures made by man, whether punctual, extensive or linear. (roads, high-tension lines, urbanization, green areas, etc.).
- Areas of historical interest: they are all areas that have a historical or patrimonial load relevant to a country, region or city. (Areas where important battles have been recorded, settlements of native peoples, etc.).

### *3.4.1.4 Cabinet stage*

At this stage we worked with all the information acquired in the field, defining the following points:

- Characterization of the intervisibility of the project, based on the points of observation obtained in the field, on theoretical models of visibility. These models are Developed in GIS platform (© Arcgis 10.1, 3d Analyst module), by crossing different variables. The visibility model supports the analysis of intervisibility, in relation to the visual access that could possibly have the observers to the works of the project.

**Figura 3.36** Diagram of steps for obtaining a theoretical model of visibility




Source: Self-elaboration

- Identification of the landscape assumptions, for the preliminary and general recognition of the evaluated area, by means of the identification of dominant characteristics referring to their biophysical attributes, for this the environmental Impact Assessment Guide was used , landscape value in the SEIA (SEA, 2013).
- Identification of the landscape value by means of the identification of the presence or absence of biophysical attributes in the area of influence, for this we used the matrix of determination of landscape value, of the

guide Environmental impact Assessment (SEA, 2013) (see Annex 3.2 Baseline, landscape).

- Determination of the Visual quality of the defined landscape unit (s). To carry out this evaluation, we used the method proposed by the Environmental Assessment Service (SEA, 2013), in the Environmental Impact Assessment Guide, Landscape value (see annex 3.2 baseline, landscape)
- Determination of the Visual fragility of the defined landscape unit (s). In this case an adaptation of the methods proposed by Escribano was used *et al.* (1987) and Aguiló *et al.* (1992). These methods assign values to a number of factors that interact in the visual manifestation of the landscape, such as biophysical attributes, visualization, singularity and visual accessibility.
- Justification for the presence or absence of impacts. The potential impacts of the project on the local landscape will be assessed, based on the impacts identified in the Sea Landscape Assessment Guide (2013).
- Evaluation of investment projects in the territorial environment of the project. will be reviewed through the platform *Online* http://www.sea.gob.cl/, identifying the investment projects present in the area.
- Based on the previous point, we will evaluate the cumulative effects and/or synergistic impacts associated with the identification of characteristics *In situ* and to the determination of factors such as the presence of visual barriers, the characteristics of the visual basin etc.

### 3.4.3. Results

#### *3.4.1.5 Scenic resources*

The landscape study and the scenic resources were carried out from a hierarchical (nested) approximation, using different scales of analysis for the Description and evaluation of each one of its components, being able to arrive

thus to an approximation of the evaluation of the type, value, quality, fragility and visibility of the landscape.

On a general scale, the evaluated area is found in a desert landscape matrix, which is characterized by having large extensions without obvious use of the territory, it is combined with areas of the territory where human settlements are configured (for example, the Oasis of Pica-Matilla), Economic activities of mining (for the exploitation of Coliche) and sectors of patrimonial and natural value (ex-nitrate offices, natural reserves and archaeological sites).

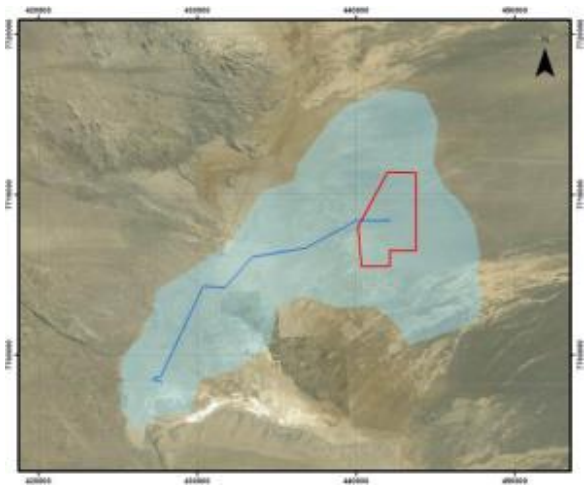
As for the landscape hierarchies, the evaluated area is located in the large North zone, in the Pampa del Tamarugal sub-zone, in a homogeneous zone called Glacis sedimentation, in the local landscape unit "Victoria".

At the local level, the project area is located in the local landscape unit (ULP) "Victoria", which is defined as an area of great extension, with low ranges of slopes and desert biogeographic characteristics, where it is possible to find intervention Localized human, as presence of access roads, electrical lines, an electrical substation and evidence of a mining productive past, given by the extraction of Lichee. Important to note, that the UPL is on the boundary with a plantation of *Prosopis Tamarugo* (Tamarugo). In general terms, it can be indicated that the area of the project and in specific the UPL, presents a typology of mixed landscape, with original characteristics, which are concentrated in the sector where the photovoltaic plant is projected and spaces Transformed in anthropic terms, which are mainly located in the sector of the tracing of LAT.

As for the visual characteristics of the UPL and their attributes, they are described below:

UPL Victoria

*Characteristics of the local landscape unit*

<table>
<tr><td>ID UPL</td><td colspan="2">Victory</td></tr>
<tr><td colspan="2">Description</td><td>Figure</td></tr>
<tr><td colspan="2">The size of the visual basin is extensive, elongated, with a low proportion of hidden areas.<br>The position of the project in the UPL is on the plain, which determines the position of the observer at the level.<br><br>The visibility is defined as high, which is related to the type of panoramic view and the low slope ranges, which allow for greater visual access, however visual rays have to be lost given the increase in distances. In general terms, the visual range can be described to distant planes (> 2,000 m).<br><br>As for the scenic background, this moderately increases the visual quality of the ensemble, as it is constituted by massifs of the Cordillera de Los Andes to the east.</td><td>  <br>Visual Basin Features<br>  <br>Tamaño extensa<br>  <br>Forma alargada<br>  <br>Compacidad baja<br>  <br>Espacialidad panorámica<br>  <br>Posicion a nivel</td></tr>
<tr><td colspan="2">Basic visual characteristics of UPL</td><td>The landscape is presented in the three-</td></tr>
</table>

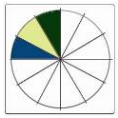
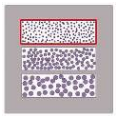
| ID UPL | Victory |
|---|---|
| **Description** | **Figure** |
|  Color bajo  Textura fina  Forma tridimensional | dimensional panoramic type with diffuse edges. The set of features that visually characterize the components of this landscape unit determine a low chromatic variety of the landscape, brown and grey, being the dominant texture of fine grain. |

Photo 3.13: View towards UPL Victoria, you can see the dominant texture, the low compactness of the landscape and Low slope ranges.

*Biophysical, aesthetic and structural attributes of UPL*

As part of the description of the landscape, an inventory of the biophysical, aesthetic and structural attributes was carried out. Which are presented below:

- Relief: The evaluated area is presented in the geomorphologic unit Pampa del Tamarugal, which greatly determines the presence of low slope ranges.
- Soil: The soil cover has a mixed roughness, as it combines areas of low and medium roughness, increasing in those places that have saline crusts removed.
- Bodies of water: No water courses were presented at the UPL.
- Key Vegetable cover: The UPL presents a formation of desert, presenting only species that are not recurrent and inconspicuas at the level of landscape.
- Presence of fauna: The possibility of observing species of fauna of scenic interest is low to nil.
- Snow: There is no snow cover.
- Way: The evaluated area presented a low diversity of shapes in the landscape.
- Color: In the area of influence was presented a low contrast of the chromatic range of landscape.
- Texture: The landscape has a fine-grained texture.
- Landscape Diversity: There are No milestones or areas of scenic interest in the limits of the UPL, it is important to note that in the east limit of the evaluated unit a plantation of Tamarugos was registered.
- Human intervention or naturalness: In the local landscape, stands out a medium to high human intervention, given by a network of interior roads, electrical paths and exploitation of the licher.
- Areas of historical interest: The UPL is presented within the communal boundary of Pozo Almonte. According to the National Monuments Catalogue (1998) and the information available in www.monumentos.cl
- This Territory has 4 historical monuments: Santa Laura nitrate Office at

more 58 km, town of La Tirana at more than 40 km, geoglyphs of painted more than 14 km and the real estate of the former nitrate Office Iris (kiosk) to 18 km, of which none is within the unit of P Landscape.

#### *3.4.1.6 Visibility analysis*

The analysis of intervisibility is related to the visual accessibility that they have to the area, the potential observers that transit through the public routes that give access to the project (Route 5 and Camino a Quebrada Blanca). In this sense, it underlies the idea that these routes are considered as sectors with a potential concentration of observers.

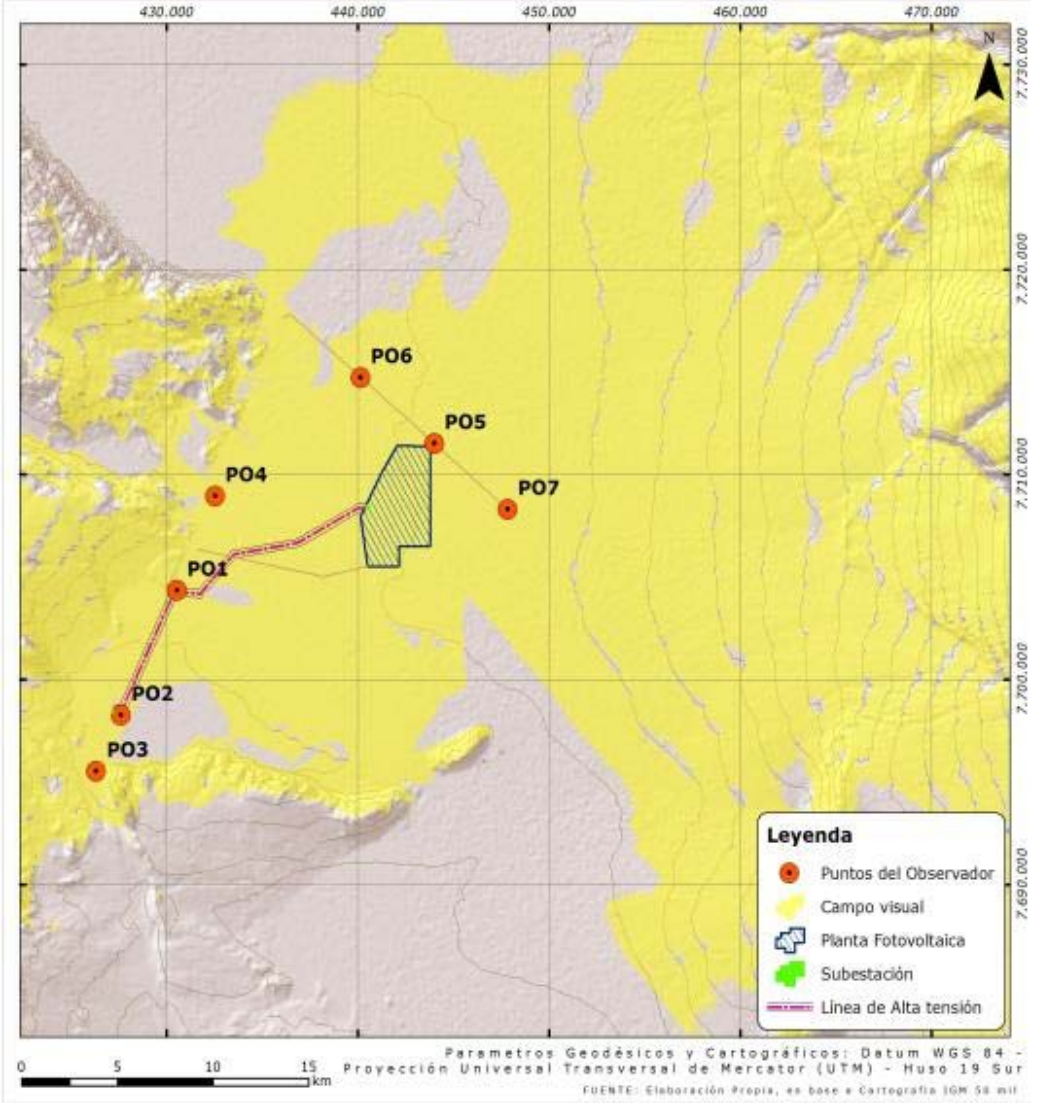
The analysis allowed dimensioning the visual vulnerability, which is directly related to the visual access that can have the observers to the sector where the works of the project would be implemented.

The intervisibility, from the evaluated routes, is direct and close, mainly due to the following factors: i) the distance between the works of the project and the routes; II) The almost horizontal slope, which allows great visual access; The low proportion of hidden areas; The almost null existence of elements in the landscape that obstruct the visible areas and; V) the angle of visual incidence of the observers.

Given the foregoing, the following visibility conditions are described to the project from the evaluated routes:

1. Route 5: The visibility from Route 5 is close and direct towards the path of the transmission line, which tends to disappear as it moves away from the route and goes into the Pampa del Tamarugal.
2. Road to Quebrada Blanca: The visibility from this route is direct and close, towards the photovoltaic plant and towards its access road. To As in the previous path, visibility disappears as observers move away from the project area.

**Figura 3.37** Visibility to project area, from observer routes




Source: Self-elaboration based on Natgeo world map – ESRI Server

As evidenced in the previous figure, 6 observation points were taken, from the two routes closest to the project, and it could be verified that the project is visible, except in points 2 and 3 (PO2 and PO3) since there is a visual barrier given by the morphology, which prevents observing the plant Photovoltaics and the beginning of LAT, however this situation is of an isolated nature and does not happen with the other points of observation.

The following image shows an example of visibility towards the project, corresponding to the PO3 observation point (see Photography 3.14).

Photo 3.14: From the PO3 observation point it is not possible to view the project.

- *Identification of assumptions*

From the executed geozoning and landscape characteristics identified in the field, the following are recognized the assumptions that are present in the area where the project is located and that are applicable to the identification of the landscape value.

**Tabla 3.39** Landscape assumptions applicable to the study area

| Zone | Assumptions that apply to the study area (SEA, 2013) |
|---|---|
| **Large North** | The character of the landscape is determined by the dominance of abiotic attributes, from the extensive presence of desert zones defined by geological and geomorphological components. |
| | In general, the landscape forms are stable and persistent. This condition is mainly presented in the strip defined as intermediate depression, which is interrupted in cases by ravines, oases and some formations of thorny forests. |
| | The seasonality conditions are generally stable, they are only altered by the sporadic winter Altiplánico phenomena, activating endorheic basins by the fall of water in summer months. |
| | Visibility and intervisibility conditions generally determine a high degree of exposure to the territory. |

Source: SEA, 2013.

- *Landscape value*

From the assessment of the biophysical attributes existing in the landscape under study, it was possible to determine the following:

- The landscape in the project area presents biophysical attributes that give it landscape value[8], as defined by the SEA (2013).

- *Quality assessment and visual fragility*

In relation to the identification of the landscape value is that, a quality assessment and visual fragility was carried out for the local landscape (UPL). This will allow to characterize the degree of merit or excellence of the landscape. It will therefore be possible to identify whether or not there is a significant alteration to this resource.

[8] Para determinar el valor paisajístico, se utilizó como base la Tabla 5 de la Guía de Evaluación de Impacto Ambiental, Valor Paisajístico en el SEIA del año 2013.

**Tabla 3.40** Visual quality of landscape.

| Attribute type | Attribute | UPL Victoria |
|---|---|---|
| Biophysical | Relief | B |
| | Soil | M |
| | Water | - |
| | Vegetation | B |
| | Fauna | B |
| | Snow | - |
| Structural | Landscape Diversity | M |
| | Naturalness | M |
| Aesthetic | Way | B |
| | Color | B |
| | Texture | B |
| **Quality assessment** | | **Low** |

* D: Outstanding; A: Discharge; M: Medium and B: Low (SEA, 2013).

Given the previous analysis, is obtained for the UPL Victoria presents a low quality of landscape, because more than 50% of the attributes evaluated, belong to this category (SEA, 2013).

As for the visual fragility of the landscape, the following result was obtained:

**Tabla 3.41** Visual fragility of landscape.

| Attribute type | Attribute | UPL Victoria |
|---|---|---|
| Biophysical | Earrings | 10 |
| | Vegetation density | 30 |
| | Vegetation contrast | 30 |
| | Vegetation Heights | 30 |
| Display | Size of the Visual Basin | 30 |
| | Shape of the visual basin | 30 |

| Attribute type | Attribute | UPL Victoria |
|---|---|---|
| | Compactness | 30 |
| Singularity | Uniqueness of landscape | 20 |
| Visibility | Visual accessibility | 30 |
| **Fragility assessment** | | 26.7 – **High** |

In relation to the previous analysis, it was obtained that the fragility of the whole is high, mainly by the shape of the visual basin and the null presence of visual barriers.

### 3.4.2 Conclusions

The local landscape, where the study area is inserted, is located in a desert landscape matrix, which is characterized by large extensions without obvious use of the territory, it is combined with areas of the territory where settlements are configured Human beings (for example, the oasis of Pica-Matilla), Economic activities of mining (for the exploitation of Coliche) and sectors of patrimonial and natural value (ex-nitrate offices, natural reserves and archaeological sites).

The results of the landscape evaluation, and especially those related to the quality, fragility, visual absorption capacity and intervisibility of the landscape, are strongly moderated by:

Route 5: The visibility from Route 5 is close and direct towards the path of the transmission line, which tends to disappear as it moves away from the route and goes into the Pampa del Tamarugal.

Road to Quebrada Blanca: The visibility from this route is direct and close, towards the photovoltaic plant and towards its access road. As in the previous route, visibility disappears as observers move away from the project area.

Without prejudice to the above, the landscape presents a low visual quality. This result is mainly explained by the conditions presented by the following elements of the LandscapE Considered in the evaluation:

- The presence of low slope relief;
- A moderate chromatic contrast; And
- Absence of singularities.
- For its part, the factors that have a major impact on the high value of visual fragility are fundamentally related to:
- The relief that facilitates visibility;
- Shape and size of visual watersheds; And
- Low uniqueness of landscape.

In order to provide background to the baseline, 9 projects were reviewed (see section 3.10 of the present study) located in the environment near the project area. These have RCA approved between the years 1997 and 2014.

According to the above it is possible to mention that the total of projects analyzed those that contain information on this component are "zone of New mine Victoria", "Construction system electrification agricultural colony of painted", "lines of Electrical distribution substations lagoons "and" Solar plant Pica painted ".

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- SERNATUR (2005) Res. Exempt 1,248, it declares zone of national tourist interest the area of Pica-Salar of the Huaso located in the commune of Pica, region of Tarapacá.
- SERNATUR (2009) Zones and center of National Tourist interest declared under Decree 1,224 of 1975.

## 3.5 PROTECTED AREAS AND PRIORITY CONSERVATION SITES

### 3.5.1 Objectives

The general objective of this section is to identify and characterize the protected areas, priority sites for the conservation and use of the Territory and its relation with the territorial planning instruments, with respect to the area of influence of the Project.

Specifically, the following objectives are indicated:

- To perform a characterization of baseline of areas placed under official protection (including SNASPE, nature sanctuaries, protected national property, Biosphere Reserve, ZOIT etc.) and its relationship with the area of influence of the project.
- Identify areas that are part of national, regional and/or local conservation initiatives, such as priority sites for conservation and private protected areas.

### 3.5.2 Methodology

The characterization of these components was made by the definition of protected areas determined by technical and legal antecedents available in the state agencies with jurisdiction in territorial matters, including the revision of the Territorial expression of the following protection figures:

- Revision of the antecedents related to the national system of protected areas by the State (SNASPE), which defines the reserves of Virgin regions, national parks, national reserves and monuments Natural, under law N ° 18.362/84.

- Revision of the databases of the Council of National Monuments, governed by law N ° 17.288/70 of the Ministry of Education, which defines the sanctuaries of nature, historical monuments, typical and/or picturesque areas.

- Identification of areas corresponding to protected national property, which are defined as indicated in D.L. N ° 1939/77, of the Ministry of National Property.

- Background check on the location of biosphere reserves, which are defined according to the UNESCO Man and Biosphere Program, which was ratified in Chile by DS N ° 259/80.

- Ecological preservation areas, which are contained in the Territorial planning instruments, in all their application scales.

- Wetlands of international importance, especially as aquatic species habitat (Ramsar sites), as regulated by the Ministry of Foreign Affairs, DS N ° 771/81.

- The areas of tourist interest, which depend on the Ministry of Economy (Decree Law n ° 1224/75), will be reviewed.

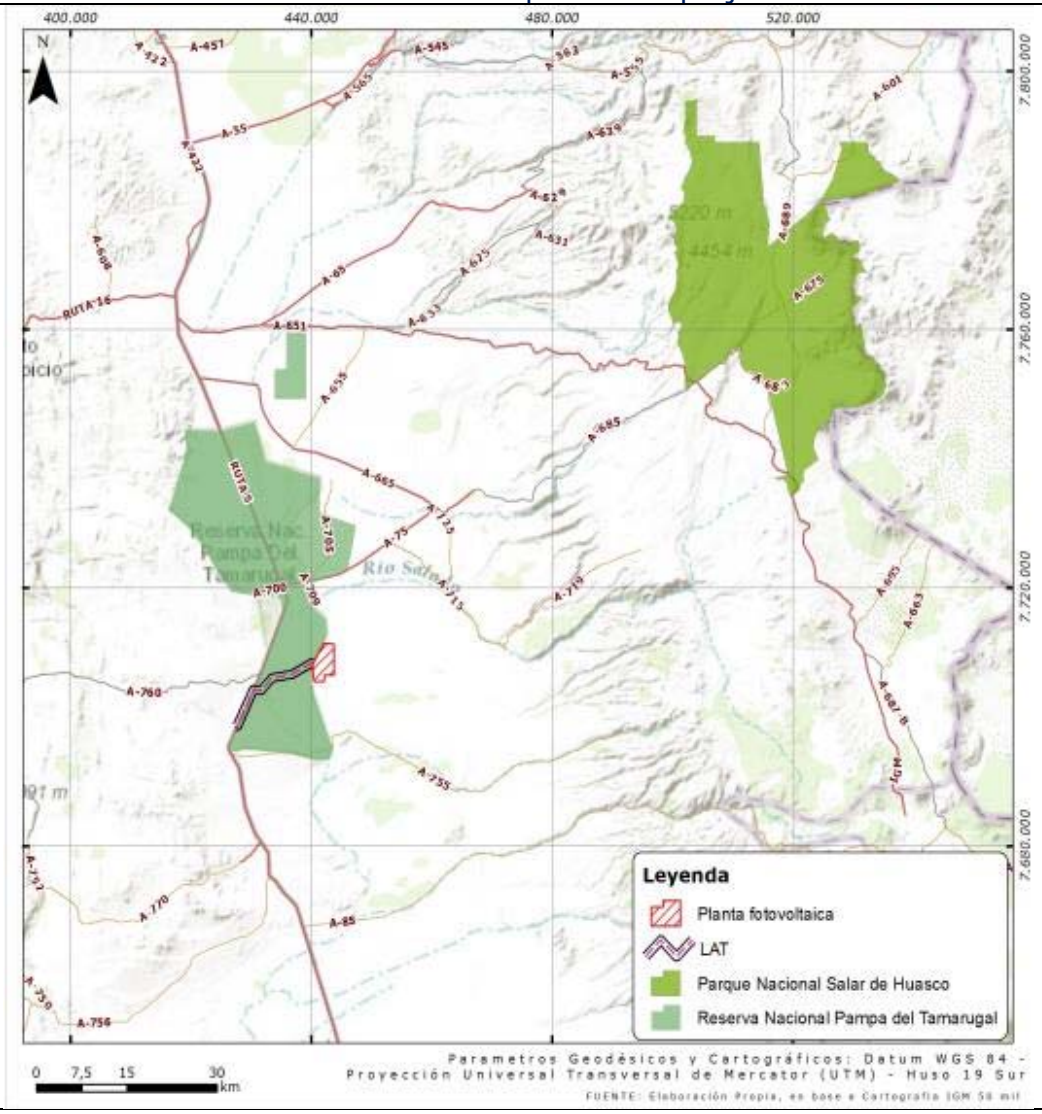
- Priority sites for the conservation of Nature (SSPP), which, in spite of not understanding areas of official protection, are relieved in article 8 of title II of the regulation of the Environmental Impact Assessment System (DS N ° 40/2012), of the Ministry of the environment.

*Protected wilderness areas of State (SNASPE)*

The national parks are areas of important territorial extension, where there are different unique environments or representative of the natural biological diversity of the country, not significantly altered by human action, able to perpetuate itself, and where the Species of flora and fauna, or geological formations, are of special interest educational, scientific or recreational.

The national park closest to the project corresponds to the National Park Salar de Huasco, located more than 71 km east of the project.

**Figura 3.38** SNASPE and its relationship with the project area




Source: Self-elaboration based on World Topo MAP-ESRI Server

Meanwhile, national reserves are called to protected areas and decreed as such by the Ministry of Agriculture, and whose natural resources it is necessary to preserve and/or use with special care, because of the susceptibility of these to undergo degradation or by its Importance in safeguarding the welfare of the community. It aims at the conservation and protection of soil resources and those endangered species of wild flora and fauna, the maintenance or

improvement of water production and the application of technologies for rational utilization of these. The proximity of Area of the project to the nearest reserve is immediate, ie the project – specifically the photovoltaic plant-, would be located immediately adjacent to the eastern boundary of the Pampa del Tamarugal National Reserve. With respect to the high voltage line, the projected path crosses the reserve in a sector with total absence of Tamarugos, where the use of the soil corresponds to salares.

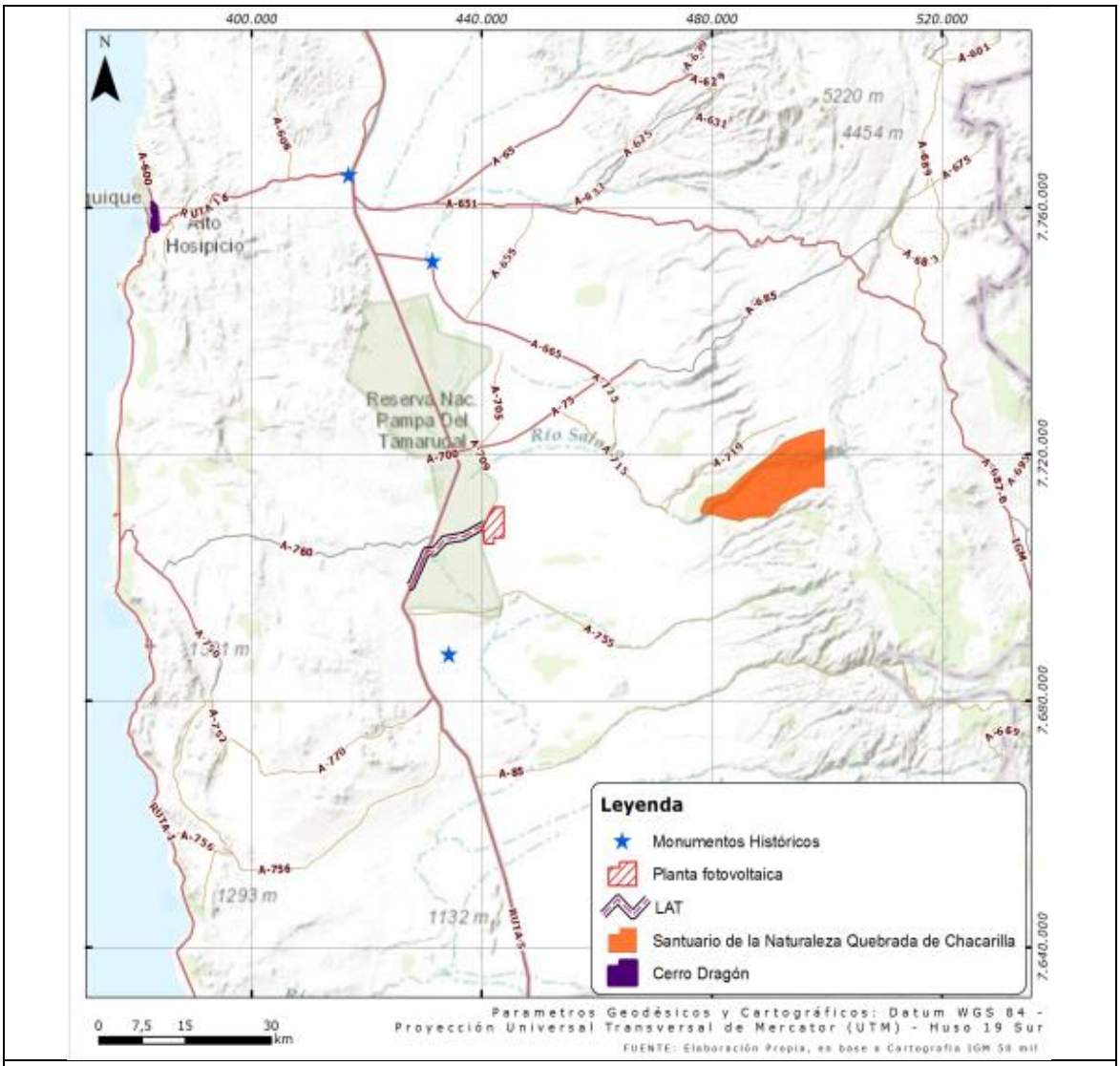
Finally, the natural monuments are generally reduced areas, characterized by the presence of native species of flora and fauna or by the existence of geological sites relevant from the point of view scenic, cultural or scientific. Its objective is to preserve the natural, cultural and scenic environment and to the extent that it is compatible with it, to develop educational, recreational or research activities. However, there are no natural monuments within the region where the project is located.

*Historical monuments*

According to the National Monuments Catalogue (2014) and the review of the information available in www.monumentos.cl, in the commune of Pozo Almonte there are 4 national monuments, historical, archaeological, public, etc. and correspond to: Santa Laura nitrate Office to more 58 km, town of La Tirana to more than 40 km, geoglyphs of painted to more than 14 km and the real estate of the ex Oficina Saltpeter RA Iris (kiosk) 18 km.

On the other hand, article 31 of Law No. 17,288 on national monuments, defines the sanctuaries of nature as: "All terrestrial or marine sites that offer special possibilities for geological studies and research, Paleontological, zoological, botanical, ecological or possessing natural formations of interest to science or state. " In this case, the Quebrada de Chacarilla Nature Sanctuary is located more than 35 km from the study area.

