Decree 1215

Gustavo Noboa Bejarano
PRESIDENT OF ECUADOR

Whereas:

In accordance with Art. 1 of the Constitution of the Republic of Ecuador, published in Official Gazette No. 1 of August 11, 1998, Ecuador is a sovereign, independent, democratic, unitary, decentralized, multicultural, and multiethnic State;

Article 86 of the Constitution provides that the State will protect the right of the people to live in a healthy and ecologically balanced environment that guarantees sustainable development. Therefore, it declares the preservation of the environment, the conservation of the ecosystems, the biodiversity and integrity of the genetic heritage of the Nation, as well as the prevention of environmental contamination, the sustainable exploitation of the natural resources, and the requirements that must be fulfilled by public and private activities that may affect the environment to be a matter of public interest that will be regulated in accordance with the law;

The Rio Declaration on Environment and Development (1992) establishes the principles [*sic*] that States must enact effective laws concerning the environment;

Article 31, secs. s) and t) of the Hydrocarbons Act require **Petroecuador**, its contractors or partners in hydrocarbon exploration and production, refining, transportation and marketing, to perform their work without adversely affecting the economic and social organization of the population residing in its area of activity or the local renewable and non-renewable resources, and to conduct their petroleum operations in accordance with the laws and regulations for the protection of the environment and the security of the Nation;

Article 12 of the Environmental Management Act, published in Official Gazette No. 245 of July 30, 1999, provides that, in the exercise of their powers and within the purview of their jurisdiction, the State institutions of the Decentralized Environmental Management System are required to apply the principles established in said Act and to take the specific actions [provided in it] relating to the environment and natural resources, as well as to regulate and promote the conservation of the environment and the sustainable use of natural resources in harmony with social interest;

Article 33 of the aforementioned Environmental Management Act provides for a number of instruments for applying environmental standards, including the following: environmental quality parameters, effluent and emission standards, and environmental impact assessments;

Executive Decree No. 2982, published in Official Gazette No. 766 of August 24, 1995, issued the Environmental Regulations for Hydrocarbon Operations in Ecuador;

It is necessary to better systematize the current regulatory provisions that govern environmental management in hydrocarbon activities, particularly in terms of socio-environmental factors, new, [as yet] unconsidered technical aspects, and the need to streamline the means for regulating, controlling, and monitoring environmental management;

In order to provide for an instrument that is efficient, readily understood, and user friendly, it is fitting to amend the Environmental Regulations for Hydrocarbon Operations in Ecuador; and,

In the exercise of the power specified in Art. 171, sec. 5 of the Constitution of the Republic of Ecuador,

the President hereby decrees as follows:
TO ISSUE THE FOLLOWING REGULATIONS IN LIEU OF THE ENVIRONMENTAL REGULATIONS FOR HYDROCARBON OPERATIONS IN ECUADOR.

ART. 1. Scope. The present Environmental Regulations and the Environmental Technical Standards included herein will apply to all hydrocarbon operations and the like conducted in Ecuador.

The purpose of these Regulations is to regulate the hydrocarbon activities of exploration, development, and production, storage, transportation, industrialization, and marketing of crude petroleum, petroleum derivatives, natural gas, and the like, that are capable of causing environmental impacts in the area of direct influence defined in each case by the respective Environmental Study.

ART. 2. Parameters and definitions. For purposes of the present Regulations, the parameters, permitted limits, formats and methods, as well as the definitions of the terms generally used in the hydrocarbon industry and in the environmental subject area that appear in Annexes Nos. 1, 2, 3, 4, 5 and 6, are included in and are an integral part hereof.

CHAPTER I
JURISDICTION AND COMPETENCE

ART. 3. Environmental authority. As part of the Decentralized National Environmental Management System, the Office of the Undersecretary of Environmental Protection (SPA) of the Ministry of Energy and Mines, through the National Environmental Protection Office (DINAPA), will be the technical-administrative agency in the sector that will control, inspect, and audit environmental management in hydrocarbon activities; it will carry out the evaluation, approval, and monitoring of environmental studies throughout the territory of Ecuador; likewise, it will verify compliance with these Regulations and ensure that, in the event of non-compliance, the parties at fault comply with the respective provisions and recommendations.

ART. 4. Regulated parties. For purposes of applying these Regulations, the term “regulated parties” refers to **Petroecuador,** its subsidiaries, and its contractors or partners for the exploration and production, refining or industrialization of hydrocarbons, storage and transportation of hydrocarbons, and marketing of petroleum derivatives, as well as any domestic or foreign companies validly organized in Ecuador that have been duly authorized to conduct these activities.

ART. 5. Re-establishment of terms and conditions. If, based on provisions applying subsequent to the signing of a contract or the approval of a development project or plan, ecologically sensitive or culturally vulnerable areas, such as conservation nuclei, intangible or other zones, such as habitats of isolated peoples and/or tribes at risk of extinction, thereby altering the technical and economic conditions of the petroleum operation, the State and the respective company must negotiate in order to re-establish the original terms and conditions of the contract or to amend the contract by mutual assent.

ART. 6. Coordination. Together with the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines, the regulated parties must coordinate the environmental management and the social aspects specified in the respective Environmental Management Plan.

Consequently, the Office of the Undersecretary of Environmental Protection is responsible for coordinating the participation of local civil society organizations, indigenous peoples, rural communities, and the population in general.

The Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines will coordinate with the other State agencies that are associated with the environment and the socio-environmental subject area, on the hydrocarbon activities of the regulated parties.

ART. 7. Coordination procedure for protected areas. Environmental studies for the execution of petroleum projects that include hydrocarbon activities in zones pertaining to the National System of Protective Natural Areas, Forests, and Vegetation must have a prior formal statement from the Ministry of

the Environment establishing the minimum technical conditions that are to be met by the environmental management to be implemented.

Based on said formal statement, the specific activities will be subject to the procedure and coordination levels established in these Regulations.

Likewise, the Office of the Undersecretary of Environmental Protection will coordinate with the Ministry of the Environment on the evaluation and approval of the Terms of Reference for zones of the National System of Protective Natural Areas, Forests, and Vegetation, both with respect to Studies and Environmental Audits.

ART. 8. Environmental aspects in competitive bidding processes. The body in charge of petroleum bidding processes must have a prior formal statement from the Office of the Undersecretary of Environmental Protection for the consideration of environmental aspects in State competitive bidding processes.

ART. 9. Consultation. Prior to commencing any State petroleum bidding process, the body in charge of conducting petroleum bidding processes will apply, in coordination with the Ministry of Energy and Mines and Ministry of the Environment, the consultation procedures specified in the Regulations issued for this purpose.

Prior to executing plans and programs regarding hydrocarbon exploration and production, the regulated parties must inform the communities in the area of direct influence about the projects and hear their suggestions and opinions. A written record, in the form of a public document, will be made of any and all proceedings, arrangements, or agreements resulting from these informational meetings and will be forwarded to the Office of the Undersecretary of Environmental Protection.

Agreements will be drafted under the principles of compensation and indemnification for any environmental burdens and damage to property caused to the population by the implementation of the energy projects. The indemnification calculations will be performed using official schedules currently in effect.

When such spaces or zones are located within the National System of natural areas, the provisions of the management plan for said zone must be observed in accordance with the Act on Forests and the Conservation of Natural Areas and Wildlife and its Regulations, approved by the Ministry of the Environment.

CHAPTER II
ENVIRONMENTAL PROGRAM AND BUDGET

ART. 10. Annual environmental program and budget. In accordance with Art. 31, secs. (c), (k), (s), and (t) of the Hydrocarbons Act, the regulated parties must present by December 1 of every year, or by the deadline specified in each contract, to the Ministry of Energy and Mines the annual program of environmental activities based on the respective Environmental Management Plan and the environmental budget for the following year for purposes of their evaluation and approval based on the respective formal statement of the Office of the Undersecretary of Environmental Protection, as an integral part of the general program and budget for the contractual activities, which must include sections on operations, investments, and administrative expenses, items which, in turn, must be clearly identified in the consolidated budget of the aforementioned agencies.

ART. 11. Annual environmental report. The regulated parties will also submit to the Office of the Undersecretary of Environmental Protection, by January 31 of every year and in accordance with Form No. 5 in Annex 4 to these Regulations, an annual report on the environmental activities completed in the immediately preceding year, as part of the annual report on contractual activities. This report must describe and evaluate the budgeted environmental activities that have been conducted in relation to

those included in the aforementioned annual program of activities, notwithstanding the right of the Office of the Undersecretary of Environmental Protection to require specific reports at any time.

ART. 12. Internal environmental monitoring. The regulated parties must perform internal environmental monitoring of their atmospheric emissions, liquid and solid discharges, as well as the remediation of contaminated soil and/or pits.

For this purpose, the regulated parties must submit to the National Environmental Protection Office a statement of the monitoring points in accordance with Form Nos. 1 and 2 in Annex 4 to these Regulations.

The National Environmental Protection Office will approve the monitoring points or will order, based on the environmental condition of the area of operations, that said points be modified.

The analyses of said internal monitoring will be reported to the Office of the Undersecretary of Environmental Protection of the Ministry of Energy of Mines, through the National Environmental Protection Office, in compliance with the requirements specified in Form Nos. 3 and 4 in Annex 4 to these Regulations, in writing and electronically:

- On a monthly basis for the drilling period and for refineries based on the daily analyses of discharges and weekly analyses of emissions;

- On a quarterly basis for all other hydrocarbon phases, installations, and activities, except those referred to in the following point, based on the monthly analyses of discharges and quarterly analyses of emissions;

- On an annual basis for the phases, installations, and activities relating to the storage, transportation, marketing, and sale of hydrocarbons based on the semiannual analysis of discharges and emissions.

The frequency of the respective monitoring and reports may be modified once the Office of the Undersecretary of Environmental Protection so authorizes based on the relevant studies.

CHAPTER III
GENERAL PROVISIONS

ART. 13. Submittal of Environmental Studies. Prior to commencing any project, the regulated parties will submit the environmental studies relating to the corresponding operational phase to the Office of the Undersecretary of Environmental Protection (SPA) of the Ministry of Energy and Mines (MEM) for their analysis, evaluation, approval, and monitoring, in accordance with the definitions and methodological guides specified in Chapter IV of these Regulations and in compliance with the environmental regulatory framework relating to each contract for the exploration, production, marketing, and/or distribution of hydrocarbons. The environmental studies must be prepared by consultants or consulting firms that are duly qualified and entered in the respective register of the Office of the Undersecretary of Environmental Protection.

For purposes of performing the hydrocarbon activities, the regulated parties must submit to the Office of the Undersecretary of Environmental Protection (SPA), by way of the National Environmental Protection Office (DINAPA), the Environmental Diagnosis — Baseline or the respective update and expansion of same, along with the environmental impact studies and any relevant supplementary analyses.

In order to commence or continue with work programs in a new phase, the regulated parties will present the corresponding Environmental Study, which will not be processed unless the Environmental Study corresponding to the prior phase, if any, has been approved previously.

Within a period not to exceed thirty (30) days after receiving said studies, the SPA, through the National Environmental Protection Office, will issue the respective report. Within the first 15 days of said period, the Office of the Undersecretary of Environmental Protection will request any supplementary or explanatory documentation it requires.

ART. 14. Control and monitoring. Within the Decentralized Environmental Management System, the Office of the Undersecretary of Environmental Protection, through the National Environmental Protection Office, will be the body in charge of performing the control and monitoring of all phases of the hydrocarbon operations in terms of the environmental and socio-cultural components, and the application of the Environmental Management Plans approved for each phase, as well as the provisions of the present Regulations.

Any and all reports that the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines issues on these subjects in reference to any of the various phases of the hydrocarbon activities will constitute the technical basis for adjudicating violations in administrative or judicial proceedings in the event of non-compliance.

ART. 15. Liability of the contracting parties. The regulated parties will be liable to the Ecuadorian State and the Office of the Undersecretary of Environmental Protection (SPA) for all activities and operations conducted by their subcontractors. Therefore, the regulated parties will be directly and exclusively liable for applying the relevant preventive, control, and remediation measures, regardless of any joint liability on the part of the subcontractors.

ART. 16. Monitoring of remediation programs. The Office of the Undersecretary of Environmental Protection will coordinate with the companies' environmental units on the technical aspects of monitoring and controlling environmental remediation programs and projects that, prior to their implementation, must be submitted to the Office of the Undersecretary of Environmental Protection for their respective approval, regardless of any actions to be taken immediately following any incident.

The remediation programs and projects subject to approval and monitoring by the Office of the Undersecretary of Environmental Protection through the National Environmental Protection Office will include the remediation of contaminated pits and/or soil, as well as remediation after major accidents in which more than five (5) barrels of crude, fuel, or other product have spilled.

All remediation programs and projects must include the following information:

- Block number and/or name of the area; cartographic location.

- Trade name of the operating company; address or domicile, telephone number, fax number, e-mail address; legal representative.

- Diagnosis and description of the contamination based on physical-chemical and biological analyses of the soil, surface and ground waters, including an accurate determination of the affected surface area, an impact assessment, and the volumes of soil to be treated.

- Description of the type(s) of remediation technology to be utilized.

- Analyses of technological alternatives.

- Subsequent use of the remediated site and remediation techniques.

- Schedule for the remediation work.

- Physical-chemical and biological monitoring of the remediation, including a schedule.

- Time frame for implementing the project.

Within 15 days of completing the remediation, the operating company in charge will present, by way of the National Environmental Protection Office, a report (including a technical evaluation of the project) to the Office of the Undersecretary of Environmental Protection.

ART. 17. Facilities for public employees. The regulated parties must provide employees of the Office of the Undersecretary of Environmental Protection and the National Environmental Protection Office with food, lodging, and transportation facilities at work sites.

ART. 18. Environmental Remediation Fund. Funds resulting from the marketing of weathered petroleum, i.e., hydrocarbons that are subject to processes of natural degradation and originate from pits, spills, and other recovery processes related to environmental remediation activities, which, once treated, is re-injected into a main pipeline, will make up the Environmental Remediation Fund, which will be distributed as provided by Ministerial Resolution No. 081, published in Official Gazette No. 199 of November 21, 1997, the purpose of which will be to cover the costs of the environmental remediation activities in the hydrocarbon sector, expenses related to oversight, control, and physical-chemical laboratory analyses performed or ordered by the Office of the Undersecretary of Environmental Protection, as well as its institutional strenghtening.

ART. 19. Opening roads in protected areas. In zones pertaining to the National System of natural areas, the opening of roads for exploratory activities is prohibited. In the case of development and production operations, if, for legitimate technical and/or economic reasons, other operating conditions are required, such conditions will be submitted for the consideration of the Office of the Undersecretary of Environmental Protection, which will coordinate the respective formal statement of the Ministry of the Environment. In any case, access from highways and roads to protected areas will be restricted and controlled under the responsibility of the appropriate authority in coordination with the operator.

ART. 20. Management of socio-environmental issues. In all phases of the hydrocarbon activities they conduct and in the operations areas, the regulated parties must have professional personnel who are trained to handle socio-environmental issues.

For this purpose, the regulated parties must have environmental protection units or departments that are suitably integrated into the [regulated parties'] corporate structures.

ART. 21. Prohibited activities. In accordance with the Act on Forests and the Conservation of Natural Areas and Wildlife, hunting and fishing, collecting flora and fauna species, keeping animals in captivity, and introducing exotic species and pets are prohibited.

ART. 22. Noise limits. The permitted limits for noise emissions are subject to the provisions of Table No. 1 in Annex 1 to these Regulations.

ART. 23. Quality of equipment and materials. Equipment and materials that are consistent with technologies accepted in the petroleum industry and compatible with protecting the environment will be used in all phases and operations relating to the hydrocarbon activities; the use of obsolete technology and equipment is prohibited.

A comparative assessment of the environmental compatibility of the proposed technologies will be made in the respective Environmental impact study.

ART. 24. Handling of chemical products and replacement of conventional chemicals. The following must be observed for purposes of handling and storing chemical products:

a) Instructing and training personnel in handling chemical products, their potential environmental effects, and the corresponding safety signs, in accordance with industrial safety rules;

b) Sites for storing chemical products will be located in non-floodable areas and will comply with the specific storage requirements of each product class;

c) For purposes of transporting, storing, and handling hazardous chemical products, the respective rules in force in Ecuador must be observed, and the material safety data sheets to be supplied by the manufacturer for each product must be used properly;

d) In all hydrocarbon activities, natural and/or biodegradable products will be used, including the following: household and industrial degreasers, cleaners, detergents, and deodorizers, digesters of toxic waste and hydrocarbons from spills; paraffin inhibitors, insecticides, manures and fertilizers, unless duly substantiated technical and/or economic reasons warrant otherwise; and,

e) In all hydrocarbon operations and related activities, strategies will be applied to reduce the use of chemical products in terms of amounts in general and hazardous products in particular, which will be identified in detail in the Environmental Management Plan.

ART. 25. Handling and storage of crude and/or fuels. The following must be observed for purposes of handling and storing fuels and petroleum:

a) Instructing and training the personnel of operators, subcontractors, concessionaires, and distributors in handling fuels, their potential environmental effects and risks, and the corresponding safety signs, in accordance with industrial safety rules, as well as regarding compliance with the industrial safety rules of the **Petroecuador** system that are in force concerning the handling of fuels;

b) The construction of tanks, groups of tanks or containers for crude and its derivatives, as well as for fuels, will be regulated by the following standards: API 650, API 12F, API 12D, UL 58, UL 1746, UL 142 or the equivalent, where applicable. Such tanks and containers must be kept hermetically sealed at ground level and be insulated with an impermeable material in order to prevent leaks and contamination of the environment and must be surrounded by a containment dike technically designed for this purpose and having a volume greater than or equal to 110% of the largest tank;

c) Tanks or containers for fuels must comply with all technical and industrial safety specifications of the **Petroecuador System** in order to prevent excessive evaporation, contamination, explosion, or spillage of fuel. Said tanks and containers must comply primarily with the code NFPA-30 or its equivalent;

d) All mechanical equipment, such as storage tanks, product pipe, electric and stationary internal combustion engines, as well as compressors, pumps, and other electrical connections, must be grounded;

e) Storage tanks for petroleum and its derivatives must be protected against corrosion in order to prevent damage that can cause leaks of petroleum or derivatives that contaminate the environment;

f) Fuel storage sites must be located in non-floodable areas. Fuel storage tanks will be installed in accordance with the industrial safety conditions established by regulation in terms of capacity and minimum distances from rural communities, schools, health centers, and other community or public places;

g) Sites intended for storing volumes of fuel and/or lubricants in excess of 700 gallons must have drains equipped with oil traps. On offshore rigs, fuel tanks must be protected by pallets that enable the collection of spilled fuel and their proper treatment and disposal; and,

h) The transportation of fuels by helicopter is subject to the safety standards of the International Civil Aviation Organization (ICAO).

ART. 26. Industrial safety and hygiene. The regulated parties are responsible for complying with national rules on industrial safety and hygiene, the technical standards of the Ecuadorian Standards Institute (INEN), their internal regulations, and other rules in force regarding environmental management, industrial safety and hygiene, and occupational health, the non-observance of which could adversely affect the environment and the safety and health of the workers who perform services, whether directly or through subcontractors, in the hydrocarbon activities provided for in these Regulations.

The regulated parties are responsible for complying in full with all the aforementioned rules and standards, even if the activities are carried out through contractual relationships with third parties.

Every industrial installation must have professional personnel trained in industrial safety and occupational health, as well as programs for training all of the company's employees in accordance with the functions they perform.

ART. 27. Operation and maintenance of equipment and installations. The regulated parties must have equipment and materials to control spills and extinguish fires and have both preventive and corrective maintenance programs, as specified in the Environmental Management Plan. This maintenance must be documented and reported annually in summary form through the National Environmental Protection Office to the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines.

During operation and maintenance, the necessary equipment and materials, as well as trained personnel specified in the Contingency Plan of the Environmental Management Plan, must be available to respond immediately to any contingency, and the respective training and drills must be carried out periodically.

ART. 28. Waste management in general:

a) **Waste reduction at the source.** All **Environmental Management Plan**s must specifically incorporate the policies and practices for reduction at the source of each of the categories of waste described in Table No. 8 in Annex 2 to these Regulations;

b) **Classification.** The wastes appearing in Table No. 8 in Annex 2 to these Regulations will be classified, treated, recycled, or reused and disposed of in accordance with environmental rules and the Environmental Management Plan;

c) **Disposal.** The uncontrolled disposal of any type of waste is prohibited. Waste disposal sites, such as sanitary landfills and final disposal pits, must be equipped with a suitable system of channels to control leachates, as well as treatment and monitoring of same prior to their discharge; and,

d) **Logs and documentation.** In all hydrocarbon installations and activities, logs must be kept concerning the classification of wastes, volumes, and/or quantities generated, and the manner of treatment and/or disposal for each class of waste in accordance with Table No. 8 in Annex 2 to these Regulations. A summary of said documentation will be presented in the annual environmental report.

