

OVERSEAS PRIVATE  
INVESTMENT CORPORATION



***ASSESSMENT OF ENVIRONMENTAL IMPACT  
AND INDUSTRIAL SAFETY IN  
DEVELOPMENT WELLS  
PALAGUA – CAIPAL FIELD  
PUERTO BOYACA (BOYACA, COLOMBIA)***

JOSHI  
TECHNOLOGIES  
INTERNATIONAL, INC.



**CHAPTER I.**

**PRELIMINARY**

**CHAPTER 1 TABLE OF CONTENTS**

**CHAPTER 1: PRELIMINARY**

1.1. INTRODUCTION .....	1
1.2. OBJECTIVES.....	2
1.2.1. GENERAL OBJECTIVE.....	2
1.2.2. SPECIFIC OBJECTIVES.....	2
1.3. JUSTIFICATION AND SCOPE .....	3
1.4. METHODOLOGY.....	4
1.4.1. GATHERING OF BASIC INFORMATION .....	4
1.4.2. SECONDARY BASIC INFORMATION .....	4
1.4.3. ANALYSIS OF INFORMATION .....	5
1.5. BACKGROUND .....	5



**ASSESSMENT OF ENVIRONMENTAL IMPACT  
AND INDUSTRIAL SAFETY IN  
DEVELOPMENT WELLS  
PALAGUA – CAIPAL FIELD  
PUERTO BOYACA (BOYACA, COLOMBIA)**



# CHAPTER I: PRELIMINARY



## 1.1 INTRODUCTION

The Municipality of Puerto Boyacá, specifically the area where the Palagua and Caipal Fields are located, has become a highly competitive territory at a regional level in the hydrological production, agricultural, oil, technology development and tourism sectors, allowing its inhabitants to keep a social wellbeing in a pleasant environment and with institutions to achieve individual and collective development. The present study is framed within the municipal, national and international policies and with the following objectives:

- To develop projects based on the law that enables the population of the area of direct and indirect influence of the Palagua and Caipal Development Fields to strive for a better life.
- To preserve the ecological and cultural heritage that exists in the municipalities of the area.
- To strengthen the territorial development in a balanced and sustainable way.
- To create a policy to strengthen institutions in the area of Palagua and Caipal Development Fields.

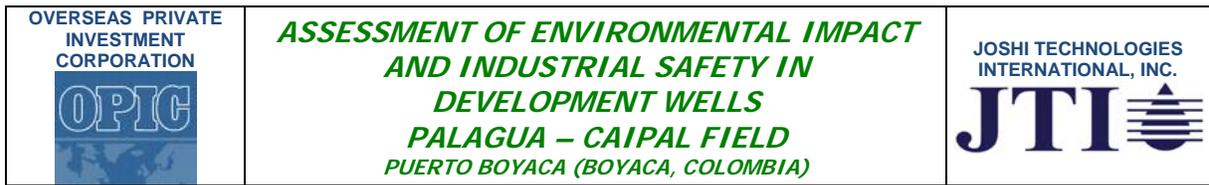
The present document is written in compliance with the requirements established by the Environmental Legislation<sup>1</sup>. It contains the social, environmental and industrial safety components for the DEVELOPMENT WELLS C-14, C-15, C-17, P-222, P-223, NWP4, NWP8, NWP11, NWP12, NWP13, NWP17, NWP31, NWP35, NWP39, NWP41, N017W010, N017W010, N020W116, N021W116, N034W186, N045W155, N116W109, N143W109, N149W145, N153W145, N155W145, N197W155, N202W062, N203W062, N210W116, N211W116, N215W010, N219W155, N222W155, N233W155, N259W155, N269W116, N271WCPL, N272WCPL, N275W186 and N284W155, IN THE PALAGUA AND CAIPAL FIELDS LOCATED IN THE MUNICIPALITY OF PUERTO BOYACA, DEPARTMENT OF BOYACA – COLOMBIA.

The main objective of this document is to serve as a decision making tool for environmental planning. It also allows for the establishment of projects, plans and programs to measure, prevent, mitigate and correct of the environmental impacts generated by the drilling of the wells.

The Environmental and Industrial Safety Impact Assessment is a priority of the project, not only to improve the quality of life of the population but also to enhance oil production. The study will create programs for environmental, social and industrial safety management with the purpose of preventing, mitigating and compensating environmental impacts.

---

<sup>1</sup> Especially the requirements established in the International and Colombian Environmental Law 99/93 and Decree 1753/94



It contains proposing strategies to improve the physical conditions that guarantee a safe environment where activities based on sustainable development can take place. It consists basically of: Objectives of environmental management, Justification and General Scope, General Description of the Processes and Activities in the project, Base Line conditions of the potentially altered zones, Environmental Risk Analysis, and Environmental Measures for mitigation, control, compensation and/or prevention. It also includes Monitoring Plan, Contingency Plan, Follow-up Plan, and Schedule for the Environmental Management Plan, and Environmental Impact assessment, according to the international and national Environmental Legislation.

