	ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN				PROC. No.: O-EP 009
	DOCUMENTATION	COMMUNICATION	TRAINING	MONITORING	
COPY No. 001	PAGE 1 of 1	ATMOSPHERIC EMISSIONS			REV. No. 001

1. Purpose

Maintenance personnel shall ensure that the Continuous Emission Monitoring Units (CEMS) equipment is calibrated and maintained as frequently as stipulated in the manufacturers' recommendations. The Environmental Coordinator shall ensure that these tasks are performed and shall keep calibration and maintenance records as necessary to prove compliance with this procedure. Compliance with specified environmental requirements will be verified through the internal system audit process and, when necessary, Corrective Action Requests will be implemented for this purpose.

2. Scope

Continuous monitoring of gases emission for NOx and CO (through CEMS) to verify compliance with the supplier's guarantee and with the emission standards established by CONAMA Resolution N° 08/90 and the requirements of FEEMA.

3. Responsible Parties

The Environmental Coordinator shall be responsible for reporting results, as shown in the table below, with help from operators and maintenance crew.

4. Procedures

Initial calibration of the Continuous Emission Monitoring System (CEMS) units shall be the responsibility of the EPC contractor and the manufacturer, pursuant to the USEPA recommendations. According to the best methods and practices, extractive samples for lab tests using alternative methods may be required every year or every two years, or whenever the findings are not consistent.

The Continuous Emission Monitoring System (CEMS) to be operated by the Macaé Merchant Power Plant will be supplied by the EPC contractor and will include an extractive sampling probe to be installed in each group of four stacks. The probe samples of the gases will be transported to the analyzer compartment by a

heated line. The sample will be cooled in the compartment and then taken to the continuous NOx, CO and O₂ analyzers. The signals generated by the analyzers will be directed to the data acquisition system, where corrections and compensations will be made. The corrected results will be sent to the Central Plant Supervision System for the indication of values, alarms and the issue of reports.

The results of the analyses will be adjusted according to the standard reference conditions (15% O₂, dry volume). The basic data and corrected data of the CEMS will be made available through the Plant Distributed Control System (DCS).

As stipulated in Operating License N° 439/2001, the data collected shall be sent continuously to FEEMA on-line, and shall also be kept on file by the Macaé Merchant Power Plant.

A summary of the daily and monthly measurements (Nox and CO) shall be prepared by the Environmental Coordinator for the monthly report, as shown in the table below.

Summary of CEMS monthly results: NOx or CO date-hour or date /ppmdv, 15 % O₂
Month:

	CEMS 1	CEMS 2	CEMS 3	CEMS 4	CEMS 5
Highest 1 hour average					
Lowest 1 hour average					
Highest 24 hours average					
Lowest 24 hours average					

5. Location

One Stack of each set of four.

6. Frequency

Continuous

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ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

DOCUMENTATION	COMMUNICATION	TRAINING	MONITORING	CONTINUOUS IMPROVEMENT
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AIR QUALITY

1. Purpose

Based on management techniques identified in the EIA, monitoring and mitigation activities are of critical importance for ensuring that the environmental impacts of the project are kept to a minimum.

Monitoring also assists in identifying any unanticipated impacts that may arise, allowing for appropriate and timely responses if such circumstances occur.

The Environmental Coordinator will mobilize the resources required to ensure that the air quality (AQ) equipment is calibrated and maintained as frequently as stipulated in the manufacturer recommendations, or at least every twelve months if these recommendations are unknown. The Environmental Coordinator will keep calibration and maintenance records as required to prove compliance with this procedure.

The monitoring and measurement of compliance with specified environmental requirements will be accomplished through the internal audit system process, as well as through Corrective Action Requests.

2. Scope

Continuous monitoring of air quality will be undertaken in order to check compliance with the air quality standards established by CONAMA Res. 03/90 and FEEMA regulations.

Air quality monitoring will also provide data for undertaking emergency actions during windless periods.

3. Responsible Parties

The Environmental Coordinator and the El Paso Manager for Brazil.

4. Procedure

The air quality monitoring station will consist of: sampling system, analyzers, calibrators, the zero air generation system, meteorological sensors, the local acquisition system, and data processing and transmission facilities, involving both

hardware and software. The following parameters are subject to monitoring: nitrogen oxides, carbon monoxide, ozone, total hydrocarbons, total suspended particulate matter and inhalable particulate matter (PM10).

