CHAPTER VI.

ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

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CHAPTER VI: ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

6.1 INTRODUCTION

The Environmental Management Plan (EMP) develops the environmental management measures necessary to prevent, mitigate, control, protect and/or compensate the possible impacts caused by the activities of the Drilling of Development Wells in the Palagua field.

The mitigation and prevention measures are developed in this chapter through the programs of the EMP, to be applied exclusively in the area of the Project, which has been structured based on the specific needs identified in the Environmental Base Line. It's purpose consist of providing the necessary tools for the proper management of the elements of the abiotic, biotic, and social sources during the drilling activities of the Project.

6.2 APPLICATION PURPOSES OF THE ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

In the Environmental Management Programs of the Palagua Field, there is a community management policy, by which social projects are being developed for the benefit of the community.

For the implementation of the Environmental Management Plan there are the following specific purposes:

- Identify the existing environmental problems in the direct and indirect area of influence of the drilling project.
- Define and develop the actions that must be followed for each of the environmental components, whose development shall be parallel to each of the activities of the project, to reduce and/or avoid the effects on the environment.
- Determine the model for the application of the Environmental Management Plan within the drilling area of the wells, its access roads, and streamline.
- Establish the responsibilities of execution of the environmental actions and the respective works of supervision, through the environmental inspection for the development of the Project.
- Follow up and Control through the Reports of Environmental Compliance, REC, from the Ministry.

6.3 ORGANIZATION OF THE ENVIRONMENTAL MANAGEMENT

The measures directed towards the prevention, control, mitigation, protection, recovery or compensation of the impacts arising during the operation of the Project, are presented in a series of components and programs that make up the EMP. These components are the result of the analysis of the evaluation of impacts. The measures to be applied to each program are presented as tables with the following content:

- **Purposes and Goals of the Program.** The scope and purpose for each program is defined.

- **Activities and Impacts to be managed.** The activities that generate impacts and the impacts to be managed are identified through the actions proposed in the program. It establishes the stage or phase in which the measure will be applied.

- **Environmental Impact.** Description of the specific impact or impacts that are to be avoided, mitigated, corrected or compensated when adopting the proposed measures.

- **Management Measures to be implemented.** The environmental management activities to be developed are described. It specifies whether the actions included in the table are preventive, protective, mitigative, corrective, or compensative controls of the mentioned impacts.

- **Type of measure. Actions to be developed.** Presents the measures and criteria of design of the activities in the table; as well as, the strategies that must be followed parallel to the proposed actions.

- **Technologies used.** Theoretical description and conceptual skills or methods that will be used for the proposed actions.

- **Site of Implementation.** Refers to the place of implementation of the Environmental Management Measures.

- **Responsibility of Execution.** The person or persons responsible for the execution of the actions are defined.

- **Applicable Regulation.** The environmental regulation that applies for each program is described.

- **Follow Up indicators.** List of the indicators defined in the environmental evaluation of the project that apply for the follow up work.

- **Execution Timescale.** Defines at what time the different measures of environmental management should be applied.

- **Required Resources and Costs.** Lists the required resources and costs of the execution of the environmental management activity of the project.

- **Responsible for the Follow Up.** Establishes who should perform the follow-up tasks.

- **Expected Results.** Establishes a guideline to conduct the follow up of the actions proposed in the table.

- **Remarks.** Issues to be considered for execution, follow up, or assessment of the actions or measures proposed in the table.

6.3.1 ENVIRONMENTAL INDICATORS

The definition of Environmental Indicators of the follow-up processes directly relates to the actions proposed in the table, and the records that must be kept in their execution. To build indicators that are dependable and useful, four main aspects must be considered:

1. **Sustainable Development:** This concept involves the interrelation of the economic, socio-cultural, and environmental factors. Therefore, the "sustainable development" must be defined for each scenario according to its characteristics.

2. **Environmental Information:** It is ideal to have an environmental information system that provides a set of integrated and organized data that enhances the efficiency in dissemination and communication of information.

3. **Decision Making Cycle:** It is a dynamic process made up of four stages: Identification of Problems, Formulation of policies and strategies, Implementation of policies and strategies, and Assessment of policies, strategies and actions.

4. **Model and Conceptual Framework:** The Model PRESSURE-STATE-RESPONSE (PSR) (OCDE, 1991; 1993) is accepted worldwide due to its simplicity, its easy use, and for the responsibility that it provides when applied to different levels, scales, and human activities.

Additionally, the construction of indicators depends on the availability of information and its quality, on the different conditions (physical, biotic, socioeconomic, and cultural) of the region and of the project to be developed.

PROGRAMS FOR ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

6.4 GENERAL GUIDELINES FOR ENVIROMENTAL HEALTH AND SAFETY

The table below contains a summary of the the guidelines of the Environmental Management Program. A table for each one of the separate guidelines will follow.

SECTION	Document Reference Number		GUIDELINE OF ENVIROMENTAL MANAGEMENT
SOCIAL MANAGEMENT	6.4.1	6.4.1.1	Information and communication guideline
		6.4.1.2	Guideline for hiring local work force
		6.4.1.3	Guidelines for education and training of staff of the work staff
		6.4.1.4	Archeological information guideline
ENVIROMENTAL	6.4.2	6.4.2.1	Guideline on environmental management of production testing
		6.4.2.2	Pipeline (flow line) management guideline
		6.4.2.3	Guideline of monitoring and tracking to disposition of industrial water and drilling solids
		6.4.2.4	Guidelines on waste management
HEALTH AND OCCUPATIONAL SAFETY	6.4.3	6.4.3.1	Signposting guideline (access road, location, flow line)
		6.4.3.2	Guideline of handling and storage of chemical products
HEALTH AND SAFETY OF THE COMMUNITY	6.4.4	6.4.4.1	Guideline of control and monitoring to the social management program
		6.4.4.2	Guideline of dump areas, land removal and land-fills management at the locations
		6.4.4.3	Guideline of drainage management of access roads and locations
CONSTRUCTION AND DECOMMISSIONING	6.4.5	6.4.5.1	Environmental alternatives guideline (abandonment stage)
		6.4.5.2	Liquid waste management guideline (stage of abandonment)

6.4.1 GENERAL GUIDELINES ON SOCIAL MANAGEMENT

6.4.1.1 Information and Communication Guideline

OBJECTIVE	• Design, develop, and disclose an information system on the drilling project of the Development Wells, in the Palagua – Caipal Field in the municipality of Puerto Boyacá, Boyacá, aimed at the population located in the direct and indirect area of influence, to make the project known and present it to the mass media and other means of communication looking for the most active possible participation from them. • Establish means of Communications among the communities, their leaders, the social leader of the project, and the company.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restorations / Abandonment**	
ENVIRONMENTAL IMPACT	• Conflicts with the community • Effect of the existing infrastructure • Lack of information from the community affected by the work activities. • Community opposition to the development of the work due to lack of information. • Conflicts of the community with the Leader of the work due to lack of information. • Generating expectations with respect to the benefits that the development of the project represents. • Increase in local and regional inter-institutional relations. • Increase of employment offer. • Strengthening of local and regional area community organizations. • Improvement of the economic conditions of the individuals and the community enterprises that have the opportunity to work or carry out activities in the different stages of the Project (Civil Works building and drilling)		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Informing the population residing in the area of influence of the Project about the characteristics of the Project, through informative meetings. • Agree with the participants the date and place of the necessary meetings and workshops. • Make the minutes of meetings and workshops with the constancy of the participants and topics.		

	• Prepare the adequate materials and aids for the presentations for the participant's level.
TECHNOLOGY USED	• Agreement and participation. • Written information and working agenda for the session.
RESPONSIBLE FOR EXECUTION	Palagua – Caipal field superintendent.
EXPECTED RESULTS	• Adequate Management of the expectations in the area of influence of the Project. • Rational participation of the unskilled workers in the region of the Project. • Strengthening of the communities. • Reduction of conflicts between the community and the work executed. • A good image of the Project and of the Company before the community.
REMARKS	Conduct meetings or Workshops in the rural area with regard to the Project as necessary. The success of the social work must be the objective of the work, for which it is recommendable to hire a professional in the social area or community relationships to be in charge of the Management and compliance of the social purposes of the Project. This professional must have an extensive knowledge of social work. He or she must also have the support of the administrative policies and techniques of the Project, establishing direct communication channels. Finally, it is important that the social worker or the representative for the relationship with the community be in permanent communication with the executors of the project in the field to be up to date with the evolution of the project. For the success of the Social Management it is recommendable that all the agreements, and the distribution of the labor participation, etc., be recorded in writing and be signed at every meeting held with the community and its leaders. This will avoid future distortion of the agreements by strangers or sections of the community that do not agree with the projects. Additionally, the results and photography of the community activities must be published on a community laminated bulletin board, placed in the mayor's office and in the rural area for best clarity with the community.

6.4.1.2 Guideline for Hiring Local Work Force

OBJECTIVE	• Present to the Mayor's Office of the Municipality of Puerto Boyacá and to the Inhabitants of the rural district of Palagua, the need for unskilled labor, according to the stages of the Project and the different activities. • Give detailed information about the requirements and commitments entailed in the labour supply of the Project in general, and in each of the stages. • Publicize hiring processes and legal aspects. • Inform about the selection processes, induction, wage and other required aspects, such as exams and others. • Answer the concerns raised by the participants in the different Workshops. • Set the personal profile that is not possible to recruit from the region. • Establish the way of distributing the participation of the unskilled labor for all the areas of influence of the Project.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restorations / Abandonment**	
ENVIRONMENTAL IMPACT	• Generation of income expectations • Increase of the local, regional and inter-institutional relations • Increase of job offer • Improvement of the quality of life of hired people		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Establish the number of personnel required and the requirements for aspiring for the job. • Establish the participation of all the areas of influence of the Project equitably and fairly. • One (1) workshop in the Palagua rural district. • Prepare the minutes of the meetings and workshops		
TECHNOLOGY USED	• Interviews • Written information and work agenda for the session. • Broadcasting on the community radio, if possible.		
APPLICATION SITE	Area corresponding to the Palagua rural area.		

RESPONSIBLE FOR EXECUTION	Palagua – Caipal Field Superintendent
EXPECTED RESULTS	- Adequate Management of the expectations in the area of influence of the Project and prevention of the negative effects that may result from the lack of information relating to real labor need of the Project. - Enablement of the positive effects of the Project and reduction of conflicts with the community that alter the normal performance of the work. - Awareness of the community and its leaders, the magnitude of the temporary employment, and the number of people and services that will be required. - Awareness of the way that unskilled personnel will be requested, of the distribution of jobs that will be applied during all the stages of the Project (civil works, drilling and restoration), and the mechanism for requesting it from the community.
REMARKS	- The Project represents the execution of the employment policies of UT-IJP, and seeks to link local labour in activities to develop. - It is necessary to be clear with the community in terms of staff numbers and work periods in order not to generate false expectations. Likewise, minimize, in any, conflicts between the personnel of the region and foreign personnel.

6.4.1.3 Guidelines for Education and Training of Work Staff

<table>
<tr><td>OBJECTIVE</td><td colspan="3">• Include environmental training and environmental safety in the work program, as working tools during the development of the operations of the Project.
• Establish among the workers and the managers of the work the commitment to carry out the work considering the environmental commitments generated by the environmental measures and laws.
• Present the environmental conditions of the area of influence of the Project, and the existing Environmental Standards, related to the care that must be taken in the use and management of the soil, air, and water resources; and avoid negative effects in the development of the activities of the Project.
• Inform about the adequate use of the soil and the adequate Management of the waste.
• Raise awareness of the social and cultural aspects of the municipalities and of the rural areas of influence, as well as of the People's Participation.</td></tr>
<tr><td rowspan="2">EXECUTION</td><td colspan="2">1. Planning</td><td>2. Preparation and Installation</td></tr>
<tr><td colspan="2">3. Drilling</td><td>4. Restoration / Abandonment of the Area</td></tr>
<tr><td>ENVIRONMENTAL IMPACT</td><td colspan="3">• Alteration of water, soil, biota, quality of the landscape, and historical or cultural heritage.
• Awareness of the residents of the area, the social conditions, and the quality of life.
• Opportunity for improving the environmental knowledge and management of the workers and of the managers of the work.
• Prevention of environmental damage due to disinformation of the operators, workers and engineers.</td></tr>
<tr><td rowspan="2">TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE</td><td>Prevention</td><td>Mitigation</td><td>Correction</td></tr>
<tr><td>Compensation</td><td>Control</td><td>Protection</td></tr>
<tr><td>ACTIONS TO BE DEVELOPED</td><td colspan="3"><u>In connection with training:</u>
• At the beginning of the civil Works in the well, a meeting of installation of the HSE Committee will be held.
• Daily five minute environmental training indicating the following:
1 - "Social and Cultural Conditions of the Area" oriented towards presenting the characteristics of the area and towards observing respect for the residents of the area.</td></tr>
</table>

	2 - "Use and Management of the Natural Resources", oriented towards the existing Environmental Regulations and Environmental Conditions of the Area, and oriented towards the care that must be taken in the area of the Project.
TECHNOLOGY USED	• Presentation of the programmed Environmental measures and of the activities. • Written Material. • Agreement and Participation.
APPLICATION SITE	In the site of the well, according to the development work and related hiring of personnel. The training programs will take place during the daily work hours.
RESPONSIBLE FOR EXECUTION	UT-IJP Environmental Coordinator.
EXPECTED RESULTS	• Training of the personnel and managers of the Project about environmental regulations, and social conditions of the area. • Adequate Management of the area and prevention of possible negative effects. • Adequate Management of industrial safety aspects during the work.
REMARKS	It is important that the personnel that will be working in the Project take necessary care in their behavior, according to the training that they get in the Workshops and the daily instructions at the beginning of the work day. However, the influence of the Environmental Director is important to maintain the environmental quality in the area. Likewise, the Officials, leaders of each stage of the Project (civil engineers of the work, team supervisor, and well supervisor) must be notified by the Management of **UT-IJP** about the environmental mitigation measures that must be used during their work.

6.4.1.4 Archeological Information Guideline

OBJECTIVE	• Comply with the current legislation on protection of the Nations' Archeological and Historical Heritage, according to what is set forth in Article 11 of Law 163 of 1959, Article 9 of Regulatory Decree 264 of 1963 and Law 397 of August 7 of 1997. • Prevent destruction and alteration of Archeological Heritage through pertinent information on archeological element safeguard. This information has to be submitted to the management, administration and operators of work area.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• Alteration of archeological sites. • Destruction of historical record.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	Informative talk on the importance of restoration and conservation of archaeological material and sites. The talk should include a general outline of the archeology of the region, its characteristics, current legislation and the necessary measures to implement in case of an archaeological find.		
TECHNOLOGY USED	Billboards and simple presentations		
PLACE OF EXECUTION	Location of wells		
RESPONSIBLE FOR EXECUTION	Environmental Superintendent and Coordinator of **UT-IJP**		
EXPECTED RESULTS	Work staff involvement in archaeological protection, information and cooperation activities in case of an eventual finding.		
REMARKS	The area of the wells and its access roads do not have archeological potential according to the Colombian Institute of Anthropology and History (ICAHN). Train company personnel about the proper actions that need to be taken when materials of historical or cultural interest are discovered.		

6.4.2 GENERAL GUIDELINE ON ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

6.4.2.1 Guideline on Environmental Management of Production Testing

OBJECTIVE	• Submit the measures for production testing management within the location to minimize the environmental risks that can be generated. • Provide the guidelines for safe transportation of the produced fluids.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	Alteration of the physical, chemical and biological properties of water and soil.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	Have adequate storage and transportation means for the formation fluids produced during the testing. Follow the measures to handle polluted waste generated during production testing.		
TECHNOLOGY USED	• The formation oil and water will be separated and stored in tanks on the location and then will be sent in tank trucks to Palagua Battery. • If there is gas production during the testing, it will be flared so that it allows full combustion to prevent emission of particles, following the regulations with respect to height and placement of the flare and according to the specifications in the Decrees 02/82 and 948/95. • The solid and liquid waste management measures designed for the drilling stage will be followed. • The management of oily waste water will be enforced with respect to its collection. • The storage tanks will be hermetic and equipped with level indicators. • In the event of a leak in the production line, the measures for solid and liquid waste management designed for the drilling stage will be followed. • The equipment used should guarantee minimum oil spill within the location. • The tank trucks used to transport formation fluids should be in good condition with regards to airtightness, and must follow the safety rules in areas of highest risk of leakage.		

PLACE OF EXECUTION	Location of the wells to be drilled.
RESPONSIBLE FOR THE EXECUTION	Production supervisor, under the supervision of the Environmental Coordinator of the **UT- IJP.**
EXPECTED RESULTS	Zero spills of produced fluids Proper disposal of produced water. Proper disposal of solid waste (domestic and industrial) during operation.

6.4.2.2 Pipeline (Flow Line) Management Guideline

OBJECTIVE	Establish the appropriate measures for the environmental management of laying, welding and pipeline radiography activities to be used in the building of the flow line.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• Emissions of gas to the atmosphere. • Negative visual changes. • Pollution of environmental resources due to inappropriate handling of radiographies.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Before laying pipelines, it must be verified that the path is clear of obstacles so as not to create difficulties in areas surrounding the road by depositing pipes in areas that have not been intervened. • All items such as butt welding, scrap metal, and pieces of cut pipe must be stored in properly marked containers along the road for later transportation to the Palagua Battery, where they will be collected and sent to scrap metal recyclers. • The handling of radiographies including fluids should be conducted away from the pipeline laying activities to reduce the risk of animals in the area and workers themselves getting in contact with these materials. • The welding processes should be supervised by the contractor's person in charge, and approved by the inspector designated by the UT-IJP to ensure optimal bonding of the pipe and prevent possible repairs later on. • During construction of the flow line, signs should be installed warning vehicles of the presence of WORKERS ON THE ROAD and use vehicle traffic signals.		
TECHNOLOGY USED	• Welding equipment. • Full topography equipment.		
PLACE OF EXECUTION	Flow lines paths projected for the wells.		

RESPONSIBLE FOR THE EXECUTION	The Well Supervisor, under the supervision of the Environmental Coordinator of the **UT- IJP**
EXPECTED RESULTS	Adequate management of waste generated during the pipeline building works.
REMARKS	A photographic record or a filmed record of the work should be kept.

6.4.2.3 Guideline of Monitoring and Tracking to Disposition of Industrial Water and Drilling Solids

OBJECTIVE	• Monitor physical, chemical, and bacteriological characteristics of wastewater generated during drilling before and after being treated. • Determine the chemical properties of solid waste from the drilling.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• Effect on natural resources by disposal of treated wastewater. • Effect on ground water by the quality of the drilling cuts.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	**Monitoring of Waters** • Carry out monitoring of the effluent of the industrial watewater treatment system of the well before being sent to the Palagua Battery, through composite sampling, analyzing the physicochemical parameters mentioned below. **Monitoring of Drilling Cuttings** • The drilling cuttings in the land farming area will be evaluated by taking two samples from the site. One sample will be taken after the drilling operations begin and the other at the end. • The samples taken in a composite way and at different heights in the heaps will be taken to the laboratory for type TCLP analysis (leaching potential) to assess the heavy metals of health interest, nitrites and nitrates in the leachate. • The results from potential leaching are not the same as the results from metal content through chemical breakdown with acids but are simulations of the leaching process of the material to determine its potential. **Results Analysis** • To analyze the physicochemical and bacteriological results it is advisable to draw diagrams or charts, showing clearly the variation of parameters over time at different sampling points to help with its interpretation. • It is important to take into account the conditions of the sampling site,		

permissible ranges according to current legislation.

Parameters to Assess

- **Physicochemical Parameters:** pH, temperature, alkalinity, total solids, dissolved solids, suspended solids, color, chloride, conductivity, sulfate, turbidity, dissolved oxygen, acidity, nitrites, nitrates, iron, phosphates, total hardness, phenols, DBO_5, DQO, grease and oil.
- **Bacteriological Parameters:** Total coliforms and fecal (E. Coli)
- **For the solids type TCLP:** The results of the TCLP simulations should be compared with the human consumption limits for heavy metals since eventually their leached is mixed with ground water that can be collected from nearby cisterns. You can also compare the results against the metal content limit to consider waste as hazardous according to Colombian environmental laws.

Recommendations for sampling and analysis

- Use clean and sterilized containers.
- Carefully label the corresponding container each collected sample. The lids should also be labeled since they can be changed.
- For the analysis of grease and oil content in water, the sample must be collected very precisely in glass bottles, because if plastic bottles are used the sample may adhere to the side of the bottle or be absorbed.
- For the bacteriological sample it is recommended for the container where the sample is collected to be sterilized and clean. It is important to avoid eventual external pollution. It is important to record the time, temperature and the aspect of the water at the time when that sample is collected.

