

Appendix A

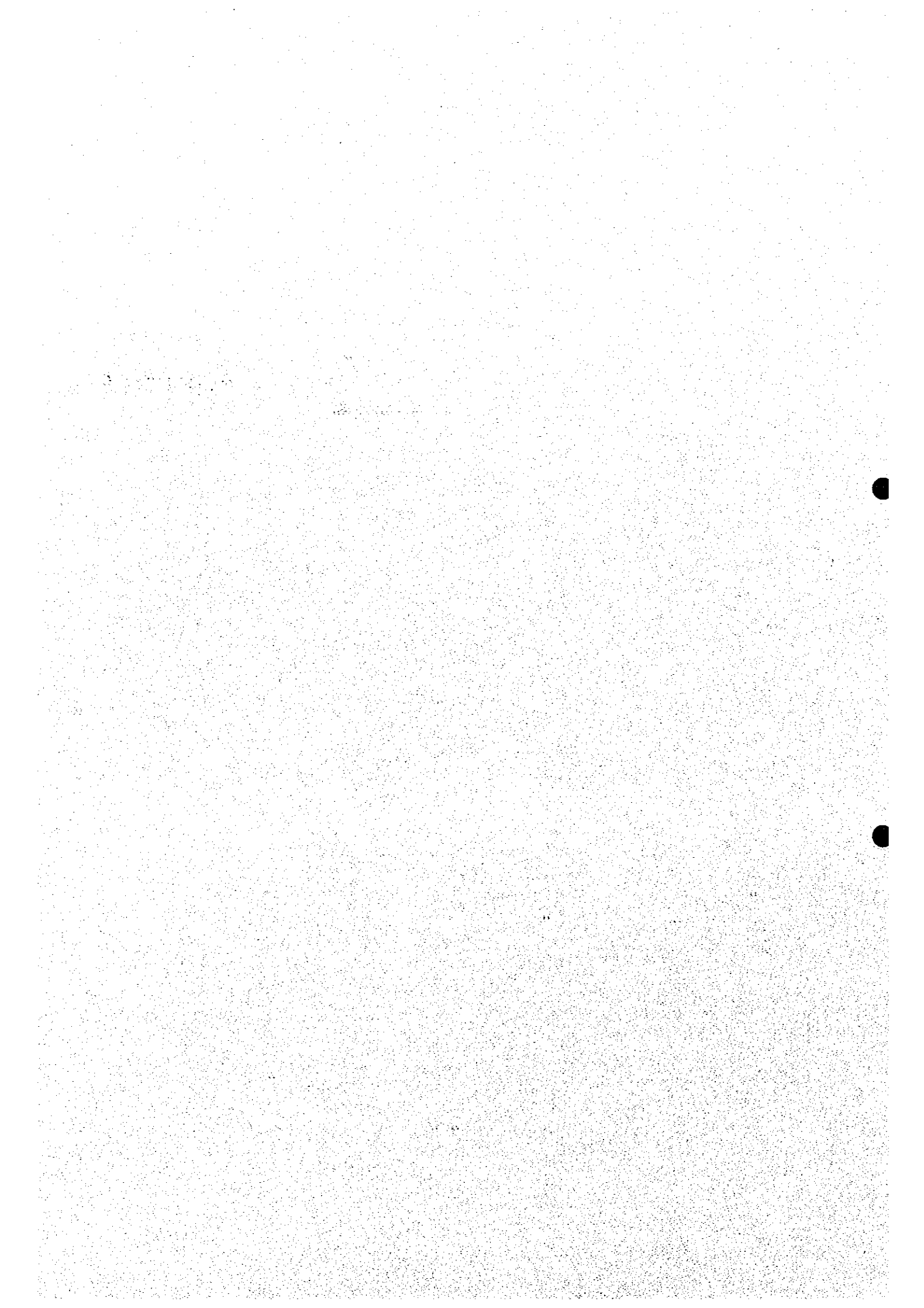


Table A.1 Maximum Permissible Level for Contaminants in the Discharge of Wastewater into the Water Body

(NOM-001-ECOL-1996, Ministry of Environment, Natural Resources and Fishery)