As stipulated in Operating License N° 439/2001, the data collected will be sent continuously to FEEMA, on-line. These data will also be kept on file by the Macaé Merchant Power Plant.

A summary of the daily and monthly measurements for each station and regulated pollutant shall be prepared by the Environmental Coordinator for the monthly report, as shown in the table below.

Summary of AQ results: $\mu\text{g}/\text{m}^3$

Month:

	Station 1						
	NO	NO ₂	CO	O ₃	HC	TSP	PM10
Highest 1 hour average						NA	NA
Lowest 1 hour average						NA	NA
Highest 24 hours average							
Lowest 24 hours average							
Monthly Average							

NA –not applicable


5. Location

Area of direct influence of the Power Plant in the Macaé Region.

6. Frequency

Continuous.

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	ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN				PROC. No.: O-EP 011
	DOCUMENTATION	COMMUNICATION	TRAINING	MONITORING	
COPY No. 001	PAGE 1 of 1	LIQUID EFFLUENTS			REV. No. 001

1. Purpose

Based on management techniques identified in the EIA, PBA and supplemental studies, monitoring and mitigation activities are of critical importance to ensure that the environmental impacts of the project are kept to a minimum.

Monitoring also assists in identifying any unanticipated impacts that may arise, allowing for appropriate and timely responses should such circumstances occur

The Environmental Coordinator will mobilize the resources required to ensure that the environmental monitoring activities follow the appropriate methods and that environmental monitoring equipment is calibrated and maintained as frequently as stipulated in the manufacturer recommendations, or at least every twelve months if these recommendations are unknown. The Environmental Coordinator will keep lab documentation, calibration and maintenance records as required to prove compliance with this procedure.

The monitoring and measurement of compliance with specified environmental requirements will be ensured through the internal audit system, as well as through Corrective Action Requests.

2. Scope

Checking compliance with the effluent constraints established by CONAMA Resolution No. 20/86, FEEMA NT-202 and World Bank guidelines (Pollution Abatement Handbook, Guidelines for New Thermal Power Plants, July, 1998).

3. Responsible Parties

El Paso and specialized third parties.

4. Procedures

As stipulated by Operating License N° 439/2001, which sanctions the PBA monitoring program, the following parameters must be analyzed in the final effluents:

PARAMETERS	FREQUENCY
Flow rate (m ³ /day)	1.000 through 10.000 m ³ /day
pH ⁽¹⁾	Daily
Temperature	Daily
Conductivity	Daily
Chlorides	Weekly
Settleable sediments	Weekly
Total non-filterable residues	Weekly
Volatile, non-filterable residues	Weekly
Dissolved Oxygen	Daily
Oil and grease	Weekly
BOD (effluent/effluent)	Semi-monthly
COD (effluent/effluent)	Weekly
Metals	Weekly
Phenol Index	Weekly
Phenol	Weekly
Sulfides	Weekly
Fluorides	Weekly
Sulfate	Semi-monthly
Surfactant substances	2 times a week
Residual Chlorine	Daily
Ammonium Nitrogen	Weekly
Nitrogen and Nitrite	Weekly
Total Nitrogen	Weekly
Total Phosphorus	Semi-monthly
Toxic Organic Compounds	Semi-monthly
Toxicity	Monthly
Fecal coliforms	Weekly
Minimum number of samples in continuous effluents	8


(1) Control in influents and effluents

Sanitary effluents - coliforms and BOD must be specifically analyzed prior to mixing or discharge.

As also stipulated by Operating License N° 439/2001, the monitoring results for effluents discharge will be presented to FEEMA through reports, delivered to FEEMA against proof of receipt. The proof of receipt and the reports themselves will be kept on file by the Macaé Merchant Power Plant.

After initial operation of the plant and implementation of the monitoring program the parameters, limits and frequency of tests must be adapted to meet World Bank requirements as per Table IV.1 in Chapter IV.

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 Macaé Merchant	ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN				PROC. No.: O-EP 011
	DOCUMENTATION	COMMUNICATION	TRAINING	MONITORING	
COPY No. 001	PAGE 2 of 1	LIQUID EFFLUENTS			REV. No. 001

5. Location

Final industrial wastewaters discharged into the Macaé River.