**Figura 3.39** Historical monuments and their relationship with the project area

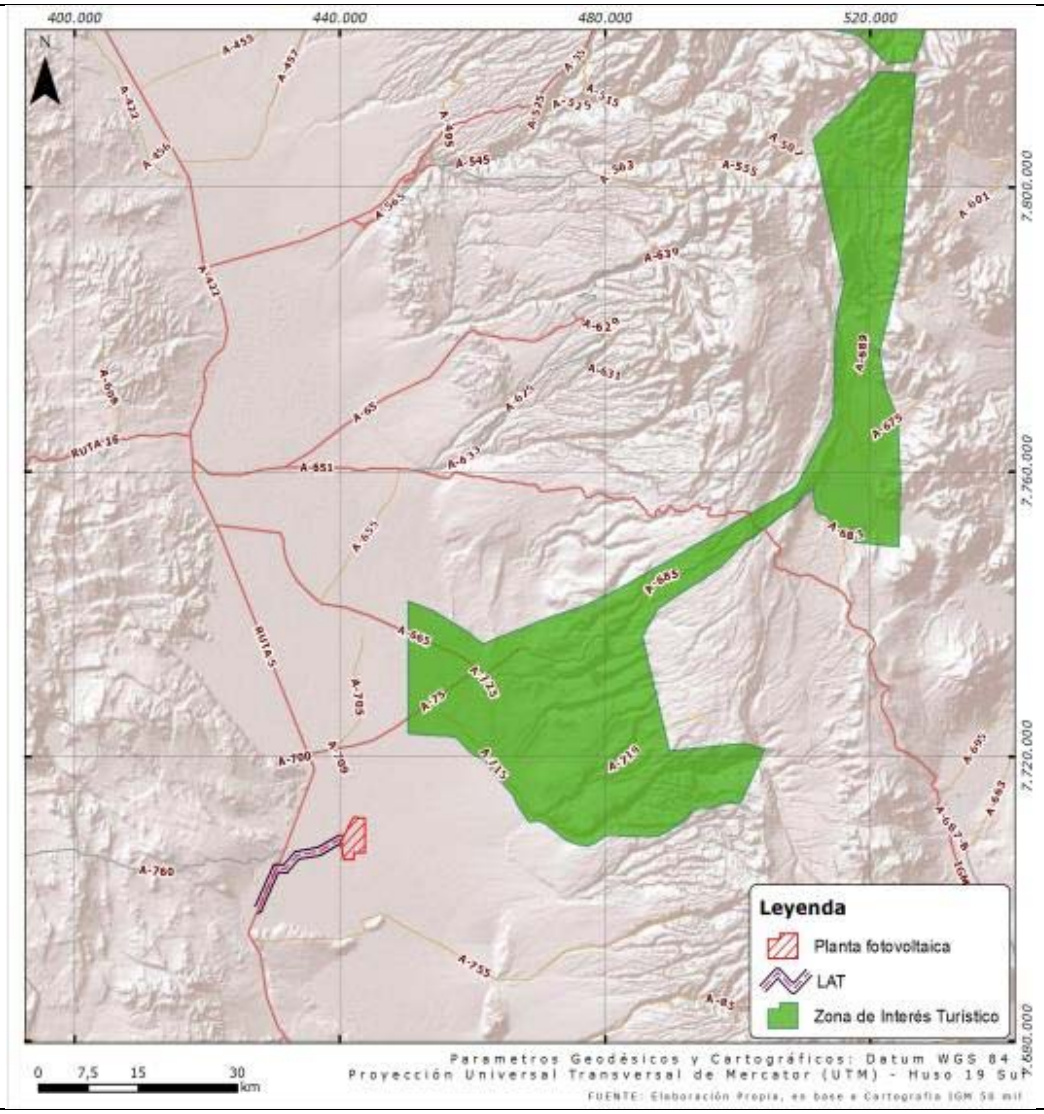



Source: Self-elaboration based on world map-ESRI server

## *Areas of IInterest Turístico (ZOIT)*

The areas of national tourist interest (SERNATUR), correspond to those areas of the territory that have special conditions for the attraction of tourism. These sites are of great scenic beauty and have a high potential for the development of the large-scale tourism industry. The ZOIT closest to the study area corresponds to the ZOIT Pica-Salar de Huasco, located at 18 km Northeast of the study area (see Tabla 3.40 ).

**Figura 3.40** Areas of tourist interest and their relationship with the project area



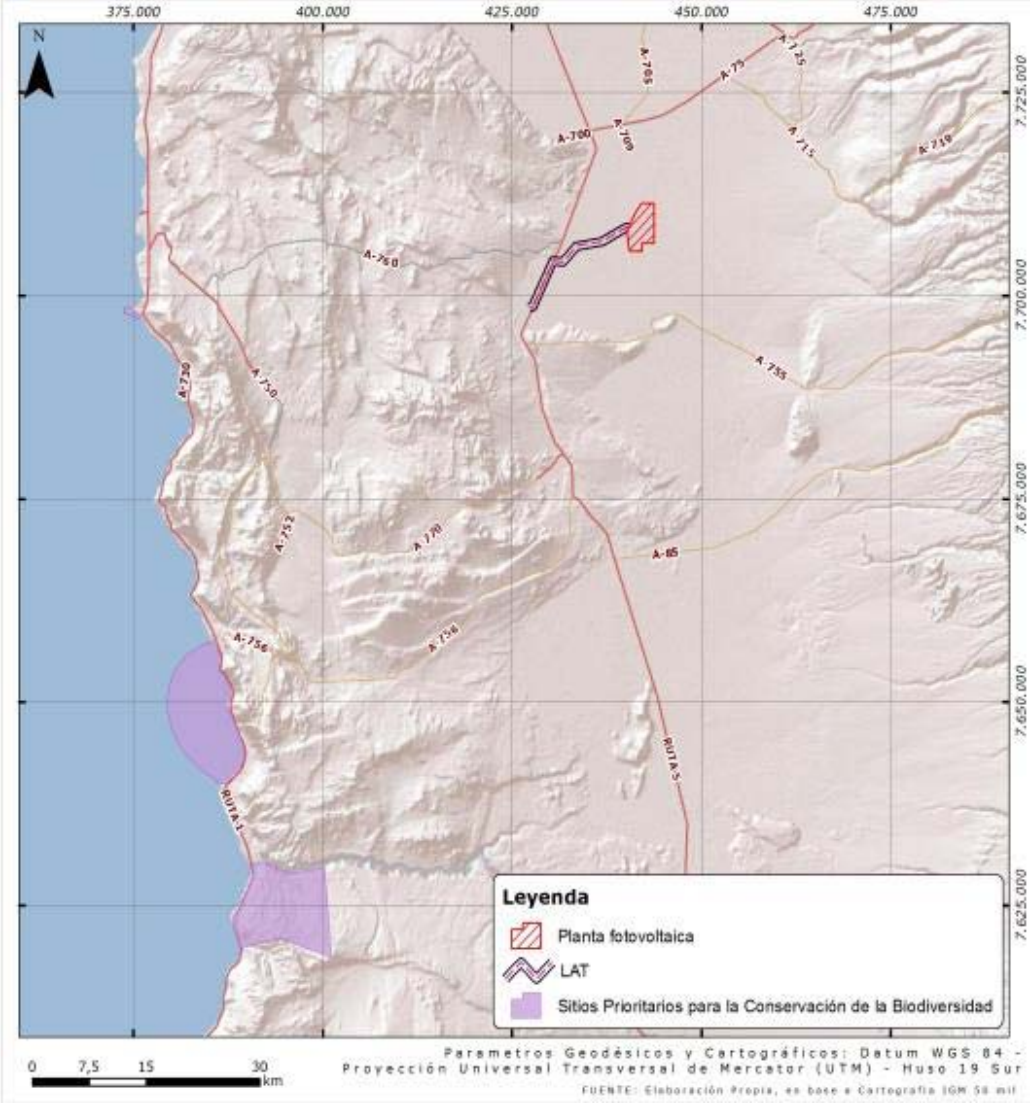

Source: Self-elaboration based on world map-ESRI server

*Priority sites*

The priority sites for the conservation of nature closest to the project area, are three, being these: "Punta Patache" at 52 km, "Bahía Chipana" at 59 km, and finally the "mouth of the River Loa", 75 km away. (see Tabla 3.41 ). These priority sites are part of the sites recognized for the purposes of SEIA, depending on the list of sites listed in the of. Ord. n ° 100143 of the year 2010 of the Environmental Assessment Service. These sites are classified as areas of

protection, given their exceptional ecological conditions and high fragility to alterations of type human. The sites "Punta Patache" and "Bahía Chipana" correspond to coastal and marine environments and the "mouth of the river Loa" corresponds to a coastal wetland.

**Figura 3.41** Priority sites and their relationship with the project area.




Source: Self-elaboration based on world topo Map-ESRI server

According to the above, the following is the Table 3.30, the protected areas according to the different categories and the distance with respect to the project.

**Tabla 3.42** Protected areas and distances to the project.

| Figure | Name | Distance to Project |
|---|---|---|
| National Park | Salar de Huasco | 71 km east |
| National Reserve | Pampa del Tamarugal | Immediate |
| Natural Monument | Salar de Surie | 212 km northeast |
| Nature Sanctuary | Quebrada Chacarillas | 35 km east |
| Area of tourist interest | Pica Salar de Huasco | 18 km east |
| Typical area | Pueblo of La Tirana | 40 km north |
| Biosphere reserves | Lauca | 249 km north |
| Protected national Well | Pampa del Tamarugal | Immediate |
| Ramsar Sites | Salar de Huasco | 82 km northeast |
| Ecological Preservation Area | Chipana Bay | 59 km southwest |
| Priority site for biodiversity Conservation (SSPP) | Punta Patache<br>Chipana Bay mouth Loa River | 52 km west<br>59 km southwest<br>75 km southwest |

Source: Self-elaboration

To complement this baseline With the contribution of data obtained from projects near the area of Study of the Cielos de Tarapacá project, was carried out s(e) carried out the revision of 9 projects (see section 3.10 of the present study) Those who They have RCA approved between the years 1997 and 2014.

In relation to the above only aOr of the projects analyzed, "New Mina Victoria area", has information Associated To this component Pointing The existence of the Pampa del TAmarugal as a protected area in the territory under study.

### 3.5.3 Conclusions

Based on the background, it is concluded that the project area has a spatial relationship with protected areas, since the photovoltaic plant would be located immediately adjacent to the eastern boundary of the Pampa del Tamarugal National Reserve. In turn, the line of high tension, crosses the reserve in a sector where the use of the soil corresponds to salares.

Meanwhile, the nearest priority site is 52 km and corresponds to "Punta Patache".

*Reference*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# 3.6 USES OF THE TERRITORY AND ITS RELATIONSHIP WITH TERRITORIAL PLANNING

## 3.6.1 Objectives

There will be developed A territorial analysis, oriented to determine the uses of the territory where the project is inserted and its relation with the instruments of territorial planning (if existing), that indicate or Norman the uses of the land and its compatibility with the type of project that It is intended to be implemented.

## 3.6.2 Methodology

EN As to The uses of territory and its relation with the instruments of territorial planning. We analyzed and administer the territorial information available, through the use of software destined to the development of geographic information Systems GIS (Arcgis 10.1 ©).

The main source of information for the use of the land, corresponded to that given by the cadastre of native forest (CONAF-CONAMA-IBRD, 1999), updated to the year 2001. This information was verified through the use of free-consultation satellite images such as ESRI On-line services and DigitalGlobe.

In conformity with the indicated by authors such as Matteucci et al. (1998); Turner et.al. (2001) and OTAS Project (2005), the information was analyzed and processed on a suitable scale, for the purposes of territorial management and mapping of natural resources and land uses for land use or planning purposes. In this case, analyses were carried out on a cartographic basis scale 1:50,000.

Finally, the revision of the territorial planning instrument was carried out, and that norm the use of the territory in the area where it is intended Locate the

project. Placing particular emphasis on the restrictions and/or compatibilities of permitted and/or proposed uses and Objectives of the project that is intended to materialize.

To complement this baseline with the contribution of data obtained from projects close to the study area of the Cielos de Tarapacá project, a review of 9 projects was carried out (see section 3.10 of the present study) with RCA approved between Years 1997 and 2014.

In relation to the foregoing, only one of the projects analyzed, "Zona de new Mina Victoria", has information associated with territorial planning and land use instruments.

### 3.6.3 Results

As indicated and In Conformity to that mentioned by authors such as Matteucci *et al.* (1998), Turner *et al.* (2001) and OTAS Project (2005), the information corresponding to land or soil uses, was analyzed and processed on a suitable scale, for the purposes of territorial management and mapping of natural resources and land uses for ordering purposes or Territorial planning.

Consequently the analyses were carried out on a cartographic basis scale 1:50,000. Establishing an area of interest defined by the Local Landscape Unit (UPL) (see annex 3.2. Baseline, Landscape) around the area where the project is intended to materialize. This area of interest analyzed has a surface of 21,970,776 About.

Within the analysis area (see Figura 3.42 ), it was possible to establish the existence of 3 uses of the soil, which are detailed in the Tabla 3.43 . Of these, the one with greater territorial extension, corresponds to areas without vegetation-salares, with a 53.25%, followed by areas without vegetation (43.07%) and Forest-Plantation (3.67%), which in this case would correspond to the National reserve Pampa del Tamarugal. The area of the project, is

inserted in the use of corresponding soil areas without vegetation-salares and other land without vegetation.

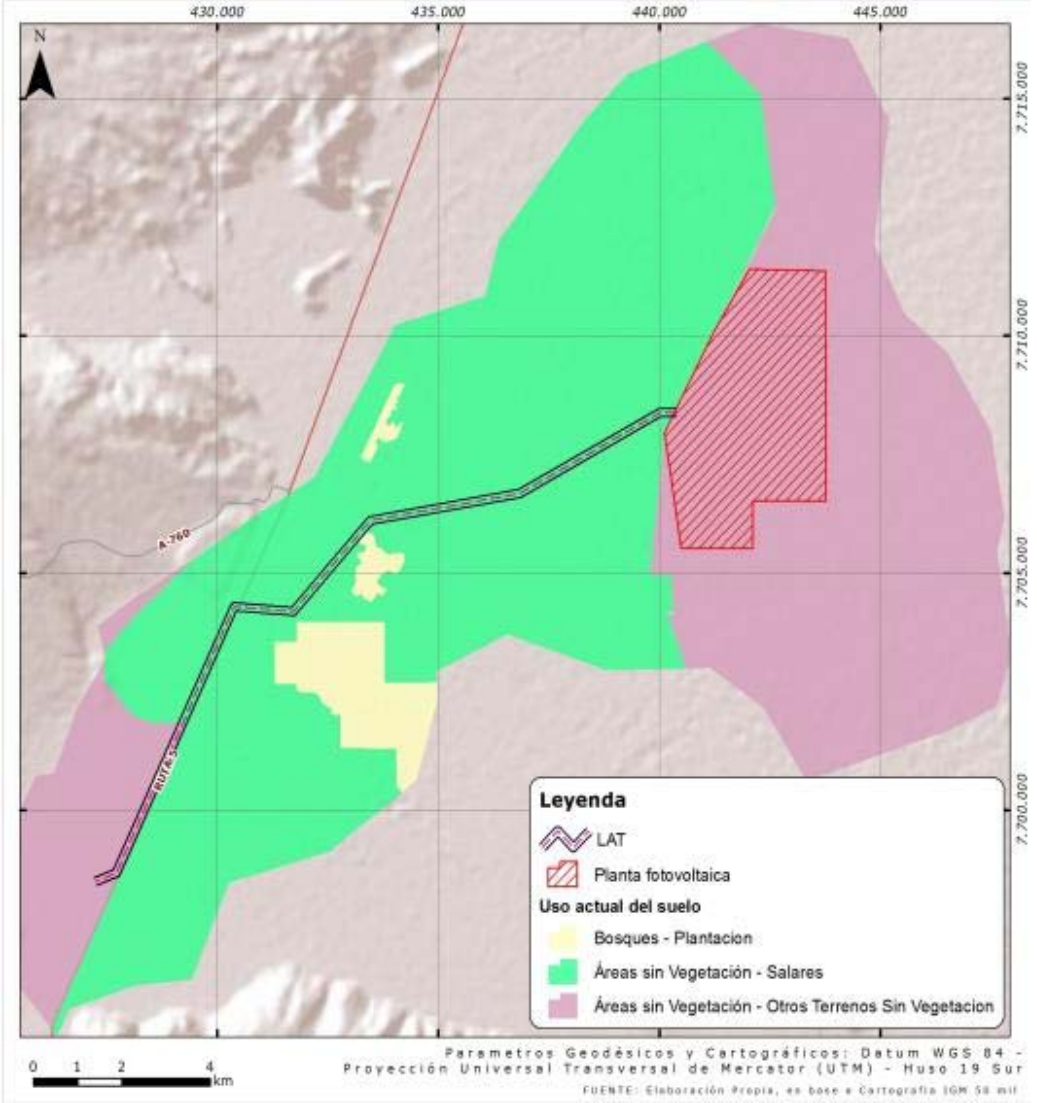
**Tabla 3.43** Surfaces of the different uses of the territory or soil in the area of interest of the project.

| **Land or land uses** | **Surface** Has | **% use** |
|---|---|---|
| Forests-Plantation | 8.07397 | 3.67 |
| Areas without vegetation-salares | 11,699,987 | 53.25 |
| Areas without vegetation | 9,463,391 | 43.07 |

Source: own elaboration based on the native Forest Cadastre (1999).

In relation to the results thrown by the cadastre of the native forest, it is possible to infer, that in general the soil is devoid of vegetation. LAT is located on the Pampa del Tamarugal, with salt type soil, given by the agglomeration of mineral salts on the surface.

**Figura 3.42** Land or land uses in the area of interest of the project.

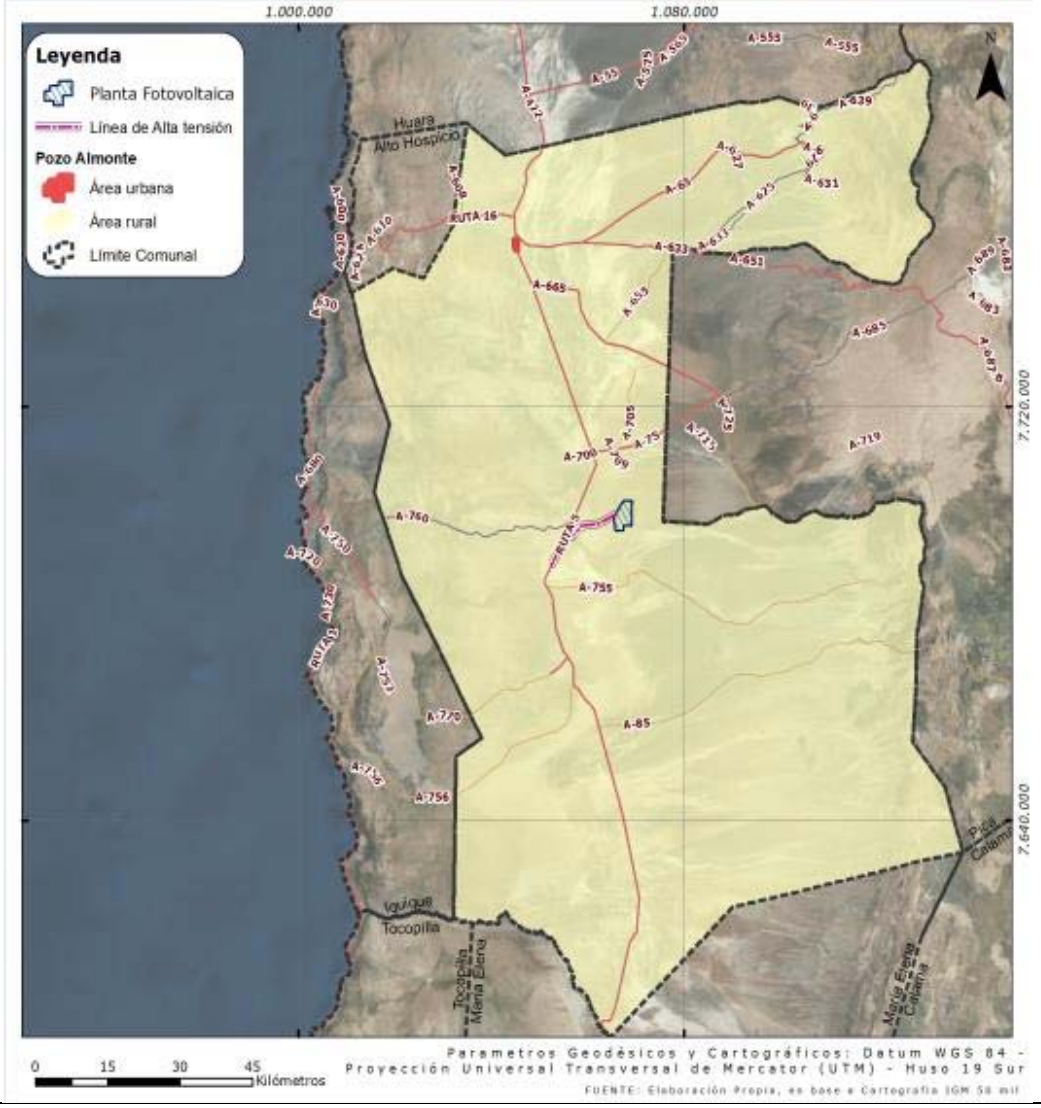



Source: Self-elaboration

## *Territorial planning Instruments*

At present and from the perspective of the territorial planning Instruments (IPT), the area of the project is located outside the urban boundary of Pozo Almonte commune (MINVU, www.observatoriourbano.cl). In other words it is located in a rural area (see Figura 3.43 ) as defined in the General Law of Urbanism and Constructions (MINVU, 1975).

**Figura 3.43** Communal regulatory Plan and its relationship with the project area




Source: Self-elaboration based on world topo Map-ESRI server

## 3.6.4 Conclusions

Three soil uses described for the territories where the project was inserted were identified. The one with the largest territorial extension, corresponds to areas without vegetation-salares, with a 53.25%, followed by areas without vegetation (43.07%) and forest-planting (3.67%), which in this case would

correspond to the Pampas del Tamarugal National Reserve. The area of the project, is inserted in the use of corresponding soil areas without vegetation-salares and other land without vegetation.

In addition there would be compatibility, with the type of project evaluated, with the uses of the ground standard for the sector, since it is located outside the urban boundary of the commune of Pozo Almonte. In other words, it is located in a rural area, as defined in the General Law of Urbanism and Constructions (MINVU, 1975).

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## 3.7 TOURIST ATTRACTIONS

### 3.7.1 Objectives

- Characterize tourist activities at the regional and communal level.
- Identify the offer of tourist services at regional and communal level.

- Identify the areas of tourist interest, tourist circuits and tourist attractions9 Present in the study area;
- Espacializar the tourist attractions depending on the area of the project.

### 3.7.2 Methodology

Activities to develop this report were conducted through the review of secondary information. The following steps include:

- Bibliographic survey of background related to statistical aspects of tourist services at regional and communal level. The revision of documents was made in www.sernatur.cl.
- Geo-data review on ZOIT, ATP, tourist circuits and tourist attractions.
- I work in geographic information systems, using ArcGis 10.1® software, to relate project area and identified tourist areas.

[9] Atractivo turístico: Es todo lugar, objeto o acontecimiento de interés turístico (OEA, 1978). Estos pueden ser atractivos naturales o culturales.

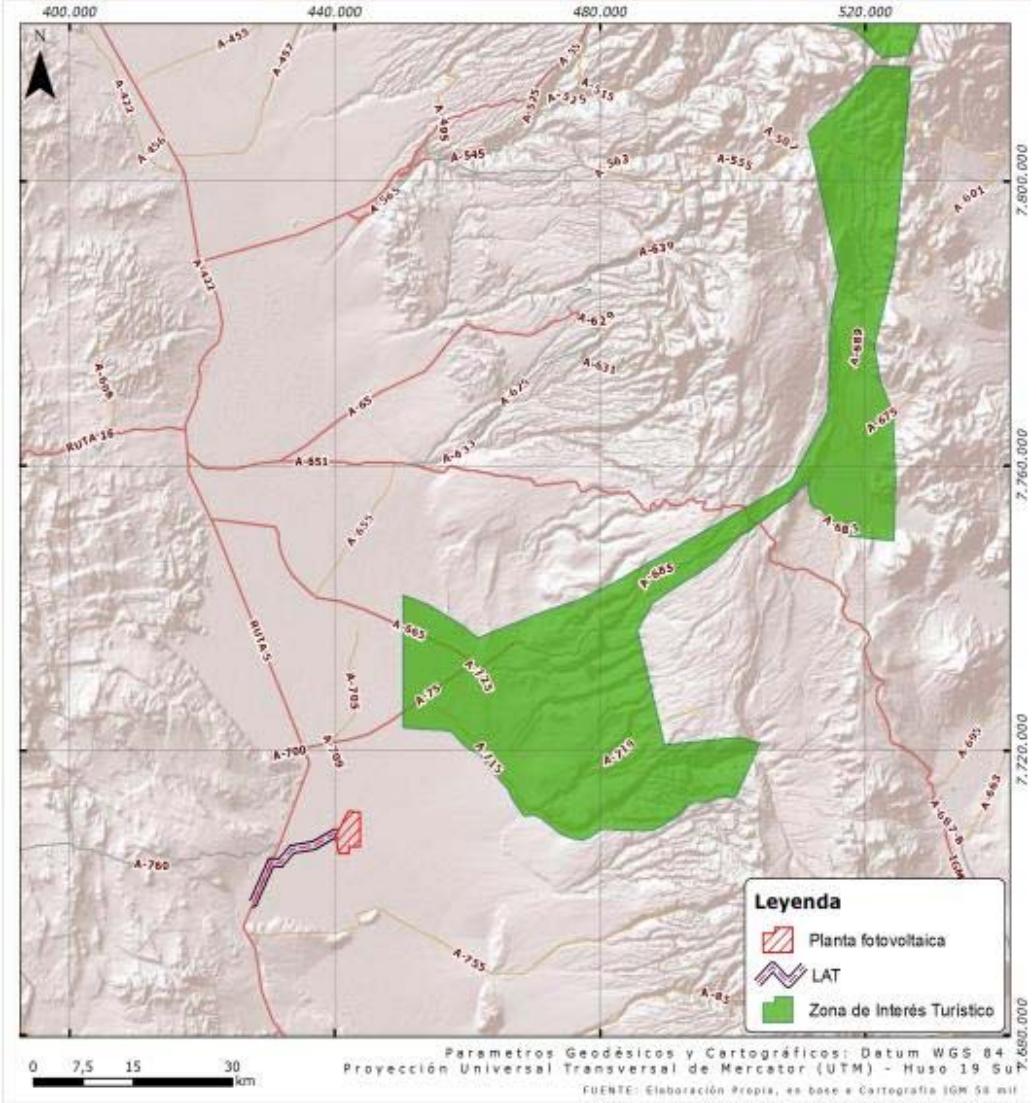
### 3.7.3 Results

*Areas of tourist interest and priority tourist areas.*

The areas of tourist interest (ZOIT) correspond to those Territories that have special conditions for tourist attraction on a communal or intercommunal scale. These are sites that have great scenic beauty and have a high potential for the development of the large-scale tourism industry.

In relation to the ZOIT, the closest to the area of the project corresponds to "Pica Salar de Huasco", which is located approximately, 18 km to the northeast of the project (See Figura 3.44 ).

**Figura 3.44** Areas of tourist interest at the regional level




Source: Self-elaboration based on world topo Map-ESRI server

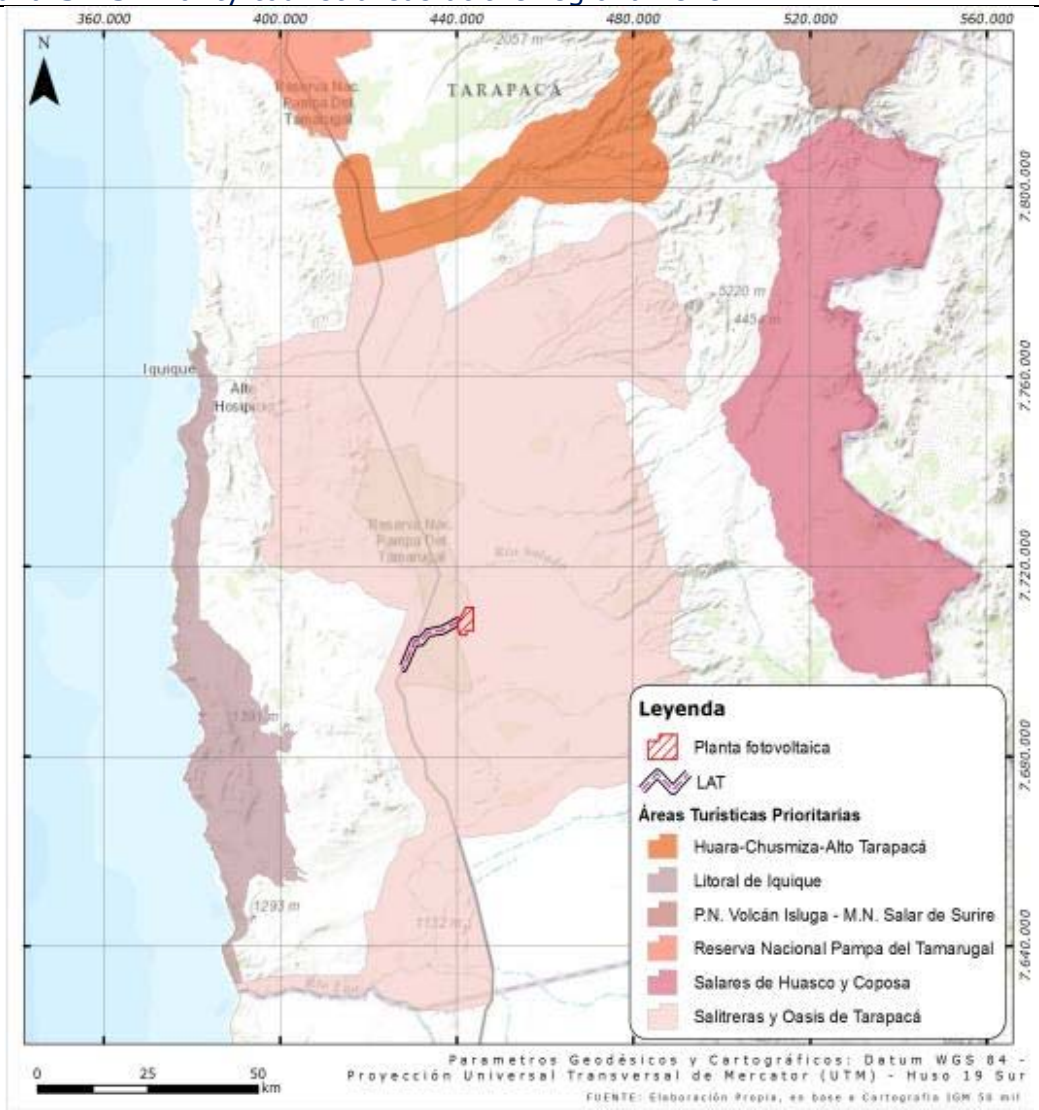
On the other hand, as established by SERNATUR (2011)10 The priority tourist areas (ATP) are defined as an extensive geographic space, in which several places are concentrated I have milestones of attraction of a homogeneous or complementary character. Therefore, an ATP must have relatively contiguous tourist attractions and variable categories and hierarchies, where They may contain one or several urban centers of varying magnitudes (SERNATUR, 1978).

[10] Documento publicado por el Servicio Nacional de Turismo en el año 2011, denominado "Áreas Turísticas Prioritarias de Chile".

It is because of this that an area to be declared a priority tourist area, must have a "tourist value" associated, which as established by the SERNATUR (2011), would be understood as an area whose internal homogeneity is given by the presence of attractive Tourist of natural and/or cultural nature, besides having singularity in the landscape and scenic beauty, where there is interrelation between these attributes, transforming the space into a systemic complex of tourist value.

The project area is located within the priority tourist area (ATP) "Nitrates and Oasis of Tarapacá", (See Figura 3.45 ) which does not include an area of official protection, but it does correspond to an area of homogeneous characteristics, whereas it is considered as an area within the Pampa del Tamarugal that housed human settlements dedicated to mining, specifically to the Extraction of nitrate, generating an urban industrial complex that endowed with singularity and history this area of the country. We speak for example, of the nitrate offices of Humberstone and Santa Laura, both as fundamental cultural vestiges in the mining history of the North of Chile (Council of National Monuments, 2003).