ART. 29. Handling and treatment of liquid discharges. All installations, including distribution centers, whether new or remodeled, as well as offshore platforms, must be equipped with a suitable separate drainage system such that a specific treatment is carried out separately for rainwater and runoff, gray water and black water, and residual effluents in order to ensure their proper disposal. All such installations must be equipped with strategically located oil-water separators or API separators and collection pits to contain and treat any spill, as well as to treat contaminated water emitted from washing, lubrication, and oil-change services, and to prevent contamination of the environment. On offshore

platforms, the deck drainage system must have valves on every floor that enable the control of potential spills on the platform deck and prevent such spills from being discharged into the environment. The drainage channels and separators must be maintained regularly.

a) **Liquid industrial waste, produced water, liquid discharges, and formation water.** Every production station and all other industrial installations must be equipped with a system to treat fluids resulting from their processes.

Formation water will not be discharged into bodies of water unless it complies with the permitted limits indicated in Table No. 4 in Annex 2 to these Regulations;

b) **Disposal.** All liquid effluents that are generated by the various operational phases and must be discharged into the environment must comply with the permitted limits specified in Table No. 4 in Annex 2 to these Regulations prior to their discharge.

Liquid waste, produced water, and formation water must be treated and may be injected and disposed of, as specified in sec. c) of the present Article, provided that the company has on hand the receiving formation study approved by the National Hydrocarbons Office of the Ministry of Energy and Mines in coordination with the Office of the Undersecretary of Environmental Protection of the same Ministry.

If the aforementioned liquids are disposed of in a manner other than into bodies of water or via injection, then the Environmental Management Plan must specify the methods, alternatives, and techniques that will be used for their disposal, indicating the technical and environmental reasons warranting their use; the parameters to be observed will be those approved in the Environmental Management Plan;

c) **Re-injection of water and liquid waste.** Any company intending to dispose of liquid waste via injection into a porous formation that does not customarily produce petroleum, gas, or geothermic resources must have on hand the study approved by the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines identifying the receiving formation and technically demonstrating:

c.1) that the receiving formation is separated from freshwater formations by impermeable layers that will provide suitable protection for these formations;

c.2) that the use of such formation will not jeopardize layers of freshwater in the area;

c.3) that the formations to be used for disposal do not contain freshwater; and,

c.4) that the selected formation is not a source of freshwater used for human consumption or irrigation, i.e., that it contains total dissolved solids in excess of 5,000 ppm.

The aforementioned study must be incorporated into the respective Environmental Management Plan;

d) **Handling of liquid waste offshore or in transitional areas.** Every platform located offshore or in transitional areas must have suitable tankage to contain fluids originating from drilling and/or production in order to eliminate their toxic components and contaminants prior to their discharge, for purposes of which the limits specified in Table No. 4 in Annex 2 to these Regulations must be observed.

In offshore operations, the discharge of oil-based drilling muds is prohibited. Such muds must be treated and disposed of onshore. On offshore platforms, closed circuits will be installed for purposes of treating all liquid waste; and,

e) **Black and gray water.** All sewage (black water) and gray water produced at the installations and during all phases of the hydrocarbon operations must be treated prior to being discharged into bodies of water, in accordance with the parameters and limits specified in Table No. 5 in Annex 2 to these Regulations.

Where such discharges of black water are deemed useful for supplementing the treatment processes of residual industrial water, a technical specification of their application will be made in the Environmental Management Plan. The parameters and permitted limits to be observed in these cases for discharges will be those specified in Table No. 4 in Annex 2 to these Regulations.

The parameters and permitted limits specified in Table No. 10 in Annex 2 to these Regulations will be applied in cases in which the routine monitoring specified in the present Regulations indicates anomalies in the discharges in order to analyze the information in depth prior to taking corrective action, or where the Office of the Undersecretary of Environmental Protection so requires, as well as every six (6) months for a thorough characterization of the effluents.

For purposes of characterizing surface water in Environmental Diagnosis — Baseline studies, the parameters specified in Table No. 9 will be applied. The results of said analyses will be reported in the respective Environmental Study together with the UTM and geographic coordinates of each sampling point, including an interpretation of the data.

ART. 30. Handling and treatment of atmospheric emissions:

a) **Atmospheric emissions.** The regulated parties must control and monitor atmospheric emissions produced by combustion systems in ovens, cauldrons, generators, and waste gas flares, based on the frequency, the parameters, and the maximum reference values specified in Table No. 3 in Annex 2 to these Regulations. Reports on internal environmental monitoring will be presented to the National Environmental Protection Office in accordance with Form No. 4 in Annex 4 to these Regulations and in accordance with the schedule specified in Art. 12;

b) **Monitoring of tanks and containers.** Storage tanks and containers, as well as pumps, compressors, transfer lines, and other equipment must be inspected periodically, and all necessary measures must be taken to minimize emissions. The Environmental Management Plan and the industrial safety and maintenance measures must take into account the mechanisms in place for inspecting and monitoring gas leaks in said installations. Once per year, the ambient air in the proximity of the aforementioned installations must be monitored, and the results must be reported in the annual environmental report; and,

c) **Fixed combustion sources.** Equipment considered to be fixed combustion sources in the hydrocarbon operations will be operated such that emissions are controlled and minimized, which must be monitored based on the frequencies, parameters, and maximum reference values specified in Table No. 3 in Annex to these Regulations.

ART. 31. Handling and treatment of solid waste. Rigs and installations must be kept free of solid waste. No waste, soil, or vegetable matter of any kind may be deposited in bodies of water or natural drainages. In the Environmental Management Plan, the operators will present the system of classification, treatment, recycling, and/or reuse of their solid waste, as well as the technologies [to be used] for its final disposal, including agreements with municipalities, specialized companies, or other operators of garbage dumps or sanitary landfills, where applicable:

a) **Inorganic waste.** Non-biodegradable waste generated by the [hydrocarbon] activities must be classified and evacuated from the operations areas for their treatment, recycling, and/or disposal, or buried in appropriately lined pits, as described specifically in the Environmental Management Plan;

b) **Organic waste.** Biodegradable waste will be processed using environmentally acceptable technologies as approved in the respective Environmental Management Plan;

c) **Sanitary landfills.** Leachates originating from sanitary landfills must be controlled by means of suitable channel systems that enable their treatment prior to discharge. For purposes hereof, leachates must comply with the parameters and limits specified in Table Nos. 4 and 5 in Annex No. 2 to these Regulations; and,

d) **Incineration.** For the incineration of solid waste, the Environmental Management Plan must contain the list and principal characteristics of the waste, the methods and technical characteristics of the incinerator and the process, as well as the treatment and final disposal of the waste. Atmospheric emissions from said process must be controlled and monitored in order to comply with the parameters and maximum reference values indicated in Table No. 3 in Annex No. 3 to these Regulations.

ART. 32. Laboratory waste. All laboratories in the hydrocarbon industry, both for the control of production processes and for environmental control, must have in place a plan for waste management and for applying suitable strategies for reducing the quantity of said waste:

a) **Control of gaseous emissions.** Gaseous emissions from the laboratories must be controlled by means of suitable systems; and,

b) **Classification and treatment of laboratory waste.** Laboratory waste must be classified, recycled, and/or treated for their controlled disposal.

CHAPTER IV
ENVIRONMENTAL STUDIES

ART. 33. Definition. For the purposes specified in these Regulations, environmental studies consist of a predictive estimate or a present identification of environmental damage or alterations, for purposes of establishing the preventive measures, mitigation activities, and measures for remediating environmental impacts caused by the probable or actual implementation of a project in any of the hydrocarbon phases. These studies constitute technical tools that, as a whole, maintain a systematic unit that, for practical purposes, is divided in reference to the various phases of the hydrocarbon activity, and they are classified as follows:

a) Environmental impact study, including the Environmental Diagnosis — Baseline;

b) Environmental Audit; and,

c) Special Investigation.

Environmental Studies constitute public documents.

ART. 34. Characteristics. Environmental Studies will be required prior to the development of each phase of the hydrocarbon activity, in accordance with the criteria indicated in these Regulations. In the case of contracts on hydrocarbon exploration and production, the environmental regulatory framework of each contract will be taken into account.

As a whole, the environmental studies of a given project constitute a systematic unit undergoing development in accordance with the requirements of the various phases of the hydrocarbon activity and the specific conditions of the areas in which each of these activities [sic] is conducted.

The Environmental Diagnosis — Baseline of the environmental impact study will include the essential information regarding the biophysical, socio-economic, and cultural characteristics of the awarded area,

as well as of the land or territory classified for a route for oil, multi-purpose, and gas pipelines and distribution centers. This diagnosis constitutes a unit that, once approved, forms the general framework in which the various factors required for the progress of the project in its various phases, areas of influence, and conditions are worked on and analyzed further.

Provided that the scope and characteristics of the project so require, and that the integrity of the study to be presented is maintained, environmental studies may be submitted in stages within the same phase, and any environmental studies submitted previously may be supplemented by way of complementary studies or supplements or addenda to same, in order to expedite the relevant analysis, evaluation, approval, and monitoring procedures.

For new operations in an area covered by an Environmental Study, a reevaluation must be performed once two (2) years have passed since said study was approved. Said reevaluation will consist of a review of the original document, inspections and updating studies in the field, as well as a reevaluation of the significance of the socio-environmental impacts, and an update of the Environmental Management Plan, which must be approved by the Office of the Undersecretary of Environmental Protection before the new operations are initiated.

For purposes of performing the environmental studies, technology and procedures accepted in the petroleum industry and compatible with protecting the environment must be used. The environmental studies will be carried out in accordance with the guides specified in the following articles of this Chapter.

ART. 35. Approvals. The environmental studies will be submitted together with two (2) copies to the Office of the Undersecretary of Environmental Protection and electronically in order to optimize access to the information.

The Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines will approve the environmental studies for each specific project within each phase and in accordance with the manner in which they are submitted. Under no circumstance will any Environmental Study be approved on a provisional basis.

ART. 36. Environmental studies for protected zones. Any regulated parties that will conduct hydrocarbon operations in areas pertaining to the National System of Protective Natural Areas, Forests, and Vegetation must submit the environmental studies to the Office of the Undersecretary of Environmental Protection together with a copy to be forwarded to the Ministry of the Environment. The Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines will approve the studies, provided that it has received a [favorable] formal statement from the Ministry of the Environment in advance. However, if no such formal statement has been received within ten (10) days after said studies were submitted, then the formal statement will be deemed favorable.

ART. 37. Public presentation. Prior to delivering the environmental studies to the Office of the Undersecretary of Environmental Protection for evaluation and approval, the regulated parties will make a public presentation of the environmental impact studies for the respective project in conjunction with representatives of the operator, the environmental consulting firm, and the population of the area directly influenced, under the coordination of the Office of the Undersecretary of Environmental Protection, which will also act as a conduit for attendees' comments and observations.

ART. 38. Qualification and registration of consultants. Hydrocarbon environmental consultants who perform environmental studies must be qualified and registered with the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines in advance pursuant to Ministerial Resolution No. 137 of August 5, 1998 (Instructions for qualifying environmental consultants in the hydrocarbon area) or any resolution issued in lieu of same. Said consultants must comply with all requirements established in Ecuador for this type of activity.

ART. 39. Qualification of laboratories. The physical-chemical and biological analyses for the environmental studies, and the monitoring and control of parameters considered in the present

Regulations must be conducted by laboratories qualified in advance by the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines in accordance with the regulations established for this purpose.

ART. 40. Terms of reference. Prior to conducting any type of Environmental Study, the regulated parties must submit to the Office of the Undersecretary of Environmental Protection the specific terms of reference, based on the methodological guide referred to in Art. 41 of these Regulations, for their respective analysis and approval within a period of fifteen (15) days.

Where hydrocarbon operations are to be conducted in areas pertaining to the National System of Protective Natural Areas, Forests, and Vegetation, the regulated parties must submit an additional copy of the terms of reference. The Office of the Undersecretary of Environmental Protection will forward this copy to the Ministry of the Environment, which will then have a period of seven (7) days in which to issue a formal statement to the Office of the Undersecretary of Environmental Protection. Said Office will, in turn, approve the terms of reference within a period of five (5) days. The absence of a formal statement from either of the aforementioned two (2) ministries will mean that said statement is favorable.

Once the approval has been obtained or the respective period has expired, the environmental studies will be conducted, taking into account any observations that have been made.

ART. 41. Methodological guide. In preparation for the environmental impact studies, the following methodological criteria and general content guide will be utilized in accordance with the characteristics of each project and the operational phase in question:

1. <u>Technical Data Sheet</u>

This section presents, in summary form, the primary information identifying the study:

- Block number and/or project number and name of the area.
- Cartographic location.
- Operational phase.
- Surface area.
- Trade name of the operating company.
- Address or domicile, telephone, fax, and e-mail address.
- Legal representative.
- Name of the environmental company in charge of conducting the study and [registration] number in the register of hydrocarbon environmental consultants of the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines.
- Makeup of the technical team previously qualified by the Office of the Undersecretary of Environmental Protection.
- Deadline for conducting the study.

2. <u>Introduction</u>

This section will explain the conceptual framework for the study and describe the overall content and the various parts of same, as well as said framework's relationship to the environmental studies conducted for any prior phases.

3. Environmental Diagnosis — Baseline

3.1 Methodological criteria. The foregoing components of the Baseline must be applied in order to describe and characterize the area. This information will serve as a parameter for identifying sensitive areas and defining the environmental monitoring plan. The Baseline is of a general nature, and once established, it is unique for all operational phases, regardless of whether it is expanded upon and updated at the beginning of a new phase, if necessary. The components of the baseline must be applied and further developed in accordance with the conditions of each operational phase and in view of the characteristics of the area in which the operations are to be carried out, as provided in the present Regulations, such that they enable a better understanding of the ecosystems and their operation, which could be affected by the activities to be conducted.

The socio-economic and cultural component should not only describe the aforementioned aspects but should also analyze the local social organization, its dynamics, and, in particular, the manner in which the natural resources [of the area] are used.

3.2 Detailed analysis.

The baseline will include a detailed evaluation of the current status of the following environmental components:

3.2.1 Physical environment: geology, geomorphology, hydrology, climatology, soil types and uses, water quality, and natural landscape.

3.2.2 Biotic environment: identification of terrestrial ecosystems, vegetation cover, flora and fauna, and aquatic or marine ecosystems, if any. Identification of sensitive zones, unique, rare, or threatened species of flora and fauna, and potential threats to the ecosystem.

3.2.3 Socio-economic and cultural aspects of the population inhabiting the area of influence: The following aspects will be identified:

3.2.3.1 Demographic aspects.- Composition by age and sex, growth rate of the population, density, migration, and characteristics of the economically active population (EAP).

3.2.3.2 Living conditions:- Food and nutrition: food supply and nutritional problems.

Health: factors affecting birth, infant, general, and maternal mortality; morbidity rate; existing health services; traditional medicinal practices.

Education: literacy rate, level of instruction, schools, teachers, and students in the last year of school.

Housing: number and types of houses, predominant materials, basic utilities.

3.2.3.3 Stratification (socio-economic groups), organization (forms of association, forms of relationship, and leadership), and social participation, as well as characterization of values and customs.

3.2.3.4 Physical infrastructure: Transportation network, basic services (education, health, and environmental sanitation).

3.2.3.5 Service stations: Types of industrial, educational, and socio-cultural activities in the vicinity; population density in the surrounding area; current and projected traffic volumes.

3.2.3.6 Productive activities: Land ownership and use, production, number and size of productive units, employment, and connections to the market.

3.2.3.7 Tourism: Places of interest because of their scenic value, natural resources, or historical and cultural value.

3.2.3.8 Archeology: Study of archeological remains and conservation with the participation of the National Institute of Cultural Heritage (INPC) in those cases specified by law.

4. Description of the project activities

The technical operation and any activities that could have environmental effects in each operational phase of the project must be described. The following general aspects must be included:

- Executive summary of the project.
- Legal and environmental frameworks of reference.
- Geographic and political-administrative location.
- Definition of the area of influence.
- Characteristics of the project according to the corresponding phase of the hydrocarbon activity: roads/paths, means of transportation, techniques to be used, necessary equipment and machinery, number of workers, electricity and water requirements, medical care, and education, among others.
- Types of materials and wastes: types of waste treatment, among others.

Depending on the type of operation or phase, the [following] additional detailed information appearing in the chapters corresponding to the phases must be included:

- Geophysical prospecting (Art. 48).
- Exploratory and outpost drilling (Art. 51).
- Development and production (Art. 55).
- Industrialization (Art. 63).
- Storage and transportation of petroleum and its derivatives (Art. 70).
- Marketing and sale of petroleum derivatives (Art. 75).

5. Determination of the area of influence and sensitive areas

The information in the foregoing sections must make it possible to identify the areas to be impacted and, within those areas, the sensitive zones, in which specific measures must be taken or certain activities must be avoided in accordance with the operational phase in question.

6. Identification and evaluation of impacts

Any and all actions in the hydrocarbon project that will cause impacts on the various environmental, socio-economic, and cultural factors will be identified according to the phase in question and determine the quality of the impact (direct/indirect, positive/negative, etc.), the time at which the impact is produced, its duration (temporary/permanent), its location and area of influence, its magnitude, etc.

An attempt must be made to demonstrate the manner in which the various components of the situation characterized by the Baseline may be modified by the activities to be conducted.

The identification of the environmental impacts and the socio-economic and cultural impacts must be presented by way of matrices that make it possible to identify and evaluate them clearly, based on all the parameters studied in the Environmental Diagnosis — Baseline.

Indirect impacts must be avoided insofar as possible or transformed into positive impacts depending on the characteristics of the given situation. Unsatisfied needs that existed prior to the project and were not caused by the same must be distinguished [from other needs].

In the affected zones, the Baseline must include an analysis of prior impacts caused by other activities.

The selection of assessment and evaluation techniques will be at the discretion of the party conducting the study. However, steps must be taken to ensure that these techniques:

- Analyze the prior environmental situation (Baseline) compared to the environmental changes resulting from the hydrocarbon activities conducted.

- Forecast the direct and indirect impacts and risks that could be generated on the physical, biotic, socio-economic, and cultural components of the environment.

- Identify and justify the methodologies used, based on the following:

    a) The nature of the hydrocarbon activity to be carried out; and,

    b) The affected environmental components.

7. Environmental Management Plan

Once the environmental impacts resulting from the hydrocarbon activities have been identified, analyzed, and quantified, the following aspects must be considered for purposes of preparing the Environmental Management Plan:

Analyzing actions that are feasible for those activities that, based on the findings of the qualitative impact evaluation, entail an undesirable impact.

Identifying institutional responsibilities to address needs that are not the direct responsibility of the company and designing the appropriate means of coordination.

Describing the processes, technologies, design and operation, and any others [sic] taken into consideration, in order to reduce any negative environmental impacts.

Based on these considerations, the environmental impact study will propose the plans detailed below, together with their respective programs, budgets, and schedules.

- Impact prevention and mitigation plan: Refers to actions aimed at minimizing the negative impacts on the environment in the various phases of the hydrocarbon operations.

- Contingency plan: Comprises the breakdown of the actions, as well as the lists and quantities of equipment, materials, and personnel for purposes of handling potential accidents and emergencies in the infrastructure or the handling of materials, in the various phases of the hydrocarbon operations, based on an analysis of risks and the behavior of spills. The plan will include the definition and assignment of responsibilities for the implementation of its various phases (flow chart and organization chart), the operational cooperation strategies, and an annual training and drill program.

- Training plan: Comprises a training program regarding the information in the Environmental Management Plan and its application to all of the company's employees in accordance with the functions they perform.

- Occupational health and industrial safety plan: Comprises the rules established by the company internally in order to maintain the health and safety of its employees, including strategies for disseminating these rules.

- Waste management plan: Comprises the specific measures and strategies to be applied in the project in order to prevent, treat, recycle/reuse and dispose of the [company's] various solid, liquid, and gaseous wastes.

- Community relations plan: Comprises a program of activities to be developed with the community or communities directly involved in the project, the relevant authority, and the operating company. The plan will include measures for disseminating the environmental impact study, the primary information and communication strategies, potential indemnification plans, compensation projects, and mitigation of socio-environmental impacts, as well as a participatory environmental education program for the community. These arrangements should make it possible to reduce negative effects and optimize the positive actions.

