



# **DP WORLD**

## **Puerto Caucedo Multimodal Terminal**

**Andrés, Boca Chica**

**República Dominicana**

## **Programme for Environmental Management and Adjustment**

**Prepared by:**

**DP World Caucedo**

**Atemar, S.A.**



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## Distribution

Organization	Contact	Copy No.
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DPW Gerente SA	José Antonio Rodríguez M.	1
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DPW Gerente Financiero	Luís Terrero	1
DPW Gerente Administrativo	José Nelton González	1
DPW Equipo Ambiental	Oswaldo Vásquez.	1



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## **1. INTRODUCTION**

### **1.1 Purpose of the Programme for Environmental Management and Adjustment**

This Programme for Environmental Management and Adjustment (PEMA) has been prepared for the purpose of providing the mechanisms which can ensure the implementation of all of the mitigation measures recommended in the Environmental Impact Assessment (EIA). At the same time, it describes the procedures which permit an immediate diagnosis of the impacts established, and ensure rapid action which will allow the correction of any other which unfavourably affects the quality of the environment.

The intention of this PEMA is to serve as a working and reference document. Its main purpose is to consolidate the environmental handling and control requirements identified in the EIA or otherwise required by the Secretariat of State for the Environment and Natural Resources (SEMARENA) as conditions for the granting of the Environmental License established pursuant to Law 64-00 General Law on Environment and Natural Resources. At the same time, it establishes clear auditing mechanisms to ensure that they are fully executed.

The PEMA will be subject to periodic review/revision according to the norms established by SEMARENA and as the environmental questions associated with the project experience significant changes.

This document is limited exclusively to providing a coherent plan for handling the impacts on the environment which are generated during the port operations.

The subjects of health and safety are essential components of this plan and are presented in detailed form in the Plan for Handling of Safety and the Environment prepared by the operator of the port terminal.

The main characteristics of the PEMA for the operation phase are presented below:

- 1. Precise identification and putting into practice of all environmental mitigation measures which will be controlled through the design and methods of functioning.*
- 2. Clear identification and implementation of the good functioning practices in the field in order to minimize the environmental impacts which could arise during ground and marine operations of the terminal.*
- 3. The supervision of the environmental conditions in order to verify the predictions presented in the EIA and promptly identify any unacceptable adverse impact.*
- 4. Efficient reporting systems.*



## **1.2 Background**

The preparation of an Environmental Impact Study for this project was required by the Secretariat of State for the Environment and Natural Resources (SEMARENA) pursuant to the General Law on the Environment and Natural Resources, and by Resolution No. 168-99 of the National District. The Environmental License No. 0013-01 was granted on December 14, 2001, by the Secretariat of State for the Environment and Natural Resources (SEMARENA). The provisions of this license establish the drafting of an Programme for Environmental Management and Adjustment, which has been divided into two phases: construction and operation. The PEMA for the construction phase was submitted to SEMARENA on September 11, 2002, and was approved by the corresponding authorities.

The plan presented below corresponds to the phase of the terminal operation, and is a component which complements the environmental management actions established in the Environmental License. It has been prepared in conformance with the Terms of Reference prepared by SEMARENA in November of 2000.

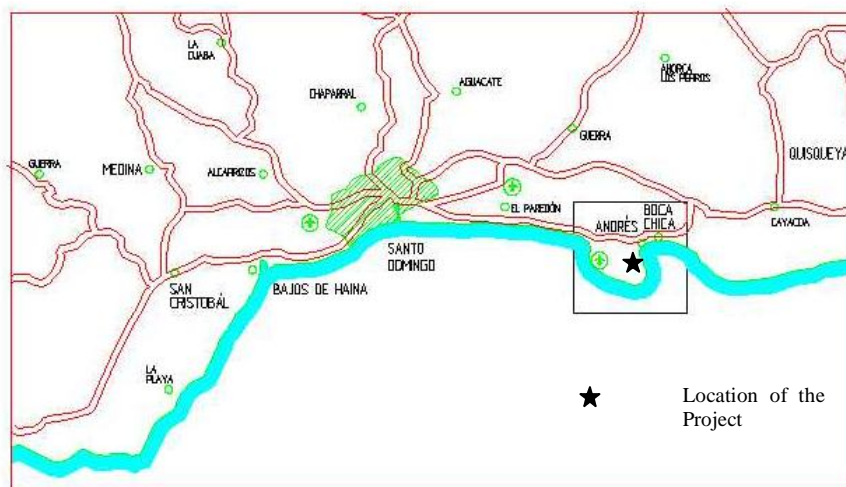
This document provides the PEMA for the project and represents a response to the provisions of the environmental license.

The lack of opportunities to expand and develop the existing ports limits the Dominican Republic's ability to develop commercial opportunities, and considerably limits the socio-economic development of the Dominican people.

In addition to domestic needs, there exists the need for a new transshipment port in the Caribbean which will provide its services to the largest container ships. The Dominican Republic is located at the crossroads between the East Coast of North America and the round-the-globe route through Panamá, and therefore has an ideal location to offer its services to the trade of container transshipment installations, as a result of the growing markets in Central and South America and the Caribbean.

It is estimated that for the next five years the potential annual growth of the container import/export sector is some 12-15%.

The consortium of the Zona Franca Multimodal Caucedo SA (ZFMC) is concluding the construction, and intends to operate a port in the Dominican Republic for the transshipment of containers in Andrés, in the township of Boca Chica, some 25 Km. To the east of Santo Domingo, as shown below in Figure 1.



**Figure 1 Location of the Project**

Below Figure 2 presents the exact location of the project which has been constructed, approximately 1 Km. to the south of the present Port of Andrés and 5 Km. from the port of Boca Chica. The Caucedo Peninsula has been zoned for industrial development. To the south of the project an electrical generating station and natural liquified gas terminal have been built.





**Figure 2 Layout of the Project**

By means of the following legal documents, the consent for the general planning to undertake and operate the Puerto Caucedo Container Terminal and the Development of a Free Zone has been granted:

- Resolution of the National Free Zone Council (CNZF) No. 01-98, dated 20 January 1998.
- Executive Power Decree No. 29-98, dated 28 January 1998.
- Contract No. 107-99, dated 13 August 1999 between the Dominican Port Authority (APORDOM) and the Caucedo Multimodal Free Zone (ZFM).
- Rate of the Contract No. 107-99 between APORDOM and ZFM, dated 17 September 1999.
- Contract between the Dominican State and the ZFM, dated 31 July 2000.
- Permit for Use of Soil by the City Hall of the National District



### **1.3 General Information about the EIA**

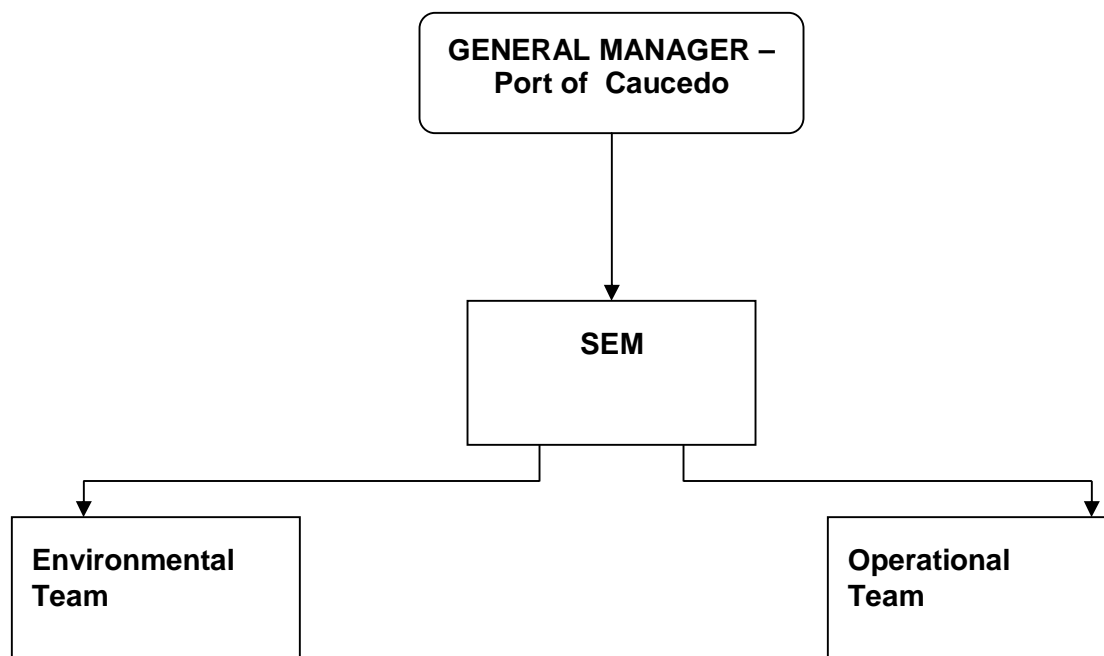
The Environmental Impact Assessment (EIA) constitutes a framework for handling the activities of operation and monitoring of the environmental conditions. The potential impacts on water quality, corals, air quality, noise, and wastes are addressed separately, but using a consistent focus. Measures are also addressed which guarantee the protection of the marine ecology, particularly the corals, and requirements are also specified for the handling of wastes.

The main characteristic of the plan is a clear listing of all of the environmental mitigation measures identified in the EIA. The putting into practice of these measures will be regularly audited by a trained Environmental Team (ET). In addition, the team will have the broadest instructions to guarantee the application of the general Good Operational Practices in order to ensure that the potential for adverse environmental impacts is maintained at a practical minimum. These inspection and auditing activities will be complimented by a broad follow-up program which consists of regular monitoring which will guarantee compliance with environmental quality standards and quick and immediate correction in case problems should arise. The criteria for environmental monitoring are specified, and will promote the initiation of the Action Plans which will guarantee that the Health Safety and Environmental Security Manager (HSES) and the responsible contractors are fully informed about any unacceptable practices, and will contribute a solid mechanism to resolve them.



## 1.4 Organization

Below are illustrated the organization of the project and the lines of communication regarding the environmental protection works:



**Figure 3 Environmental organization of the operations**

The Environmental Team (ET) will be an independent entity of operations team to be employed by the Security and Environment Manager (SEM) to whom it will report directly. The Environmental Team Coordinator (CEA) must be a manager qualified in matters of environment with experience in environmental auditing and monitoring.