TECHNOLOGY USED

Physicochemical Sampling

For this type of sampling the containers used are transparent glass and plastic usually of 500 to 1000 ml, with appropriate plastic lids. The minimum recommended volume is 500 ml for a routine analysis. The water sample must be representative of the fluid system in order to obtain satisfactory results and conclusions.

For the preservation of the samples for physicochemical analysis, the recommendations by the Standards Methods for the Examination of Water and Waste Water, last edition, should be followed.

Sampling, Preservation and Conservation of Samples

Parameter	Container	Minimum Quantity of Sample [ml]	Preservation	Maximum Storage*
Alkalinity	Plastic, Glass	200	Refrigerate	24H/14d
Chlorides	Glass	240	Analyze immediately	-
Conductivity	Plastic, Glass	500	Refrigerate	28d/28d
Carbon dioxide	Plastic, Glass	100	Analyze immediately	-
DBO	Plastic, Glass	1000	Refrigerate	6h/48 h
DQO	Plastic, Glass	100	Analyze as soon as possible or add H_2SO_4 to pH<2	7 d /28 d
Hardness	Plastic, Glass	100	Add HNO_3 to pH<2	6m/6m
Phenols	Plastic, Glass	500	Refrigerate, add H_2SO_4 to pH<2	24h/28h
Greases and Oils	Glass	400	Add H_2SO_4 a pH<2	28 d /28 d
Metals	Plastic (A), Glass (A)	-	For dissolved metals filter immediately. Add HNO_3 to pH<2	6m/6m
Dissolved Oxygen	Glass bottles	300	Analyze immediately	-
pH	Plastic, Glass	-	Analyze immediately	2h/2h
Solids	Plastic, Glass	-	Refrigerate	7d /7-14d
Sulphates	Plastic, Glass	-	Refrigerate	28 d /28 d

	Sulfides	Plastic, Glass	100	Refrigerate. Add 4 drops of zinc acetate to 2N/100 ml.	28 d /28 d
	Temperature	Plastic, Glass	-	Analyze immediately	-
	Turbidity	Plastic, Glass	-	Analyze the same day	24h/24h
	Fecal Coliforms	Plastic	500	Analyze the same day. Refrigerate.	-
	Total Coliforms	Plastic	500	Analyze the same day. Refrigerate.	-
	* Recommended / Regulated H= hours, d= days, m= months V (A)= rinse with HNO3 (1:1), P (A)= rinse with HNO3 (1:1) Source: Standards Methods for the Examination of water and wastewater.				
PLACE OF EXECUTION	Affluent of the Industrial WASTE WATER treatment system of the wells.				
RESPONSIBLE FOR EXECUTION	Well Chief and the contractor under the supervision of the Environmental Coordinator from **UT-IJP**.				
EXPECTED RESULTS	Full compliance with the permit for industrial wastewater disposal. No effect on natural resource for industrial wastewater disposal during the drilling stage.				
REMARKS	It is important to process the Environmental Compliance Reports (EVR) from the Ministry				

6.4.2.4 Guidelines on Waste Management

OBJECTIVE	Provide information on the measures to carry out an effective control of pollution that may be generated by the well location improvements.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• Emissions of particle to the atmosphere caused by the machinery and equipment. • High noise level produced by machinery and equipment in the work area. • Disposal of polluting materials (construction material, solid and liquid waste, or fuel and lubricants) in water bodies or soil by workers • High visual impact for dumping solid and liquid waste in zones close to the work area. • Soil pollution due to accidental spill of fuel and lubricants from machinery. • Pollution of groundwater supplies by spills described in the preceding item.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Conduct periodic inspections of smoke emissions from machinery. The emissions that are too high need to be immediately corrected. Also, the operation of machinery with hydraulic oil or fuel leaks will not be allowed since they affect the soil. • Conduct periodic checkups of the machinery in the work area, for leakages of fuel and / or lubricants. • Select the area for fuel and oil storage away from water streams. This fuel storage area should have geo-membrane flooring or a cement floor and have a grease trap. It is recommended that this area have a ceiling, posted No Smoking signs, and be lined with security tape. • The machinery leaking polluting fluids will not be allowed to function and will not return to work until the leakage is repaired. • Do not wash work machinery and equipment in water bodies located in the vicinity of the work area. • Change of lubricants or fuel must be carried out in remote areas of vegetation or water bodies and placing 55 gallon metallic barrels to receive the lubricant that is been changed or to contain accidental		

	spilling of fuel. Also, the soil must be protected with polyethylene to prevent pollution. • Provide training to workers about the importance of pollution control in the work area, including issues such as causes, consequences and control methods. • Inform workers in due course on the rules established in the work area to avoid the impacts caused by pollution at the site of the work. • The disposal of surplus construction materials or organic residues by workers in places like water bodies, work place surrounding areas, springs, or other places than authorized areas will not be allowed. • The containers to store solid waste produced by workers will be strategically placed in the work area. The facilities needed for the management of domestic waste water will be provided.
TECHNOLOGY USED	• Waste collection systems in plastic containers. • Knowledge and experience of the Environmental Inspector to detect pollutant factors. • Septic tanks and / or portable toilets for domestic waste management.
PLACE OF EXECUTION	Access roads, location and flow line.
RESPONSIBLE FOR THE EXECUTION	Well Chief under the supervision of the Environmental Coordinator from **UT-IJP**.
EXPECTED RESULTS	Adequate waste management and minimization of visual impact generated.
REMARKS	None

6.4.3 GENERAL GUIDELINES ON HEALTH AND OCCUPATIONAL SAFETY

A complete Manual of Occupationa Health and Safety for UT can be found in Appendix C.

6.4.3.1 Sign Posting Guideline (Access Road, Location, Flow Line)

OBJECTIVE	Establish adequate signs and the basic industrial safety measures to carry out, in an efficient and safe manner, the execution of the works.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• High accident rate in the high-risk activities at the field. • Occurrence of environmental incidents due to the lack of knowledge of the work procedures and of the work area.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• The following signs will be made and placed according to the type of work, area, and accident risk: • Warning signs: This type of sign warns workers regarding possible danger in the work area, and must be placed closest to the place where an accident may occur. • Informational signs: The informational signs are located in pertinent places to guide the personnel in the work area, showing direction to work areas. • Hold periodic talks with workers at every level of the works, involving basic industrial safety aspects. • Prepare and implement a monitoring and control program of industrial safety elements, confirming its effectiveness. • Install signs as to the access to the well for the vehicles that transport material and equipment for the drilling operations (name of the well and approximate distance). • Install CAUTION SCHOOL ZONE signs and post speed limit signs at appropriate areas around the school.		
TECHNOLOGY USED	• Skilled labor.		
PLACE OF EXECUTION	Access road, location and flow line.		

RESPONSIBLE FOR THE EXECUTION	The Well Chief, under the supervision of the Environmental Coordinator of the **UT- IJP**.
EXPECTED RESULTS	Zero operational accidents with environmental or occupational health impact on the road and the location during construction works.
REMARKS	None.

6.4.3.2 Guideline of Handling and Storage of Chemical Products

OBJECTIVE	Stipulate the actions for handling, storage and disposal of chemical residues generated during the Drilling of Wells of the Palagua – Caipal Field.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	Pollution of water bodies and soils by chemical products and fuel spills.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Execution of proper warehouses for storing chemicals and empty packaging and containers. • Post appropriate signs. • Classify the chemicals to be stored according to flammability and/or reaction to other products, to determine the adequate storage areas within the warehouse. • Adequate labeling of the containers of the chemical products to minimize risks. • Forbid the reuse of the packaging of special products in all activities. It is recommended that the packaging be returned to / reused directly by the supplier and / or manufacturer. • Implement the “Material Safety Data Sheet – MSDS” (commonly known as Safety Sheet) for each product and have them available for information of the worker.		

TECHNOLOGY USED	**Specifications and Location of the Warehouse or Chemical Products Containers** • Building of a chemical products storage warehouse preferably covered with sheets of zinc or plastic to prevent rain runoff from chemicals to the soil or nearby water bodies and on a concrete surface surrounded by a perimeter channel that allows collecting rain water and possible spills; otherwise install containers to do so. • The warehouse or chemical products and fuel storage containers will have to be built or installed in a place distant from the dormitories and of the drinking water and food storage areas. • For the storage of Packaging a provisional storage place will have to be used until the contractors remove them; the area will have to be covered to prevent rain runoff from dragging chemicals to the soil or nearby water bodies. **Chemicals Control on Locations** • Complete list of all the chemicals stored at the locations. • Inventory of the products taken in and stored during the operation. • Safety Sheets – MSDS of each of the products, that will include a separate part that contains the instructions on how to store, collect and clean in case of spilling on water or on the floor, and their environmental implications. **Chemicals Handling** • The staff responsible for the safety of these products should receive the training and protective clothing and equipment needed to prevent workers' health from exposure and handling of toxic and flammable substances.
PLACE OF EXECUTION	Location area of the wells.
RESPONSIBLE FOR THE EXECUTION	The Drilling Company and the contractors, under the supervision of the Environmental Coordinator of the **UT- IJP.**
EXPECTED RESULTS	Zero pollution of soil or water from chemical spills. Zero accidents or incidents reported from improper handling of chemicals.
REMARKS	Before the beginning of the operation, the staff must be familiar with the handling of the waste produced by the operation.

6.4.4 GENERAL GUIDELINES FOR HEALTH AND SAFETY OF THE COMMUNITY

6.4.4.1 Guideline of Control and Monitoring to the Social Management Program

OBJECTIVE	• Develop the different actions required for the adequate execution of the Social Management Plan in the area of influence of the project. • To exercise continuous control in the Social Management Program projects, in the different actions of UT-IJP.	
EXECUTION	**1. Planning**	**2. Preparation and Installation**
	3. Drilling	**4. Area Restoration / Abandonment**
ENVIRONMENTAL IMPACT	• Commitment at a management level of the project and the technical leader to comply with social management associated to the EMP. • Provision the economic resources for the execution of social management. • Enablement of positive impacts.	
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation** / **Correction**
	Compensation	**Control** / **Protection**
ACTIONS TO BE TAKEN	The actions to be taken should be directed towards: • Initial review of the Social Management Plan and ensure the awareness and commitment of the projects' management to social management. • Take part in meetings and workshops, in the observation and analysis of written documents, and take minutes. • Timely meet the needs of the community which must be managed using the company's legal support and with full knowledge of the project's management. • Monitor and control of the activities from the Social Management Program, periodically. This includes monitoring and control over: • Meetings and workshops • Community involvement • Number of Participants to the Meetings and Workshops. • Evaluations of the meetings and workshops with the participants. • General Dynamic of the Meetings. • Execution in the time specified.	

6.4.4.2 Guideline of Dump Areas, Land Removal and Fillings Management at the Locations

OBJECTIVE	Establish the applicable environmental management measures to execute the land removal in the preparation of the well location.	
EXECUTION	**1. Planning**	**2. Preparation and Installation**
	3. Drilling	**4. Area Restoration / Abandonment**
ENVIRONMENTAL IMPACT	• Hydric or wind superficial erosion. • Contribution of sediment to adjacent water bodies. • Noise, gas or particle emissions. • Changes in landscape. • Creation of obstacles to natural drainage near or included in the dump area site.	
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation** / **Correction**
	Compensation	**Control** / **Protection**
ACTIONS TO BE TAKEN	• The locations are in acceptable condition to install drilling infrastructure. Additional to this the fractions of materials such as rubble and certain building materials waste, which require change or renewal, will be used in the geo-morphological recovery of an external area affected by natural erosion and not induced by the existing operation. • According to preliminary calculations of the movement of earth and the requirements of the project, no surplus material will be generated, therefore the will be no need to use dump areas. • Adapt protection works, such as bag-concrete or wood barriers, that are resistant and with high bearing capacity, to protect the slope located behind the wells.	
TECHNOLOGY USED	Heavy machinery: bulldozers, backhoes, front loader, motor grader, metal roller vibrocompactor.	
PLACE OF EXECUTION	Location of the development well Palagua – Caipal Field.	
RESPONSIBLE FOR THE EXECUTION	Environmental Coordinator of the **UT- IJP**.	

6.4.4.3 Guideline of Drainage Management of Access Roads and Locations

OBJECTIVE	Design and implement a program for the proper management of drainage in access roads and locations to the wells, through the building of drainage works.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• Changes in the drainage pattern of the site. • Contribution of sediment to nearby streams.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Protect the soils with polyethylene or a similar material when making mortars or concrete during the building of drainage works. • Construct the drainage works that are needed for the disposal of rainwater in the access roads: • Build the necessary drainage works at the location for the disposal of rain and industrial water, as described below: - A perimeter ditch will be built in the area of each location to dispose of rain water, in a trapezoidal shape of 0.80 m. width, 25 cm. depth, 0.40 m. base and 7.5 cm. thick in concrete with f'c = 2,000 psi. - Channels to collect oily water will be built. These channels will deliver water to a skimmer, and later carry this water to the treatment tanks. - As a part of the treatment for the drilling water, a trap for oily water will be built at the location.		
TECHNOLOGY USED	Small equipment: concrete mixers, vibrators, building formwork.		
PLACE OF EXECUTION	Access roads and location.		
RESPONSIBLE FOR THE EXECUTION	Environmental Coordinator of the **UT- IJP**.		
EXPECTED RESULTS	Adequate handling of rain water at the locations. Adequate handling of polluted rain water at the locations.		

6.4.5 GENERAL GUIDELINES FOR CONSTRUCTION AND DECOMMISSIONING

6.4.5.1 Environmental Alternatives Guideline (Abandonment Stage)

OBJECTIVE	Identify and present the alternatives that will exist after completion of the operation stage.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	Pollution of the water, air and soil resource at the location and in general, in the area of the project.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	Execute or implement environmental alternatives identified at the completion of the drilling phase and production tests of the wells.		
TECHNOLOGY USED	**Positive Production Tests**. - If the well is productive, the access roads will be kept. - The areas of the well locations are part of the current production areas of the development wells and will be left in the same conditions as before. - The flow lines will be installed to connect the well to the production flow lines of the Field. **Negative Production Tests (Dry Well).** The same measures presented above will be implemented except for the installation of flow lines.		
PLACE OF EXECUTION	Access roads, flow lines and location of the wells.		
RESPONSIBLE FOR THE EXECUTION	The Superintendent of the Palagua – Caipal Field and the Environmental Coordinator of the **UT- IJP.**		
EXPECTED RESULTS	Dismantling and total clean up of the area of the location, without causing pollution or negative effects. Recovering of the intervened area and permanent harmonization with the environment surrounding it.		

6.4.5.2 Liquid Waste Management Guideline (Abandonment Stage)

OBJECTIVE	• Dismantling and cleaning the location to leave it environmentally and technically ready for its subsequent recovery. • Removing the components installed for the management of domestic liquid waste generated in the execution of the typical activities of the company. • Removing the structures built in order to prevent alterations to the terrain.	
EXECUTION	**1. Planning**	**2. Preparation and Installation**
	3. Drilling	**4. Area Restoration / Abandonment**
ENVIRONMENTAL IMPACT	Affectation of the soil as a result of an inadequate disposition of waste from the dismantling of the location. Change in the natural landscape and its landforms.	
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation** / **Correction**
	Compensation	**Control** / **Protection**
ACTIONS TO BE TAKEN	Removal of structures and facilities set up during the building and assembly process. Treatment of all sanitary facilities that were built. Adequate disposition of the waste generated during the drilling and production tests, as well as the waste generated in the dismantling of the facilities and the demolition of structures.	
TECHNOLOGY USED	**Removal of the drill structures and facilities** The dismantling will begin with the disassembling and removal of drilling equipment and piping, auxiliary equipment such as mud pumps, warehouses, and office camps. The disassembling should not leave waste at the location, metal scrap and accumulated waste will be collected disposed of properly. **Closing and Final Management of Sanitary Facilities** Grounded structure, cement and concrete such as grease traps, sediment traps, ditches and canals must be dismantled and /or demolish. Organic waste accumulated in them should be transferred to be mixed with the closure material, since it can be useful for re-vegetation processes.	
PLACE OF EXECUTION	Location	

RESPONSIBLE FOR THE EXECUTION	The Field Superintendent and the contractors, under the supervision of the Environmental Coordinator of the **UT- IJP.**
EXPECTED RESULTS	Dismantling and total clean up of the area of the location, without causing pollution or negative effect to achieve recovery.

6.5 GUIDELINES FOR THE EVALUATION AND MANAGEMENT RISK FOR OIL AND GAS DEVELOPMENT

The following table contains a summary of the the guidelines of the Environmental, Healt and Safety Program. A table with each one of these guidelines can be found below.

PROGRAM	Number in the document		ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT GUIDELINES	
COMPREHENSIVE PROGRAM OF EVALUATION AND MANAGEMENT OF RISKS AND SPECIFIC POTENTIAL IMPACTS OF THE PROJECT	6.5.1		Assessment and management of risk and potential impacts of emissions into the air	
	6.5.2		Wastewater discharge management – Effluents	
	6.5.3	6.5.3.1	Solid waste management	Solid and liquid waste management
		6.5.3.2	Liquid waste management	
	6.5.4		Assessment and management of risk and potential impacts from noise generation	
	6.5.5	6.5.5.1	Conformation and stabilization of slopes at the locations	Terrestrial impact management
		6.5.5.2	Environmental revegetation and recovery of the surrounding area	
	6.5.6	6.5.6.1	Environmental management of production testing	Spills
		6.5.6.2	Waste management and pollution control	
	6.5.7		Assesment And Management Risk For Blow Out (Well Control Policy)	
	6.5.8		Measures for energy saving and efficient use	
	6.5.9		Water conservation measures	
	6.5.10		Water quality	

6.5.1 ASSESSMENT AND MANAGEMENT OF RISK AND POTENTIAL IMPACTS OF EMISSIONS INTO THE AIR

OBJECTIVE	• Comply with the regulations of air quality. • Identify and minimize atmospheric pollution from emissions. • Perform monitoring activities to determine volumes of total suspended pollutant particles (TSP), particulate matter, Sulfur Oxides (SOx), Nitrogen Oxides (NOx), Carbon Dioxide (CO2) and Ozone (O3).		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• Air quality deterioration from emissions of CO, CO_2, NOx, particulate matter as a result from machinery operation and vehicle traffic. • Disturbances to the fauna, flora and human settlements located near the wells' facilities.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Keep records of the state and maintenance of vehicles and equipment used during the development of the project. • Verify the compliance with regulations of the vehicles used regarding air quality.		
TECHNOLOGY USED	**If required, it** is essential to take into account the relevant provisions in Article 33 of Decree 02 of 1982, the air quality verification should be evaluated using the following methods:		
PLACE OF IMPLEMENTATION	Wells location and surrounding areas.		

Pollutant	**Method of Analysis**
Particles in suspension	Gravimetric by high volume sampler
Sulfur Dioxide	Colorimetric using pararosaniline
Carbon Monoxide	Analyzer, non-dispersive infrared
Photochemical oxidants (O_3)	Gas-phase chemiluminescence
Nitrogen oxides	Jacobs and Hochheiser
NPA	Slow response sound level meter

RESPONSIBLE FOR THE IMPLEMENTATION	Well Chief and the contractor company under the supervision of the Environmental Coordinator of the **UT-IJP**.
EXPECTED RESULTS	• No effect of emissions caused on the activity to the fauna and the people of the areas surrounding the wells. • Identification and reduction of the polluting sources of the air by emission of pollutants. • Monitoring records of air quality in terms of TSP, SOx, NOx, CO and HC. • Permanent use of elements of personal protection by workers of the company.

6.5.2 WASTEWATER DISCHARGE MANAGEMENT – EFFLUENTS

OBJECTIVE	Prevent or mitigate pollution of soil, surface water bodies and aquifers, by the improper disposal of waste water – effluents. Implement environmental management measures to manage liquid waste generated by activities of the company.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	Change in the physical, chemical and microbiological properties of the soil, water bodies, streams and aquifers produced by handling and pouring of untreated liquid waste.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	**Wash Water** • The location will have a drainage system to collect rain water, wash water, oil and chemical leaks from the equipment used in the operations. These waters will pass through an oil trap before taking it to the industrial waste water treatment system of the well. • To minimize the production of wash water from machinery and equipment, the equipment and machinery should be washed as seldom as possible and when they are washed, use as little water as possible. The vehicles should not be washed at the well location. **Domestic Waters** • Sewage water will be collected by separate sanitary networks, built in PVC of 3" or 4". • The treatment of domestic waste water will be done using compact portable plants of activated sludge. Some sewage water will be treated in grease traps. • The effluent of the activated sludge treatment plant and the grease tramp will be taken to the industrial waste water treatment system of the well, where once it complies with what is established in Decree 1594 of 1984 will be uploaded to a tank truck to be transported to the Palagua – Caipal Battery, where it will be treated with produced water from the field and then injected into deep reservoir.		