| Parameter | River | | | | | | Natural and Artificial Reservoirs | | | |
|------------------------------|---------------------------------|--------|------------------|--------|-----------------------------|--------|-----------------------------------|--------|------------------|--------|
| | use for agricultural irrigation | | urban public use | | Protection of Aquatic biota | | use for agricultural irrigation | | urban public use | |
| | PM | PD | PM | PD | PM | PD | PM | PD | PM | PD |
| Temperature (°C) | NA | NA | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Grease and Oil (mg/l) | 15 | 25 | 15 | 25 | 15 | 25 | 15 | 25 | 15 | 25 |
| Floating Material | absent | absent | absent | absent | Absent | absent | absent | absent | absent | absent |
| Settleable Solid (m/l) | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Total Suspended Solid (mg/l) | 150 | 200 | 75 | 125 | 40 | 60 | 75 | 125 | 40 | 60 |
| BOD5 (mg/l) | 150 | 200 | 75 | 150 | 30 | 60 | 75 | 150 | 30 | 60 |
| Total Nitrogen (mg/l) | 40 | 60 | 40 | 60 | 15 | 25 | 40 | 60 | 15 | 25 |
| Total Phosphorus (mg/l) | 20 | 30 | 20 | 30 | 5 | 10 | 20 | 30 | 5 | 10 |
| Arsenic (mg/l) | 0.2 | 0.4 | 0.1 | 0.2 | 0.1 | 0.2 | 0.2 | 0.4 | 0.1 | 0.2 |
| Cadmium (mg/l) | 0.2 | 0.4 | 0.1 | 0.2 | 0.1 | 0.2 | 0.2 | 0.4 | 0.1 | 0.2 |
| Cyanide (mg/l) | 2 | 3 | 1 | 2 | 1 | 2 | 2 | 3 | 1 | 2 |
| Copper (mg/l) | 4 | 6 | 4 | 6 | 4 | 6 | 4 | 6 | 4 | 6 |
| Chromium (mg/l) | 1 | 1.5 | 0.5 | 10 | 0.5 | 10 | 1 | 1.5 | 0.5 | 1 |
| Mercury (mg/l) | 0.01 | 0.02 | 0.005 | 0.01 | 0.005 | 0.01 | 0.01 | 0.02 | 0.005 | 0.01 |
| Nickel (mg/l) | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 |
| Lead (mg/l) | 0.5 | 1 | 0.2 | 0.4 | 0.2 | 0.4 | 0.5 | 1 | 0.2 | 0.4 |
| Zinc (mg/L) | 10 | 20 | 10 | 20 | 10 | 20 | 10 | 20 | 10 | 20 |

| Parameter | Coastal Water | | | | | |
|------------------------------|---|--------|------------|--------|---------|--------|
| | fish exploitation, navigation and other use | | recreation | | Estuary | |
| | PM | PD | PM | PD | PM | PD |
| Temperature (°C) | 40 | 40 | 40 | 40 | 40 | 40 |
| Grease and Oil (mg/l) | 15 | 25 | 15 | 25 | 15 | 25 |
| Floating Material | absent | absent | absent | absent | Absent | absent |
| Settleable Solid (m/l) | 1 | 2 | 1 | 2 | 1 | 2 |
| Total Suspended Solid (mg/l) | 100 | 175 | 75 | 125 | 75 | 125 |
| BOD5 (mg/l) | 100 | 200 | 75 | 125 | 75 | 125 |
| Total Nitrogen (mg/l) | NA | NA | NA | NA | 15 | 25 |
| Total Phosphorus (mg/l) | NA | NA | NA | NA | 5 | 10 |
| Arsenic (mg/l) | 0.1 | 0.2 | 0.2 | 0.4 | 0.1 | 0.2 |
| Cadmium (mg/l) | 0.1 | 0.2 | 0.2 | 0.4 | 0.1 | 0.2 |
| Cyanide (mg/l) | 2 | 2 | 2 | 3 | 1 | 2 |
| Copper (mg/l) | 4 | 6 | 4 | 6 | 4 | 6 |
| Chromium (mg/l) | 0.5 | 1 | 1 | 1.5 | 0.5 | 1 |
| Mercury (mg/l) | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 |
| Nickel (mg/l) | 2 | 4 | 2 | 4 | 2 | 4 |
| Lead (mg/l) | 0.2 | 0.4 | 0.5 | 1 | 0.2 | 0.4 |
| Zinc (mg/L) | 10 | 20 | 10 | 20 | 10 | 20 |

PD: daily average, PM: monthly, NA: not applicable

Note:

- The permissible range of hydrogen potential (pH) is from 5 to 10.
- The maximum permissible limit of fecal coliform in effluent which is discharged into national water and land is 1,000 and 2,000 (MPN/100 ml) for monthly mean, and daily mean, respectively.
- The maximum permissible limit of eggs of helminth in wastewater which is discharged into irrigation land is one egg per liter for all the agricultural products and five eggs per liter for the agricultural products except legumes and vegetables which are uncookedly consumed.

Table A.2 (1) Environmental Criteria of Water Quality (CE-CCA-001/89; Ministry of Urban Development and Ecology (SEDUE)) (mg/l for parameters without indication)