Sanitary effluents from washrooms and the restaurant before and after treatment.

6. Frequency

After the first year, monitoring the discharge will be re-negotiated with the environmental agency and the IFC, provided that the parameters constantly indicate acceptable values in the samples. However, effluent temperatures and pH levels will be monitored constantly during the Power Plant operations.

Sanitary effluents - Monthly analyses.

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	ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN				PROC. No.: O-EP 012
	DOCUMENTATION	COMMUNICATION	TRAINING	MONITORING	
COPY No. 001	PAGE 1 of 1	MONITORING THE QUALITY OF THE MACAÉ RIVER			REV. No. 001

1. Purpose

Based on management techniques identified in the EIA, monitoring and mitigation activities are of critical importance to ensure that the environmental impacts of the project are kept to a minimum.

Monitoring also assists in identifying any unanticipated impacts that may arise, allowing for appropriate and timely responses if such circumstances occur

The Environmental Coordinator will mobilize the necessary resources to ensure compliance with the monitoring plan for the receptor body, as indicated in Table IV-1. The Environmental Coordinator will also ensure that Contractors follow the necessary calibration and maintenance procedures for the monitoring equipment in order to prove compliance with this procedure, while also keeping the necessary calibration and maintenance records.

The monitoring and measurement of compliance with specified environmental requirements will be accomplished through the internal audit system process, as well as through Corrective Action Requests.

2. Scope

To check compliance with water quality standards established by CONAMA Resolution 20/86 CLASS 2, as well as FEEMA regulations.

3. Responsible Parties

The Environmental Coordinator, Contractors and the El Paso Brazilian Environmental Manager

4. Procedure

The following parameters will be monitored: temperature, pH, oil and grease, BOD (biological oxygen demand), COD (chemical oxygen

demand), fecal and total coliforms, turbidity, dissolved solids, metals, residual chlorine, chlorides, sulfates, phosphates (orthophosphates PO₄, to be expressed as P) and nitrogen (ammonia). See Table IV.1 for applicable standards.

As stipulated in Operating License N° 439/2001, the data collected will be presented to FEEMA in digital format, according to a pre-established model prepared by FEEMA. A confirmation of reception – via e-mail or protocol – should be provided by FEEMA. These data will also be kept on file by the Macaé Merchant Power Plant.


5. Location

Monitoring of the Macaé River will be performed at pre-established points, both upstream and downstream from the effluent discharge point.

6. Frequency

Daily, weekly, monthly, quarterly and bi-annually, as shown in Table IV-1.

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	ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN				PROC. No.: O-EP 013
	DOCUMENTATION	COMMUNICATION	TRAINING	MONITORING	
COPY No. 001	PAGE 1 of 1	NOISE			REV. No. 001

1. Purpose

Based on management techniques identified in the EIA, monitoring and mitigation activities are of critical importance to ensure that the environmental impacts of the project are kept to a minimum.

Monitoring also assists in identifying any unforeseen impacts that may arise, allowing for appropriate and timely responses, should such circumstances occur

The Environmental Coordinator will mobilize the resources required to ensure that the noise monitoring equipment is calibrated and maintained as frequently as stipulated in the manufacturer recommendations, or at least every twelve months if these recommendations are unknown. The Environmental Coordinator will keep calibration and maintenance records as required to prove compliance with this procedure.

The verification of monitoring procedures and compliance with specified environmental requirements will be accomplished through the internal audit system process, as well as through Corrective Action Requests.

2. Scope

Monitoring the conformity of Power Plant operations with the criteria in the technical standards NBR – 10151/152 and CONAMA Resolution 01/90.

3. Responsible Parties

The Environmental Coordinator and the El Paso Brazilian Environmental Manager

4. Procedure

Internal noise levels must comply with the standards established by the Ministry of Labor (NR-15). External noise is to be measured at the fence line, according to NBR 10151/10152.

As stipulated by Operating License N° 439/2001, external noise reports will be presented to FEEMA on a half-yearly basis, against signed proof of receipt. Both the proof of receipt and the reports themselves will be kept on file by the Macaé Merchant Power Plant.

5. Location

Internal noise in administrative areas, and external noise at the Plant boundaries.

6. Frequency

At least two campaigns recording the external noise levels (fence line) are planned each year.

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