	Industrial Water • The industrial water that will be treated is mainly from mud dewatering or due to changes in the mud program. • Water will be sent to the storage tank at the well, where a conventional physicochemical treatment will be done (TECHNOLOGY USED). Once the water complies with what is established in Decree 1594 of 1984 will be uploaded to a tank truck for its mixing and treatment with waters from the field and then injected into deep reservoir. • Another alternative is to sprinkle the water on the roads, once it complies with the requirements established in Decree 1594 of 1984 for its use. **Oily Liquid Waste** • Oily waste generated in the well is burnt lubricants from oil changes of engines, therefore it is suggested that the contractors do not perform maintenance to engines at the well site.
TECHNOLOGY USED	**Sewage Water – Activated Sludge Plant** Activated portable treatment plants are the most commonly used for sewage water treatment, that consist of contact between waste water and bacteria that feed on organic waste in the presence of oxygen. The residual water that enters the system is mixed with activated sludge by recirculation. The mixture is aerated to allow different oxidation reactions to occur, that remove many organic components from the residual water. The characteristics of the design of the activated sludge treatment plant are: - Hydraulic retention time: 18 – 24 hours - Operation mode: full mixture - Type of Aeration: compressed air or mechanical aeration - Feeding / microorganisms ratio: 0.05 - 0.15 d-1 (d – 1 = days) - Solids retention time: 20 – 40 days - Concentration of suspended solids mixing liquor SSML: 3000 – 5000 mg/L **Industrial Water** The treatment of industrial waste water will be done in a tank and will consist of a physiochemical process, although a bacteriological process will also be carried out when the results from the monitoring samples show it is needed. The physicochemical treatment will include a pH adjustment, adding coagulants, flocculants and polymers when the latter are necessary, given that their use should be minimal and must be approved by the staff HSE of the UT-IJP. All the water must be disinfected before being transported to the water plant.

PLACE OF IMPLEMENTATION	Location where the wells are drilled.
RESPONSIBLE FOR THE IMPLEMENTATION	The Drilling company under the supervision of the Environmental Coordinator of the **UT- IJP.**
EXPECTED RESULTS	Comprehensive management and handling of liquid waste generated by the drilling of wells.

6.5.3 SOLID AND LIQUID WASTE MANAGEMENT

6.5.3.1 Solid Waste Management

OBJECTIVE	Prevent and/or mitigate potential impact caused by improper management, storage and final disposal of solid waste that will affect soil, superficial water bodies and aquifers.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	Change in the physical and chemical properties of the soil and water bodies by improper disposal of solid waste.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	**Domestic Solid Waste** • **Separation at the Source** Organic and recyclable waste has to be separated in order to facilitate its handling and disposal. To do so, there must be 55 gallon barrels at the location, strategically placed, appropriately colored and labeled as follows: ♦ Black Color - organic waste: food waste, fruit peels, etc. ♦ Green or White Color - recyclable waste: print paper, newspapers, magazines, cardboard, aluminum, disposable polystyrene, glass in all its presentations, ferrous metals, wood, etc. Some wastes that are neither technically or economically recyclable nor biodegradable must be collected in this container, to separate them in the treatment phase. ♦ Red Color - special waste: paper waste from sanitary facilities. The location must be kept clean. • **Collection** The waste bags, place in containers at the location, must be collected regularly. • **Storage** The bags will be stored in a collection center, in which they will be arranged and organized on pallets, according to their classification.		

The collection center must have a retaining wall, roof and three walls for the protection of the waste from the weather, and good ventilation.

- **Treatment and Final Disposal**

  - Organic waste will be stored and disposed of in the landfill in Puerto Boyaca.
  - The food waste will be given to people in the region, to feed animals (pig breeding).
  - Recyclables will be handled through the community action board of the rural area of Palagua for marketing.
  - Special waste will be disposed of by incineration in accordance with the Management Plan implemented by the contractor.

Industrial Waste

- **Drill Cuttings**
  - The most important industrial waste by quantity and quality, that is generated in a drilling well is composed of two fractions: the cuttings separated from the mud in the solid waste control equipment (product from the excavation of soil by action of the drilling bit); and the solids resulting from dewatering or dehydration of mud (removed from the line due to aging, loss of rheological properties or changes in the mud program).
  - The drill cuttings will be stored in a tank at the location, which will be transferred to the land-farming area for final disposal. I

- **Other Industrial Waste**

  - *Soil pollution from hydrocarbons*

The polluted soils generated in the wells are minimal; they will be transported and put in the oily waste storage yard at Palagua Field, next to the Water Injection Plant. An economical and technical viable volume will be held in storage, until it is put through a Bioremediation process in the land farming area.

  - *Cans, packaging, plastics and other*

Diesel fuel containers, packaging of chemicals for the preparation of drilling mud, plastic drums, gallons, pails, etc., generated by emptying chemicals, drilling pipe thread protectors, junk hoses, waste PVC pipe, etc.

	- All the products containing chemicals must be evacuated by the supplier of the service and cannot be sold or given away for any activity. - All containers of the chemicals for mud preparation or water treatment will be collected by the contractor (supplier). - The chemicals storage containers should be collected by the contractor (supplier). - The pipe thread protectors will be reused by the pipe supplying companies. - *Filters* Oil, air and engine fuel used filters are usually of fabric or cardboard with galvanized steel frame. This kind of waste, if possible, should not be generated, provided that the contractor performs equipment maintenance to the engines before arriving at the location. - *Wood, paper, cardboard* Wood is generated from the packaging of equipment and spare parts used in drilling. Paper and cardboard are generated from the bags and sacks used in packaging of mud chemicals, cements, completion fluids and water treatment. The material will be collected and stacked in the well location area and then removed by the contractors. - *Metal Scrap* Produced in the manufacture of homemade tools, components, parts, etc., changing parts and repair shop activities. The non-reusable material will be sent to the storage yard for industrial solid waste of the field, adjacent to Palagua – Caipal Battery. - *Polluted Textiles* Waste such as burlap, gloves, overalls, rags and other textiles, which cannot be recycled, will be taken to the industrial waste storage yard at the field, adjacent to Palagua –Caipal Battery.
TECHNOLOGY USED	**Solidification and Stabilization of Solid Waste from Drilling** This is a treatment and disposal process for solid waste from drilling consisting of reducing humidity and stabilizing waste through the use of materials such as quicklime (purity > 65% of CaO), which generates an exothermic reaction that guarantees dehydration and compacting of the waste.

	Solidification and stabilization is recommended for cuttings resulting from water based mud systems. The water based cuttings, once solidified and stabilized, can be mixed with cementitious material for later use. The same procedure is utilized for treating the sand produce from the clean out services.

PLACE OF IMPLEMENTATION	The location where the development wells are drilled.
RESPONSIBLE FOR THE IMPLEMENTATION	The Drilling Company and the contractors, under the supervision of the Environmental Coordinator of the **UT- IJP.**
EXPECTED RESULTS	• Comprehensive solid waste management for waste generated during well drilling. • Adequate handling of solid waste in collection, temporary storage and final disposal.
REMARKS	The Contractors of the project are responsible for the comprehensive waste management of the waste produced during the development of the activities.

6.5.3.2 Liquid Waste Management

OBJECTIVE	• Formulate the liquid waste management measures to prevent or minimize the alteration of the drainage of the area of influence of the project. • The waste generated in the management and operative quarters is treated and disposed of according to the current environmental legislation and in an environmentally safe manner.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• Pollution of soil and water bodies. • Possible change in the physical, chemical and biological properties of the surface and ground water and the soil.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	During operation, special care will be taken for the liquid waste management at the management quarters and the area surrounding the location of the wells. Drainage should be through ditches, sewers, culverts, dock and/or sumps, in order to minimize contact of soil and natural water with pollutants. The workers should be familiar with the measures so that the liquid waste will not be disposed of in surface water bodies.		
TECHNOLOGY USED	At the location, it is expected that liquid wastes be separated into independent collection systems for industrial liquid waste. The rain water management system consists of ditches, sewers, culverts, docks and/or slumps which are separated from greasy and oily water before being taken to the grease trap.		
PLACE OF IMPLEMENTATION	Perimeter areas of the location.		
RESPONSIBLE FOR THE IMPLEMENTATION	Environmental Coordinator of the **UT- IJP** and the Well Supervisor as representative of the drilling company.		
EXPECTED RESULTS	Disposing of liquid waste and runoff water without pollution.		

6.5.4 ASSESSMENT AND MANAGEMENT OF RISK AND POTENTIAL IMPACTS FROM NOISE GENERATION

<table>
<tr><td>OBJECTIVE</td><td colspan="3">• Comply with the regulations for noise generation and keep sound levels within the established standards of the current environmental legislation.
• Identify and minimize the noise pollution sources.
• Implement control measures to mitigate noise levels produced by machinery operation at the development wells.</td></tr>
<tr><td rowspan="2">EXECUTION</td><td colspan="2">1. Planning</td><td>2. Preparation and Installation</td></tr>
<tr><td colspan="2">3. Drilling</td><td>4. Area Restoration / Abandonment</td></tr>
<tr><td>ENVIRONMENTAL IMPACT</td><td colspan="3">• Deterioration of the air quality by noise generation, resulting from functioning machinery and vehicular traffic.
• Affectation of fauna and human settlements located closet o the wells facilities.</td></tr>
<tr><td rowspan="2">TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE</td><td>Prevention</td><td>Mitigation</td><td>Correction</td></tr>
<tr><td>Compensation</td><td>Control</td><td>Protection</td></tr>
<tr><td>ACTIONS TO BE TAKEN</td><td colspan="3">• Keep records of the state and maintenance of vehicles and equipment during the development of the project.
• Verify compliance of vehicles with the regulations regarding noise emissions.</td></tr>
<tr><td>TECHNOLOGY USED</td><td colspan="3">If required, the technology for environmental noise measuring will be taken into account included in the resolution 627 of 2006 by the Ministry, Housing and Land Development (MHTD):

<table>
<tr><th>NPS</th><th>Method of Analysis</th><th>Sampling Frequency</th></tr>
<tr><td>75 dB</td><td>TEFC</td><td>Daytime maximum value (7:01 to 21:00)</td></tr>
<tr><td>70 dB</td><td>TEFC</td><td>Nightime maximum value (21:01 to 7:00)</td></tr>
</table>
</td></tr>
<tr><td>PLACE OF IMPLEMENTATION</td><td colspan="3">Wells locations and surrounding areas.</td></tr>
<tr><td>RESPONSIBLE FOR THE IMPLEMENTATION</td><td colspan="3">Well Chief and the contractor under the supervision of the Environmental Coordinator of the UT-IJP.</td></tr>
<tr><td>EXPECTED RESULTS</td><td colspan="3">No effects on the fauna, the inhabitants of the surrounding areas of the well and workers due to high sound levels caused by the activity.
Identification and reduction of noise polution.</td></tr>
</table>

6.5.5 TERRESTRIAL IMPACT MANAGEMENT AND TRACE OF THE PROJECT

6.5.5.1 Conformation and Stabilization of slopes at the locations

OBJECTIVE	Establish the appropriate measures to manage fill slopes of the wells locations, related with the stability during and after the execution of works.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• Changes in the drainage system of the place. • Negative visual changes. • Removal of the vegetation cover of the affected area. • Instability of slopes caused by filling and excavation activities.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• There are no slopes near to the access roads and the locations where their height is over 4 m., therefore there is no need to build coronation ditches. • Revegetalize the fill slopes at the locations. • The angle of inclination of the fill slopes cannot exceed a maximum of 1V: 1H.		
TECHNOLOGY USED	Heavy machinery: Bulldozer, backhoe and motor grader.		
PLACE OF IMPLEMENTATION	Access road and location.		
RESPONSIBLE FOR THE IMPLEMENTATION	Environmental Coordinator of **UT- IJP**.		
EXPECTED RESULTS	Stability of the executed works, adequate management of the environment and minimization of the visual impact generated by the works.		

6.5.5.2 Environmental Revegetation and Recovery of the Surrouding Area

<table>
<tr><td>OBJECTIVE</td><td colspan="3">• Mitigate the landscape impact caused during location preparation.
• Restore the vegetation cover lost during the adaptation of the locations.
• Contribute to landscape improvement and the conservation of the species of ecological importance in the area.
• Protect the existing fill slope at the location with vegetation cover in order to prevent landslides or destabilization of the fill slope.</td></tr>
<tr><td rowspan="2">EXECUTION</td><td colspan="2">1. Planning</td><td>2. Preparation and Installation</td></tr>
<tr><td colspan="2">3. Drilling</td><td>4. Area Restoration / Abandonment</td></tr>
<tr><td>ENVIRONMENTAL IMPACT</td><td colspan="3">• Loss of the vegetation cover during construction.
• Destabilization of slopes.</td></tr>
<tr><td rowspan="2">TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE</td><td>Prevention</td><td>Mitigation</td><td>Correction</td></tr>
<tr><td>Compensation</td><td>Control</td><td>Protection</td></tr>
<tr><td>ACTIONS TO BE TAKEN</td><td colspan="3"><u>Species Selection</u>
• The arboreal species selected should be, as much as possible, of rapid growth during the early years,with easilyy dispersed seeds for rapid growth of foliage.
• The graminea to be used should be adapted to the region, easily obtainable and of good performance. It is recommended to use braciaria grass as introduced species, with good adaptability.
• The recommended planting depth depends on the species (between 50 cm and 1.5 m).

<u>Planting Location</u>
• The species should be planted around the locations and on the sides of the road leading to the wells. The arboreal species will be planted at a spacing of approximately 10 to 15 meters.</td></tr>
<tr><td>TECHNOLOGY USED</td><td colspan="3"><u>Sowing Time</u>
It is recommended that the planting be done during rainy periods. In that way, it will take advantage of the whole wet season in order to have a good adaptation. Planting can be done at other times if IJP UT does the watering when necessary, at least every third day during the dry or low precipitation season.</td></tr>
</table>

	Type of Spacing To take maximum advantage of the area to be reforested and to create favorable conditions for optimal growth and natural pruning, it is recommended to place trees with regular and dense spacing, when required by the terrain. **Sowing of Grass** • The grass will be planted by seed scattering at a rate of 20 kg/ha prior soil preparation. Since the seed in very light it should be sown with a mixture of soil to give it a very light coverage. • Planting of braciaria runners is used to recover graminae coverage areas. The sections should be planted with a triangle or staggered system. The runner chosen must present at least a 15 cm section which should include at least one leaf, node or bud. • The soil fertilization must be the same as that used for the planting of native species. As in the case of braciaria grass, it develops very well in poor soils and is not demanding in nutrients.
PLACE OF IMPLEMENTATION	Well location.
RESPONSIBLE FOR THE IMPLEMENTATION	Field Superintendent and the contractor of the works under the supervision of the Environmental Coordinator of the **UT-IJP**.
EXPECTED RESULTS	Total recovery of the intervened area and/or harmonization of the landscape. Stabilization of all slopes.
REMARKS	Due to the fact that the construction of the Palagua well location does not imply removal of arboreal species, the application of this fact sheet is not mandatory, but for landscape beautification reasons.

6.5.6 SPILLS

6.5.6.1 Environmental Management of Production Testing

OBJECTIVE	• Present management measures for well production testing at the location to minimize the environmental risks that may be generated. • Provide safety guidelines for the transportation of produced fluids.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	Alteration of physical, chemical and biological properties of water and soil.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Adopt adequate storage and transportation measures for fluids produced during the testing. • Follow the management procedures for polluted waste generated during production testing.		
TECHNOLOGY USED	• The crude and formation water will be separated and stored at the location in tanks, to be then transported in tank trucks to the Palagua Battery. • If there is gas production during the testing, it will be burnt in a flare that allows full combustion in order to avoid emission of particles, following the regulations with respect to height and placement of the flare and according to the specifications in the Decrees 02/82 and 948/95. • The prodecures for solid and liquid waste designed for the drilling stage will be followed. • Storage will be done in hermetic tanks and provided with flood levees. • In the event of a leak in the production line, the procedures for solid and liquid waste management designed for the drilling stage will be followed. • The tank trucks for transportation of formation fluids should be securely airtight, and should follow the safety regulations to avoid spilling		
PLACE OF IMPLEMENTATION	Location of the wells to be drilled.		

RESPONSIBLE FOR THE IMPLEMENTATION	Production supervisor, under the supervision of the Environmental Coordinator of the **UT- IJP.**
EXPECTED RESULTS	• Zero spills of produced fluids. • Adequate disposal of produced water. • Adequate disposal of solid waste (domestic and industrial) during the operation.

6.5.6.2 Waste Management and Pollution Control

OBJECTIVE	Develop procedures for effective control of pollution that may arise by access roads and the location preparation work.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	• Emissions of particles to the atmosphere caused by the machinery and equipment used. • High noise levels produced by machinery and equipment at the work area. • Disposal of polluting materials (Building material, solid and liquid waste, or fuel and lubricants) in water bodies or soil by workers. • High visual impact for dumping solid and liquid waste in zones close to the work area. • Soil contamination due to an accidental spill of fuel and lubricants from machinery. • Contamination of ground water supplies by spills described in the preceding item.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Conduct periodic checkups of the machinery in the work area, to prevent spillis caused by leakages of fuel and/or lubricants onto the ground or into water bodies,. • Select an area where fuel and oil can be stored without the possibility of affecting water streams. This fuel storage area should have geomembrane flooring or a cement floor and have a grease trap. It is recommended that this area have a ceiling with No Smoking signs posted. • Change of lubricants or supplying fuel must be carried out in remote areas away from vegetation or water bodies. Lubricant that is been changed will be placed in 55-gallon metallic barrels. Likewise, the soil must be protected with polyethylene to prevent contamination. • Inform workers of the rules established in the work area to avoid the impacts caused by pollution at the site of the works. • The disposal of surplus materials or organic residues by workers in places like water bodies, work place surrounding areas and springs will not be allowed.		

	• The containers to store solid waste produced by workers will be strategically placed in the work area.
TECHNOLOGY USED	• Waste collection systems in plastic containers. • Knowledge and experience of the Environmental Inspector to detect pollutant factors. • Septic tanks and / or portable toilets for domestic waste management.
PLACE OF IMPLEMENTATION	Well location and flow line.
RESPONSIBLE FOR THE IMPLEMENTATION	The Well Supervisor, under the supervision of the Environmental Coordinator of the **UT- IJP**.
EXPECTED RESULTS	Adequate waste management and minimization of visual impact generated by the work.

(See Figure 6-1, Areas in the Palagua-Caipal field Susceptible to Spills, on the next page).