| Substance or Parameter | Supply Source of Potable Water | Recreation with direct contact | Agricultural Irrigation | Pasture | Protection of aquatic biota | |
|--|--------------------------------|--------------------------------|-------------------------|---------|-----------------------------|-----------------|
| | | | | | Freshwater | Coastal Area |
| Acenaphthene | 0.02 | - | - | - | 0.02 (I) | 0.01 (I) |
| 2,4-dichlorophenoxyacetic acid | 0.1 | - | - | - | - | - |
| Acrylnitrile | 0.0006 (III) | - | - | - | 0.07 (I) | - |
| Alkalinity (as CaCO ₃) | 400 | - | - | - | (IV) | (IV) |
| Aldrin | 0.00003 (III) | 0.00005 | 0.02 | - | 0.003 | 0.001 |
| Aluminum | 0.02 | - | 5 | 5 | 0.05 | 0.2 |
| Antimony | 0.1 | - | 0.1 | - | 0.09(I) | - |
| Arsenic (II) | 0.05 (III) | - | 0.1 | 0.2 | 0.2 (as As III) | 0.2 (as As III) |
| Asbestos (fibers/l) | 3000 (III) | - | - | - | - | - |
| Esthetic Aspects | (V) | (V) | (V) | (V) | (V) | (V) |
| Barium | 1 | - | - | - | 0.01 | 0.5 |
| Benzene (II) | 0.01 (III) | - | - | - | 0.05 (I) | 0.005 |
| Benzidine (II) | 0.000001 (III) | - | - | - | 0.02 (I) | - |
| Beryllium | 0.00007 (III) | - | (VI) | 0.1 | 0.001 | - |
| PCB (II) | 0.0000008 (III) | - | - | - | 0.00001 | 0.000003 (I) |
| BHC (II) (VII) | - | - | - | - | 0.001 (I) | 0.000003 (I) |
| BHC (Lindane) | * 0.003 (III) | - | - | - | 0.002 | 0.0002 |
| bis(2-chloroethyl) ether | 0.0003 (III) | - | - | - | (VIII) | - |
| bis (2-chloroisopropyl) ether | 0.03 (III) | - | - | - | (VIII) | - |
| bis (2-ethylhexyl) phthalate | 32 | - | - | - | (IX) | (X) |
| 4-bromophenyl phenyl ether | - | - | - | - | 0.01 | - |
| Boron | 1 | - | 0.7 (XI) | 5 | - | 0.009 (XII) |
| Bromoform | 0.002 (III) | - | - | - | - | - |
| Bromomethane | 0.002 | - | - | - | - | - |
| Cadmium (II) | 0.01 | - | 0.01 | 0.02 | (XIII) | 0.0009 |
| Organic Carbon | - | - | - | - | - | - |
| (Extraction with alcohol) | 1.5 | - | - | - | - | - |
| (Extraction with chloroform) | 3 | - | - | - | - | - |
| Cyanide (as CN ⁻) | 0.2 | 0.02 | 0.02 | - | 0.005 (XIII) | 0.001 (XIV) |
| Chlordane (II) (technical mix of Metabolitos) | 0.003 (III) | 0.00002 | 0.003 | - | 0.002 | 0.00009 |
| Residual chlorine | - | - | - | - | 0.011 (XII) | 0.0075 (XII) |
| Chlorobenzene | 0.02 | - | - | - | (IV) | (XV) |
| 2-Chloro-ethyl vinyl ether | - | - | - | - | 0.5 (I) | - |
| 2-Chlorophenol | 0.03 | - | - | - | 0.04 | 0.1 |
| Chloroform (II) | 0.03 (III) | - | - | - | 0.3 (I) | - |
| Chloronaphthalenes | - | - | - | - | 0.02 (I) | 0.00007 (I) |
| Chloride (as Cl ⁻) | 250 | - | 147.5 | - | 250 | - |
| Dichloromethane | 0.002 (III) | - | - | - | - | - |
| Chloromethane | 0.002 (III) | - | - | - | - | - |
| Vinyl chloride | 0.02 (III) | - | - | - | - | - |
| Copper | 1 | - | 0.2 | 0.5 | (XVII) | 0.003 (XIV) |
| Fecal Coliform (MPN/100ml) | 1000 | (XVIII) | 1000 | - | (XVIII) | (XVIII) |
| Color (Pt-Co unit) | 75 | - | - | - | (XX) | (XX) |
| Electric Conductivity (mmho/cm) | - | - | 1 (XX) | - | - | - |
| Hexavalent Chromium | 0.05 | - | 1 | 1 | 0.01 (XII) | 0.05 (XII) |
| DDD (II) | 0.0000002 (III) | - | - | - | 0.000006 (I) | 0.00004 (I) |
| DDE (II) | - | - | 0.004 | - | 0.01 (I) | 0.0001 (I) |
| DDT (II) | 0.001 (III) | 0.000005 | - | - | 0.001 | 0.0001 |
| Dichlorobenzenes | 0.4 | - | - | - | 0.01 | 0.02 |
| 1,2-dichloroethane (II) | 0.005 | - | - | - | 1.2 (I) | 1.1 (I) |
| 1,1-dichloroethylene (II) | 0.0003 | - | - | - | (XXI) | (XXI) |
| 1,2-dichloroethylene (II) | 0.0003 | - | - | - | (XXI) | (XXI) |
| 2,4-dichlorophenol | 0.03 | - | - | - | 0.06 (I) | 0.008 (I) |
| Dieldrin (II) | 0.0000007 (III) | 0.000003 | 0.02 | - | 0.002 | 0.0007 |
| Diethyl phthalate | 350 | - | - | - | (IX) | (X) |
| 1,2-diphenylhydrazine (II) | 0.0004 (III) | - | - | - | 0.003 | - |
| 2,4-dimethylphenol | 0.4 | - | - | - | 0.02 | - |
| Dimethyl phthalate | 313 | - | - | - | (IX) | (X) |
| 2,4-dinitrophenol | 0.07 | - | - | - | 0.002 (I) | 0.05 |
| dinitro-o-cresol | 0.01 (III) | - | - | - | - | 0.01 |
| 2,4-dinitrotoluene (II) | 0.001 (III) | - | - | - | - | 0.01 |
| 2,6-dinitrotoluene | - | - | - | - | (XXIII) | (XXIV) |
| Endosulfane (alpha and beta) (II) | 0.07 | - | - | - | 0.0002 | 0.00003 |
| Endrin | 0.001 | 0.000002 | - | - | 0.00002 | 0.00004 |

