

OVERSEAS PRIVATE
INVESTMENT CORPORATION



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

JOSHI
TECHNOLOGIES
INTERNATIONAL, INC.



**GENERAL GUIDELINES ON
ENVIRONMENTAL, HEALTH AND
SAFETY**

1. GENERAL GUIDELINES ON SOCIAL MANAGEMENT ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

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. Installation and Adaptation
	3. Drilling	4. Area Restorations / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> • Conflicts with the community • Affection of the existing infrastructure • Lack of information from the community affected by the work's activities. • Community opposition to the development of the work due to lack of information. • Conflicts of the community with the Dealer 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)
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<ul style="list-style-type: none"> • Informing the population residing in the area of influence of the Project about the characteristics of the Project, through informative meetings.
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	<ul style="list-style-type: none"> • 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 or didactic aids for the presentations for the participant's level.
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TECHNOLOGY USED	<ul style="list-style-type: none"> • Agreement and participation. • Written information and working agenda for the session.
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RESPONSIBLE FOR EXECUTION	Palagua – Caipal field superintendent.
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EXPECTED RESULTS	<p>Adequate Management of the expectations in the area of influence of the Project. Rational participation of the non-qualified work force of 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.</p>
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REMARKS	<p>This Project will raise two meetings or Workshops in the rural area. Nevertheless, it is necessary to have all the meetings that are needed, according to the development of the project.</p> <p>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 a professional in relationships with the community 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 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.</p> <p>For the success of the Social Management it is recommendable that all the compromises, agreements, and the distribution of the labour 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.</p>
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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 non-qualified labour, 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 non-qualified labour for all the areas of influence of the Project.

EXECUTION	1. Planning	2. Installation and Adaptation
	3. Drilling	4. Area Restorations / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> • 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
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<ul style="list-style-type: none"> • 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 equivalently equitably and fairly. • One (1) workshop in the Palagua rural district. • Arrange with the participants in the meetings and workshops the names of the candidates to be hired. • Make the minutes of the meetings and workshops • Prepare adequate materials or didactic aids for the presentations an adequate them to the participant's level. • Prepare the summary document to be distributed in the meetings and workshops
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TECHNOLOGY USED	<ul style="list-style-type: none"> • Interviews • Compromise and participation • Written information and work agenda for the session. • Broadcasting on the community radio, if possible.
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APPLICATION SITE	Area corresponding to the Palagua rural area.
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RESPONSIBLE FOR EXECUTION	Palagua – Caipal Field Superintendent
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EXPECTED RESULTS	<ul style="list-style-type: none"> - 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 labour supply 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 community leaders, and of the magnitude of the generation of temporary employment, and the amount of people and services that will be required. - Awareness of the way that non-qualified 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.
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REMARKS	<ul style="list-style-type: none"> - Hiring of local labour must be made according to the policies of the company, and in consultation with the respective community authorities. - The Project represents the execution of the employment policies of UT-IJP, and seeks to link local labour in activities to develop. Giving an answer to the situation of low labour offer in the area on one hand, and on the other hand, to the need for non-specialized labour, for some of the typical activities of the Project. - 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, should there be conflicts between the qualified personnel of the region and foreign personnel; an agreement must be made that permits the use of qualified labour until the point permitted by the activities and the capacities shown by the candidates.
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1.3 GUIDELINES TO EDUCATION AND TRAINING OF STAFF OF THE WORK

OBJETIVE

- Include in the work program the environmental training and environmental safety 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 Works taking into account the environmental commitments generated by the environmental measures and environmental 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.

EXECUTION	1. Planning	2. Building and Adaptation
	3. Drilling	4. Restoration / Abandonment of the Area