To execute the Environmental and Industrial Safety Assessment, a multi-disciplinary group of professionals and specialists in different areas was formulated, which developed the corresponding studies based on the Quality Standards to achieve a sustainable development between the activities that would take place at Development Wells C-14, C-15, C-17, P-222, P-223, NWP4, NWP8, NWP11, NWP12, NWP13, NWP17, NWP31, NWP35, NWP39, NWP41, N017W010, N017W010, N020W116, N021W116, N034W186, N045W155, N116W109, N143W109, N149W145, N153W145, N155W145, N197W155, N202W062, N203W062, N210W116, N211W116, N215W010, N219W155, N222W155, N233W155, N259W155, N269W116, N271WCPL, N272WCPL, N275W186 and N284W155.

## **1.2 OBJECTIVES**

### **1.2.1 GENERAL OBJECTIVE**

To perform the environmental, health and industrial safety assessment for development drilling of oil wells in the Palagua – Caipal Field. Additionally, to identify, define and assess the impact that can be generated on natural resources and the physical, biotic and social medium, during the development drilling of oil wells. To facilitate the execution of Environmental Management through programs to prevent, mitigate, correct and compensate for the negative effects caused by possible impacts on natural resources and environment. Additionally, to develop plans for Follow-up and Monitoring of the environmental measures adopted. To address contingencies that may occur during the development of the project and its operation.

### **1.2.2 SPECIFIC OBJECTIVES**

- To identify the most important environmental areas that require special handling such as critical, sensitive or very important environment ecosystems.
- To describe, characterize and analyze the environment (geographic, historic, biotic and social) in the area where the project under study takes place.
- To assess the possible vulnerability of the natural and social ecosystems affected by the project.



- To identify, measure, assess and evaluate the impacts produced by the project. To establish the probability of its occurrence, magnitude, and duration. To establish its reversibility and permanent status, both in its installation and drilling stages at the Palagua – Caipal Field.
- To present record sheets of the actions to prevent, mitigate and compensate the negative effects and potentiate the positive effects produced by the development at each stage of the project.
- To consult the public and private, international and national plans that will take place in the area of study, to assess the existing global, national, regional and local standards of the project.
- To gather the information needed about natural resources to be intervened, used or affected by the installation and operation of the DEVELOPMENT WELLS C-14, C-15, C-17, P-222, P-223, NWP4, NWP8, NWP11, NWP12, NWP13, NWP17, NWP31, NWP35, NWP39, NWP41, N017W010, N017W010, N020W116, N021W116, N034W186, N045W155, N116W109, N143W109, N149W145, N153W145, N155W145, N197W155, N202W062, N203W062, N210W116, N211W116, N215W010, N219W155, N222W155, N233W155, N259W155, N269W116, N271WCPL, N272WCPL, N275W186 and N284W155.
- To design an Environmental Follow-up and Monitoring Program that allows assessing the efficiency of the measures designed in the Environmental Management plan.
- To prepare the Contingency Plan based on the identification and assessment of possible accidents and anticipated risks related to the development and normal operation of the project.

### **1.3 JUSTIFICATION AND SCOPE**

The present study complies with the current established environmental regulations for the project of DEVELOPMENT DRILLING of OIL WELLS AT THE PALAGUA FIELD, LOCATED IN THE MUNICIPALITY OF PUERTO BOYACA, and DEPARMENT OF BOYACA within established guidelines on environment, health and safety, as per the Good International Industrial Practice (GIIP) and the World Bank Operational Policy.

The scope of the document is to obtain the guidelines to manage the environmental, health and safety components and the social aspects during the execution of activities to prevent, mitigate, and control possible effects and to potentiate positive impacts during the development of the project.



## **1.4 METHODOLOGY**

The Environmental and Industrial Safety Assessment is done by gathering primary information and visiting and inspecting. Bibliographic references were compiled to ascertain methods used to assess environmental and social factors to obtain a characterization of the impacts the project could cause on the current local and regional environment and the way to prevent environmental damage, if any.

### **1.4.1 GATHERING OF BASIC INFORMATION**

The elements of judgment and analysis of the environmental study were obtained both from primary as well as secondary sources.

To gather the basic primary information field visits were carried out as well as, photographic records, blueprints, analysis of the activities that take place during the installation and drilling of the wells at the Palagua – Caipal Field, temporary placement and spatial map of the elements that generate potential threats, observation of the scenic and landscape components, relationship between the existing vegetation in the area surrounding the intervention zone, maps that support the mitigation, correction, control or compensation activities, among others. To obtain secondary information search, revision, assessment and transcription of the information was gathered from state and private sources.