Table A.2 (2) Environmental Criteria of Water Quality (CE-CCA-001/89; Ministry of Urban Development and Ecology (SEDUE)) (mg/l for parameters without indication)

| Substance or Parameter | Supply Source of Potable Water | Recreation with direct contact | Agricultural Irrigation | Pasture | Protection of aquatic biota | |
|---|--------------------------------|--------------------------------|-------------------------|---------|-----------------------------|-------------------------|
| | | | | | Freshwater | Coastal Area |
| Ethylbenzene | 1.4 | - | - | - | - | 0.5 |
| Phenol | 0.3 | 0.001 | - | - | 0.1 (I) | 0.06 (I) |
| Iron | 0.3 | - | 5 | - | 1 | 0.05 |
| Fluorene | 0.04 | - | - | - | 0.04 (I) | 0.0004 (I) |
| Fluoride (as F) | 1.5 | - | 1 | 2 | 1 | 0.5 |
| Phosphate (as PO ₄) | 0.1 | - | - | - | (XXV) | 0.002 |
| Elemental phosphorus (as P) | - | - | - | - | 0.0001 | 0.0001 |
| Dissolved gases | - | - | - | - | (XXVI) | (XXVI) |
| Grease and oil | Absent | - | - | - | - | - |
| Halomethane | 0.002 (III) | - | - | - | 0.1 (I) | - |
| Heptachlor (II) | 0.0001 (III) | 0.000002 | 0.02 | - | 0.0005 | 0.0005 |
| Hexachlorobenzene | 0.00001 (III) | - | - | - | (XV) | (XVI) |
| Hexachlorobutadiene (II) | 0.004 (III) | - | - | - | 0.0009 (I) | 0.0003 (I) |
| Hexachloropentadiene | 0.001 | - | - | - | 0.00007 (I) | 0.00007 (I) |
| Hexachloroethane | 0.02 (III) | - | - | - | 0.01 (I) | 0.009 (I) |
| Polynuclear Aromatic Hydrocarbon | 0.00003 (III) | - | - | - | - | 0.1 |
| Isophorone | 5.2 | - | - | - | 1.2 (I) | 0.1 (I) |
| Manganese | 0.1 | - | - | - | - | - |
| Floating Material | V.2 | V.2 | V.2 | V.2 | V.2 | V.2 |
| Mercury (Hg) (II) | 0.001 | - | - | 0.003 | 0.00001 (XII) | 0.00002 (XII) |
| Methoxychlor | 0.03 | - | - | - | - | - |
| Naphthalene | - | - | - | - | 0.02 (I) | 0.02 (I) |
| Nickel | 0.01 | - | 0.2 | 1 | (XXVII) | 0.002 (XII) |
| Nitrates (NO ₃) (as N) | 5 | - | - | 90 | - | 0.04 |
| Nitrites (NO ₂) (as N) | 0.05 | - | - | 10 | - | 0.002 |
| Nitrobenzene | 20 | - | - | - | 0.3 (I) | 0.07 (I) |
| 2-Nitrophenol and 4-nitrophenol | 0.07 | - | - | - | 0.002 (I) | 0.05 (I) |
| Ammonium nitrogen | - | - | - | - | 0.06 | 0.01 |
| N-Nitrosodiphenylamine (II) | 0.05 (III) | - | - | - | (XXVIII) | (XXIX) |
| N-Nitrosodimethylamine (II) | 0.00001 (III) | - | - | - | (XXVIII) | (XXIX) |
| N-Nitroso N-propylamine | - | - | - | - | (XXVIII) | (XXIX) |
| Dissolved oxygen (XXX) | 4 | - | - | - | 5 | 5 |
| Paration | 0.00003 | - | - | - | 0.00004 | 0.00004 |
| Odor | Absent | - | - | - | - | - |
| Pentachlorophenol | 0.03 | - | - | - | 0.0005 (I) | 0.0005 (I) |
| pH (XXXI) | 5-9 | - | 4.5-9 | - | (XXXII) | (XXXII) |
| Silver | 0.05 | - | - | - | (XXXII) | 0.002 |
| Lead | 0.05 | - | 5 | 0.1 | (XXXIV) | 0.006 (XII) |
| Taste | characteristics | - | - | - | - | - |
| Selene (as Selenate ?) | 0.01 | - | 0.02 | 0.05 | 0.008 | 0.4 |
| Dissolved Solid | 500 | - | 500 | 1000 | - | - |
| Suspended Solid | 500 | - | 50 | - | (XIX) | (XIX) |
| Total solid | 1000 | - | - | - | - | - |
| Active substance to Methylene blue | 0.5 | - | - | - | 0.1 | 0.1 |
| Sulphate (SO ₄ ²⁻) | 500 | - | 170 | - | ? | - |
| Sulphide (as H ₂ S) | 0.2 | - | - | - | 0.002 | 0.001 |
| Talium | 0.01 | - | - | - | 0.01 (I) | 0.02 (I) |
| Temperature (°C) | Natural condition +2.5 | - | - | - | Natural condition + 1.5 | Natural condition + 1.5 |
| 2,3,7,8-Tetrachlorobenzo-p-dioxyne | 0.0000000001 (III) | - | - | - | - | - |
| 1,1,2,2-Tetrachloroethane (II) | 0.002 (III) | - | - | - | 0.09 (I) | 0.09 (I) |
| Tetrachloroethylene (II) | 0.008 (III) | - | - | - | 0.05 (I) | 0.1 (I) |
| Toluene | 14.3 | - | - | - | 0.2 (I) | 0.06 (I) |
| Toxaphen | 0.000007 | 0.00003 | 0.005 | - | 0.0000002 (XII) | 0.0000002 (XII) |
| 1,1,1-Trichloroethane (II) | 18.4 (III) | - | - | - | 0.2 (I) | 0.3 (I) |
| 1,1,2-Trichloroethane (II) | 0.006 (III) | - | - | - | 0.2 (I) | - |
| Trichloroethylene (II) | 0.03 (III) | - | - | - | 0.01 | 0.02 |
| 2,4,6-Trichlorophenol (II) | 0.01 (III) | - | - | - | 0.01 | - |
| Turbidity (Unit scale of silicate) | Natural condition | - | - | - | (XIX) | (XIX) |
| Zinc | 5 | - | 2 | 50 | (XXXVI) | 0.09 (XII) |
| Total alpha radioactivity (Bq/l) | - | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Total beta radioactivity (Bq/l) | - | 1 | 1 | 1 | 1 | 1 |