**Figura 3.45** Priority tourist areas at the regional level

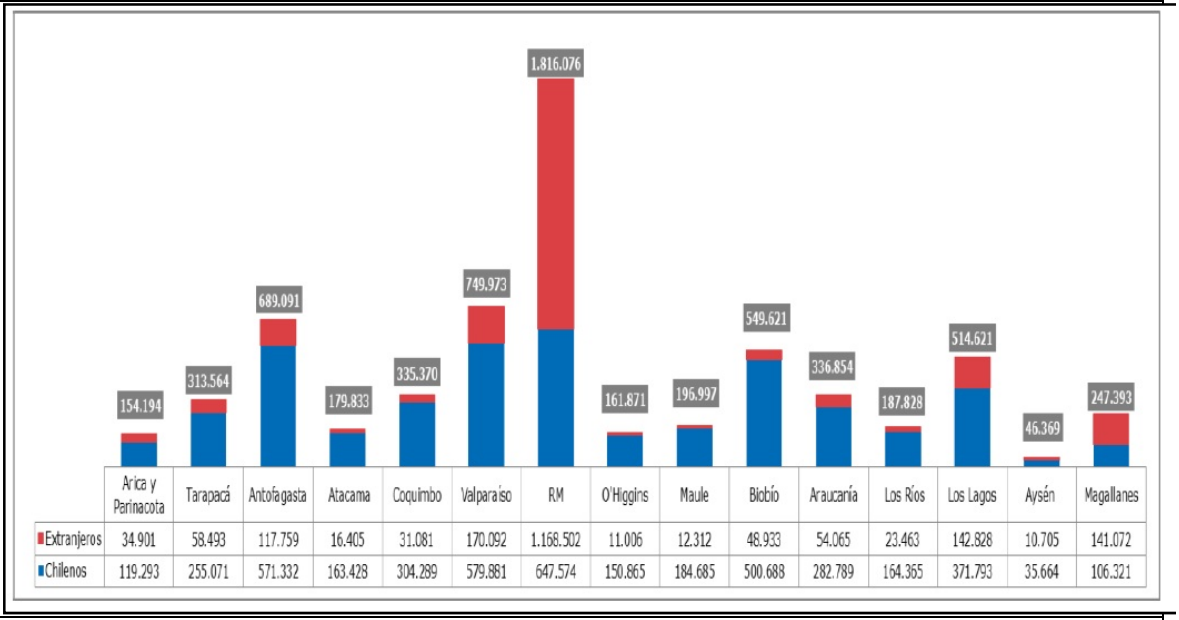



Source: Self-elaboration based on world topo Map-ESRI server

## *Tourism statistics at regional, communal level and local*

Based on the statistics of SERNATUR (www.sernatur.cl) and the definition of the area of study, which comprises the regional and communal scale. Statistics related to the offer of accommodation and tourist arrival services will be presented below.

**Graphic 1**. Arrival of passengers, depending on source and destination region



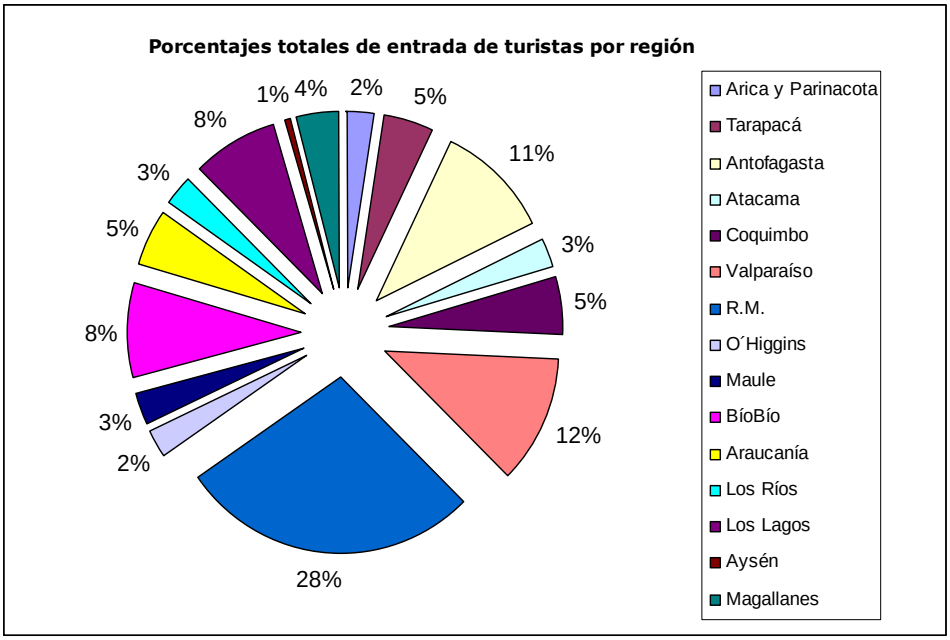

| | Arica y Parinacota | Tarapacá | Antofagasta | Atacama | Coquimbo | Valparaíso | RM | O'Higgins | Maule | Biobío | Araucanía | Los Ríos | Los Lagos | Aysén | Magallanes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Extranjeros | 34.901 | 58.493 | 117.759 | 16.405 | 31.081 | 170.092 | 1.168.502 | 11.006 | 12.312 | 48.933 | 54.065 | 23.463 | 142.828 | 10.705 | 141.072 |
| Chilenos | 119.293 | 255.071 | 571.332 | 163.428 | 304.289 | 579.881 | 647.574 | 150.865 | 184.685 | 500.688 | 282.789 | 164.365 | 371.793 | 35.664 | 106.321 |

**Source: Statistics of establishment of tourist accommodation, SERNATUR 2014.**

As can be seen in Figure 1, the region of Tarapacá presents an entrance of national tourists (255,071) far superior to foreign tourists visiting the region (58,493). In addition, it is possible to note that the region of Tarapacá does not stand out over other regions in the number of incoming tourists, but rather belongs to the range of regions with fewer visitors.

In percentage terms, the region of Tarapacá, the total number of national and foreign tourists visiting the regions of the country (6,479,655), reaches 5% by sharing this percentage with regions such as Coquimbo and La Araucanía. This figure is well below the reach of regions such as metropolitan (28%) Valparaíso (12%) and Antofagasta (11%) (See Figure 2).

**Graphic 2**. Total percentages of tourists entering by region.




Source: Own elaboration based on data obtained from SERNATUR 2014.

On a communal scale, and in relation to the tourist offer dedicated to accommodation services, Pozo Almonte has 28 establishments that are divided into residential, hotels, camping and others (see Tabla 3.44 ).

**Tabla 3.44** Accommodation services

| Name | Locality |
|---|---|
| Astro Sol Residential | Pozo Almonte |
| Residencial Don Solomon | Pozo Almonte |
| Residencial El Casket | Pozo Almonte |
| Mirage Residential | Pozo Almonte |
| Victoria Residential | The Rotito |
| Hotel Tamarugal | Mamiña |
| Hotel Dupliza | Mamiña |
| Hotel Llamas Inn | Mamiña |
| Hotel Los Cardenales | Mamiña |
| Hotel Kusi Tambu | Mamiña |
| Hotel Termas la Coruña | Mamiña |
| Hotel Bellavista | Mamiña |
| Residencial Cholele | Mamiña |
| Residencial Refugio del Salitre | Mamiña |
| Residential Girl of my eyes | Mamiña |
| Los Heroes Resort | Huayca |
| La Huayca Resort | Huayca |
| Mustard Seed Hut | Huayca |
| Camping Municipal de Pozo Almonte | Pozo Almonte |
| Campsite La Huayca | Huayca |

| | |
|---|---|
| Campsite Municipal de Macaya | Macaya |
| Campsite Municipal de Huatacondo | Huatacondo |
| Camping Los Pinos | La Tirana |
| Camping Adventist Camp | La Tirana |
| Camping El Pin | La Tirana |
| Rancho El Tata | Painted |
| Casa Manuel Hidalgo | Huatacondo |
| Headquarters of the old school Macaya | Macaya |

Source: own elaboration based on the data obtained from Carevic (2009).

With regard to the food services the commune has 39 establishments, consisting of restaurants, meals to the pass and fast food premises (See Tabla 3.45 ).

**Tabla 3.45** Food Services

| Name | Locality |
|---|---|
| Astro Sol Restaurant | Pozo Almonte |
| Called Inn | Pozo Almonte |
| Doña Lola | Pozo Almonte |
| Loa Shop | Pozo Almonte |
| South Corner | Pozo Almonte |
| The tourist | Pozo Almonte |
| Romane | Pozo Almonte |
| The route | Pozo Almonte |
| Vissio's Shop | Pozo Almonte |
| Doña Pastora | Pozo Almonte |
| The Tambo | Pozo Almonte |
| Cantucan | Pozo Almonte |
| Paradise | Pozo Almonte |
| El Rincón del Sol P | Pozo Almonte |
| Shell | Pozo Almonte |
| The Cholitas | Pozo Almonte |
| The aunt | Pozo Almonte |
| The Tambo | Pozo Almonte |
| The farms of Pasquito | Mamiña |
| Cerro Morado | Mamiña |
| La Juanita | La Tirana |
| Los Pinos | La Tirana |
| Berta Méndez | La Tirana |
| to step | La Tirana |
| Tirana 84 | La Tirana |
| Carmelita | La Tirana |
| Hot Chicken | La Tirana |
| Mancheli | La Tirana |
| The Queen of the Tamarugal | La Tirana |
| Wolves Hut | La Tirana |
| The Rotito | Victory |
| Veronica | Victory |
| The Heroes | Victory |
| where skinny | Victory |

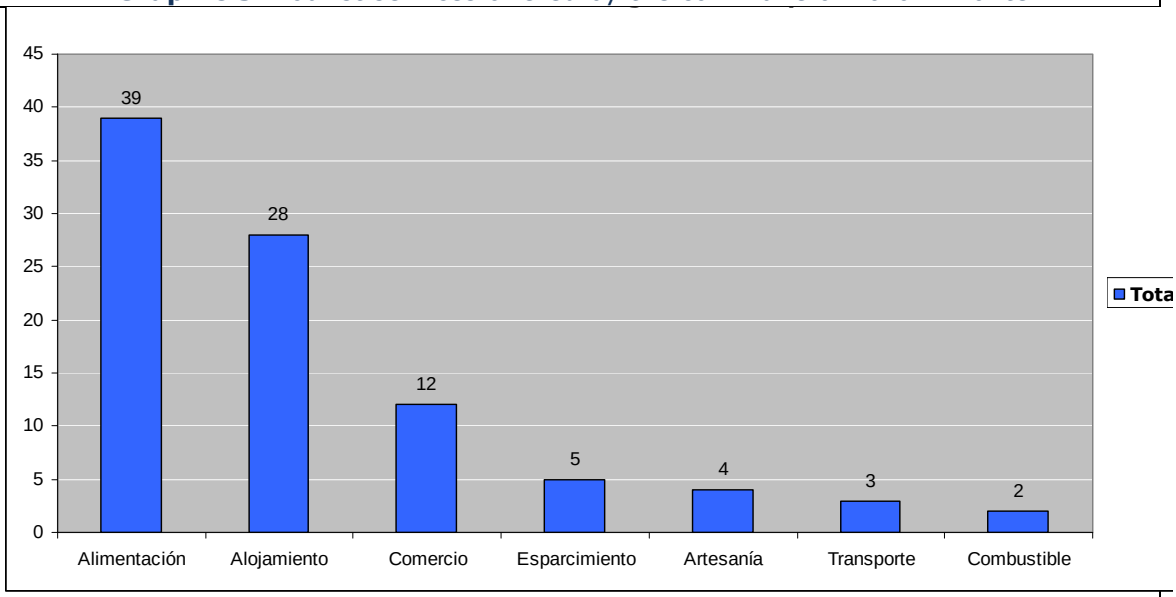
| | |
|---|---|
| The Heroes | Huayca |
| La Huayca | Huayca |
| The mine | Huayca |
| Social Headquarters – Old school | Macaya |
| Amalia Cruz | Macaya |

Source: own elaboration based on the data obtained from Carevic (2009).

As indicated in the planning of Communal Development (2009) in relation to the total cadastre of tourist services of the commune, it is possible to indicate that much of the tourist offer is dedicated to the gastronomy and the services of food, followed by the Accommodation services (see Figure 3).

On a local scale, it can be inferred that with respect to the accommodation, it is concentrated mostly in the locality of Mamiña preferably, contrary to what is observed in the food services, which are concentrated preferably in the Locality of Pozo Almonte.

**Graphic 3**. Tourist services offered by the commune of Pozo Almonte




Source: own elaboration based on the data obtained from Carevic (2009).

*CTourist Ircuitos close to the project area*

The tourist circuits present in the region, as stipulated by the SERNATUR (2013), correspond to:

- Circuit of the ravines (Huara-Colchane); And
- Circuit of the Salares (Iquique-Salar de Huasco).

In relation to the project area, None of the regional tourist circuits, crosses the study area, being the closest circuit of the salares, more than 25 km to the north.

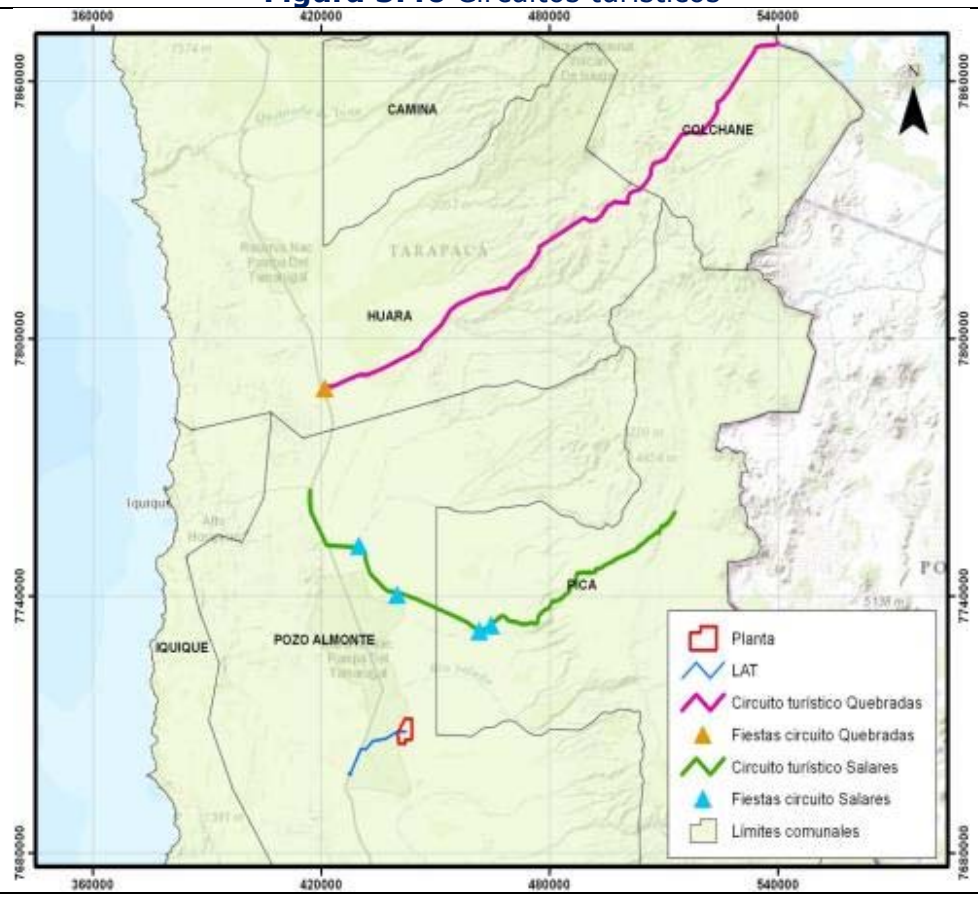
Both circuits, they contemplate in their route, traditional festivities (see picture 3) of the region which will be specified as follows:

With regard to the tourist circuit of Las Quebradas (Huara-Colchane), one of the most typical festivities corresponds to the feast of San Salvador de Huara, which is held every year, on August 4.

On the other hand, the tourist circuit of the Salares (Iquique – Salar de Huasco) includes in its layout 4 typical festivities (see picture 3) being ÉStas (from west to east):

- Easter of the blacks of Tirana (from 4 to 6 January);
- Feast of San Isidro de la Huaica (15th May);
- Feast of San Antonio de Matilla (13th June); And
- Feast of the Virgin of Lourdes (February 11th).

**Figura 3.46** Circuitos turísticos




Source: Self-elaboration based on world topo Map-ESRI server

## *Areas of tourist interest and tourist attractions*

Pozo Almonte's communal territory presents tourist attractions mainly related to natural and scenic (Salar), historical (painted geoglyphs) and patrimonial (nitrate offices) resources.

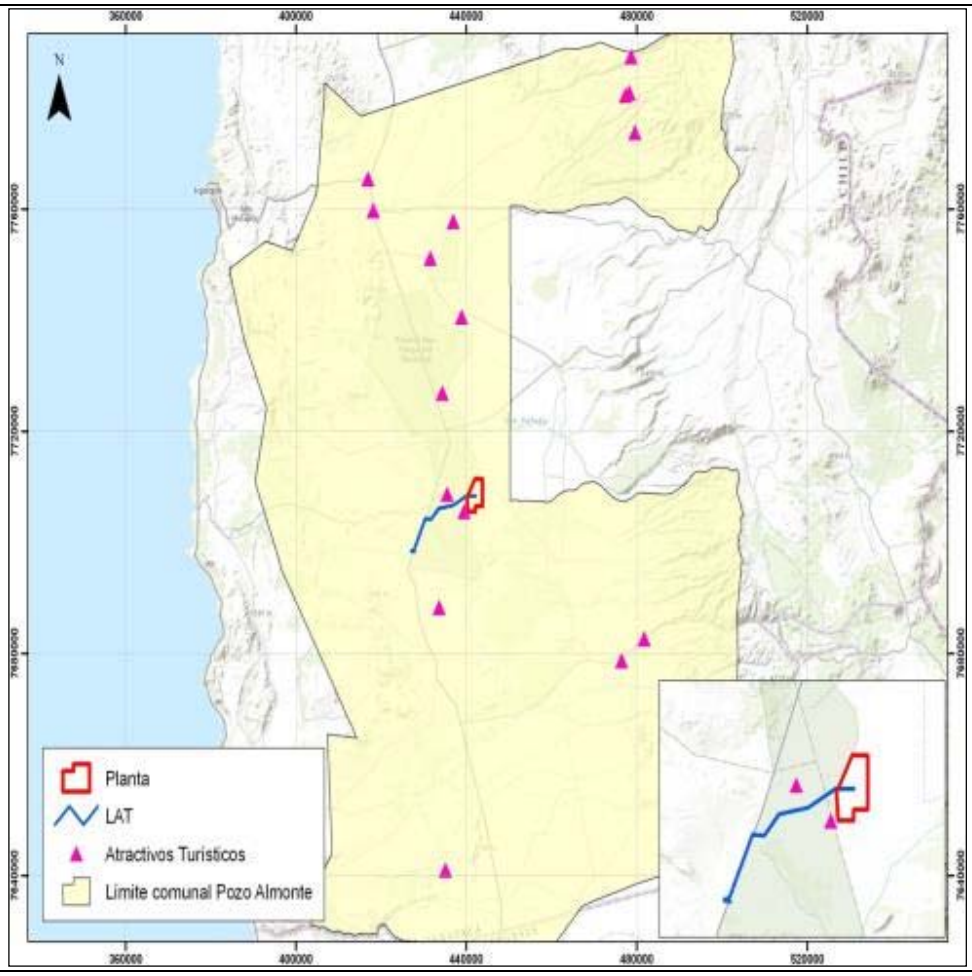
It could be noted that there are currently 16 tourist attractions (see table 6), of which two are close to the project area (See Figura 3.46 ); The Oasis-painted agricultural colony located more than 1.4 km south-west; And the Salar de Bellavista is located more than 2.2 km north of the project.

**Tabla 3.46** List of tourist attractions in the commune of Pozo Almonte

| Attractive | Hierarchy | Kind of attractive |
|---|---|---|
| Pozo Almonte | Regional | Spontaneous Popular architecture |
| Mamia | Regional | Spontaneous Popular architecture |
| Geoglyphs of painted | International | Ruin or archaeological site |
| Termas de Macaya | Regional | Therm |
| Termas de Mamia | International | Therm |
| La Guaica | Local | Spontaneous Popular architecture |
| Pueblo of La Tirana | National | Spontaneous Popular architecture |
| Isis Nitrate Office | National | Historical Place |
| Petroglyphs Tamentica | Regional | Ruin or archaeological site |
| Pampa del Tamarugal National Reserve | National | Protected wilderness Area or reserve of Flora and Fauna |
| Salar de Bellavista | Regional | Plain |
| Salar de call | Regional | Plain |
| Grim reaper | Local | Spontaneous Popular architecture |
| Oasis Agricultural Colony of painted | Local | Farm |
| Pre-Hispanic village of Huatacondo | National | Ruin or archaeological site |
| Nitrate offices Humberstone and Santa Laura | International | Historical Place |

Source: own elaboration based on the data obtained from SERNATUR (2010).

**Figura 3.47** Tourist attractions at the communal level




Source: Self-elaboration based on World Mole Map-ESRI Server

In general, most of these tourist attractions have a hierarchy of national and international level, which has generated a high interest for the preservation and promotion of some of these. The following are three of the most important, as indicated by the Department of Communal Development, belonging to the municipality of Pozo Almonte (2009-2012):

- *Nitrate Office Humberstone:*

It is 60 km from the project area. Its formal name is Santiago office Humberstone, was established in 1862 and declared a National Monument (1970). His first name was La Palma and then, when he changed the owner In

1934, it adopted the name with which it is known today. The nitrate office worked until the year 1960, when the company of this mineral decayed. The buildings built here are preserved in good condition, allowing them to enter and appreciate their constructions.

- *Village of La Tirana:*

The village of La Tirana is located in the heart of Pampa del Tamarugal, 40 km north of the project, surrounded by tamarugos, peppers and carob trees. It is a small town that provides lodging and basic services to its visitors. adobe houses or wood, in well delineated streets, that end up looking at the church. At least two religious festivities are held in this locality, being the most recognized, the festival of Tirana and the Passover of the blacks of Tirana.

- *Pampa del Tamarugal National Reserve:*

The Pampa del Tamarugal National Reserve is inaugurated in the year 1987. Comprises 24000 hectares of Tamarugo artificial plantations (Prosopis Tamarugo). It is located 70 km to the interior of Iquique, in the communes of Huara and Pozo Almonte.

To complement this baseline with the contribution of data obtained from projects close to the study area of the Cielos de Tarapacá project, a review of 9 projects was carried out (see section 3.10 of the present study) with RCA approved between the years 1997 and 2014.

In relation to the above The review of the projects did not generate new contributions for this baseline.

### 3.7.4 Conclusions

The project area is located within the priority tourist area (ATP) "Nitrates and Oasis of Tarapacá", which does not include an area of protection Official, but it does correspond to an area of homogeneous characteristics, whereas it is

considered as an area within the Pampa del Tamarugal that housed human settlements dedicated to mining, specifically to the extraction of nitrate, generating a complex Urban industrial that endowed with singularity and history this area of the country.

On a local scale, it can be inferred that with respect to housing, this is mostly concentrated in the locality of Mamiña Preferably, contrary to what is observed in the food services, which are concentrated preferably in the locality of Pozo Almonte.

Pozo Almonte's communal territory presents tourist attractions mainly related to natural and scenic (Salar), historical (Geoglyphs Painted) and patrimonial (nitrate offices).

It could be noted that there are currently 16 tourist attractions, of which two are close to the project area; The Oasis-painted agricultural colony located more than 1.4 km south-west; And the Salar de Bellavista is located more than 2.2 km north of the project.

Meanwhile, the tourist circuits present in the region, as stipulated by the SERNATUR (2013), correspond to:

- Circuit of the ravines (Huara- Colchane); And
- Circuit of the Salares (Iquique-Salar de Huasco).

In relation to the area of the project, none of these regional tourist circuits crosses the area of study, being the closest circuit of the salares, more than 25 km to the north.

In relation to the ZOIT, the closest to the project area corresponds to "Pica Salar de Huasco", which is located approximately, 18 km to the northeast of the project

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# 3.8 HUMAN ENVIRONMENT

## 3.8.1 Objective

The main objective of this baseline Consists of DeliveryR The main antecedents of the human environment of the Environmental Impact Study (EIA) of the project "Cielos de Tarapacá", in accordance with article 11 (c) of law 19,300 on general environmental Bases and the regulation of the impact assessment system Environmental (SEIA) in force DS N ° 40 June 2013.

## 3.8.2 Methodology

For This component, the characterization is carried out according Article 11 (c) of law 19,300 (environmental Law) and the Regulations of the SEIA in force, according to the criteria that identify the significant alteration in the life and customs systems of human groups (art. 7), and the five dimensions to be To detail within the area of influence, this is dimensions: geographic, demographic, anthropological, socioeconomic and Social welfare (Art. 18 Letter E. 10). Also, in the case of having indigenous population within the area of influence of the project, emphasis should be placed on the use and valorization of the resourcesNatural resources, cultural practices, organizational structure, appropriation of the environment, cultural heritage, group identity, value systems, community rites and symbols of group membership (ART. 18 Letter E. 10).

In order to meet The Objectives Raised, a methodology was developed from several background collection mechanisms. On the one hand, It reviewed secondary information in the cabinet, relative to the dimensions of the human environment. This cabinet review considered official documents, such as the current Pladeco Coordination Unit 2009 – 2012, and current population statistics such as the population and housing census carried out in the year 2002, which continues in force until a new census of Population and housing.

In addition, two field campaigns were carried out. The first was carried out between the 14th and 16th of April of 2014, and the second between the days 3 and 5 of September of 2014.

During the field visits, a recognition of the site area of the project was developed, along with its localities, georreferenciando the points of interest there.

In addition, interviews were conducted with key actors, mainly officials of the illustrious municipality of Pozo Almonte (in charge of social organizations), managers of land tenure of the National Forestry Corporation (CONAF) to The Pampa del Tamarugal sector, some leaders of indigenous associations and painted Cologne neighborhood boards, and regular residents of the town of Victoria (according to municipality data and field interviews, do not exist Social organizations in force in that locality).

### 3.8.3 Results

The different dimensions considered for the baseline of the human environment are described below. The antecedents were extracted mainly from the public documentation of Conadi and the illustrious municipality of Pozo Almonte, supplemented with the secondary antecedents collected from the National SINIM Municipal Information System and the National Institute of Statistics (INE), from the population and housing Census of the year 2002. Additionally, it was supplemented with primary information obtained during the field campaign.

- *Geographic dimension*

The locality closest to the project is the locality of Victoria, which is 8.5 kilometers, and painted that it is to 9 kilometers. The other locations are more than 10 Kms. In addition, the project is located more than 30 kilometres from other important community-level towns, the Tirana and the communal capital,

Pozo Almonte. The other nearby locality is Pica, which is located at 26.5 Kms. In the following table The table of approximate distances is presented in a straight line of the installations of the project of the nearest and most important locations.

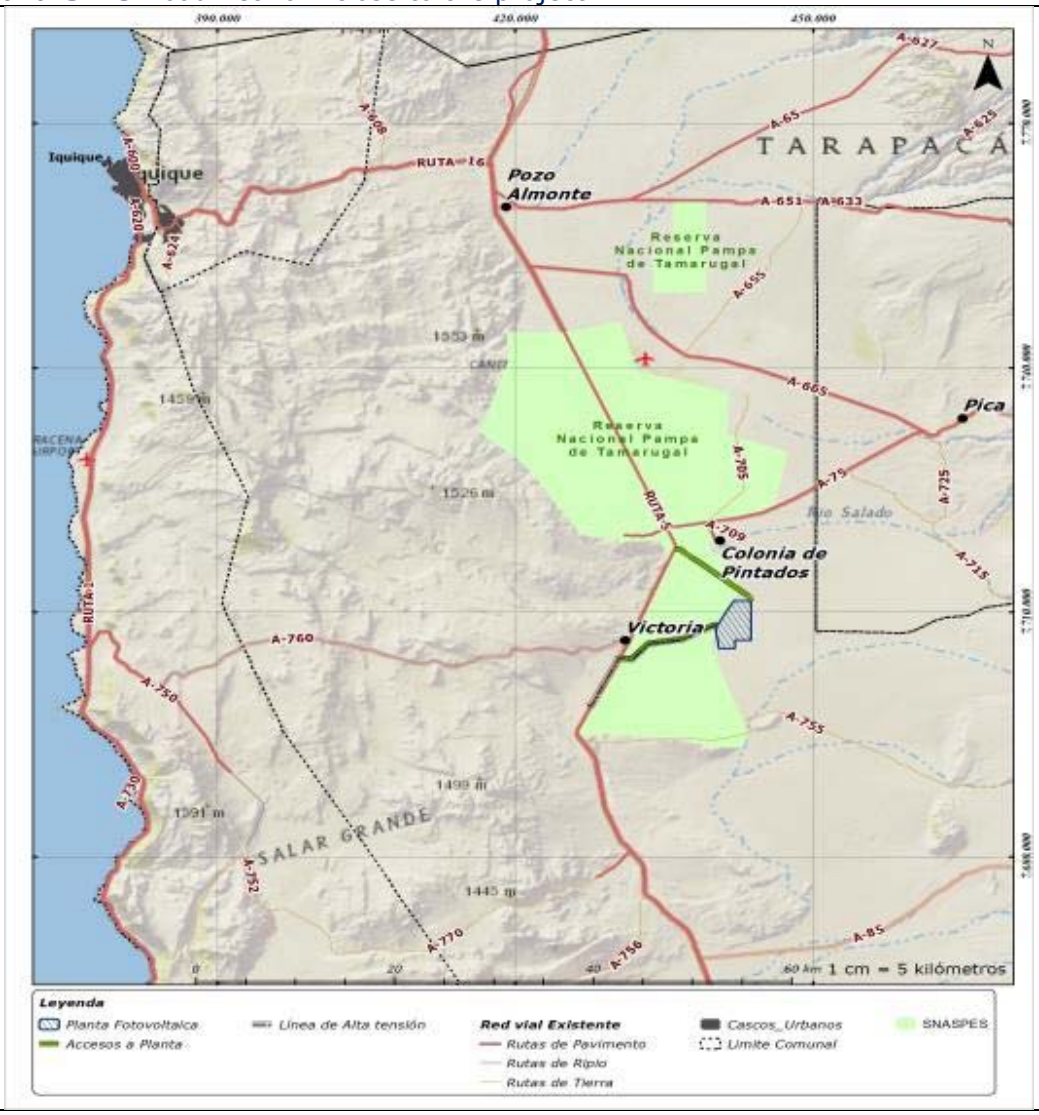
**Tabla 3.47** Distance chart of localities with respect to the project

| Commune | Locality | Lat |
|---|---|---|
| Pozo Almonte | **Victory** | **8.5 Kms.** |
| | **Painted** | **9 Kms.** |
| | La Tirana | 32 Kms. |
| | Pozo Almonte | 47 Kms. |
| Pica | Pica | 26.5 Kms. |

Source: Own Elaboration.