- Remediation Plan for Affected Areas: Comprises the measures, strategies, and technologies to be applied in the project in order to remediate the affect areas (reestablish the vegetation cover, guarantee the stability and duration of the work, remediate contaminated soils, etc.).

- Plan for the abandonment and surrender of the area: Comprises the design of the activities to be carried out once the operation has been completed, with a view to abandoning and surrendering the project area covered by the respective Environmental Study.

8. Monitoring Plan

The environmental impact study will define the systems for tracking, evaluating, and monitoring the environment and community relations that are aimed at suitably controlling the impacts identified in the environmental impact study and fulfilling the Environmental Management Plan, as well as the corrective actions proposed in same. Reports relating to the monitoring plan must be presented every year as part of the annual report on environmental activities, notwithstanding the provisions of Art. 12 of these Regulations.

9. Annexes

a) Basic and thematic cartographic information [must be provided] in digital and analog format, together with geographic and UTM coordinates, in files compatible with those of the Office of the Undersecretary of Environmental Protection, including the respective databases, at the following scales corresponding to the phases of the hydrocarbon activities:

- Geophysical prospecting: 1:50,000.

- Exploratory drilling: 1:10,000.

- Development and production: 1:25,000.

- Industrialization: 1:10,000.

- Storage: 1:10,000.

- Transportation and distribution marketing: 1:25,000.

- Service stations and other marketing establishments in urban areas: 1:100 up to 1:10,000; for rural areas and where the corresponding digital information does not exist, cartographic plans from the Military Geographical Institute (IGM) may be submitted in written form.

All geographical information must be documented by indicating the source(s) and dates of the information.

The graphic presentation will be made in accordance with the format established in Diagram 1 in Annex 1 to these Regulations.

Thematic maps must include, among other information, the following:

- National System of Natural Areas.

- Use of soils and sensitive areas.

- Communities and ethnic groups.

- Federations;

b) Satellite information and/or color vertical aerial photograph[s];

c) Dated photographic or videographic record of the most significant aspects;

d) Texts considered supplementary to the baseline;

e) Executive summary: Comprises a synthesis or summary that facilitates a thorough understanding of the results obtained in the study and contains the most relevant information, critical problems, description of the negative and positive impacts, primary environmental management measures and strategies, and sources of information used. This document must be submitted separately from the principal report;

f) Bibliography and sources consulted; and,

g) Complete list of the technicians and professionals who participated in conducting the study, signed by each of them.

ART. 42. Environmental audit. The Office of the Undersecretary of Environmental Protection, through the National Environmental Protection Office, will audit, at least every other year, or whenever the

Undersecretary of Environmental Protection so orders upon detecting non-compliance with the Environmental Management Plan, the environmental aspects of the various hydrocarbon activities conducted by the regulated parties.

The Office of the Undersecretary of Environmental Protection, through the National Environmental Protection Office (DINAPA), will determine the type and scope of the environmental audit for the operations of the regulated parties based on compliance with the Environmental Management Plan.

At least every other year, the regulated parties will conduct an environmental audit of their activities upon approval of the corresponding terms of reference by the Office of the Undersecretary of Environmental Protection, and they will submit the respective audit report to the Office of the Undersecretary of Environmental Protection.

Furthermore, upon terminating the hydrocarbon exploration and production agreement, or in the event of a change of operator, the parties will conduct the audit referred to in Art. 11 of the Regulations to Article 44 Amending the Hydrocarbons Act.

For purposes of the aforementioned audits, the regulated parties will select an environmental auditing firm qualified by the Office of the Undersecretary of Environmental Protection to carry out the monitoring and verification of compliance with the Environmental Management Plan, in accordance with the terms of reference previously approved by the Office of the Undersecretary of Environmental Protection and defining the range of documents against which the audit will be conducted.

ART. 43. Content. The environmental audit will consist of:

a) General information.

The principal elements identifying the study will be presented in summary form:

- Name of the area.
- Location.
- Operational phase.
- Surface.
- Name or trade name of the petroleum company.
- Address or domicile, telephone number, fax number, and e-mail address.
- Legal representative.
- Technical representative or consultant.
- Name of the environmental consulting firm in charge of conducting the environmental audit.
- Number in the Register of Hydrocarbon Environmental Consultants of the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines.

- Makeup of the technical team qualified in advance by the Office of the Undersecretary of Environmental Protection.

- Deadline for conducting the environmental audit;

b) Objectives.

The primary objectives of the environmental audit are as follows:

To determine whether the hydrocarbon activities comply with the operational environmental requirements in force, including an evaluation of the technology utilized.

To identify the risks and impacts that the hydrocarbon activities represent for the natural environment, the local community, and the personnel involved in the operation.

To verify compliance with the Environmental Management Plan and the environmental monitoring plan, as well as with the environmental legislation in force;

c) Procedures used.

The environmental audit will focus on the petroleum company's current operating conditions, take into account the local conditions and the physical process characterizing every operation, and refer primarily to the following:

Operational aspects:

- Existing conditions.

- Review of equipment.

- General review of the operation.

- Review of specific areas.

- Review and evaluation of logs and documentation in accordance with the approved Terms of Reference.

- Review of compliance with rules.

- Review of compliance with the environmental management and monitoring plans.

The audit will also identify:

- The specific source of the impact.

- The causes of the impact.

- Recommendations for correcting prior errors.

The environmental audit will include a verification of compliance with the limits established in these Regulations for the soil, water, and air components by means of samples and laboratory analyses, as well as an evaluation of the company's self-monitoring;

d) Conclusions and recommendations.

Immediately after the environmental audit, the auditing firm will prepare a report summarizing the environmental condition of the hydrocarbon activities and stating its recommendations for complying with the environmental management objectives;

e) Annexes.

Texts considered complementary to the Environmental Audit will be submitted as annexes; and

f) Executive summary.

Comprises a synthesis or summary that facilitates a thorough understanding of the results obtained in the Environmental Audit and contains the most relevant information, the achievements made, the critical problems, and the principal corrective measures.

This document must be submitted separately from the general report.

ART. 44. Special Environmental Inspection. This Inspection will be conducted in case of emergency at the discretion of the Office of the Undersecretary of Environmental Protection or at the request of the regulated parties and will consist of:

1. Objectives.
2. Scope.
3. Procedures.
4. Inspection record.
5. Technical report.

ART. 45. Inspection Record. In special inspections, once the field verification inspection has been completed, the respective record will be prepared, which must be signed by the technician(s) from the National Environmental Protection Office (DINAPA) and the environmental representative(s) of the company or any delegate(s) with whom the proceeding has been conducted. The inspection record will include:

1) Place, date, time, delegates, and parties present.

2) Purpose.

3) Explanations and provisions.

4) Signatures of the delegates.

ART. 46. Technical Report. Within a period of fifteen (15) days after the audit or special inspection has been completed, the Office of the Undersecretary of Environmental Protection will deliver the technical report to the audited or inspected organization and will state its conclusions and recommendations as well as relevant corrective measures and deadlines, if applicable.

CHAPTER V

GEOPHYSICAL PROSPECTING AND THE LIKE

ART. 47. General provisions. All general provisions established in Chapter IV of these Regulations must be observed where relevant.

ART. 48. Environmental studies. For geophysical prospecting activities, the Environmental Diagnosis — Baseline must cover the awarded area.

Apart from the provisions of Art. 41 of these Regulations, the following specific description of the project activities for this phase must be submitted:

Description of the project: Stages of the geophysical prospecting activity.

1) Survey of the area.

2) Information on obtaining permits, land negotiation, and payment of damages and indemnification.

3) Construction of heliports, location and analysis of alternatives, dimensions and layout of DZs.

4) Deployment of personnel and equipment.

5) Installation of temporary campsites, description of environmental measures for the construction and operation of same.

6) Location of seismic lines and analysis of alternatives for avoiding sensitive zones.

   6.1) Exploration project (maps).

   6.2) Location system (geodesic and topographical, GPS, GIS).

   6.3) System for marking out boundaries.

   6.4) Opening of trails.

7) System and techniques for boreholes, explosive and non-explosive techniques.

8) Plugging of wells.

9) Analysis of alternatives.

ART. 49. Operational rules. The companies must comply with the following rules:

a) **Heliports and shot points.** Heliports and shot points will not be established in critical zones such as animal breeding and/or feeding grounds, salting places, and archeological sites. In the National System of Protective Natural Areas, Forests, and Vegetation, heliports will be constructed in accordance with the graphic guide, Diagram No. 2 in Annex 1 to these Regulations;

b) **Temporary constructions.** When opening trails and installing outpost campsites, heliports, and shot points, only the [amount of] vegetation strictly necessary will be removed.

Latrines constructed at outpost camp sites must maintain a minimum distance of 20 meters from the nearest body of water.

In the zones pertaining to the National System of Protective Natural Areas, Forests, and Vegetation, all the aforementioned temporary constructions will be made without using wood from the area except wood removed previously for purposes of adapting the area. All other materials to be used must be reusable and resistant to the local climate conditions;

c) **Laying of lines.** The clearance of trails for laying seismic lines will be exclusively by hand, and no tree with a diameter at chest height (DCH) of more than 20 cm will be felled. The standard width of such trails will be 1.20 m, and the maximum width will be 1.50 m. All wood and vegetable material resulting from the clearance and cleaning of the ground will be technically processed and reintegrated into the topsoil using technologies currently available, particularly in sites susceptible to erosion. Under no circumstance will cut vegetation be deposited into natural drainages;

d) **Aerial cargo transport.** Helicopters to be utilized must be capable of minimizing the environmental impact. For aerial cargo transport, the “longline” technique must be used in accordance with the safety standards of the International Civil Aviation Organization (ICAO).

If, for legitimate reasons, other operating conditions are required, such conditions will be submitted for the consideration of the Office of the Undersecretary of Environmental Protection;

e) **Erosion control.** The following steps must be taken in order to control erosion:

e.1) Remove any obstruction to the natural flow of bodies of water when said obstruction has been caused by seismic operations or exploration-related activities.

e.2) Provide for a revegetation program using species native to the area for any affected areas in which the topsoil has been removed in accordance with the Environmental Management Plan;

f) **Crossing bodies of water.** If a seismic line is to cross the same body of water more than once, the minimum distance between the crossings must be two (2) km, except in cases of meandering river beds and in other cases approved by the Office of the Undersecretary of Environmental Protection;

g) **Compensation.** Where land owned by individuals or legal entities is adversely affected, the necessary compensation must be paid in accordance with the Hydrocarbons Act and taking as a reference the existing official schedules;

h) **Explosives handling.** The following must be taken into account for purposes of handling explosives:

h.1) The minimum distances established for shot points in Table No. 2 in Annex 1 to these Regulations.

h.2) In rivers, lakes, and lagoons, explosives will not be used; instead, the air-gun system or an equivalent method may be used.

h.3) Shot points must be refilled and compacted with soil in order to prevent the formation of craters or damage to the environment.

h.4) Charges at shot points must not be detonated at distances of less than 15 m from surface water bodies.

h.5) Protective blankets must be used whenever explosives are detonated in the vicinity of populated areas.

h.6) At least twenty-four (24) hours in advance, the neighboring populations must be informed of the hazard posed by the explosive materials and of the occurrence and duration of the explosions.

h.7) The contracting and contractor companies are responsible for ensuring that their workers are qualified and in good health. Furthermore, these companies will provide each worker with the personal protection equipment specified in the industrial safety rules in force, including the following: gloves, helmet, noise protectors, and safety boots;

i) **For abandonment:**

i.1) Any organic layer removed from heliports and camp sites must be redistributed on the soil prior to abandoning the areas.

i.2) The area of land in which the topsoil has been removed during the operations, including those intended for heliports and camp sites, will be revegetated and/or reforested with species native to the zone.

i.3) The company that conducts the geophysical prospecting and the company that contracts for this work will be liable for any damage caused to the environment and for implementing the [necessary] preventive, control, and remediation measures.

CHAPTER VI
EXPLORATORY AND OUTPOST DRILLING

ART. 50. General Provisions. All of the general provisions specified in Chapter IV of these Regulations must be observed where relevant.

ART. 51. Environmental Studies. The environmental studies of the area of influence, including an update or expansion of the Environmental Diagnosis — Baseline, must be submitted for the exploratory and outpost wells; all other drilling will be covered by the environmental studies prepared for the development and production phase. Apart from satisfying the provisions of Art. 41 of these Regulations, the following specific description of the project activities for this phase must be submitted:

Project description:

1) Exploratory and outpost drilling program.

2) Plan for use of the surface in affected and/or non-affected areas:

2.1) Location of drilling sites.

2.2) Activities prior to drilling.

2.3) Identification of sources of materials and treatment and disposal of waste.

2.4) Means of access.

2.5) Installation of pads, heliports, and camp sites.

2.6) Characteristics and assembly of equipment and drilling techniques.

2.7) Water collection.

2.8) Treatment and disposal of drilling fluids and cuttings.

2.9) Operating and exploratory drilling activities.

2.10) General list of chemical products to be used.

3) Analysis of alternatives

ART. 52. Operating rules. The following rules must be observed at all times for purposes of exploratory drilling:

a) **In the National System of Natural Areas.** The parameters for exploratory and outpost drilling in areas pertaining to the National System of Natural Areas are as follows: Prohibition on opening roads; useful area for pad, heliport, and camp: less than 1.5 ha;

b) **In other zones.** For exploratory and outpost drilling in unprotected areas of the national territory, the useful pad, heliport, and camp area must not exceed 1.5 ha. Where more useful area is required, the technical and economic supporting documents must be submitted as part of the Environmental Study, which must also specify the total area to be cleared, which will depend on the topography of the drilling site;

c) **Offshore.** In offshore drilling, a system for processing cuttings, closed systems for treating effluents, and a system for treating black and gray water must be in place. The characteristics of the effluents must comply with the permitted limits specified in Table Nos. 4 and 5 in Annex 2 to these Regulations;

d) **Supplementary rules.** To supplement the provisions of the Environmental Study, exploratory and outpost drilling will be performed in accordance with the following operational regulations:

d.1 **Drilling site.**

1.1 At the drilling site, the three (3) spaces of useful area (pad, camp, and heliport) will not have a fixed assignment; they will be located in accordance with the topography of the land, surrounded by vegetation, with suitable space in between them. In offshore operations, the drilling equipment to be utilized must be specified.

1.2 For exploratory drilling, the operations will, as a matter of preference, be conducted in a helitransportable manner, for purposes of which a helicopter approach area will be cleared in accordance with the regulations of the ICAO.

The opening of roads up to five (5) m in width with a surface layer will be authorized whenever such is technically and economically justified.

If the well proves to be dry, the petroleum company agrees to remediate the drilling site and to remove the access road under the coordination of the respective provincial or cantonal authorities, upon approval by the community residing in the sector. Where situations arise that

are beyond the control of the petroleum company, they will be reported to the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines.

1.3 Drilling pads in the actual operating area will be leveled off, compacted, and drained appropriately. In hilly areas, for purposes of the operations, several levels or partially leveled-off sites will be considered in order to minimize erosion.

1.4 Pads for offshore drilling or in transitional areas must not interfere with the normal course of fishing, tourism, sailing, and aerial navigation activities. Therefore, a safety area of one (1) nautical mile must be provided.

d.2 **Treatment and final disposal of drilling fluids and cuttings.**

2.1 Every onshore or offshore drilling site must have in place a system for treating and disposing of fluids and solids produced during the drilling.

2.2 During the drilling, and upon its conclusion, the liquid fluids that have been treated insofar as possible must be recycled and/or may be disposed of as provided for by Art. 29 of these Regulations. The physical-chemical monitoring of discharges into the environment will be performed on a daily basis and will be documented and reported to the Office of the Undersecretary of Environmental Protection by way of monthly reports.

2.3 During and after the drilling, the solid waste, treated decantation mud and drill cuttings may be disposed of once they have satisfied the parameters and limits specified in Table No. 7 in Annex 2 to these Regulations.

2.4 Underwater discharges will be made at a depth and distance that make it possible to control the variation in temperature as specified in Table No. 4 in Annex 2 to these Regulations, obtain a rapid initial dilution complemented with a satisfactory dispersion and assimilation by the receiving medium that minimizes the contaminants' return to the coastline. For purposes hereof, the Environmental Study will include the following:

a) Description of the technical specifications of the pipe and characteristics of the effluents to be discharged, including their temperature;

b) Studies concerning the physical-chemical, biological, and microbiological quality of the water and shallow-bottom sediment in the area of influence of the discharge;

c) Bathymetric study, as well as of marine and surface currents at the discharge site; and,

d) Features of the coastline: configuration and morphology.

2.5 Where mineral oil-based muds are used, their final disposal will be onshore in compliance with the permitted limits specified in Table No. 4 in Annex 2 to these Regulations; any decantation mud resulting from the treatment of fluids will be treated and disposed of in compliance with the permitted limits specified in Table No. 7 in Annex 2 to these Regulations.

2.6 If the results of the monitoring determine that discharges into the environment in offshore projects fail to comply with the permitted limits, all the fluids and cuttings will be treated and disposed of onshore.

d.3 **Completion of wells.** Where the completion of wells is carried out, the fluids used must be collected in tanks and treated such that they comply with the permitted limits for discharges indicated in Table No. 4 in Annex 2 to these Regulations.

d.4 **Production tests.** Where logistical and economic conditions do not permit the crude to be transported, the tests will be performed [in an] auxiliary settling tank, and where it is expected that crude will be found that is not susceptible to handling in tanks, oxygen-enriched incinerators will be used, and the emissions into the atmosphere must comply with the provisions of Table No. 3 in Annex 2 to these Regulations.

Tests of non-associated natural gas production will be conducted using the best technology available as specified in the Environmental Management Plan for this purpose. An atmospheric emissions monitoring program must also be in place in accordance with Table No. 3 in Annex 2 to these Regulations.

ART. 53. In case of abandonment. Where the area of influence is abandoned either temporarily or permanently, the following steps must be taken:

a) Locate and properly dispose of any equipment and structure at the work sites that are not necessary for future operations;

b) After being classified, all waste of a domestic or industrial origin will be treated and disposed of as specified in the Waste Management Plan of the Environmental Management Plan proposed by the operator and approved by the Office of the Undersecretary of Environmental Protection;

c) At the drilling site, the drainage systems must be readapted, and the area that is not to be reused must be reforested if the abandonment is temporary;

d) When a well is to be abandoned permanently, it must be sealed with cement plugs on the surface and at appropriate intervals in order to prevent leaks or migrations of fluids.

Where crude oil leaks occur as a result of work involving the improper plugging of the well, the company will assume all remediation costs and reparations associated with the well.

The locations of abandoned wells must be remediated environmentally;

e) In offshore drilling, where a well is to be abandoned permanently, the casing pipe must be sealed 1.5 m below the seabed and other installations that protrude from the seabed will be removed in order to prevent damage or obstacles to fishing, boating, or other activities; and

f) In offshore drilling or transitional areas, where a well is to be abandoned temporarily or permanently, a mechanical plug will be placed on the casing pipe, and the cap will be covered with an anticorrosive hood. The position of the well will be marked with a buoy and a suitable electronic device for detecting it.

CHAPTER VII
DEVELOPMENT AND PRODUCTION

ART. 54. General provisions. All of the general provisions specified in Chapter IV of these Regulations must be observed where relevant.

ART. 55. Environmental Studies. The environmental studies of the area of influence, including an update or expansion of the Environmental Diagnosis — Baseline, must be submitted for the activity of developing and producing hydrocarbons. Apart from satisfying the provisions of Art. 41 of these Regulations, the following specific description of the project activities for this phase must be submitted:

Project description

1) Location, conceptual design and development of the surface for production installations.

2) Conceptual design, layout, construction and adaptation of access roads.

3) Sources of materials, plan for utilizing materials, and waste treatment and disposal.

4) Layout and construction of flow lines and main lines.

5) Water collection and discharge.

6) Installation of camp sites.

7) Construction and assembly of equipment.

8) Production.

9) Development wells.

10) Supply of energy and utilities.

11) Analysis of alternatives.

ART. 56. Development drilling. The following provisions must be observed:

a) The same rules established for exploratory and outpost drilling will apply where relevant;

b) For cluster drilling, clearing is permitted for a useful area of up to 0.2 ha for each additional well. However, the petroleum companies must endeavor to optimize the use of the previously cleared area; and

c) Drilling fluids and/or cuttings may be treated and disposed of or injected as specified in Art. 29 of these Regulations.