Note:

- (I) the limit value of this substance is obtained from multiplying the reported acute toxicity by 0.01.
- (II) the substance which has persistence, bioaccumulation or risk of cancer, so that human exposition should at least be reduced.
- (III) the limit value has been extrapolated with the mathematical model, so that posterior revision could be modified to the less strict value
- (IV) the reduction on natural alkalinity of water body should not be more than 25%, when this natural alkalinity is equal or less than 20 mg/l the reduction on natural alkalinity of water body should not be admitted.
- (V) the water body should be free from substances attributed to wastewater or other discharges which:
1. form deposits which adversely change the physical characteristics of water;
 2. contain floating material like particles, oil or other residues which appear unpleasant.
 3. produce color, odor, taste or turbidity; or
 4. make aquatic biota undesirable or unpleasant.
- (VI) for continuing irrigation of soil, water should not contain more than 0.1 mg/l of beryllium, except for the case of alkaline soil and of fine texture where it can be applied under the concentration to 0.5 mg/l.
- (VII) the data indicated as BHC includes the mixture of isomers alpha, beta and epsilon.
- (VIII) the value obtained from multiplying the acute toxicity for freshwater organisms by 0.01 indicates that chloroalkyl esters should not be larger than 2.38 mg/l.
- (IX) the value obtained from multiplying the acute toxicity for freshwater organisms by 0.01 indicates that the concentration of esters of phthalic acid should not be greater than 0.0094 mg/l.
- (X) the value obtained from multiplying the acute toxicity for estuarine or coastal organisms by 0.01 indicates that the concentration of esters of phthalic acid should not be larger than 0.02944 mg/l.
- (XI) For irrigation of crops which is sensitive to boron, the water should not contain larger than 0.75 mg/l of this substance, except for other crops for which the concentration to 3 mg/l can be applicable.
- (XII) the average concentration of this substance during 4 days should not exceed this level more than once each three years.
- (XIII) the average concentration of cadmium (micro-g/l) during 4 days should not exceed the calculated value from the following equation more than once each three years:
- $$\text{Cd (micro-g/l)} = e^{(0.7852 \cdot \ln(\text{hardness}) - 3.490)}$$
- hardness = mg/l as CaCO₃
- (XIV) the average concentration of this substance during one hour should not exceed this level more than once each three years.
- (XV) the value obtained from multiplying the acute toxicity of chlorobenzenes by 0.01 indicates that the concentration of these (except dichlorobenzenes) should not be larger than 0.00250 mg/l in order to protect the freshwater organisms.
- (XVI) the value obtained from multiplying the acute toxicity of chlorobenzenes by 0.01 indicates that the concentration of these (except dichlorobenzenes) should not be larger than 0.00250 mg/l in order to protect the estuarine and coastal organisms.
- (XVII) the average concentration of copper (micro-g/l) during 4 days should not exceed the calculated value from the following equation more than once each three years:
- $$\text{Cu (micro-g/l)} = e^{(0.8545 \cdot \ln(\text{hardness}) - 1.465)}$$
- hardness = mg/l as CaCO₃
- (XVIII) the organisms should not exceed 200 (MPN/100ml) in freshwater or estuarine and coastal water, and more than 10% of monthly samples should not exceed 400 (MPN/100 ml).
- (XIX) suspended solid (including settleable) in combination with color should not reduce the depth of compensation level of light for the photosynthetic activity to more than 10% from the natural value.
- (XX) this level is considered from the use of water under medial condition of soil texture, velocity of infiltration, drainage, lamina of used irrigation, climate and tolerance of the crops towards salts. Considerable deviations of this parameter make the use of this water insecure.
- (XXI) the value obtained from multiplying the acute toxicity of dichloroethylenes by 0.01 indicates that the concentration of these

should not be larger than 0.116 mg/l in order to protect the freshwater organisms.