The EA will be composed of qualified personnel and will be under the supervision of a Team Coordinator in order to comply with the PEMA's requirements. The duties of the Environmental Team will be as follows:

The duties of the team are:

- To investigate and to audit the operations team and the methods of functioning with respect to the control of contamination and environmental mitigation, and to anticipate environmental questions for pro-active action before problems occur.
- To audit the environmental monitoring reports provided by the operations team for the monitoring reports referring to daily operations and operations proper to the port.



- Performing of supplementary monitoring of the quality of the environment whenever required.
- To determine compliance with the criteria of regulation and the criteria of action of the PEMA.
- To reveal to the SEM and to SEMARENA the status of the putting into practice of the PEMA and the environmental conditions.
- To investigate any environmental incident or complaint, to recommend the immediate solution, appropriate mitigation, and prevention of recurrence.

### **1.5 Environmental Monitoring Work Group**

In order to ensure the effective implementation of the PEMA, we propose the establishing of an Environmental Management Work Group which will review periodically all aspects concerning the plan and the results of the auditing and monitoring work. The Work Group would be headed by the SEM, who would have authority to instruct the organization to amend any unacceptable work practices identified, or orient the Environmental Team to concentrate on any key question which might come up.

Below is a summary of the composition and Terms of Reference of the Work Group proposed:

#### Composition:

SEM (President and Secretary in the meetings)  
Coordinator of the Environmental Team  
Operations Team  
Contractors

#### Terms of Reference:

- To discuss the monthly audit reports
- To discuss the monthly monitoring reports, identify any necessary additional mitigation.
- To identify the need to amend the PEMA and the monitoring program associated with the port operations or other environmental questions
- To verify the progress of the previously identified mitigation measures and the monitoring work.



The Environmental Work Group should meet regularly once per month to discuss the audit and monitoring report prepared by the Environmental Team.

## **1.6 Summary of the PEMA**

Chapter 2 of this document provides an integral list of all environmental mitigation measures recommended in the EIA or otherwise identified during the process of environmental impact evaluation, including all specific requirements for environmental control instructed by SEMARENA in association with the granting of the Environmental License for the port's operation. The origin of each requirement is indicated together with the party responsible for putting it into practice. This responsibility generally falls on the Operations Team, and its implementation will generally be seen to by the SEM through the control of the specification of the program under standard quality control procedures. Wherever other forms of handling will be used, it will clearly be so indicated.

Chapter 3 expands the scope of the design of the audit in order to ensure that the site workers limit themselves to the requirements of environmental management expressed in the EIA (operational phases of the project) and to good work practices on a daily basis. This section describes the routine process of the audit and site inspection and introduces the checklists for the audit and the procedures for corrective actions which will be established by the Environmental Team. It includes the details of the training for environmental management for the field personnel.

Chapter 4 provides the details of the programs for monitoring the environment which will be established in order to provide updated information on the environmental conditions and the actual degree of any impact on the environment. It also describes the criteria of environmental quality which will be adopted and the steps of the actions which will be followed in the event that additional mitigation or the adjustment of the proposals are necessary in order to bring the impacts back within acceptable limits.

Chapter 5 describes the process of drafting of the reports which will be followed during the Port and Terminal operations.

A system of appendices is included in the document which comprises the detailed information required by SEMARENA:

- Operations Plan - Appendix A
- Manual for Environmental Management System - Appendix B
- Contingency Plan for Oil Spills and Dangerous Materials - Appendix C



- Emergency Response Manual - Appendix D
- Health and Safety Handbook - Appendix E
- Hurricane Contingency Plan - Appendix F
- Water Quality Monitoring Plan - Appendix G
- Health, Safety, Environment and Security Plan - Appendix H
- Waste Management Plan - Appendix I
- Construction of Multipurpose Berth PEMA – Appendix J



## **2. DESCRIPTION OF PORT OPERATIONS**

### **2.1 Introduction**

The EIA made numerous recommendations for environmental mitigation measures to reduce the degree of any adverse impact which activities proper to the Port operations could have on the environment during the life of the project. They are related especially to the measures which affect the project's design, the programming, and the operational methods. They are easily favourable to implementation through the process of quality management, adopted already by the promoters, to control the specification of the design and the work methods or functioning used by the Port. This process includes reviewing processes and procedures, before approval to proceed, as well as the verification of the progress of the operations. Other controls over good working practices will be controlled by the routine intervention of the site under scrutiny of the Environmental Team. These measures are described in chapter 3.

The following tables provide an integral list of all environmental mitigation measures which were identified during the EIA process. They include the Environmental Management requirements, as listed in the project's Terms of Reference, in the EIA recommendations, in the previous Environmental Management Plan, in the conditions added specifically to the Environmental License, and other related requirements of SEMARENA.

The tables identify the agent responsible for putting each one of the environmental mitigation measures required into execution, and the mechanism proposed by the General Manager of the Port to ensure that they are carried out.

### **2.2 Description of the terminal operations**

The main functions of the proposed container terminal are the receiving and dispatching of containers. The containers will arrive and depart from the port on board ships which arrive from abroad or other places inside the Dominican Republic, and will be conveyed by trucks which arrive from all regions of the country. It is expected that 60% of the containers passing through the port are destined for import or export from the Dominican Republic, and that 40% will be transshipped from one ship to another.

When a ship arrives and docks at the terminal, the container handling equipment will unload them onto tractor rigs. These vehicles transport the containers to places inside the container yard where they will be piled for temporary storage. The movements of containers are recorded by computerized systems so that their location and the contents of each container remaining inside the container area are known. It is projected that when the terminal begins operations in the year 2003, it





will have the capacity to handle the present volume of trade experienced in the DP World in Haina West, and a portion of the volumes presently handled by the wharf in Haina East. In addition, it will have the capacity to handle a significant volume of transshipment containers. It is expected that by the year 2004 the terminal will handle approximately 320,000 container movements per year. This will increase to 700,000 movements per year with a 40% transshipment load for the year 2010, and more than one million movements per year by the year 2020.

These projections of activity have been used in the preparation of the general plan of phases for the terminal. The projected expansion of the dock, the breakwater, and the expansion of the container yard will respond to the terminal's success in reaching these figures. It is expected that for its first year of operation, the terminal will receive up to 30 container ships per week. It is expected that, due to the nature of the conditions of the seabed in the site, maintenance dredging in the navigation channel and the docking berths will not be required.

### **2.3 Ship Operations**

During the preparation of the port's design, a study was made to evaluate the best route a ship should take when arriving in the port. The direction of approach to the entrance to the port and the manoeuvres to be performed will depend in large measure on the type of ship arriving, and the direction of the winds and waves prevailing at the moment. The study determined that in order to optimize the compatibility with the terminal's design, the approach route requires that the ships arrive from the south, parallel to the breakwater, and slow down under their own power. Then, assisted by tugboats, they would turn eastward in deeper waters at the extreme north end of the breakwater. Once the ship is lined up, it would enter the berth in reverse. Only two tugboats will be required during the ships' docking.

The design of the ocean works is directed towards facilitating the simultaneous and adequate docking for two Panamax ships of the Sea-Land Champion Class size. The development of Phase 2 includes docks adequate for Post-Panamax ships similar to that of the Class K/Maersk-SeaLand Regina. There will also be installations for RoRo type ships of size both inter-island and inter-ocean, plus facilities for the docking of cruise ships. In Table 1 are presented the sizes of the largest ships expected to dock in the terminal.





Characteristics	Phase 1	Phase 2
	SEALAND CHAMPION	REGINA MAERSK
Total length (m)	292.2	318.0
Beam (m)	32.3	42.0
Maximum Draft (m)	13.0	14.0
Displacement (tons)	66,004	109,534

**Table 1** Characteristics of the largest ships expected to dock in the terminal

Once the ship has been tied to the dock, the container handling team begins unloading operations. During this process, the ship is serviced. It is probable that facilities will be provided for tugboats and ships for the pilots inside the Port of Andrés. No anchoring of ships in the Bay of Andrés will be permitted.

Notices of arrival and departure of ships will be channelled through the office of the Port Captain. The time that a ship remains in the dock will be directly related to the number of containers it transports. As the size of the ships increases, and the number of movements per ship grows, the total volume of traffic of ships will grow; nevertheless, this will occur at a lower rate than the movement of containers through the terminal.

It is expected that at the beginning of operations, the profile of the ships that will dock in the port will be similar to those in Haina in terms of number and size. Nevertheless, once transshipment clients are incorporated into the regime, it is projected that both the size and the number of movements per ship will significantly increase.

It is considered that the existing land-based traffic lighthouses which help the ships on their arrival to the neighboring Port of Andrés will be sufficient to mark the approach route to the Port of Caucedo during Phase 1. Nevertheless, it is noted that the design of the project's Phase 2 indicates that the transit line from Andrés passes by the extreme northern end of the breakwater, and that way we will need to place some traffic lighthouses. It could also be necessary in Phase 2 to contemplate the realignment of the navigation channel to the Port of Andrés with the corresponding changes in location of the buoys that mark it.

It is not considered necessary to have navigation markers inside the port. Nevertheless, in compliance with international norms, the extreme northern end of the breakwater will be marked with the two vertical fixed conventional red lights, as obstruction to navigation.



## **2.4 Operations of the Container Yard**

In order to have the storage area required to take the volume of cargo activities forecast. (sic) The projected figures estimate that at the beginning of the operations, a storage capacity will be required of 5,200 standard container units (known as units equivalent to forty feet, or FEUs). This number will increase to 9,400 FEUs for the year 2010, and some 14,000 FEUs for the year 2020.

In order to fulfill the requirements for the year 2003, the storage area will be directly behind the phase 1 wharf. This will guarantee a total capacity of 9,200 FEUs. As the requirements increase, the container area will be developed towards the north.

In order to move the containers inside the yard, several types of specialized equipment will be used:

- A total of five gantry cranes have been assigned to the development of phase 1, and four additional ones in phase two of the operations. These cranes will be used to cover the width of the deck of the largest ships which are expected to use the port, and to lift the containers and transfer them to the yard vehicles.
- Rubber-Tyred Gantry cranes (RTGs) will be used to move the containers from the yard vehicles (bomb carts) to the container piles. These piles will be up to five containers in height, and six containers wide. The number of RTGs used on the dock will depend in last instance on the level of activity, but initially there will be ten of these machines.