ART. 57. Production installations. In the hydrocarbon activity, the petroleum companies must observe the following for purposes of carrying out the production operations:

a) **Additional useful area.** Where drilling rigs are converted into production rigs, the Environmental Management Plan must provide for a useful area in addition to that specified in Art. 56 in order to install production equipment such as the following: multiple generators, separators, and others.

Suitable fences will be built around the production installations in order to protect wildlife. The fencing must be designed such that it is covered by a curtain of vegetation. The area of this curtain will be in addition to that permitted for constructing the infrastructure and will not be included in the useful area;

b) **Retention area.** A waterproof dam (retention area) must be constructed around the wellhead for purposes of collecting oil residues issuing from the wellhead and thus prevent contamination of the drilling site;

c) **Natural drainage patterns.** Natural drainage patterns will be respected for purposes of constructing the production installations;

d) **Treatment, management, and disposal of coke.** Where the elimination of coke at production stations that handle heavy crude is technically and economically feasible, an environmentally suitable system must be utilized for treating, handling, and disposing of same;

e) **Wells for injection.** For purposes of the injection and disposal of liquid waste, wells that are no longer economically productive or that have been abandoned will be worked over and, where strictly necessary and environmentally justifiable, additional wells will be drilled [for this purpose];

f) **Handling atmospheric emissions.** As a matter of priority, gas must be considered for reinjection and enhanced recovery. Gas not used in this manner must be used in a manner that ensures a rational utilization of the resource after the respective technical and economic analysis [has been conducted], preferably for the generation of electrical energy, for purposes of which the relevant environmental studies will be submitted to the appropriate authority;

f.1) If technological and economic conditions do not permit full utilization at certain installations, then any residual associated natural gas and producer gas may be flared using waste gas flares, upon authorization in accordance with the Hydrocarbons Act, and in accordance with the maximum reference values specified in Table No. 3 of Annex 2 to these Regulations;

f.2) The waste gas flares will provide temperature and oxygenation conditions adequate to achieve the thorough combustion of the gases.

The location, height, and direction of the waste gas flares must be designed such that the emission of heat and gases affects the natural environment (soil, vegetation, and avian fauna) as little as possible.

Atmospheric emissions will be monitored periodically at every gas flaring site as specified in Table No. 3 in Annex 2 to these Regulations.

If the operator fails to comply with the parameters specified in these Regulations, it will have a period of thirty (30) days in which to make the necessary corrections.

In the respective Environmental Management Plan, the regulated parties must identify the technical or technological alternatives they will use for flaring the gas and reducing and controlling emissions; and

f.3) In any case, associated natural gas and producer gas resulting from the production of petroleum will be subject to special handling to be determined on a case-by-case basis by the operator and the National Hydrocarbons Office (DNH) as specified in the Hydrocarbons Act.

ART. 58. Production tests:

a) In production tests, tanks that are compatible with protecting the environment will be situated in accordance with the relevant technical standards accepted in the hydrocarbon industry;

b) The fluid from the production tests must be transferred or pumped to a production station where it will be treated, and the crude will be incorporated into production. The transfer must be carried out subject to the safety and environmental protection rules in force. Under no circumstance may such fluids be disposed of in pits;

c) Where hydraulic pumping is used in production tests, the produced fluid and the power fluid employed must be transported to the nearest production station for purposes of being treated, and the crude will be incorporated in to production; and

d) For offshore production tests, systems that recover and treat contaminant fluids will be used.

ART. 59. Treatment and closing of pits. Where pits contain weathered crude or have been poorly managed, the regulated parties must see to their cleaning, the recovery of the crude, and the treatment, plugging, and/or revegetation of each of same with species native to the zone, based on the remediation

program or project to be submitted by the company, as specified in Art. 16 of these Regulations, for approval by the Office of the Undersecretary of Environmental Protection.

The plugging [of the pits] must be carried out in accordance with the following provisions.

a) Pits containing crude and/or water:

a.1) The crude will be recovered for subsequent use.

a.2) Any residual crude not incorporated into production will be treated in accordance with its composition and physical-chemical characteristics. If, after a treatment, a stable bituminous mix is achieved that is free of leachates that affect the environment, the crude may be used on roads upon approval by the Office of the Undersecretary of Environmental Protection based on the respective analyses. Under no circumstance may such crude be utilized without being treated.

a.3) Any crude that could not be recovered will be treated in the pit itself or off site in accordance with the approved remediation program or project, and bioremediation technologies that use microorganisms endemic to the site undergoing remediation will be given preference. The use of genetically modified microorganisms is prohibited.

a.4) Residual water will be treated and disposed of once the permitted limits specified in Table No. 4 in Annex 2 to these Regulations have been observed.

a.5) Once the crude and/or the water have been evacuated, the soil at the bottom and the walls of the pits will be treated as specified in point a.3) of the present Article until it complies with the parameters and limits specified in Table No. 6 in Annex to these Regulations, and the site will be remediated.

If the pit is not closed but it is to be used by the community or the owner upon the express request of same and under the responsibility of same, the quality of the water and the characteristics of the sediments will be analyzed prior to delivery. In this case, the quality of the water must be assessed based on the planned use; for purposes of fish farming, the assessment may be made based on the parameters and reference values appearing in Table No. 11 in Annex 3 to these Regulations.

a.6) Solid waste and other materials found in the pit to be treated will be classified and stored temporarily in sites prepared with geomembrane and equipped with a system for collecting and controlling leachates and runoff. Inorganic solid waste will be removed from the site for purposes of treating, recycling, and/or disposing of same. Organic solid waste may be treated on site using environmentally accepted technologies and in accordance with the aforementioned remediation program or project.

a.7) The controlled incineration of solid waste originating from the pit to be treated will be carried out in oxygen-enriched incinerators that guarantee thorough combustion upon authorization by the Office of the Undersecretary of Environmental Protection and the associated atmospheric emissions will be controlled in accordance with the maximum reference values specified in Table No. 3 in Annex 2 to these Regulations. The open and uncontrolled incineration of said waste is prohibited;

b) Dry pits: Dry pits that do not contain water but do contain crude or drilling muds at the bottom will be remediated as specified in points a.3), a.5), a.6), and a.7) of the present Article until they comply with the limits specified in Table Nos. 6 and 7 in Annex 2 to these Regulations; and

c) Revegetation: Any pits that have been closed will be revegetated with species native to the area. The operator will be responsible for the monitoring and results of the revegetation.

ART. 60. Workover of wells. The operators will have the necessary installations in place for storing, treating, and disposing of the workover fluids for purposes of complying with the provisions of Art. 29 of these Regulations.

ART. 61. Enhanced recovery. Prior to initiating an enhanced recovery project, the origin and source of the water or fluid to be injected must be specified, along with its short, medium, and long-term supply capacity, and the environmental and social effects of this type of project. As a matter of preference, treated water from the production processes will be used instead of water from natural sources and natural gas produced in the area.

CHAPTER VIII
INDUSTRIALIZATION

ART. 62. General provisions. All general provisions established in Chapter IV of these Regulations must be observed where relevant.

ART. 63. Environmental studies. The environmental studies of the area of influence, including the Environmental Diagnosis — Baseline or an update or expansion of same, must be submitted for the design, construction, and operation of the hydrocarbon industrialization infrastructure (gas plant, refineries, petrochemical plants, oil and lubricant production plants, and plants for the treatment and/or recycling of used oils, etc.). Apart from satisfying the provisions of Art. 41 of these Regulations, the following specific description of the project activities for this phase must be submitted:

Project Description:

1) Presentation of the industrialization plan.

2) Basic design of the new or modernized units.

3) Description of the process units

    3.1) Non-catalytic units.

    3.2) Catalytic units.

    3.3) Other industrialization areas.

    3.4) Storage and transfer areas.

    3.5) Auxiliary service area.

4) Material and overall thermal balance.

5) Existing and additional laboratory equipment.

6) Existing tank and storage areas.

7) New tankage and storage areas.

8) Generation of waste in industrial plants:

    8.1) Generation of waste per generating source.

    8.2) Evaluation of the existing system for handling solid, liquid, and gaseous waste.

8.3) Existing and proposed studies for handling solid, liquid, and gaseous waste.

9) Collection and discharge of water.

10) Effluent treatment system.

11) Analysis of alternatives for expansions and/or new installations:

11.1) Review of location proposals.

11.2) Review of the Environmental Diagnosis for the industrial plants.

11.3) Preliminary field work.

11.4) Evaluation of alternatives.

11.4.1) Ecological, socio-economic, and cultural characteristics.

11.4.2) Environmental risks.

11.4.3) Recovery measures and expenses.

12) Conclusions.

ART. 64. Infrastructure and Environmental Impacts. The design, construction, and operation of the hydrocarbon industrialization infrastructure will be carried out in view of the geoseismic stability of the site, its physical security, and the potential impacts that may occur in the environment of the operating area, the area of direct influence, and its socio-cultural characteristics.

Under no circumstances will hydrocarbon industrialization infrastructure be permitted in areas pertaining to the National System of Protective Natural Areas, Forests, and Vegetation.

ART. 65. Industrialization installations. Industrialization installations must comply with the following:

a) For purposes of handling and storing fuels, crude oil, and its derivatives, the provisions of Art. 25 of these Regulations must be observed; and

b) In offshore operations, extracted gas will be dehydrated, and the formation water will be discharged into the environment or injected as specified in Art. 29 of these Regulations.

ART. 66. Handling and treatment of discharges, emissions, and waste. Every industrialization installation must have in place closed systems for treating effluents, controlling atmospheric emissions, and solid waste resulting from the various processes, which must comply with the provisions of Arts. 28, 29, 30, 31, and 32 of these Regulations. The use of clean technologies will be given priority. Furthermore, the following provisions must be observed:

a) **Handling of atmospheric emissions.**

a.1) Gas produced in the treatment of crude and production of its derivatives must be handled suitably in the plant itself for purposes of optimizing its rational use for the energy needs of the plant.

The remainder may be flared upon authorization in accordance with the Hydrocarbons Act and under technical conditions that ensure that the atmospheric emissions produced through combustion comply with the provisions of Table No. 3 in Annex 2 to these Regulations.

a.2) Every plant for the treatment of crude and production of its derivatives must have in place suitable systems for treating acid gases and sulfur compounds that guarantee the transformation and/or reduction of noxious sulfur compounds;

b) **Handling of solid waste.** The special, domestic, and industrial wastes indicated in Table No. 8 in Annex 2 to these Regulations will be treated and handled in accordance with the following provisions:

b.1) The selection of the optimum method for treating and handling the solid waste will be made in view of the following parameters and based on Table No. 8 in Annex 2 to these Regulations:

- Type of waste.

- Danger of the waste.

- Cost/benefit.

- Environmental impact.

- Volume of the waste.

b.2) For domestic solid waste, the treatment and disposal will be applied using the best technology available for purposes of optimizing the benefit from the product obtained.

b.3) For industrial waste, the industrial installation must have a treatment plant that takes acceptable environmental technical specifications into account for purposes of reducing the volume and concentration of the contaminants contained in the waste.

b.4) The disposal site must not be located in the vicinity of residential areas, swamp areas, sensitive wildlife habitats, drainage channels, areas subject to temporary floods, or areas close to bodies of water.

b.5) Special (hazardous) solid waste will be classified, treated, and disposed of, as the case may be, using the most suitable alternative appearing in Table No. 8 of these Regulations; and,

c) Personnel must be instructed regarding the handling, transportation, storage, treatment, and disposal of waste generated in the industry.

ART. 67. Production of fuels. The following provisions must be observed in the production of fuels:

a) Companies that participate in the field of hydrocarbon industrialization will satisfy the respective INEN standards regarding the quality of gasoline and diesel, specifically in terms of octane rating and cetane rating, content of aromatics, benzene, and sulfur, as well as other contaminants;

b) The regulated parties are prohibited from producing and importing gas containing lead;

c) Any and all imported gasolines will be subject to the respective INEN standards; and

d) Fuel quality: gasoline (octane rating) and diesel 2 (cetane rating) may be enhanced by incorporating additives in the refinery and/or terminals upon authorization of the National Hydrocarbons Office and the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines.

The operating company must submit to the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines the safety data sheet including the composition of the additives to be used. The installation of refinement technologies that improve the quality of

the gasoline, such as isomerization plants, alkylation, and the use of oxygenated additives up to the equivalent of 2.7% O_2 will be promoted. The production and use of oxygenated additives, such as anhydrous ethanol, from renewable raw materials will be given preference and promoted.

ART. 68. Safety distances:

a) **Safety zone.** The industrialization infrastructure must be surrounded by a safety zone, whose boundary will be set based on a risk analysis in the respective Environmental Study. For purposes hereof, a treed or revegetated safety zone using species native to the region will be given preference. The Office of the Undersecretary of Environmental Protection, through the National Environmental Protection Office (DINAPA), will control and monitor the observance of this safety zone; and

b) **Distance from rural communities.** The new industrialization infrastructures must be constructed at sites located at least ten (10) km away from rural communities and other public and/or communal places.

CHAPTER IX
STORAGE AND TRANSPORTATION OF HYDROCARBONS AND THEIR DERIVATIVES

ART. 69. General provisions. All general provisions established in Chapter IV of these Regulations must be observed where relevant.

ART. 70. Environmental studies. The environmental studies of the area of influence, including an update or expansion of the Environmental Diagnosis — Baseline, must be submitted for the construction of pipelines (principal and secondary petroleum pipelines, gas pipelines, and multi-purpose pipelines, as well as pumping stations) and installations for the storage of petroleum and its derivatives. Apart from satisfying the provisions of Art. 41 of these Regulations, the following specific description of the project activities for this phase must be submitted:

Project Description:

1) Location, conceptual design, layout, construction, rights of way, and preparation of the surface for the construction of pipelines, storage stations and terminals, and other installations for storing and transporting petroleum and/or its derivatives and the like.

2) Sources of materials, as well as waste treatment and disposal.

3) Layout and construction of flow lines and main lines.

4) Construction and assembly of equipment.

4.1) Infrastructure, storage, transportation, and marketing.

5) Water collection and discharge.

6) Analysis of alternatives.

ART. 71. Storage tanks. Apart from the provisions of Art. 25, the following provisions must be observed for tanks used for storing petroleum and its derivatives:

a) Vertical API tanks and underground UL tanks:

a.1) The area intended for vertical API tanks must be equipped with interior gutters and drains that enable easy drainage, the flow of which must be controlled using a valve located on the exterior

of the enclosure that permits the rapid evacuation of any rainwater or hydrocarbons spilled in an emergency and must be connected to a system of separator tanks.

a.2) Between every group of vertical API tanks, there must be a minimum space equal to one quarter (¼) of the sum of their diameters for purposes of maintaining proper safety.

a.3) The storage tanks must be equipped with a leak-detection system in order to prevent contamination of the subsoil. The storage tanks, dam construction, and containment dikes will be inspected periodically in order to prevent and control product leaks and contamination of the subsoil. For purposes hereof, API or equivalent standards must be observed.

a.4) Buried pipe must be properly protected in order to avoid corrosion and situated at least 0.5 m from sewer, electrical, and telephone lines.

a.5) Every tank must be equipped with a ventilation pipe that, as a matter of preference, will be placed in an open space in order to prevent the concentration or accumulation of vapor and contamination of the air;

b) Pressure vessels for LPG:

b.1) Spheres and horizontal tanks for storing liquefied petroleum gas (LPG) must be secure on foundations made of concrete and solid stonework that are capable of resisting the weight of the tank when it is full of water in order to ensure the stability and safety of the vessels and thus prevent any accident that might cause contamination to the environment.

b.2) All maintenance operations conducted on tanks for storing fuels and/or LPG spheres will be conducted under the restrictions of the safety rules of the **Petroecuador** system in order to prevent any spill or leak that might affect the environment;

c) Transportation of hydrocarbons and/or their derivatives offshore:

c.1) The transportation of hydrocarbons and/or their derivatives offshore, by means of tankers, will be carried out subject to the provisions of the Merchant Marine and Coastal Directorate, as the national maritime authority in charge of preventing and controlling the contamination of the coasts and national waters.

c.2) Semiannually, in the months of June and December, the Merchant Marine and Coastal Directorate will submit to the Office of the Undersecretary of Environmental Protection, through the National Environmental Protection Office, a report on the environmental measures applied in the transportation activities for purposes of the respective control and monitoring; and

d) General provisions for all types of installations:

d.1) Vegetated areas of industrial installations must be maintained periodically in order to control runoff and the resulting erosion.

d.2) An inspection and maintenance report concerning the storage tanks and the effectiveness of the Contingency Plan, including a log of trainings and drills conducted, together with an evaluation of same must be submitted to the Office of the Undersecretary of Environmental Protection on an annual basis.

ART. 72. Installation and re-utilization of tanks:

1. Installation. Tanks for storing flammable liquids and fuels to be buried, will comply with the following provisions:

a) A minimum gap of 50 cm, filled with sand that is inert to corrosion, must be supplied between the tank walls and lids and the excavation;

b) The excavation, in which a fill of at least 30 cm of inert sand must be deposited under the tank, must be sufficiently deep regardless of whether or not concrete elements are installed for purposes of anchoring the tank;

c) A minimum fill of 30 cm of inert sand must be supplied in between each tank whenever tanks are placed in the same excavation;

d) The installation depth of the tanks may vary depending on whether there is traffic above them, as follows:

In areas not subject to traffic, the depth must not be less than 90 cm.

In areas subject to regular traffic, the depth must not be less than 125 cm.

In both cases, the depth will be measured from the dome of the tank to the level of the finished floor, including the thickness of the slab of reinforced concrete on the floor itself;

e) Where the water table is situated close to the surface of the ground, the storage tanks must be secured using steel cables fastened to concrete anchors, which must be constructed along the entire length of the tank, thereby guaranteeing (based on the respective calculation) the stability of the installation (i.e., the non-flotation) of the storage tanks;

f) A buried tank must never be installed directly over rigid objects made of concrete or any other material;

g) Where a tank is lowered or otherwise moved inside the excavation, any impact between the tank and any other object must be avoided;

h) Where more than one storage tank is installed, sand that is inert to corrosion must be placed around each tank in order to prevent movement;

i) Where the ground-bearing capacity presents the characteristics of unstable soil, based on the soil mechanics study conducted in advance, the storage tanks must be protected from the direct pressure of the ground using suitable construction techniques that guarantee impermeability and resistance to attack from the hydrocarbons;

j) Both the excavation and other constructions in which the tanks are placed must be filled completely with inert gas once the tanks have been installed and tested in order not to leave any free space in which hydrocarbon could accumulate;

k) In accordance with the practices recommended by API 1615 or API 653 and API 2610 for service stations, devices must be installed to prevent contamination of the subsoil whenever a leak or spill of product from the storage tanks occurs; and

l) Devices that make it possible to immediately detect product leaks must be installed on all tanks (including both underground and above-ground tanks) in order to control contamination problems.

2. Re-utilization. For purposes of reusing tanks, their physical integrity must be verified, and the body and lid thickness and the condition of the weld beads and of the wear plates must be inspected in conformity with the manufacturing standards UL 58. The tanks must then be subjected to the hermeticity tests specified in the standards NFPA-30 and UL-58 or equivalent; the tanks must be cleaned of any prior covering and recovered with fiberglass or the like in order to form a double containment in accordance

with the standard UL-1746 or equivalent. All of the aforementioned verifications of physical integrity must be certified by an internationally or nationally renowned firm that specializes in technical inspections.

ART. 73. Construction of pipelines. The following provisions must be observed for purposes of constructing oil, gas, and multi-purpose pipelines:

1) Layout:

1.1) Prior to the construction and operation of [oil], multi-purpose, and gas pipelines, the characteristics of the ground that the pipeline will traverse, any bodies of water that will be crossed, the use of the land, and the relief of the ground must be considered in order to prevent and/or minimize impact on the environment and to ensure the integrity of said construction and operation.

1.2) Submarine pipelines will be constructed below the seabed in order to minimize the risk of damage and any resulting environmental contamination.

1.3) Insofar as possible, geologically unstable areas must be avoided for purposes of defining the route of the pipelines.

1.4) The layout and right-of-way of a pipeline and the access routes to installations and camp sites must be situated such that they minimize impacts to bodies of water in general.

1.5) When defining routes, land clearance should be kept to the minimum required, and specific places of ecological, archeological, and ethnic interest must not be adversely affected.

2) Land clearance:

2.1) The width of the clearance on the pipeline route must not exceed 10 m on average at grade level, which will depend on the topography and type of terrain to be traversed along the route. Where the clearance is adjacent to a road, its maximum width will be 6 m from the edge of the road bed, except where more than line is to be constructed (including energy-transmission or signal-transmission cables and fluid-transportation lines) and it is not technically feasible to bury them in the same trench.