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> • Alteration of water, soil, biota, quality of the landscape, and historical or cultural heritage. • Awareness of the residents of the area, and the social conditions, and the existing 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.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE DEVELOPED	<p><u>In connection with training:</u></p> <ul style="list-style-type: none"> • At the beginning of the civil Works in the well, a meeting of installation of the HSE Committee will be held, which will have the commitment of making a follow up and registering it in the minutes of the environmental activities defined in the activities of environmental mitigation. • Daily five minutes environmental training indicating the following: <ul style="list-style-type: none"> 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. 2 - “Use and Management of the Natural Resources”, oriented towards the existing
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	<p>Environmental Regulations and Environmental Conditions of the Area, and oriented towards the care that must be taken in the area of the Project.</p> <p><u>In connection with the preparation of the Didactic Material.</u></p> <ul style="list-style-type: none"> • Written material Environmental Journeys will be prepared, to be distributed among the participants <p><u>Related with the Assessment of the Actions:</u></p> <ul style="list-style-type: none"> • Preparation of the material for the evaluation of the meetings and workshops with the participants.
TECHNOLOGY USED	<ul style="list-style-type: none"> • Presentation of the programmed Environmental measures and of the activities, to the coordinators of the Project to Schedule and place in the activities Schedule the activities of the Workshops. • Written Material. • Agreement and Participation.
APPLICATION SITE	<p>In the site of the well, according to the advance, development of the Works, and hiring of personnel.</p> <p>The training program will take place during the daily Works, making work meetings in which space is given for the environmental variable during the development of the work.</p>
RESPONSIBLE FOR EXECUTION	<p>UT-IJP Environmental Coordinator.</p>
EXPECTED RESULTS	<ul style="list-style-type: none"> • Training of the personnel that will be working in the Project, on the Management of the main themes and environmental regulations, and social conditions of the area of the Project, including citizen participation. • Adequate Management of the area and prevention of possible negative effects. • Adequate Management of industrial safety aspects during the labor.
REMARKS	<p>It is important that the personnel that will be working in the Project, to have a careful behaviour in the area, according to the training that they get in the Workshops, the didactic material that they receive, 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, head of the team, and head of the well) must be notified by the Management of UT-IJP about the environmental mitigation measures, as a tool of obligatory use and application during their work, and that is involved in the contractual undertaking.</p>

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. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> • Alteration of archeological sites. • Destruction of historical record.
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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.
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TECHNOLOGY USED	Billboards and simple presentations
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PLACE OF EXECUTION	Location of wells
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RESPONSIBLE FOR EXECUTION	Environmental Superintendent and Coordinator of UT-IJP
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EXPECTED RESULTS	Work staff involvement in archaeological protection, information and cooperation activities in case of an eventual finding.
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REMARKS	<p>The area of the wells and its access roads do not have archeological potential according to the ICAHN's concept.</p> <p>During the HSE (Hygiene and Industrial Security) talks the heavy equipment operators, workers and all the personnel must be informed of the way to act in case of an eventual finding of material of historical or cultural interest.</p>
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2. GENERAL GUIDELINE ON ENVIRONMENT ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

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. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	Alteration of the physical, chemical and biological properties of water and soil.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	Adopt adequate storage and transportation measures for the formation fluids produced during the testing. Follow the measures to handle polluted waste generated during production testing.
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TECHNOLOGY USED	<ul style="list-style-type: none"> • The formation oil and water will be separated and stored in tanks on the location and then will be sent in tank trucks cars to Palagua Battery. • If there is gas production during the testing, it will be burnt in a torch that allows full combustion to prevent emission of particles, following the regulations with respect to height and placement of the torch 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, which will be used in case its management is required at the location. • The storage tanks will be hermetic and equipped with levees. • 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.
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	<ul style="list-style-type: none"> • The management of oily waste water will be enforced with respect to its collection, which will be used in case its management is required at the location. • The equipment used should guarantee minimum oil spill within the location. • The tank trucks used to transport formation fluids should be in top condition with regards to airtightness and must follow the safety rules in those 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	<p>Zero spills of produced fluids</p> <p>Proper disposal of produced water.</p> <p>Proper disposal of solid waste (domestic and industrial) during operation.</p>
REMARKS	It is expected that the wells are producers, depending on the results of the testing.