The effective placement of the containers inside the yard is essential for the efficiency of the operations; for that purpose each container will be moved to the optimum position on numerous occasions during its stay in the terminal, based on the process applied to it (e.g. verification, inspection, etc.). Maximum use will be made of computerized methods of control in order to help in the movement of the containers. The optimization of the placement of the containers will be carried out in order to minimize the time of transfer of the containers between the cranes to the RTGs which in last instance is what determines the terminal's productivity.

## **2.5 Port Operations**

The distribution of the ground installations has been designed to optimize the flow of vehicles inside the terminal, and to minimize construction costs. The gate for access to the terminal has been placed at the point closest to the Las Américas highway. The routes for entry to and departure from the terminal have been scaled in order to minimize their surface area and to maximize the gate's capacity.

The trucks that arrive at the gate coming from the interior of the country must stop at the entrance gate to allow a check to be made, and to comply with certain



administrative functions. These checks include the gathering of the information required by the terminal, as well as the condition of the container, the nature of any product which requires special handling, the temperature required of any refrigerated container, etc.. Once it passes through the gate, the truck will proceed eastward along the highway towards the yard where there will be equipment to receive or deliver the containers. Once the truck has completed its operation in the wharf, it will proceed along the highway towards the exit gate where the checks and administrative procedures for exit will be performed.

The design of the gate is focused on reducing the waiting time for the trucks to a maximum of 20 minutes no matter what transaction is to be carried out at the gate, and to accommodate the total length of the line which may be formed at the gate. In this way the location of the gate inside the terminal will prevent the waiting lines not prevent the access of vehicles to other areas of the terminal or to the Free Zone.

It is projected that for the year 2004 during the maximum peak days, some 1,000 daily visits will be processed through the terminal gate. This will increase to 2,400 daily visits in 2010 and some 3,300 visits per day in the year 2020. The gate has been designs in such a manner that it is possible to expand the installations in order properly to process the increase in number of visits.

### **2.5.1 Vehicular traffic**

The gate has been designed to minimize the surface area occupied, and to maximize efficiency, being located in the northwestern corner of the terminal. The gate personnel will process the trucks that arrive with loaded and empty containers, and tractor rigs which arrive to pick up a container. The trucks will be separated into different lanes according to the purpose of thier visit.

Sixteen lanes will be needed to accommodate the traffic for 10 years after the opening of the project. Twelve lanes will process the arrivals, and four lanes will process the departures. The volumes expected for the year 2020 will need three additional lanes for arrival, and one additional lane for departure.

The arrival of containers during the day will vary each hour. Based on the pattern of arrivals observed in Haina, there exists a peak of truck arrivals just before noontime, and a second peak in the afternoon (3-4 PM). The comparisons of patterns of arrival in the case of a gate open for 10 hours or 16 hours indicate that as the volumes increase and the hours of operation are expanded, the distribution of traffic tends to be distributed more evenly instead of accentuating the peaks in traffic.

All traffic enters/exits the terminal along the access road which will join the terminal with the Las Américas Highway. Approximately 85% of the traffic to and from the



terminal will travel to/from the west side of Caucedo (Santo Domingo). The remaining 15% will travel to/from the eastern side (Boca Chica).

## **2.6 Supplementary Operations**

Besides the main functions of the terminal for the handling of the containers, it is necessary to offer support operations. These functions will guarantee the successful and productive operation of the terminal.

There will be maintenance installations which will permit the maintenance of the container handling equipment (gantry cranes, tractors, RTGs, etc.), infrastructure (roads, buildings, gate, etc.), and refrigerators. There will be limited installations for maintenance both of the mechanical equipment and for the containers that pass through the terminal.

The present Customs regulations require that all import and export cargo be verified by customs officials in order to certify that it has been duly declared. For these purposes it is necessary to have available installations for the customs officials to inspect the contents of the containers destined to or from the local Dominican market. The verification of a container can take from two to six hours. Normally the container is emptied into an adjacent empty container in order to limit the handling of the cargo. A Customs Verification Station has been made available inside the infrastructure of the terminal in order to be able to provide this service. The transshipment containers are not subject to this type of customs inspection.

An adequate lighting system will be made available in the container yard through lighting from high poles located on the perimeter of the terminal, thus guaranteeing a safe and productive operation. The location of the light posts has been selected in order to avoid obstructing the road for the vehicles that use the yard. There will be radio antennas and digital video cameras mounted on lightpoles in order to facilitate effective communication.

Safety installations and equipment have been identified to fulfill the terminal's needs. This equipment will include video cameras supported by site supervisors, and the possible inclusion of "watchtowers" in the event that the authorities should so require.

Fire hydrants will be available which will use sweet water. Training and evacuation procedures have been drafted with a view to the initiation of the operations.

Limited kitchen installations will be available inside the terminal to supply food to the administrative employees. There will be recreation rooms in each one of the buildings, which will be equipped with microwave ovens and refrigerator. It is expected that there will be available a food market which will include food booths for use of the labour force.



Despite the fact that the terminal will not have available complete medical services, it will sign a contract with a local specialized company which will offer ambulance and emergency care services. It is possible that these installations be established inside the adjacent commercial free zone. First aid equipment will be available on site for the treatment of minor injuries.



### **3. IMPACT DURING THE OPERATION**

#### **3.1 Terrestrial Flora and Fauna**

It is not expected, as a result of the terminal's operation, that there will be any additional impact on the terrestrial flora and fauna. The proper handling of the green areas will increase their value for conservation, and will therefore benefit the local flora and fauna.

#### **3.2 Marine Fauna and flora**

##### **3.2.1 Ship Movements**

The movement of the ships, especially when turning to enter the port, could have an impact on the sensitive marine fauna and flora by causing an increase in the suspended sediments in the water. Nevertheless, the zone where the ships turn is not located over any coral area, and it is also considerably deeper than the area where the port is located. Therefore a moderate impact on the marine flora and fauna is expected due to the movement of ships.

During the studies of marine flora and fauna, it was estimated that a container ship anchored in coral reefs in approximately some 30m of water can cause damage to the reef; this practice will not be permitted during the operation of the port. In addition, the handling of the arrivals and departures of the ships implies that the ships will not have to wait to dock in the Bay of Andrés. Consequently there will not be any impact on the traffic entering the Boca Chica lagoon.

A program of continuous monitoring of the health of the marine flora and fauna will be carried out. This program includes the monitoring of the expected recuperation of the fish population in the zone, and the quantification of the colonization in the breakwater.

##### **3.2.2 Maintenance dredging**

One of the key concepts in the location of the proposed project in Cabo Caucedo was the fact that no maintenance dredging will be needed. There is little movement of sediments in the navigation channel, as shown by experience in the Andrés navigation channel, as well as in the port's turning basin. Therefore there will be no negative impact on the marine flora and fauna because of maintenance dredging.



### **3.2.3 Spills or discharges of fuel or chemicals**

The areas for service and fuels for the container yard's operational equipment have been totally protected with retaining walls. Therefore any spill in these areas of the terminal will be contained, and there will not be any impact on marine or terrestrial flora and fauna. No bulk chemicals will be imported or exported in the terminal, so it is not expected that there will be any indirect impact on these areas caused by materials transported through the terminal.

### **3.2.4 Movement of vehicles**

The vehicles will be directed towards and from the terminal over the new access highway. There will not be any significant impact on the ecology or resident community as a result of the displacement of the vehicles to and from the terminal.



## **4. MITIGATION OF IMPACTS CORRESPONDING TO THE OPERATION**

A contingency plan has been prepared for oil spills (Appendix C), which must guarantee that any spill be contained and cleaned up rapidly and efficiently.

### **4.1 Impact on Air Quality and Mitigation**

#### **4.1.1 Operation of the terminal**

It is not expected that the operation of the terminal itself will produce any significant impact on the air quality. No bulk or uncovered material shall be exported, imported, or stored in the terminal.

Vehicular traffic to and from the terminal will create a moderate impact on the air quality of the zone. There will be frequent monitoring of the emission of CO<sub>2</sub> in the Port's zone.

#### **4.1.2 Vehicles which use the access highway**

The increase of traffic over the access highway has the potential to cause an impact on the quality of air experienced by the residents located along the road; specifically, an increase in contaminants such as benzene, nitrogen oxides, and particles. The concentrations of primary contaminating substances generated by the vehicular traffic are reduced exponentially with the increase in distance from the road. This means that at 50 m from the center of the road, the concentrations of carbon monoxide, nitrogen oxides, particles, and non-methane hydrocarbons (benzene and related compositions) are recorded at less than half the levels found in its center. In addition, the final aligning of the access highway has meant that this impact be reduced significantly.

#### **4.1.3 Model of Air Quality**

In order to evaluate the potential impacts on air quality as a result of the movement of vehicles along the access highway, a study was performed using the methodology of the Highway Agency of the United Kingdom. This methodology represents a screening method to identify the possible problems of air quality. The method requires the identification of receptors/receptacles, which are sensitive to air quality up to a distance of 200 m from the access road. Then it calculates the concentrations of atmospheric contaminants for these receptors/receptacles, using





data such as the annual figures for the average flow of traffic, the annual average of traffic speeds, and the percentage of heavy vehicles and their average speed. The initial values are given for the basic concentrations, besides the equations which permit the calculation of future concentrations. The concentrations deriving from the average annual traffic thus calculated are converted into values adequate for purposes of comparison with the air quality standards used in the United Kingdom for purposes of protection of human health. These standards are derived from Directive 96/62/EC of the European Community on the evaluation and handling of environmental air quality, from the "Reference Framework Directive on Air Quality," and their corresponding Directives.

The methodology was applied using the expected weekly volumes of entries and departures in the year 2003 and the year 2020, and supposing a 10-hour working day. Three receptors were selected at 5m, 10m, and 50m from the edge of the pavement. A traffic of 100% heavy vehicles (trucks) was supposed, i.e., no local traffic was included in the calculation. In the absence of local data, the calculation supposes a base value similar to the one expected in the United Kingdom, which probably would be less than that of the Dominican Republic, and which is based on factors of emissions of the vehicular fleet of the United Kingdom.