(XXII) the value obtained from multiplying the acute toxicity of dichloroethylenes by 0.01 indicates that the concentration of these should not be larger than 2.24 mg/l in order to protect the estuarine and coastal organisms.

(XXIII) the value obtained from multiplying the acute toxicity of dinitrotoluenes by 0.01 indicates that the concentration of these should not be larger than 0.0033 mg/l in order to protect the freshwater organisms.

(XXIV) the value obtained from multiplying the acute toxicity of dinitrotoluenes by 0.01 indicates that the concentration of these should not be larger than 0.0033 mg/l in order to protect the freshwater organisms.

(XXV) total phosphate, a measure of phosphorus, should not exceed 0.05 mg/l for influents into lakes or reservoirs nor exceed 0.025 mg/l in lakes or reservoirs in order to prevent them from development of undesirable biological species and to control accelerated eutrophication. For the case of rivers or streams, the concentration should not exceed 0.1 mg/l.

(XXVI) total concentration of dissolved gases should not be 1.1 times more than saturation level under the condition of prevalent hydrostatics and atmosphere.

(XXVII) the average concentration of nickel (micro-g/l) during 4 days should not exceed the calculated value from the following equation more than once each three years:

$$\text{Ni (micro-g/l)} = e^{(0.8460 \cdot \ln(\text{hardness}) - 1.1645)}$$

hardness = mg/l as CaCO₃

(XXVIII) the value obtained from multiplying the acute toxicity of N-nitrosoamines by 0.01 indicates that the concentration of these should not be larger than 0.0585 mg/l in order to protect the freshwater organisms.

(XXIX) the value obtained from multiplying the acute toxicity of N-nitrosoamines by 0.01 indicates that the concentration of these should not be larger than 0.0585 mg/l in order to protect the estuarine and coastal organisms.

(XXX) for dissolved oxygen, indicated levels should be considered as minimum.

(XXXI) for hydrogen potential (pH), indicated levels should be considered as maximum and minimum.

(XXXII) The variation more than 0.2 unit of pH from seasonal natural value should not be exceeded.

(XXXIII) the average concentration of silver (micro-g/l) during 4 days should not exceed the calculated value from the following equation more than once each three years:

$$\text{Ag (micro-g/l)} = e^{(1.72 \cdot \ln(\text{hardness}) - 6.52)}$$

hardness = mg/l as CaCO₃

(XXXIV) the average concentration of lead (micro-g/l) during 4 days should not exceed the calculated value from the following equation more than once each three years:

$$\text{Pb (micro-g/l)} = e^{(1.273 \cdot \ln(\text{hardness}) - 4.705)}$$

hardness = mg/l as CaCO₃

(XXXV) the concentration of dissolved solid which does not have toxic effects for any crops is 500 mg/l, is between 500 and 1000 mg/l for sensible crops, is between 1000 and 2000 mg/l for high productivity which demands special treatment, and is between 2000 and 5000 mg/l for tolerant crops in permeable soil which requires special treatment. For other part, in the production of sensible fruits, ratio of absorption of sodium (RAS) should be less than or equal to 4 and for pasture should be between 8 and 18.

(XXXVI) the average concentration of zinc (micro-g/l) during 4 days should not exceed the calculated value from the following equation more than once each three years:

$$\text{Zn (micro-g/l)} = e^{(0.8473 \cdot \ln(\text{hardness}) - 10.3604)}$$

hardness = mg/l as CaCO₃

Table A.3

**Environmental Criteria of Water Quality for Aquiculture
(CE-CCA-001/89, SEDUE)**

| Parameter or Substance | Unit | Species | | | | | | |
|------------------------|---------------------------|-------------------|-------|--------|-----------------|-------------------------|--------|---|
| | | Tilapia | Carp | Barge | Trout Arco-iris | Langostino | Shrimp | Mollusk Bivalve |
| Color | - | Green - Bluegreen | | | | | | |
| Transparent | cm | 45 | 30-50 | 45 | 45 | 15-25 | - | - |
| Turbidity | Unit of Jackson Turbidity | 100 | - | - | - | 15 | - | - |
| Temperature | °C | 24-30 | 20-30 | 20-30 | 10-15 | 18-34 | 26-30 | 15-30 |
| pH | - | 7-8 | 7-8.5 | 6.5-8 | 7-8.5 | 7.5-8.8 | - | - |
| Suspended Solid | mg/l | - | - | 25-70 | - | - | - | - |
| Dissolved Solid | mg/l | - | - | - | 400 | - | - | - |
| Dissolved Oxygen | mg/l | 2.1 | 5 | 4 | 7.8 | 75% of saturation Level | 6 | - |
| Salinity | ppm | - | 15 | - | - | 12-14 | 27-35 | 23-28 |
| Alkalinity | mg/l | 54-200 | 100 | 20-200 | 5-31 | - | - | - |
| Hardness | mg/l | 50-100 | 300 | 20-150 | 5-200 | 150 | - | - |
| Carbon dioxide | mg/l | - | - | 25 | - | - | - | - |
| Ammonia | mg/l | - | - | 0.42 | - | - | 0.1 | - |
| Nitrogen of nitrite | mg/l | - | - | - | 0.55 | - | 2 | - |
| Nitrogen of nitrate | mg/l | - | - | - | - | - | 5 | - |
| Total phosphate | mg/l | - | - | - | - | - | 5 | - |
| Fecal Coliform | MPN/100ml | - | - | - | - | - | - | 14 no more than of 10% of the samples should be larger of 43 |
| Total Coliform | MPN/100ml | - | - | - | - | - | - | 70 no more than of 10% of the samples should be larger of 230 |
| Aluminum | mg/l | - | 0.2 | 0.5 | - | - | - | - |
| Arsenic | mg/l | - | 1 | - | - | - | - | - |
| Barium | mg/l | - | 5 | 0.6 | - | - | - | - |
| Cadmium | mg/l | - | 0.05 | - | - | - | 0.005 | - |
| Chromium (VI) | mg/l | - | 0.5 | - | - | - | - | - |
| Chromium (III) | mg/l | - | 1 | - | - | - | - | - |
| Copper | mg/l | - | 0.02 | 0.025 | 0.06 | - | 0.005 | - |
| Cyanide | mg/l | - | 0.025 | - | - | - | - | - |
| Iron | mg/l | - | 0.5 | 0.5 | 1 | - | - | - |
| Lead | mg/l | - | 0.1 | 0.1 | - | - | 0.005 | - |
| Silicates | mg/l | - | - | - | - | - | 100 | - |

Appendix B

Appendix B.1 Pollution Load Analysis

B.1.1 Coastal Water, Rivers, and Lagoons

(1) Coastal Water

Table B.1 Water Quality of Sea Water at Altamira Port and River Mouth of Panuco River

(average value between August and November in 1998)

| Surface layer | | Unit:mg/l | | | | | | |
|-----------------------|----------------|-----------|------|-----------------------------|------|------|-------|------|
| Items | Sampling Point | | | | | | | |
| | Altamira Port | | | River Mouth of Panuco River | | | | |
| | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 5 |
| Total Suspended Solid | 28.8 | 15.1 | 18.3 | 20.2 | 25.2 | 23.8 | 153.7 | 78.2 |
| Phosphate | 0.21 | 0.16 | 0.30 | 0.14 | 0.12 | 0.03 | 0.03 | 0.12 |
| Inorganic Nitrogen | 0.41 | 0.30 | 0.63 | 0.48 | 0.59 | 0.48 | 0.76 | 0.41 |
| BOD ₅ | 1.50 | 1.60 | 1.57 | 0.50 | 1.00 | 0.50 | 1.05 | 1.10 |

| Intermediate depth | | Unit:mg/l | | | | | | |
|-----------------------|----------------|-----------|------|-----------------------------|------|------|------|------|
| Item | Sampling Point | | | | | | | |
| | Altamira Port | | | River Mouth of Panuco River | | | | |
| | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 5 |
| Total Suspended Solid | 26.1 | 18.0 | 12.0 | 18.5 | 21.0 | 21.5 | 78.2 | 46.8 |
| Phosphate | 0.19 | 0.12 | 0.29 | 0.08 | 0.16 | 0.03 | 0.03 | 0.15 |
| Inorganic Nitrogen | 0.40 | 0.30 | 0.38 | 0.44 | 0.39 | 0.36 | 0.60 | 0.40 |
| BOD ₅ | 1.25 | 1.18 | 1.20 | 0.60 | 0.80 | 0.50 | 0.70 | 0.50 |

Source: Secretary of Marine

(2) Rivers and Lakes

a) Panuco River Upstream (C/1)

Table B.2 Water Quality of Panuco River at El Alamo Station

| Parameter | Unit | Average value from 1990 to 1997 | | |
|------------------|-----------|---------------------------------|-----------------------------------|------------|
| | | Dry Season (from Nov to May) | Rainy Season (from Jun to Oct) | Whole Year |
| Fecal Coliform | MPN/100ml | 100 | 456 | 245 |
| BOD ₅ | mg/l | 1.81 | 1.02 | 1.51 |
| COD | mg/l | 20.7 | 24.7 | 22.3 |
| Ammonia-N | mg/l | 0.037 | 0.057 | 0.044 |
| Nitrate-N | mg/l | 0.381 | 0.448 | 0.408 |
| Nitrite-N | mg/l | 0.006 | 0.006 | 0.006 |
| Organic-N | mg/l | 0.370 | 0.525 | 0.421 |
| Total N | mg/l | 0.788 | 1.036 | 0.835 |
| Soluble P | mg/l | 0.090 | 0.149 | 0.114 |
| Ortho P | mg/l | 0.042 | 0.101 | 0.067 |

Rainy Season: Jun – Oct

Dry Season: Nov – May

Source: CNA (Water Quality Monitoring Station)