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. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> Emissions of gas to the atmosphere. Negative visual changes. Pollution of environmental resources due to bad handling of radiographies.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<ul style="list-style-type: none"> 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, pieces of cut pipe must be stored in properly marked containers along the road to later be transported to the Palagua Battery, where they will be collected and sent to scrap metal recyclers. The handling of radiographies including developing 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 building work of the flow line should be installed signals warning the vehicles of the presence of WORKERS ON THE ROAD and use vehicle traffic signals.
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TECHNOLOGY USED	<ul style="list-style-type: none"> Welding equipment. Full topography equipment.
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PLACE OF EXECUTION	Flow lines paths projected for the wells.
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RESPONSIBLE FOR THE EXECUTION	The Well Supervisor, under the supervision of the Environmental Coordinator of the UT- IJP
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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.

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. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> • Affection of natural resources by disposal of treated wastewater. • Affection of ground water by the quality of the drilling cuts.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<p><u>Monitoring of Waters</u></p> <ul style="list-style-type: none"> • Carry out monitoring both from the affluent and the effluent of the industrial wastewater treatment system of the well before being sent to the Palagua Battery, through composite sampling, analyzing the physicochemical parameters mentioned below.
	<p><u>Monitoring of Drilling Cuts</u></p> <ul style="list-style-type: none"> • The drilling cuts 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.
	<p><u>Analysis of Results</u></p> <ul style="list-style-type: none"> • 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, base documents and bibliography of the area.
	<p><u>Parameters to Assess</u></p>



- **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, DBO₅, DQO and 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.
- Perform IN SITU analysis for dissolved gases, immediately after sampling, since after the sample has been removed from its normal environment rapid changes can happen to the content of the dissolved gas.
- 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 avoiding eventual external pollution. It is important to write down the time, temperature and the aspect of the water at the moment 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 coherent and satisfactory results and conclusions.

For the preservation and conservation 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 ₂ SO 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 ₂ SO ₄ to pH<2	24h/28h
Greases and Oils	Glass	400	Add H ₂ SO 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



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	Fecal Coliforms	Plastic	500	Analyze the same day. Refrigerate.	-
	Total Coliforms	Plastic	500	Analyze the same day. Refrigerate.	-
<p>* 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.</p>					
PLACE OF EXECUTION	<ul style="list-style-type: none"> Affluent and effluent of the activated sludge plant of the wells. 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	<p>Full compliance with the permit for pouring or disposing of industrial wastewater. No affectation of natural resource for pouring or disposing of industrial wastewater during the drilling stage.</p>				
REMARKS	It is important to process the Environmental Compliance Reports (EVR) from the Ministry				

2.4 GUIDELINES ON WASTE MANAGEMENT

OBJECTIVE

Make known the measures to carry out an effective control of pollution that may be generated by the execution of building work of access roads and location.

EXECUTION	1. Planning	2. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> Emissions of particle to the atmosphere caused by the used machinery and equipment. High noise level 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 pollution due to an accidental spill or materials used during building or for fuel and lubricants from machinery. Pollution of groundwater supplies by spills described in the preceding item.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<ul style="list-style-type: none"> Conduct periodic inspections of smoke emissions from machinery, to control this aspect. The emissions that are too high need to be immediately corrected and the machinery that produces these emissions should not be put to function until the problem is solved. Also, the operation of machinery with hydraulic oil or fuel leaks that affect the soil will not be allowed. Conduct periodic checkups to the machinery in the work area, to prevent spilling to the ground or water bodies, caused by leakages of fuel and / or lubricants. The area where fuel and oil can be placed without the possibility of affecting water streams must be selected. This fuel storage area should have geo-membrane flooring or a cement floor and have a grease trap. It is recommended for this area to have a ceiling with the respective No Smoking signs and 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. Under no circumstances will be allowed to wash work machinery and equipment in water bodies located in the vicinity of the work area and in general in no river or water stream. This activity should be carried out in a washing area with the right conditions for that purpose. Change of lubricants or supplying 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, likewise, the soil must be protected with polyethylene to prevent pollution there.
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	<ul style="list-style-type: none"> • Give talks 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 works and the sanctions for which will be responsible if they infringe these rules. • The disposal of surplus building materials or organic residues by workers in places like water bodies, work place surrounding areas, springs, or other places different to the ones authorized for that purpose will not be allowed, according to the Waste Management Project of the Drilling Activity Management Program. • The containers to store solid waste produced by workers will be strategically placed in the work area, and to provide the facilities needed for the management of domestic waste water.
TECHNOLOGY USED	<ul style="list-style-type: none"> • 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 by the works.
REMARKS	None

3. GENERAL GUIDELINES ON HEALTH AND OCCUPACIONAL SAFETY

ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

3.1 SIGNPOSTING GUIDELINE (ACCESS ROAD, LOCATION, FLOW LINE)

OBJECTIVE

Establish which are the most adequate signals and the basic industrial safety measures to carry out in an efficient and safe manner the execution of the works.