A model was created of the following contaminants:

- Nitrous Oxide (NO<sub>2</sub>)  
Combustion processes emit various nitrous oxides (No<sub>2</sub>), ground transportation being responsible for an important proportion of the total amount of same.
- Carbon Monoxide (CO)  
Combustion processes also produce carbon monoxide, ground transportation being responsible for a significant proportion of same. It is quickly absorbed into the blood, forming carboxyhaemoglobin, which reduces the blood's ability to transmit oxygen. Carbon monoxide is acutely toxic in high levels of concentration, but high atmospheric levels could also have chronic effects on health.
- Fine Particles (PM<sub>10</sub>)  
Particles comprise a wide variety of chemical compositions. Fine particles less than 10 µm in diameter (so-called PM<sub>10</sub>), which are emitted predominantly by diesel engines, are especially harmful to health, because they pass into the lung cavities.
- Benzene



Benzene is an aromatic hydrocarbon, which is known to be a human carcinogen, associated with leukemia.

- 1,3-Butadiene

It is suspected that 1,3-butadiene is also a human carcinogen formed in the process of fuel combustion.

#### 4.1.4 Results

The levels of carbon monoxide, benzene, 1,3-butadiene, and PM10 generated by the traffic corresponding to the proposed project were all considerably less than the relevant norms and standards of the United Kingdom. Below Table 2 presents the highest value forecast for each contaminant of the model and the corresponding norm/standard.

The data on forecasted nitrous dioxide exceeded the average annual standard both at 5 m and at 10 m from the road in the year 2003. Nevertheless, the 99.8th percent level of the average norm per hour of NO<sub>2</sub> was not exceeded; in the United Kingdom they frequently exceed the average annual norm of NO<sub>2</sub>.

The model includes an integrated correction factor taking into account improvements both in vehicular technology and in the cleaning of the fuel over a period of time. Therefore, all increases in the flow of traffic should be imposed on this integrated correction factor so that one can see a negative effect over time. For that reason the highest concentrations forecast will be seen in the year 2003 despite an increase of flow, which are forecast for 2020.

Contaminant	Norm	Measured as	Highest concentration forecast		
			Value	Year	Location
CO	11.6 mg/m <sup>3</sup>	Maximum average 8 hours	1.88	2003	5 m
Benzene	16.25 µg/m <sup>3</sup>	Annual average	1.18	2003	5 m
1,3-butadiene	2.25 µg/m <sup>3</sup>	Annual average	0.16	2003	5 & 10 m
PM <sub>10</sub>	40 µg/m <sup>3</sup>	Annual average	19.45	2003	5 m
	50 µg/m <sup>3</sup>	90 <sup>th</sup> % of daily average	34.81	2003	5 m
NO <sub>2</sub>	40 µg/m <sup>3</sup>	Annual average	49.6	2003	5 m
	200 µg/m <sup>3</sup>	99.8 <sup>th</sup> % of average per hour	178.32	2003	5 m

**Table 2 Forecasted concentrations of contaminants resulting from traffic on access road**



## **4.2 Mitigation**

Based on the results of the model described above, one can see that the annual concentrations of nitrous dioxide exceed the norm of the United Kingdom for the protection of human health. The fact that the access highway was aligned along the airport fence and therefore far from the road of the most highly populated zone has minimized the impact of these contaminants in the area.

## **4.3 Noise**

### **4.3.1 Terminal activities**

Daily terminal activities such as the loading/unloading of ships, handling of containers, etc., do not generate important levels of noise because the equipment around which the personnel works functions based on electrical energy, which makes it extremely silent. The personnel will not require ear protectors.

### **4.3.2 Traffic on the Access Highway**

The impacts during operations will be the result of the traffic of the containers which arrive and depart during the course of the day. A peak volume of 1,000 visits per day is expected after the start-up of the operation, afternoon hours being those of greatest activity.

### **4.3.3 Mitigation of Traffic**

Detailed consultations will be held continuously with the residents along the access highway, which can result in the relocation of those persons most affected by the terminal operations, and specifically by the traffic.

The fact that most of the access road is marked between two fences has permitted the reduction in transmission of the noise.

## **4.4 Impact on Water Quality**

An operational program for monitoring water quality will be developed as part of the Environmental Management System (Appendix B). Samples will be taken from the point of discharge to permit compliance with NORDOM 436, or with the guidelines



of the World Bank, whichever are more demanding. Samples will also be taken of the surface runoff waters of the access road. The parameters to be measured will include the pH, temperature, solids in suspension, BOD, COD, and oils and grease; the results will be provided to SEMARENA. It is recommended that the parameters be measured at the beginning of the operation, and subsequently at six month intervals to guarantee the good functioning of the infrastructure. Subject to SEMARENA's approval, it is expected that this frequency can be maintained at these levels.

#### **4.4.1 Changes of currents, flow regime, dissolving and dispersion in the Bay of Andrés.**

Numerical models will also be used to evaluate possible impacts resulting from the project's operation, specifically an evaluation of the port's potential to:

- Alter the currents/regime of flow existing in the Bay of Andrés.
- Reduce the dissolving and dispersion of key contaminants to the point that there is an increase in the negative effects on the health of bathers (due to pathogenic bacteria) or the growth of algae (due to excess nutrients).
- Have any other effect on the marine environment, e.g. effects on the regime of erosion/sedimentation inside the reef.

Four different scenarios will be prepared in order to examine the impact of the proposed project. These scenarios are described in detail in Appendix G of the EIA and were selected in order to represent the situations under which it would be expected that the project would have the greatest impact on the circulation of waters.

Each scenario was modelled to represent the continuous discharge of a representative substance discharge from the entrance to the Port of Andrés.

Under each one of the four scenarios, the location of the Phase 2 breakwater did not cause any deterioration in water quality inside the Boca Chica lagoon, nor did it cause any change in the direction of the currents or the regime of flow. Similar results can be inferred for the Phase 1 breakwater. Nevertheless, the location of the breakwater caused a slight deviation in the dispersion towards the south of the substance along the eastern coast of the Caucedo Peninsula without significant consequence.

Therefore no mitigation measure is required.



#### **4.4.2 Minimization of Impacts During the Design Process**

Insofar as is feasible, there have been eliminated in the design the possible impacts on water quality as a result of the project's operation, by means of the following measures:

- Locating the areas for servicing vehicles and the mechanical plant, bays for washing vehicles, and bays for lubrication inside covered (roofed) areas and encircled by dikes wherever possible. The runoff (drainage) in these covered areas has been connected to the sewerage system through an oil interceptor or catch. All areas with dikes have a volume of 110% of the capacity of the tank they contain.
- A sewerage treatment plant has been installed so that there will not be any discharge into the subsoil.
- Designing the rainwater runoff from the access road, in accordance with norm M-019 of the Secretariat of State for Public Works and Communications (SEOPC) Provisional Recommendations for the design and construction of highway drainage systems.
- Refraining from directly extracting underground water.
- Processing leaks of products which require special handling, in a specialized area of the container yard as described in Section 4.4.5 of the EIA. This area will be covered and enclosed by a retaining dike. Equipment against spill/neutralization will be maintained for specific materials if required.

#### **4.4.3 Service areas**

Waste oils and hydraulic and engine fluids must be stored in clearly marked containers inside a roofed area enclosed by retaining dikes, before they are picked up by an approved contractor, for purposes of recycling or disposal.



#### **4.4.4 Emergencies and accidents**

Any leak or spill of oil must be immediately contained and cleaned up; equipment against spills must be provided in all service areas and lubrication bays, and in any other area as applicable. A contingency plan must be drawn up for oil spills as described in Appendix C.

#### **4.5 Socioeconomic Impacts**

The key potential positive and negative impacts resulting from the project's operation on the local community were identified in the socioeconomic study (Appendix O of the EIA) and are summarized below:

##### **4.5.1 Employment**

The operation of the proposed project will generate between 5,000 and 8,000 direct jobs, together with some 15,000 indirect jobs, of which it is expected that 90% will be available for local workers. The recruiting of personnel for the operation has emphasized contracting local personnel in order thus to contribute more pointedly to the benefit of the community.

##### **4.5.2 Migration**

The development of the tourism industry over the last 25 years has resulted in migration towards the area of Andrés Bóca Chica. The project's operation has the potential to generate migration coming from other areas of the country of persons seeking employment and opportunities associated with the project. Nevertheless, this has not been the case, because 80% of the local labor opportunities have been occupied by workers from Andrés and Boca Chica.

##### **4.5.3 Use and Value of Lands**

It is probable that the operation of the proposed project and the benefits for the local economic resulting from the project will raise the values of lands in the area. This will benefit the legal owners of lands, but could have a negative impact on people who at present live in dwellings which are rented or who are illegal occupants of lands. Regarding this inevitable impact, we cannot take any mitigation action whatsoever.



#### **4.5.4 Infrastructure and Public Services**

The construction of the access highway has improved the quality of the infrastructure in the area. The local school adjacent to the access highway has been improved in accordance with the wishes presented by the community itself after a series of consultations with the residents.

Eight of the nine key sectors of the community who were interviewed during the course of the socio-economic study agreed that they were in agreement with the proposed project, and were of the opinion that it would represent a benefit for their respective sector within the community. The key positive impacts which were identified for these sectors and the local interviewees in the four barrios are the following:

- The proposed project would reduce the level of unemployment in the area, which is considered very high after the closing of the sugarmill; 93% of those interviewed indicated that the employment benefits would constitute their principal motive to support the project.
- Andrés Boca Chica has a “right to development.”
- The tourism sector does not offer any benefit to the sector where the proposed project is located.
- The proposed project will activate the local economy through direct and indirect employment.

The key negative impact which those interviewed indicated was the fact that the people from other zones would feel attracted to the area of Andrés Boca Chica, thus increasing the pressure on the infrastructure and local resources, etc.. This has not been the case because most of the employees come from the area adjacent to the project.



#### **4.5.5 Relocation of Residents**

It is not expected that the operation of the proposed project requires any additional resettlement. If it should be required, it would be carried out pursuant to the guidelines of the World Bank which are in effect at the moment.

#### **4.5.6 Mitigation**

As part of the recruiting for the start-up of the project's operation, training and skill-building has been offered to the residents of the locale so that they have improved their skills and had the opportunity to apply for the best paying jobs to be offered in the port's operation. Consultation and dialogue have been maintained with the local residents, and not only with those persons directly affected by the project. In this way their points of view and concerns have been and continue to be dealt with, thus promoting the participation of the interested parties, which at present has been increasing.