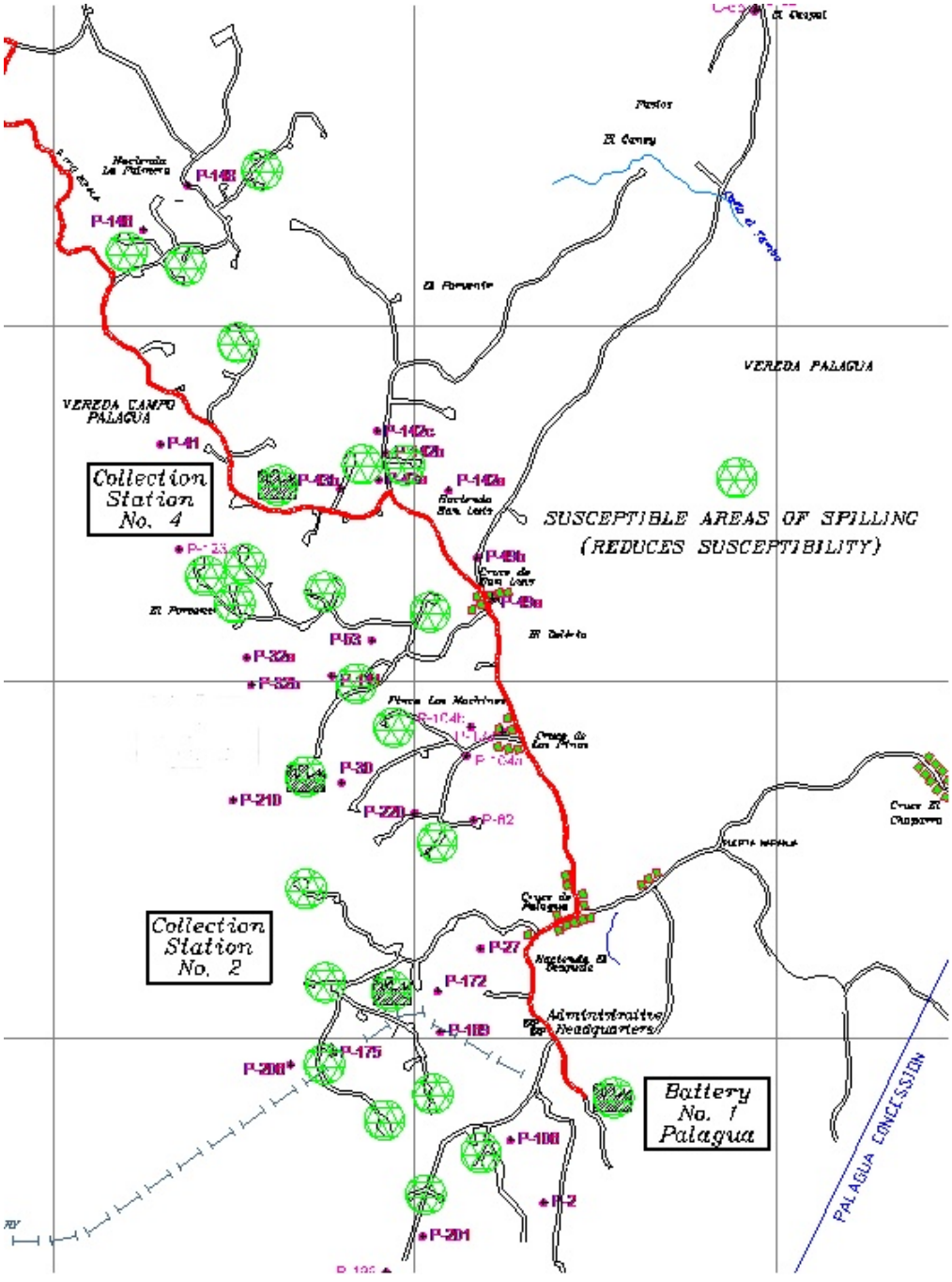

Figure 6 - 1 Areas in the Palagua-Caipal field Susceptible to Spills

6.5.7 ASSESMENT AND MANAGEMENT RISK FOR BLOW OUT (WELL CONTROL POLICY)

<table>
<tr><td>OBJECTIVE</td><td colspan="3">UTIJP's well control policy is to have pressure barriers that prevent uncontrolled flows of oil, gas or water either to the surface during drilling and workover activities. All field operations are conducted in such a way that operations do not expose to unreasonable well control risks</td></tr>
<tr><td rowspan="2">EXECUTION</td><td colspan="2">1. Planning</td><td>2. Preparation and Installation</td></tr>
<tr><td colspan="2">3. Drilling</td><td>4. Area Restoration / Abandonment</td></tr>
<tr><td>ENVIRONMENTAL IMPACT</td><td colspan="3">• Workforce health and life
• Spillage in the area</td></tr>
<tr><td rowspan="2">TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE</td><td>Prevention</td><td>Mitigation</td><td>Correction</td></tr>
<tr><td>Compensation</td><td>Control</td><td>Protection</td></tr>
<tr><td>TECHNICAL CONSIDERATIONS</td><td colspan="3">• The risk of well flowing to the surface during the drilling operations arises when the reservoir is over pressured. The over pressures reservoir is defined as the reservoir, where the downhole reservoir pressure is more than the NORMAL hydrostatic gradient of 0.44 psi/ft. for example, the reservoirs in the Palagua- Caipal field are 5000 ft deep. The normal hydrostatic pressure at this depth is 5000 * 0.44 psi/ft= 2200 psi.

• In the Palagua –Caipal fields, which are on production from 1957, the reservoirs are depleted, which means the reservoir pressure is less than the normal hydrostatic pressure of 2200 psi at 500 ft depth. Due to depletion of pressure, the wells in Palagua-Caipal field cannot flow oil to the surface, without the help of a pump. Hence, <u>it is not possible to have a blow out of a well in this pressure depleted Palagua- Caipal oil field</u>.

• The operator, UT-IJP, measures reservoir pressures by shutting the wells for few days and then measure reservoir pressure. This is also called as a pressure build-up test. The low reservoir pressure (below the hydrostatic pressure) is confirmed by build-up pressure tests shown in the table below.
<table>
<tr><th>Date</th><th>Well</th><th>Datum (feet)</th><th>Formation Pressure (psi)</th><th>Hydrostatic pressure (psi)</th><th>REMARKS</th></tr>
<tr><td>7-21-2004</td><td>P-179</td><td>4,569</td><td>1,829</td><td>2,025</td><td>Reservoir depleted</td></tr>
<tr><td>7-6-2006</td><td>P-185</td><td>5,064</td><td>1,444</td><td>2,243</td><td>Reservoir depleted</td></tr>
<tr><td>5-12-2007</td><td>P-204</td><td>4,432</td><td>1,660</td><td>1,965</td><td>Reservoir depleted</td></tr>
</table></td></tr>
</table>

ACTIONS TO BE TAKEN	• **Primary control (Adequate drilling mud weight)** Primary well control is maintained by controlling formation pressures with the hydrostatic pressure of the drilling fluid. The hydrostatic pressure of a mud column is a function of the mud density and the true vertical depth of the well. Although the Palagua and Caipal reservoirs are pressure depleted, they are drilled using a drilling fluid (mud) that is able to provide sufficient hydrostatic pressures to equal or exceed the reservoir pressures. Therefore, the hydrostatic pressure of the drilling fluid is an essential feature in maintaining control of a well and preventing blowouts. Insufficient pressure in the hole while drilling control can cause kicks, hole heaving, and blowouts. For this reason, Palagua and Caipal wells are drilled with a drilling fluid having a hydrostatic pressure of 0.478 psi/ft (i.e., mud weight of 9.2 pounds per gallon or density of 68.86 lbs per cubic ft). • **Secondary control** When primary control of the well has been lost due to insufficient mud hydrostatic pressure, it becomes necessary to seal or close the well to prevent an uncontrolled flow, or blowout, of formation fluids. This secondary seal or close the well is provided by installing a Blowout Preventer (BOP). It consists of drill pipe blowout preventers designed to stop the flow through the drill pipe and annular (BAG) preventers designed to stop the flow from the annulus. To activate the BOP there are two methods. The primary method of closing both ram and annular preventers is by hydraulically operated accumulators. The accumulator has to be capable to supply sufficient pressure fluid to close all preventer units in the BOP stack. The accumulator itself is equipped with a pressure regulating system that allows adjusting the closing pressure on the preventers. In case the hydraulic system fails, the second method is manual, where ram preventers have a screw-type locking device that can be used manually to close them. On onshore locations such as Palagua field, the access to manual control method is easily available. The drilling rig must be evaluated to determine if its BOP equipment meets the minimum specifications. The Palagua field has never experienced a problem with the BOP while drilling.

	   BOP STACK INSTALLED — RAM TYPE PREVENTER — BAG TYPE PREVENTER • **Tertiary control** In an emergency and extreme case, and where secondary control is not reliable due to equipment failure or hole conditions, tertiary procedures can be employed. Tertiary procedures are the 'last resource' and to be considered only in an emergency situation. In most cases it is expected to lose the well or part of the hole. Two common types of tertiary control techniques are cement and barite plugs.
TECHNOLOGY USED	**Primary control** Common forms of the hydrostatic pressure equation are as follows: Hydrostatic pressure (psi) = 0.052 x Mud Weight (ppg) x Depth (ft) The mud hydrostatic pressure for Palagua and Caipal wells corresponding to a depth of 5,000 ft is: Hydrostatic pressure = 0.052 x 9.2 ppg x 5000' = 2392 psi, which exceeds the reservoir pressure of 1829 psi recorded in the well P-179. Thus, a bottomhole pressure of 2392 psi will prevent oil flow into the wellbore during drilling. This is because reservoir pressure of 1829 psi is less than the bottomhole pressure of 2392 psi. **Secondary control** For secondary control, the following are the minimum or equivalent specifications for the drilling rig:

BOP Well Control Equipment	
Nominal 11" – BOP Stack	
BAG TYPE PREVENTER	CAMERON Type D
Size	11"
Working Pressure	5000 psi
Top connection type	Flange
Top Connection size	11 x 5000 psi x R-54
Bottom Connection Type	Flange
Bottom Connection Size	11 x 5000 psi x R-54
RAM TYPE PREVENTER	CAMERON QRC
Size	11 "
Working Pressure	5000 psi
Top Connection type	Flange
Top Connection Size	11" x 5000 psi x R-54
Bottom Connection Type	Flange
Bottom Connection Size	11" x 5000 psi
Pipe ram size available	4 ½ ", 3 ½ ", 2 7/8 ", 7", 9
Blind Ram	1 set
Nominal 11" Drill Spools "T"	CAMERON, type "T"
Top Connection type	Flange
Top Connection size WP	11" x 5000 psi x R-54
Bottom Connection Type	Flange
Bottom Connection Size WP	11" x 5000 psi x R-54
ED x Height	44"
Outlets	No. 2 Side gate valve check valve
Outlets size WP	4" x 5000 psi
Choke valve	FLOCON
Hydraulic Operated	Type HCR
Number	No. 1
Size & Working pressure	4 1/16" x 5000 psi
Check Valve	FLOCON
Type	ONE WAY DROP
Number	No. 1
Size	2 1/16"
Working Pressure	5000 psi
ADAPTER / SPOOLS	No. 1
BOP Control System & Associated Equipment	
BOP control system	KOONEY
	Type 80
Surface accumulator unit	Model MOD-160-80G
Installation site	
Soluble oil reservoir capacity	280 Gal.
Accumulator Skid consisting of	HUDSON MACH WKS

Number of bottles No. 2 Guide float	
Accumulator	
Total Bottles capacity	80 Gal. E/A
Bottles working pressure	3000 psi
Control Panel	GENERAL ELECTRIC 206-D704 MABA
Triplex Pumps	KOOMEY
	Model UET20B
Each pump delivers	8.7 GPM
Max. Working pressure	3000 psi
With Electrical motor	U.S. MOTOR
	Model R7509-00-046M, L, 25 hp.
	230/460V. 60 Hz, 50.6/25.3A, 1765 rpm
	GENERAL ELECTRIC
Control Panel	CR-206-d704, 460v, 60h
Air Pumps	Model U7A26
Each pump delivers	9.6 gpm
Max. Working pressure	3000 psi
Drilling control panels	Model KOOMEY A 7GR
Remote control panel	Model KOOMEY A 7GR
Installation site	RIG FLOOR
	AG MODEL 5120
Air Compressor	Size 6" x ¾" x 4"
Accumulator	Model WP200H2412
Electrical motor	Make-U.S. MOTOR
	Type L, 230/460 V. 50/25 A
	1755 RPM, 3 PH 25 HP
Choke Manifold	
Size	2" x9 Valves
Working Pressure	5000 psi
Number of adjustable choke	2
Make	FLOCON
Maximum Aperture	64/64"
Kill & Choke lines From drilling Spools to choke man	1
Inside diameter/Working pressure	2" X 5000 PSI
Chicksan Joints	
Quantity	6
Size	2"
Working Pressure	5000 psi
Length of Each Joint	8 Fts

	Tertiary control - *Barite plugs* A barite plug is a slurry mixture of barite in fresh water or diesel oil that is placed in the hole via the work string. The idea is that the solids settle out rapidly to form an impermeable plug. This plug is impermeable and is known to shut off the well flow. - *Cement plugs* Cement plugs may be used to isolate downhole flows. Cementing is also considered a 'last' option and should only be used if there is no other choice. Note that cementing will most likely result in the loss of the well and total abandonment. It may also cause the tools and work string to be cemented in place.
PLACE OF IMPLEMENTATION	This fact sheet will be applied inside the location where the development wells are drilled, and outside the location, at the main office at bidding time.
RESPONSIBLE FOR THE IMPLEMENTATION	The Drilling Company and the contractors, under the supervision of the Environmental Coordinator of the **UT- IJP.**
EXPECTED RESULTS	Adequate well control during the drilling campaign.
REMARKS	In Palagua field, the reservoirs are depleted and their pressure is below the normal hydrostatic pressure. Hence, oil from the reservoir cannot flow to the surface on its own, without installing a pump. However, as an extra precaution, a high density drilling fluid shall be used which provides significantly high pressures in the hole as compared to the reservoir pressure, preventing any possibility of the well blow out during drilling.

6.5.8 MEASURES FOR ENERGY SAVING AND EFFICIENT USE

OBJECTIVE	• Present options and effective measures or programs for energy conservation. • Save energy in different areas and stages of the Project with the participation of the company's employees. • Obtain benefits from energy conservation by continuous administrative and operational improvements.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	Improvement in Energy efficiency.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Adopt habits of energy efficiency without changing the Company's typical activities. • Be proactive in activities intended to reduce energy consumption. • Reduce the Company's energy consumption.		

TECHNOLOGY USED	**Change of consumption habits for immediate benefit, through actions such as:** • Turn off lights and disconnect equipment while not in use in the office. • Minimize the use of electric light during daylight hours. • Reduce lighting in corridors during daylight hours. • Control of air conditioning (closing doors when entering and exiting) • Use of energy efficient lights. • Avoid dampness in walls of the facilities. • Avoid leaks through doors and windows. • Divide the lighting circuits and take advantage of natural light. • Control leaks and air conditioning with exhaust fans in restrooms. • Paint walls of facilities with light colors. • Clean and maintain lighting and air conditioning systems. **Save non- renewable fuels, such as oil, through actions such as:** • Avoid use of automobile for a short distance. • Drive the vehicle correctly (avoid abrupt starts and brakes) • Optimize routes to cut down on distance. • Tune the motor and inflate tires correctly. • Reduce the use of public transportation outside of rush hours. • Keep internal roads in good conditions. **Staff Training :** • Train staff in saving energy and being efficient. • Encourage workers to adopt new energy-saving habits.
PLACE OF IMPLEMENTATION	Local facilities- Administrative and operative areas. Location of the wells to be drilled.
RESPONSIBLE FOR THE IMPLEMENTATION	Production Supervisor**,** with the Supervision of the Environmental Coordinator of **UT- IJP.**
EXPECTED RESULTS	• Reduction of energy use, to be undertaken by the members of the organization, by improving their habits. • Reduce energy use expenses. • Higher efficiency in the use of natural resources.

6.5.9 WATER CONSERVATION MEASURES

OBJECTIVE	• Present water conservation options in a comprehensive program to protect natural resources that are directly and indirectly in the Palagua – Caipal Field. • Inform and train Company employees and residents of the Palagua – Caipal field about the importance of conserving water and suggest measures to improve efficiency in water use.		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration / Abandonment**	
ENVIRONMENTAL IMPACT	Change in the physical, chemical and biological properties of water Reduction in consumption of the water in the Palagua – Caipal field area.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• Identify and repair leaks in the Company's distribution services. • Identify the areas of the Company that consume the most water and plan measures in addition to the distribution system, if it becomes necessary. • Adopt water saving measures and habits. • Make good use of water for human consumption (do not waste) • Avoid polluting bodies of water in the Palagua – Caipal field area. • Avoid oil or toxic substance spills that may filter into bodies of water on the surface or underground. In the event of a spill, actions noted in section 6.5.6 (Spills) should be taken. • Use rain water for irrigation and cleaning activities. • Forbid the disposal of dangerous waste in landfills. • Monitoring aquifers and treated water before their injection in to the deep Wells.		
PLACE OF APPLICATION	Local facilities- Administrative and operative areas. Location of the wells to drill.		
RESPONSIBLE FOR EXECUTION	Production Supervisor**,** with the Supervision of the Environmental Coordinator of **UT- IJP.**		
EXPECTED RESULTS	• Reduction in the water use and conservation of the underground and surface water quality and volumes. • Reduce expenses in water consumption. • More efficient use of natural resources.		

6.5.10 WATER QUALITY

OBJECTIVE	• Continue the waste water injection program performed in the plant. • Monitor injection water quality near its treatment site. • Guarantee injection water quality by improving quality from the starting conditions to the sewage plant for its injection		
EXECUTION	**1. Planning**	**2. Preparation and Installation**	
	3. Drilling	**4. Area Restoration/Abandonment**	
ENVIRONMENTAL IMPACT	• Pollution of soil and water bodies. • Change in the physical, chemical and biological properties of soil, surface and under-ground water.		
TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	**Prevention**	**Mitigation**	**Correction**
	Compensation	**Control**	**Protection**
ACTIONS TO BE TAKEN	• During the drilling operation of wells, the sewage will be treated for its injection. • The waste water quality will be monitored at the entrance and exit of the treatment plant analyzing the physical-chemical parameters: O/W, Suspended Solids, Turbidity, and Dissolved Oxygen. • Ensure that none of the waste water is disposed in water bodies, nor in areas of the Palagua field. Any treated sewage is re-injected.		
TECHNOLOGIES USED	The Palagua – Caipal field has a water treatment plant. Once treated, water is re-injected in the reservoir.		
PLACE OF APPLICATION	Location – Water treatment plant.		
RESPONSIBLE FOR EXECUTION	Environmental Coordinator of **UT- IJP** and the Well Supervisor as representative of the drilling company.		
EXPECTED RESULTS	Improvement of water quality. Water Conservation		

6.6 EMERGENCY AND CONTINGENCY PLAN - GENERAL

6.6.1 INTRODUCTION

Preparing for emergency response is important given the legal, economic and environmental implications that can be caused by emergencies. For this reason, being prepared for emergencies is a priority since they may occur at any given time, resulting in devastating consequences.

This guide establishes the mechanisms and response actions to attend in a timely, efficient and effective manner any partial or total disruption of activities of the project **"DEVELOPMENT WELL DRILLING IN PALAGUA-CAIPAL FIELD".** The safety of workers or visitors, the operational stability of the different areas or work sites, and members of the community working in the surrounding area is ensured through the Emergency and Contingency Plan. It also seeks to reduce the environmental impact caused to the affected area.

The activities developed within the project **"DEVELOPMENT WELL DRILLING IN PALAGUA-CAIPAL FIELD"** are diverse and vary in time. The *Emergency Plan* aims to cover most of the possible events, but there are several activities that require adjustments or adaptation to external procedures, thus leaving open the possibility of adopting temporary measures and plans which are developed according to the particular circumstances.

6.6.2 APPLICABLE DEFINITIONS

Contingency: An event that has the possibility of occurrence or non-occurrence.

Emergency: An event that has been calculated to occur.

Possibility: Something that can be done, exists or occurs. It is analyzed from a qualitative point of view, for example: Low, Medium or High.

Probability: Eminent occurrence of the event, without specifying the time. The valuation system is taken from the quantification of the level of possibility.

Incipient Emergency: An event that can be controlled by a group of people with basic training and available equipment in the area.

Internal Emergency: An event that occurs in or around the project area that requiring specialized staff.

General Emergency: An event that occurs within the institution and also threatens neighboring institutions.

Vulnerability: Weakness due to an event that can cause impairment.

Risk: Degree of impairment resulting from an event.

Emergency Committee: An administrative group which is responsible for organizing and operating the Emergency Plan.

Emergency Brigade: Task Force trained to attend or respond to emergencies.

Provision for Emergency Care: Clothing that provides protection to the task force faced with an emergency.

Emergency Care Equipment: Equipment designed to be operated by the brigade in accordance to the risk factor.

6.6.3 LEGAL FRAMEWORK

The following is the Colombian legal basis on which this Emergency and Contingency Plan was built:

- **Law 9. of 1979:** National Health Code, Articles 80, 84, 96 and 114.
- **Resolution 1016 of 1989:** By which the organization, operation and method of Occupational Health Programs developed by employers in the country is regulated.
- **Decree 1295 of 1994:** By which the organization and administration of the General System of Occupational Hazards is determined.
- **Decree 033 of 1998:** National Earthquake Resistance Code.
- **Substantive Labour Code:** Article 205

6.6.4 SCOPE

To develop an Emergency and Contingency Plan for employees, visitors and other persons involved in the project **"DEVELOPMENT WELL DRILLING IN PALAGUA-CAIPAL FIELD"** through a document that states and applies knowledge to act efficiently and promptly in case of emergency.

This plan is applicable for the different stages of the project to prevent, control, and recover from an emergency event.

6.6.5 OBJECTIVES

6.6.5.1 Main Objective

To identify potential threats or risks that may arise from natural or anthropogenic causes, to take measures for prevention and control, through the formation of emergency brigades and by developing procedures for emergency care.

6.6.5.2 Specific Objectives

- Establish and generate skills, conditions and procedures that allow users (workers, visitors and other persons involved in the project) to prevent and to protect themselves in case of disaster or collective threats that may jeopardize the project, through quick, coordinated and reliable actions, and to have and organizational structure that provides adequate health care to all injured persons, if any.
- Plan evacuation drills.
- Identify and implement a planning process of prevention, forecasting, mitigation, preparedness, response and recovery in case of disaster.
- Have an adequate organizational structure in case of emergency.
- Determine threats, conduct vulnerability analysis and define levels of risk.
- Establish a standard evacuation procedure for all project users (operators, contractors, visitors).
- Establish an operational system " IN SITU " for the attention of potential injuries during all types of emergencies
- Promote among workers or employees an environment of trust, and to motivate their participation in the emergency prevention measures and activities.