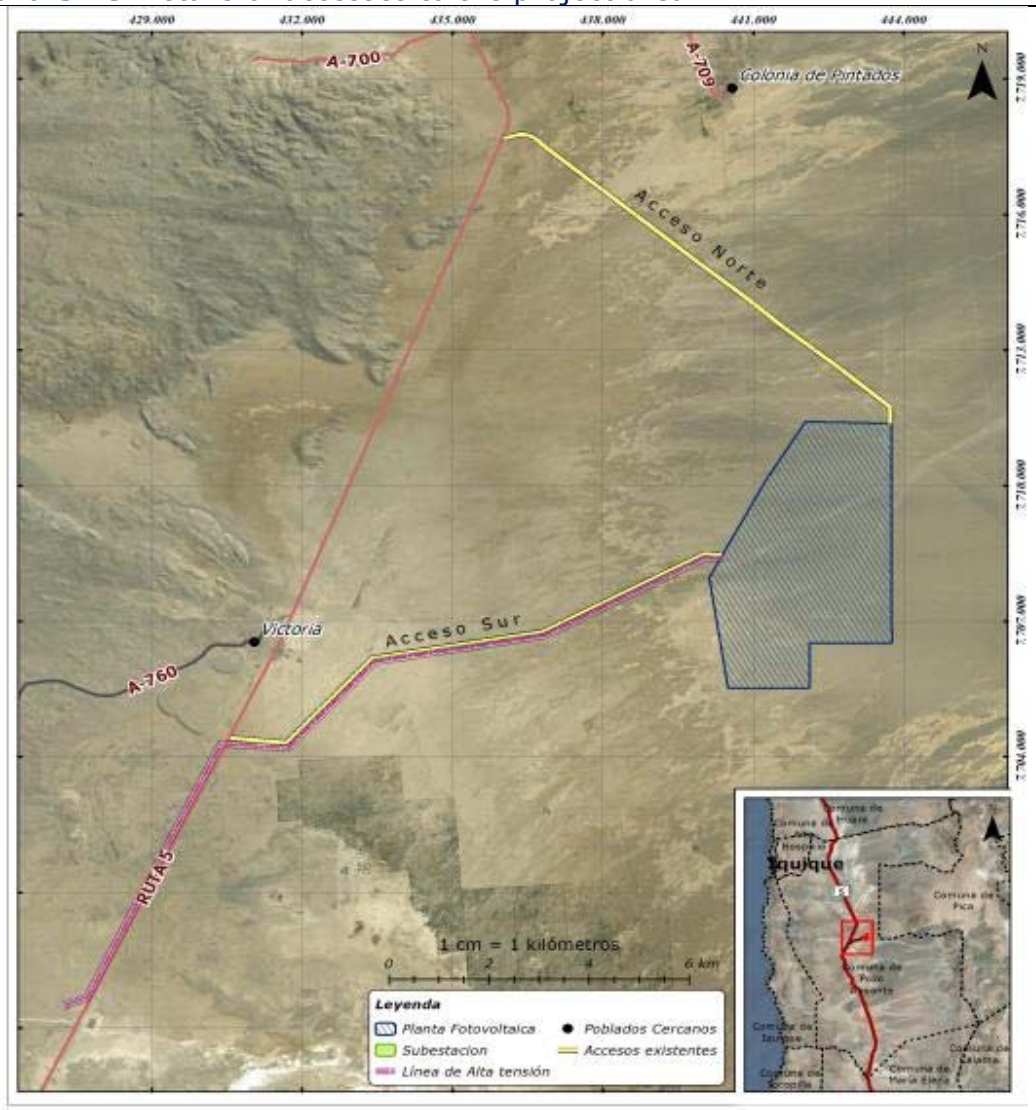
The accesses to the project are generated through Route 5, heading south from Pozo Almonte, to the junction towards Quebrada Blanca. This road is paved and in good condition. It can also be accessed from the town of Victoria. The road network associated with the project, according to information from the Ministry of Transportation, can be seen in the Figura 3.48 and the internal paths of access to the project can be seen in the Figura 3.49

**Figura 3.48** Road network close to the project




Source: Highway MOP

**Figura 3.49** Details of accesses to the project area




Source: Own Elaboration.

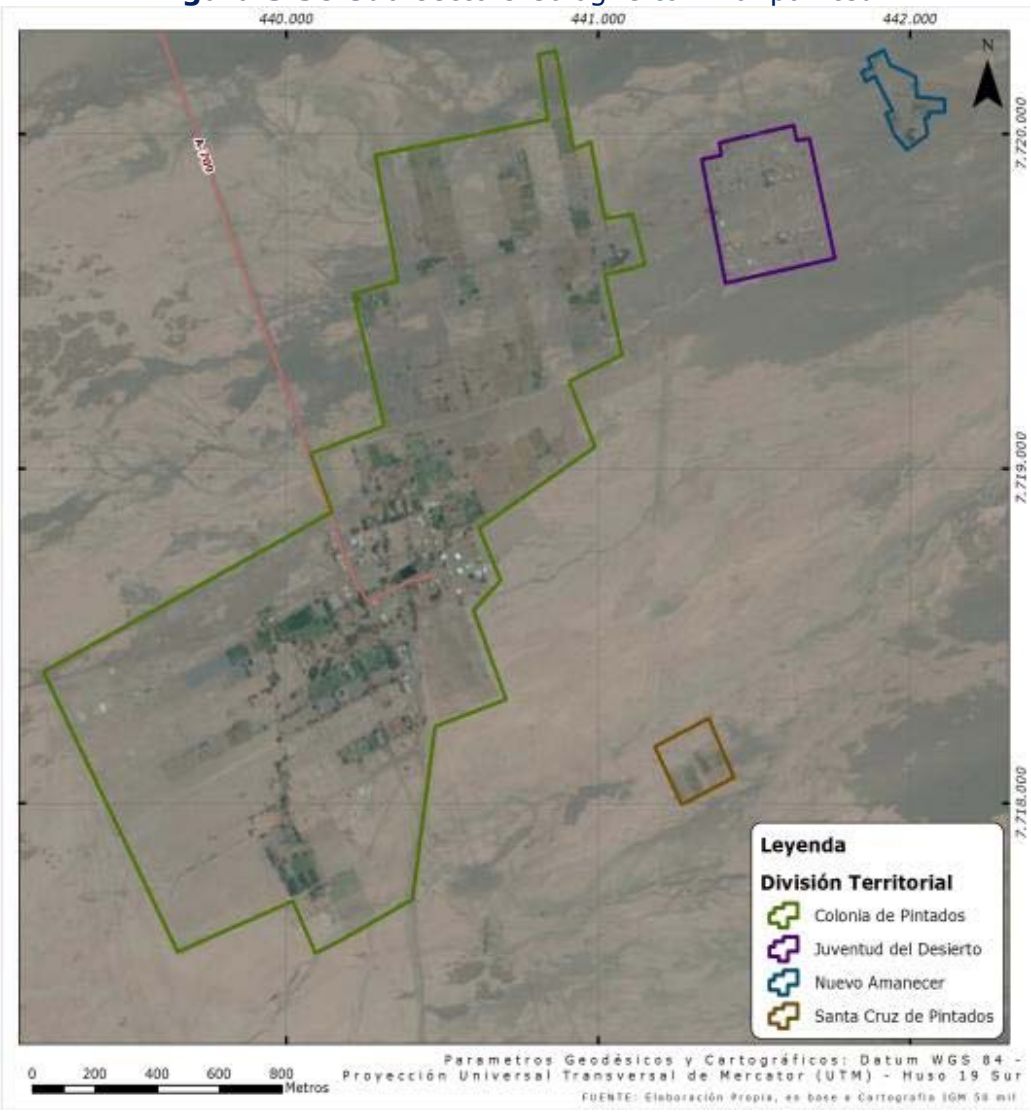
The village of Colonia de Pintado belongs to Pozo Almonte commune, being 47 kilometers south of its capital, Pozo Almonte. It is also located 22 kilometres west of Pica. It is mostly evangelical and contains indigenous migrant population from Cordilleran sectors. The village's vocation is mainly agricultural, highlighting the abundance of water resources in the sector. It's about 3.5 miles long by 2 wide. The access that this village has is through a shingled route That emerges from route A-75 to the south, approximately 4.5

kilometers to the west of the village. Route A-75 connects Route 5 with Pica and route A-700, which is its continuation to the east and communicates with the Geoglyphs of paint.

An alternative path of access, it is located about 2.7 kilometers to the south of the route A-75, taking the private route that connects with the Minera Quebrada Blanca, and that has a bifurcation about 300 meters of the entrance of the road, by which it is continued straight to the west by a CA Mino of land, and which arrives directly to Cologne painted.

Colony of painted, according to the impressions of the community itself, is divided into four sectors with particular characteristics, which are the land of the Lord, Youth of the Desert, New Dawn and Santa Cruz de Pintado. The central and original settlement of the locality is painted cologne. These subsectors can be seen in the Figura 3.50 Figura 3.50 , according to field observation and interviews:

**Figura 3.50** Sub-sectors Cologne town of painted

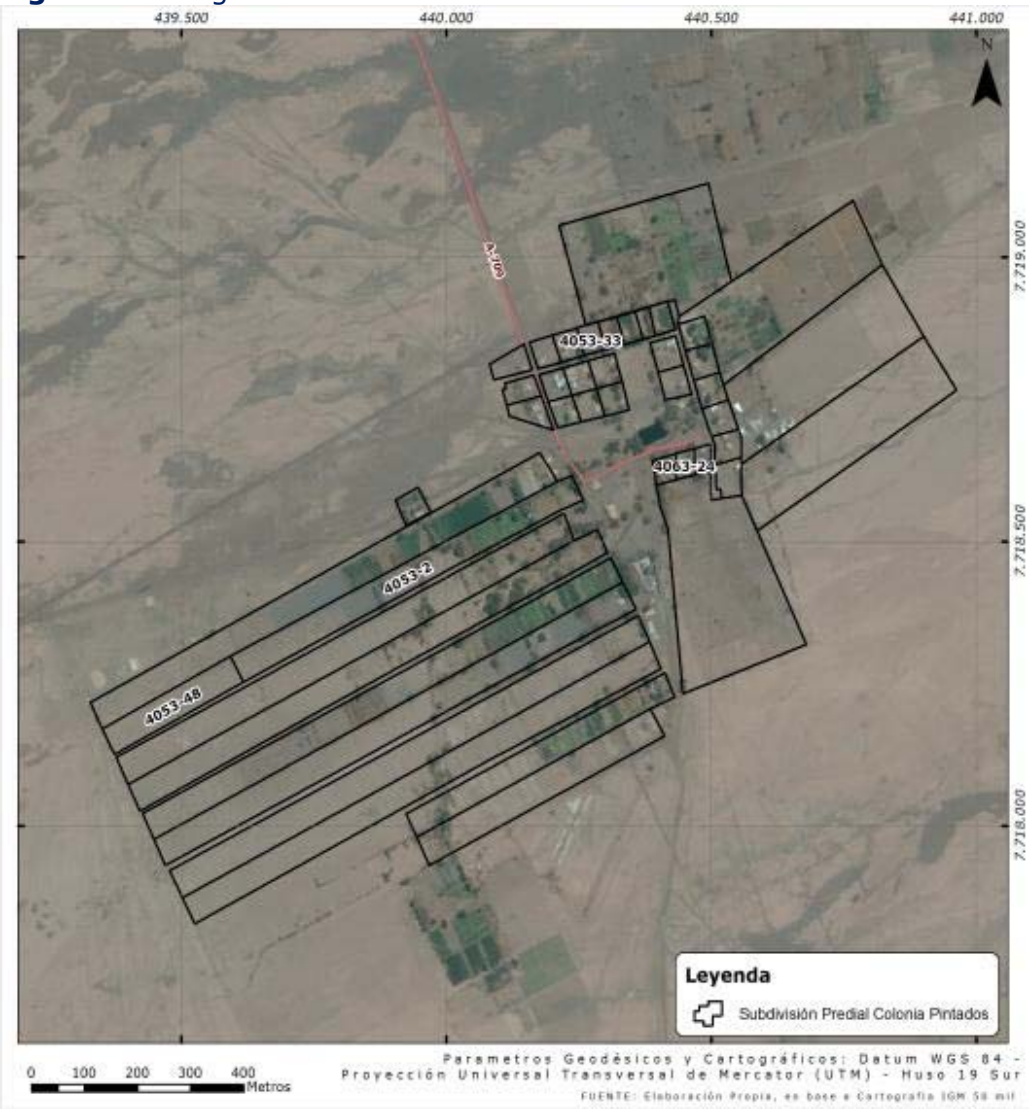



Source: Own Elaboration.

The subsector that has a greater population density corresponds to the land of the Lord, which accounts for approximately 283 people in an area of 0.28 square kilometres, which means 1.01 people per square metre. The Desert youth subsector has an amount of 88 people, at 0.118 square kilometres, which would mean 0.74 people per square metre. In the case of new dawn there would be about 8 people in 300 square meters, and the sector of Santa Cruz to 6 People in 96 square meters. All these sectors have territories for agricultural use.

According to the available information provided by law of Transparency Folio AE006W50007018, the port of the lands considering agricultural territories in the year 2014, are the following[11]:

**Figura 3.51** Agricultural land Sub-sector of the Lord



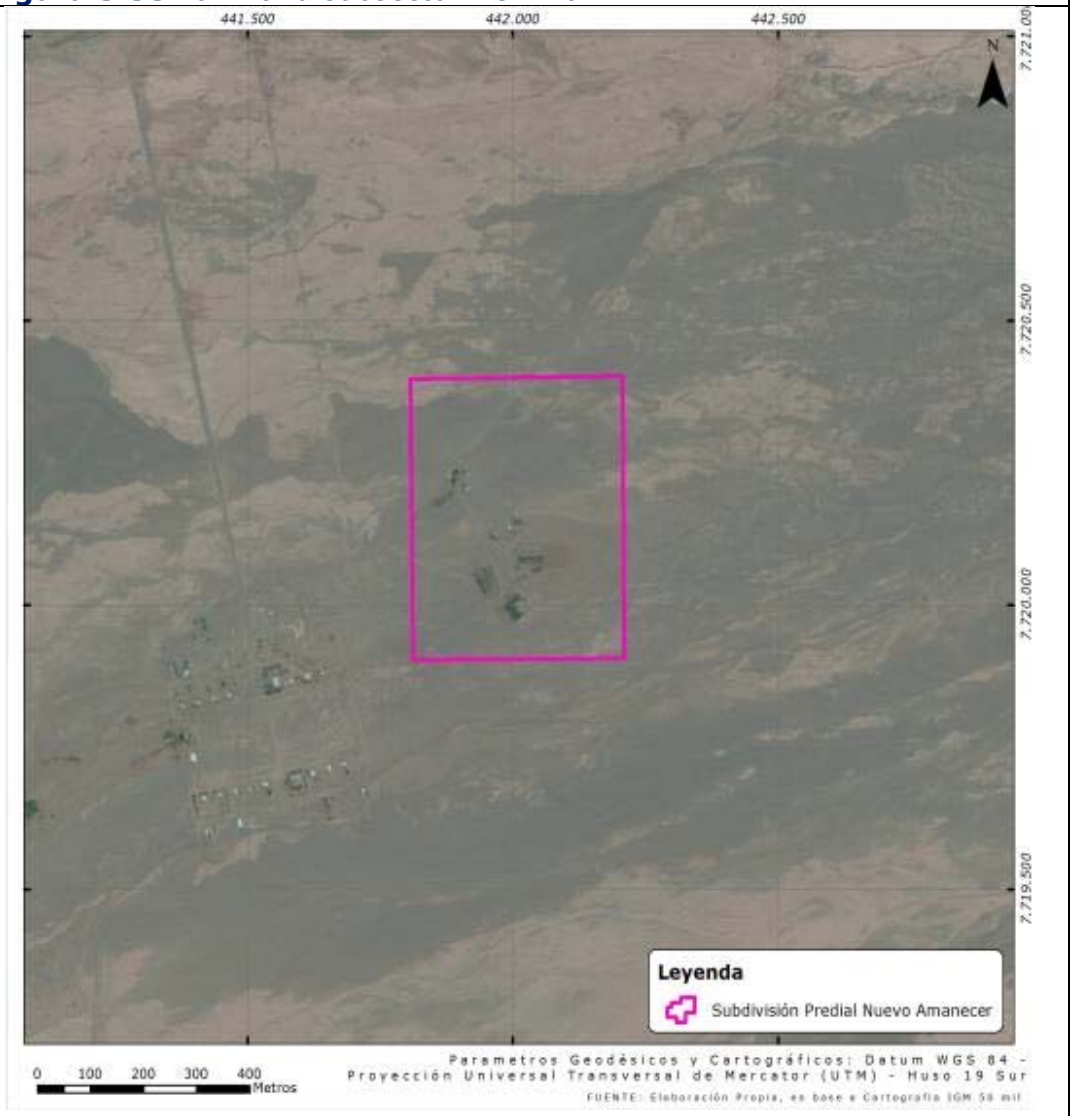

Source: Own Elaboration.

[11] El Servicio de Impuesto Internos no contaba con información respecto del sector de Santa Cruz de Pintados, por lo que no se incorporó esta información.

**Figura 3.52** Agricultural land subsector Youth of the desert


Source: Own Elaboration.

**Figura 3.53** Farmland subsector New Dawn




Source: Self-elaboration Poch 2014

In relation to transport and communication flows, the four sub-sectors of the painted colony are mobilized preferably by private transport, although there is also, as a means of public transport, the possibility of mobilizing by means of a van Particular that passes 3 times a week, for a value of $2,500 pesos. This transport has a tour that starts at 9 A.M. and returns at 6 P.M., with an additional tour near noon.

In the case of the schoolchildren, there is a special transport of the commune of Pozo Almonte in agreement with the commune of Pica, in which is used a bus that connects the locality of Pica with Pozo Almonte. There is also a specific bus for the transport of mining workers to the locality of Pozo Almonte.

In the subsectors of the Land of the Lord, New Dawn and youth of the desert there is a cell phone signal, television and radio, but they do not have Internet or newspapers. The only exception is the school of painting cologne, which if you have access to the Internet.

All the social relations of the four painted Cologne sub-sectors are centralized in the town of Tierra de Jehovah which has all the commercial and educational services of Colonia de Pintado, while the other sub-sectors do not have Services. To carry out formalities and access to the health and education services, you must travel to Pozo Almonte.

In relation to land tenure, the subsector of the land of the Lord has its origin in the transfer of land linked to the agricultural project that emerged in the early 1940s, which was then abandoned until the 1950s, due to the high costs it caused for s Er repopulated by private owners in the 1960s. In those years, according to the interviews conducted, what is now known as the colony of paintings would belong to a single owner to be expropriated in the 70 's, giving the titles of property to 14 agricultural workers of individual type, which LueOr they would inherit the land to their families, who are the ones who currently have ownership over the people, and are the ones who exercise their main guidelines. Each one of them received 5 hectares, of which are currently exploited 3.

In this sense, the subsector of the land of the Lord belongs to an agricultural association, as defined in article 36 and 37 of the indigenous Law n ° 19,253, which is mandated by the descendants of these 14 families Original. From there, new organizations have been formed, such as the indigenous associations and the neighbors ' meetings.

The desert youth subsector originates from the individual delivery of land by Conadi to the members of the Indigenous Association of the same name, according to article 12 and 20 of the indigenous law N ° 19.253. In this sense, each of the 22 partners of the Association has a land of 5 hectares on average, for their residence and agricultural production. This subsector was created in the early 1990s.

The sector of Santa Cruz de Pintado, was also generated by the transfer of individual lands to persons belonging to an indigenous association, but it originated late, in the year 1998, from the migration of indigenous Aymara Who lived towards the Cordillera.

Finally, the new dawn sector functions as an agricultural cooperative and its land is leased to national property. They have 5 hectares of which 2 are enabled and producing.

In the sector of Colonia de Pintado, there are individual deliveries of indigenous lands, which consider 4.5 hectares to each of its 16 beneficiaries, according to the information of indigenous lands registered in the public Registry of indigenous lands (RPTI), Colonia Painted, delivered by CONADI and national goods. It is important to mention that in this same register there are no community land deliveries. The detail of the indigenous lands registered, is in the

**Tabla 3.48** Registration of indigenous lands

| Natural Person Name | Registration year of indigenous lands |
|---|---|
| Rosa Angela Cayo Esteban | 2004 |
| Patricia Yubitza Flores Ramos | 2004 |
| Theophilus Toribio Ticuna Really | 2004 |
| Orlando Silverio Ramos González | 2004 |
| Ana Elizabeth Esteban Gómez | 2004 |
| Yannet Yolanda Flores Ramos | 2004 |
| Zaida Rosa Lázaro Quispe | 2004 |
| Rosa Angela Esteban Gómez | 2004 |

| Natural Person Name | Registration year of indigenous lands |
|---|---|
| Patricia Nora Copa Carlos | 2004 |
| Germán Mamani Mamani | 2004 |
| Edwin Herculaneum Moscoso Challapa | 2004 |
| Marco Rubén Esteban Gómez | 2004 |
| Justo Basilio Ramos Mamani | 2004 |
| Andrés Fabián Mamani Esteban | 2004 |
| Melanio Faustino Vilches Castro | 2004 |

Source: own elaboration based on the public register of indigenous lands, Conadi – Subdirectorate-North, 2013.

In this sector there are no claims of indigenous lands in the area of painted cologne, while those lands that have not been used correspond to municipal land. In this way, there are no lands with indigenous claims in the area of the project's works, nor can they be affected by their actions.

In relation to the rights and use of water, it can be observed that in the sector adjacent to the project area the following registered water rights are observed, according to the DGA's public information on its website:

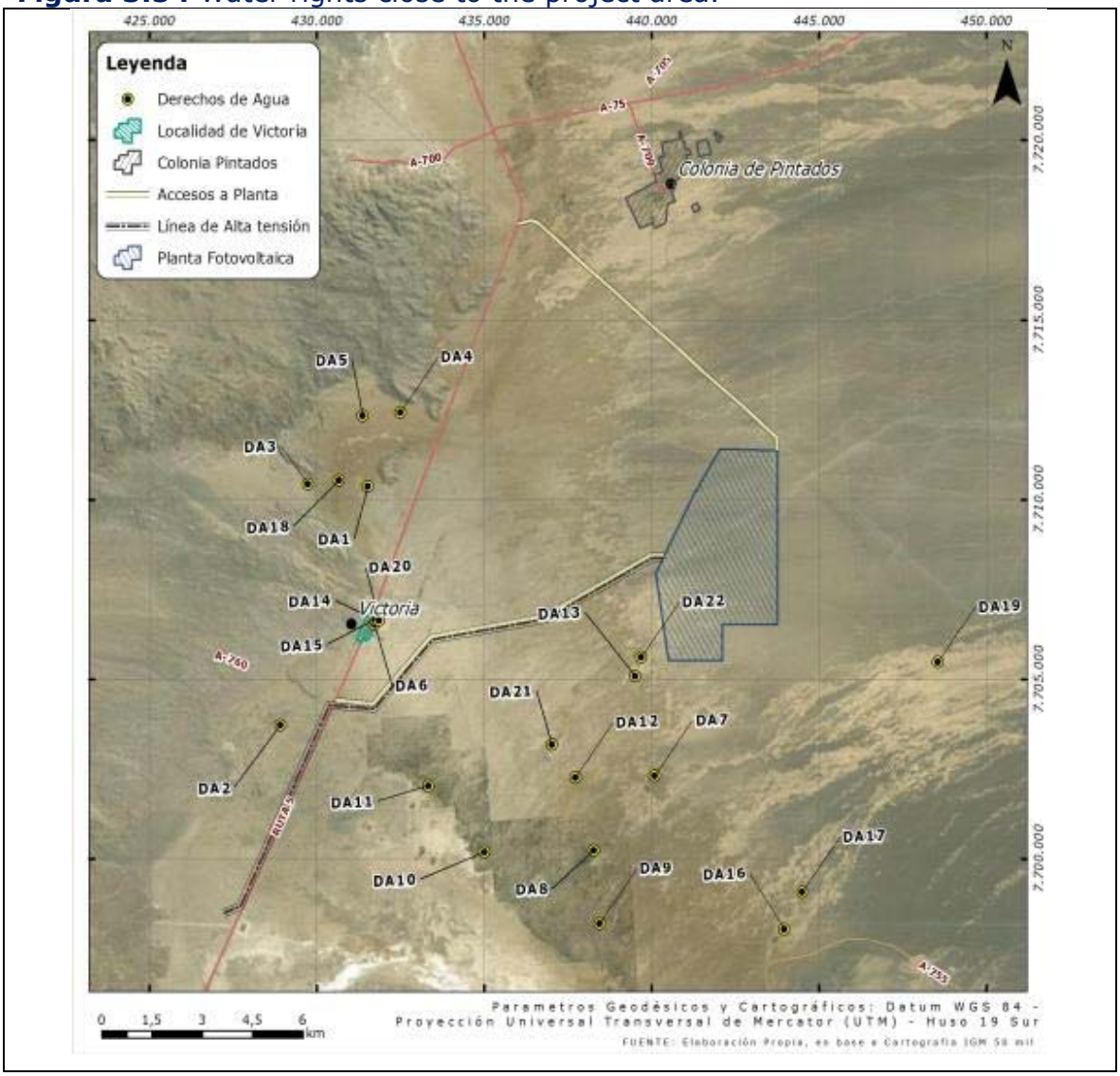
**Tabla 3.49** Water rights close to the project

| Water Right | Owner | UTM N Coordinate | UTM coordinate E |
|---|---|---|---|
| Qa1 | SOCIEDAD Química Y MINERA DE CHILE S.A. | 7,710,376.60 | 431,523.71 |
| DA2 | SOCIEDAD Química Y MINERA DE CHILE S.A. | 7,703,728.60 | 428,924.08 |
| DA3 | SOCIEDAD Química Y MINERA DE CHILE S.A. | 7,710,445.97 | 429,734.17 |
| DA4 | Chemical and Mining Society DE CHILE S.A. | 7,712,442.87 | 432,497.51 |
| DA5 | SOCIEDAD Química Y MINERA DE CHILE S.A. | 7,712,348.98 | 431,373.39 |
| Qa6 | SOCIEDAD Química Y MINERA DE CHILE S.A. | 7,706,547.00 | 431,728.00 |
| DA7 | SOCIEDAD Química Y MINERA | 7,702,325.00 | 440,093.00 |

| Water Right | Owner | UTM N Coordinate | UTM coordinate E |
|---|---|---|---|
| | DE CHILE S.A., SOQUIMICH | | |
| DA8 | National Forestry Corporation of the REGION of TARAPACA | 7,700,244.00 | 438,279.00 |
| DA9 | National Forestry Corporation of the REGION of TARAPACA | 7,698,211.00 | 438,436.00 |
| DA10 | National Forestry Corporation of the REGION of TARAPACA | 7,700,201.00 | 435,015.00 |
| DA11 | National Forestry Corporation of the REGION of TARAPACA | 7,702,051.00 | 433,334.00 |
| DA12 | SOCIEDAD Química Y MINERA DE CHILE S.A. SQM S.A. | 7,702,279.00 | 437,721.00 |
| DA13 | SOCIEDAD Química Y MINERA DE CHILE S.A. SQM S.A. | 7,705,089.00 | 439,507.00 |
| DA14 | SOCIEDAD Química Y MINERA DE CHILE S.A. SQM S.A. | 7,706,670.00 | 431,740.00 |
| DA15 | SOCIEDAD Química Y MINERA DE CHILE S.A. SQM S.A. | 7,706,670.00 | 431,740.00 |
| DA16 | JUAN URRUTICOECHEA ECHEVERRIA and others | 7,698,050.00 | 443,960.00 |
| DA17 | JUAN URRUTICOECHEA ECHEVERRIA and others | 7,699,080.00 | 444,500.00 |
| DA18 | SOCIEDAD Química Y MINERA DE CHILE S.A. | 7,710,546.91 | 430,669.75 |
| DA19 | SOCIEDAD Química Y MINERA DE CHILE S.A. | 7,705,490.00 | 448,545.00 |
| DA20 | Chemical and Mining Society DE CHILE S.A. | 7,706,641.00 | 431,862.00 |
| DA21 | SOCIEDAD Química Y MINERA DE CHILE S.A. | 7,703,192.00 | 437,030.00 |
| DA22 | SOCIEDAD Química Y MINERA DE CHILE S.A. | 7,705,620.00 | 439,700.00 |

Source: Self-elaboration from information DGA.

**Figura 3.54** Water rights close to the project area.




Source: own elaboration from DGA.

In this way, there are 22 water rights granted close to the project, of which all belong to CONAF, SOQUIMICH and the mining company Juan Urruticoechea Echeverría and others, but none of them within the project area, and those within the area of influence, such as the four that are within Victoria, are not intervened or affected in any way, because the characteristics of the project They do not imply the use or restriction of water or their access.

In the Jehovah's Land sector, the water found in its groundwaters was delivered along with the title of domain of the 14 original plots during the 1970s, a period in which there was still no division between land properties and As.

With the change of legislation in the year 1981, there was the possibility of making claims to obtain the rights of use of the water resources, to those owners who had previously benefited from the agrarian reform, even if they had already Sold their pregod, which led to a dispute between the situation of fact and law, which has brought the parties to prosecute the issue.

The water rights holders, according to the Directorate General of Waters (DGA) in the area of Cologne painted, are the following:

**Tabla 3.50** Holders that has water rights

| Headlines |
|---|
| Llanina of the Maldonado Transit Chandía |
| Red Educational Society Crocco Limited |
| Paul Second Chandía Sagua |
| Jesus Eudes Tolmo Juyumaya |
| Just Elena Castro Mamani |
| Florencio Amable Peñafiel Díaz |
| Freddy Orlando Vilchez Paz-Soldán |

Source: General Directorate of Water.

The Jehovah's Land Indigenous Association administers the water resources of the Jehovah's Land subsector, charging about 11000 pesos per hour to other farmers who do not own water. The rights reach a total of 50 L/s of water, from the moment they were awarded the land during the 1970s. This is extracted from two wells, well 1 and well 2 with 22 L/s respectively, which are located on the side of the Irrigation Water Collection Center, which is also used as a swimming pool.

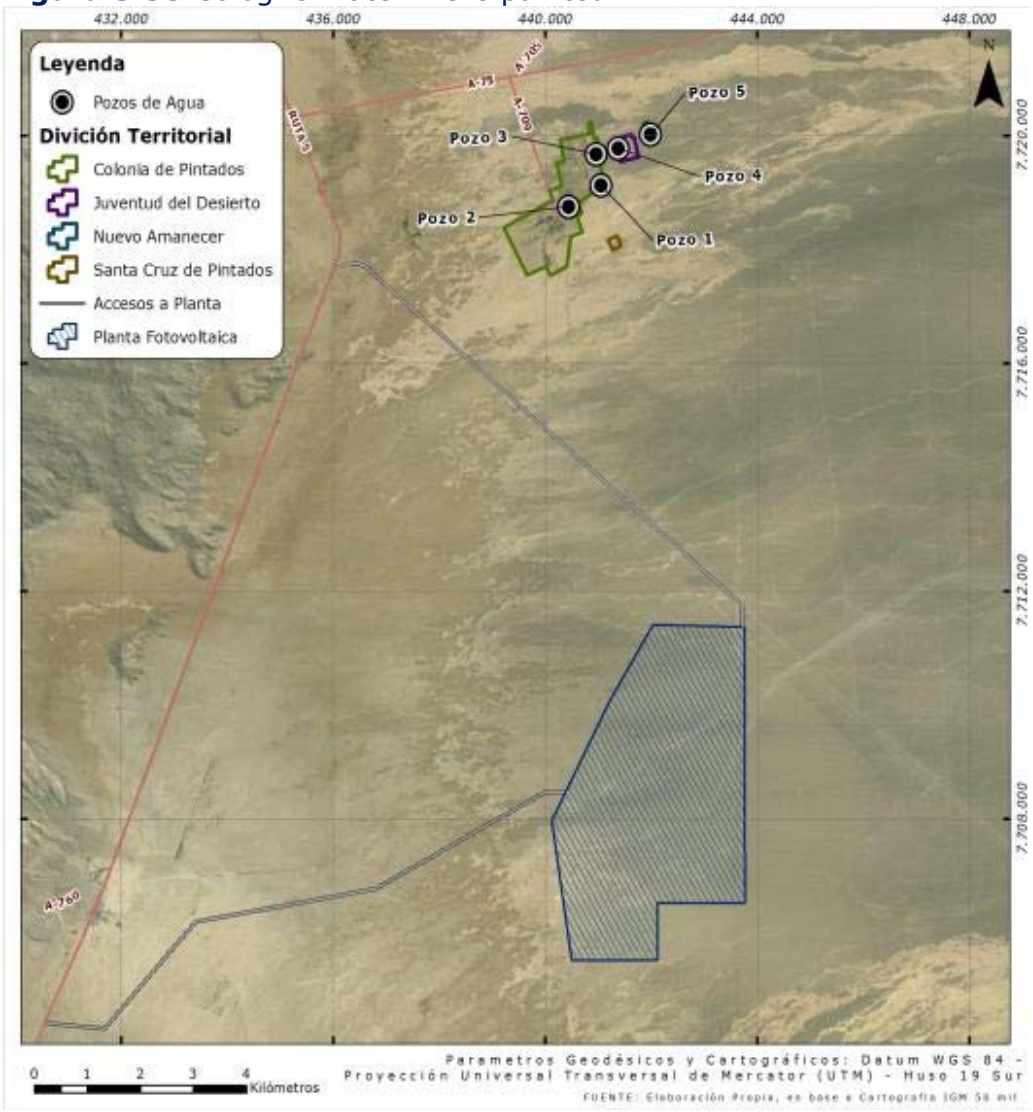
On the other hand, the President of the neighborhood Board of Colonia de Pintado, mentions that the water used for human consumption is free for the entire community of Tierra de Jehovah.