#### **4.6 Visual impact**

The main visual impact caused by the port is that of the gantry cranes, which have an operational height of some 70 m. Five additional gantry cranes will be installed as programmed for Phase 2. Nevertheless, the distance of the peninsula from the beach is such that the visual impact of the proposed project can be considered moderate. In addition, the presence of the islands of La Piedra and La Matica imply that the terminal cannot be seen from several parts of the beach.

#### **4.7 Traffic**

Despite the fact that the volume of traffic generated by the operation of the proposed port will be significant, the traffic will not pass through Boca Chica and therefore there will not be, as there was none during construction, any impact on tourism or the residents of the area.

##### **4.7.1 Vehicles to receive and dispatch containers**

Traffic will increase on the Las Américas Highway insofar as the containers are destined to the local market; likewise the containers carrying goods produced in the Dominican Republic will travel to the Port of Caucedo to be exported. Nevertheless, it is important to note that a significant proportion of the containers





will be destined for the project's free zone park and for transshipment, and that therefore this volume will not affect the local traffic.

The traffic generated by the proposed project will vary according to the hour; the pattern observed in the Port of Haina reflects a peak just before noon, and a second peak in the middle of the afternoon.

The access highway has been designed to comply with the levels of traffic expected beyond 2020. As the design of the accessway will incorporate a ridge, the local traffic will have access on both sides of the road.

#### **4.7.2 Mitigation**

With the works of expansion of the Las Americas Highway related to the Pan American Games and which are presently being performed, any additional load caused by the container traffic to and from the proposed project will be alleviated.

The intersection with the Las Americas Highway will be improved through an overpass, in order to raise the level of safety and maintain a minimum of lines of traffic in both directions.

#### **4.8 Diving**

The key potential impact on tourism refers to the closing of the skin diving sites, which was the result of the construction and operation of the port.

The closing of the sites for skin diving could have an impact on the businesses of the skin diving operators in Boca Chica. This could be the result of an increase in the number of divers in other sites, which produces less satisfactory diving and a reduction in repeat visitors; or it could force the operators to visit more distant sites, which would mean that fewer trips could be made on an average day.

##### **4.8.1 Mitigation**

The project has submitted to SEMARENA a project to improve the environmental quality of the island of La Matica and integrate it into a scheme of use which could be advantageous for skin diving operators. In this way an environmental compensation for the zone is made in an integrated manner, which includes skin diving activities.



#### **4.9 Additional Tourism**

The multi-purpose dock inside the proposed project has the potential to become an installation for cruise ships which would offer services to more than 100,000 tourists per year. Conversations are constantly being held with cruise ship operators regarding the possibility that the proposed project offer a port of call for cruise ships.

#### **4.10 Solid Wastes**

The solid wastes will be removed daily by a contracted company, and therefore they will not have any impact on the existing municipal services of garbage collection.



## **5. ACCUMULATED IMPACTS**

### **5.1 Existing Developments**

#### **5.1.1 Sugar mill**

The sugar mill has ceased its operations. Therefore there does not exist any possibility of bothering or interfering with the sugar mill's operation due to the proposed project.

#### **5.1.2 Port of Andrés**

The Port of Andrés at present serves approximately some 300 ships per year. Of these, some are container ships, which produce the movement of container vehicles on the surrounding roads. The following measures will be implemented in order to guarantee that the operation of the proposed project not block or interfere with the Port Andrés operations.

- A liaison and daily communications will be maintained with the Captain of the Port of Andrés in order to exchange updated information about ship movement and mechanical plants.
- At no time will the tie lines be extended to the zones used for navigation.

It is probable that some support services such as tugboats will be based in the Port of Andrés, and that therefore the existing port will benefit from the operation of the Port of Caucedo. The following measures will be implemented in order to maximize the operational safety of the Port of Caucedo:

- Every ship will be led to the terminal by one pilot aboard and will be assisted by tugboats.
- It has been required that the tugboat contractor undertake detailed simulations in order to determine the procedures, which have been established as operating instructions. These procedures will also be used to train the pilots.



- A ship control system will be prepared in order to guarantee that no conflicts are caused by the close proximity of the two ports.
- The ships will arrive and depart from the container terminal according to a planned timetable, and will adjust their speed accordingly in order to guarantee the punctuality of their arrival. Therefore there will be no need for the formation of lines of ships inside or outside the Bay of Andrés.

### **5.1.3 Airport**

The Las Américas Airport is some 3 Km. To the west of the project's location. Studies of air space performed for this project have shown that the proposed heights of the cranes will not violate the requirements of the Federal Aviation Authority (FAA) or the International Civil Aviation Authority (OACI).

### **5.1.4 Port of Haina**

It is projected that some container lines will transfer their operations from Haina to Puerto Caucedo given the existing levels of saturation. Nevertheless, the projected commercial growth, the high percentage of transshipment in the Caucedo terminal, and the volume generated by the adjacent Free Zone Park will generate sufficient specialized activity not to affect Haina significantly and to keep it as the largest port in the country.

### **5.1.5 AES Electrical Generating Plant - Operation**

Liquid natural gas will be delivered by ship every 28 days, and will be stored in a tank of some 52 m in height and 83 m in diameter. The unloading process will take approximately 12 hours. The hydrocarbon fuel will be delivered by barge, and will be stored in an above-ground tank. Deliveries will be required every 12 days, although will increase to a frequency of 9 days in the event that there is no availability of gas.

### **Emissions**

Two chimneys will be built: one emergency chimney of some 38 m in height and 6 m in diameter, and the main chimney of some 42 m in height and 6 m in diameter.

The emissions from the electrical generator will include the following:



- Particles (PM<sub>10</sub>)
- Sulphur dioxide
- Nitrogen dioxide
- Carbon monoxide

The maximum level of concentration of these contaminants will be 40% of the value stipulated by the World Bank, and the majority will be between 20 and 25% of the World Bank's Norms. Therefore it is not required to apply to the chimneys any mitigation measure or emissions control.

### **Discharges**

The electrical generator will use seawater for chilling, and will use approximately 25 million liters per hour in the combined cycle mode, which will be treated with chlorine, acids, biocide, and "inhibitors to prevent corrosion." The plant will use a primary biological treatment of residual sanitary waters and separators for waters contaminated with oil and grease. The effluents will be monitored regularly to guarantee compliance with the NORDOM 436 limits.

### **5.1.6 Future developments**

#### **Free Zone and Logistical Center**

The Free Zone Park will be designed as a high-quality Logistical Center with green areas and low buildings, similar to the industrial free zone operated in the Parque Industrial Itabo S.A. in Itabo. It is intended to permit only the installation of merchandise storage and distribution activities as well as high technology and high added value assemblies in the free zone. It is expected that international companies will be attracted to the free zone due to its proximity to the multimodal terminal and to the airport. The free zone will be an independent premises with its own cafeteria services and other facilities for the personnel working there, and therefore there will be no demand for food stands, which exist on the access road to the Port of Haina.

#### **Sewerage treatment plan financed by the World Bank**

When the scoping study was performed (November 1999), the construction of a new sewerage treatment plant financed by the World Bank as part of its "Water and Sanitation Project in Tourism Centers" was to be initiated at the end of 2000. The plant would be located to the northwest of the proposed port, and would cover five large aerobic treatment lagoons capable of processing some 600 m<sup>3</sup>/hour of sewerage from the airport, Andrés, and Boca Chica. The final effluent would be injected into the limestone bedrock, or discharged into the ocean at the site proposed for the Port of Caucedo's breakwater, or it could discharge beyond Punta



Caucedo. Nevertheless, the construction of the installations still has not been begun, and it is understood that there is no probability that the plant will be built in an immediate future.

### **5.1.7 Summary**

All future developments of which there is knowledge in the zone of the proposed project, as well as the project itself, have been designed, constructed, and operated by highly reputable domestic or international companies. This fact, together with the powers of SEMARENA in relation to the approval of the developments and its consent in regard to the monitoring and audit of the construction and operation of infrastructure projects, mean that all of the installations have been duly constructed and shall be operated with due consideration to environmental concerns and impacts. In addition, the ZFMC and the AES Andrés have been closely collaborating during the planning and implementation of their respective projects to guarantee that opportunities be maximized.

## 6. IMPLEMENTATION OF THE ENVIRONMENTAL MITIGATION MEASURES

### 6.1 Water Quality

Mitigation Measure	EIS/ EMP SEMARENA/ PA ref.	Implementation Agent
Areas for servicing vehicles and other mechanical plant, bays for washing vehicles, and bays for lubrication should be inside covered (roofed) areas and encircled by dykes/bunds wherever possible. The runoff (drainage) in these covered areas has been connected to the sewerage system through an oil interceptor. All areas with dykes/bunds have a volume of 110% of the capacity of the tank they contain.	EIS 13.3.2	Maintenance Manager
A sewage treatment plant has been installed and must be correctly used and maintained to ensure there is no effluent discharge to groundwater.	EIS 17.4.2	Maintenance Manager
Rainwater and surface water from the main operations area, storage areas and access roads to go to a drainage system designed, constructed and maintained in accordance with SEOPC Provisional Recommendations.	SEOPC M-019	Operations Manager
No water supply shall be taken directly from groundwater sources.	EIS 13.3.2	Operations Manager
Storage facilities for hazardous materials or those requiring special handling, shall be provided with sufficient fire protection systems to control fires and/or the release of hazardous materials to the environment.	Client requirement	Operations Manager
Any leak or spill must be immediately contained and cleaned up. Equipment to deal with spills must be provided in all service areas and lubrication bays and in any other area as applicable. A contingency plan for oil spills must be available at all times.	EIS 13.4.2	SEM
Discarded oils, hydraulic fluids, and motor fluids must be stored in clearly marked containers in a roofed area enclosed by earthen dykes/bunds, before being picked up by an approved contractor or before their recycling or disposal.	EIS 13.4.1	Maintenance Manager
No maintenance, refuelling or storage of hazardous materials shall occur within 100m of	Client	Operations

the ocean, a borehole, well or swallow hole.	requirement	Manager
An operational water quality monitoring programme will be developed as part of the operational management system. The details are found in an Appendix to this document.	EIS 13.4.3	SEM