Environmental management was performed to optimize, rationalize and restrict the use of renewable and non-renewable natural resources during the development drilling in the Palagua-Caipal Field.

The environmental impacts were identified and then qualitatively assessed to determine the effect on the ecosystems and the degree of vulnerability of the communities and their current cultural heritage. The strategies, plans, programs and mechanisms of the Environmental Management Plan suggest solutions for the possible impacts identified at the assessment stage.

The analysis of the resulting thematic information was fully carried out through modern information systems and Interdisciplinary groups consisting of specialized professionals that participated in the execution of the present Environmental Study.

### **1.4.2 SECONDARY BASIC INFORMATION**

- Measurements and studies carried out at Palagua and Caipal Fields.
- Revision of existing bibliography at the Union Temporal-IJP.
- Land Zoning Plan of the Municipality of Puerto Boyacá, Department of Boyacá.
- Climatic and meteorological information of the area.
- Information of demographic and socio-economic matters of the area resulting from the Land Zoning Plan of Puerto Boyacá and DANE.



### 1.4.3 ANALYSIS OF INFORMATION

For the analysis of each of the environmental components (biotic, hydrosphere, geospheric, social, hydric, etc.), an objective assessment was carried out, based primarily on the identification of the actual state of each of the components in the environment (without the project) and the way it would probably be affected by the proposed activities during the development of the project. Environmental impacts in the area of influence created by the alteration of any component of the environment were identified by magnitude and importance.

The environmental assessment of the project essentially consisted of confirming the actions and activities prone to produce environmental alterations in the area of influence. The purpose is to identify, describe, qualify and quantify the significant environmental impacts, both during the installation and the operation of the project.

For the environmental assessment the methodology proposed by CONESA was used since it was considered as appropriate for the natural and social characteristics of the area of influence and the specifications of the project.

The Environmental Management Plan was prepared based on the set of strategies, plans, programs and designs needed to prevent, control, mitigate, compensate or correct the environmental impacts generated in each of the stages and activities of the project.

### 1.5 BACKGROUND

The drilling is the only way of knowing if hydrocarbon deposits actually exist, even with the results of previously performed seismic and geological research.

In Colombia, the depth of a well will normally be between 2,000 and 25,000 feet, depending on the region and the depth at which the formation containing the oil is located.

At the Palagua Field an exploratory well was drilled (first well that has been drilled in an area that had not been geologically explored – “A-3”), in the year 1954, by the Texas Petroleum Company, who through Resolution 1092 of November of 1956, earned the Exploration Concession. In 1987, the Field was returned to the Colombian State to be managed by ECOPETROL through Resolution No. 293 of 1983 until today.

The Colombian Petroleum Company – ECOPETROL, offers the operation of Palagua – Caipal Field through an Incremental Production Contract – IPC for improving the recovery factor of the oilfield, by means of habilitation, technological application and drilling of wells. With regard to the development wells the aim is to recover oil from the non-drained proved reserves. The Union Temporal-IJP began its development activities at the Palagua Field in the year 2001.

Taking into account that the Palagua Field began activities before Law 99 of 1983, it did not require an Environmental License to operate. In the year 2000 ECOPETROL S.A. presented



operational plans to the Ministry of Environment. Today, Ministry of Environment, Housing and Territorial Development monitors activities through the Environmental Management Plan for Palagua and Caipal Fields; this document contains the management measures approved for the current operations and to environmentally endorse future activities related to the Field development.

The present Environmental Management Plan for the DEVELOPMENT WELLS C-14, C-15, C-17, P-222, P-223, NWP4, NWP8, NWP11, NWP12, NWP13, NWP17, NWP31, NWP35, NWP39, NWP41, N017W010, N017W010, N020W116, N021W116, N034W186, N045W155, N116W109, N143W109, N149W145, N153W145, N155W145, N197W155, N202W062, N203W062, N210W116, N211W116, N215W010, N219W155, N222W155, N233W155, N259W155, N269W116, N271WCPL, N272WCPL, N275W186 y N284W155, corresponding to the Palagua and Caipal Fields, is a basic tool that contains the environmental measures and actions during the execution of the project, that is considered as of relatively low significance impact, due to the fact that the new wells are drilled from an existing locations, where there is no need to build new access roads or to build big embankments, and hence, there is no additional effect on natural resources in the area.

At the end of the project is proposed a Closure and Abandonment Program that establishes the required measures for the recuperation and renewal of the area where the wells are located.

For the drilling activities of the development wells described in the Environmental Management records, there are no known additional permits or authorizations are required.