6.6.6 RESPONSIBLE PERSONNEL FOR THE IMPLEMENTATION OF THE PROCEDURES

The UT-IJP, will monitor and supervise the overall development and implementation of the Emergency and Contingency Plan for all activities during the operation of the project **"DEVELOPMENT WELL DRILLING IN PALAGUA-CAIPAL FIELD"** It will also provide the necessary infrastructure and resources for the proper implementation of this plan.

Finally all the people working on the Project are responsible for developing and implementing the activities described to control and to prevent emergencies.

6.6.7 NATURAL, TECHNOLOGICAL AND ANTHROPOGENIC RISK ASSESSMENT

6.6.7.1 Evaluation of the various threats.

- ***Threat Identification.***

The following table presents a summary of the existing potential threats.

Table 6 - 1 Existing Potential Threats

POTENTIAL THREATS	POSSIBLE SCENARIOS	FACTORS THAT PROMOTE RISK
ANTHROPIC Civil disorder type Bombing Assault, robbery, theft Kidnapping or an attempt	Work Fronts, Camp Areas	Project Location Social, economic characteristics of the sector Existence of infrastructure and urban settlements that increase the likelihood Of an accident or the severity of its consequences. Main street area, Project Security, Social situation in the area.
NATURAL Earthquake Weather Floods	Work Fronts, Camp Areas	Location of medium - high seismic zone. History of occurrence of climate-related events (blizzards, hail, storms). Infrastructure, characteristics that increase the likelihood of an event or the severity of its consequences.
TECHNOLOGICAL Electrical Fire, Fire Fuels Exhaust Gas Explosion	Work Fronts, Camp Areas	Human error. Misuse of equipment and tools. Poor use of materials and supplies. Improper storage of combustibles. Inadequate signs. Inadequate maintenance of machinery and tools.

Source: Work Group

- ***Probability of occurrence of the threat***

To organize the basic information for the design of the Emergency and Contingency Plan and to set priorities, emergencies were classified according to their severity, as seen in the table below.
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Table 6 - 2 Probability Of Occurrence Of The Emergency

CATEGORY	PROBABILITY
LOW	Event that has never happened, but there is information that does not preclude its occurrence, it is unlikely to happen. Is characterized by the color green.
MEDIUM	Event has already occurred at the site or in similar conditions and may even occur in these conditions. It is represented by yellow.
HIGH	Instrumented event or with information which makes it evident and detectable. It has happenned in previous projects, and is represented by the color red.

Source: Field Work

- ***Assessment of vulnerability conditions.***

The assessment of vulnerability is established by qualitatively measuring the impact of threats on people and its economic implications. The methodology and results on each assessment is presented below.

Vulnerability of Individuals

The potential impact of each emergency is analyzed. The categories, in which the severity of the threats is quantified, are described in the following table.

Table 6 - 3 Vulnerability Of The People Related Threat / Risk

CATEGORIES	VULNERABILITY	COLOR
LOW	The event can produce mild injuries in people without disabilities.	GREEN
MEDIUM	The event can produce injuries resulting in temporary incapacity for up to 180 days, which can be extended another 180 days	YELLOW
HIGH	The event can result in serious injury, permanent disability, death, and high economic losses.	RED

Source: Law 1295 of 1994

Vulnerability and Threat Analysis

Vulnerability analysis is a process which determines the level of exposure and susceptibility to the loss of an element or group of elements to a specific threat. These features can be seen in the following tables.

Table 6 - 4 Anthropogenic Threats

THREAT	LIKELIHOOD	VULNERABILITY	COMMENTS AND RECOMMENDATIONS
CIVIL DISORDER	LOW	LOW	The location of the Project and the current social situation do not create crowd movements that are difficult to control.
BOMBING	LOW	HIGH	The social situation of our country makes this a potential risk for all.
ASSAULT, THEFT, or HOLD UP	LOW	HIGH	The remote location of the project may provoke these types of actions at different levels of complexity. People must be alert.
KIDNAPPING OR ATTEMPTED KIDNAPPING	LOW	HIGH	While the risk of kidnapping is possible, it is unlikely to happen in this type of project and work front. However, each officer must ensure his or her own work safety, especially when travelling to and from the workplace.

Table 6 - 5 Natural Hazards

THREAT	LIKELIHOOD	VULNERABILITY	COMMENTS AND RECOMMENDATIONS
EARTHQUAKE	MEDIUM	HIGH	The location of the Project makes this a medium probability risk. The physical and constructive nature of the project estimates considerable consequences in case of an earthquake. It is recommended that the areas of refuge for people in case of an earthquake should be located in the projects and all the staff should be informed of them. Bulky or heavy items should be safely stored and secured to prevent falling; fuels should be safeguarded.
FLOOD	MEDIUM	LOW	The project location has a tendency to flood. Isolated events may occur in some areas of the project due to heavy rain. The drilling locations are mostly on hill top areas and hence the chance of flooding is very low.
STORM, HAIL AND STRONG WIND	LOW	MEDIUM	Under particular weather conditions, such as strong winds, storms and even hail, the project may be affected. However, the nature of the infrastructure used during the project makes potential damage a small possibility. It is recommended to periodically review temporary camps, signs, ceilings, lighting and other items that my fall during high winds.

Source: RPS -- Work Group

Table 6 - 6 Origin Of Technological Threats

THREAT	LIKELIHOOD	VULNERABILITY	COMMENTS AND RECOMMENDATIONS
ELECTRIC AND FUEL FIRE	MEDIUM	MEDIUM	There are several fuel sources in the project. Different types of materials such as combustible materials (solids, liquids, electrical), as well as the presence of heat sources such as sparks, stoves or welding equipment, among others, are stored on site. Electrical installations should be periodically checked in order to keep them in good physical condition and performance. Adequate storage facilities of liquid fuels exist. All personnel must be trained in fire prevention and control, and these issues should be reviewed periodically. Fire control drills are recommended as part of the planned activities of the Industrial Safety and Occupational Health program.
EXPLOSION	LOW	HIGH	Propane gas cylinders, oxygen and acetylene used in machinery, welding and cutting processes are stored in the project area in workshops or storage. Considering their location on site, there is a low probability of an incedent as long as the appropriate security standards are implemented.
GAS LEAK	MEDIUM	MEDIUM	Along the field, there is a gas transmission network, which may constitute a petential emergency threat. All staff should be informed of the network location in order to prevent it from being accidentially damaged. Activities near this area should be avoided as much as possible. It is important to note that daily gas production from the field is small.

Source: RPS -- Work Group

Risk assessment

The risk matrix allows for a global view on the impact of a threat in different areas of the project.

Table 6 - 7 Emergency Hazards Generators

ANTHROPOLOGIC RISKS

THREAT	LIKELIHOOD	VULNERABILITY	RISK
CIVIL DISORDER	LOW	LOW	LOW
BOMBING		HIGH	MEDIUM
ASSAULT, THEFT, or HOLD UP			
KIDNAPING OR ATTEMPTED KIDNAPPING			

NATURAL HAZARDS

THREAT	LIKELIHOOD	VULNERABILITY	RISK
EARTHQUAKE	MEDIUM	HIGH	HIGH
FLOOD		LOW	MEDIUM
STORM, HAIL AND STRONG WIND	LOW	MEDIUM	LOW

TECHNOLOGICAL THREATS

THREAT	LIKELIHOOD	VULNERABILITY	RISK
ELECTRIC AND FUEL FIRE	MEDIUM	MEDIUM	MEDIUM
EXPLOSION	LOW	HIGH	
GAS LEAK	MEDIUM	MEDIUM	

Source: RPS -- Work Group

The following figure summarizes the risks that generate emergencies and their assessment according to the risk area:

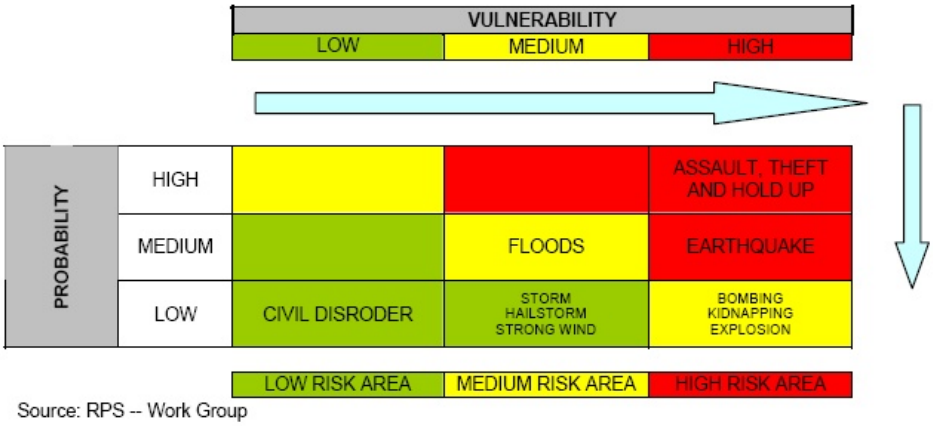


Figure 6 - 2 Summary Of Hazards Emergency Generators

In conclusion it is possible to state that there are high risks associated with the multiplicity of factors in the area. In the anthropic aspect, assault robbery or holdup are worth noting, in the technological aspect, stands the risk of fire of different types, in the natural aspect, the highest vulnerability regards to the occurrence of an earthquake, which can trigger all types of emergencies. In the medium-risk area, there are floods and explosions, explosions due to project activities, kidnapping or kidnapping attempts and, finally disorders related to civil crowds and those related to weather conditions.

6.6.7.2 Monitoring and Evaluation

Emergency program drills should be scheduled to assess the preparedness of those who visit the project and its labor force. Staff or emergency response brigades must verify the availability of equipment used for emergency support.

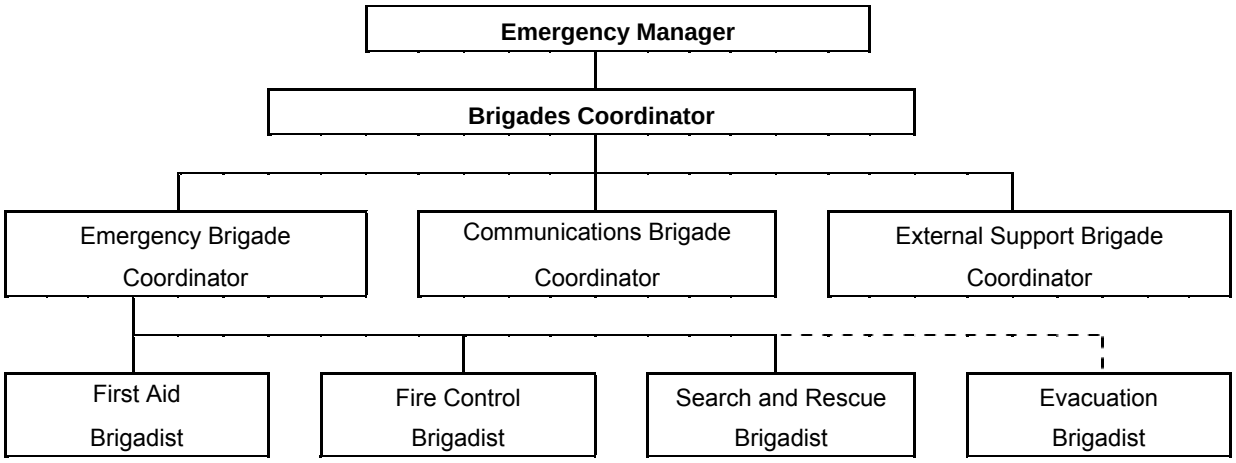
6.6.8 REACTION GROUP ORGANIZATION AND OPERATING PROCEDURES

The immediate and safe response to emergencies depends on efficient care to minimize workers' injuries, damages or losses to equipment, machinery and infrastructure. It also serves as a guide for employees for the procedures to follow in an emergency.

6.6.8.1 Organizational structure of the response team

During the drilling project activities, a variable number of personnel will be working. However, the steps to be undertaken during an emergency response will be distributed among the

most permanent staff. There would always be a person responsible for these activities. Nevertheless, a basic structure as follows should be taken into account:



* People who make up these groups should be designated and trained promptly

Figure 6 - 3 Organizational Structure of the Response Team

- ***General Procedure***

Once the emergency response personnel or brigade is designated, training workshops will be specific to each of the brigades. These people will be identified and are in turn responsible for disseminating and monitoring the emergency plan and actively participating in case of an emergency. The Emergency Plan should be made available to all staff working in the project, as well as identity of people in the emergency response team:

- ***Control actions***

1. The person who discovers the emergency should report what happened to coworkers who are in the area, or to the Brigade formed at this point or the nearest camp. If the person is trained, he or she should attempt to control it, if it is not so, he or she should evacuate.

2. Upon hearing the alarm signal, depending on the type of emergency that has occurred, all staff should apply the established and known procedures. The following are the steps that should be considered:

   - The Brigade staff of the area where the emergency comes up should report to the camp and inform the type of event and the site where it is happenning. Then, he or she should proceed to control the emergency and evacuate his or her staff if necessary.
   - The person who receives the communication in the camp, proceeds to report the event to the Coordinator of Brigades and immediately, if necessary, requests backup from the

corresponding external emergency response team (Fire, Red Cross, Police, etc.) Priority is given to keeping telephone lines and roads clear.

- The Brigades Coordinator being informed of the case, makes sure that the emergency response personnel is aware of the emergency. He performs the appropriate analysis of the situation and if necessary goes to the site to support the emergency.
- The general emergency groups begin the process of preparation for exit on each of their areas and await confirmation of the evacuation command, in order to move the staff.
- Other personnel suspend their activities, initiate the process of preparing for exit and wait for the brigade´s command to start the evacuation.
- Upon confirmation of the evacuation, personnel go along the established route towards the agreed meeting point and remains in place until further notice.
- Once at the check point each brigade or guide counts the people which he is in charged of for the evacuation and informs the General Evacuation Coordinator.
- When the emergency is controlled and it is deemed safe to return to the facilities and work areas, the Emergency Coordinator advises or reports to the staff at the check point.

o ***Final check point***

In each work area, there should be a suitable site located to reunite the staff, considering the number of evacuees and checking that everyone has been able to get out. This is managed by the emergency coordinator so that in case that there is someone missing, it can be reported in order to start the search procedure.

o ***Notifying Rescue Agencies***

Depending on the extent of the emergency and in case support is needed; rescue or first aid agencies close to the area will be notified. This may mean that lives will be saved or serious damage to the facility will be prevented.

For this notification the following steps should be taken into account:

1. Use the emergency telephone list that should remain in a visible place, or be carried by field personnel.

2. Provide clear and specific information as follows:

    - Name of the company.
    - Name and job position of who makes the call.
    - Description of the situation at hand and special requirements if any

- Exact address of the company or the site where the emergency occurs (giving directions to make access to the location easier.)
- Phone number of where to call to confirm the veracity of the claim made
- Any other information requested by the rescue agency.

o ***Evacuation of wounded or injured people***

In case that there are injuries during an emergency, the injured person must be taken to the meeting point and, if necessary, the Emergency Coordinator will request the necessary assistance for transportation to a nearby medical center to receive the required assistance.

o ***Communication systems*.**

The work area should keep available communication equipment (Avantel, PTT radio, cellular) in order to have timely communication both internally and externally. This will be verified. It is necessary to have the list of numbers and references of people, who have such equipment, e.g.:

- Radio # 5, Juan Perez, Brigade Force 3.
- Mobile 357-800-800, Mr. Pedro Rodriguez, Camp # 2.

The Emergency Manager will inform the directors of the project regarding the evolution of the event and will make the necessary requests to attend the emergency.

o **Measures to protect property.**

The activities of the project **"DEVELOPMENT WELL DRILLING IN PALAGUA-CAIPAL FIELD ",** requires an established procedures for rapid protection of physical documents, securities, money, information, or any other valuable element. Such procedures must be fully known by those in charge of the mentioned elements.

The procedure for this staff is the following:

1. Define specifically which documents should be protected in the event of an evacuation.

2. Establish the place where they will be safely stored and protected. It should be noted that they might be locked and this place should preferably be fireproof.

3. When the alarm sounds and the process of preparing for exit begins. Tthe person in charge should proceed to place the documents in the pre defined location to protect them, or be carried by the person responsible.

- ***Determining when danger has passed***

The Emergency Coordinator together with rescue agencies, shall determine when the situation has been controlled and will evaluate if it is safe for staff to enter the facility again, or if they must remain outside.

- ***Reestablishment of activities***

If there is no risk in re-entering the facility, the Emergency Coordinator advises the staff through the communication system or directly, giving the necessary recommendations for each case.

6.7 CONTINGENCY PLAN IN CASE OF FIRE OUTBREAK

Fire is a phenomenon that occurs when one or more combustible or flammable materials are consumed in an uncontrolled way by fire, causing losses in lives and property. The initial stage of a fire is called fire outbreak. It is at this stage where individuals with basic knowledge of this risk can intervene and prevent the fire.

6.7.1 Cause

It is crucial to learn that there are four classes of fires. Fires can be set off by different factors: chemical, physical, mechanical or electrical. They can occur because of facilities or equipment, or ungrounded electrical connections (wiring), accumulation, storage and improper handling of combustible materials, and tank or fuel spillage. For each of these kinds of fires, different substances are used to extinguish them. The equipment containing these substances are called extinguishers.

6.7.2 Preventive measures

The purpose of the Fire Prevention and Control Plan is to eliminate the causes of fire, prevent loss of life and property by fire, and to comply with the applicable provisions of NFPA (including Code

30 for flammable and Combustible Liquids) and API Standard 2610. It provides employees with information and guidelines that will assist them in recognizing, reporting, and controlling fire hazards. The Fire Prevention and Control Plan is written for a facility with more than 10 employees. The Fire Prevention and Control Plan:

- Identify materials that are potential fire hazards and their proper handling and storage procedures;
- Distinguish potential ignition sources and the proper control procedures of those materials;
- Describe fire protection equipment and/or systems used to control fire hazards;
- Identify persons responsible for maintaining the equipment and systems installed to prevent or control ignition of fires;
- Identify persons responsible for the control and accumulation of flammable or combustible material;
- Describe good housekeeping procedures necessary to insure the control of accumulated flammable and combustible waste material and residues to avoid a fire emergency;
- Provide training to employees about fire hazards.

6.7.3 General Precautions

- Make sure that the doors, hallways, stairs, and other exit routes are kept free of obstructions;
- Dispose of combustible waste in covered, airtight, metal containers;
- Use only nonflammable cleaning products;
- Store chemically reactive substances away from each other;
- Perform “hot work” such as welding, working with an open flame and/or other ignition sources in controlled and well-ventilated areas;
- Where flammable vapor-air mixtures cannot be eliminated, sources of ignitions shall be controlled;
- Maintain all the equipment in good working order. Inspect all electrical wirings and electrical appliances regularly and avoid accumulation of dust and grease on motors and machine tools;

- Ensure that all the heating units are safeguarded;
- Look out for gas leaks, and report all gas leaks immediately. The authorized person shall ensure that all gas leaks are repaired immediately upon notification;
- Repair and clean up flammable liquid leaks immediately;
- Keep work areas free of dust, lint, sawdust, scraps, and similar material;
- Do not rely on extension cords if wiring improvements are needed, and ensure that the circuits are not loaded with multiple pieces of equipment;
- Ensure that required hot work permits are obtained;
- Turn off electrical equipment when not in use.

6.7.4 Responsibility

Fire safety is everyone's responsibility. All employees (managers, on-site administrators, supervisors and general employees) should know how to prevent and respond to fires, and are responsible for adhering to company policy regarding fire emergencies.

Management determines the UT-IJP's fire prevention and protection policies. Management will provide adequate controls to provide a safe workplace, and will provide adequate resources and training to its employees to encourage fire prevention and the safest possible response in the event of a fire emergency.

An On-site Administrator shall manage the Fire Prevention and Control Plan for UT-IJP, and maintain all records pertaining to the plan. This administrator will also have the following duties:

- Develop and administer the UT/JTI's fire prevention training program;
- Ensure that fire control equipment and systems are properly maintained;
- Control fuel source hazards;
- Conduct fire risk surveys and make recommendations;

Supervisors are responsible for ensuring that employees receive appropriate fire safety training, and for notifying the responsible person(s) when changes in operation increase the risk of a fire. Supervisors are also responsible for enforcing UT-IJP's fire prevention and protection policies.

All employees shall:

- Complete all required training before working without supervision;
- Conduct operations safely to limit the risk of fire;

- Report potential fire hazards to their supervisors; and
- Follow fire emergency procedures.

The person(s) responsible for the facility will ensure that all the equipment is maintained according to manufacturer's specifications. UT-IJP will also comply with requirements of the National Fire Protection Association (NFPA) codes for specific equipment. Only the properly trained individuals will perform all the maintenance work.