2.2) Adverse effects must be minimized in primary forest zones and grounds that are dedicated to farming or are subject to intensive draining or irrigation. Where adverse effects are caused to communal or indigenous lands, or to the property of individuals or legal entities, the respective indemnification will be determined and paid as specified in the Hydrocarbons Act and using as a reference the existing official schedules.

2.3) The clearance of paths for laying out pipelines will be exclusively by hand; the maximum width for same will be 1.20 m. The material resulting from the clearance and cleaning of the ground will be properly reintegrated into the topsoil. Under no circumstance will cut vegetation be deposited into natural drainages.

2.4) During the clearance, areas having rare vegetation or threatened species must be avoided.

2.5) Insofar as possible, populated areas, sensitive environmental areas, such as salting places, lagoons, and temporarily flooded zones, as well as wetlands, animal breeding grounds, and archeological sites will be avoided.

2.6) In the National System of Natural Areas, oil pipelines will be laid without opening roads.

3) Hydrostatic tests:

3.1) During the tests, steps must be taken to ensure that the pipeline's volume of flow from surface sources does not interfere with uses downstream.

3.2) The pipe must be drained at a velocity not to exceed the intake velocity at the source. An energy dissipator must be installed to minimize erosion during discharge.

3.3) Prior to discharge, waters originating from the hydrostatic tests must comply with the limits specified in Table No. 4 in Annex 2 to these Regulations.

4) Restoration:

4.1) The operator must identify and restore the areas affected during the construction of the pipeline.

4.2) In the event of a contingency of any nature whatsoever, the operator must guarantee that, within a reasonable period of time, the right-of-way will be restored in order to mitigate the impact.

4.3) The Contingency Plan must be updated on an ongoing basis in order to prevent the runoff of mud and/or crude and its derivatives from reaching bodies of water in the event of a spill.

5) Construction:

5.1) The operator and/or contractor must train and instruct their personnel regarding environmental procedures, awareness and behavior of ecologically and culturally sensitive areas, and the use of environmental judgment not only for the construction, but also for the operation and/or maintenance of the lines, in order to prevent and/or minimize the impact [on the environment].

5.2) Suitable techniques must be used for clearing the land intended for the right-of-way in order to minimize the visual impact, and restoration measures must be adopted that facilitate the establishment of acceptable environmental conditions.

5.3) In populated areas and road crossings, the operator and/or contractor must post public information signs that include the name of the operating company, the depth at which the buried pipe is situated, and the telephone number of the appropriate agency to contact in case of emergency.

5.4) All waste generated in the construction must be treated and disposed of such that no adverse impact is caused on the environment and as specified in the Waste Management Plan proposed by the construction company in the EMP.

5.5) Tanks used for supplying fuel during the construction of the oil, multi-purpose, and gas pipelines must comply with all standards generally accepted in the petroleum industry in order to prevent spills or contingencies of any nature whatsoever.

5.6) Oil and multi-purpose pipelines must be buried except for the sections for which it is technically impossible, in which case the respective technical and economic supporting documents will be included in the Environmental Study.

5.7) Where pipelines cross rivers, the line must be buried under the riverbed where such is technically warranted.

5.8) If the pipelines cross population centers, shut-off valves will be installed at each end and at any point where such is warranted, in accordance with the Environmental Management Plan.

5.9) For purposes of exercising the right-of-way, the area must be kept free of waste and must be revegetated using techniques that enable easy access for maintaining the pipeline in case of emergency.

5.10) Pipelines in general must be equipped with suitable protection both externally and internally that serves to prevent spills caused by high pressure, high temperatures, corrosion, obsolescence, or other risk factors, in accordance with standards accepted in the petroleum industry.

5.11) All buried pipe must be protected at road crossings in accordance with API or equivalent standards.

5.12) Vibrations resulting from construction work and the operation of the installations associated with pipelines that transport hydrocarbons and/or their derivatives must be controlled such that they do not adversely affect the health of the workers and residents or the surrounding ecosystem.

5.13) Once the construction has been completed, all surface equipment and installations will be dismantled and removed, and the area must be remediated in accordance with the Environmental Management Plan.

6) Transportation on tank trucks and tankers

Vehicles and ships that transport liquid and gaseous fuels derived from petroleum must satisfy the following minimum requirements:

6.1) They must have the necessary equipment for controlling fires and/or any emergency.

6.2) Tanks, pipe, valves, and hoses must be maintained in good condition in order to prevent damage that might be caused by any type of contamination, both onshore and offshore.

6.3) Fuel transportation, both onshore and offshore, must be conducted subject to the respective laws and standards of industrial safety and environmental protection that are in force in Ecuador.

6.4) The companies responsible for this type of transportation must instruct and train their personnel concerning the respective industrial safety, conservation, and environmental protection measures in order to ensure that their personnel apply said measures when performing their work.

CHAPTER X
MARKETING AND SALE OF DOMESTICALLY PRODUCED AND IMPORTED PETROLEUM DERIVATIVES

ART. 74. General provisions. All general provisions established in Chapter IV of these Regulations must be observed where relevant.

ART. 75. Environmental studies. The environmental studies of the area of influence, including the Environmental Diagnosis — Baseline, must be submitted for the construction and remodeling of distribution centers, including service stations, national and international shipping depots, fishing depots, aviation depots, LPG bottling plants, and clean product storage terminals. The methodological guide specified in Art. 41 will be applied to the degree of detail warranted based on the scope and location of the project, in accordance with the approved terms of reference, and the following specific description of the project activities must be submitted for this phase:

Project Description:

1) Location, conceptual design, and development of the surface for the construction or remodeling of distribution centers, including service stations, national and international shipping depots, fishing depots, aviation depots, LPG bottling plants, and clean product storage terminals.

2) A diagnosis of potential contamination of soil and ground water (samples, analyses, exact location, etc.) for the remodeling of distribution centers.

3) Construction materials to be used.

4) Equipment installation and assembly.

4.1) Infrastructure and storage for marketing.

4.2) Evaluation of the system for managing solid, liquid, and gaseous waste.

5) Analysis of alternatives.

6) Inclusion of the following in annexes: document classifying the ground, issued by the National Hydrocarbons Office (DNH).

The Environmental Diagnosis — Baseline for the remodeling of distribution centers will include a characterization of the soil and ground water, and, where contamination of the environment has been detected, the Remediation Plan for Affected Areas (part of the Environmental Management Plan) will specify the remediation treatment and technology to be used for purposes of correcting the problems.

The requirement specified in Art. 37 of these Regulations will apply to environmental studies for new installations.

ART. 76. Tanks at Service Stations:

a) New installations.

Prior to granting permits for the construction and operation of distribution centers in accordance with the definitions in the foregoing article, the National Hydrocarbons Office must have received a favorable environmental technical report and the approval of the respective Environmental Study from the Office of the Undersecretary of Environmental Protection.

a.1) Tanks for storing combustible and flammable liquids must be horizontal, cylindrical, and atmospheric tanks, [designed] for underground installation, having a dual wall, and equipped with an interstitial leak monitoring system, manufactured under standards UL 58 and UL 1746.

Above-ground tanks must be manufactured under UL 142 and be equipped with a fire-retardant system that will continuously protect the tank from potential ignition for at least two (2) hours, or with an air-inertization system in order to prevent fire, or with an automatic fire-extinguishing system, or any other system that prevents the tank from the risk of fire.

a.2) The design, manufacture, and assembly will be performed in accordance with best practices in engineering and in strict compliance with the applicable codes and standards, both national and of the ASTM, API, ASME, NFPA, UL, ANSI, and EPA or equivalents.

a.3) Tanks must be cylindrical for horizontal installation, manufactured with sheets of carbon steel in accordance with the respective code, and covered on the exterior with fiberglass or the like, and they must come with a certificate of quality issued by the manufacturer.

a.4) All tanks must be hydrostatically tested on site using clean water in order to verify their hermeticity prior to use.

a.5) Valves must be appropriate for use with refined petroleum products at a working pressure corresponding to ANSI No. 150.

a.6) The venting lines will be 2 inches in diameter, and their discharge spouts must be at a height of not less than 4 m above floor level, and it [sic] will be equipped with a venting hood in order to prevent rainwater from entering the storage tanks.

a.7) On dispensers that operate with a submersible pump, an emergency valve must be installed that shuts off automatically if the dispenser is stricken or tipped over.

a.8) The drawing-off of flammable liquids from tank trucks or underground depots will be performed by means of hoses with tight-fitting connections that are not affected by such liquids and do not emit sparks upon friction or impact.

a.9) Factors relating to sanitary, industrial safety, and environmental protection installations will be in accordance with the municipal ordinances in force and other similar regulations of the Ministry of Energy and Mines.

a.10) The dimensions of the tank, interior diameter, and wall thickness must be determined based on its capacity and construction material in accordance with the laws and standards in force and with good engineering practices. The operator is responsible for guaranteeing the structure of the construction so as to prevent accidents that could adversely affect the environment.

The operating capacity of the tank must not be less than its nominal capacity nor greater than 110% of same.

The length of the tank must not exceed six (6) times its diameter.

b) Service stations undergoing remodeling.

b.1) Service stations undergoing remodeling will require a certificate, issued by companies qualified and/or duly authorized by the appropriate agency, of the current condition of the fuel storage tanks as specified in sec. 2 of Art. 72.

b.2) The remodeling of service stations will be completed under the same standards specified in point a) of the present Article and other applicable regulations.

ART. 77. Waste management. Apart from the provisions of Arts. 28, 29, 30, and 31 of these Regulations, the marketing of fuel, lubricants, and the like to the various sectors of consumption must comply with the following:

For distribution centers where not only fuel, but also lubricants, are sold, and lubrication, motor-oil change, and car-wash services are provided, in accordance with the Environmental Management Plan, said distribution centers must have equipment in place for the recirculation of water and the collection and recovery of hydrocarbons: fuel, grease, oil, etc. The installation of oil and grease traps at strategic points is mandatory. Such establishments must keep a monthly log of the volumes of fuel, grease, and oil recovered and of their final disposal.

ART. 78. Safety rules. Apart from the provisions of Arts. 26 and 27, the following safety provisions must be observed for purposes of marketing petroleum derivatives and the like:

a) Fuels must not be dispensed to public-service vehicles that are occupied by passengers or to any vehicle whose motor is running;

b) The loading and unloading of tankers will be performed such that it does not obstruct vehicular or pedestrian traffic because of the danger posed by this activity;

c) Smoking, lighting fires, and littering are prohibited at service stations, which must have the corresponding signs in place;

d) All delivery and ventilation pipes will be installed so as to be protected from waste and accidents. Wherever buried, the pipe must be at a minimum depth of 40 cm below the pavement at ground level and must be properly protected on the exterior against corrosion in order to prevent leaks or spills that might cause damage to the environment;

e) A ground will be installed next to the discharge spouts. The tank truck will be connected to this ground before the fuel is transferred in order to eliminate the transfer of static electricity;

f) The fuel dispensers must be located such that they enable easy access and rapid evacuation in case of emergency;

g) An ornamentation program must be implemented around the periphery of the installations by lining the periphery with forest or trees in order to provide the site with good quality air and scenery; and

h) All centers that sell lubricants, and all service stations, car washes and lubrication establishments, LPG bottling plants and distribution centers, and other distribution centers intended for the marketing of derivatives must comply with the following requirements:

h.1) All stations for storing hydrocarbons and/or derivatives must register a manufacturer-certified photocopy of the identification plate on the tanks with the National Environmental Protection Office (DINAPA). The identification plate on the tanks must show at least the following information: manufacturing company, manufacturing standard or rule, years of manufacture, capacity, and tank identification number.

h.2) At all service stations and gasoline stations, steps must be taken to ensure that the tanks comply with the required technical specifications and that, apart from safety, they guarantee a minimum risk of damage to the environment. Where fuel is sold in drums, cans, or other containers, such containers must be hermetic and observe the respective safety requirements.

ART. 79. Rules on handling. Companies that produce or market lubricant oils and greases and are domiciled in Ecuador must indicate on the product's container the technical rules and useful life of the product, the rules to be observed in handling same, and the minimum conditions to be satisfied for the environmentally clean final disposal of any waste produced in handling same.

Monitoring compliance with such rules by the distribution or service centers is the responsibility of the manufacturers or marketers that supply the lubricant oils and greases, which must report quarterly to the National Environmental Protection Office the volume of lubricant greases and oils sold, as well as the identification of the establishments or individuals or legal entities from which distribution or supply has been withdrawn because of non-compliance with the rules on handling and disposal.

ART. 80. Additives. Marketers of petroleum derivatives must inform the Office of the Undersecretary of Environmental Protection as to the chemical composition of any additives they intend to add to the fuels to be marketed.

ART. 81. Responsibility of the marketer. In all phases of their activities, manufacturers and/or marketers and their distributors, individuals, or legal entities associated with these activities must conduct same in compliance with the laws and regulations on environmental protection and international treaties ratified by Ecuador. To this end, and for purposes of monitoring compliance with their environmental obligations, any contractual framework they establish with PETROECUADOR and its distributors and/or wholesalers must include the respective clauses referring to environmental protection, and the manufacturers and/or marketers will be responsible for monitoring compliance with said environmental obligations. On an annual basis, the manufacturers and/or marketers will submit to the Office of the Undersecretary of Environmental Protection, through the National Environmental Protection Office, a

report concerning the environmental monitoring of their distributors and/or wholesalers and other activities conducted with respect to environmental protection issues.

In any case, the marketers must take measures to prevent any adverse effects on the environment. Furthermore, the marketers will be exclusively responsible for any non-compliance with these provisions on the part of their distributors, individuals, or legal entities associated with these activities.

ART. 82. Logs regarding lubricant oils and greases. All establishments, distribution centers, and service stations that sell lubricant greases or oils and provide lubrication services, such as oil changes and washing and greasing car motors, must keep a log of their suppliers, the quantities of greases and oils they handle, and the final disposal of their waste. This information must be reported quarterly to the National Environmental Protection Office.

CHAPTER XI
CIVIL ENGINEERING WORK

ART. 83. General provisions. All general provisions established in Chapter IV of these Regulations must be observed where relevant.

ART. 84. Environmental studies. For purposes of implementing civil engineering projects and construction agreements for wells and distribution centers, and for the construction and/or expansion of refineries, gas plants, storage terminals, gas bottling plants, service stations, and other installations pertaining to the hydrocarbon industry, the regulated parties must submit, for the analysis, evaluation, and approval of the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines, the environmental studies to be included in the corresponding phase.

ART. 85. Operational rules. The following provisions must be observed for purposes of implementing civil engineering work:

a) Construction of roads:

a.1) The clearance of land for opening paths will be exclusively by hand. All material resulting from the clearance and cleaning of the ground will be technically processed and reintegrated into the topsoil using technologies currently available in Ecuador. Under no circumstance will cut vegetation be deposited into natural drainages.

a.2) The total width of the clearance and clear-cutting must not exceed 20 m; where clearance of more than 20 m is warranted, the technical reasons for this will be presented to the Office of the Undersecretary of Environmental Protection.

a.3) All trees pertaining to the canopy and sub-canopy will be placed on the edges of the route for subsequent use. Any remaining vegetable material will be reintegrated into the topsoil.

Environmental studies for the layout of roads must identify, and provide for the conservation of, forest species having exceptional characteristics or dimensions or threatened, endemic, or rare species.

a.4) Excavation, cutting and filling.

a.4.1) The road must be laid out using slopes that minimize the environmental impact. Embankments must be treated and revegetated so as to prevent landslides and erosion.

a.4.2) The width of the road bed will not exceed 10 m, including gutters; the width of the lane will not exceed 5 m. Every 500 m, there will be an additional excess width of road not to exceed 5 m for

purposes of enabling the crossing of vehicles; where the topography of the terrain and traffic safety so warrant, the excess widths may be located at a shorter interval.

a.4.3) Material used for reinforcing the road area may be synthetic; however, sand and gravel will be used for the formation and compaction of the sub-base. Furthermore, material resulting from the clearance of the road may be used in work areas.

a.4.4) For the construction of minor structures, such as drains for water crossings and rainwater, lateral gutters along the entire length of the road, treatment of embankments, construction of intercepting ditches, and formation of terraces on high embankments, proper technical measures will be taken in order to ensure the suitable operation of the road and to guard against environmental conditions.

a.5) During the implementation of civil engineering work, including the construction of bridges, steps must be taken to minimize the effects of the construction on the environment by maintaining the stability and proper compaction of the roads in order to prevent the deterioration of the air quality from the emission of particulate matter.

a.6) Where possible, forest canopy bridges and structures that allow for the continuity of natural corridors will be kept in place.

a.7) Where the organic layer is removed, it must be stored, without compacting, for subsequent use in revegetation projects.

a.8) Vegetation removal must be kept to a minimum by preserving green areas where the topography is not altered. The replacement of vegetation must be provided for in the reforestation plan using species native to the area.

a.9) Where a sand or gravel mine is under the operator's control, a production plan must be developed as part of the Environmental Management Plan.

a.10) The survey of the route will be conducted based on the selection of the best technical, economic, and environmental alternative.

a.11) For purposes of maintaining the surface layer, crude by-products may be used, provided they are treated so as to form a stable bituminous mix and are compatible with protecting the environment, upon authorization of the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines.

In order to prevent contamination, the spreading of oil on road surfaces is prohibited.

b) Drains.

b.1) Drains having dimensions, resistances, capacities, and slopes appropriate for preventing adverse effects on the environment must be installed.

b.2) Maintenance of the drains, including cleaning sediment and vegetable matter that could cause back-ups, must be performed regularly.

b.3) Erosion must be controlled at drain inlets and outlets by constructing suitable structures.

b.4) Drains must be installed taking into account the flow, course, and natural slope in order to reduce erosion and the integration of sediment into bodies of water.

c) Gutters:

c.1) Gutters will be constructed using a slope that facilitates the circulation and evacuation of rainwater.

c.2) Gutters must be cleaned and maintained regularly to prevent their deterioration and control the free circulation of rainwater.

d) Embankments:

d.1) In areas where cuts are smaller, embankments will be constructed at a greater slope, and where cuts are larger, embankments will be constructed at a lesser slope, using terrace systems in order to prevent landslides and benefit subsequent revegetation.

d.2) Embankments must be stabilized in order to minimize the erosive action caused by the impact of rainwater on the matter. Where embankments are revegetated, the operator will be responsible for monitoring such revegetation.

d.3) Where technically advisable, intercepting ditches must be constructed and maintained in order to collect surface runoff and channel it to its final disposal and thereby prevent its circulation and evacuation via the surface of the embankment.

e) Signs.

Signs must be posted on all roads subject to the traffic laws in force in Ecuador and to other regulations adopted by each company.

f) Abandonment.

Once the need to use roads in projects in progress in the National System of Protective Natural Areas, Forests, and Vegetation and in swamps has ceased, bridges located at water body crossings must be removed and roads must be shut down. The area must be revegetated using species native to same. Control barriers must be maintained for an additional period of two (2) years, and signs prohibiting the use of the road must be posted, in accordance with the Environmental Management Plan approved by the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines.

Any extraordinary situations must be reported to the Office of the Undersecretary of Environmental Protection as specified in sec. d.1), No. 1.2 of Art. 52 of these Regulations.

g) Major river crossings.

The site selected for river crossings must avoid salting places and take into account the morphology of the river, making provision for the angle of the crossing in order to prevent the riverbed from narrowing because of the installation of columns or buttresses in the current.

h) Infrastructure of campsites.

h.1) The maximum area of deforestation, clean-up, and movement of earth must be planned based on the number of users and services.

h.2) Temporary campsites must be portable and modular in order to utilize the minimum space necessary; wood resulting from the clearance of the campsite area, and synthetic and reusable materials must be used. Existing infrastructure must be used to the extent possible in inhabited areas.

i) Service stations, gas bottling plants, and other centers for storing and distributing hydrocarbon derivatives:

i.1) During the establishment of service stations, gas bottling plants and other storage and distribution centers, provisions must be made for the construction and/or installation of perimeter gutters, grease and oil traps, closed systems for the recirculation and retention of water, and other infrastructure that minimizes environmental risks and damage.

i.2) Fuel tanks and the handling of same must comply with the provisions of Arts. 25, 72, and 76 of these Regulations.