EXECUTION	1. Planning	2. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> • 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.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<ul style="list-style-type: none"> • The following signals will be made and placed according to the type of work and area, and accident rate risk: • <u>Warning signs</u>: This type of signals warn workers regarding possible danger in the work area, and must be placed closest to the place where an accident may occur and in the number that is considered necessary according to the situation. • <u>Informational signs</u>: The informational signs are located in pertinent places to guide the personnel in the work area, showing the direction to where a certain path leads and any additional information to locate them at the place where they are, also visitors and in general all the personnel that is in the area. • To hold periodic talks with workers at every level of the works, involving basic industrial safety aspects, with a guidebook made especially for them so that they can clearly identify signals with which they should be familiar and other aspects of particular interest at that moment. • Prepare and implement a monitoring and control program of industrial safety elements, confirming or not its effectiveness. • To delegate the design and placing of all necessary signs to a specialist in Industrial
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**ASSESSMENT OF ENVIRONMENTAL IMPACT
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PALAGUA – CAIPAL FIELD
PUERTO BOYACA (BOYACA, COLOMBIA)**



	<p>Safety (Inspector), in order to further emphasize these aspects of such importance at the works site.</p> <ul style="list-style-type: none"> • Install at least 6 informational 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). If there are crossings near schools a warning sign must be installed informing to slowing down the speed to 25 kph and school zone in both directions of the road.
TECHNOLOGY USED	<ul style="list-style-type: none"> • Basic tools of ornamentation to make signals. • 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 building works.
REMARKS	None.

3.2 GIDELINE OF HANDLING AND STORAGE OF CHEMICAL PRODUCTS

OBJECTIVE

Stipulate the actions as to the handling, storage and disposal of chemical residues generated during the drilling of Wells of the Palagua – Caipal Field.

EXECUTION	1. Planning	2. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	Pollution of water bodies and soils by chemical products and fuel spills.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<ul style="list-style-type: none"> • Execution of properly differentiated warehouses for storing chemicals and empty packaging and containers. • Signaling of all areas of storage handling. • 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 prevent inadequate handling and minimizing 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 and diffuse the “Material Safety Data Sheet – MSDS” (commonly known as Safety Sheet) of each product and have them available for personal information of the worker.
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TECHNOLOGY USED	<p><u>Specifications and Location of the Warehouse or Chemical Products Containers</u></p> <ul style="list-style-type: none"> • Building of a chemical products storage warehouse preferably covered with sheets of zinc or plastic to prevent rain runoff from dragging 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.
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	<ul style="list-style-type: none"> 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. <p><u>Chemicals Control on Locations</u></p> <ul style="list-style-type: none"> Complete list of all the chemicals stored at the locations. Daily 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. <p><u>Chemicals Handling</u></p> <ul style="list-style-type: none"> The staff responsible for the safety of these products, should receive the training and the provision of personal protection implements needed and required in order to prevent occupational diseases and accidents that affect workers' health, the operation and the environment, caused by exposure and handling of toxic and flammable substances.
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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.

4. GENERAL GUIDELINES ON HEALTH AND SAFETY OF THE COMMUNITY

ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

4.1 GUIDELINE OF CONTROL AND MONITORING TO THE SOCIAL MANAGEMENT PROGRAM

OBJECTIVE
<ul style="list-style-type: none"> 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. Rate and qualify the project execution: during the process and on completion of the execution. Guarantee the commitment of the project's management and organization to comply with the EMP regarding social management.