The following equipment is subject to regular inspection, maintenance, and testing procedures:

- Equipment installed to detect fuel leaks, to control heating, and to control the system pressurization;
- Different fire extinguishing systems such as portable fire extinguishers, automatic sprinkler systems, and fixed fire extinguishing systems;
- Smoke, Heat and Flame detection systems;
- Fire alarms; and
- Emergency backup systems and the equipment they support.

Weekly testing of the firefighting system in Palagua-Caipal field.

Emergency team (Brigade) training at UT-IJP (Palagua field)

6.7.5 Potential Hazards

6.7.5.1 Storage Tanks

This section applies to the commonly recognized management techniques and fire control methods used to prevent the loss from fire or explosion in the tank storage facilities. To prevent fire hazards due to leaks or spillage from storage tanks, the following precautionary steps need to be taken:

- Tank storage facilities shall have fire prevention and control for life and safety, for minimizing property loss, and for reducing fire exposure to adjoining facility resulting from fire and explosion;
- Tanks shall be of steel or other approved noncombustible material, considering all the limitation and exceptions;
- The materials of construction for tanks shall be compatible with the liquid to be stored;
- Unlined concrete tanks can be used only for liquid with having gravity 40° API or higher;
- The type of lining and its thickness shall depend on the type of material to be stored in the tank;
- The thickness of the tank and its lining should also be considered for resistance to vehicular impact;
- Pressure vessels or tanks shall not be operated above their design pressure, the normal operating pressure shall not exceed the design pressure of the tank or vessel;
- Support for the tanks shall be designed and constructed in accordance with recognized engineering standards;
- Pressure vessels or tanks shall be adequately vented to prevent the development of pressure or vacuum that exceeds the design pressure of the tank or vessel while filling, emptying or due to the change in atmospheric temperature;
- The normal vents in the tanks shall be sized in accordance with either API Standard 2000, or another accepted standard. In no case shall it be less than 32 mm nominal inside diameter;
- If the tank or vessel has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, the vent size shall be based on the maximum anticipated simultaneous flow;
- For all kind of pressure vessels or tanks, the vents and vent drains shall be arranged to discharge in a manner that prevents localized overheating of or flame impingement on any part of the tank, if vapors from any tank are ignited;
- Every aboveground storage tank shall have emergency relief venting in the form of construction or a device or devices that will relieve excessive internal pressure caused by exposure fire;

- Metal used to fabricate the tank shall be thick enough to compensate for internal corrosion expected during the design life of the tank;
- If the internal corrosion is anticipated beyond that provided for in the design formulas or standards used, additional metal thickness or suitable protective coating or lining shall be provided to compensate for the corrosion loss expected during the design life of the tank;
- To overcome the loss due to external corrosion of the tank, the type of material selected shall be based upon the corrosion history of the area and the judgment of a qualified engineer;
- The walls and the floor of the vaults shall be constructed of reinforced concrete at least 150 mm thick;
- The top of an vault that contains a tank used to store Class I and II liquid, shall be constructed of a noncombustible material and shall be designed to be weaker than the walls of the vault;
- Sufficient clearance between the tank and the walls of the vault shall be provided to allow for visual inspection and maintenance of the tank;
- Adjacent vaults shall be permitted to share a common wall;
- The vaults shall be provided with an approved means to admit a fire suppression agents;
- The vaults enclosure have no openings except those necessary for access to, inspection of, and filling, emptying and venting of the tank;
- Vent pipes that are provided for normal venting shall terminate outside the vault and at least 3.6 m above the ground level, while emergency vents shall be vaportight and shall be permitted to discharge inside the vault;
- An approved means of overfill protection system will be installed to every tank;
- The vaults shall be provided with an approved vapor and liquid detection system and equipped with on-site audible and visual warning devices with battery back-up; Each tank shall be inspected and maintained to ensure compliance with the requirements in the NPFA Code 30, and maintained liquidtight.

6.7.5.2 Containers and Portable Storage Tanks

This section applies to the storage of liquids in drums or other containers that do not exceed 450 L, in overpack drums used for temporary containment, in portable tanks, and in intermediate bulk containers that do not exceed 3000L. To prevent fire hazards due to any leaks or spillage from any containers and portable storage tanks the following precautionary steps needs to be taken:

- The containers and the portable storage tanks can be made of metals, plastic, fiber and rigid nonmetallic material;

- The material used to make these containers should be authorized by the U.S. Department of Transportation Hazardous Materials Regulations, 49 CFR or by Part 6 of the UN Recommendations on Transport of Dangerous Goods;
- Proper steps must be taken to ensure that all the containers and the portable storage tanks are securely closed and placed in their proper locations;
- Each portable tank or intermediate bulk container shall be provided with one or more devices installed in top with sufficient emergency vending capacity to limit internal pressure under fire exposure conditions to a gauge pressure of 70 kPa or 30 percent of the bursting pressure of the portable tank, whichever is greater;
- The maximum allowable size of a container or metal portable tank shall be decided according to the guidelines provided in NFPA Code 30;
- Leaking or damaged containers up to 230 L capacity shall be permitted to be stored temporarily, provided they are enclosed in a overpack containers;
- The cabinets were the containers and portable storage tanks are kept shall be marked in conspicuous lettering: “FLAMMABLE – KEEP FIRE AWAY”;
- Wood at least 25mm nominal thickness shall be permitted to be used for shelving, racks, dunnage, scuffboards, floor relays, and similar installations;
- Solid pile and palletized storage in liquid warehouses shall be arranged so that piles are separated from each other by at least 1.2 m. Aisle shall be provided and arranged so that no container or portable tank is more than 6 m from an aisle. Main aisle shall be a minimum of 2.4 m wide;
- The height up to which these containers can be stored in the room, and the allowable quantity shall we decided on basis of the guidelines given in the NFPA Code 30;
- Containers of liquid in their original shipping packages shall be permitted to be stored either palletized or solid piled. Unpackaged containers shall be permitted to be stored on shelves or directly on the floor of the locker;
- No flammable or combustible materials shall be permitted in the vicinity of the containers or the portable storage tanks;
- An automatic sprinkler and foam-water fire protection systems shall be installed in the area designated for the containers and portable storage tanks;
- Power-operated industrial trucks must be used to move the containers and care must be taken that the containers and the portable storage tanks are properly closed at the time of shifting to avoid any spillage of the liquid, and to protect against any accidents.

6.7.5.3 Piping Systems

This section shall apply to piping systems consisting of pipe, tubing, flanges, bolting, gaskets, valves, fittings, flexible connectors, strainers, and devices used for the purpose of mixing, separating, distributing, or secondary containment of liquids. To prevent fire hazards due to any leaks from any pipes the following precautionary steps needs to be taken:

- The design, fabrication, assembly, test, and inspection of piping systems shall be suitable for expected working pressures and structural stresses. They should comply with applicable sections of ASME B31, Code for Pressure Piping;
- Piping systems shall be maintained liquid-tight, and the piping that has a leak and may result in hazard shall be emptied of liquid or repaired;
- Valves at storage tanks and their connections to the tank shall be steel or ductile iron;
- Valves at the storage tanks shall be permitted to be other than steel or ductile iron where the chemical characteristics of the liquid stored inside are not compatible with steel or if the valves are installed internally to the tank;
- Cast irons, brass, copper, aluminum, malleable iron, and similar materials shall also be used, provided they are compatible with the type of liquid being handled;
- Piping systems shall be substantially supported and protected against physical damage and excessive stresses arising from settlement, vibrations, expansion, or contraction. The installation of nonmetallic piping shall be in accordance with manufacturer's instructions;
- Piping that passes through or pierces a dike wall or the wall of a structure shall be designed to prevent excessive stresses and leakage due to settlement
- Piping systems that are subject to corrosion shall be suitable protected;
- Underground piping shall be installed on a bedding of at least 150 mm of well-compacted backfill material, in areas subjected to vehicle traffic, the pipe trench shall be of sufficient depth to permit a cover of at least 450 mm;
- Two or more levels of pipes within the same trench shall be separated vertically by a minimum 150 mm of well-compacted backfill;
- If loading and unloading is done through a common pipe system, a check valve shall not be required, however, an isolation valve shall be provided. This valve shall be located so that it is readily accessible or shall be remotely operated;
- Piping systems shall be grounded properly.

6.7.5.4 Electrical Equipment and Installations

Electrical system failures and the misuse of electrical equipment are leading causes of workplace fires. Fires can result from loose ground connections, wiring with frayed insulation, or overloaded fuses, circuits, motors, or outlets. To prevent fire hazards related to electrical equipments and there installations, the following precautionary steps need to be taken:

- Any electrical equipment provided shall not constitute a source of ignition for the flammable vapor that might be present under normal operation or during a spill;
- All electrical equipment and wiring shall be of a type specified by and installed in accordance with NFPA 70, National Electrical Code (NEC);
- All the wiring in hazardous locations will be regularly inspected where the risk of fire is especially high;
- The guidelines given in the NFPA Code 30 manual shall be used to delineate and classify areas for the purpose of installation of electrical equipment under normal conditions;
- All the electrical equipments shall be regularly inspected to check the condition of wires, if any of the wires are found to be worn out, they have to be replaced immediately;
- The fuses used shall be installed in accordance with NFPA 70, National Electrical Code (NEC);
- An extension cord shall not be used as a substitute for wiring improvements;
- All the electrical equipment shall be properly inspected to ensure that they are double insulated or are properly grounded;
- High level of safety shall be observed while performing maintenance.

6.7.5.5 Operations

This section shall apply to operations involving the use or handling of liquids either as a principal or incidental activity. To prevent fire hazards related to various operations the following precautionary steps needs to be taken:

- All the equipments used directly or indirectly in the operations shall comply with the NFPA Code 30;
- Operators of heat transfer systems shall be trained in the hazards of system misoperation and leakage and shall be trained to recognize upset conditions that can lead to dangerous situations;

- Safety interlocks shall be inspected, calibrated, and tested annually in accordance with appropriate standards to determine that they are in proper operating conditions;
- During all operations special care shall be taken to minimize the generation of static electricity, all the means provided to reduce static electricity shall meet the requirements stated in NFPA Code 30;
- When pumps are used for liquid transfer, means shall be provided to deactivate liquid transfer in the event of a fire due to liquid leak or spill;
- A loading or unloading facilities shall be provided with drainage systems or other means to contain spills;
- A loading or unloading facility shall be provided with a canopy or roof that does not limit fire fighting access or control;
- During all the loading and/or unloading of liquid to the tank vehicles, the vehicle engine shall be shut down;
- Liquids shall be loaded into the tank vehicles whose material of construction is compatible with the chemical characteristics of the liquid;
- The liquid being loaded into the tank vehicle shall be the same liquid hauled on the previous load unless the vehicle has been cleaned;
- Tanks and equipment shall have independent venting for overpressure or vacuum conditions that occur from malfunction of the vapor recovery or vapor processing system;
- Metals or conductive objects, such as gauge tapes, sample containers, and thermometers, shall not be lowered or suspended in a tank vehicle when the vehicle is being filled or immediately after cessation of pumping to permit the relaxation of charge.

6.7.5.6 Cutting, Welding and/or Open Flare Work

This section shall apply to operations involving the use of open flames in case of welding and operations involving cutting, which may produce a spark or intense heat. To prevent fire hazards due to the ignition of flammable vapors by sources like open flames, cutting, welding, frictional heat or sparks the following precautionary steps needs to be taken:

- Before the start of any of the above-mentioned work the required hot work permits shall be obtained;
- Cutting and welding shall be done by authorized personnel in designated cutting and welding areas whenever possible;
- Welding, cutting and similar spark producing operations shall not be permitted in any areas containing flammable liquids, except when a written permit authorization

such work is issued. This permit shall be issued by a person in authority following his/her inspection in the area to assure that proper precautions have been taken;

- All the equipment used for these operations shall be properly grounded;
- Adequate ventilation shall be provided in the area were such operations are taking place;
- All the equipment used for these operations shall comply with the regulations stated by NFPA;
- The personnel performing these operations shall always wear eye protection and protective clothing at the time of the operation;
- These operations shall be prohibited on metal walls, ceilings, or roofs built of combustible sandwich-type panel construction or having combustible covering;
- Confined spaces such as tanks shall be tested to ensure that the atmosphere is not over ten percent of the lower flammable limit before these operations are performed in or on the tank;
- Small tanks, piping, or containers that cannot be entered shall be cleaned, purged, and tested before these operations are performed;
- Smoking shall be permitted only in designated and properly identified areas.

6.7.5.7 Flammable and Combustible Materials

Certain types of liquids can ignite at relatively low temperatures or pose a risk of catastrophic explosion if ignited. Such liquids obviously require special care and handling.

Any liquids that have a closed-cup flash point below 100°F are known as Flammable liquids. They are classified a Class I liquids. Any liquids that have a closed-cup flash point at or above 100°F are known as Combustible liquids. They are classified a Class II or Class III liquids.

- Class I liquids: Any liquid that has a closed-cup flash point below 100F and a Reid vapor pressure not exceeding 40 psia at 100°F, as determined by ASTM D 323, Standard Method of Test for vapor pressure of Petroleum Products. This types of liquids are further classified as:

    - Class IA – liquids that have flash points below 73°F and boiling points below 100°F;
    - Class IB – liquids that have flash points below 73°F and boiling points at or above 100°F;
    - Class IC – liquids that have flash points at or above 73°F but below 100°F.

- Class II liquids: Any liquid that has a closed-cup flash point at or above 100°F and below 140°F.

- Class III liquids: Any liquid that has a closed-cup flash point above 140°F. They are further classified as follows:

    - Class IIIA – liquids that have flash point at or above 140°F, but below 200°F;
    - Class IIIB – liquids that have flash point at or above 200°F.

To prevent fire hazards due to flammable and combustible liquids the following precautionary steps needs to be taken:

- Only approved pumps, taking suction from the top, to dispense liquids from tanks, drums, barrels, or similar containers (or use approved self-closing valves or faucets).
- Combustible and flammable liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected by contact or by a bonding wire. Either the tank or container must be grounded;
- Flammable and combustible liquid shall not be used as a cleaning agent inside a building;
- Flammable and combustible liquids shall not be used, handled, or stored near exits, stairs, or any other areas normally used as exits;
- All the personnel in the facility should know the location of and how to use the nearest portable fire extinguisher rated for flammable and combustible liquids;
- Water should not be used to extinguish fires caused by flammable and combustible liquids. Water can cause the burning liquid to spread, making the fire worse. To extinguish a fire caused by flammable and combustible liquids, exclude the air around the burning liquid. The following fire-extinguishing agents are approved for these kinds of liquids: carbon dioxide, multi-purpose dry chemical (ABC), halon 1301, and halon 1211.

6.7.5.8 Office Fires

Fire hazards may be due to other reasons than the one discussed above. In an industrial facility, fires can take place in the office building. Fires in offices have become more likely because of the increased use of electrical equipment, such as computers and fax machines. To prevent fire hazards in offices the following precautionary steps needs to be taken:

- Precautions shall be taken to avoid overloading circuits with office equipment such as computers, radios, faxes, etc.;

- It shall be ensured that all the nonessential electrical equipment is turned off at the end of each workday;
- It shall be ensured that all the storage areas are kept clear of rubbish;
- It shall be ensured that extension cords are not placed under carpets;
- It shall be ensured that the trash and paper set aside for recycling is not allowed to accumulate.

6.7.6 ALTERNATE METHODS OF FIRE CONTROL

Although fire prevention equipment is installed in the facility, the following techniques can also be used to control fire:

6.7.6.1 Controlled Burn

With a fire involving flammable and combustible liquids, rapid extinguishment may not be possible or prudent. Where heat impingement on other vessels or facilities may be controlled and there is no danger to the public, it may be acceptable and sometimes safer to allow the fire to burn itself out, under controlled conditions. This practice usually involves controlling the flow or otherwise limiting the amount of material involved in fire. The decision to select this method of fire control shall be made with the advice of qualified fire control personnel.

6.7.6.2 Manual Control and Extinguishment

This method involves the use of portable fire extinguishers on fires in their incipient and initial stages. Large fires usually require the application of water for control and cooling application of foam and fire extinguishers. Larger fires, like those involving tanks, extinguishment requires special techniques, material, equipment and trained personnel. Manual attacks on fire shall be supervised and conducted only by trained and qualified personnel.

6.7.7 PALAGUA AND CAIPAL FIRE FIGHTING SYSTEM

In the Palagua-Caipal oil field, the risk of a possible fire is in Stations 1, 2, and 4 where crude oil storage tanks are installed. (Please note that Station 3 is closed). We have installed fire fighting equipment in these three stations. The description of the fire fighting system is given below.

Specific fire fighting systems have been installed in each one of the stations in the Palagua-Caipal Field. In addition, a fire truck was added to the system. This unit is able to fight fire with water and

foam. The tables below list the current firefighting equipment in the field. (The words Battery and Station are used interchangeably).

Table 6-8 Station No. 1

No.	DESCRIPTION	CHARACTERISTICS
1	Main Pump with electrical motor	750 gpm @ 150 PSI
2	Pump 2 with diesel motor (Cummins)	750 gpm @ 150 PSI
3	Emergency pump (Jockey) with diesel motor	750 gpm @ 150 PSI
4	Main ring in tubing	6" size
5	Water hydrants	6ea of 250 gpm/ea
6	Water-foam hydrants	4ea of 150 gpm/ea
7	Refrigeration rings (4ea).	1ea/tk of 250 gpm
8	Water storage tank	5000 bls
9	Foam storage tank	700 bbls

Table 6-9 Station No. 2

No.	DESCRIPTION	CHARACTERISTICS
1	Main Pump with electrical motor	750 gpm @ 125 PSI
2	Emergency pump with diesel motor	750 gpm @ 125 PSI
3	Ring main in pipe	6" size
4	Water hydrants	3ea of 250 gpm/ea
5	Foam water monitors	5ea of 150 gpm/ea
6	Cooling ring.	250 gpm at tank 3000-22
7	Water storage tank	5000 bls capacity

Table 6-10 Station 4

No.	DESCRIPTION	CHARACTERISTICS
1	Main Pump with electrical motor	750 gpm @ 125 PSI
2	Emergency pump with diesel motor	750 gpm @ 125 PSI
3	Main ring in tubing	6" size
4	Water hydrants	2ea of 250 gpm/ea
5	Water-foam hydrant monitors	5ea of 150 gpm/ea
6	Water storage tank	2000 bls


Fire fighting truck for foam and water, Palagua-Caipal field


Training for Fire fighting Truck, Palagua-Caipal field

In Station 1, the fire prevention system has an electric engine and a diesel engine, each one with a pump; the two engines can work with the water system, foam system or as two parallel systems.

There are two manifolds at the outlet of the each pump, which are connected to the four tanks in the Station No 1, where cooling rings have been installed. These rings are triggered manually from the manifold exit. The system also has monitoring pressure devices in the four sides of the tanks, which can be maneuvered with different kinds of jets and directionally fix them to where the cooling is required.

The foam system also has a Jockey pump that maintains the pressure, which is utilized for the generation of foam. Foam is equally directed from the manifold toward each one of the tanks. A chamber of injection has been installed permitting the entrance of the foam to the inside of the

tanks resulting in fire extinction by isolation of oxygen. Within the area of the tanks and the station, a foam monitor has been installed which allows aiming foam directly (or by means of a hose) for protection of equipment in case of fire.

In the area of the pumping system of the oil pipeline, a system of sprinklers of foam and water has been installed for the protection of the equipment installed.

6.7.7.1 Foam System

A foam system was installed In Station (Battery) 1. This sytem consist of a generator device which generates fixed-foam (foam supply tank is under pressure) with a pipe supplying water. The foam is discharged directly on the fire using the foam cameras on the hydrocarbon storage tanks or using water hoses to attack fire on the ground.

The supply is obtained by the use of an orifice plate for water and an orifice plate for concentrate of foam, both discharging at reduced pressure to the Discharge Header.

The foam is a homogeneous mixture of water and protein foam concentrate (These foam concetrates consist of additives and inhibitory products of a hydrolysis of protein stabilization) in a proportion of 3% of foam concentrate and 97% water.

The foam extinguishes fire by reducing the concentration of oxygen around the fire and reducing convection and the radiation and movement of inflammable vapor.

Foam is an effective fire fighting tool for extinguishing fire due to ordinary fuels, inflammable liquids and combustible liquids.

The foam system is not recommended for use in fires caused by chemical such as cellulose nitrate, that generates enough oxygen or any other oxidizing agent to maintain the combustion, electrical equipment not contained in isolation equipment, reactive metals with water such as sodium, potassium, etc, and unsafe materials that react with water, such as pentoxide of phoporus and tri-ethyl aluminum, inflammable liquified gas.