## 6.2 Waste

Mitigation Measure	EIS/ EMP SEMARENA/ PA ref.	Implementation Agent
Waste generated during the day to day operation of the facility should be separated and recycled where possible.	EIS 17.4.2	Manager of Building Services
Any waste materials that can not be re-used shall be disposed of to approved official waste disposal sites. All waste management contractors shall be authorised by SEMARENA. Waste materials destined for landfill will be transported by truck	EIS 17.4.1 SEMARENA mod. No. 3	Manager of Building Services
Burning of waste on the site will not be permitted	EIS 17.4.1	Operations Manager
Solid waste will be removed by a contractor on a daily basis.	EIS 17.4.2	Manager of Building Services

## 6.3 Ecology

Mitigation Measure	EIS/ EMP SEMARENA/ PA ref.	Implementation Agent
The management of vessel arrivals and departures should be managed in such a way that vessels will not be waiting and needing to anchor in Bahia de Andres.	EIS 10.3.2 EIS 18.1.2	Port Manager



Mitigation Measure	EIS/ EMP SEMARENA/ PA ref.	Implementation Agent
In manoeuvring, the principal disturbing forces will be due to the tugboats, which have a relatively shallow draft, and which will not have any impact on the sea bed at this depth. Therefore no impact on the marine flora and fauna caused by the movement of the ships is expected, however monitoring the practices of ships' turning and docking will be undertaken.	EIS 10.3.2	Operations Manager.
In conformance with the requirements of MARPOL 73/78, in cases of emergency only, facilities for receiving oily wastes, sewerage, etc., from the ships will be provided. Also a contingency plan will be drafted for oil spills, which will guarantee that any spill be contained and cleaned up quickly and efficiently.	EIS 10.4	Maintenance Manager / supervisor/ SEM
A continuous program to monitor the health of the marine fauna and flora will be prepared. This program will include the monitoring of the anticipated recuperation of stocks of fish in the area, and the quantification of the colonization of the breakwater.		SEM / External Environmental Consultant
The areas for servicing and loading fuel for the terminal equipment will be surrounded completely by dykes/bunds. Therefore any spill in these areas of the terminal itself will be contained, so that there will not be any impact on the terrestrial or marine flora and fauna. Bulk chemical substances will not be imported or exported in the terminal, so that no indirect impact on another site caused by materials transported through the terminal is expected.	EIS 10.3.3	Maintenance Manager/SEM

#### 6.4 Air Quality

Mitigation Measure	EIS/ EMP SEMARENA/ PA ref.	Implementation Agent
It is not expected that the operation of the terminal itself will produce any significant impact on air quality. No uncovered or bulk material will be exported, imported, or stored on site.	EIS 11.3.1	Operations Manager

Mitigation Measure	EIS/ EMP SEMARENA/ PA ref.	Implementation Agent
All static and mobile diesel-powered plant will be maintained in accordance with the manufacturer's specification to minimise emissions.	EIS 11.2.1	Maintenance Manager

## 6.5 Noise

Mitigation Measure	EIS/ EMP SEMARENA/ PA ref.	Implementation Agent
Although the noise levels will not be sufficiently high to justify the specific attenuation of noise, mitigation measures for the port operations, the green areas of ecological improvement will also serve to reduce the levels of noise in the areas outside of the terminal.	EIS 12.4	Operations Manager/ SEM

## 6.6 Human Environment

Mitigation Measure	EIS/ EMP SEMARENA/ PA ref.	Implementation Agent
The local people will be given training/skill-building, so that, as appropriate, they can improve their skills and have the opportunity to seek better paying employment when available in the proposed project.	EIS 14.4	Human Resources Manager
Consultations and dialogue will be maintained with the local populace and organizations, not only with those directly affected by the project, so that their opinions and any concern may be addressed, thus promoting the participation of the interested parties/actors through community groups.	EIS 14.4	General Manager
The local school adjacent to the access road will be improved in a form to be	EIS 14.3.1	General Manager

Mitigation Measure	EIS/ EMP SEMARENA/ PA ref.	Implementation Agent
determined in consultation with the residents.		
The principal visual impact of the proposed regime will be the result of the gantry cranes, which have an operational height of 70 m. The islands of La Piedra and La Matica mean that the peninsula cannot be seen from several areas along the beach. In order to minimize this impact, the cranes will be maintained with the most appropriate colour paint.	EIS 15.3.4	Maintenance Manager
The ZFMC has submitted to SEMARENA, a project to improve the environmental quality of the island of La Matica, and integrate it into a scheme of use which can be advantageous for diving operators. In this way environmental compensation is created for the zone in an integrated form which includes skin diving activities.	EIS 15.3.7	SEM
Although additional operational traffic will be generated this will not enter the communities of Andrés or Boca Chica, therefore reducing the impact on local residents.	EIS 15.3.5	SEM

## **7. ENVIRONMENTAL AUDIT OF THE SITE**

### **7.1 Site Inspections**

The Operations PEMA requires implementation of well defined pollution control and mitigation specifications. These will be enforced by means of a rigorous site inspection, deficiency and action reporting system.

Responsibility for implementing the various pollution control and mitigation measures identified in the Operations PEMA rests with the managers within the Port's Operations Team, as identified in the Mitigation tables in chapter 2.

The implementation of all of these measures will be independently verified by a full time Environmental Team (ET). This section of the Operations PEMA describes the auditing activities of the ET.

Site inspections shall be undertaken routinely by the ET to observe that appropriate environmental protection and pollution control mitigation measures are being properly implemented by the Operations Team.

Regular site inspections of all works activities at the Port shall be carried out at least once per week.

The weekly site audit checklists to be used by the ET are provided in Section 3.5, below. These will be reviewed continually by the ET.

The scope of inspection is not limited to the environmental situation or pollution control and mitigation measures within the site; it also extends to surrounding areas outside the site which are affected by the site activities either directly or indirectly.

The ET shall make reference to the following information in conducting the inspections:

- Environmental protection and pollution control mitigation measures identified in the Operations PEMA.
- Works progress and programme.
- Works method statements.
- The Environmental protection and pollution control laws of the Dominican Republic.
- Previous site inspection results.

Environmental incidents should be logged using the forms provided in Section 3.3, below.

Follow up site inspections shall also be carried out, on an ad-hoc basis, if significant environmental problems are identified. Inspections shall also be required after receipt of an environmental complaint (Section 3.3), or as part of the investigation work, as specified in the Environmental Monitoring Plan (Section 4).

## **7.2 Compliance with legislative and other requirements**

The Operations Team is responsible for ensuring that the port activities always conform to the specific requirements given in the relevant sections of the Environmental Permit and the laws of the Dominican Republic.

## **7.3 Environmental incidents and complaints**

Complaints shall be referred to the ET for investigation. The complaint will be addressed by means of the procedures outlined in Figure 3.1.

The steps to be followed are described below:

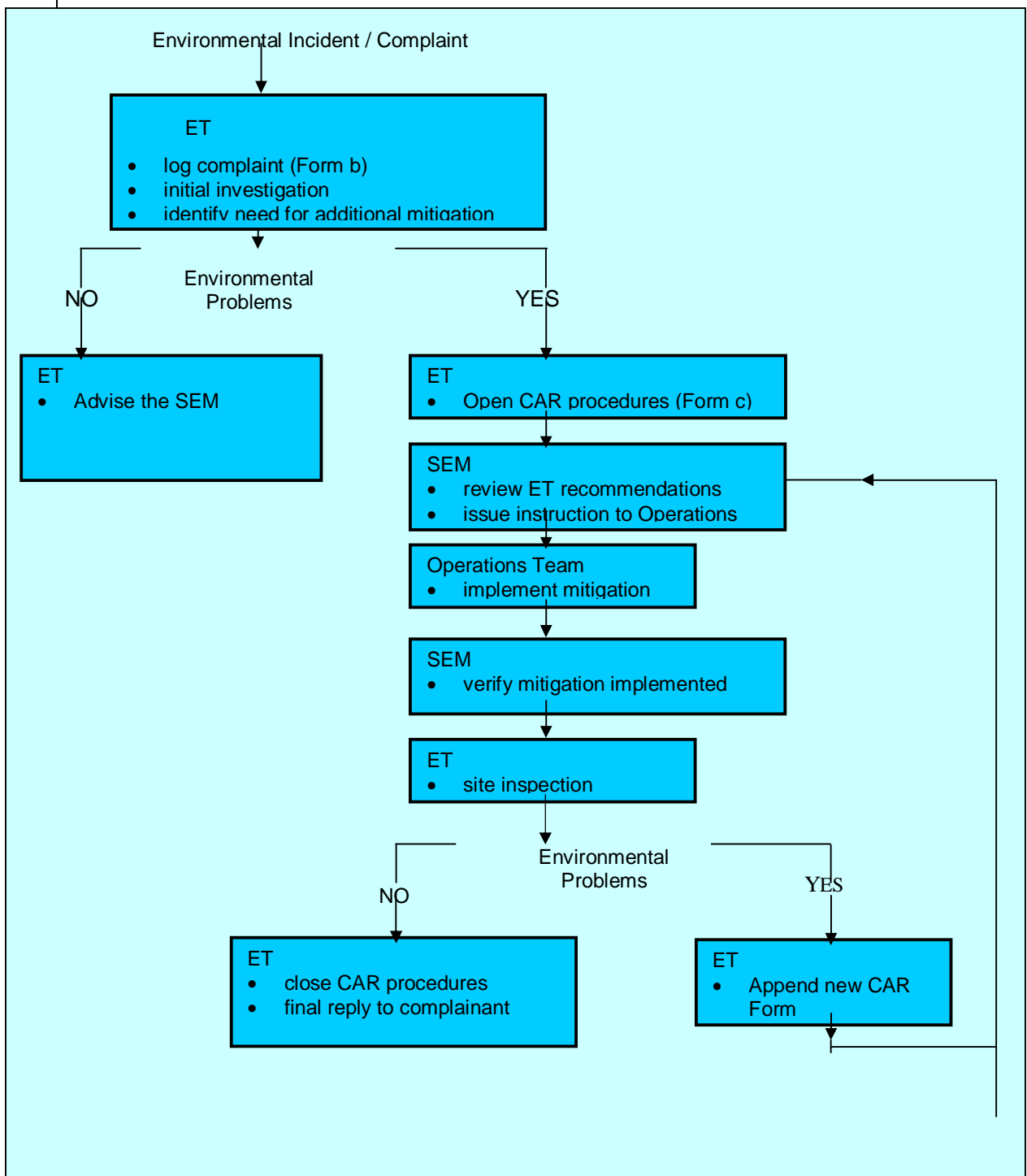
- a) ET to log details of the complaint and date of receipt onto a complaint database, using an Environmental Incidents and Complaints Log (Form b)
- b) The ET shall investigate the complaint to determine its validity and to assess whether the source of the problem is due to works activities.
- c) If a complaint is valid and due to works on-site the ET shall identify the necessity for mitigation measures to prevent re-occurrence.
- d) If mitigation measures are required the ET shall advise the SEM using a Corrective Action Request (CAR) (Form c). The ET will make recommendations to the SEM on the necessity and scope of any additional mitigation.
- e) The SEM will review and then forward the CAR to the Operations Team as a formal request for action.
- f) The General Manager shall review the SEM's response on the identified mitigation measures and forward this to the ET as a status report.
- g) The ET shall arrange a repeat inspection to confirm that the problem has been effectively mitigated.
- h) If the problem has been resolved the ET shall close off the CAR procedure and advise the SEM and the Operations Team accordingly. If the problem persists the ET shall append a new CAR sheet and re-refer this to the SEM. (i.e. re-start the procedure at Step (d), above).
- i) On resolution of the problem the ET shall report the results of the investigation and the subsequent actions to the author of the complaint. Draft replies shall be reviewed by the SEM prior to issue.