EXECUTION	1. Planning	2. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> 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. Creation of community problems for lack of proper social management. Failure to create a social program that cannot be or is not planned to be executed or to which is not given enough managerial or economic support. Enablement of positive impacts.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<p>The actions to be taken should be directed towards:</p> <ul style="list-style-type: none"> - Initial review of the Social Management Plan and ensure the awareness and commitment of the projects' management to social management and to carry out the necessary adjustments. - Take part in meetings and workshops, in the observation and analysis of written documents about assistance to held meetings and minutes in order to make recommendations and suggestions. - Timely meet the demands of the community which must be managed using the company's
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	<p>legal support and with full knowledge of the project's management.</p> <p>- Monitoring and control of the activities from the Social Management Program, periodically (weekly), according to the foreseen objectives, the proposed goals and the success indicators.</p> <p>Therefore includes monitoring and control over:</p> <ul style="list-style-type: none"> • 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.
<p>TECHNOLOGY USED</p>	<ul style="list-style-type: none"> • Active involvement of management in the resolution of social programs associated with the project. • To demand social impact assessment of the measures implemented and analysis of the results obtained by the social responsible. • Meetings and Workshops. • Observation, Reviewing and Analysis of Documents. • Arrangement Process Review • Report Preparation.
<p>PLACE OF EXECUTION</p>	<p>At the Palagua Rural Area, according to the progress, execution of works and staff recruitment.</p>
<p>RESPONSIBLE FOR THE EXECUTION</p>	<p>Superintendent of the UT-IJP, the contractor company for the works with the supervision of the Environmental Coordinator of the UT-IJP.</p>
<p>EXPECTED RESULTS</p>	<ul style="list-style-type: none"> • Knowledge on behalf of the projects' management of the commitments generated by the EMP. • Execution of the Social Management Plan according to the objectives proposed. • Timely execution of the changes required in the execution of Social Management Program. • Adequate environmental and social conditions in the area during the execution of the project.
<p>REMARKS</p>	<p>As part of monitoring the different projects proposed, the determination of the need of providing more information to communities should be included, as well as the evaluation of possible conflicts that may arise in the development of those activities.</p>

4.2 GUIDELINE OF DUMP AREAS, CUTTINGS AND FILLINGS MANAGEMENT AT THE LOCATIONS

OBJECTIVE

Establish the applicable environmental management measures to execute the cuttings in the adaptation of the location of the wells, located at existing terreplains.

EXECUTION	1. Planning	2. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> • Hydric or wind superficial erosion. • Contribution of sediment to adjacent water bodies. • Changes in the ground water level of the place. • Noise, gas or particle emissions. • Changes in landscape. • Changes in the physicochemical properties of the soil. • Creation of obstacles to natural drainage near or included in the dump area site.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<ul style="list-style-type: none"> • For the flow line no cuttings, conformation and disposition of filling material in the dump area are considered to be done, since the passage of the line is very close to the "Collectors" of the Palagua – Caipal Field and there is no affectation of the areas that were not intervened. • 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. • Perform necessary analysis and laboratory tests to the conforming material of the terreplain, to verify that its technical characteristics correspond to the ones demanded to a filling of this type and in that way guarantee the stability of the work area and hence any environmental incident that may be generated by deficiencies in the building of the site. • According to preliminary calculations of the movement of earth and the requirements of the project, no surplus material will be generated, therefore there 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.
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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 .

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. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	<ul style="list-style-type: none"> • Changes in the drainage pattern of the site. • Contribution of sediment to nearby streams. • Alteration of the physicochemical properties of the soil.
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TYPE OF ENVIRONMENTAL MANAGEMENT MEASURE	Prevention	Mitigation	Correction
	Compensation	Control	Protection