The discharge of large quantities of foam blocks the vision, causes difficulty to listen, creates shortness of breathing and causes space disorientation. It is dangerous to enter a facility which is on fire and has low visibility.

6.7.7.2 Foam Storage Tank

The foam storage tank is made out of a corrosion resistant material and is rated for 250 psig maximum working pressure as per ASME, Section VIII, Division 1 code. The tank has a vent, inspection port, and a drainage valve at its lowest point. In order to maintain an ample reserve

supply of foam, 55-gallon drums with liquid foam concentrate have been placed nearby the storage tank. These drums are stored at a temperature between 35°F (2 °C) and 100°F (38 °C).

Characteristics of the Foam Storage Tank

Brand:	National Foam
Header:	PPH 50
Tank Diameter:	4 ft – 6 in.
Tank length:	4 ft – 8 in.
Tank Capacity:	700 Gallons
P min	165 psi
Foam Concentrate:	Proteinico National Foam Aero-foam XD3 Angus Fire FP70

6.7.7.3 Water Distribution and Foam Solution Networks

The pipe utilized for the construction network of water cooling and foam solution is Casing N80 of 7 " of nominal diameter, with a working pressure no less than 175 psi.

Most of the pipe used for the distribution from the header (discharge manifold) are buried with proper protection and at safe levels of depth.

The feed flow lines that connect to the foam cameras and the flow line that supplies water to the sprinkler rings around the tank are fasten in such a way that could not move during the operation.

6.7.7.4 System of Sprinkler Rings for Water Cooling Tanks

It is an integrated system by a subterranean flow line with the shape of semi-ring around the tanks to be cooled. The system is designed hydraulically following the norms of anti-fire protection. The system operates with open sprinklers that are joined to a flow line system and connected to a water supply through a valve that opens manually. When this valve opens, the water flows through the flow lines and discharges from the sprinklers around the ring and cools the exposed area.

6.7.7.5 Sprinkler System at the Vasconia Oil Pipeline

In the sprinkler system, the flow line is connected to the feed (discharge manifold) of the foam solution, using a manual valve. When this valve is opened, the foam solution is discharged. Also the system could be used to discharge water alone (without mixing it with any solution, for a certain period of time).

6.7.7.6 Anti-Fire Monitoring Water Outlets

These are devices or headers connected to the main water pipes to supply water to the anti-fire hoses or any other appliance of anti-fire protection. The water outlets have specifically designed nozzle devices to give a powerful current for the protection of the tank, process vessels and any other risky area, at a discharge rate of 200 - 250 gpm.The nozzle sizes vary from 1½ to 2 inches. Additionally, the water outlets have (at the exit) a 2 ½ " screwed valve with a female connection for the counter-fire hose connection.

6.7.7.7 Anti-Fire Cabinets

These are steel cabinets housing hose assemblies with reduction nozzles of 2 ½, 1 ½ inches. The cabinet is installed near the Cummins engine of the anti-fire system of Battery No 1.

6.7.7.8 Anti-Fire Hoses

The hoses connected to the water supply or foam solution are lined and coated. The sizes of hose and its length were selected according to hydraulics of the system. The diameter of the hoses available are 1 ½, 2 ½ inches, with an approximate length of 100 feet. The hoses are stored in the anti-fire cabinet, located strategically for immediate use and protection against the weather (changes in temperature to avoid hose damage).

6.7.7.9 Water Tank Storage

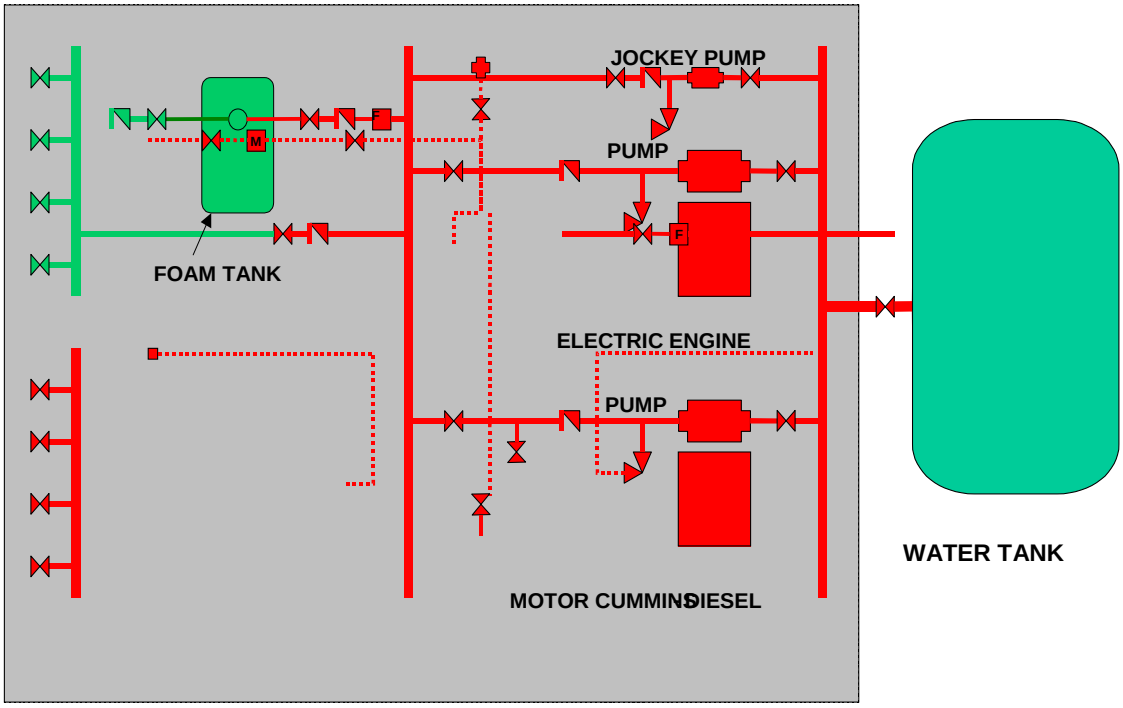
In the north side of the anti-fire system, in a most elevated level, a water tank is constructed with a capacity of 5,000 bbl supply for the anti-fire system. For the filling and maintenance of water in the tank, a flow line is installed that pumps water from Palagua Well–1.

There is enough storage water to supply water to the automatic sprinklers for more than two hours. The water storage tank capacity is about 5,000 bbls (about 800 cubic meters) which would be needed in a worst case scenario. The worst case scenario is defined as four fixed tanks storing Class I liquids to be protected by foam cannons, as shown in the following table.

Table 6 - 11 Water tank capacity

Item	Duration (Class I liquid/other) (minutes)	Flow (L/min)	Total Water Requirement. (m3)
Cooling to expose floating roof tanks	120	2000	240
Cooling to expose fixed roof tanks	120	3200	384
Cooling to tank on fire	55/330	4000	220/120
Rim-seal foam system	20	900	18
Top pourer/Base injection foam to fixed roof	55/30	2000	110/60
Foam cannons to fixed roof	65/50	3100	202/155

V= 384 + 220 +202 = 806 m^3 (approximately 5,000 bbls)



SOURCE: ACT. RDP 2005

Figure 6 - 4 Anti-fire system distribution in Palagua Field

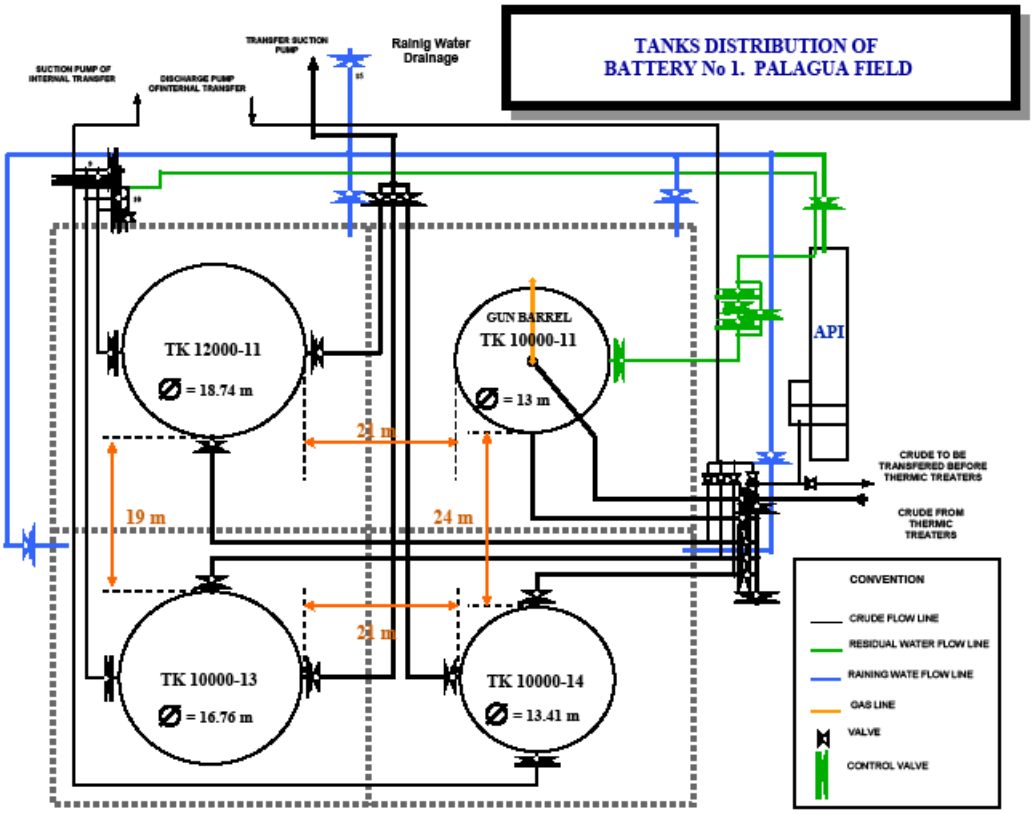


Figure 6 - 5 Distribution of gun barrel tanks at Palagua Field

Photo Gallery of Fire Fighting Equipment and Training Procedures in Palagua-Caipal field

Training and usage of the foam

Training operation of the anti-fire system

On-ground foam discharge near equipment

Foam tank-outlet manifolds

Engine and anti-fire diesel Cummins engine

Water storage tank for the anti-fire system

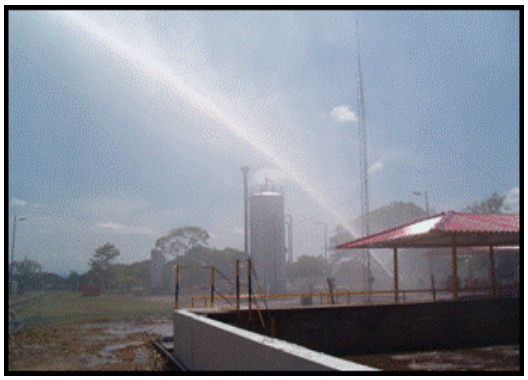
Activation of the cooling rings K-12000-11

Activation of the sprinklers around the tanks

Activation of the cooling ring K-10000-11

Fire fighting system installed at Station 4

Testing the system at Station 4



Testing the system at Station 4

Fire fighting system training at Station 2

Fire fighting system training at Station 2

Table 6-12 Actions In Case Of Fire Threat

STEP	WHAT TO DO?	HOW TO DO IT?
1	1.Notify or imform the occurrence of event	Whoever finds the event, immediately warns the camp, or Emergency Coordinator in the area. If you are in a closed site, go outside, leaving the door closed without lock, go to an open area and wait for instructions from emergency personnel. Turn off electrical equipment near to the event
2	2. Remove people to a secure site	Start immediate evacuation, with the support of the brigade. Remove people at least at a distance of 10 m
3	3. If the threat is not controlled, get help from the Firefighters	The brigade attempted to fight the fire with the extinguishers available. If the outbreak of fire is not controlled, immediately notify the firefighters
4	4. Ensure that all staff are in the meeting place	The emergency coordinator, calls the emergency and contingency brigade, who support and direct the evacuation process.
5	5. After inspecting the fire investigation to proceed	The brigades are working with the fire department guide them on the event and the additional risks that can be met. After inspecting and controlling the event, theinvestigation phase of the accident will begin.

Source: RPS - Working Group

6.7.8 AFTER THE CONTINGENCY

1. Maintain contact with workers from the area where the event took place.
2. Help those who need care.
3. Assess the situation for safe return to the site.
4. If the electricity supply was interrupted, do not try to restore it until it is verified that it will not cause any further damage.
5. Keep track of and follow up on the recovery of injured, if any.

6.7.9 REVIEWING AND RECORD KEEPING

The Fire Prevention and Control Plan shall be reviewed regularly and updated as equipment and operating conditions change. The plan shall be reviewed at least once every year. Updating and the filling of the plan shall be in accordance with the local requirement. As the plan includes assistance from outside source such as local fire department, the plan has to be reviewed with them in case of any changes in the plan. All the personnel shall be made familiar with all the changes made in the plan.

6.7.9.1 Fire Risk Survey

Type of Fire Hazard	Location	Emergency Actions	Required changes

Completed by:_____ Date:_____

6.7.9.2 General Fire Prevention Checklist

Use this checklist to ensure fire prevention measures comply with the general fire prevention requirements found in NFPA standards.

□ Yes □ No	Is the local fire department acquainted with your facility, its location, and specific hazards?
□ Yes □ No	If you have a fire alarm system, is it tested at least annually?
□ Yes □ No	If you have interior stand pipes and valves, are they inspected regularly?
□ Yes □ No	If you have outside private fire hydrants, are they on a routine preventive maintenance schedule and flushed at least once a year?
□ Yes □ No	Are fire doors and shutters in good operating condition?
□ Yes □ No	Are fire doors and shutters unobstructed and protected against obstructions, including their counterweights?
□ Yes □ No	Are automatic sprinkler system water control valves, air pressure, and water pressure checked weekly or periodically?
□ Yes □ No	Has responsibility for the maintenance of automatic sprinkler systems been assigned to an employee or contractor?
□ Yes □ No	Are sprinkler heads protected by metal guards?
□ Yes □ No	Is proper clearance maintained below sprinkler heads?
□ Yes □ No	Are portable fire extinguishers provided in adequate number and type?*
□ Yes □ No	Are fire extinguishers mounted in readily accessible locations?*
□ Yes □ No	Are fire extinguishers recharged regularly with the recharge date noted on an inspection tag?*
□ Yes □ No	Are employees periodically instructed in the use of extinguishers and fire protection procedures?*

*(NOTE: Use of fire extinguishers is based on company policy regarding employee fire fighting in your Emergency Action Plan and local fire code.)

Completed by:_____ Date:_____

6.7.9.3 Exits Checklist

Use this checklist to evaluate UT/JTI comply with NFPA standard on emergency exit routes.

□ Yes □ No	Is each exit marked with an exit sign and illuminated by a reliable light source?
□ Yes □ No	Are the directions to exits, when not immediately apparent, marked with visible signs?
□ Yes □ No	Are doors, passageways, or stairways that are neither exits nor access to exits, and which could be mistaken for exits, marked “NOT AN EXIT” or other appropriate marking?
□ Yes □ No	Are exit signs provided with the word “EXIT” in letters at least five inches high and with lettering at least one inch wide?
□ Yes □ No	Are exit doors side-hinged?
□ Yes □ No	Are all exits kept free of obstructions?
□ Yes □ No	Are there at least two exit routes provided from elevated platforms, pits, or rooms where the absence of a second exit would increase the risk of injury from hot, poisonous, corrosive, suffocating, flammable, or explosive substances?
□ Yes □ No	Is the number of exits from each floor of a building and from the building itself appropriate for the building occupancy? (NOTE: Do not count revolving, sliding, or overhead doors when evaluating whether there are sufficient exits.)
□ Yes □ No	Are exit stairways that are required to be separated from other parts of a building enclosed by at least one-hour fire-resistant walls (or at least two-hour fire-resistant walls in buildings over four stories high)?
□ Yes □ No	Are the slopes of ramps used as part of emergency building exits limited to one foot vertical and 12 feet horizontal?
□ Yes □ No	Are glass doors or storm doors fully tempered, and do they meet the safety requirements for human impact?
□ Yes □ No	Can exit doors be opened from the direction of exit travel without the use of a key or any special knowledge or effort?
□ Yes □ No	Are doors on cold storage rooms provided with an inside release mechanism that will release the latch and open the door even if it's padlocked or otherwise locked on the outside?
□ Yes □ No	Where exit doors open directly onto any street, alley, or other area where vehicles may be operated, are adequate barriers and warnings provided to prevent employees from stepping into the path of traffic?
□ Yes □ No	Are doors that swing in both directions and are located between rooms where there is frequent traffic equipped with glass viewing panels?

Completed by:_____ Date:_____

6.7.9.4 Flammable and Combustible Material Checklist

Use this checklist to evaluate UT/JTI comply with NFPA's standards on flammable and combustible materials:

□Yes □No	Are combustible scrap, debris, and waste materials such as oily rags stored in covered metal receptacles and removed from the worksite promptly?
□Yes □No	Are approved containers and tanks used for the storage and handling of flammable and combustible liquids?
□Yes □No	Are all connections on drums and combustible liquid piping vapor and liquid tight?
□Yes □No	Are all flammable liquids kept in closed containers when not in use?
□Yes □No	Are metal drums of flammable liquids electrically grounded during dispensing?
□Yes □No	Do storage rooms for flammable and combustible liquids have appropriate ventilation systems?
□Yes □No	Are NO SMOKING signs posted on liquefied petroleum gas tanks?
□Yes □No	Are all solvent wastes and flammable liquids kept in fire-resistant covered containers until they are removed from the worksite?
□Yes □No	Is vacuuming used whenever possible rather than blowing or sweeping combustible dust?
□Yes □No	Are fuel gas cylinders and oxygen cylinders separated by distances or fire-resistant barriers while in storage?
□Yes □No	Are fire extinguishers appropriate for the materials in the areas where they are mounted?*
□Yes □No	Are appropriate fire extinguishers mounted within 75 feet of outside areas containing flammable liquids and within 10 feet of any inside storage area for such materials?*
□Yes □No	Are extinguishers free from obstruction or blockage?*
□Yes □No	Are all extinguishers serviced, maintained, and tagged at least once a year?*
□Yes □No	Are all extinguishers fully charged and in their designated places?*
□Yes □No	Where sprinkler systems are permanently installed, are the nozzle heads directed or arranged so that water will not be sprayed into operating electrical switchboards and equipment?
□Yes □No	Are NO SMOKING signs posted in areas where flammable or combustible materials are used or stored?
□Yes □No	Are safety cans utilized for dispensing flammable or combustible liquids at the point of use?
□Yes □No	Are all spills of flammable or combustible liquids cleaned up promptly?
□Yes □No	Are storage tanks adequately vented to prevent the development of an excessive vacuum or pressure that could result from filling, emptying, or temperature changes?

*(NOTE: Use of fire extinguishers is based on company policy regarding employee fire fighting in your Emergency Action Plan and local fire code.)

Completed by:_____ Date:_____

6.8 OTHER CONTINGENCIES IN THE FIELD

6.8.1 CONTINGENCY PLAN IN CASE OF BOMBING WITH EXPLOSIVES IN THE AREA

6.8.1.1 Causes

The country's current social situation creates this risk.

6.8.1.2 Preventive measures

- Observe and report any suspicious activity to authorities
- Do not touch or move any suspicious material
- Restrict access to the general public
- Evacuate calmly and without creating panic

6.8.1.3 Procedure

Table 6-13 Procedure In Case Of Attack With Explosives In The Sector

STEP	WHAT TO DO?	HOW TO DO IT?
1	The staff lies dow n on the floor	Move towards the outside of buildings, whenever possible. In open areas lie on the ground and seek shelter.
2	Notice to physical security institutions	The Emergency Coordinator communicates with the hotline
3	Identify other possible artifacts and inform the competent authorities	The Emergency Coordinator gives notice to the emergencies and contingencies brigade. The brigade identifies foreign elements, such as packages, vehicles, bicycles, motorcycles, packages, boxes or cans that are suspecious, but not approach or handle them.
4	Provide first aid for injured	The emergency and contingency brigade evaluate the staff members who havs suffered injury. Ask for support from ambulances and refer injured workers to the nearest health centers . They fill in an accident at work report for ARP. When private individualsare injured the data of the referral sitemust be written down.
5	The brigade prepares a census: injured personnel, and damages to equipment, property, and enviorement.	The emergency and contingency brigade prepared census: injured personnel, equipment and property involved, affected parties, property damage in the environment. The Emergency Management Coordinator reports this in turn to the Building Manager.
6	Ensure that the area is controlled and safe	The administration through the person he delegated decrees the emergency has beencontrolled, and people return to their normal work activities. The an accident investigation must be carried out.