These waters are not exclusively indigenous in use, because they are not found in Conadi's records.

In the case of the new sunrise and Santa Cruz de Pintado Sub-sectors, water is obtained from wells, which are extracted by solar and petroleum engines. Water rights are in process. In this case, the water is also sold in some cases to contractors, in addition to being used for domestic and agricultural consumption.

In the case of desert youth, water from wells is extracted through probing financed by the INDAP Land habitability project. As in previous cases, the use at home is free, while there is a charge for agricultural work. Water rights are currently under process, and is administered by the Indigenous Industry Association. The painted Cologne sector wells can be seen in the Figura 3.55

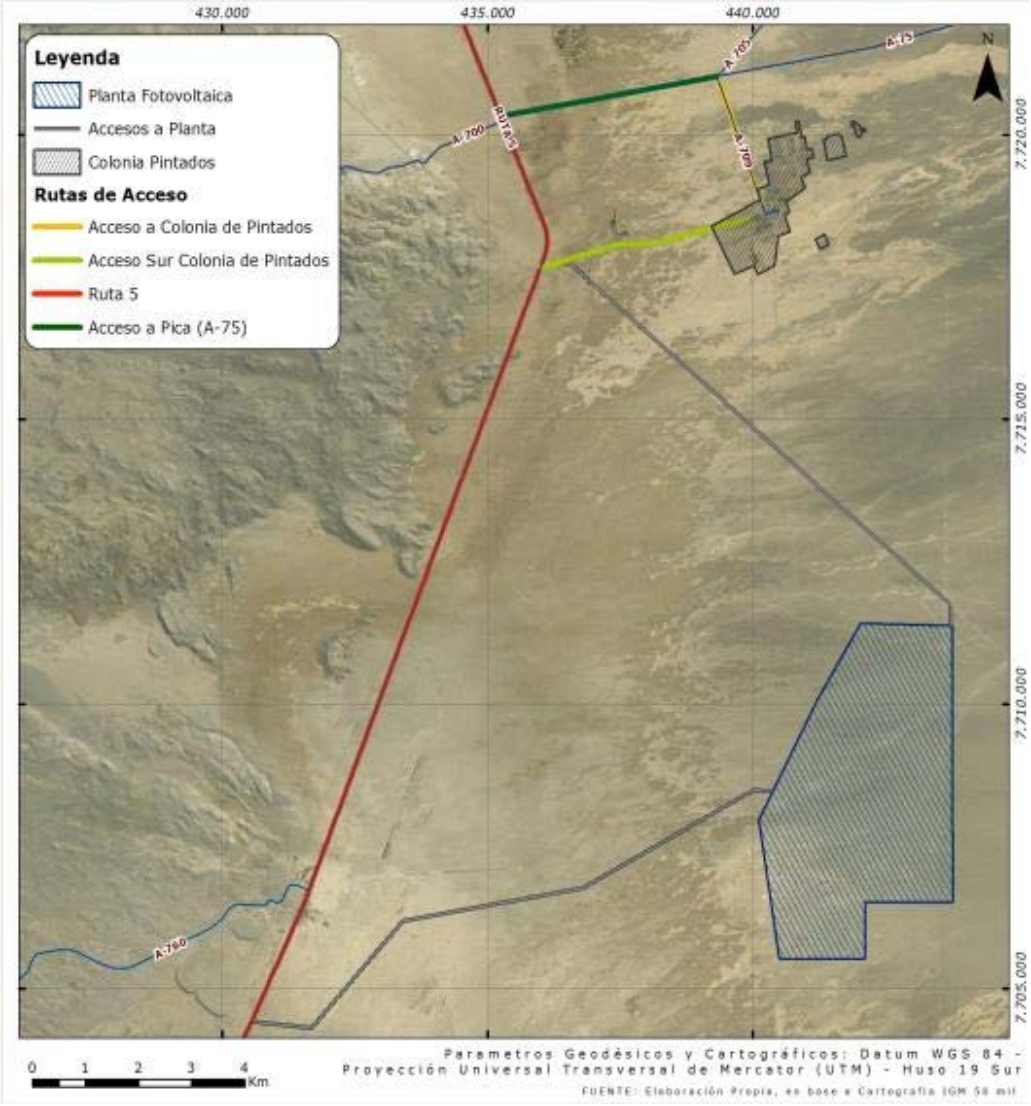
**Figura 3.55** Cologne Water Wells painted




Source: Own Elaboration.

The town of Victoria, is adjacent to Route 5, 54 kilometers approximately south of Pozo Almonte, starting at the crossroads of route A-760 that leads from Victoria to the port of Patillos and Route 1 connecting Antofagasta with Iquique.

**Figura 3.56** Town of Victoria




Source: Own Elaboration.

This small settlement occupies both sides of the road, and is adjacent to the ruins of the former Victoria nitrate, which closed in the year 1979. It is composed by 19 people, who inhabit about 7 houses. The size of this village is approximately 0.196 km2, which means a population density of 10.31 people per square metre.

Photography 3.15: North view of the town of Victoria


Source: Poch Environmental 2014

Victoria has no means of transportation, no public locomotion. In fact, they can only take the buses that travel from Arica or Iquique to the south, or vice versa. The value oscillates between 2,000 and 3,000 pesos in the stretch of Victoria to Pozo Almonte, and 6,000 pesos in the stretch of Victoria to Iquique.

The census of the year 2002, showed that 7 of the 8 households present did not have access to cellular telephony, and only 2 people had access to landline. Today, this condition has changed as respondents say they have access to at least one company's cell phone and have cable and radio, but they cannot access any kind of newspaper.

Practically all the transport flows are made towards Pozo Almonte, because the access to all the services are carried out in this locality, as is the case of health, education, municipal procedures, etc. In the event that It requires a more

complex process, you must go to the city of Iquique. They do not have any service within Victoria, except for food, housing and benzine.

- *Demographic dimension*

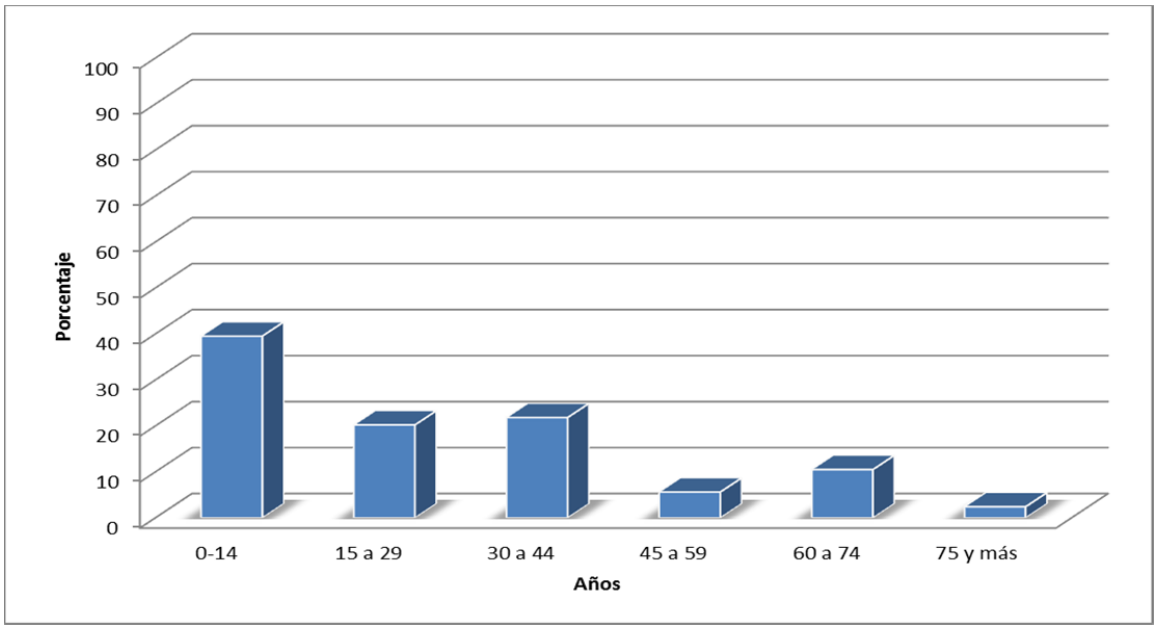
Within the project area, there is no population, which was verified both in the interviews and in the field work. It also verified the possible existence of temporary or permanent population of peasants, indigenous or livestock in the nearest sector of the Pampa del Tamarugal which is the *Bellavista* Inside the Pampa de Tamarugal, which is 7.8 kilometers away. When consulted the CONAF, said that until the year 2011 Mrs. Patricia Shock occupied a field in that place, but that stopped leasing today and no longer occupies it. Therefore, any type of population outside the localities of the area of influence, which may be relevant to the project, is discarded. Also, no population was found that could be affected by the passage of LAT.

In the case of the locality of Colonia of painted, it was found that the population that inhabits the sector is of a total 385 people, counting the 4 sub-sectors that make it up. In the case of Jehovah's Lands, they are a total of 283 people, in Santa Cruz de Pintado A total of 6 people, with 54 people who only have passing activities, in the desert youth sector a total of 88 inhabitants and in the sector of New dawn some 8 inhabitant S approximately. This shows an increase of the population important, since in the census of the year 2002, Cologne painted, with its fourSectors, housed a population of 126 inhabitants, implying an increase of approximately 67.27%. The entire population is rural in nature.

Of the people who live in the sector, approximately 60% are inhabitants who belong to some indigenous people. According to the interviews, representatives of the ethnic group have been recognized within these inhabitants Aymara, Quechua and Diaguita, but it was not possible to make an approximation of how many inhabitants by ethnicity live in the sector.

By observing the population structure by age, it can be noted that Jehovah's Land has a young population, which according to the census of the year 2002, recorded the following population distribution:

***Graph: Percentage of colony population painted by age sections, Census 2002***

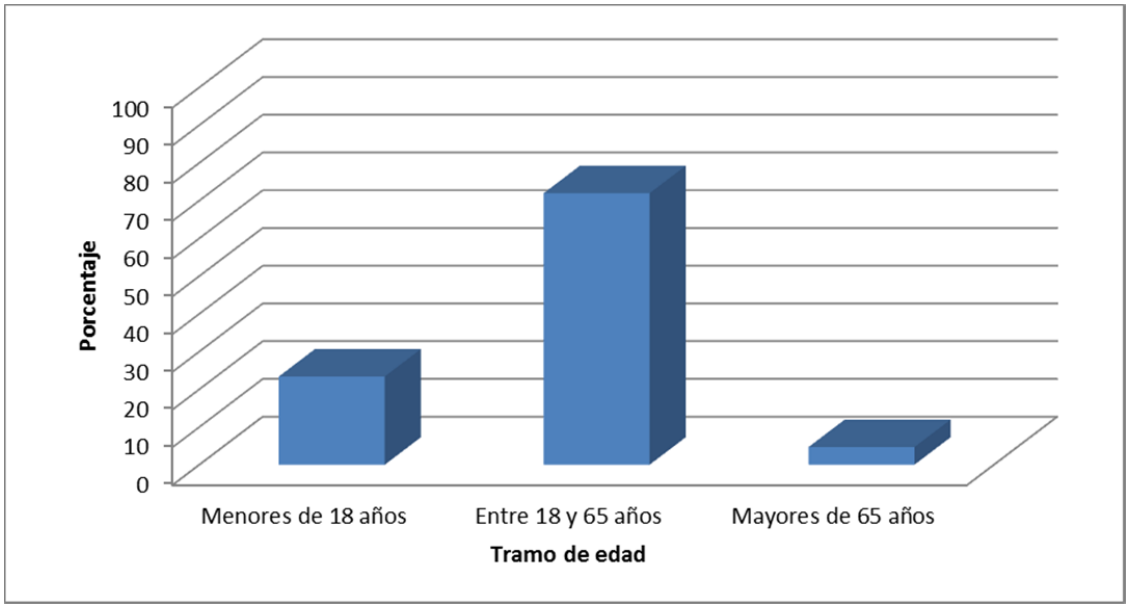



Source: Own elaboration from census 2002.

This result shows that the Jehovah's Land population is quite young, as almost 40% of the population is 14 years old or younger, and less than 20% of the population is over 45 years old. 47% of the population has a fluctuating age between 15 and 60 years.

To the year 2014, the distribution by age (approximate) is presented as follows:

***Graph: Percentage of population by age sections, 2014***

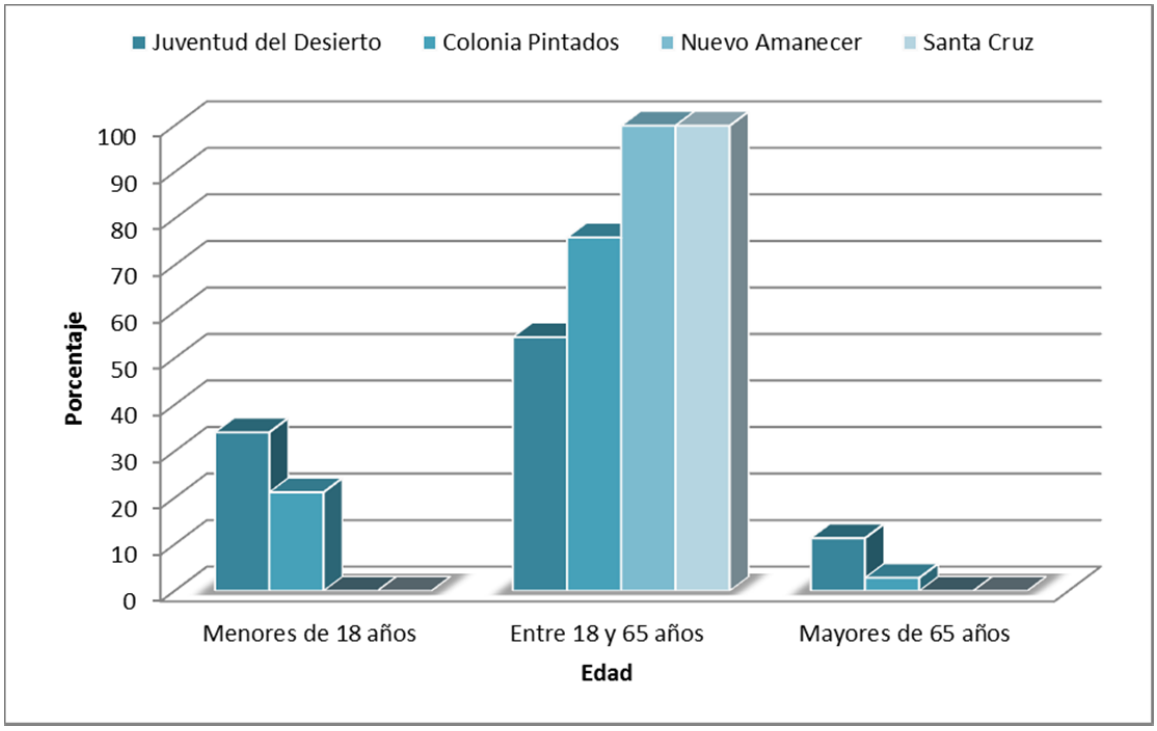



Source: Self-elaboration with information delivered from interviews

When analysing the results by age sections, it can be observed that the population is still quite young, with a percentage close to a quarter of the population corresponding to children under 18 years old. However, this percentage is lower than the year 2002, which recorded almost 40% of the population that was 14 years or less, now registers 25% of the population that is under 18 years, while the most relevant section is between 18 and 65 years old , a range that exceeds 70% of the population. This can be explained by a high amount of immigration, which has brought a large CAIdentity of young families, without children, and who are in productive age.

In analyzing the subsectors, it can be observed that the highest percentage of people under 18 years old have desert youth, which reaches a total of 34% of the total population, followed by the Jehovah's Land, with 21% of the population. The new sunrise and Santa Cruz subsectors have 100% of their population in the age range between 18 and 65 years, while the largest number of older adults also have desert youth with a percentage that reaches 11%.

***Graph: Percentage population compared by subsectors, 2014***




Source: Own elaboration with percentage delivered of interviews.

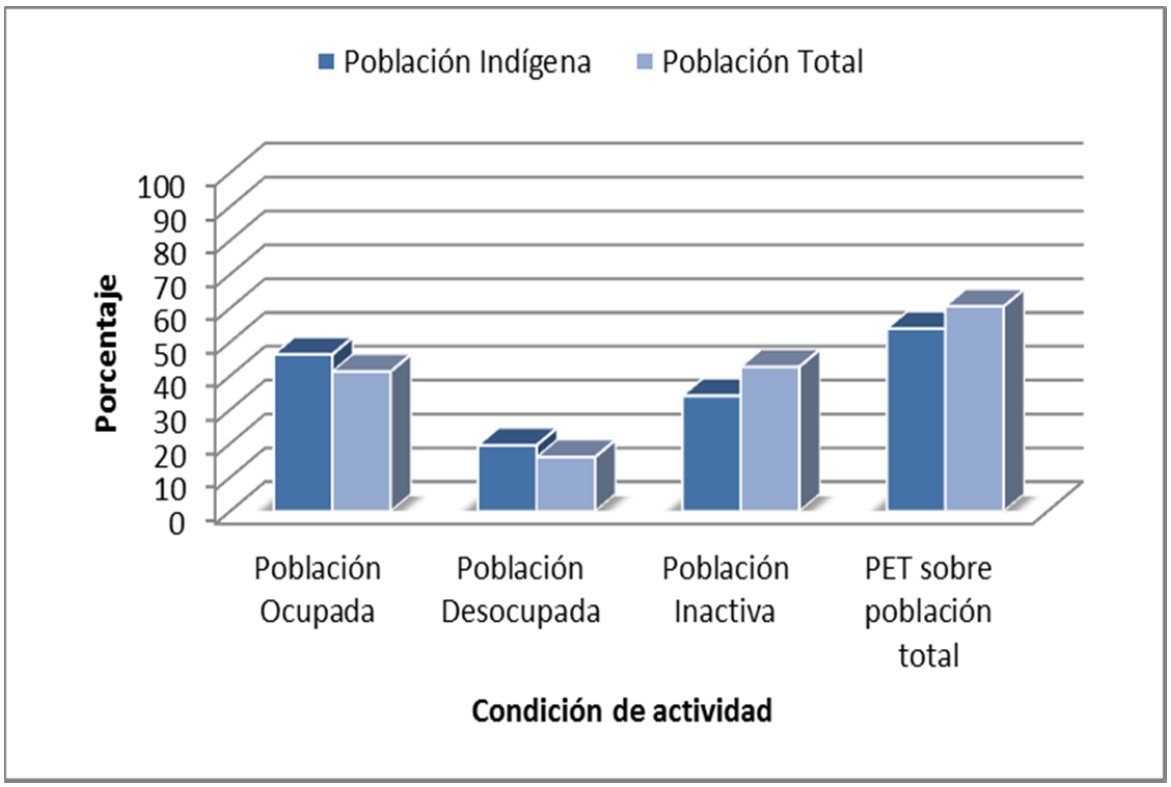
When analysing the population of painted by sex, it is observed that the census figures of the year 2002 showed that a total of 55.6% of the population were men, and 44.4% were women. According to the information given in the interviews, the proportion of men and women would remain in the same range, with a predominance of the number of men. In relation to the indigenous population, this would also be maintained in the same way, reaching 55.3% of men, versus 44.7% of women.

The population of painted people who were of working age (PET) in the year 2002 was of a total of 75 people, which corresponded to 60.5% of the population. Of this population, the one that was economically active were 43 people, leaving 31 people occupied, 10 dismissed and 2 who were looking for work for the first time.

In this sense, 42.7% of the population was considered as inactive population, while a 41.3% is occupied population. The rest is unoccupied population. However, this data can be misleading because ground work from interviews and field observation showed that there is a high percentage of informal work related to work in agriculture.

If this data is analyzed in relation to the indigenous population, of a total of 76 people, 41 were part of the population of more than 15 years in conditions of work, which corresponds to a total of 53.9% of the total indigenous population of Cologne painted. Of this total, it can be observed that there is a decrease in the amount of inactive population and an increase of the population occupied with respect to the population that also integrates the non-indigenous population, reaching a 34.1% of inactive population and a 46.3% of population Busy. These differences can be seen in the Graphic:

***Graphic: Condition of activity of indigenous and non-indigenous population of painted cologne, according to Census 2002.***




Source: Own Elaboration from census 2002

However, in reviewing the information on the ground, there is an increase in the distribution of the occupied population, since the work related to mining and services, which are more formalized, has recently increased.

The results of the population by its occupation according to branches of economic activity, according to the census of the year 2002 showed the following results:

**Tabla 3.51** Branch of economic activity

| Branch of economic activity | n ° | % |
|---|---|---|
| Agriculture, livestock, hunting and forestry | 22 | 71 |
| Manufacturing | 1 | 3.2 |
| wholesale and less trade; Repair of motor vehicles, motorcycles and personal effects and household goods. | 1 | 3.2 |
| Teaching | 5 | 16.1 |
| Health and social services | 1 | 3.2 |
| Other community, social and personal services activities | 1 | 3.2 |
| Total P.E. to Busy | 31 | 100 |

Source: Own Elaboration from census 2002

As seen in the Previous table, the largest number of people work in the agricultural sector, which shows that it has been the predominant activity within the town of Colonia of painted in its entirety. This has been reaffirmed by the Pladeco coordination Unit of the Commune (2009), which proposes that the people of Colonia de Pintado present the largest number of agricultural workers, together with La Tirana and Pampa Verde.

At present, it has been said that all the people who are located in the sub-sectors of Santa Cruz de Pintado and New Dawn take care of the agricultural activity, either by working directly on their land or by hiring people for it. In the case of the subsector of the land of the Lord and Desert Youth, there is also an extensive agricultural vocation, which has been changing since the 1980s, giving way to more mining-related economic activity. This is related to the start up of three major mining projects, which are CRro Colorado, Quebrada Blanca and Doña Inés de Collahuasi. In this way, people who are linked to mining or construction have increased.

This was expressed in the distribution by groups of occupation of Cologne painted to the year 2002, according to the statistical data of the census, shown in the following table:

**Tabla 3.52** Number of people per occupancy group

| Occupation groups | Number of people | % |
|---|---|---|
| Small Business managers | 1 | 2.4 |
| Teaching Professionals | 2 | 4.9 |
| Middle-level technicians and professionals in the biological, social and health sciences | 1 | 2.4 |
| Teachers and technical Instructors | 1 | 2.4 |
| Clerks | 1 | 2.4 |
| Personal services and protection and security workers | 4 | 9.8 |
| Farmers and skilled workers of agricultural, forestry and fishing farms with different markets | 20 | 48.8 |
| Subsistence farming and fishing workers | 2 | 4.9 |
| Mining and construction industry officers and operators | 1 | 2.4 |
| Vehicle drivers and heavy and mobile equipment operators | 3 | 7.3 |
| Unskilled sales and service workers | 1 | 2.4 |
| Agricultural, forestry, fishing and tuning pawns | 3 | 7.3 |
| Pawns from mining, construction, manufacturing and transportation | 1 | 2.4 |
| Total | 41 | 100 |

Source: Own elaboration from national census of Population and Housing year 2002, National Institute of Statistics.

In addition, there are small miners in the area, and the activity of extending the road by the company San Felipe, also means new possibilities of work for the inhabitants of the area that have modified the structure of work that it had since that time. However, the structure of the painted colony, in its four sub-sectors, remains eminently agricultural.

Regarding this, the interviewees have said that the children after completing the basic education in Colonia de Pintado continue their education in two possible places according to their vocation: Pica or Pozo Almonte. Thus, those who choose Pica, are oriented to agricultural activities, while those who choose Pozo Almonte, are oriented to mining activities. However, young people today have a majority inclination for mining activities.

In relation to the indigenous people of painting, it participates actively in agriculture, which has been represented by 78.9% of the total.

In relation to the category of occupation, described by sex, it can be observed that almost all the occupation of the locality is made by men. This is expressed in census data 2002 (95.7%) and interviews, predominating the self-employed, as can be seen in the table below:

**Tabla 3.53** Number of people by occupational category

| Occupational category | Man | Woman | Total |
|---|---|---|---|
| Salaried worker | 11 | 5 | 16 |
| Domestic service worker | 0 | 1 | 1 |
| Self-employed | 22 | 1 | 23 |
| Total | 33 | 8 | 41 |

Source: Own elaboration from national census of Population and Housing year 2002, National Institute of Statistics.

In this way, the eminently agricultural character of the colony area of Pintado explains that the majority of the workers are self-employed, while some others are salaried workers of other agricultural landowners.

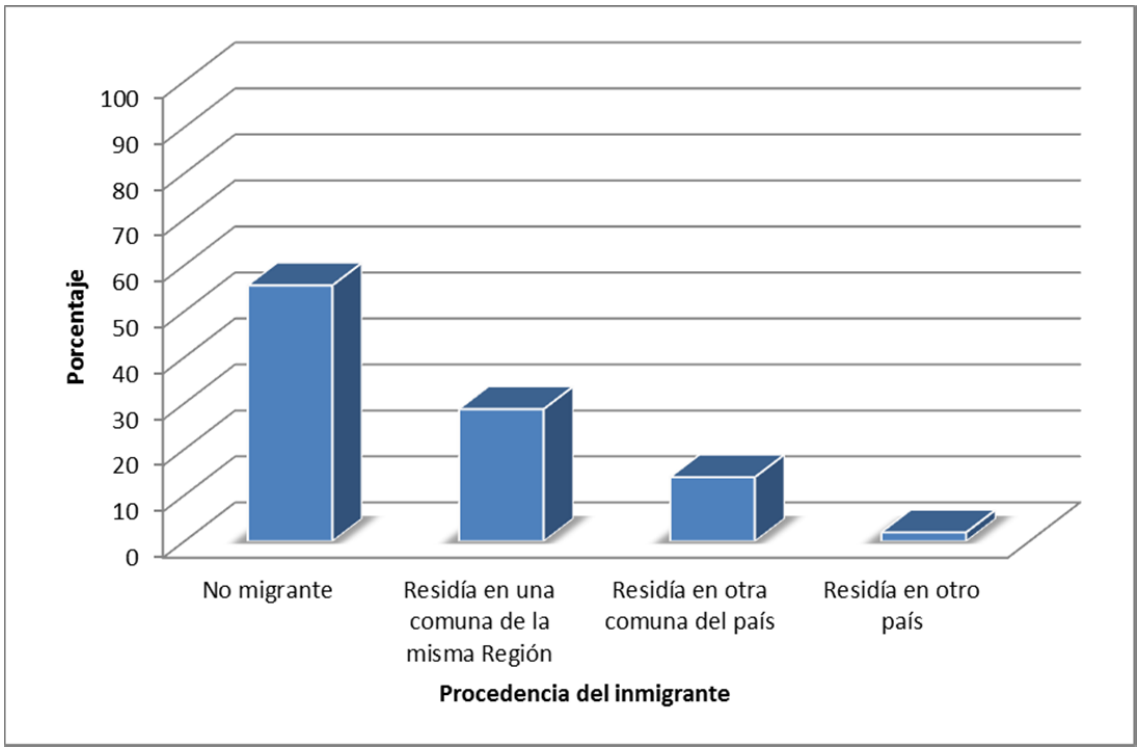
This situation has not changed to date because the rural character is maintained. In fact, there are different areas in the painting area that are worked by a family unit, maintaining their character as self-employed, while in other zones like New dawn and youth of the desert there is non-permanent population that has been contracted, and which are mostly foreigners.

So the migrant population has been important in recent years. The majority comes from the mountain ranges, establishing new populated sectors, as is the case of desert youth and Santa Cruz de Pintado, and others who have come from other countries to work on the grounds, as is the case of what happens in the subsector again  Dawn. These immigrants would come mainly from Bolivia, and they would live temporarily in each one of the countries, generating a

rather informal work. In this way, though There could be some part of the population from Peru or Bolivia that currently resides in Colonia de Pintado.

In this sense, the census of the year 2002 identified that a percentage close to half of the population was an immigrant, and only 1.9% came from another country. Of what came from the same country, a 13.9% indicated that it came from another commune of the country and 28.7% indicated that it came from another commune in the region of Tarapacá, as shown in the chart below:

***Graph: Population according to migration condition, painted colony, Census 2002***




Source: Self-elaboration based on census 2002

However, it is important to note that the Lord's land was born as a result of the migration of other Cordilleran sectors. Since its beginnings in the 1970s, Tierra de Jehovah was established as an agricultural pilot project, aimed at the parceleros and interior workers settling within the locality. In addition, the Lord's land was formed around the centrality of The Evangelical Pentecostal

Church, which has also helped to boost the immigration of other evangelicals to live in the locality.

On the other hand, youth of the desert consolidated from a more recent immigration, occurred in the 1990s, generated by groups Aymara Of the interior that were looking for new agricultural places, and that settled in the sector despite the acidity of the earth, which improved with sand.

Migration is a process that has continued its course today, because the interviews have shown that the church has asked all of its parishioners to move to Jehovah's Lands, and that the Santa Cruz sector is settling , receiving new immigrants to consolidate as a new village.

In relation to internal immigration, or switching of painted cologne, it can be observed that in the census of the year 2002 shows that the vast majority of the population works or studies in the same commune, which represents a 93.5% of the total. This situation has not changed, because it was observed in the interviews that people performed all their activities within the Jehovah's Land, except when the students finished basic education and were going to finish their studies to other locations.