If the complaint is transferred from SEMARENA, the ET shall modify the above procedure and follow all specific instructions issued by SEMARENA relating to handling of the case. The ET shall submit any interim reports to SEMARENA as necessary on the status of the complaint investigation and follow-up action within the time frame required by SEMARENA. Draft replies shall be reviewed by the SEM prior to issue.

The ET shall specifically return to all activities that have been the subject of environmental incidents or complaints as part of the routine site environmental audit activity to identify any future re-occurrence.

The ET shall routinely report the status of all complaints, investigation, subsequent actions and results including the status of all active CAR items in the monthly Operations PEMA reports.

During the investigation of the complaint the Operations Team and SEM shall co-operate with the ET to provide all necessary information and assistance for completion of the investigation. If mitigation measures are required, the Operations Team shall promptly implement any required mitigation measures and the SEM shall ensure that the measures have been carried out.



## 7.4 Employee Training

All port employees, will receive environmental training both on first appointment and throughout the period of their employment as they are required to undertake potentially environmentally damaging activities.

All employees will be required to undergo general environmental induction training on how to identify and minimise environmental risks.

Upon completion of this training all employees will be required to sign a statement acknowledging that non-compliance with the Port's environmental policies will be grounds for immediate dismissal.

Formal training programs will be provided in Spanish, English and other languages if necessary to ensure that the workforce has good awareness of environmental hazards and the key elements of the Operations PEMA including relevant mitigation measures. Three principal categories of training shall be organised as follows:

- Work post training courses - all newly appointed persons will be trained on the specific environmental issues associated with their role before starting work in a new post.
- Hazardous products training – staff will receive an environmental briefing before using hazardous products.
- High environmental risk work - staff will receive additional environmental briefing before starting work on specific tasks where there is a high level of risk to the environment.

Training sessions will be organised for groups of staff sharing a common job classification where this group would use the same materials in the course of their work. In addition, focussed training to address specific hazards will be provided across the workforce for all staff handling widely used hazardous materials (e.g. acids, bases, solvents, etc). Employees will be trained before initial assignment, at least yearly thereafter and any time after the exposure to toxic substances of an existing employee changes. The yearly retraining sessions will include a short review lasting 10-15 minutes to confirm that the group is aware all of the safety and environmental precautions for the substances they are exposed to. In addition, practical information such as the availability and location of material safety data sheets shall be emphasised.

Newly assigned employees require more comprehensive training. Every hazardous substance the employee is required to handle at work will be reviewed during the induction process to ensure that appropriate training is provided.

All training sessions must be documented and records kept of contents covered and employees attending.



## **7.5 Environmental Audit Checklist Sheets**

This section contains the various checklists and documentation forms to be used by the ET in the course of the routine auditing work and in response to any environmental incidents or complaints. These include:

Form a) Weekly Audit of Port Operations

Form b) Environmental Incidents and Complaints Log

Form c) Corrective Action Request forms

The scope and presentation of these forms may be amended from time to time in the light of developments and experience gained on site.

**a) WEEKLY AUDIT OF PORT OPERATIONS**

Date		Period Covered	
Auditors			
Audited Parties/Elements			

**ENVIRONMENTAL AUDIT OF PORT OPERATIONS**

**ENVIRONMENTAL MANAGEMENT SYSTEM**

MODULE : Weekly Audit of Operations	Locality:
-------------------------------------	-----------

All comments must be included on a separate sheet. The reference numbers must coincide with those in the module and a check (✓) must be placed in the box for comments to indicate that comments have been made.

No.	Question	Yes	No	N/D	Comment(✓)
✓	<b>Maintenance and supply Plant</b>				
	a) Is there any evidence of spills (oil on the water, stained dirt, etc.)?				
	b) Are the oils, fuels, and hydraulic fluids, etc., for maintenance of the plant and re-supply covered and protected by earthworks?				
	c) Do the earthwork areas have a volume of 110% of the capacity of the tank they contain?				
	d) After rainy periods, have they emptied the earthworks that cannot be covered and the drip pans used for the mobile plant?				
	e) Is the drainage from the re-supply area placed through an oil interceptor ?				
	f) Are the kits against spills available in all service areas, lubrication pits, and any other place appropriate? (Ask the personnel where the closest one is and have them describe its use).				
	g) Have any of the vehicles inspected exceeded the emissions limits of 5000ppm of CO <sub>2</sub> ?				
✓	<b>Water Contamination</b>				

No.	Question	Yes	No	N/D	Comment(✓)
	a) Has there been any contaminating incident known to have affected the underground water or surface water since the last inspection? b) Is there any evidence of spills or leaks which have not been reported?				
✓ <b>Noise</b>					
	a) Has noise monitoring been done? b) Is the plant maintained according to the manufacturer's specifications? (Comment on the inspection system). c) Is the sound of the mechanical plant reduced effectively by silencers, mufflers, acoustic linings or shields, acoustic sheds or meshes necessary to comply with the regulations and standards required? (Comment on the systems in place.)				
✓ <b>Air Quality</b>					
	a) Has there been any complaint about disagreeable odors? (Check the Complaints Notebook). b) Has there been any complaint about dust? (Check the Complaints Notebook). c) Are the vehicles in operation respecting the speed limit of 20km/h?				
✓ <b>Traffic</b>					

No.	Question	Yes	No	N/D	Comment(✓)
	a) Are all of the Port's vehicles avoiding Boca Chica and the central and residential part of Andrés?				

No.	Question	Yes	No	N/D	Comment(✓)
✓ <b>Handling of Residues</b>					
	<p>a) Are containers of waste correctly labelled as specified in the Waste Handling Plan?– see Appendix PEMA.</p> <p>b) Are the wastes segregated in containers and stored on hard surfaces?</p> <p>c) Are the containers of dangerous waste closed and do they have double packaging?</p> <p>d) Are the liquid wastes in pond areas?</p> <p>e) Are the storage areas kept safe for the general public?</p> <p>f) Is the file of inventory of wastes,</p> <ul style="list-style-type: none"> <li>• available for inspection?</li> <li>• Up to date?</li> </ul> <p>(Check sample of the documentation)</p> <p>g) Are the Contractors for Handling Wastes (transporters/receivers/brokers) approved by SEMARENA?</p> <p>h) Are all the facilities for disposal of wastes authorized by SEMARENA?</p> <p>i) Are personnel informed of the procedures for, handling, and disposal of dangerous waste? If so:</p> <ul style="list-style-type: none"> <li>• Are the procedures being followed? (Interview the personnel, check the containers of wastes)</li> <li>• Are personnel aware of those wastes classified as dangerous?</li> </ul> <p>j) Are the initiatives for recycling being used for the following materials?</p> <ul style="list-style-type: none"> <li>• Oily residues?</li> <li>• Residues of cement and concrete?</li> <li>• Scrap metal?</li> <li>• Glass?</li> <li>• Plastics?</li> <li>• Batteries?</li> <li>• Tires?</li> <li>• Office articles?</li> <li>• Domestic Residues?</li> <li>• Others?</li> </ul> <p>a) Is there evidence of the burning of garbage in the terminal?</p> <p>b) Is there evidence of the discharging of garbage into the ocean or the bay?</p>				
✓ <b>Emergency Incidents</b>					

No.	Question	Yes	No	N/D	Comment(✓)
	a) Has there been any emergency incident? b) If there was, were the correct procedures taken? (see the appendices of the PEMA). c) Are the emergency training and planning procedures established?				

Date		Period covered	
Auditors			
Audited Parties/Elements			

Comments	
No.	Comment

**b) ENVIRONMENTAL INCIDENTS AND COMPLAINTS LOG**

**Section 1: Incident/complaint description (to be completed by Environmental Team)**

Date:

Recorded by:

Location and nature of incident or complaint:

**Severity of Incident**

**Tick all that apply:**

Death or Injury to People

Threat of Death or Injury to People

Pollution of the environment

Non-compliance with Operations PEMA or Method Statement

Complaint from public

Damage to or loss of property, assets or equipment

Other (state)

**Complaints Only:**

Name of correspondent:

Address:

Telephone number:

Date Received:

Nature of complaint:

Response made to correspondent

**Section 2: Actions recommended (to be completed by the Environmental Team)**

Remedial Actions Recommended:

Initials:

**AT THIS STAGE A COPY OF THE FORM MUST BE PASSED TO THE SEM AND SECTION 1 OF THE CAR FORM COMPLETED**

**Section 3: Action on the incident or complaint (to be completed by the SEM)**

Corrective Action Request issued? Yes / No

If not state reason and file form in complaints and incidents log.

Corrective Action Request Closed

Signed (SEM)

Date

Attach copy of CAR to this form and file in Environmental incidents/complaints log.

Complainant informed of action?



C)

**CORRECTIVE ACTION REQUEST**

Authorities involved:

Security and Environment Manager (SEM)

Operations Team (OT)

Environmental Team (ET),

**Section 1: CAR background** (to be completed by the ET)

Date:

Requested by:

Nature of Problem:

Origin of Request (Complaint, Inspection, Monitoring, Audit etc.)