Source: RPS - Working Group

6.8.1.4 After the contingency

a. Assist if needed.
b. Maintain contact with police authorities
c. Evaluate the area before returning to the site
d. If the electricity supply was interrupted, not try to restore it; without verifying first that it will not cause other damage.
e. If anyone was injured, do follow up as to their location and the treatment provided

6.8.2 CONTINGENCY PLAN IN CASE OF EARTHQUAKES

6.8.2.1 Causes

Studies conducted by different institutions at the national level have defined an average level of seismicity for the project area.

6.8.2.2 Preventive measures

- Identify the safest places on site where daily activities are carried out.
- In enclosed areas, identify resistant structural columns or sturdy resistant tables.
- In open areas, locate places away from where building or construction debris or stacking materials, walls, poles and wires of high and medium voltage or fallen buildings may be.
- Memorize, identify, and locate evacuation routes and MEETING POINTS.
- Do not place heavy or breakable objects on unsecured shelves or file cabinets
- Check that there are no electrical wires obstructing the exit routes.
- Do not place heavy objects and glass on the top shelves or racks, separate chemicals, fuels, and glassware.
- Check that water pipes and other facilities are in good condition: natural gas, electricity and telephone.
- Maintain high traffic places such as stairs, hallways and exits clear of obstructive objects.
- Maintain good condition of storage areas of chemicals and fuels.

6.8.2.3 Procedure

Table 6-14 ECP-1 PROCEDURE IN CASE OF EARTHQUAKE

STEP	WHAT TO DO?	HOW TO DO IT?
1	Remain calm and seek shelter at a secure site	All staff should avoid running when evacuating. Seek refuge near strong structural elements or under strong elements: tables or desks.
2	Evacuate the entire staff to the Meeting Point.	Through coordination of brigade, evacuate the camps and work fronts calmly. Meet at the Meeting Point
3	Evaluate the work area to asses the present physical conditions.	The emergengy and contingency brigadists will search for: structural damages,broken or damaged water pipes, gas pipe leaks, damage in electrical installations, lack of stability in debris piles or stored materials.Verify for any earthquake victims.
4	Transfer of injured people to health care centers	If there are victims, provide first aid, contact the emergency pre-defined lines, assist in rescue, and evacuation to hospitals. If the victims are workers, carry out work accident report for the ARP.
5	Assess damage to infrastructure	If gas leaks: implement contingency plan for a gas leak. If structural damage: Do not allow entry of personnel to the affected area. In case of a broken water pipe: close valves where possible to channel water flow, using pumps to drain. In case of damage to electrical installations: interrupt the service and restore it to sites affected if possible. If there is piled debris with stacking instability: remove height.
6	After analyzing the state of the physical structures return to the area.	Brigades reported the situation to the Emergency Coordinator. He a in turn relays information to the Building Manager. Based on risk assessment, staff is either authorized or not to enter the facility. If anyone was injured conduct the accident investigation.

Source: RPS - Working Group

6.8.2.4 After the contingency

- Do not enter the affected area until you understand and meet the security conditions, and receive reports from the area of communications, the Emergency Coordinator.
- Keep track of and follow up on the recovery of injured, if any.
- Report if there are any damaged or broken gas, water, or sewer pipes, or electrical wiring and a risk of electrocution.
- Wait for instructions to return to the work area

6.8.3 CONTINGENCY PLAN IN CASE OF EXPLOSION

6.8.3.1 Cause

The nature and quantity of materials stored, allows establishing a low probability of explosion, as long as they are stored under security regulations.

6.8.3.2 Preventive measures

a. Do not store flammable products. In an absolutely necessary case, store in closed containers, in a well ventilated place.

b. Avoid connecting more than one appliance in each electrical outlet. Do not overload power lines.

c. No smoking in restricted areas

d. Report the presence of gas or fuel leaks or spills of flammable liquids
.

e. Identify emergency exits and nearest phones to call external support groups.

f. Adapt specific sites for fuel storage and supply.

6.8.3.3 Procedure

Table 6-15 WHAT TO DO IN CASE OF EXPLOSION

STEP	WHAT TO DO?	HOW TO DO IT?
1	Report the occurrence of event	Whoeverdiscovers the event immediately notifies the Emergency Coordinator or the nearest person in charge.
2	Isolate the area w here the event happened	Once the Emergency Coordinatorhas been informed, he will communicated by radio with the Response GroupBrigade, and they will isolate the area.
3	Inventory of injured people sent to hospitals	Having secured the area,if there was a threat of fire, the Response Group puts out the outbreak . If there is fire, they will ask the Fire Department for help. An inventory of the injured people is conducted . If thecasualties are sent to hospital a reportof the accident must be made .
4	Report and Resume Normal Activities	Report the end of theincident to the Emergency Coordinatorto whom it was who initially reported: who in turn, reports to the Building Department and based on risk analysis, the decision to resume normal activities or not is taken. If someone was injured, an accident investigation must be conducted.

Source: Consortium IASCOL-CGS

6.8.3.4 After the contingency

- Maintain contact with workers in the area where the incident happened.
- Help all those in need.
- Depending on the danger of the situation, do not to return to the site
- If the electricity supply was interrupted, not try to restore it until it is verified that it will not cause any further damage.
- Keep track of and follow up on the recovery of injured, if any.

6.9 EMERGENCY PLAN

The emergency plan provides preventive measures and training activities for workers. It describes the activities necessary to control emergency situations.

The purpose is to give all workers a basic knowledge of emergency preparedness, so that they can react appropriately and contribute to preserving their own personal safety as well as that of the public. This plan is based on educational activities and training drills for any emergency situations. The following strategy was developed to achieve the aforementioned plan.

6.9.1 INSTITUTIONALIZATION OF THE EMERGENCY PLAN

Once the document has been revised and approved, the Managment Department should issue a communication indicating:

i. That from this day on the Emergency Plan has been adopted.
ii. That the Emergency Plan is known and can be applied by company employees rather than contractors and/or subcontractors.

6.9.2 DISCLOSURE OF THE EMERGENCY PLAN

Aimed at workers and visitors emphasizing the actions to follow in case of:

i. Discover emergency events (fire, gas leak, explosion, bomb attack, earthquake, etc.).
ii. Activation of emergency alarms in case of accident or sudden illness of a worker.

The surrounding community must also be involved and integrated to participate in prevention activities and emergency care as part of an ongoing educational process developed within the training and outreach activities.

6.9.3 EDUCATION AND TRAINING OF RESPONSE TEAM

The brigaders and workers will be trained regularly to update their knowledge on management and control of emergencies and contingencies that apply to different groups. This programming will be published periodically in the activities schedule. The training will be based on the following topics:

i. ***First Aid:*** Attitude of the volunteer helper, evaluation of the injured, rescue technique, cardio pulmonary resuscitation, altered consciousness, shock, soft tissue injuries, wounds, bleeding, osteo muscular trauma, immobilization, bandaging, and first aid techniques.

ii. **Prevention, control and firefighting:** chemistry and physics of fires; different kinds of fires and fuels, fire extinguishing systems,and the use of fire extinguishers

iii. .**Evacuation and rescue:** effective communication, evacuation, relocation of people, salvage of material belongings and evacuation process, basic transportation of injured personnel, coordination of evacuation process, and, basic rules for evacuation of personnel.

iv. **Management of hazardous substances:** Layout and knowledge of safety data sheets with hazardous substances management and contingency measures in case of spillage.

v. **Practice Drills** of possible emergencies in the respective area.

6.9.4 PLAN OF EMERGENCY CONTROL ACTIONS

To operate the emergency control actions, it is necessary to establish actions chronologically distributed before, during and after the emergency. This is necessary because the emergency response requires an organization that allows the use of all available resources efficiently, minimizing personal injury, damage to equipment, and loss of property.

6.9.5 OPERATING PROCEDURE OF THE EMERGENCY BRIGADES

Emergencies present during the execution of the project will be classified according to severity, and this will be the starting point for defining the emergencies that will be handled by the Emergency Coordinator.

Table 6-16 SEQUENCE OF ACTION IN CASE OF EMERGENCY

STAGE	RESPONSIBLE	TAKE ACTIONS	OTHER ACTIONS
1	Who discovers an event: * Workers * Visitors * Security Guards * Others (community)	Notify nearest person to assure that it is reported immediately to one of the following: * Emergency Coordinator * Response Group Brigade	* Prioritize the safety of persons * Control the situation if it is possible to do so in a safe manner *Protect equipment and installations from further damage of the event ONLY IF possible and safe.
2	Staff who is informed * Emergency Coordinator * Response Group Brigade * Director of Emergency (Camp)	* Assess the situation. Determine need for evacuation of areas. * Coordinate control of the event actions with the Brigades . * Communicate with Central Office or Unified Command Post. * Request help from any relief corps present in the area	* Make follow-up of the event and the chances of successful control. * Feedback information to the Communications Director (or Project Manager)
3	Emergency Coordinator Response Group Brigades	* Support the intervention of relief corps * Provide first aid to those affected as required. * Evacuate personnel threatened by the event. * Coordinate the transfer of injured who require attencion to the health care centers, using vehicles.	* Feedback your information to Communications Director (or Manager) or Project Manager
4	Emergency Coordinator Response Group Brigades	Coordinate actions for the restitution of normality after the emergency. * Reset communications. * Take stock inventory of the event. * Retrieve informaciór. * Retrieve information for the Communications Director . * Restore the basic services: energy, water, gas, etc. * Request staff, substitutes, if required.	Responsibilities of theCommunications Director * Submit official version of the events. * Communicate with different stakeholders.

Source: RPS - Work Group

6.9.6 EMERGENCY EQUIPMENT

The main elements that should form the emergency response team in the field camp and at the work front are presented in the following table.

Table 6-17 Minimun Equipment For Emergency Care At Camp Sites And Work Fronts

MINIMUM EQUIPMENT	QUANTITY IN OFFICE AND/OR FIELD	QUANTITY AT WORK FRONT
First Aid Kits	One at the First Aid Area	One per vehicle for non-exclusive use in Emergencies.
Stretchers	One at the First Aid Area	One per Work Area
Directory of work posts and external support agencies	One Published on the Bulletin board	One for each non-exclusive use vehicle for emergencies
First Aid Area	One Located at the Main Office	Not applicable
Fire Extinguishers	According to Risk Analysis at the Camp Site or Office	One per vehicle and / or machine (PQS-multipurpose min. 10 lbs.)
Surveillance Personnel	According to the project's needs	According to the project's needs
Radio or mobile cellphone	One at each Office or Camp Site	One per activity coordinator

Table 6-18 Minimum Equipment For The Attention Of Emergencies At Offices And/Or Camp Sites

MINIMUM EQUIPMENT	QUANTITY OF EACH ONE AT CAMPSITE AND / OR OFFICE	QUANTITY AT WORK FRONT
First Aid Kits	One (1)	Clean and sterile gauze, cloth tape, tongue depressors, latex gloves, elastic bandage, povidone, (iodine solution), saline solution, thermometer, antiseptic alcohol, antiseptic soap, (disinfectant), band-aids. Elements for restraining arm and leg injuries.
Gurneys	One (1)	One (1) portable stretcher.

Source: RPS – Work Group

6.9.7 SUPPORT AGENCIES

List of centers and relief agencies that provide support in emergency care: clinical and hospital centers, and government entities, rescue and help corps.

Table 6-19 Emergency Telephone Fixed Lines Mobile and Avantel

NAME	NUMBER	COVERAGE
Disaster Warning	111	National
Police	112 ; *118 Tigo	National
Time	117	National
Fire	119 ; *115-120 Tigo	National
District Attorney	122	National
Single National Emergency Number	123 *128 Tigo	National
Health Emergency Services (Ambulance)	125	National
Highway Patrol	126 - #767 (*SOS)	National
Transit	127	National
Red Cross	132	National
Ambulance	137	National
Civil Defence	144	National
Emergency Assistance Military Forces	146	National
Army	152	National
DAS	153	National
CAI	156	National
Dijin	157	National
Gaula Anti-Kidnapping	147, 165	National
Narcotics	167	National

SOURCE: RPS –Work Group

6.9.8 EVACUATION PLAN

6.9.8.1 Objective

Protect the life and physical integrity of workers and visitors who are in the offices, camps or working areas at the front at the time of an emergency, moving them to safety with the lowest risk possible

6.9.8.2 Responsibilities.- Executive Level.

Work Management: their responsibility is to maintain this evacuation plan in permanent operational conditions.

6.9.8.3 Level Coordinator and Emergency Response Teams

For workers in the Emergency Response Group (evacuation and rescue, first aid, prevention of fire outbreaks) present in the project and at work fronts: their responsibility is to implement the necessary actions for carrying out the evacuation procedures in order to insure the safety of the people threatened by the emergency.

Initially, there will be an alarm system consisting of whistles which will be kept by the Emergency Coordinator, brigaders and security personnel; later, there will be a siren warning system.

6.9.8.4 Communication equipment

The communications system consists of:

i. Mobile phones, Avantel (walkie-takie/mobile combination) and Radios will be kept at the camp's management office

ii. PTT radios and mobile cell phones will be available at the work fronts, as well as temporary camps, and other security points.

6.9.8.5 Evacuation routes

All personnel will evacuate the work area and go to the MEETING POINT known to everyone which should be pre - established during the training stage.

The main emergency exit route for the evacuation of the work fronts will be marked with warnings to guide the personal information to the Meeting Point, located at an exterior or safe area.

The Director of emergency will identify and locate the MEETING POINT in the project area or its surroundings. Workers and visitors shall arrive by the available routes to the previously established Meeting Point.

It must be stated that in certain special cases, the access roads to the work place will be used as emergency routes to evacuate / exit the work area.

6.9.9 ROLES AND RESPONSIBILITIES OF THE BRIGADERS

6.9.9.1 Emergency Coordinator

Functions.

- The emergency coordinator's main task is to establish, implement and evaluate the Emergency Plan, in coordination with different groups. Manage the resources allocated, following the rules and procedures established by the project.

- He/She oversees the organization and the conditions necessary to ensure the success of the evacuation. He must also ensure compliance with the emergency plan ensuring the administrative technical and logistical resources for its implementation, maintenance and commissioning.

- In an emergency, the Coordinator will assume the communications' control and management and is therefore responsible for making decisions such as: partial or total evacuation and shut-down activities.

Responsibilities.

- Give support and back up to the organizational structure of the emergency plan taking leadership of it.
- Participate in the selection process of members of different groups of the Brigade.
- Develop, revise and implement the operational procedures and regulations policy for the conditions of company-specific hazards in their stages of prevention, care and recovery.
- Establish lines of authority and allocation of responsibilities to ensure compliance with plans and the by laws of the Emergency Brigade.
- Coordinate beforehand with agencies working in emergencies, and in advance establishes procedures to follow if necessary.
- Encourage each member of the Brigade, to cooperate, participate and comply with the provisions of the Emergency Plan and the by laws of the organization as well as training programs and training.
- Evaluate periodically the activities scheduled by the Brigade
- Run a national emergency drill at least once a year.
- Seek advice on a permanent basis and provides training to members of the Brigade, in management and disaster prevention.
- Make the Emergency Plan known to all members of the staff.
- Keep the group coordinators always informed on changes or security policies adopted by him or by the general management.
- Receive the alarm or communication and activates the Emergency Plan. If the alarm is communicated by a person, inquire with the leader of the respective area as to the type and characteristics of the emergency

- Establish permanent communication with all area leaders or their alternates, providing the necessary support to control the emergency.
- Make decisions and takes extraordinary control actions not contemplated for an effective control of the emergency

Assess and communicate the needs of:

- Evacuation
  - Intervention group or domestic support (Brigade)
  - Intervention teams or external support (Fire, Red Cross, Civil Defense, among others.)
  - Return to normal
- Maintain the number of brigaders in accordance with the requirements of coverage for the company besides ensuring that they cover all their work hours as well.

- Receive reports of safety inspections carried out by the control groups and fire prevention, evacuation, rescue, first aid, to give the corresponding processed correction of anomalies.

- Coordinate with the agencies in emergency care, the procedures to be followed in each case.

6.9.9.2 Fire control group.

Functions.

It is directly responsible for monitoring fire protection equipment, to ensure adecuate operation at the time of an emergency, and to coordinate the necessary resources for the proper functioning of each team.

Group Leader

- Plans and maintains the organization of the group.

- Has his staff registered and develops action plans.

- Provides whatever is needed for preparing and training his group.

- Checks that all the equipment is maintained, cared for, and used properly.

Brigaders

BEFORE THE EMERGENCY

- Obtain basic knowledge of fire and fire control methods.
- Conduct trainings and practices that enable them to acquire the necessary skills to perform.
- Participate in defining the elements needed to perform their work safely.
- Perform preventive maintenance of equipment.
- Carry out inspections of workplaces, report abnormal conditions and suggest methods of control.
- Train other staff members in aspects of fire prevention and control.
- Know the different fire hazards that are present in their area of responsibility and monitor their control.

DURING THE EMERGENCY

- Respond promptly to any emergency situation that is present on the premises of the company, using equipment available to take care of them.
- Act in coordination with other response teams and follow the instructions given by the group leader and coordinator of the brigade.
- Support the evacuation of the facility and possible rescue of trapped.

AFTER THE EMERGENCY

- Perform debris removal, collect and clean the equipment used in emergency care.
- Assess the procedures performed and, if necessary, suggest any amendments.
- Prepare report on what happened, possible causes, actions, and recommendations for correction.
- Carry out the preparation of the equipment needed to respond to another emergency in the shortest time possible.

RESPONSIBILITIES

- Conduct regular inspections of existing fire fighting equipment in their area of responsibility.
- Check the operation of the alarm transmission mechanisms within the company and to support areas from local authorities.

- Oversee the operation of pumps and valves of the hydraulic fire fighting system (if any).
- Make the control of public services in the area of the fire.
- Fire extinguishing or control.
- Conduct research as to the causes of fires.
- Permanent training.
- Prepare and train the staff in use of fire extinguishers.

6.9.9.3 First Aid Group

Functions

It must ensure the maintenance of first aid equipment and identify the needs of acquiring new equipment to enable the proper care of the wounded, through the brigade coordinator.

Group Leader

- Plans and directs the operation of the First Aid group.
- Makes list of officials for each of the areas of the project and submits permanent disabilities or illnesses and constantly updated.
- Provides whatever is necessary for preparing and training the group.
- Checks that equipment is maintained and used properly

Brigaders

BEFORE THE EMERGENCY

- Participate in training and simulations that will enable them to master the knowledge and skills to administer first aid.
- Define the elements and equipment necessary to perform their work.
- Regularly check the provision of first aid kits and the state of the support elements available for the project and keep them in condition to be used at any time.
- They make sure to implement a rapid and appropriate transportation system and verify its operation.
- Perform the location and classification of health facilities in the area of interest according to their distance and level of care

DURING THE EMERGENCY

- Collaborate in the evacuation of staff from any area where they might be

- Move the equipment needed to provide first aid care for injuries.
- Provide first aid.
- Under the supervision of attending physician coordinate and monitor the movement of the injured to health facilities.
- Complete the report of the care given to each one of the victims or injured

AFTER THE EMERGENCY

- Assess the quality and timeliness in providing first aid.
- Make recommendations for the adjustment of procedures or attention plans.
- Inspect, clean and replenish the elements and equipment used for the care of the injured leaving them in proper conditions to be used again.
- Present report to the coordinator of the brigade activities done, caseload, severity, and place shipments for reference and information necessary for the replenishment

6.9.9.4 Support and Control Group

Functions.

- To cordon off the affected area or areas in an emergency.
- Restrict the entry and control the exit of people to the project in coordination with the Brigade Coordinator and / or Emergency Coordinator.
- Prevent acts of theft and/or vandalism with the security groups.
- Immediately notify External Support Groups (Fire, Red Cross, Civil Defense, Police, among others), according to indications given by the Brigade Coordinator and / or team Emergency Coordinator. In case of not having effective communication with the above, the Safety Coordinator should call relief units upon his sole discretion.
- Support the Brigade, during and after the emergency.
- Provide support and guidance to external emergency services upon arrival and enter the company premises.

MEMBERS OF THE EMERGENCY BRIGADE

BRIGADE COORDINATOR (TO BE ELECTED)
NAME: _____
TELEPHONE: _____

FIRE CONTROL GROUP (TO BE ELECTED

NAME		NAME	
PHONE		PHONE	
NAME			
PHONE		PHONE	

FIRST AID GROUP (TO BE ELECTED)

NAME		NAME	
PHONE		PHONE	
NAME		NAME	
PHONE		PHONE	

EVACUATION GROUP (TO BE ELECTED)

NAME		NAME	
PHONE		PHONE	
NAME		NAME	
PHONE		PHONE	

GROUP SUPPORT AND CONTROL (TO BE ELECTED)

NAME		NAME	
PHONE		PHONE	
NAME		NAME	
PHONE		PHONE	