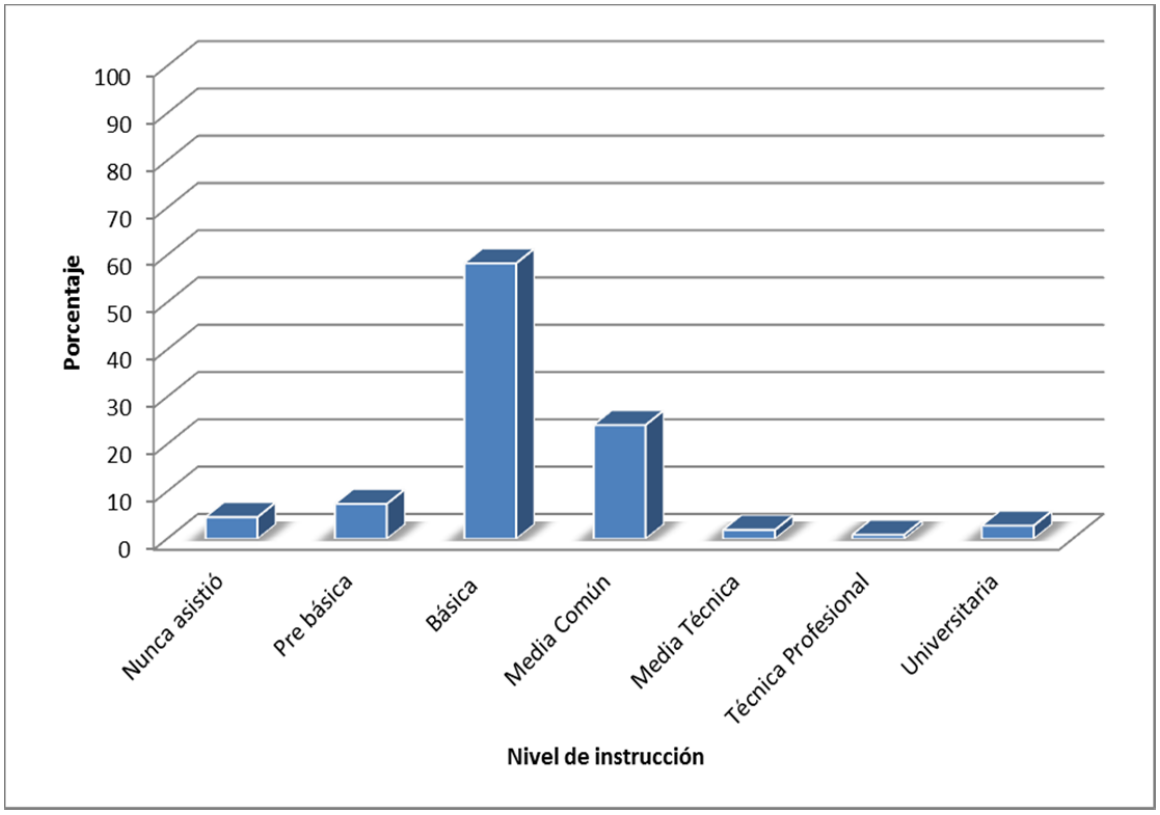
This is true for the four sub-sectors, as Santa Cruz de Pintado, New Dawn and desert youth access almost all of their services in the Land of Jehovah.

However, the four sub-sectors carry out their municipal procedures in Pozo Almonte, as well as attend their post. Also, La Posta de Pica is an alternative place to go in case of an emergency, due to its proximity to the painted colony and its disposition to receive them.

In relation to the level of instruction of people living in painted cologne, it could be observed that the interviews conducted showed that the majority of its inhabitants have complete basic instruction, and a level of High literacy. The census 2002, showed that 74.1% of the total population of 5 years or more

could read and write and that a 58.3% completed the level of basic instruction, as can be seen in the chart below:

***Graph: Level of instruction, total population painted colony, year 2002***




Source: Own elaboration from census 2002.

Then, the highest percentage of population ended the common average education, with a 24.1%, followed by pre-basic education, with a 7.4%. The lower percentage are those that completed the technical-professional education with a 0.9% and a technical average of 1.9%. The percentage of people who never attended is kept under 5%, with 4.6%.

If we compared these results with those of the indigenous population, the latter presents a presence in the average education of 6 points less, reaching 18.2%. On the other hand, it has a percentage of 8 more points in basic education, reaching 66.7%.

As for the results of the SIMCE, the Oasis of the Desert School has the following scores:

**Tabla 3.54** Results SIMCE Colony of painted

| Sector | SIMCE 4 ° Basic 2012 | | |
|---|---|---|---|
| | **Reading comprehension** | **Mathematical** | **History, Geography and social sciences** |
| Locality of Colonia of painted | 225 | 220 | 201 |
| Pozo Almonte Commune | 248 | 238 | 239 |

Source: Own elaboration based on SIMCE 2012, Ministry of Education.

Based on the Previous table It can be observed that the locality of colony of painted has obtained a SIMCE score lower in all the areas than the communal level. In addition, it is important to mention that this locality does not have average education, so there are no other results of the SIMCE to compare.

In the case of **Victory**, it has been observed that the population that lived in this hamlet, according to the census of the year 2002, was of a total of 31 people. Of these 31 people, 27 would be men and 4 women. In addition, five people under the age of 24 would have lived, comprising 3 persons under the age of 15. In addition, there are a total of 6 adults older than 60 years old.

The level of instruction for these people was mostly average or humanities, reaching 48% of the population, while 33.3% reached basic or primary education. There was a person who would have studied in professional institute. The percentage of literacy was extremely high, as only one person could not read and write.

It also indicated that the economically active population was integrated by 90.3% of the population, and that the vast majority of that population, 67.8% He worked for income, while 17.8% worked in household chores, and 7.1% were retired or rented.

The main occupation can be seen in the following table:

**Tabla 3.55** Amount of inhabitants by type of occupation

| Type of Occupation | Victory |
|---|---|
| Ignored | 1 |
| Small Business managers (have 1 or 2 directors) | 1 |
| Other technicians | 3 |
| Personal services and protection and security workers | 3 |
| Models, vendors and demonstrators | 3 |
| Mining and construction industry officers and operators | 2 |
| Officers and operators of metallurgy, mechanical and allied construction | 2 |
| Other officers, operators and craftsmen of mechanical arts and other trades | 2 |
| Vehicle drivers and heavy and mobile equipment operators | 2 |
| Total | 19 |

Source: Own Elaboration based on Census 2002.

In this way, it shows that there is a diversification of the types of occupation existing in the locality, being the most important the workers of the personal services and of projection and safety, and the models, sellers and demonstrators.

When observing workers by type of economic activity, the following table can be observed:

**Tabla 3.56** Number of inhabitants by type of economic activity

| Type of economic activity | Victory |
|---|---|
| Extraction of metalliferous Minerals | 1 |
| Exploitation of other mines and quarries | 2 |
| Preparation of food products and beverages | 1 |
| Construction | 1 |
| Sale, maintenance and repair of motor vehicles and motorcycles, retail of automotive | 3 |

| Type of economic activity | Victory |
|---|---|
| fuel | |
| Hotels and restaurants | 8 |
| Land transport, Pipeline transportation | 2 |
| Complementary and ancillary transport activities, travel agency activities | 1 |
| Total | 19 |

Source: Own Elaboration from census 2002

In this way, it is shown that the main activities are linked to hotels and restaurants, with 8 people, followed by the sale, maintenance and repair of motor vehicles and motorcycles, retailing of automotive fuel, with 3 People.

At present, the field activities detected a total of approximately 19 people, without considering those people who live sporadically in the locality. Considering this, there is currently a decrease of 38.7% over that year.

This population is dealt in 5 families, and a group of people who live in the Benzine bomb.

There are No children in the area, and four older adults live. When disaggregated by sex, 9 women and 10 men can be seen. The whole town lives in the rural sector.

In addition, it is necessary to consider an important migrant mass that works in shifts of 20 x 10 mainly from Bolivia, which works in The restaurant San Roque, and that would be an amount close to 50 people. These workers would be mostly women in public service functions, cashiers, waitresses, copears, cleaning, etc.

In the area it has been possible to see different economic activities, with three restaurants, a petrol pump, and a vulcanization workshop. In this way, the main activities that are detected in the area are small businesses that provide services, being mainly self-employed. The most important activity is the benzine pump, which provides services to passing trucks.

The economically active population, older than 15 years and who have not retired, are all the inhabitants of Victoria, which corresponds to 19 people. Of these, 100% is occupied in the various activities mentioned above.

The level of instruction at present has remained constant, with a majority reaching humanities, average common or industrial average, and a relatively high percentage of people who would have achieved only basic education.

In relation to migrations, there has been a process of emigration of the younger population to other sectors in search of better opportunities for study or work, which shows that there is no young population within the locality. Also, some of the people have immigrated, as is the case of the owner of Vulcanization that came 6 years ago in search of job opportunities, but from another locality, within the same commune.

Victoria was formed from the inhabitants of Victoria's nitrate, of which three original residents remain, who continue to maintain their identity as a people.

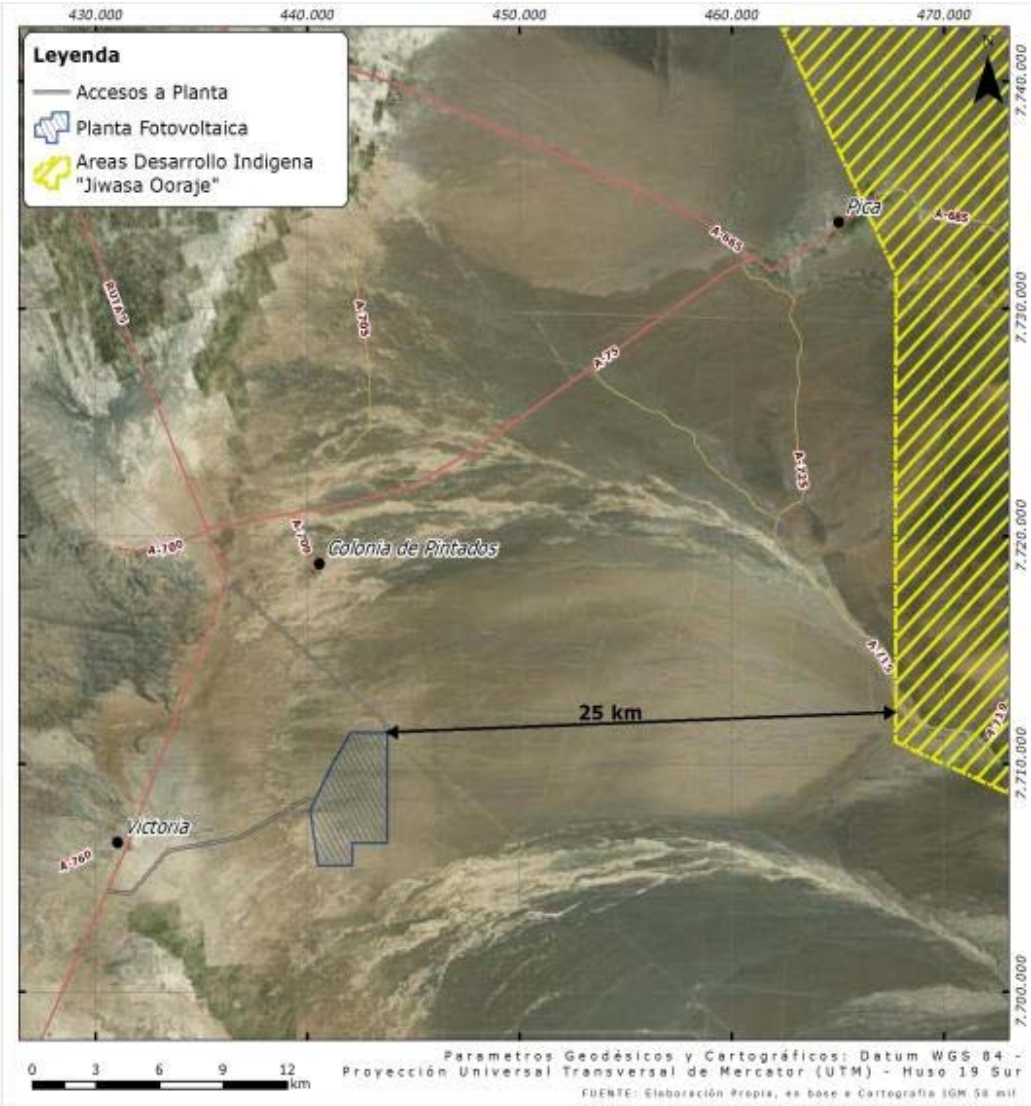
- *Anthropological Dimension*

Law 19,253, in its articles 26 and 27 provides the definition of areas of indigenous development (ADI), which constitute territorial spaces in which the State focuses its action on behalf of the indigenous people and their communities. The criteria for defining ADI consider the following elements:

- The existence of lands of indigenous communities or individuals;
- Organic homogeneity;
- dependence on natural resources;
- Legal background (indigenous law 19,253).

In the region of Tarapacá, the indigenous development area has been defined Jiwasa Oraje, which contemplates the communes of Colchane, Camiña, Pozo Almonte, Huara and Pica. In relation to the project, it should be noted that the project "Cielos de Tarapacá" is not within the ADI, meeting more than 25 kilometers at its closest point, as shown in the Following figure:

**Figura 3.57** Project in relation to ADI Jiwasa Oraje




Source: Own Elaboration.

Colonia de Pintado is one of the populated centers that grew since the 1970s, because it was consolidated as an agricultural center that provided inputs to the nitrate. In this way, Colonia de Pintado was transformed into a locality that comprised population of different ethnic groups, that came with some traditions from its place of origin, but that does not have a traditional rooting

with the sector of colony of painted. Among these groups Emphasize the confluence of at least the cultures Aymara, Diaguita and Quechua.

However, in the interviews it was recognized that the area of painting was a sector in which there was some pre-Hispanic use because some localities Aymara Of the interior fell with their cattle for grazing, temporarily. However, they say that in the area there were no traditional, religious or cultural uses of importance that were related to indigenous communities, in the community sense. However, if it has been observed that there are some traditions that are kept in the internal sphere of each household, in an intimate way.

In addition, it should be mentioned that painted cologne was formed from the centrality existing around the Evangelical Pentecostal Church of the locality, which until today has a preponderant role in the social and spiritual organization of the community. Interviews with the local population show that a large proportion of the population attends the church's spiritual workshops, and that children also attend after school. The decisions taken in relation to the people go through the opinions of the spiritual leaders of the community, Are those leaders linked to the church. In that sense, the example was the fact that no other court was wanted in the land of Jehovah because it could discourage young people from entering the church's activities.

Photography 3.16: Evangelical Pentecostal Church Cologne painted


Source: Poch Environmental 2014

This centrality of the church has also affected the continuation of the traditional indigenous activities, since the spiritual centrality of the ancestral cults has been displaced by the spiritual centrality of the Evangelical Church. Indeed, the President of the Jehovah's Witness Indigenous association stated that for them the high places of the hills are important, as they are places of ancestral importance, but now any place that has any natural beauty, such as the Trees or water flows, were considered a sacred place. of this FRMA, the religious worldview went on to have an individual dependence, marked by personal experience and detached from indigenous territoriality.

In addition, it has been noted that this faith is central to the identity of the people. The chair of the painted (non-Evangelical) neighborhood Board of Neighbors, says that people "live on faith," referring to people being able to survive even if food or money is scarce. This can be explained by an important solidarity among the members of the village before the urgency of one of its members. On the other hand, the church has also maintained popular beliefs through myths, which are expressed in predictions, as is the case of a large earthquake in the north, in CUL ONLY the painted people will be safe, or the transmission of divine messages through third parties

This form of organization entails positive aspects, as the President of the Board of Neighbours in Cologne painted has said, there is no crime or drug addiction, as well as an absence of violence among the members of the community. Episodes of crime, violence, and alcohol or drug use would come from people outside the community, especially in the summer time when a large number of foreign people used the pool of Jehovah's Land.

However, the prevalence of the Evangelical Pentecostal religion has generated that traditional or community festivities and ceremonies of indigenous or traditional origin brought by the population have not been imported into this locality, because they have been Replaced by those of the dominant religion.

In the desert youth sub-sectors, New dawn and Santa Cruz de Pintado, there are no traditional ceremonies, both indigenous and non-indigenous, in a community way. The respondents commented that there were only traditional ceremonies in the internal or family environment.

According to the census of the year 2002, in the population of painted, 61.3% of the total population declared to belong to some ethnic group, in which a 96.1% Identified as Aymara While a 3.9% as Quechua. However, based on interviews with the neighbouring boards and indigenous associations of the four sub-sectors, there is a high percentage of the population that has arrived in recent years and that Self identify Like Diaguita.

Within the community of Pica, and according to the database of the Register of indigenous communities updated to June 2013 Conadi, in the commune of Pozo Almonte, there are 5 communities and 30 indigenous associations in force, as can be seen in the Tabla 3.57 : and Tabla 3.58 :

**Tabla 3.57** Existing indigenous communities of Pozo Almonte commune

| n ° | Name Indigenous community | Legal personality |
|---|---|---|
| 1 | Indigenous community Aymara De grime | 4 |
| 2 | Quechua Indigenous community of Mamiña | 30 |
| 3 | Indigenous community Aymara Macaya | 76 |
| 4 | Quechua Indigenous community of Quipisca | 113 |
| 5 | Quechua Indigenous community of Iquica | 131 |

Source: Registration of indigenous communities and associations, Conadi June 2013.

**Tabla 3.58** Indigenous associations in force in the municipality of Pozo Almonte

| n ° | Name Indigenous Association | Legal personality |
|---|---|---|
| 1 | Indigenous Association Aymara Desert Flower | 2 |
| 2 | Indigenous Association Aymara San Jose | 3 |
| 3 | Indigenous Association Aymara Ayllu | 6 |
| 4 | Indigenous Association Aymara Pampa Yapu | 7 |
| 5 | Indigenous Association Aymara Kespi Kala Mamiña | 8 |
| 6 | Indigenous Association Aymara Pampa Verde | 15 |
| 7 | Indigenous Association Aymara Workshop Kumie | 18 |
| **8** | **Indigenous Association Aymara Jehovah's Lands** | **22** |
| **9** | **Indigenous Association Aymara Desert Youth** | **31** |
| 10 | Indigenous Association Aymara Santa Rosa de Villablanca | 43 |
| **11** | **Santa Cruz de Pintado Indigenous Association** | **46** |
| 12 | Indigenous Association Aymara Migrants Daughters of Isluga | 48 |
| 13 | Indigenous Association Machaj Horage | 66 |

| n ° | Name Indigenous Association | Legal personality |
|---|---|---|
| 14 | Indigenous Association Aymara The Andes | 82 |
| 15 | Indigenous Association Aymara Ranchers, farmers and craftsmen Pampa del Tamarugal Marka Masis | 96 |
| 16 | Indigenous Association Aymara Peasant Pampa del Tamarugal | 112 |
| 17 | Indigenous Association Aymara Tamarugal Flower Artisans | 114 |
| 18 | Indigenous Association Aymara Santa Lucía de grime | 140 |
| 19 | Indigenous Association Aymara Marka Pahata | 168 |
| 20 | Indigenous Association Aymara Rising Sun | 170 |
| 21 | Indigenous Association Aymara Apo | 175 |
| 22 | Indigenous Association Children of Macaya | 180 |
| 23 | Indigenous Association Aymara Jallalla | 187 |
| 24 | Indigenous Agricultural Association, Aymara and Quechua Termas de Mamiña | 201 |
| 25 | Indigenous Agricultural Association of San Isidro de Quipisca | 202 |
| 26 | Mapuche Indigenous Association Newen Tw Le To Hyiñ Pw Peñi | 217 |
| 27 | Asociaicón Indigenous Aymara Tagj Pacha Arustañani | 226 |
| 28 | Aymara Kullalla Bury | 242 |
| 29 | Quechua Indigenous Association Cultural Center Girl of my eyes of Mamiña | 248 |
| 30 | Indigenous Association Aymara Nayra Inti | 254 |

Source: Registration of indigenous communities and associations, Conadi July 2013.

There are no indigenous communities within the project area, nor within their area of influence. However, it can be verified that there are three indigenous associations within the area of influence of the project, within the locality of Colonia de Pintado, in three of its sub-sectors, which are the indigenous association Aymara Jehovah's Lands, the indigenous association Aymara Youth of the desert and the Indigenous association Santa Cruz de Pintado, who were duly interviewed.

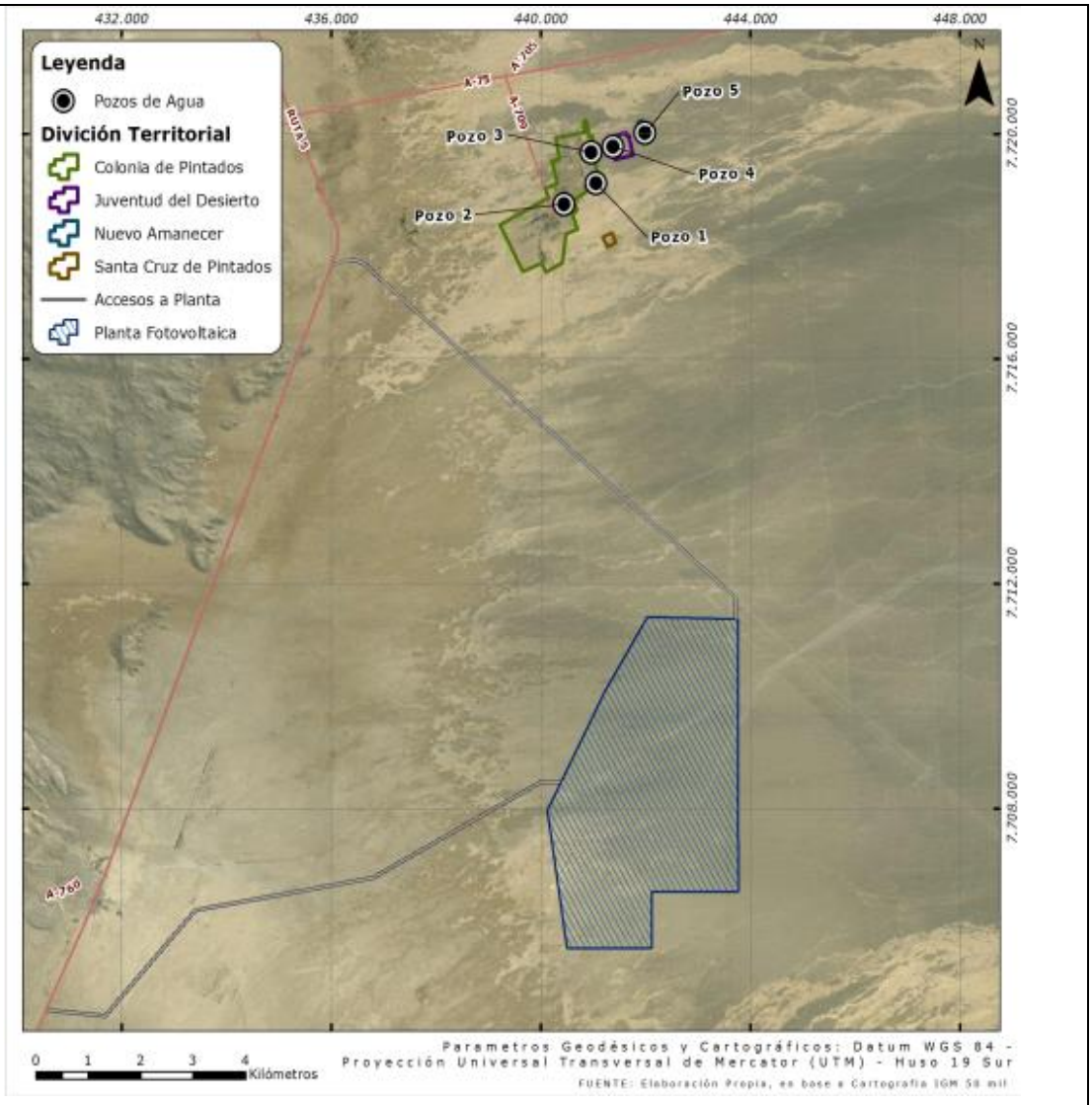
Of these three associations, and according to information from Conadi requested by law of Transparency Folio 1426, only the indigenous association is registered and in force. Aymara Jehovah's Lands. In accordance with the provisions of letter E. 10 of the regulation of the current environmental impact assessment system, the following points should be considered and described in the event of an indigenous population within the area of influence:

*Appropriation of the environment and use and valorization of natural resources*

In the case of painted Cologne, considering its four sub-sectors, it is observed that the natural resources occupied by the indigenous human groups are mainly linked to the economic, productive and subsistence activities, which are mainly Livestock and agriculture.

For this purpose the land and water are mainly occupied, which are accessible from the four sub-sectors indicated. In relation to water, there are the following extraction wells:

**Tabla 3.59** Water wells in Cologne painted




Source: Own Elaboration.

In this way, there would be 3 wells in the sector of Jehovah's Lands, a well in the desert youth sector, and a well in the new dawn sector. Santa Cruz de Pintado has no well, but has access to water from the wells of the other sub-sectors. Access to land has been better in the painted colony sub-sector, while in the other sectors the Interviewees say that the earth is clayey and that it must be worked intensely to be improved.

According to information from the DGA, those water wells that are regularized in response to the application by law of transparency (ACIS 15101) are as follows:

**Tabla 3.60** Water Wells regularized in the zone of Colonia of painted

| ***Type of regularization*** | **Dossier DGA** | **Holder** | **Act** | **Cause role** | **Date** | **Name Dot** | **Flow rate (L/s)** | **Nature** |
|---|---|---|---|---|---|---|---|---|
| With court ruling | NR-0103-0792 | Gregorio Shock Garcia and other | Court ruling | 1454 | 17-05-1999 | Well | 3 | Underground |
| With court ruling | NR-0103-0793 | Nicanor Segundo Ramos González | Court ruling | 1455 | 20-05-1999 | Well | 5 | Underground |
| No court ruling | NR-0103-3276 | Vladimir Mamani Vilca | S/I | S/I | S/I | Well | 5 | Underground |
| "Jehovah's Land" Parcel Project | Doesn't have | SAG resolution | 2015 | N ° Res. 2015 | 24-11-1988 | Deep Well n ° 1 | 22 | Underground |
| "Jehovah's Land" Parcel Project | Doesn't have | SAG resolution | 2015 | N ° Res. 2015 | 24-11-1988 | Deep Well n ° 2 | 28 | Underground |

Source: Information requested by transparency Law DGA 2014.

Some people, mainly from the area of the painted Cologne subsector, have said that they have livestock for self-consumption. This breeding is fed within the limits of the colony of painted, implying that they do not travel in other

adjacent sectors. This is generated because the production is low, so you do not need large extensions of land for your food.

In any case, they do not occupy the sectors in which the project is located for the provision of basic resources for agriculture or livestock, since in this sector there are no water sources used by painted Cologne, including its four sub-sectors, as well as Nor are there grazing areas for animals, nor land suitable for agriculture.

In addition, it has not been observed that natural resources are used for other purposes, such as traditional medicine, or practice of rites, as well as for heating, clothing, fuel, fodder, construction, utensils or handicrafts. In the interviews, it was ruled out that the site of the project is occupied to carry out traditional activities or any other type of activity of indigenous or non-indigenous religiosity. In none of the four sub-sectors mentioned there are festivities or ceremonies associated with these indigenous groups in a collective way. However, se h Stated that there are some ceremonies at the individual or family level, which are practiced inside the home.

Such intimate celebrations are coincident with the date of St. John, on June 23 or 24, and are not open to the community, but to the close family group, which can sometimes include people living in other locations.

Finally, it has not been observed that the area of the project, as well as the LAT, can hinder access to some natural resource used by some indigenous community for any purpose, especially traditional, ceremonial or religious. In this sense, CONAF reported that in the past there was an indigenous person who grazed in the area of La Pampa del Tamarugal de Bellavista, close to LAT, but currently no longer occupies the place temporarily or permanently. This place can be seen in the Photography:

Photography 3.17: Abandoned property Sector Bellavista, Pampa del Tamarugal


Source: Poch Ambiente 2014

On the other hand, the typical national festivities are celebrated as it is the 18th of September, Christmas and New Year. The school of painted Cologne has begun to position itself as a central place for the celebration of rites of an indigenous nature, such as the celebration of the indigenous New Year, which has begun to build a local significance, but which has not been Consolidated as a ritual of ethnic and historical origin, or something generalizable to the population on a regular basis.

Traditional indigenous rites and celebrations have been displaced by the rites of an evangelical nature. This church celebrates worship three times a week in the Jehovah's Land Sector. In the case of Desert youth, the cult Evangelical is celebrated in a particular house, with the same frequency, and with the same pastor. There is a very large number of the population involved, especially in the Jehovah's Land sector, which includes all ages and ethnic groups.

Although there are no celebrations within the community, some inhabitants of the four sub-sectors of the painted colony attend indigenous cults in other nearby locations, which are linked to their family and friends, as is the case with the parties that Are made in Cariquima, Camiña, Huara and Chumiza, as well as the Feast of St. Lawrence and/or the Tirana.

*Cultural practices and rituals*

The cultural practices of the locality of Pintado are strongly marked by the presence of the Evangelical Church, whose centrality is territorially plotted as it is constituted in the center of the locality. This is contextualized with the strong presence of the indigenous population, which has a system of values and beliefs that has been sincretizado with the evangelical belief and the strong agricultural culture of its inhabitants. However, it is this last (the evangelical religion) that has dominated more strongly on the ancestral indigenous culture, almost eclipsándola completely.

In this way, the family and cultural pattern is largely governed in a rather traditional way, establishing weekly continuous rites of the Evangelical Church, to which a large part of the population attends. Family characteristics are maintained in a traditional way, through marriage alliances that reinforce a traditional family sense.

Syncretism can be seen in the perception of the religious beliefs of the indigenous groups. For example, the president of the Jehovah's Indigenous Land Association stated that the beliefs of sacred sites linked to the areas typically Aymara, as are the high hills, has been transformed into a veneration to any space that has an intrinsic natural beauty, As can be the shadow of a tree in a deserted place. Thus also the idea of the divine manifestation has moved from an external vision to a vision that manifests itself internally, within the personal experience.

The settlement pattern and the hierarchical relationships within the community have been marked by the Evangelical church, especially in the Painted colony

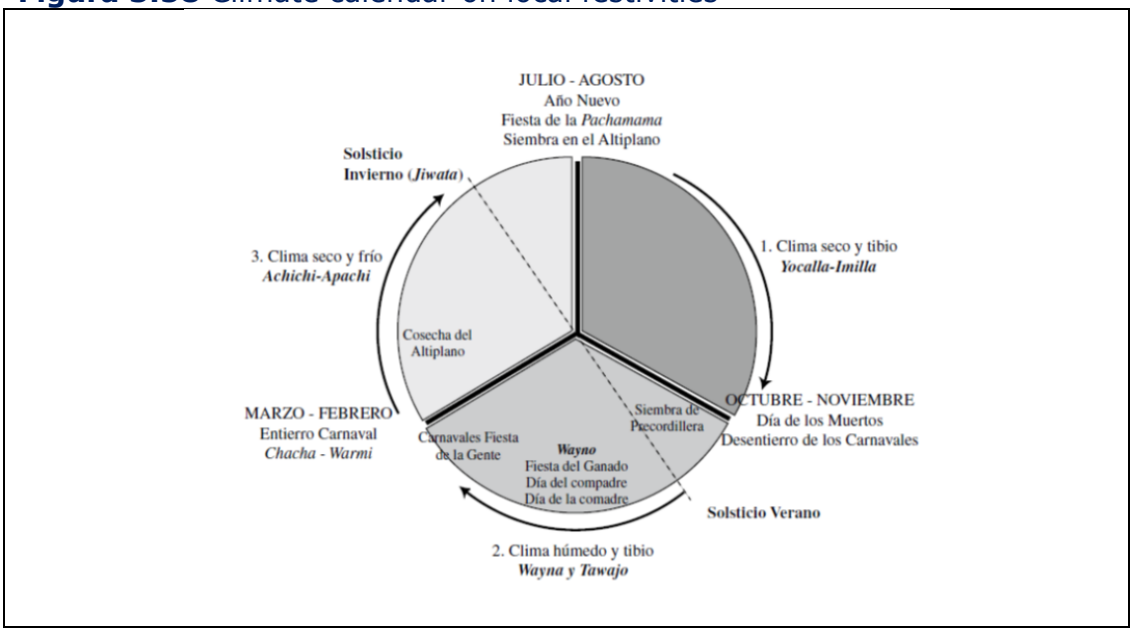
subsector. In this way, in the words of the President of the neighborhood Board of Colonia de Pintado, the Evangelical Church has a preponderant role in making the decisions of the people. In this sense, it was stated that there was an offer from the companies Quebrada Blanca and Cerro Colorado to buy the people to make use of their water, and that was rejected by the decision of the Church on behalf of the people in GenerL, because I could be against the divine mandates. On the other hand, the descendants of the 14 founding families are those who have control of natural resources, as is the case of land and water, because they are their owners and therefore, who can deny or facilitate access to it.