**Section 2: CAR Task** (To be completed by the SEM)

Action Required:

Request to be implemented by:

Person:

by (date)

**Section 3: CAR closure** (to be signed and dated).

Signed

Dated

CAR implemented

OT

Verification

.....

.....

SEM	.....	.....
Site inspection confirmed		
ET	.....	.....
Comments:		
File in closed CAR file with copy attached to original environmental incident/complaint notice as appropriate.		

## **8. ENVIRONMENTAL MONITORING PLAN**

### **8.1 Objective and scope**

The Environmental Monitoring Plan is related to the gathering of data in situ in order to describe the conditions of the receiving environment adjacent to the Port operations. This implies the routine noting of environmental conditions throughout the period of operations.

The implementation of the monitoring program will provide a mechanism for the quantitative comparison of the environmental conditions with the limits of conformance established. This will facilitate the immediate identification of any environmental deterioration caused by the activities of the operations and the implementation of any other mitigation and adjustment necessary.

### **8.2 Monitoring overview**

#### **8.2.1 Water Quality Monitoring**

The key objective in the monitoring program is to show that port operations comply with the limits permitted in terms of suspended solids and turbidity.

Sampling of the seawater turbidity will be performed using a combination of monitoring techniques.

#### **8.2.2 Noise Monitoring**

The levels of noise in the port terminal from mobile receptors monitored on the Port boundary during operating hours.

#### **8.2.3 Coral and Marine Ecological Monitoring**

A comprehensive marine environmental survey was commissioned during preparation of the Environmental Impact Statement. This provides a baseline for future ecological survey.

### 8.3 Monitoring Programme Summary Matrix.

Medium and Activity	Impact	Parameters to be monitored	Sample point	Frequency	Duration	Compliance criteria	Equipment details	Responsibility and contract ref.	Date of Implementation
<b>General</b>	At same time as measuring the key parameters specified in the matrix below, relevant supporting data such as monitoring location, time, water depth, weather conditions, sea state, tidal stage and any other special activity underway should be recorded. Ad hoc monitoring of all parameters may be required if significant environmental problems are identified.							SEM	
	Increase of suspended solids and turbidity	Water sampling and testing for suspected sediment concentrations and turbidity	4 control stations, Depths: 2m below surface; mid depth and 0.5m above seabed.	Once every 3 months	6 months post construction	Suspended solids concentration of 20 mg/l above background level	Sampling team  Portable Turbidity meter with 0-1000NTU capacity of censor	Operations Team Report submitted	
	Generation of dust  Impact on the local populace and wildlife  Questions of Health and safety	Regular inspections of the operation to initiate mitigation measures, identify potential problems of air quality, and deal with these matters in their early stages	Terminal and surroundings covered by the inspections	Weekly.	Inspection during the operational phase			Operations Team	

## 8.4 Noise Limits and Action Plan

Notwithstanding the specific mitigation and monitoring measures specified in this Operations PEMA the Port Operator is required to ensure full compliance with all requirements of statutory requirements and standards applicable in the Dominican Republic.

In addition, the World Bank Guidelines\* must be complied with. The World Bank guidelines state that noise abatement measures should achieve either the levels given in Table 4.1 or a maximum increase in background levels of 3dB(A) shown in Table 4.2. These two standards will be invoked depending upon the baseline levels using the following criteria.

<i>Conditions</i>	<i>Standard to use</i>
<i>Baseline noise level &lt; maximum ambient noise levels</i>	<i>maximum ambient noise levels</i>
<i>Baseline noise level &gt; maximum ambient noise levels</i>	<i>baseline plus 3 dB(A)</i>

Should non-compliance occur then actions in accordance with the action plan given in Table 3.5 shall be carried out.

**Table 4.1. Maximum ambient noise levels**

<i>Receptor</i>	<i>Maximum allowable log equivalent (hourly measurements) in dB(A)</i>	
	<i>Day (07:00 – 22:00)</i>	<i>Night (22:00 – 07:00)</i>
<i>Residential, institutional, educational</i>	55	45
<i>Industrial, commercial</i>	70	70

**Table 4.2. World Bank Limit Levels for Noise based on baseline conditions**

<i>Time period</i>	<i>Limit (dB(A))</i>
<i>07:00 – 22:00 hrs on normal weekdays</i>	<i>Baseline plus 3 dB(A)</i>
<i>07:00 – 22:00 hrs on holidays</i>	<i>Baseline plus 3 dB(A)</i>
<i>22:00 – 07:00 hrs of next day</i>	<i>Baseline plus 3 dB(A)</i>

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\* World Bank Group (1998). Pollution Prevention and Abatement Handbook, General Environmental Guidelines.

**Table 4.3. Event / Action Plan for Noise for exceedence of World Bank Standards.**

<b>ET Leader</b>	<b>SEM</b>
Notify SEM Identify source Require SEM to implement mitigation measures Increase monitoring frequency to assess effectiveness of mitigation	Submit noise mitigation measures to ET Leader and General Manager Implement agreed measures/ Prove to ET Leader / General Manager the effectiveness of measures applied.

## **9.0 REPORTS**

### **9.1 General**

There are two main activities which are central to the PEMA which require regular disclosure. They are field inspections and monitoring of the environment. These will be combined in a monthly report prepared by the SEM.

The EA will resort to the monitoring reports submitted by the SEM. The report's requirements for this information are indicated below in Section 9.2. In addition, the EA will summarize the results of the site inspection (referring to section 3,1) and the status of the procedures of the corrective actions which follow any environmental incident or complaints (section 3,3)

The copies of the monthly report will be distributed to Security and Environment Management. This report is conceived as a tool to assist in following up the jobs of mitigation, work experiences, and monitoring practices required by the PEMA. The report will be discussed once a month in the Work Group for Environmental Management and will be presided by the Security and Environment Manager (SEM).

Also, a formal report in compliance with PEMA will be submitted quarterly to SEMARENA according to the requirements of the terms for Environmental Permit. This report will be prepared by the Environmental Team and will summarize the results of environmental control and the monitoring of the previous three month period.

A report of the base line monitoring and also a report on the supervision of the phase after construction will be produced at the end of the water quality monitoring programs as detailed in section 4.2.1 of the PEMA for Construction. These reports will also be submitted to SEMARENA under the terms of the Environmental Permit. These reports shall be prepared by the Operator and submitted to SEMARENA after being reviewed by the Environmental Team. The format for these reports is described in sections 9.3 and 9.4.

The content of the fourth month report to be submitted to SEMARENA is described in section 9.4. The contents of the monthly report prepared by the Environmental Team for the Work Group for Environmental Management, will be based initially on the latter for the formal four-month report to SEMARENA. It may be varied after that according to what is ordered by the SEM in order to ensure that it continue to resolve the needs of the Environmental Management Work Group as an effective tool for information.

### **9.2 Reporting Requirements for Water Quality Data Management**

The data will be processed such that by consulting the data base one can make a prompt evaluation of:

- Present levels and instantaneous averages of turbidity and the concentrations of suspended solids for each station
- A comparison of the Control Stations data with data from Reference Stations
- A comparison of the Control Stations data with data from the base line period

- Present profiles of the currents in time
- Present profiles of the winds in time
- Present profiles of the tides in time

### 9.3 Report on Base Line Monitoring

A report on Base Line Environmental Monitoring shall be finished within the ten (10) working days after the completion of all base line monitoring.

The Base Line Environmental Monitoring report shall include the following information:

- a) A one page executive summary.
- b) Brief information about the Port history of the Port and its Operations and/or activities.
- c) Drawings showing the locations of the stations for base line monitoring.
- d) Tabulated results of the monitoring (in hard and electronic copies) with the following information:
  - Monitoring methodology
  - Equipment used and calibration details.
  - The parameters monitored
  - Monitoring locations (and depth).
  - Date, hour, frequency, and duration of monitoring
- e) Details of influencing factors including:
  - Important activities, if any, that took place *in situ* during the time period.
  - Atmospheric conditions during the time period.
  - Other factors that could have affected the determination of the results
- f) Determination of the Levels of Actions and the Limit Level for each monitoring parameter and statistical analysis of the base line data
- g) Revisions for inclusion in the PEMA.
- h) Comments and conclusions.



## 9.4 PEMA quarterly reports

The results of all the work required in this PEMA shall be recorded in the quarterly reports on the PEMA prepared by the EA. The PEMA reports will be prepared and submitted within ten working days for reports at the end of each reporting period. The first report shall be prepared during the the third month after the operations begin.

The quarterly PEMA reports submitted to SEMARENA will include the following:

- a) 1-2 Pags. Executive Summary.
  - Action events/limit levels.
    - Record of complaints
    - Report of Changes.
    - Future key topics.
- b) Environmental status
  - Drawings showing the project area, any sensitive receiver, and the locations of monitoring and control stations.
  - Summary of noncompliance with the environmental quality limits.
  - Summary of the inspection results and of the site audits.
- c) Including the list of deficiencies
- d) Environmental topics and actions
  - Implementation status of the Mitigation Measures and the corresponding efficiency of such measures.
  - Description of the actions taken during the occurrence of non compliances or deficiencies.
  - Review of topics brought from previous reports including any follow up actions
- e) Summary of complaints and environmental incidents
- f) Summary of future key questions
- g) Appendices
  - Graphs of tendencies of monitored parameters in the last report period for the representative monitoring stations with the following identifiable factors:
  - Important activities realized *in situ* during the time period.
  - Atmospheric conditions during the time period
  - Any other factor that may affect the monitoring results.
  - Monitoring program for the present and next reporting period.

- Cumulative statistics of the complaints.
- Details of any complaints, exceptional questions, and deficiencies.

## **9.5 Maintenance of data**

Site documentation such as field monitoring records, laboratory analysis dossiers, site inspection forms, etc. do not need to be included in the PEMA monthly or quarterly reports. However, the documents shall be kept by the EA and by the Security and Environment Management with all pertinent information clearly and systematically recorded, and shall be ready for inspection when needed. All documents and data shall be retained for at least one year after their collection.

## **Operations Plan - Appendix A**

# **Environmental Management System Manual - Appendix B**

# **Contingency Plan for Spills of Oil and Dangerous Materials**

## **- Appendix C**

## **Contingency Plan for Emergency response - Appendix D**

## **Health and Occupational Safety Guide - Appendix E**

## **Contingency Plan for Hurricanes - Appendix F**



## **Construction of Multipurpose Berth PEMA – Appendix G**