ACTIONS TO BE TAKEN	<ul style="list-style-type: none"> • Protect the soils with polyethylene or a similar material when melting mortars or concrete during the building of drainage works. • Construct the drainage works that are needed, at the discretion of the environmental coordinator, for the disposal of rainwater in the access roads as described below: <ul style="list-style-type: none"> - The rainwater ditches of the access roads will be outlined with a motor grader while ensuring their proper conformation so that they will meet the required capacity and without interruptions along its course to the delivery sites (sewers). The outlined ditches will be L-shaped and their total width will be 1.00 m, with a depth of 30 cm. - Perimeter ditches must be built with their respective dock, around the location, to prevent water to cause problems to the slope. The perimeter ditch has to be built in accordance with the specifications in the design of civil works. - To prevent water from causing flooding and problems with the existing slopes, it is recommended to build a cross sump at the access to the location with its respective dock to the hollow or a box connected to a 8" drainage pipe and link dock of the hollow. - Avoid steep slopes where the ditches are located so that when the water reaches the delivery area does not get there at a high speed producing gully erosion in the surrounding areas. - It is necessary to carry out periodic maintenance in the ditches of the roads, because, over time, sedimentable material accumulates that obstructs part or all of these elements and does not allow for their efficient functioning. • Build the necessary drainage works at the location for the disposal of rain and industrial water, as described below: <ul style="list-style-type: none"> - 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 that will deliver to the nearby hollows at the location.
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	<ul style="list-style-type: none"> - To dump the water generated by the operation of the well, channels to collect oily water will be built in 3000 psi reinforced concrete. The cross section will be rectangular and its internal dimensions will be B = 40 cm, with a variable height according to the development but with a minimum dimension of 10 cm and a maximum of 70 cm. with a thickness of 10 cm. These channels will deliver to a skimmer, and later carry this water to the treatment tanks. The mixture of different concrete components will be supervised by the technical and environmental inspector to ensure the resistance of the structure to movement or ground settlement. - As a part of the treatment for the drilling water, a trap for oily water will be built at the location in 3,000 p.s.i. concrete and a height of 1.50 m and with two compartments and an exit box. The thickness of the walls will be 15 cm. - In the lowest corner of the location a sand trap – grease trap will be built, to retain the solids from the surface waters and in turn, prevents oily substances coming from the drilling rig to pass to the receiving drainage. The structure will be built in concrete block and will have a height of 1.50 m, a width of 1.50 m and three compartments. The total length of the trap will be 4.00 m. - Do not undersize the drainages that will be built, not even during the dry season, and do not ignore sites that may require drainage work however small the need for it, since occasionally a storm may generate inconveniences not only from flooding but also from erosion, gully and slope instability at the work area.
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TECHNOLOGY USED	Small equipment: concrete mixers, vibrators, building formwork.
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PLACE OF EXECUTION	Access roads and location.
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RESPONSIBLE FOR THE EXECUTION	Environmental Coordinator of the UT- IJP .
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EXPECTED RESULTS	Adequate handling of rain water at the roads and locations. Adequate handling of polluted rain water at the locations.
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5. GENERAL GUIDELINES ON CONSTRUCTION AND DECOMMISSIONING ENVIRONMENTAL MITIGATION AND PREVENTION MEASURES

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. Installation and Adaptation
	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.
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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.
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TECHNOLOGY USED	<p><u>Positive Production Tests.</u> In the event that the well is found to be productive, the access roads will be kept, since they are part of the internal network of Palagua Field currently in production. Similarly, the areas of the location are part of the current production areas of the development wells and will be left in the same conditions foreseen after the implementation of the <i>Post-Treatment and Sanitary Facilities Management Project</i>. The flow lines of each of the wells to production collectors of the Field will be installed.</p> <p><u>Negative Production Tests.</u> Basically, the same measures presented above will be implemented except for the installation of flow lines.</p>
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PLACE OF EXECUTION	Access roads, flow lines and location of the wells.
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**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 any kind of pollution or negative secondary effect.
Recovering of the intervened area and permanent harmonization with the environment surrounding it.

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 to be re-conformed.

EXECUTION	1. Planning	2. Installation and Adaptation
	3. Drilling	4. Area Restoration / Abandonment

ENVIRONMENTAL IMPACT	Affectionation 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.
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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 and still present at the facilities, as well as the waste generated in the dismantling of the facilities and the demolition of structures.
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TECHNOLOGY USED	<p>Removal of the drill structures and facilities The dismantling will begin with the disassembling and removal of drilling equipment and piping, auxiliary equipment as the one used to control solids, sludge pumps, warehouses, office camps or containers and machine shops. The disassembling should not leave waste at the location, metal scrap and accumulated waste will be collected and integrated to the MIRS at the Palagua Field.</p> <p>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.</p>
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PLACE OF EXECUTION	Location
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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 any kind of pollution or negative secondary effect, to attain or achieve recovery