CHAPTER XII
PERMITTED LIMITS

ART. 86. Parameters. For liquid discharges, atmospheric emissions, and the disposal of solid waste into the environment, the regulated parties and their operators and related parties in the implementation of their operations will comply with the permitted limits specified in Annexes Nos. 1, 2, and 3 to these Regulations, which constitute the minimum program for internal environmental monitoring. The aforementioned parties will report to the Office of the Undersecretary of Environmental Protection on the schedule specified in Art. 12 of these Regulations.

Where a permitted limit specified in the annexes is exceeded, this must be reported immediately to the Office of the Undersecretary of Environmental Protection, and verification of the corrective actions taken must be provided.

a) Annex 1: Technical parameters.

a.1) Table No. 1: Maximum permitted noise limits.

a.2) Table No. 2: Minimum permitted distances for explosive or non-explosive shot points.

b) Annex 2: Parameters, maximum reference values, and permitted limits for routine internal environmental monitoring and environmental control.

b.1) Table No. 3: Maximum reference values for atmospheric emissions.

b.2) Table No. 4: Permitted limits for water and liquid discharges in the exploration, production, industrialization, transportation, storage, and marketing of hydrocarbons and their derivatives.

4.a) Permitted limits at the effluent discharge point (liquid discharges).

4.b) Permitted limits at the control point in the receiving body (immission).

b.3) Table No. 5: Permitted limits for discharges of black water and gray water.

b.4) Table No. 6: Permitted limits for the identification and remediation of contaminated soils in all phases of the hydrocarbon industry, including service stations.

b.5) Table No. 7: Permitted limits of leachates for the final disposal of drilling muds and cuttings on the surface.

b.6) Table No. 8: Classification of waste from all phases of production, transportation, storage, industrialization, and marketing in the hydrocarbon industry.

c) Annex 3: Parameters, maximum reference values, and permitted limits for advanced environmental monitoring and control.

c.1) Parameters to be determined in the classification of surface water in Environmental Diagnosis — Baseline studies.

c.2) Additional parameters and permitted limits for water and liquid discharges in the exploration, production, industrialization, transportation, storage, and marketing of hydrocarbons and their derivatives.

c.3) Recommended parameters and reference values for water in remediated pits intended for fish farming.

ART. 87. Additional Parameters. For all other parameters not specified in these Regulations for ongoing environmental monitoring, the parameters and permitted limits specified in Tables Nos. 9 and 10 in Annex 3 to these Regulations will apply. A complete physical-chemical characterization of water, emissions, and soil will be required for:

a) The Environmental Diagnosis — Baseline of the Environmental Studies;

b) As part of the internal environmental monitoring, every six (6) months, except for the phases, installations, and activities pertaining to the storage, transportation, marketing, and transportation [sic] of hydrocarbons, for which the diagnosis must be performed every two (2) years; and

c) In all cases in which one or more parameters of the environmental monitoring specified in these Regulations fall outside the permitted limits or ranges.

In these cases, the results and all corrective actions taken will be reported immediately to the Office of the Undersecretary of Environmental Protection, in addition to the regular monitoring reports.

The Office of the Undersecretary of Environmental Protection, through the National Environmental Protection Office, may request samplings and analyses of additional parameters at any time it deems them necessary based on the environmental control and monitoring it performs of the hydrocarbon operations.

CHAPTER XIII
ENVIRONMENTAL OVERSIGHT AND MONITORING

ART. 88. Mechanisms for environmental oversight and monitoring. In order to ensure that the performance of the hydrocarbon activities does not adversely affect the ecological balance or the economic, social, and cultural organization of the populations, and rural and indigenous communities established in the areas directly influenced by such activities, the Office of the Undersecretary of Environmental Protection will define and coordinate mechanisms for citizens to participate in the oversight and monitoring of said activities.

ART. 89. Oversight and monitoring spaces for the community. In the environmental oversight and monitoring work that the National Environmental Protection Office conducts in the field with respect to the hydrocarbon operations, spaces will be provided for oversight by the citizens. Such oversight will be performed by community representatives who will contribute their observations and recommendations in surveys and at meetings. Their observations and recommendations will be evaluated and considered by the National Environmental Protection Office for purposes of the technical development of its oversight and monitoring.

CHAPTER XIV
PENALTIES AND COMPLAINTS

ART. 90. Fines and other penalties. Socio-environmental violations of the Hydrocarbons Act or of the Regulations that are committed by the regulated parties during the hydrocarbon activities and that the Undersecretary of Environmental Protection submits for the cognizance and decision of the National Hydrocarbons Director will be penalized by same in accordance with Art. 77 of the Hydrocarbons Act, depending on the severity of the violation, apart from any indemnification of damages or reparation of damage caused.

Apart from any penalties that may apply to them in accordance with these Regulations, subcontractors may be removed from the register of companies qualified to render work and services.

In order to apply penalties, the National Hydrocarbons Director only requires that the Undersecretary of Environmental Protection send him the corresponding written decision, together with a copy of the record of proceedings on which it is based. The National Hydrocarbons Director must issue the penalty within sixty (60) days of receiving said documentation if the regulated party in question fails to correct the violation within the period granted to it for this purpose.

Penalties imposed by the National Hydrocarbons Director may be appealed to the Minister of Energy and Mines.

The Office of the Undersecretary of Environmental Protection may temporarily suspend the respective activity until such time as the violation or omission has been corrected.

ART. 91. Complaints. Any act that violates the present Regulations may be reported to the Office of the Undersecretary of Environmental Protection by means of a "people's action" *(acción popular)*. Complaints filed with the Ministry of the Environment will be reported to the Office of the Undersecretary of Environmental Protection for subsequent processing.

Once a complaint has been filed, and, based on an evaluation of the documents supporting same, the Office of the Undersecretary of Environmental Protection of the Ministry of Energy and Mines, if it deems it necessary, will instruct the National Environmental Protection Office to conduct immediately a technical inspection of the place in which the reported facts took place or a special investigation in order to evaluate the environmental impact caused and, within a period of ten (10) days after that proceeding, issue the corresponding well-substantiated report, a copy of which must be forwarded to the complainant.

Within a period of fifteen (15) days after receiving notice of the complaint, the accused party will file any evidence of in its defense with the Office of the Undersecretary of Environmental Protection and may bring any legal action that may lie in the event of an unproven and unfounded complaint.

If the Office of the Undersecretary of Environmental Protection deems the complaint to be unfounded, it will order that the complaint be dismissed. Otherwise, the provisions of Art. 90 of these Regulations will be observed.

TRANSITIONAL PROVISIONS

FIRST. Environmental confirmation of hydrocarbon operations. Within the 360 days following the publication of the present Regulations in the Official Gazette, the regulated parties must submit, unless they have already done so, the environmental studies for all phases of the hydrocarbon activity. Otherwise, the Office of the Undersecretary of Environmental Protection will take action in accordance with Art. 90 of these Regulations.

Institutional planning must provide for sufficient environmental budgets for all items specified in these Regulations.

SECOND. Installations in operation. All pipes and installations for storage, as well as all distribution centers that are in operation without approved environmental studies and plans, must submit, within 180

days after the promulgation of these Regulations, the respective Environmental Management Plan based on an environmental diagnosis, as specified in Chapters IX and X of these Regulations.

Once said period has expired, the National Environmental Protection Office of the Ministry of Energy and Mines will inform the National Hydrocarbons Office of the situation so that the latter may take action to temporarily suspend any installations lacking the respective approved Environmental Management Plan.

THIRD. Qualified environmental laboratories. For as long as environmental laboratories qualified by the Office of the Undersecretary of Environmental Protection for the hydrocarbons sector do not exist, the interested parties may engage the services of those environmental laboratories that best satisfy the requirements of said Office.

FOURTH. Internal environmental monitoring. Within a period not to exceed ninety (90) days after the publication of the present Regulations in the Official Gazette, the regulated parties must submit to the National Environmental Protection Office of the Office of the Undersecretary of Environmental Protection a statement of the internal monitoring points for atmospheric emissions and liquid discharges for all their projects and installations in operation, in accordance with Art. 12 and Form Nos. 1 and 2 in Annex 4 to these Regulations, as well as the programs and projects for the monitoring and/or remediation of soils and pits, in accordance with Art. 16 of these Regulations, for their approval.

FIFTH. Cartographic information in electronic format. The format that is required and compatible with the files of the Office of the Undersecretary of Environmental Protection will be files having the extension *.apr. Files having the extension *.dgn or *.dgw may only be submitted for service stations in urban areas.

PETROECUADOR, its subsidiaries and contractors or partners must submit, upon the express request of the Office of the Undersecretary of Environmental Protection, the cartographic information available in electronic format from the last three (3) years prior to the publication of the present Regulations in the Official Gazette.

SIXTH. Procedures for Environmental Studies. After a period of ninety (90) days from the publication of the present Regulations in the Official Gazette, all environmental studies must be submitted to the Office of the Undersecretary of Environmental Protection in accordance with the requirements and procedures specified in same.

Environmental studies in progress on the date of publication of the present Regulations in the Official Gazette may be submitted via the procedure specified in Executive Decree No. 2982, published in Official Gazette No. 766 of August 24, 1995.

SEVENTH. Permitted limits for atmospheric emissions. Based on the atmospheric emissions monitoring data systematized and evaluated by the National Environmental Protection Office, the maximum reference values specified in these Regulations will be reviewed and the corresponding permitted limits will be set in accordance with the various types of emission sources within a period of up to two (2) years from the publication of the present Regulations in the Official Gazette.

EIGHTH. Monitoring of Polycyclic Aromatic Hydrocarbons and Volatile Organic Compounds. The monitoring of polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOC) in atmospheric emissions must be initiated within a period not to exceed twelve (12) months from the publication of the present Regulations in the Official Gazette, in accordance with the frequency specified for the monitoring of atmospheric emissions.

FINAL PROVISIONS

First. The present Decree expressly repeals Executive Decree No. 675 of April 15, 1993, published in Official Gazette No. 174 of April 22, 1993, Executive Decree No. 2982, published in Official Gazette No. 766 of August 24, 1995, and Ministerial Resolution No. 195, published in Official Gazette No. 451 of May 31, 1994.

Second. The enforcement of the present Decree, which will enter into force upon its publication in the Official Gazette, is the responsibility of the Minister of Energy and Mines.

Delivered in the National Palace in Quito on February 2, 2001.

f.) Gustavo Noboa Bejarano, President of the Republic.

f.) Pablo Terán Ribadeneira, Minister of Energy and Mines.

The foregoing is a true copy of the original. - Certified by:

f.) Marcelo Santos Vera, Secretary General of the Public Administration.

Annex 1: **Technical parameters**

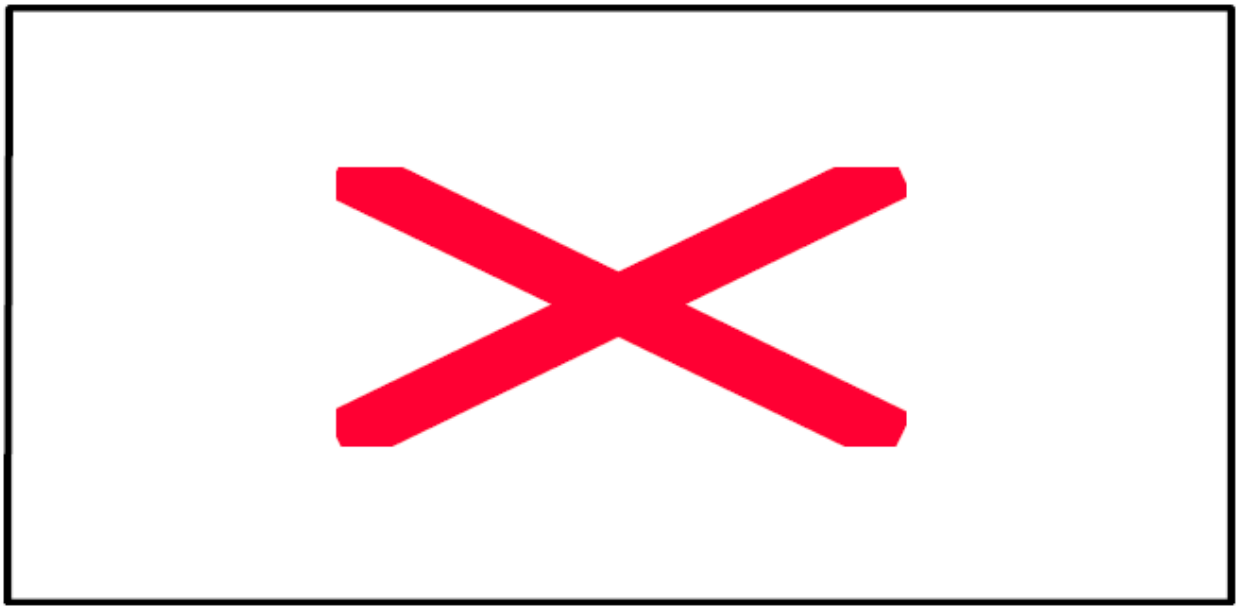
Table 1: **Maximum permitted noise limits.**

Daily duration - hours	Noise level (dBA)
16	80
8	85
4	90
2	95
1	100
1/2	105
1/4	110
1/8	115

Table 2: **Minimum permitted distances for explosive or non-explosive shot points.**

	Non-explosive	Explosive	
	Distance in meters (m)	Load	Distance in meters (m)
1. Roads or underground aqueducts	5	All	10
2. Markers or underground communication lines	1	All	1
3. Oil pipelines, gas pipelines, water wells, residence, homes, and concrete structures	15	<2 kg 2 – 4 kg 4 – 6 kg 6 – 8 kg 8 – 10 kg 10 – 20 kg 20 – 40 kg	30 45 50 75 100 150 180

Diagram 1: **Format for the graphic presentation of all cartography submitted for the consideration of the Office of the Undersecretary of Environmental Protection**



Required information:

Conventional signs: All the conventional signs used in the map, in standard form, with their respective symbols.

Name of the map: Refers to the subject matter with respect to which the information is being developed.

Date of execution: Date on which completed or updated.

Scale: Reference of the scale with which the project has been carried out.

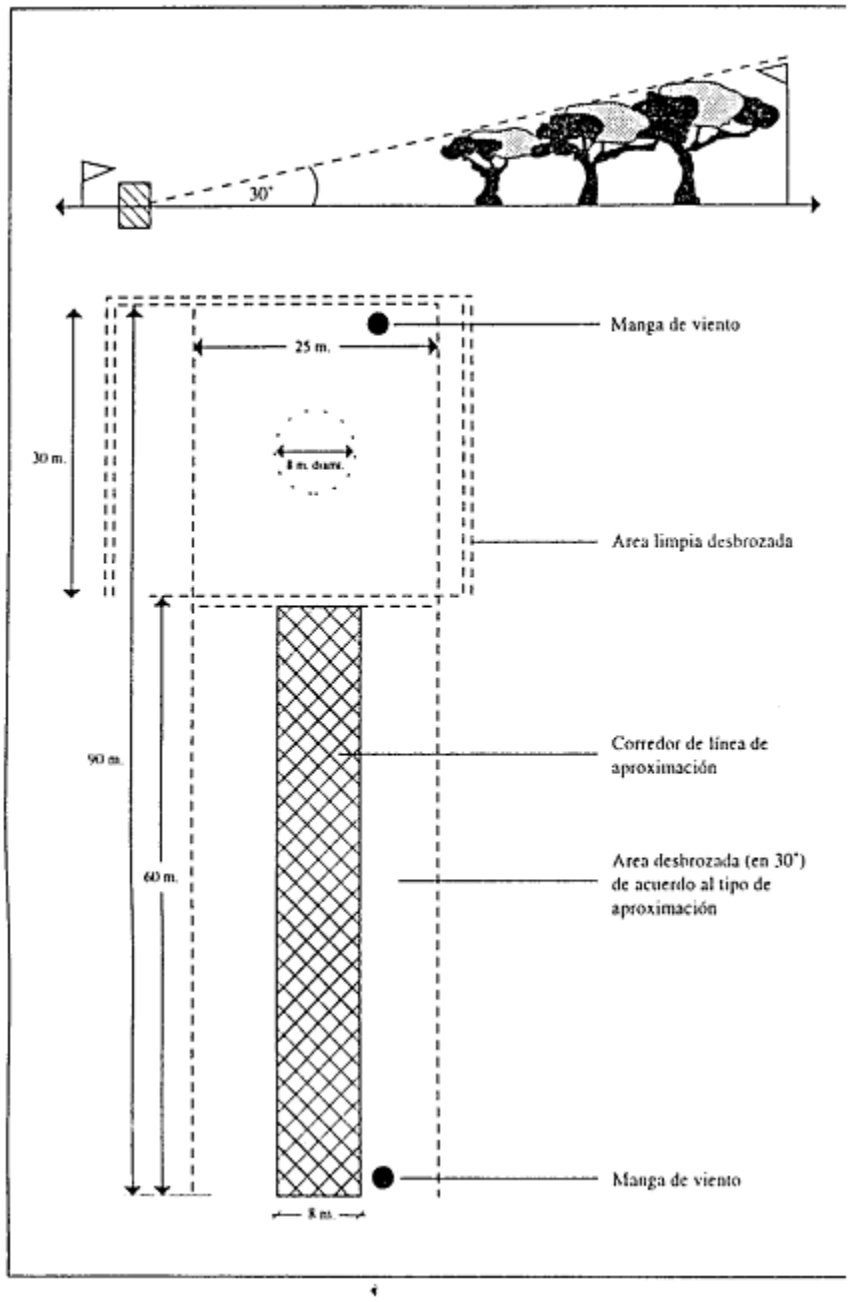
Thematic legend: The entire legend containing the items that refer to the subject matter and the symbols used must be included.

Location on the map of Ecuador: Graphic representation of the map of Ecuador and the graphic location of the site analyzed in said context.

Company or marketer: Name of the oil company or name of the marketer to which the project belongs.

Remarks: Space for providing all the technical data referring to the project, such as:
- Ministry of Energy and Mines.
- National Environmental Protection Office.
- Location (province, canton, parish, etc).
- Originator. (Name of the project's author)
- Based on: (satellite format or IGM cartography)
- Reference and sources of information.
- Name of the digital file

Diagram 5: Construction of heliports in the National System of Natural Areas.



[Manga de viento: wind sock.
Area limpia desbrozada: clean cleared area
Corredor de línea de aproximación: approach line corridor
Area desbrozada (en 30^{o}) de acuerdo del tipo de aproximación: Cleared area (30^{o}) according to the type of approach]

Annex 2: Parameters, maximum reference values, and permitted limits for routine internal environmental monitoring and environmental control

Table 3: Maximum reference values for atmospheric emissions.

Parameters and maximum reference values that must be monitored and controlled at the emission points. These values represent a referential framework for the subsequent establishment of permitted limits; consequently, they should be considered recommended values.

The schedule for the sampling and analysis must comply with the following:

- Weekly at refineries (installation's total emissions);
- Minimum quarterly at waste gas flares, boilers, generators, and other emission sources, except those mentioned below;
- Every six (6) months for the phases, installations, and activities of hydrocarbon storage, transportation, marketing, and sale.

The sampling points will be located at the emission point (sampling ports in smokestacks or at the outlet of the respective pipeline). At least two (2) readings will be taken at an interval of two (2) hours for the determination of each parameter. In addition to the parameters specified in the table, the oxygen (% O_2) and temperature values for each measurement will be reported.

Parameter	Stated in	Unit[1)]	Maximum reference value	
			until 12/31/2002	starting 1/1/2003
Particulate material	PM	mg/m3	200	100
Sulfur oxides	SO2	mg/m3	2,000	1,000
Nitrogen oxides (NOx)	NO2	mg/m3	500	460
Carbon oxides	CO	mg/m3	350	180
Volatile organic compounds (VOC)	C	mg/m3	70	35
Polycyclic aromatic hydrocarbons (PAHs)	C	mg/m3	0.01	0.01

[1)] Milligrams per dry cubic meter of exhaust gas at 25 °C and 101.3 kpa (atmospheric pressure) and 11% oxygen.

Table 4: Permitted limits for the ongoing environmental monitoring of water and liquid discharges in the exploration, production, industrialization, transportation, storage, and marketing of hydrocarbons and their derivatives, including washing and maintenance of tanks and vehicles.

4.a) Permitted limits at the effluent discharge point (liquid discharges).

4.b) Permitted limits at the control point in the receiving body (immission).

The limits established at the two points must be met; this means that, if the effluent meets the established limits, but the limits are exceeded at the control point, the respective measures must be taken to

decrease the values in the effluent until it complies with the required quality at the control point (immission).

Any effluent must be oxygenated ([via] aeration) prior to discharge.