This also results in a significant reduction in the rates of crime, drug addiction and alcoholism, elements considered to be sinful by the church. And it is also a condition of maintaining the rural character of the locality of painted in its four sub-sectors, because the agricultural character is better adapted to the conditions and beliefs of both the Pentecostal religion and the indigenous groups present.

Although the indigenous language Aymara And Quechua It is known by an important part of the population, it is not spoken daily, and it does not constitute a relevant cultural symbol. Nor have they been able to observe indigenous cultural practices of a collective order. Only some traditional indigenous practices have been maintained at the family level, and privately.

Although it has been mentioned that there are no collective rites within the four sub-sectors of the colony of painted, it is good to mention that the tradition Aymara It is governed by calendars closely linked to the Seasons determined by the weather, as can be seen in the following calendar:

**Figura 3.58** Climate calendar on local festivities




Source: Gavilan and Carrasco, 2009.

In this way, the celebrations that exist in the commune of Pozo Almonte and that participate some members of the locality of painted Cologne, are reflected in the Tabla 3.61 :

**Tabla 3.61** PartyS Traditional in the commune of Pozo Almonte

| Religious holiday Name | Date held | Place in which it is carried out |
|---|---|---|
| Fiestas de San Santiago | 25 July | Macaya |
| La Tirana | 16 July | La Tirana |
| Pastors | 6 January | ReaperMamiña/Parca/La Tirana/Huatacondo |
| Candelaria | 2 February | Mamiña/ Macaya/Parca |
| Lourdes | 11 February | Quipisca |
| San Jose | 18 March | La Tirana |
| San Marcos | 25 April | Mamiña |
| San Felipe | 1 May | Iquiuca |
| Santa Cruz | 3 May | Mamiña/Tirana |
| San Isidro | 15 May | Quipisca/La Huayca |
| Pentecost | Variable | Mamiña/Tirana |
| San Pedro/San Pablo | 29 June | Grim reaper |
| Madonna del Carmen | 16 July | La Tirana |
| San Santiago | 29 July | Macaya |
| Assumption of the Virgin | 15 August | Huatacondo |
| Madonna of the Rosary | 7 October | Mamiña |
| Deceased | 2 November | Mamiña |
| Santa Barbara | 4 December | Iquiuca |
| Immaculate Conception | 8 December | Mamiña/Quipisca |
| Saint Lucia | 13 December | Grim reaper |

Source: Municipality of Pozo Almonte, 2013.

*Organizational structure*

Considering the four sub-sectors, there are three indigenous associations and two neighborhood meetings within the painted colony. In the case of the Jehovah's Lands subsector, both the indigenous association Aymara Jehovah's Lands as the neighboring board Colonia de Pintado belong to a larger unit that is the agricultural colony of painted, which is the one that gathers the whole town, and that is organized around the founding families.

In this organizational structure exists a structure of formal domination, which is expressed by the territorial organizations, such as the Board of neighbors and the indigenous associations, which have their own directive elected by vote, and that They represent the local indigenous and non-indigenous groups, with a structure of informal domination, which is the church, and which strongly influences other groups.

In the case of desert youth, a similar structure is functioning, with less influence from the Pentecostal church.

In the Santa Cruz subsector of painted and New dawn, there is no hierarchical structure so clear, because they are settlements that are in formation and do not have a relationship with the church as evident as the case of the Land of Jehovah and Desert Youth. In addition, the population is much smaller and would be directly linked to the formation of productive associations for agriculture.

*Indigenous Cultural heritage, including the places or sites in which are carried to Cultural and folklore manifestations.*

Within the area of influence there are no indigenous heritage sites, nor are there sacred places in which are carried out manifestations of culture or folklore, with the exception of the rites that are held in the Evangelical church.

According to interviews with the indigenous associations, they identify that the sites of religious importance indigenous are located in the high areas of the hills. In this context, the Geoglyphs Of painted are constituted as a site of cultural importance, which are located 5 kilometers northwest of Cologne painted. They are considered cultural patrimony, according to DS 5591 of the year 1969, which declares archaeological site by the Council of National Monuments.

These Geoglyphs They represent 964 figures, and represent a site of high archaeological and tourist interest, which is outside the area of influence and has no potential effect due to the execution of the project.

Another site of cultural significance is the former painting station, which is close to the Geoglyphs, and in which some people usually perform Pic-NIC, and the old employers ' house of the administrators and workers of the experimental agricultural project, which is currently occupied by the school and cemetery near the station painted.

However, the archaeological analysis found elements of cultural importance within the area of influence, which were troop routes, which moved from the indigenous communities of the Cordillera, to Cerro Pintado and the nitrate of the Victoria office.

*Group identity through cultural elements*

The only aspect that was considered relevant for the group identity of the indigenous groups of the sub-sectors of the colony of painted were the traces troop found, since these corresponded to a relationship of dependence between colony of painted and the office of Victoria, which gave birth to what is Cologne painted today. In this way, it is historically linked to the formation of the identity of the people of Colonia de Pintado, which became, in the year 1948 in an exchange center that grouped the different indigenous communities of the interior, and that posteriormenE served for the provision of goods and services to the nitrate.

In this way, the troop routes constituted a historical link that gave the origin and character to the locality. However, there is currently no reference to the troop footprints existing in the sector by the community, nor do they perform cults, acts of protection or other social actions related to them, so it is ruled out its importance in the Today. In addition, there are no organizations linked to the footprints Troop, and the interviews did not cast a vital importance on them.

*System of values and symbols of group membership*

Due to the locality's strong evangelical Pentecostal influence, which has surpassed in many respects the ancestral indigenous culture, the system of values and beliefs of the town of Colonia de Pintado has been significantly dominated by it. In fact, the census of the year 2002, showed that in the locality there is a more or less similar percentage of Catholics and evangelicals, and that the indigenous population is mainly evangelical, as can be seen in the following table:

**Tabla 3.62** Inhabitants by type of religion

| **Professing religion** | **%** |
|---|---|
| Catholic | 44 |
| Evangelical | 42.7 |
| Another religion or creed | 6.7 |
| None, atheist, agnostic | 6.7 |
| Total population, 15 years or more | 100 |

Source: Own Elaboration from census 2002

In this way, the evangelical religion has been superimposed on the traditions that could be expected in the population of ethnicity, implying that the worldview is more related to the religious than to the ethnic. For some inhabitants, even their ancestral customs could be counterproductive with religious Pentecostal customs, but for others, incorporate them with their own or practice them at a much more individual and discreet, which is the Family environment.

In relation to the symbols of group belonging, they have become, nowadays, more by the symbols of the Evangelical Pentecostal church than by those of indigenous belonging. In this sense, the greater centrality has Church and all its rites, which has gone on to form the symbol of greater presence regarding the group identity of the community. On the other hand, Colonia de Pintado has a distinctive seal to the rest of the colonies of the area in its eminently

agricultural seal, with a greater proximity to nature and the environment, which has also become part of its identity. Therefore, water and land are understood to be essential to their identity and survival as a people.

However, painted colony also shares certain symbols Identity Originated from their indigenous status, such as the Painted Hills, which appear as a common reference to all inhabitants of the locality, as they establish a connection with their common ancestors.

It is in this line that the school of the people has generated a rescue of the identity of the people, establishing the rescue of the indigenous. In it, it has been identified as the meeting place to celebrate traditional festivities, such as the indigenous New Year.

- *Socio-economic dimension*

In the case of Colonia de Pintado, the main productive activity is agriculture, which has also been constituted as an essential part of its identity as a human group. By observing the subsectors, one can see that there are significant differences in the access of the essential resources for their production, which are the land and the water.

The increased availability of these resources is presented in the Painted colony subsector. In the other subsectors the water can be extracted from engines, whereas the lands must be prepared arduously to be able to cultivate products.

Since its inception, Colonia de Pintado was a locality that based its productive activity on the sale of its agricultural products, oriented towards horticulture and the sale of some fruits. In the beginning, this sale was Destined to the former Victoria nitrate, while later, and due to the closure of this, had to expand to other sectors such as Pozo Almonte, Iquique and Antofagasta. The main agricultural activities are alfalfa, quinoa, onion, lettuce, tomatoes, watermelons and melons.

Photography 3.18: Agriculture in Colonia de Pintado


Source: Poch Environmental, 2014

The work system is generated through drip irrigation, in which the soil is prepared by mixing flour and guano, so that the ground has the necessary nutrients for a good harvest. It is valued that this production is free of chemical products, so it is prioritized to be developed from biological control, which can be largely due to its evangelical Pentecostal religious conception.

On the other hand, there is also a cam productive activity, which is managed exclusively for family consumption, which is mainly based on the breeding of llamas, pigs and hens.

It is important to mention that in the subsectors of the lands of the Lord, Youth of the Desert and new dawn, solar panels have been installed in various places in order to make cheaper the production of crops and the electric consumption in general, which is more notorious In the case of desert youth and New dawn, sectors that use solar energy to mobilize water from wells.

It is important to mention that the Parceleros have participated in various public and private development programs. In the private sector, mining companies such as SQM and Quebrada Blanca have participated, and in the public sector INDAP, and the prodesal of the I. Municipality of Pozo Almonte.

Nowadays the programs of these organisms are focused on the improvement of soils, injecting them with sand so that they have a greater porosity and aeration.

These programs benefit three of the four current sub-sectors, excluding the Santa Cruz sector, and benefiting 20 users.

The quantity of cultivated hectares of colony of painted in its entirety would be of about 26 hectares according to information of the prodesal, and its Breakdown can be seen in the following table:

**Tabla 3.63** Arable land in painted colony (hectares)

| Land of the Lord | Desert Youth | New Dawn |
|---|---|---|
| 13 | 10 | 3 |

Source: own elaboration from information of the prodesal of the I. Municipality of Pozo Almonte.

Despite the fact that in the majority tendency of the painted colony is to work in agriculture, there is an important percentage of the young population that has been linking with the mining work, because this sector presents greater opportunities of work and Better pay conditions. In this sense, the perception

of the community is that young people are orienting themselves towards branches of economic activity away from the world of agriculture.

In addition, there is also the development of some degree of trade, which includes small family businesses selling groceries and warehouses, in the sub-sectors of Jehovah's lands and desert youth.

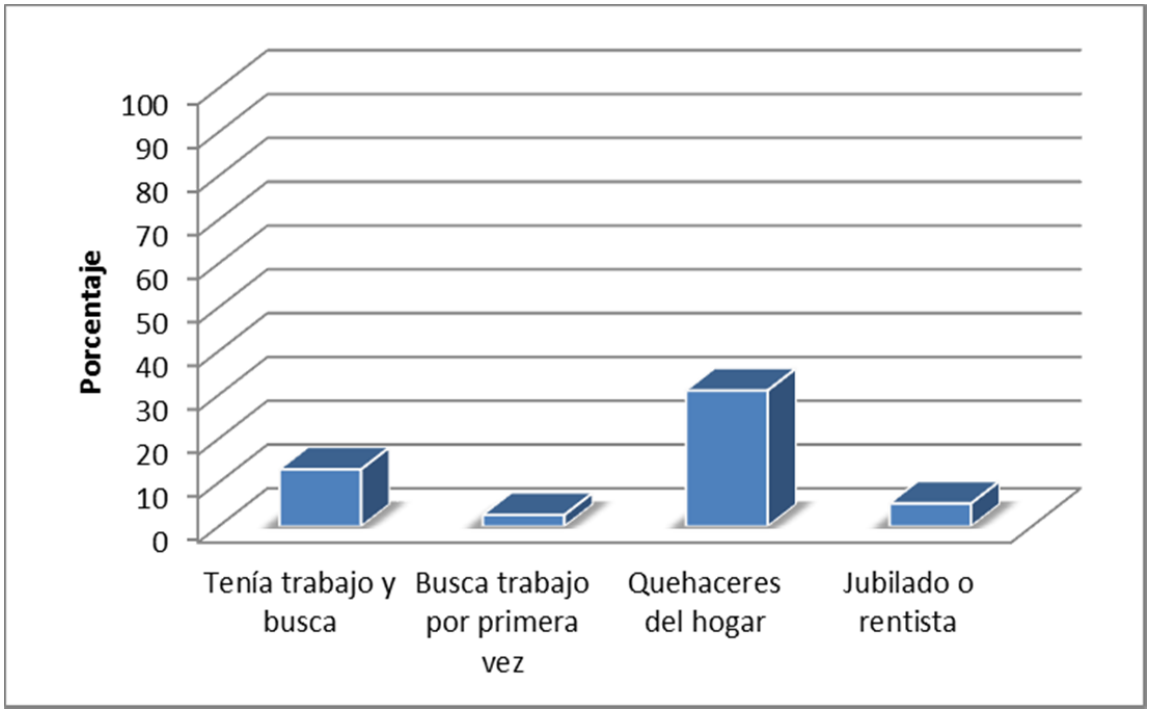
In addition, there are accommodation and food services for mining-related companies (such as Minera San Luis), as well as a private camping site and a permanent residence camp.

The Cologne Agricultural Society painted, as a whole, carries out commercial transactions with the water to the contractors companies of mining projects, which provides important income for the community.

In this sense, the tendency of economic growth of the locality is oriented to provide services to the companies related to the mining, that to the development of other productive activities like the tourism, although it is not ruled out that it can produce a work of Mutual growth.

According to the census of the year 2002, the occupied population corresponded to 41.3% of the economically active population, and to 46.3% of the economically active indigenous population. The breakdown of unoccupied persons would be as follows:

***Graphic: Economically occupied population by type of occupation***




Source: Own Elaboration from census 2002

In this way, 13% had work before and are looking for, a 2.6% seek work for the first time, 31% are looking to work in household chores and 5.2% are retired or renters. The rest, has another situation not specified in the census.

In the case of Victoria, productive activity is linked to the provision of services. This was also the year 2002, since of the 19 people working for income, 15 worked providing services.

Currently, this service delivery is reduced to three restaurants, a benzine pump, a warehouse and a vulcanization workshop. According to the inhabitants themselves, there has been an immigration process, which has diminished the population, so there is a slow decrease in the village. However, because demand for service provision should increase in the coming years, there might be an opportunity for Victoria to have some degree of development. Tourism has positioned itself as a possible source of potential development, due to the The growing importance of the Geoglyphs of painting and the possibility of

enhancing the tourist interest of the remains that are present in the former Victoria office.

In this way, the entire population of Victoria works independently by providing services in their own businesses. The contracted people work mainly in the benzine pump, or in the restaurant San Roque, of which the majority are temporary migrants from other countries, especially Bolivia.

Photography 3.19: Restaurants in Victoria




Source: Poch Environmental 2014

- *Social Welfare dimension*

*Access to health*

Within the area of influence, there are no health facilities. Indeed, both cologne of paintings and Victoria attend health services outside their locality, which corresponds to Pozo Almonte by communal division. In the case of Colonia de Pintado, they also attend Pica's health services in case of urgency, as it is a locality much closer to Colonia de Pintado. In addition, the I. Municipality of Pozo Almonte provides a medical round for Cologne painted, but not for Victoria. This medical round is already insufficient for a population that has had a crec rather explosive demographics in recent years.

The administration of La Posta de Pozo Almonte was given to the Municipal Social Development Corporation of Pozo Almonte (CORMUDESPA).

The medical round is made once a month, on the 24th, and it considers in its endowment a doctor and a paramedic, but it does not consist of midwife. In the case of an emergency, they call the ambulance coming from Pozo Almonte, although the respondents say that it is often occupied in other services. This is also reflected in the information collected in the Pladeco Coordination Unit, one of the biggest problems detected has to do with this lack of post, ambulance and staffing.

*Access to education*

In Colonia de Pintado there is a basic school, which is under the administration of CORMUDESPA, which is called "Oasis in the Desert". In the year 2008 had 41 children registered, and currently has approximately 60 children. He has four teachers in the classroom. Attends children ranging from kindergarten to eighth grade, with two courses Multigrade.

Photography 3.20: Desert Oasis Basic School


Source: Poch Environmental 2014

In general, the parents of this school have a complete average education, being about 80% of the children indigenous descendants. This school is connected to the Internet, mainly because it is part of the government's links network, which makes it the only place with internet access of the painted colony and its four sub-sectors.

In general it has good infrastructure, because it has air conditioning, computers, projectors, etc. It is important to mention that part of this infrastructure was deteriorated by the earthquake of the year 2005. The school has important funding from various sources, such as the mining companies Teck and SQM, the MINEDUC and the Regional development funds.

In addition, the school has been a center of rescue of the indigenous culture, because it produces different activities in the important days for the indigenous calendar. Indeed, the interviews show that it is there where the new Year is celebrated indigenous, there are activities of coexistence, and traditional dances are made. This will lead to the implementation of the Intercultural Bilingual education program next year.

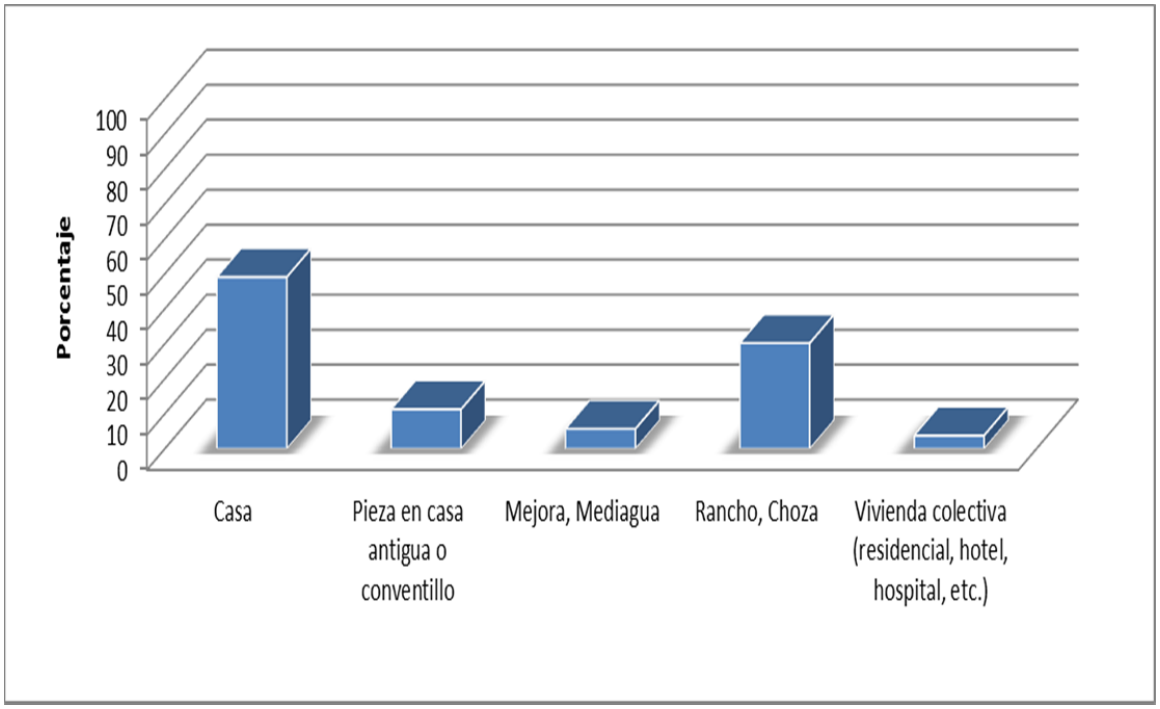
At the end of basic education must travel to Pozo Almonte or Pica, which involves traveling every day or attend a boarding school. The respondents said that the choice of one or another place has to do with the type of profession that may be interested the least in the future, as Pica is more related to agricultural activities, while Pozo Almonte is more related to the Mining activities. It is important to mention, that by communal division, it corresponds rather to Pozo Almonte the continuity of the studies, but many times it is easier for the people ofPainted cologne continue the studies in Pica.

In the town of Victoria there are no educational services of any kind, so the children should attend Pozo Almonte to study. However, the field work showed that there were no children in the locality, so this service is not necessary at present, rather than to encourage the migration of new people.

*CAntidad and type of housing*

According to the information rescued from the census 2002, Colonia Pintado had 53 houses, of which 49.1% corresponded to houses, 30.2% were ranches or huts and 3 mediaguas. This can be seen in the following graph:

***Graphic: Percentage of people per type of housing***

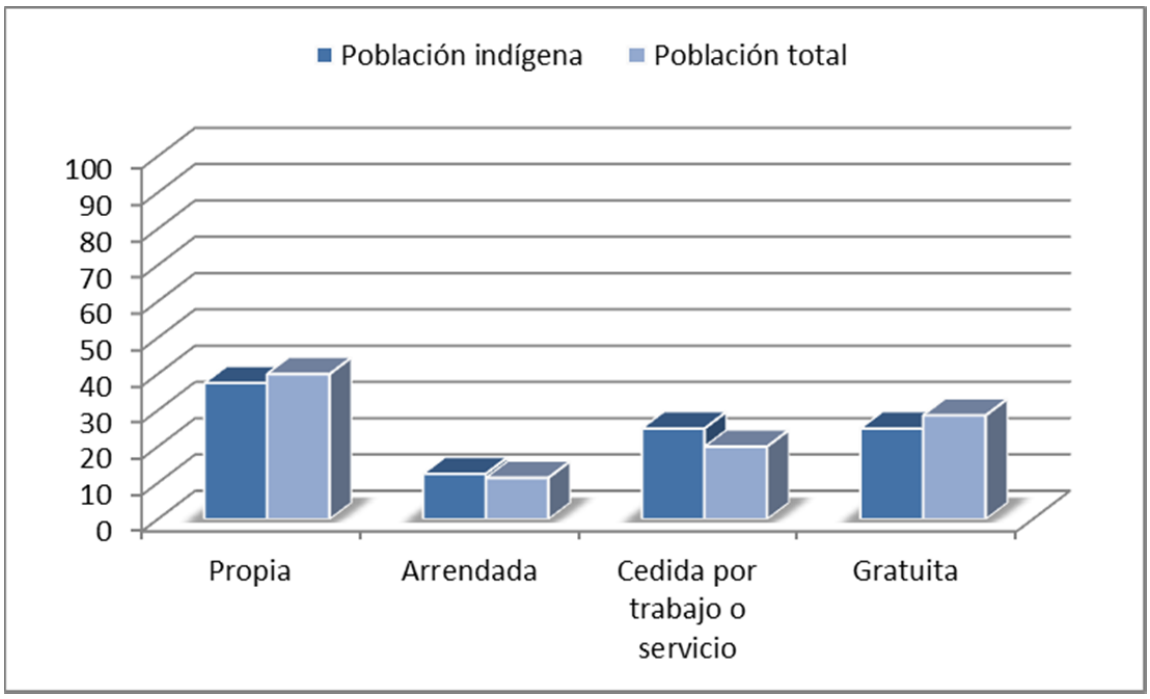



Source: Own elaboration from census 2002.

When analyzing the indigenous population, it can be observed that this percentage is similar, since the 2002 marked 11 inhabited houses, followed by 7 ranches or hut, implying that a total of 75% of the inhabitants lived at home.

When analyzing the tenure of the house, it can be observed that the largest number of people in the locality falls into the own category, with about 40%, which is shown with a slight difference between indigenous and non-indigenous population:

***Graphic: Comparative percentage of population by property of the House, in total and indigenous level.***



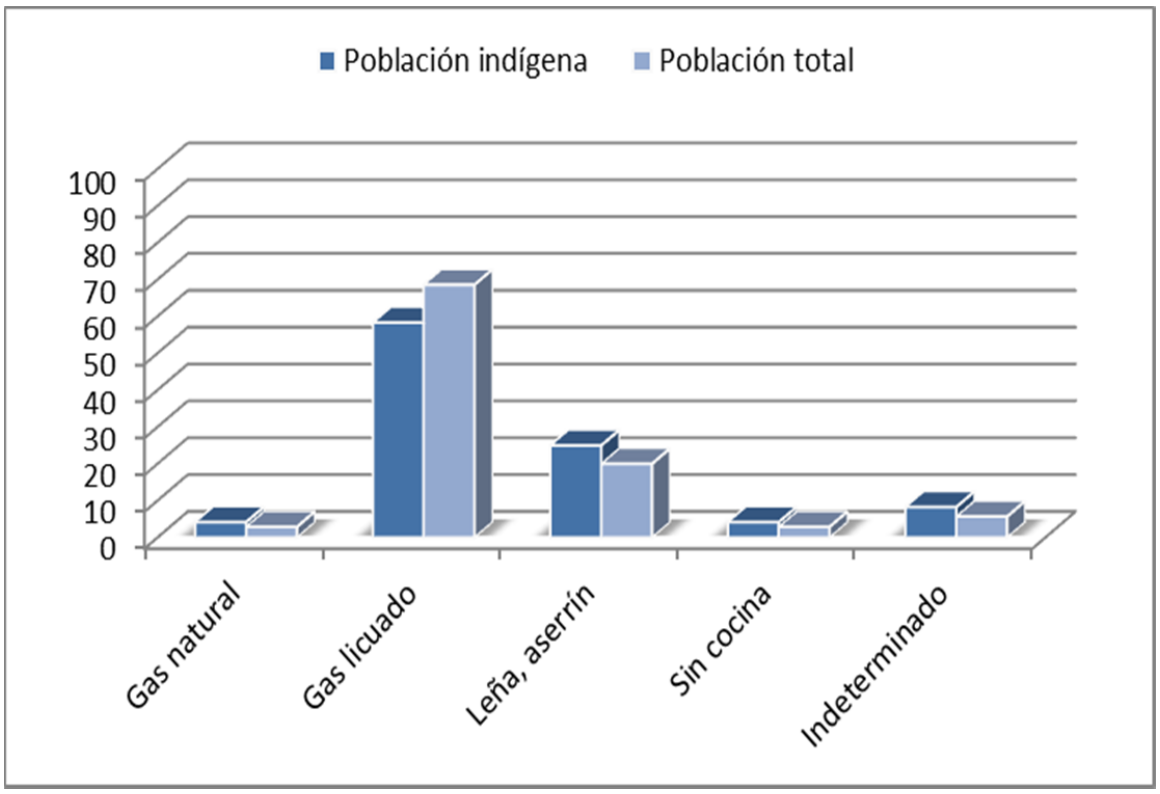

Source: Own elaboration from census 2002.

In this way, there is a slight difference in the number of own and free homes, which are higher in the total population, while the number of homes leased and ceded for work or services, which are higher in the indigenous population. The biggest difference is observed in the category ceded, in which the indigenous population reaches 25% while the total population to 20%, and in the free, in which the total population has a 28.6%, while the indigenous population is 25%.

On the other hand, there is a rather minor overcrowding condition in the indigenous population with respect to the total population, since in the first case it reaches 33.3% while in the second case it reaches a 50.9%.

Finally, the data regarding the type of fuel used for cooking, can be seen in the following chart:

***Graph: Comparative percentage of population by use of fuel for cooking, in total and indigenous level***




Source: Own elaboration from census 2002.

In this way, it has been observed that the indices that compared the total population with the indigenous population on the use of cooking fuel are similar, with the clearest exception of the use of liquefied gas. In this sense, 68.6% of the total population uses liquefied gas, against 58.3% of the indigenous population. Another difference is that the total population uses 5% less firewood than the indigenous population, which reaches 25%.

In the case of Victoria, according to the census record of the year 2002, there were a total of 8 dwellings, of which 2 are houses, 5 are pieces in old house or tenement, and one is a collective dwelling. The main fuel used was liquefied gas, with a total of 5 households, followed by firewood with 3 households. In relation to the property, there were 4 houses paid, 2 rented, and 2 ceded by work.

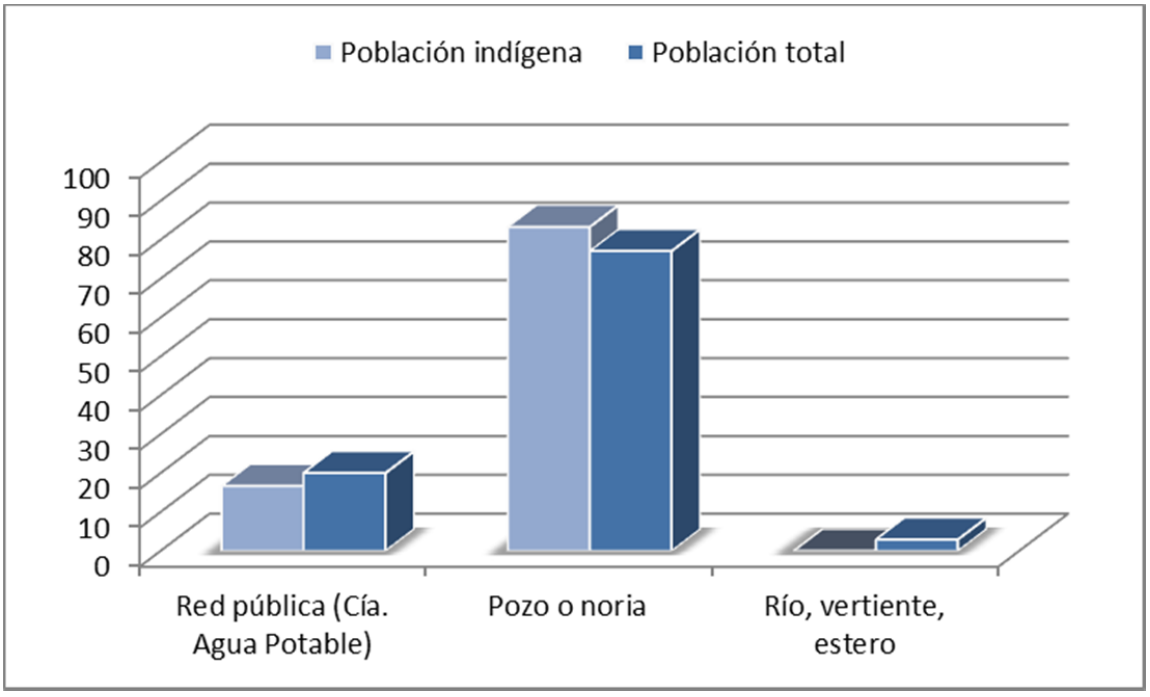
At present, year 2014, there are a total of 6 dwellings, which are in general in good condition. In this way, there are 2 houses, 2 shared pieces and a common house. Of these, 4 houses are paid, 1 leased and 1 ceded for work.

The majority use of fuel is gas, which comes from Pozo Almonte.