The frequency of the sampling and analyses must comply with the following:

- Daily at refineries and for drilling discharges throughout the drilling period;
- Minimum once a month at all the other hydrocarbon installations that generate liquid discharges and in all phases of operation, except those mentioned in the following point;
- Semiannually for the phases, installations, and activities of storage, transportation, marketing, and sale of hydrocarbons that generate liquid discharges.

a) EFFLUENT (discharge point)

Parameter	Stated in	Unit	Permitted value limit[1)]	Annual average[2)]	Destination of discharge
Hydrogen potential	pH	---	5<pH<9	5.0<pH<9.0	All
Electrical conductivity	EC	µS/cm	<2500	<2000	Inland
Total hydrocarbons	TPH	mg/l	<20	<15	Inland
Total hydrocarbons	TPH	mg/l	<30	<20	Open sea
Chemical oxygen demand	COD	mg/l	<120	<80	Inland
Chemical oxygen demand	COD	mg/l	<350	<300	Open sea
Total solids	TS	mg/l	<1700	<1500	All
Barium	Ba	mg/l	<5	<3	All
Chromium (total)	Cr	mg/l	<0.5	<0.4	All
Lead	Pb	mg/l	<0.5	<0.4	All
Vanadium	V	mg/l	<1	<0.8	All
Global nitrogen (includes organic N, ammoniacal N, and N oxides) [3)]	NH4-N	mg/l	<20	<15	All
Phenols[3)]		mg/l	<0.15	<0.10	All

[1)] At any time.

[2)] Average of the determinations made in one year, according to the frequency of monitoring established in Art. 11 of these Regulations.

[3)] Parameter required only for refineries in the routine internal environmental monitoring program.

b) IMMISSION (control point at the receiving body)

Parameter	Stated in	Unit	Permitted value limit[1)]	Annual average[2)]	Application
Temperature[4)]		°C	+3°C		General
Hydrogen	pH	---	6.0<pH<8.0	6.0<pH<8.0	General

potential[5)]					
Electrical conductivity[6)]	EC	µS/cm	<170	<120	Inland
Total hydrocarbons	TPH	mg/l	<0.5	<0.3	General
Chemical oxygen demand 7)	COD	mg/l	<30	<20	General
Polycyclic aromatic hydrocarbons (PAHs)	C	mg/l	<0.0003	<0.0002	General

[1)] At any time.

[2)] Average of the determinations made in one (1) year, according to the frequency of monitoring established in Art. 11 of these Regulations.

[4)] At a distance or in a radius of 300 meters, compared with a representative point at the receiving body upstream of the effluent's entry point.

[5)] If the receiving body's natural pH is lower than the established limits, the values may be decreased to this level, provided that it has been statistically tested through monitoring of the receiving body at a point upstream of the effluent's entry point.

[6)] If the receiving body's natural electrical conductivity is higher than the established limits, the values may be increased to this level, provided that it has been statistically tested through monitoring of the receiving body at a point upstream of the effluent's entry point.

[7)] If the receiving body has a natural COD higher than the established limits, the values may be increased to this level, provided that it has been statistically tested through monitoring of the receiving body at a point upstream of the effluent's entry point.

Table 5: **Permitted limits for discharges of black and gray water.**

Sampling and analysis must be performed at least weekly, except for the phases, installations, and activities of hydrocarbon storage, transportation, marketing, and sale, for which it will be semiannually.

Parameter	Stated in	Unit	Permitted value limit
Hydrogen potential	pH	---	5<pH<9
Chemical oxygen demand	COD	mg/l	<80
Fecal coliforms	Colonies	Col/100 ml	<1000
Residual chlorine	Cl2	mg/l	<2.0

If the established parameters are not met, the treatment of:
- rainwater
- industrial water
- gray and black water

must be carried out separately, except for the cases established in Art. 29 e) of these Regulations.

Table 6: **Permitted limits for the identification and remediation of contaminated soils in all phases of the hydrocarbon industry, including service stations.**

The permitted limits to be applied in a certain project depend on the subsequent use of the remediated soil, which will be made a matter of record in the respective Remediation Plan or Project approved by the Office of the Undersecretary of Environmental Protection.

If the natural (uncontaminated) soils in the area have concentrations in excess of the established limits, the values of the respective parameter may be increased to this level, provided that this circumstance has been statistically tested through monitoring of undisturbed and unimpacted soils in the same area.

The monitoring will consist of an initial classification of the site and/or material to be remediated, monitoring of at least one (1) sample with the respective analyses every six (6) months, and a final classification once the work has been concluded. Depending on the remediation technology applied, the frequency of the monitoring will be higher, in accordance with the Remediation Plan or Project approved by the Office of the Undersecretary of Environmental Protection:

Parameter	Stated in	Unit[1)]	Agricultural use[2)]	Industrial use[3)]	Sensitive ecosystems[4)]
Total hydrocarbons	TPH	mg/kg	<2500	<4000	<1000
Polycyclic aromatic hydrocarbons (PAHs)	C	mg/kg	<2	<5	<1
Cadmium	Cd	mg/kg	<2	<10	<1
Nickel	Ni	mg/kg	<50	<100	<40
Lead	Pb	mg/kg	<100	<500	<80

[1)] Stated on the basis of dry substance (gravimetric; 105°C, 24 hours).

[2)] Permitted value limits focused on the protection of soils and crops.

[3)] Permitted value limits for industrial use sites (buildings, etc.).

[4)] Permitted value limits for the protection of sensitive ecosystems such as the National System of Natural Areas and others identified in the corresponding Environmental Study.

Table 7: Permitted limits of leachates for the final disposal of drilling muds and cuttings on the surface.

For their final disposal on the surface, drilling muds and cuttings must comply with the parameters and permitted limits shown in the table, depending on whether or not the site for final disposal has a waterproof base. The sampling will be performed so as to obtain representative composite samples based on total volume disposed of at the respective site.

The decantation muds from the treatment of drilling fluids will be included in the treatment and disposal of the drilling muds and cuttings. In addition to the initial analysis for final disposal, a follow-up with periodic sampling and analyses is required:

1. seven (7) days after disposal of the treated muds and cuttings;
2. three (3) months after disposal; and
3. six (6) months after disposal.

a) WITHOUT waterproof base			
Parameter	**Stated in**	**Unit**	**Permitted value limit**
Hydrogen potential	pH	---	6<pH<9
Electrical conductivity	EC	µS/cm	4,000
Total hydrocarbons	TPH	mg/l	<1
Polycyclic aromatic hydrocarbons (PAHs)	C	mg/l	<0.003
Cadmium	Cd	mg/l	<0.05
Total chromium	Cr	mg/l	<1.0
Vanadium	V	mg/l	<0.2
Barium	Ba	mg/l	<5

b) WITH waterproof base			
Parameter	**Stated in**	**Unit**	**Permitted value limit**
Hydrogen potential	pH	---	4<pH<12
Electrical conductivity	EC	µS/cm	8,000
Total hydrocarbons	TPH	mg/l	<50
Polycyclic aromatic hydrocarbons (PAHs)	C	mg/l	<0.005
Cadmium	Cd	mg/l	<0.5
Total chromium	Cr	mg/l	<10.0
Vanadium	V	mg/l	<2
Barium	Ba	mg/l	<10

Table 8: **Classification of waste from all hydrocarbon phases and operations, and recommendations for reduction, treatment, and disposal.**

A) Waste classified as hazardous
(in accordance with the hazardous waste classification of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; in effect since 1992):

Code	Type of waste	Reduction, treatment, and disposal
A0010	Wastes from radioactivity detectors	
A0046	Infectious sanitary wastes	
A1010	Metal wastes or wastes containing metals such as antimony, arsenic, beryllium, cadmium, lead, mercury, selenium, tellurium, and/or thallium.	Including, among others, ash from incineration inertization/solidification, controlled disposal
A1040	Wastes having as constituents metal carbonyls and/or hexavalent chromium	
A2030	Waste catalysts	Regeneration and reutilization [of waste] whenever possible
A3010	Wastes from the production or processing of petroleum coke and asphalt	
A3020	Waste mineral oils unfit for their originally intended use	Adequate recovery, treatment, and reuse
A3021	Wastes from oil filters, hydraulic filters, etc.	
A3070	Waste phenols, phenol compounds, including clorophenol in a liquid form or sludges	
A3140	Waste non-halogenated organic solvents	
A3150	Waste halogenated organic solvents	
A3190	Waste tarry residues (excluding asphaltic cements) arising from refining, distillation, or any other pyrolytic treatment of organic materials	
A4020	Clinical and related wastes	
A4030	Wastes from the production, formulation, and	

	use of biocides and phytopharmaceuticals, including waste pesticides and herbicides which are off-specification, outdated, or unfit for their originally intended use.	
A4060	Waste oils/water, hydrocarbons/water mixtures, emulsions	
A4070	Wastes from the production, formulation, and use of inks, dyes, pigments, paints, lacquers, or varnishes	
A4080	Wastes of an explosive nature	
A4091	Acidic solution wastes with pH<2	
A4092	Basic solution wastes with pH>11.5	
A4100	Waste from the use of industrial pollution control devices for gas purification	
A4120	Wastes that contain, consist of, or are contaminated with peroxides	
A4130	Waste packages and containers that contain substances or materials included in this list	
A4140	Wastes consisting of or containing off specification or outdated chemicals corresponding to the categories included in this list	
A4150	Waste chemical substances that are unidentified or new arising from research, whose effects on human beings or the environment are not known.	
A4160	Spent activated carbon, except that resulting from the treatment of potable water	

B) Waste not classified as hazardous:
(subject to control in accordance with these Regulations)

Code	Type of waste	Reduction, treatment, and disposal
B0045	Inorganic domestic wastes	Classification; controlled disposal.
B0046	Organic domestic wastes	Classification; composting.
B2011	Cuttings	Controlled disposal.
B2020	Glass waste	Classification; recycling.
B2041	Formation water	Reinjection.
B2042	Contaminated drilling and bottom sediments from storage or non-hazardous waste warehousing	Controlled disposal of solids.
B3001	Soil with hydrocarbons	Spill prevention; Bioremediation, landfarming
B3002	Mud and sand contaminated with hydrocarbons	Bioremediation, landfarming
B3003	Hydrocarbons recovered in the production flow and/or effluent treatment	Reincorporation into the production process

B3004	Crude oil waste	Reincorporation into the production process
B3005	Gases removed from production flow such as: hydrogen sulfite and carbon dioxide and other volatile hydrocarbons	Recovery and treatment in the production processes.
B3006	Drilling fluids and muds	Prioritization of water-based drilling muds; recycling of muds; treatment of sedimentation and decantation; reinjection of liquids; controlled disposal of solids.
B3010	Plastic waste	Classification; recycling
B3020	Paper, paperboard, paper products waste	Classification; recycling
B3030	Textile wastes	Classification; recycling
B3150	Other inorganic industrial wastes not classified as hazardous; specify	Classification; controlled disposal.

Annex 3: Parameters, maximum reference values, and permitted limits for advanced environmental monitoring and control

Table 9: **Parameters to be determined in the classification of surface water in baseline environmental diagnosis studies.**

Parameter	Stated in	Unit
Temperature	°C	---
Hydrogen potential	pH	---
Electrical conductivity	EC	µS/cm
Fecal coliforms	Colonies	Col/100 ml
Dissolved oxygen	DO	mg/l
Biochemical demand of oxygen	BDO_5	mg/l
Chemical oxygen demand	COD	mg/l
Ammonium	NH_4	mg/l
Barium	Ba	mg/l
Cadmium	Cd	mg/l
Chromium (total)	Cr	mg/l
Nickel	Ni	mg/l
Lead	Pb	mg/l
Vanadium	V	mg/l
Tensioactive substances (methylene blue)	MBAS	mg/l
Phenols	---	mg/l
Total hydrocarbons	TPH	mg/l

Table 10: **Additional parameters and permitted limits for water and liquid discharges in the exploration, production, industrialization, transportation, storage, and marketing of hydrocarbons and their derivatives**

Parameter	Stated in	Unit	Permitted value limit
Chlorides	Cl-	mg/l	<2,500
Sulfates	SO_4^{2-}	mg/l	<1,200
Fluorides	F-	mg/l	<5.0
Cadmium	Cd	mg/l	<0.1
Mercury	Hg	mg/l	<0.01
Nickel	Ni	mg/l	<2.0
Selenium	Se	mg/l	<0.5
Free cyanides	CN-	mg/l	<0.05
Hydrogen sulfide	H2S	mg/l	<0.0002
Biochemical demand of oxygen	BDO_5	mg/l	<40

Phenols		mg/l	<0.15

Table 11: **Recommended parameters and reference values for water in remediated pits intended for fish farming.**

Parameter	Stated in	Unit	Maximum reference value
Hydrogen potential	pH	---	6.5<pH<8.5
Ammonium	NH_4^+-N	mg/l	<1.0
Biochemical demand of oxygen	BDO_5	mg/l	<6.0
Chemical oxygen demand	COD	mg/l	<20
Total hydrocarbons	TPH	mg/l	<3.0

Annex 4: **Environmental control and monitoring forms**

For environmental control, the companies will be required to submit reports on their self-monitoring. The reports must contain the following data:

Form 1: **Identification of effluents (points of discharge to the environment) and control points (receiving body, immission) for internal environmental monitoring.**

Name of the company:		
Block No.		
A)	**Discharge point (effluent):**	
	Coordinates (UTM): **Geographic coordinates:**	
	Description: Type of discharge: Average volume of flow: Treatment prior to discharge: Other characteristics:	
B)	**Control point (immission):**	
	Distance from discharge point:	
	Description: Average volume of flow: Meteorological conditions: Other characteristics:	

For each discharge point (A), establish the respective control point at the receiving body (B) at a distance of approximately 300 meters downstream, or the distance, established using the pertinent technical studies, at which an adequate mix between the volume of flow of the effluent and the receiving body has been achieved.

Form 2: **Identification of installations subject to atmospheric emissions monitoring.**

Name of the company:		
Block No.		
Emission point:		
	Coordinates (UTM) **Geographic coordinates:**	
	Description[1)]**:** Type of installation (emission source): Type of fuel used: Fuel consumption: Capacity of the source: Operating time of the source: Materials to be burned: Height of the emission source: Average emission volume: Principal wind direction: Average wind speed:	

[1] For waste gas flares, indicate the dimensions of each waste gas flare (width, height, type of waste gas flare, technical details, and frequency of operation).

Form 3: **Report on the internal environmental monitoring of liquid discharges (A) and control points at the receiving body (B).**

Name of the company										
Period/year										
Name of the laboratory										
Sampling point[1]/ sample date/code	**pH**	**CE** (µS/cm)	**TPH** (mg/l)	**COD** (mg/l)	**TS[2]** (mg/l)	**Ba[2]** (mg/l)	**Cr[2]** (mg/l)	**Pb[2]** (mg/l)	**V[2]** (mg/l)	**PAH[3]** (mg/l)
A)										X
B)					X	X	X	X	X	
Etc. (for all points)										

[1] Code assigned by DINAPA for the approved monitoring points.

[2] Analysis of this parameter is required only for the effluent (discharge); it is not mandatory for the receiving body.

[3] Analysis of this parameter is required only for the receiving body; it is not mandatory for the effluent (discharge).

Form 4: **Report to DINAPA on internal environmental monitoring of atmospheric emissions.**

Name of the company **Period/year** **Name of the laboratory**							
Sampling point[1]/ sample code	**Date**	**PM**	**SO_2** (mg/m^3)	**NO_x** (mg/m^3)	**CO** (mg/m^3)	**VOC** (mg/m^3)	**PAH** (mg/m^3)
Etc. (for all points)							

[1] Code assigned by DINAPA for the approved monitoring points.

Form 5: **Annual Environmental Report.**

1 General information about the operator

2 Activities conducted on the basis of the Environmental Management Plan

2.2 Impact prevention and mitigation plan

2.2.1 Summary maintenance schedules for principal equipment and installations

Location	**Equipment, Installation**	**Preventive**	**Corrective**

2.3 Contingency plan

2.3.1 Log and evaluation of Contingency Plan training and simulations

Date	Place	Participants	Evaluation and corrective measures

2.4 Training plan

2.5 Occupational health and industrial safety plan

2.6 Waste management plan

2.6.1 Atmospheric emissions

Point/code	Days per year	Average Volume	PM (mg/m^3)	SO_2 (mg/m^3)	NO_x (mg/m^3)	CO (mg/m^3)	VOC (mg/m^3)	PAH (mg/m^3)

2.6.2 Liquid discharges (including receiving body)

Point/code	Average vol. of flow	pH	EC (µS/cm)	TPH (mg/l)	COD (mg/l)	TS (mg/l)	Ba (mg/l)	Cr (mg/l)	Pb (mg/l)	V (mg/l)	PAH (mg/l)
A)											X
B)						X	X	X	X	X	

A) Discharge point (effluent).
B) Control point at the receiving body (immission) corresponding to the discharge point.
X… Parameters not required by these Regulations for ongoing routine monitoring

2.6.3 Drilling muds and cuttings

Point/code	Treatment	Disposed volume	Impermeable Base	TPH (mg/l)	PAH (mg/l)	Ba (mg/l)	Cd (mg/l)	Cr (m./l)	V (mg/l)

2.6.4 Waste classification, generation, treatment, and disposal

Code	Class of waste	Quantity	Treatment	Disposal

2.7 Community relations plan

2.8 Plan for restoration of affected areas

2.8.1 Description and general evaluation (including schedule of work performed)

2.8.2 Results obtained from physical-chemical monitoring of the remediation

Point/code	**Treatment**	**Volume treated**	**Subsequent use**	**Phase**	**TPH** (mg/l)	**PAH** (mg/l)	**Cd** (mg/l)	**Ni** (mg/l)	**Pb** (mg/l)
				Beginning					
				Ending					

2.8.3 Other physical-chemical analyses performed (soil, water, etc.)

2.9 Plan for abandonment and delivery of the area

Annex 5: Analytical methods

WATER		
Parameter	**Method**	**References** [#)]
Sampling	Sample collection and preservation	APHA/AWWA/WEF Standard Methods No. 1060; DIN 38402 (series A11 – A22)
Temperature	Direct determination with mercury or alcohol thermometer; graduation of 0.1°C. Alternative: determination with temperature sensor.	APHA/AWWA/WEF Standard Methods No. 2550 B
Hydrogen potential	Potentiometric determination with electrode calibrated at two (2) points.	APHA/AWWA/WEF Standard Methods No. 4500-H^+ B
Electrical conductivity	Determination with electrode calibrated at two (2) points.	APHA/AWWA/WEF Standard Methods No. 2510
Total hydrocarbons (TPH) [8)]	Extraction with methylene chloride, gas chromatography and FID determination (GC/FID). Alternative: Extraction with Freon, removal of polar substances in the extract, and determination by infrared spectroscopy	Publication No. ECY 97-602 (Washington, June 1997) EPA 418.1; 1664 (SGT-HEM) ASTM D3921-96; DIN 38409-H18
Polycyclic aromatic hydrocarbons (PAHs)	Extraction with methylene chloride, separation by chromatography: GC or HPLC and determination by UV or FID, respectively. Determination of the sum of six (6) PAHs: fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(ghi)perylene, and indeno(1, 2, 3-cd)pyrene. Statement of results based on carbon (C) – conventional conversion factor: 0.95	APHA/AWWA/WEF Standard Methods No. 6440 B DIN 38407-F8
Chemical demand of oxygen	Hot acid digestion of the sample with dichromate and sulfuric acid in the presence of a catalyst and mercury sulfate to eliminate chloride interference, and determination of the excess dichromate by titration	APHA/AWWA/WEF Standard Methods No. 5220
Total solids	Drying of the sample at 105°C to constant weight and gravimetric determination.	APHA/AWWA/WEF Standard Methods No. 2540 B
Barium	Filtration and acidification of the sample and direct determination by atomic absorption spectroscopy	APHA/AWWA/WEF Standard Methods No. 3030 B, 3111 B, D

	(AAS).	
Chromium (total)		
Lead		
Vanadium		
Fecal coliforms	Filtration through membrane and incubation at 44.5°C. Alternative: Most probable number.	APHA/AWWA/WEF Standard Methods No. 9222, 9221

[8)] The “oils and greases” parameter is not accepted (EPA 418.1: EPA 1664 HEM).

Residual chlorine	Determination of total residual chlorine with DPD by titration or colorimetry.	APHA/AWWA/WEF Standard Methods No. 4500-Cl F, G
Global nitrogen	Distillation of the sample and determination of ammonium (NH_4) by titration, photometry, or ion-sensitive electrode	APHA/AWWA/WEF Standard Methods No. 4500-NH_3; DIN 38406-E5
Phenols	Distillation, extraction with chloroform, and photometric determination	APHA/AWWA/WEF Standard Methods No. 5530
SOILS		
Parameter	**Method**	**References [#)]**
Sampling	Composite representative sample (minimum 15-20 subsamples per hectare or equivalent, homogenization)	
Total hydrocarbons (TPH) [9)]	Extraction with methylene chloride, gas chromatography and FID determination (GC/FID). Alternative: Extraction with Freon, removal of polar substances in the extract, and determination by infrared spectroscopy.	Publication No. ECY 97-602 (Washington, June 1997) EPA 413.1; 1664 (SGT-HEM) ASTM D3921-96;
Polycyclic aromatic hydrocarbons (PAHs)	Extraction; determination by gas chromatography (GC) or HPLC.	EPA SW-846 Methods 8100 or 8310
Cadmium Nickel Lead	Acid digestion of the sample and direct determination by atomic absorption spectroscopy.	EPA SW-846 Methods 3050B, 7130, 7520, 7420
LEACHATES		
Parameter	**Method**	**References [#)]**
TCLP	Extraction under standard conditions; determination in accordance with parameter to be analyzed.	EPA SW-846 Method 1311
ATMOSPHERIC EMISSIONS		
Parameter	**Method**	**References [#)]**
Particulate matter	Gravimetric determination of	ISO/DP 10473

	atmospheric deposits.	
Sulfur oxides	Various electrochemical and colorimetric methods.	Commercial tests and kits may be used, provided that they are based on standardized, accepted methods.
Nitrogen oxides (NOx)		
Carbon oxides		
Volatile organic compounds		
Polycyclic aromatic hydrocarbons (PAHs)		

#) The reference methods cited in the table or equivalent, standardized [methods] published by other environmental agencies or entities will be applied.

9) The “oils and greases” parameter (EPA 413.1; EPA 1664 HEM) is not accepted.

Annex 6: Glossary

Abandonment: Action of leaving an installation or a well, for technical reasons or when there are no hydrocarbons; also when the petroleum or gas production has concluded or its production is not profitable.

Temporary abandonment: Action of plugging a productive oil or gas well when the field is declared unmarketable or the infrastructure necessary to include it in the production phase is unavailable.

Aquifer: Soil or land with water or underground layer of permeable rock, sand, or gravel that contains water, or through which water flows. Refers to ground water.

Aerobe: Refers to a living being that subsists on free oxygen.

Formation water: Water found together with the petroleum and gas in the hydrocarbon deposits. May have different concentrations of mineral salts.

Black water and gray water: Water residue, of varying composition, resulting from a domestic activity process, in which its original composition has degraded. Black water comes from bathrooms; gray water comes from kitchens and laundries.

Waste water: Water resulting from industrial activities, discharged as effluent.

Ground water: Water from the subsoil, especially the part found in the zone of saturation, in other words, below the water table.

Surface water: Mass of water on the surface of the land. It forms rivers, lakes, lagoons, bogs, and other similar bodies, whether natural or artificial.

Environment *(ambiente)*: Set of biotic and abiotic elements and physical, chemical, and biological phenomena that determine the life, growth, and activity of living organisms. Generally referred to as "environment" *(medio ambiente)*.

Anaerobe: Microorganism capable of living without the presence of free oxygen, which it obtains from the decomposition of various organic compounds.

API: American Petroleum Institute – the specific gravity of petroleum is determined on the basis of API standards.

Crude	°API
Extra heavy	<10
Heavy	10 – 20
Medium	20 – 35
Light	35 – 45

Area of influence: Includes the space in which the potential environmental and socio-cultural impacts caused by the hydrocarbon activities are manifested.

Area of direct influence: Includes the space in which the socio-environmental impacts become evident during the performance of the work.

(Natural) protected area: Publicly or privately-owned area of ecological, social, historic, cultural, and scenic relevance, established in the country in accordance with law, in order to prevent its destruction and promote the study and conservation of plant or animal species, natural landscapes, and ecosystems.

Usable area: Surface area occupied by rig, heliport, and camp site.

Sandstone: Sedimentary rock formed by grains of cemented sand.

Environmental audit: Analysis, assessment, and verification of the environmental situation and the impact of a certain company or project on the environment and the sustainable management of the natural resources, also verifying compliance with Ecuadorian environmental laws and regulations and the Environmental Management Plan.

Biodegradation: Process of transformation and decomposition of organic substances by living beings, changing the characteristics of the original product in the process.

Biodiversity: Quantity and variety of different species (animals, plants, and microorganisms) in a certain area, be it a land, marine, or aquatic ecosystem, and in the air. Includes the diversity within each species, among various species, and among the ecosystems.

Bioremediation: Process of remediating contaminated sites that uses the potential of certain microorganisms to degrade and decompose the organic contaminants, optimizing, through mechanical and physical-chemical techniques, the conditions for microbiological action.

Biota: Set of all the living beings in a certain area (animals, plants, microorganisms). Biotic: pertaining to living beings.

Forest: Cluster of vegetation in which trees and other woody plants predominate; also contains bushes, grasses, fungi, lichens, animals, and microorganisms that affect each other and the characteristics and composition of the total group or mass.

Primary forest: Arboreal formation that represents the final, mature stage of an evolutionary series, untouched by man.

Protective forest: Forest formation whose function is to protect a zone from erosion by regularizing its hydrological system. That envisaged in the Act on Forests and Conservation of Natural Areas and Wildlife and any Decrees and Resolutions that may establish it.

Calcination: Burning at high temperatures in order to volatilize the entire organic part, leaving only the mineral residue.

Climate: Average state of the meteorological phenomena that develop over a geographic space over a long period of time. Determined by a series of factors: tilt of the earth's axis, land-sea proportion[s], latitude, altitude, exposure to wind, etc., and linked to a set of elements such as pressure, humidity, temperature, rainfall, clouds, etc.

Complete combustion: Chemical reaction between oxygen or other elements and an oxidizable (combustible) material, almost always accompanied by the release of energy in the form of incandescence or flame, leading to the formation of products with a maximum degree of oxidation (complete combustion); if the process is incomplete, lower-grade products of oxidation are formed.

Ecological compatibility: Characteristic of processes and measures adopted by man that have no negative effect on the environment and each of its components.

Contamination: Process by which an ecosystem is altered due to the introduction, by man, of elements, substances, and/or energy into the environment, to a degree capable of jeopardizing its health, thereby placing the ecological systems and living organisms at risk, damaging the structure and characteristics of the environment, or impeding the rational use of natural resources.

(Environmental) control: Periodic and systematic surveillance and follow-up (external monitoring) of the development and quality of processes, verifying that they are in keeping with a pre-established model. In

hydrocarbon operations, control is carried out through the DINAPA; synonym for environmental oversight. See also Monitoring.

Coke: Carbonaceous residue that remains after the distillation of the hydrocarbons capable of migrating from the oil product subjected to high temperatures and pressure.

Off-shore: [Referring to an] Activity conducted at sea.

VOC: Volatile organic compounds. Have the capacity to form photochemical oxidants through reactions with nitrogen oxides in the presence of sunlight; some VOC are harmful to health.

Crude: Mixture of oil, gas, water, and sediments, such as what comes from the producing formations to the rig floor.

Weathered crude: Crude that has been exposed for a long period to the elements, under the effect of temperature, solar radiation, humidity, and biological action and, consequently, has undergone changes of its initial composition and physical-chemical characteristics.

Longline: Technique for discharging materials and equipment from a helicopter via a long cable, without the need to land.

Body of water: Accumulation of moving or still water, which, as a whole, forms the hydrosphere; comprises temporary pools, streams, springs, marshes, lagoons, lakes, seas, oceans, rivers, brooks, underground reserves, swamps, and any other accumulation of water.

DCH: Diameter at chest height; standardized term for referring to the size of a tree.

Chemical oxygen demand (COD): A measure for the oxygen equivalent to the content of the organic matter present in waste or in a water sample, subject to oxidation by means of a strong oxidant (stated in mg/l).

Right-of-way: Strip of land of specific dimensions, in which a pipeline and/or access road has been installed, that crosses one or more properties and to which the owner of the pipeline has access and a right-of-way, and within whose area the legal limitations on property rights are established.

Hydrocarbon spill: Escape of hydrocarbons produced by unforeseen operating causes or natural causes, to the various bodies of water and soils.

Discharge: Release of waste water or liquid contaminants into the environment during a certain period or continuously.

Waste: Generic term applied to any type of residual products or garbage resulting from human activities, or a product that does not meet specifications. Synonym of *residuo* [meaning “residue” or “waste”—Trans.].

Environmental diagnosis: The complete description of the Baseline in the Environmental Studies referred to in these Regulations.

Dilution: Process of mixing one material with another in such proportion as to decrease the concentration of elements and/or substances of the former.

Final disposal: Manner and/or site of definitive storage or manner of destruction of waste.

Natural drainage: Natural paths that bodies of surface water take depending on the topography of the land.

DZ [Drop zones]: Zones for dropping materials from a helicopter via the “longline” technique.

Ecology: Science that studies the conditions of existence of living beings and the interactions between said living beings and their environment.

Ecosystem: Basic unit of organism – environment integration consisting of a complex and dynamic set, characterized by a substrate material (soil, water, etc.) with certain physical-chemical factors (temperature, illumination, etc.), the organisms that live in said space, and the interactions among all of them in a given area.

Effluent: That which flows to the exterior, discharged as waste, whether or not previously treated; generally refers to liquid discharges to bodies of surface water.

Emission: Discharge of contaminants into the atmosphere.

Endemic: Native organism of the country or region it inhabits.

Erosion: Geological process of wearing down the land surface and removal and transportation of products (materials from soil, rocks, etc.) originating as a result of rain, runoff, and rain currents [perhaps meant *“corrientes fluviales,”* i.e., “river currents”—Trans.], action of waves, ice, wind, gravitation, and other agents.

Runoff: Surface flow of water, generally resulting from precipitation, that runs on or near the surface in a short time period.

Species: Set of individuals with similar biological characteristics and the potential to exchange genes with each other, thereby producing fertile young.

Native species: Set of plant and animal species as well as microorganisms belonging to the country, region, or habitat.

Production station: Site of an oil field at which the flow lines from the wells come together and where the collection, separation, storage and pumping of petroleum takes place.

Stratigraphy: Science that describes the strata. It is concerned with the shape, disposition, distribution, chronological sequence, classification, and relationships of the rocky strata (and other associated bodies of rock) in normal sequence with respect to any or all characteristics, properties, and attributes they may possess.

Stratum: A geological stratum is a layer (a generally flat body) of rock characterized by certain unifying features, properties, or attributes that distinguish it from adjacent strata. The adjacent strata may be separated by visible levels of stratification or separation, or by less perceptible boundaries of change in the lithology, mineralogy, fossil content, chemical composition, physical properties, age, or any other property of the rocks.

Barimetric study: Studies that describe the situation of a maritime zone with respect to currents, behavior of the waves, winds, etc.

Hydrocarbon exploration: Phase of hydrocarbon operations that uses a set of techniques making it possible to locate and detect, in the subsoil, geological formations with possible accumulation of hydrocarbons.

Hydrocarbon production: Phase of hydrocarbon operations that uses a set of techniques aimed at producing hydrocarbons.

Phases of the hydrocarbon activity (operations): For purposes of these Regulations, the phases are classified as follows:

- Geophysical (or other) prospecting
- Exploratory and extension drilling
- Development and production
- Industrialization
- Storage and transportation of petroleum and its derivatives
- Marketing and sale of petroleum derivatives

Development phase: Phase in which the work necessary to develop the discovered fields and put them into production is carried out.

Production phase: Phase encompassing the start of production and abandonment of an oil field. In industrialization, the production phase includes the entire period of refinery operation.

Flora: Set of plant species that populate certain territories or environments.

Drilling fluid: Mixture utilized to stabilize the walls of the well and transport the drilling cuttings to the surface. Synonym of “drilling muds.”

Forestation: Planting of trees at a certain site to create a forest; reforestation – planting of trees at a site where there was previously a forest.

Formation: The formation is the fundamental formation unit of lithostratigraphic classification; it has an intermediate range in the hierarchy of lithostratigraphic units and is the only formal unit used for completely dividing the entire stratigraphic column all over the world into named units based on its lithostratigraphic nature.

Associated gas: Natural gas found in the oil reservoirs and whose composition is variable.

Liquefied petroleum gas: Mix of gaseous hydrocarbons in their natural state, in whose composition propane and butane predominate, which is stored and expended in the liquid state, in hermetic pressure vessels.

Natural gas: Gas composed of light hydrocarbons, found in the natural state alone or associated with petroleum.

Geomorphology: Study of the earth’s landforms, describing them (morphology), systematizing them, and investigating their origin and development (morphogenesis).

Environmental management: Set of policies, strategies, rules, operating and administrative activities of planning, financing and control that are closely associated with and aimed at achieving maximum rationality in the environmental conservation and protection processes in order to guarantee sustainable development and are executed by the State and society.

GIS: Geographic Information System. Techniques and computer programs that make it possible to store and process spatial data and produce maps.

LPG: Liquefied petroleum gas.

GPS: Global positioning system. Permits the exact determination of coordinates using equipment and satellites.

Habitat: Area of distribution of a species or a set of localities that have the appropriate conditions for the life of a species.

PAH: Polycyclic aromatic hydrocarbon. The PAHs are a group of compounds, some of which are known for their high carcinogenic potential.

Wetlands: Zone which is moist due to its high capacity to retain water.

IGM: Military Geographical Institute.

Incineration: Process that is controlled with respect to the factors of temperature and oxygenation for burning solid and liquid wastes, considered a method for elimination of residues, thereby transforming their combustible fraction into inert matter and gases.

Industrialization: Phase of hydrocarbon operations devoted to the physical, thermal, and chemical separation of crude oil into its major distillation fractions in order to produce petroleum products and derivatives that can be marketed directly or used as raw material in other industries.

Immission: Solid, liquid, or gaseous materials or substances that originate from a potential source of contamination and are received into the environment, whether in water, soils, or the atmosphere.

Water injection: Secondary recovery method for raising the pressure of the reservoir in order to increase hydrocarbon recovery; and for the disposal of residual fluids to subsurface formations through unproductive wells, often called reinjection of water.

Permitted limit: Maximum value of concentration of element(s) or substance(s) in the different components of the environment, determined using standardized methods and regulated by means of legal instruments.

Leachates: Solutions that result from the transportation of water through the pores and fissures of the soil or another porous solid medium and the physical-chemical interactions of this water with the soil's mineral and organic components.

Decantation mud: Solid that settles after a colloidal system or suspension of materials rests, for example, after the treatment of waste water with flocculant agents and the sedimentation of the floccules that form.

Drilling mud: See drilling fluid.

Acid rain: Rain with acidic hydrogen potential (pH), caused by the interaction of the rainwater and atmospheric contaminants such as sulfur dioxide and nitrogen oxides.

Environmental measures: These are:

- for mitigation: those implemented to lessen and reduce the negative environmental impacts of hydrocarbon operations.
- for control: those that guarantee the minimum occurrence of unforeseen circumstances that have an adverse impact on the environment. They may be based on plans for control of contamination, maintenance, industrial safety, etc.
- for prevention: those implemented in advance to prevent deterioration of the environment.
- for compensation: those required to compensate for and counter the deterioration and/or removal of any tangible or intangible element from the environment, existing prior to or during performance of the hydrocarbon operations.
- for restoration: to minimize deterioration of the environment and ensure its improvement during or after the hydrocarbon operations.
- for contingency (emergency): designed to provide an immediate response to any damage.

Stable bituminous mix: Fraction of heavy hydrocarbons with minimal potential for leaching of contaminants such as heavy metals and hydrocarbons, suitable for applying on roads and highways without negative environmental effects.

mg/l, mg/kg: Units of concentration: mg/l (milligrams per liter); mg/kg (milligrams per kilogram). The two units are often referred to in the literature as ppm (parts per million).

(Environmental) monitoring: Ongoing follow-up through continuous record-keeping, observations, and measurements, samplings and laboratory analyses, and through evaluation of these data to determine the effect of the observed parameters on health and the environment (= environmental monitoring). The monitoring is carried out at different levels:
- Internal at the industry level: self-monitoring;
- External at the community level: surveillance;
- External at the level of government entities: control and/or oversight.

Internal environmental monitoring (self-monitoring): Ongoing and systematic follow-up through continuous record-keeping, observations, and/or measurements, and through evaluation of the data that affect health and the environment, carried out by the company itself.

Water table: Height that reaches the most superficial underground aquifer.

ICAO: (International Civil Aviation Organization): Standards that govern the control and safety of flight operations.

Petroleum pipelines: Pipes that transport crude oil containing the minimum quantity of impurities.

Landscape: Basic physiographic unit in the study of the morphology of ecosystems, with elements that are mutually dependent and that generate a unique and indissoluble set in constant evolution.

Bog: Poorly-drained land, more or less permanently damp and easily flooded, whose soil contains a high percentage of organic matter, giving it a spongy character.

National Park: Extensive area with the following features or purposes:
- One or more ecosystems included in a minimum of 10,000 hectares;
- Diversity of flora and fauna species, geological traits and habitats that are important to science, education, and recreation; and
- Maintenance of the area in its natural condition, for the preservation of ecological, esthetic, and cultural traits, any production and occupancy being prohibited.

EAP: Economically active population.

Cluster drilling: Drilling of several wells from a single rig, achieved through directional drilling (clusters), thus decreasing the need for space on the surface.

Permeability: Capacity to move a fluid through the cracks, pores, and interconnected spaces in a rock.

Multi-purpose pipelines: Pipes that transport petroleum derivatives and liquefied petroleum gas.

Outpost well: A well drilled after the discovery of hydrocarbon traps in one or more structures to delimit the deposits.

Development well: A well drilled in a hydrocarbon field to tap its deposits.

Exploratory well: A well drilled to verify the potential accumulations of trapped hydrocarbons in a structure detected through geological and geophysical studies.

Injection well: A well drilled or completed to inject a fluid in order to confine it or to implement improved hydrocarbon recovery processes.

Hazardous chemical product: Also known as hazardous substances. Substances and products which, because of their physical-chemical and/or toxic characteristics, are hazardous to human health and the environment in general. They are subject to special handling and precautions in transportation, treatment, and disposal.

Seismic prospecting: Technique for collecting information about the subsurface by using sound waves.

Workovers: Work intended to improve the production of a well. May be work for repair of the completion of a well or formation work such as stimulation, acidizing, fracturing, etc.

Environmental rehabilitation: Set of actions and techniques intended to restore original or [provide] substantially improved environmental conditions at sites that have been contaminated and/or degraded as a consequence of human activities. Synonyms: environmental remediation, environmental repair, environmental restoration.

Enhanced recovery: Process by means of which a fluid is injected into a deposit in order to increase the amount of recoverable hydrocarbons.

Waste: Any material that the owner/producer can no longer use in its original capacity or form, and that can be recovered, recycled, reused, or eliminated.

Hazardous residues: Waste which, due to its nature and quantity, may be hazardous to human health or the environment. Requires special treatment or elimination techniques to terminate or control its hazardous nature. Also called “special residue,” hazardous waste and special waste.

Revegetation: Sowing of plant species of collective interest, generally as the last stage of environmental remediation work.

Casing: Process by which steel pipe is introduced into the borehole. It is screwed on in sections and keeps the walls from collapsing so that the drilling of a well can proceed properly.

Services related to the marketing of derivatives: The service activities of changing oil, lubricants, and car washes, whether or not installed jointly with a service station.

Right-of-way *(servidumbre de tránsito)*: Free access, at no charge, to the right-of-way strip granted by the owner of the land.

Drilling site: The surface area which includes the usable area, in addition to pits or tanks for disposal of cuttings, treatment of drilling fluids, and production tests, green space, storage of plant matter, and other areas required in accordance with the topography of the land.

Soluble: Refers to a substance that dissolves in a liquid.

Soil: Superficial layer of the earth’s crust, consisting of mineral components resulting from the physical-chemical degradation of the parent rock and organic compounds in the process of degradation and/or transformation, thoroughly mixed, with pores of different sizes that provide space for water and air in the soil, as well as soil microorganisms and animals and plant roots, for which the soil provides a substratum and sustenance.

Subsurface: The land found below the soil or arable layer and owned by the State.

Drawing-off: Process of transferring a liquid from one place to another, for example, by using hoses and pumps.

TPH: Total petroleum hydrocarbons (soluble or recoverable in certain solvents). Synonym: mineral hydrocarbons.