*Access to basic goods*

According to the census of the year 2002 in relation to access to water, the majority of the population, ie 77.1%, access through well or noria, while 20% is connected to the public network, ie the drinking water company. The breakdown is shown in the chart below:

***Graphic: Access to water compared to the indigenous and total population levels.***




Source: Own Elaboration from census 2002

In the Graphic, it can be seen that there is a difference between the total population that has access to drinking water with respect to the indigenous population, since the latter reaches a percentage of 16.7%. There is also a

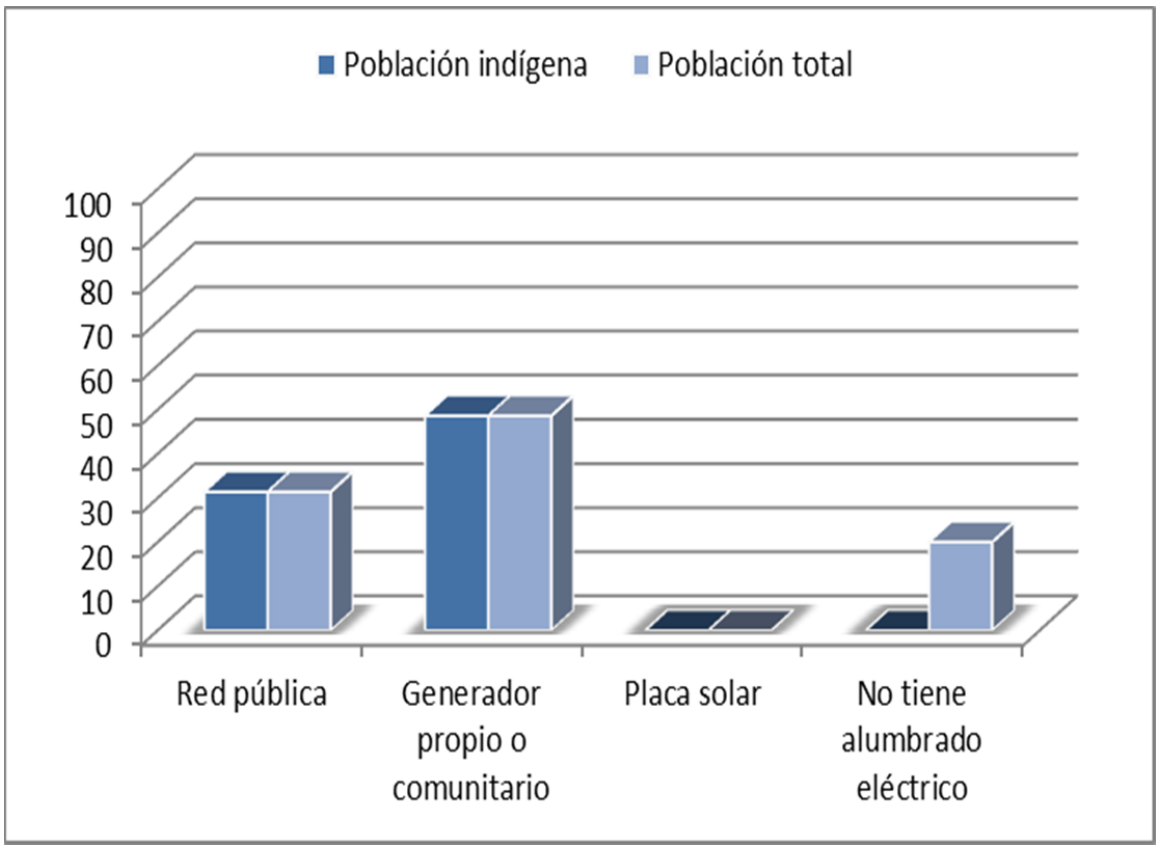
Positive difference of 6 points in those indigenous people who have access to Pozo to Noria with respect to the total population, reaching 83.3%. It is important to note that the indigenous population does not have population that obtains water directly from the river, shed or estuary, which makes a difference with the total population that has a 2.9% population that accesses the water through this form.

As mentioned above, the water is free and administered by the Agricultural Society of the Lord, in the case of the colony of painted subsector, and by the Indigenous Youth Association of the Desert, in the case of the desert youth subsector.

Field-based interviews show that there is no public water network in the sector, but they are extracted entirely by wells or groundwater norias.

On the other hand, the census of 2002 showed that about 80% of the houses have access to electricity. This can be seen in the following graph that compares the total population with the indigenous population:

***Graph: access to electricity compared to indigenous level and total population.***




Source: Own Elaboration from census 2002

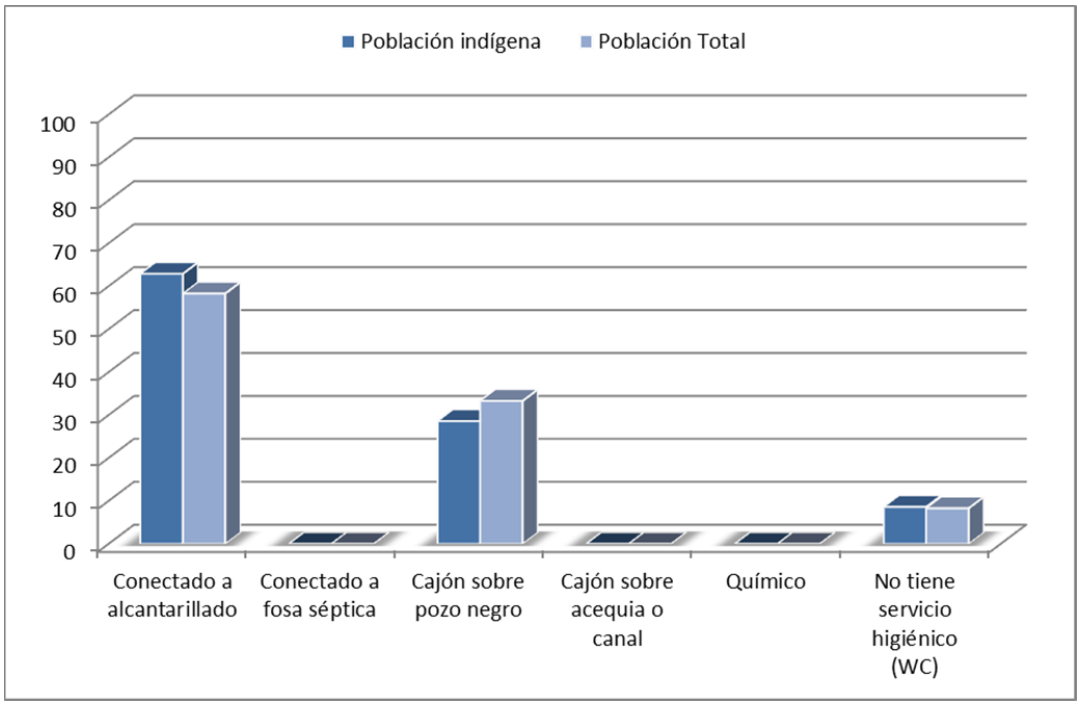
When comparing the data of the total population with respect to the indigenous population, it is observed that there is a difference in access to public lighting. In this way, 20% of the total number of houses does not have public lighting, whereas in the indigenous population there are no houses that do not have access to public lighting.

However, this situation could have worsened, because there are currently new relatives who are indigenous, as is the case of the youth of the desert and Santa Cruz de Pintado, who have no access to electricity.

Statistics on the excreta disposal system show that, according to the census of 2002, 62.9% of the population is connected to sewers, while 8.6% have no hygienic service. The remaining would have drawer over black well, which would correspond to a 28.5%.

When comparing these results to the total and indigenous population, the following graph can be seen:

***Graphic: System of elimination of excreta at a comparative level, indigenous population and total population.***




Source: Own Elaboration from census 2002

The previous graph shows that the most important differences are in the percentage of people with connection to the sewer, as the total population reaches 58.3%, while the indigenous population indicates a 62.9%. In this case, people who are not connected to sewers have a drawer over a cesspool, or no toilet service.

In relation to waste collection and disposal systems, it is managed by the municipality of Pozo Almonte, which is deposited in its municipal landfill.

In the locality of Victoria, they must buy the water in Cologne of painted, because they do not have access to this resource, which is transported by means of private vehicles. On the other hand, all inhabitants have access to electricity permanently through splicing with the central interconnected system. Victoria does not have sewerage, so its excreta disposal system is made by septic tank.

*Access to transportation, infrastructure and recreation*

As basic infrastructure, it is necessary to say that there is no municipal office in Colonia de Pintado, nor headquarters for neighbours ' meeting, so the municipal procedures are carried out in the locality of Pozo Almonte. The neighborhood board of Colonia de Pintado meets usually in the House of the President, or in the home of another neighbor.

The town of Pintado has two ground football fields, which are located in the subsector of the land of the Lord and in the Desert youth subsector. There are playgrounds adjacent to a water collection pond for irrigation, which are in regular conditions. This pond is used as a swimming pool in the summer. In addition, the Jehovah's Land subsector has a church, a school, and some minor businesses.

In Colonia de Pintado there is a transport that passes 3 times per week, 3 times a day, from 7 AM, and charges $2,500 pesos. In addition, there is a particular transport so that local children can mobilize to their schools, ranging from Pica to Pozo Almonte.

Photography 3.21: Water collecting pond which is used as pool, painted colony


Source: Poch Environmental 2014

In the case of Victoria, there is no mobilization, so they use private car, or take the buses that go from Arica or Iquique to the south, which charge 3,000 pesos and are conditioned to the availability of seats.

There are no children in this locality as well as social and community organizations. There are no churches or other relevant infrastructure that has current use, except for the cemetery. There are remnants of past infrastructure, which are the remains of the former Victoria nitrate, which is consolidated as a site of tourist interest, especially the remains of the pool, the square, and the old houses.

Photography 3.22: Victoria Cemetery


Source: Poch Environmental 2014

Photography 3.23: Remains of the central square and swimming pool, Victoria


Source: Poch Environmental 2014

## 3.8.4 Conclusions

The area of influence of the project was defined according to the possible affectations in its cultural roots and Identity, which could have the human groups close to the project, before the eventual intervention of patrimonial routes. These human groups correspond to the towns of Victoria and Colonia painted.

In this way, both villages were characterized, taking into consideration the five dimensions established in the regulation of the Environmental Impact Assessment System (SEIA) as minimum contents of an EIA, in point E. 10, namely, geographical dimension, Demographic dimension, anthropological dimension, socioeconomic dimension and basic Social welfare dimension.

In relation to the geographical dimension, Colonia de Pintado is a village whose main access is by the road to Pica on route A-75, and is located 8.5 kilometers from Victoria, 32 kilometers from La Tirana and 47 kilometers from Pozo Almonte.

The town of Pintado is composed of four sub-sectors, which are the land of the Lord, Youth of the Desert, New Dawn and Santa Cruz de Pintado. The one with the highest population density is the subsector of the lands of the Lord, which is also the service center of the four subsectors. It has a basic school, stores, the main church and entertainments, such as the swimming pool and playgrounds, among others. In addition, it has a transport system that passes three times a week and that allows to mobilize to Pozo Almonte and Pica. It also has access to water and electsecularity, but not sewer.

This locality has access to the main natural resources for its economic sustenance, which are obtained within the same locality, and are administered by groups of peasants both indigenous and non-indigenous. Its form of organization has a formal structure, organized by the neighbors ' meetings and the agricultural and peasant associations, and one rather informal, which has to do with the church and the descendants of the families who inherited the town.

Victory instead is a small town that is adjacent to Route 5, located on the southern boundary of the commune of Pozo Almonte, inhabited by people who belonged to the nitrate Victoria. This locality is aimed at delivering food, housing, and fuel services to workers in companies operating in the area, such as SQM, Quebrada Blanca, and other smaller enterprises.

For all the most complex procedures and services must go to Pozo Almonte. The town of Victoria has no water or sewer, but with electricity. In addition, it has no children and its population has been migrating to other locations since the year 2002. It has No transport, and if you have a phone connection.

The results of the geographical characterization show that there is no possibility of affectation in Cologne of painting or victory in relation to its accessibility, connectivity, access to services, or territorial distribution, due to the works or actions of the project.

As for the demographic dimension, baseline results show that no population was found in the areas surrounding the area of influence. There is also no population that makes use of natural resources in the area of La Pampa del Tamarugal closest to the project, ie Bellavista. The painted population is particularly young, with a population engaged in agricultural activities, and has been increasing in recent years. On the other hand, in Victoria, there is a decrease in population, there are no children, and it is a population dedicated mainly to services.

It is not observed that there is affectation in relation to the demographic dimension of the population due to the works or actions of the project.

As for the anthropological dimension, in Colonia de Pintado there is an indigenous population that does not maintain traditional activities linked to their ethnic groups in a collective way. There is no use of natural resources, traditional uses, festivities, rituals or sites of cultural significance within the project area, or that may be affected by their works or actions.

Despite the fact that, for the definition of the area of influence, the elements contained in point (d) of article 7 of the Regulation of the current environmental system were considered, DS No. 40 of the year 2013, because there was a potential effect on cultural roots due to The existence of traces troop, its effect was ruled out because the interviews do not show a manifest interest, as well as there are not actions of vindication to them as they could be rites, cults, actions of protection or others.

As for the socioeconomic dimension, it can be observed that the productive vocation of the painted colony, including its four sub-sectors, is oriented towards the production of vegetables and fruits for sale to the main towns of the north, and livestock For self-consumption. They also sell water in a community manner, and there is an orientation towards the growth of mining in the young population because it delivers better wage prospects and employability. The occupied population is 40% and 20% are looking for work. This is explained because there is a degree of informalityAt work in the area. In the subsector of Jehovah's Lands There is also provision of some services, such as warehouses, groceries, accommodation and restaurants.

In the case of Victoria, its composition in terms of employment has not varied since the year 2002, since it is still oriented towards the services to mining and construction companies that are located in the vicinity. In this sense, all people have their own businesses, and people who have been employed are almost all from abroad, and work in a restaurant in the area. It has been observed that there may be an opportunity Related to the development of tourism that can be used by this locality.

It has been observed that there is no possibility of affecting the socioeconomic activities of Colonia de painting and Victoria due to the works or actions of the project.

Finally, the analysis of the social welfare dimension showed that both the colony sector of painting and Victoria do not have access to health within their

locality, for which they must attend, by Municipal dependency, to the locality of Pozo Almonte. However, the people of painted Cologne also attend Pica's office in case of urgency, because it has less time away.

In relation to education, the subsector of the Land of Jehovah has a school that has up to eighth basic. Both cologne of painting and Victoria do not have other educational centers. In the case of Colonia de Pintado, children travel to Pica or Pozo Almonte to continue their studies, while in the case of Victoria, no children were presented who might need the educational services.

Painted Colony in its four sub-sectors has well water, electricity, mobile phone, but not sewer. On the other hand, Victoria must buy the water in Cologne painted.

The connectivity and access to all these goods is given through Route 5 or within the locality, so they will not be affected by the works or actions of the project.

In conclusion, there is no alteration in the life and customs systems of the human groups associated with the works or actions of the project, according to article 11 (c)) of the Environmental law and article 7 of the Regulation of the impact assessment system to Mbiental (ds N ° 40 of June of 2013), relative to the human environment.

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## 3.9 PROJECTS WITH RCA NEAR THE PROJECT AREA

### 3.9.1 Objective

Will identify And they will describe in general terms Projects close to the site area of the QPhotovoltaic arch Cielos de Tarapacá In order to establish The contribution of these to the baseline.

### 3.9.2 Methodology

According to DS n ° 40/12, art. 18, letter F, "for the evaluation of synergistic impacts, projects or activities with a current environmental qualification should be considered in accordance with the provisions of paragraph E. 11". On the other hand, in paragraph E. 11 of the same article indicates that "projects or activities that have a current environmental qualification resolution, when they are not operating. For these purposes, all projects or activities that relate to the environmental impacts of the project under evaluation will be considered,

contemplating the TÉRMWe in which such projects or activities were approved, especially in relation to their location, emissions, effluents and wastes, the extraction, exploitation or use of environmentally approved renewable natural resources and any other information Relevant to define the baseline of the environmental impact study. "

In order to comply with the foregoing, the projects with a favorable RCA have been identified which are close to the project site area.

In order to identify projects with RCA favorable, we proceeded to review and compile the antecedents published in the Environmental Impact Assessment System (SEIA) of the region of Tarapacá, Pozo Almonte commune, whose income form was through declaration of environmental impact (DIA) or by environmental impact assessment (EIA).

The search for projects was located in the commune of Pozo Almonte, given the location of the project photovoltaic Cielos de Tarapacá. Finally, the description of those defined projects was made.

### 3.9.3 Results

#### *3.9.3.1 Project identification*

Is Identified 9 Projects In the environment of the project area, the Which Is Show In Tabla 3.64 :

Post-identification of projects with RCA Approved, a characterization was made to show the relationship between these and the project photovoltaic Cielos de Tarapacá.

**Tabla 3.64** Projects With Rca In The Area

| n ° | Name | Holder | RCA Date |
|---|---|---|---|
| 1 | Painted SOLAR Plant | Solar-Painted Plant S.A. | 02-Oct-2014 |
| 2 | Extraction of aggregates for "improvement of route A-760, DM 13,500.000 to DM. 34,400.000, and other ways. EX-Office SECTOR VICTORIA, POZO ALMONTE commune, TAMARUGAL Province, TARAPACÁ region | Constructora SALFA S. A | 10-Apr-2012 |
| 3 | Modification LOCAL Day Commercial restaurant and housed | Veronica Isabel Zárate Arancibia | 14-Feb-2012 |
| 4 | Visitor Center and CONTROL Booth geoglyphs of painted | CONAF first region of Tarapacá | 10-Jun-2011 |
| 5 | SOLAR PV Complex PICA 90 MW | Element Power Chile S.A. | 20-Dec-2011 |
| 6 | New VICTORIA Mine Area | SQM S.A. | 5-Jun-2008 |
| 7 | LOCAL Commercial Restaurant and housed (E-SEIA) | Veronica Isabel Zárate Arancibia | 18-Aug-2005 |
| 8 | Construction system electrification Agricultural colony of painted (E-SEIA) | Augusto Smith Marín | 31-Oct-2003 |
| 9 | Electrical distribution line substations of the ACF mining lakes | Compañía Electrica Tarapacá S.A. | 11-Jul-1998 |

Source: Elaboration Own

### *3.9.3.2 Characterization of projects*

Below are the projects and the characterization of these.

**Tabla 3.65** Painted Solar Plant

| Project name | Painted Solar Plant |
|---|---|
| Location | Pozo Almonte Commune |
| RCA number | Resolution exempt N º 093/2014 |
| Approval date | 02-Oct-2014 |
| Holder | Solar-Painted Plant S.A. |
| General description | The project consists of the construction and operation of a 77.44 MW photovoltaic plant and a maximum installed power of 85.30 MW. All the energy generated by this plant will be injected into the large North interconnected system (SING). The plant will have 280,000 photovoltaic modules on horizontal axis supporters. The evacuation system comprises a transforming substation located inside the plant and a high voltage line (hereinafter LAT) of 220 Kv and 29 km in length, which will allow to connect the energy generated by the PFV with the existing LAT of 220 Kv, which goes from Pozo Almonte to the substation of Lagunas. Additionally, the project includes interior roads, a perimeter fence and an access road that will connect the route A-75 with LAT. This road will have an approximate extension of 1.3 km and a width of 10 meters. |
| Main environmental measures | The main control measures to be implemented are:<br>-it is envisaged the use of provisional signposting (pedestrian and of transit) suitable to the interior of the tasks.<br>-The road signs existing in the nearest routes and access to the project area will be reinforced.<br>-All personnel who drive a vehicle will be trained |

| Project name | Painted Solar Plant |
|---|---|
| | through a driving course to the Defensive, especially in relation to driving in a preventive way in the presence of pedestrians.<br>-The verification system will be carried out by means of a control of each vehicle that enters the Area Of the project, through an access Control record. |
| Main voluntary commitments | -Archaeological monitoring: Perform an archaeological monitoring, by an archaeologist or licentiate in archaeology, during the phase of Earth movement of the project. In addition, with regard to the archaeological findings described in the area of influence of the project, the owner undertakes to keep a thorough record of the structures, and the protection through perimeter fences.<br>Then, in case of recovering archaeological materials, the holder undertakes, if applicable, to point out the proposal of definitive destination of the archaeological finds, at the time of submitting the final report of the monitoring, sending a document Official of the museum institution to which it will be destined.<br>-Environmental Education Program: the holder will implement an environmental education program, in relation to the identification of the fox species in the project area, which may be Lycalopex Griseus and/or L. Culpaeus (Fox squeals or Zorro blames respectively). The fox is classified as an inadequately known species (SAG, 2012), which will consist of conducting lectures on environmental education to all personnel involved in the construction and operation of the project.<br>-Aggregate Control. It undertakes to certify all documentation relating to it or the aggregate |

| Project name | Painted Solar Plant |
|---|---|
| | supplier (s), associated with the origin (deposit) of these, i.e. the respective permits of the companies that provide it (technical certification of the DOH and authorization are requested. of the corresponding municipality).-Humidification Control: During the construction stage, a humidification program and a register of the humidification to be carried out will be maintained, whose objective is to cover sectors where activities are being carried out that generate Dust lifting.<br>-Water Control: Prior to the beginning of the construction stage of the project, the owner shall inform the environmental authority and the General Directorate of Waters of the region of Tarapacá, or the authorized suppliers (companies) that will supply the water resource, indicating The source (location) and the legal rights over the water resource.<br>-Wastewater Control: A withdrawal control record (made by authorized companies) of the household liquid waste generated by the installation of chemical baths during the construction stage will be maintained.<br>-Relationship plan with the communities: a plan will be generated that determines commitments on the part of the company towards the community with<br>Look To generate sustainable relationships, through instances Co-Participatory and respectful of the local culture, and take charge of the expectations of the interest groups that are identified, either direct or indirect. |

**Tabla 3.66** Extraction of aggregates for "improvement of route A-760, Dm 13,500.000 to Dm. 34,400.000, and other roads. Ex-Office Sector Victoria"

| **Project name** | **Extraction of aggregates for "improvement of route A-760. Ex-Office Sector Victoria, Pozo Almonte commune, Tamarugal Province, Tarapacá region** |
|---|---|
| Location | Pozo Almonte Commune |
| RCA number | Exempt Resolution N º 44 |
| Approval date | 10-Apr-12 |
| Holder | Constructora SALFA S. A |
| General description | The Project Corresponds To The Extraction Of Aggregates In The Commune Of Well Almonte Specifically In The Limit Internal Of The Reservation National Pampa Of Tamarugal. Considered A Surface Total Of 4 Hectares 3 Of Them For The Exploitation Of Aggregates With A Volume Total Of Extraction Of 45,000 M3 Of Material (4,500 m3/month) In A Period Of 10 Months. |
| Main environmental measures | -Installation of sprinklers in the sector of the discharged mailbox and conveyor belts, moistening of the places of collection of material, requiring contractors and suppliers to use vehicles with technical revision a day, in case of transport Construction materials outside the These must be in trucks The cliffs With canvas and subject to the bodywork, keep the roads of circulation of vehicles, machinery and equipment moist, prohibit the accumulation of materials derived from the construction outside the site in which the project was executed, to keep moist those materials that Can release dust, use vehicles and machines with their current technical revisions according to The Law and the technical standards required by the authority. |
| Main voluntary commitments | The holder voluntarily commits to: |

| | |
|---|---|
| **Project name** | **Extraction of aggregates for "improvement of route A-760. Ex-Office Sector Victoria, Pozo Almonte commune, Tamarugal Province, Tarapacá region** |
| | -Perform Monitoring Of the faunistic component, both the zone of direct and indirect influence of the area of extraction of arids, in order to protect the presence of fauna in the Pampa del Tamarugal.<br>-Train staff on the prohibition of approaching the Tamarugos forest (distant 7.57 km from the project area) and on the procedure to be followed in case of an archaeological or paleontological finding.<br>-The installation of a perimeter closure composed of poultry mesh covered by green Rachel mesh, the height is calculated considering decreasing the view of the selection plant. |

**Tabla 3.67** Solar Complex FV Pica 90MW

| **Project name** | **Solar PV Complex Pica 90 MW** |
|---|---|
| Location | Pozo Almonte Commune |
| Identification of the respective RCA | Exempt resolution N º 113/2011 |
| Approval date | 20-Dec-2011 |
| Holder | Element Power Chile S.A. |
| General description | The project consists of the incorporation of 140.01 km2 of new mine areas to support the current production of iodine from the new Victoria plant. |
| Main environmental measures | -Dampening of the access roads and interior paths at the moment of the transfer of structures for the assembly of the panels. Protection of the temporal mounds of land generated by the excavation of trenches, by means of materials such as tarpaulins or polyethylenes that prevent the lifting of dust.<br>-In the construction stage will be generated wastewater product of the use of chemical baths, showers and washing water of canteens. These effluents will be removed by an authorized company and will be taken to an authorized final disposal site.<br>-In the operation stage the wastewater generated by the effect of the use of the bath located in each office, will accumulate in particular sewage systems to which will be done the proper maintenance. |
| Main voluntary commitments | does not have |

**Tabla 3.68** New Victoria Mine Zone

| **Project name** | **New Victoria Mine Area** |
|---|---|
| Location | Pozo Almonte Commune |
| Identification of the respective RCA | Exempt Resolution No. 173/2007 |
| Approval date | 5-Jun-2008 |
| Holder | SQM S.A. |
| General description | The project consists of the incorporation of |

| Project name | New Victoria Mine Area |
|---|---|
| | 140.01 km2 of new mine areas to support the current production of iodine from the new Victoria plant. |
| Main environmental measures | During operation, the following solid wastes will be generated: overload, household waste, and hazardous and non-hazardous industrial waste.<br>-The overload will be stacked in sectors already exploited or lacking mineral (as is currently done in other mine areas belonging to the industrial complex operation Nueva Victoria). This residue is absolutely inert, without presenting health risks.<br>-Non-hazardous waste (plastics, traces of pipes, parts or parts of machinery, etc.) will be handled according to the non-hazardous waste management Plan which is currently in use in the industrial complex operation Nueva Victoria (see annex V). Its disposition will be made in the landfill for non-hazardous waste of Nueva Victoria, which is currently used for the disposal of non-hazardous waste generated in the current industrial operation of Nueva Victoria and complies with the regulations Current environmental.<br>-Hazardous waste (batteries, batteries, absorbent material impregnated in hydrocarbons, rags with fats and oils, etc.) will be handled according to the hazardous waste management Plan that is currently in use in the industrial complex operation New Victory (was approved |
| Main voluntary commitments | SQM S.A. does not contemplate making voluntary environmental commitments, not required by the legislation in force. |

**Tabla 3.69** Local Commercial Restaurant and housed

| **Project name** | **Local Commercial Restaurant and housed** |
|---|---|
| Location | Pozo Almonte Commune |
| Identification of the respective RCA | Exempt Resolution No. 118/2005 |
| Approval date | 18-Aug-2005 |
| Holder | Veronica Isabel Zárate Arancibia |
| General description | The project corresponds to one of the most habitual commercial activities in these areas destined to the vehicles of passage. |
| Main environmental measures | During the construction stage:<br>-The work area shall be adequately irrigated during all operations of the work.<br>-surpluses or rubble will be transported to an authorized disposal site of the illustrious municipality of Pozo Almonte, in trucks that carry the cargo properly.<br>-Special care will be taken in the maintenance of the machinery, to avoid the emissions of gases product of incomplete combustions.<br>-The burning of any kind of waste will not be allowed.<br>-Work will be carried out only during the daytime and on weekdays.<br>-The machines, trucks and equipment in good condition will be kept to minimize their noises.<br>-Domestic solid waste from workers ' activity shall be provided in specially installed containers for this purpose, and the existing containers may also be used in the enclosure. They will then be taken out of the enclosure and taken to an approved final disposal site.<br><br>During the operation stage:<br>-the zones of operation as access and parking, has been arranged the application of a irrigation "matapolvo" composed of thin liquid asphalt of type Bunker-C or Fuel Oil Number 6, at the rate |

| Project name | Local Commercial Restaurant and housed |
|---|---|
| | of 1 Lt/m2 approx., in spaces of 8 to 9 months between each application, at the most, reason why no material emissions will be produced Particulate By the effect of the transit of the trucks.<br>-The speed of circulation will be limited when accessing the commercial site of the trucks to a maximum of 20 Km/hour.<br>-As for the emission of noises that can affect the environment and especially the population near the enclosure, it is established that the noise of the engines of the trucks is very short because once entered to the enclosure the engines are extinguished.<br>-In relation to the DS N º 594/2000, of the Min. Of Health, it will be complied with the standard that no worker will be exposed to a sound pressure level greater than 85 DB (a).<br>-On the other hand, and as a way to ensure the non-evacuation of liquid waste on the outside of the premises, the washing of trucks will not be allowed.<br>-The wastewater, generated by the SS. Hh. Of the enclosure, are discharged into the proposed sewer system.<br>Solid waste<br>-The solid waste that can eventually generate the trucks by effect of consumption in the exterior will be deposited in a special deposit of waste, from where they are removed later and are taken to site of Municipal authorized disposition.<br>-The waste generated by the personnel, either chauffeurs, chargers, caretakers, cleaners or others, in their daily work action, are transferred to the waste deposit already mentioned and with the same subsequent treatment. |

| Project name | Local Commercial Restaurant and housed |
|---|---|
| | |
| Main voluntary commitments | does not describe |

**Tabla 3.70** Construction system electrification agricultural colony of painted

| Name of the project. | Construction system electrification agricultural colony of painted |
|---|---|
| Location | Pozo Almonte Commune |
| Identification of the respective RCA | Exempt Resolution N º 116/2003 |
| Approval date | 31-Oct-2003 |
| Holder | Augusto Smith Marín |
| General description | The project consists of building a medium-voltage network of 26 Kms, from Sub-station Lagunas to the agricultural sector of Pintado, is located administratively in the commune of Pozo Almonte, region of Tarapacá. The physical site will start from the S/E Lagunas (owned by ENDESA) and begin its journey to 50 Mts. Of Axis of the road route A-5 from south to north, passing and benefiting the community of Victoria and finally arriving to the path of access to the locality of painted to then continue to the locality of painted and young people of the desert. |
| Main environmental measures | -As for the solid waste generated by the project, a property will be leased in the sector of agricultural colony of painted, which has hygienic services. Place to be occupied by the workers of the work.<br>-As for the solution that will be given in the slaughter, chemical baths will be taken to then evacuate the contents in the hygienic service of the offices of Elisa in Pozo Almonte.<br>-Daily, once the work activity is completed, a tour of the sites of the executed works will be carried out, verifying that there is no leftover material or remains of them and that they have |

| Name of the project. | Construction system electrification agricultural colony of painted |
|---|---|
| | been used previously. If they exist, they will be removed and transferred to the place of camp established in painted or to the facilities of ELIQSA de Pozo Almonte. |
| Main voluntary commitments | -To carry out and maintain the cleaning of the ground, once the construction work of the 23kV line is finished and during its operation or useful life.<br>-Restore the terrain in a similar way to the original when removing structures from the line. |

**Tabla 3.71** Electrical distribution line substations mining lagoons

| Name of the project. | Electrical distribution line substations of the ACF mining lakes |
|---|---|
| Location | Commune Pozo Almonte |
| Identification of the respective RCA | Resolution No. 27/1998 |
| Approval date | 11-Jul-1998 |
| Holder | Compañía Electrica Tarapacá S.A. |
| General description | The project consists of the installation of 15 Km of single-circuit electrical distribution line, with a nominal voltage of 23 KV, for a maximum consumption of 4,000 KW. The line will depart from the Lagunas substation located in La Pampa del Tamarugal and reach the facilities of ACF Minera Limitada, located in Iris. |
| Main environmental measures | -Must incorporate for the sector within the limits of the National reserve Pampa del Tamarugal, some element of visual dominance directed (positive) within the visual corridor constituted by the international Route A-5 north.<br>-The S/E Lagunas will be accessed by the "Special use zone" that exists in the south-west boundary of the reserve, immediately to the east side of Route 5 Norte, where the cruise line-Pozo Almonte is currently located. |

| Name of the project. | Electrical distribution line substations of the ACF mining lakes |
|---|---|
| | -The distance, to the east of the transmission line, for technical and safety reasons must be at least 20 meters. These reasons include: i) the need for a strip between the two lines, for the safe maintenance of the same; II) safety that a wind-displaced driver does not get too close to the other line; and III) security that the fall of a post does not affect another line.<br>-Within the reserve grounds no point of this line will be located more than 50 m from the existing line. Main voluntary commitments |
| Main voluntary commitments | are not considered voluntary commitments |

### 3.9.4 Conclusions

In the study area were detected 9 projects with RCA approved which are being located in the close vicinity of the Cielos de Tarapacá project.

Of the projects defined Two correspond to environmental impact studies and seven of them are environmental impact statements.

The field of the projects is varied among them some related to the mining sector And Energy, among others Products.

On the other hand, on the basis of the review carried out, it has been determined that the projects analyzed provide information on the Project.