Table B.3 Water Quality of Upstream Part of Panuco River System

(Average Value, July 1997)

| Parameter | Unit | Tampeon River | Moctezuma River | Las Adjuntas | Upstream of Panuco | Downstream of Nanuco | Downstream of Chicayan River | Upstream of Chila Lagoon |
|--------------------------|-------------------------|---------------|-----------------|--------------|--------------------|----------------------|------------------------------|--------------------------|
| Total suspended solid | mg/l | 76 | 53 | 91 | 25 | 33 | 46 | 17 |
| Total hardness | mg CaCO ₃ /l | 798 | 289 | 413 | 563 | 408 | 385 | 526 |
| Total alkalinity | mg CaCO ₃ /l | 157 | 264 | 184 | 193 | 206 | 191 | 196 |
| Chloride | mg/l | 6.5 | 80 | 33 | 49 | 55 | 50 | 443 |
| Phosphate | mg/l | 0.13 | 0.43 | 0.21 | 0.17 | 0.21 | 0.22 | 0.19 |
| Grease and oil | mg/l | 1.7 | 1.6 | 0.92 | 1.06 | 0.4 | 1.16 | 1 |
| Sulphate | mg/l | 724 | 161 | 520 | 395 | 364 | 402 | 448 |
| Kjeldhal nitrogen | mg/l | 2.34 | 1.78 | 2.27 | 2.17 | 1.69 | 2.33 | 2.27 |
| Organic nitrogen | mg/l | 1.82 | 1.32 | 1.77 | 1.68 | 1.21 | 1.76 | 1.75 |
| NH ₃ nitrogen | mg/l | 0.54 | 0.45 | 0.5 | 0.49 | 0.41 | 0.57 | 0.53 |
| Nitrite nitrogen | mg/l | 0.0027 | 0.005 | 0.005 | 0.012 | 0.01 | 0.015 | 0.019 |
| Nitrate nitrogen | mg/l | 0.12 | 1.9 | 0.42 | 1.34 | 0.91 | 0.85 | 0.86 |
| COD (dichromate) | mg/l | 41.8 | 41 | 34.3 | 30.3 | 37 | 34.3 | 55.5 |
| BOD ₅ | mg/l | 3 | 1.25 | 2 | 2.3 | 4 | 2.5 | 2.5 |
| Fecal coliform | UFC/100ml | 670 | 581 | 677 | 49 | 1617 | 78 | 89 |
| Total coliform | UFC/100ml | 11152 | 3317 | 7922 | 19529 | 9841 | 1446 | 319 |
| Electric conductivity | Micro S/cm | 1450 | 1483 | 1450 | 1387 | 1600 | 1190 | 2740 |
| Water temperature | °C | 32.7 | 32 | 32.8 | 30.9 | 31.3 | 31.8 | 31.5 |
| PH | | 7.77 | 8.1 | 8 | 7.75 | 7.88 | 7.9 | 7.98 |
| Dissolved oxygen | mg/l | 7.82 | 7.56 | 8.19 | 8.16 | 9.27 | 9.25 | 9.18 |

Source: Estudio de Clasificación del Río Panuco, Segundo Informe (1997)

b) Tamesi River and its Freshwater Lakes (C/2)

Table B.4 Water Quality Data (average value in 1992-1997) for Tamesi Stations and Freshwater Lakes

| Item | Unit | Station | | | | | |
|-----------------------|------------|-----------|--------------|------------------|-----------|--------------|-----------------------|
| | | Tamesi R. | Champayan L. | | Puerta L. | Chairel L. | Tanco L. ^a |
| | | Tamesi | Allamira | CFE ^a | Pigmentos | Toma de Agua | |
| Electric Conductivity | micro S/cm | 895 | 967 | 811 | 1199 | 884 | 1034 |
| Hardness | mg/l | 378 | 316 | 249 | 378 | 346 | 341 |
| Calcium | mg/l | 85.5 | 77.6 | 61.7 | 86.4 | 68.6 | 80.4 |
| Magnesium | mg/l | 40.3 | 30.0 | 23.7 | 38.8 | 42.3 | 34.1 |
| Potassium | mg/l | 2.53 | 4.79 | 4.06 | 6.13 | 3.74 | 4.37 |
| Sodium | mg/l | 56.4 | 78.3 | 75.4 | 103.8 | 57.7 | 88.8 |
| Chloride | mg/l | 58 | 118 | 119 | 193 | 76 | 150 |
| Bicarbonate | mg/l | 232 | 166 | 154 | 178 | 202 | 200 |
| Sulfate | mg/l | 228 | 186 | 108 | 201 | 195 | 137 |
| Total Nitrogen | mg/l | 0.875 | 0.608 | 0.545 | 0.754 | 0.575 | 1.02 |
| Total Phosphorus | mg/l | 0.095 | 0.052 | 0.035 | 0.048 | 0.053 | 0.08 |
| Dissolved Oxygen | mg/l | 8.5 | 3.9 | 4.79 | 5.51 | 5.91 | 4.08 |
| Grease and Oil | mg/l | 4.2 | 5.1 | 4.1 | 5.0 | 4.7 | |
| TSS | mg/l | 654 | 785 | 607 | 858 | 670 | 755 |
| BOD ₅ | mg/l | 1.6 | 1.2 | 1.4 | 2.2 | 1.6 | 3.7 |
| COD | mg/l | 14.5 | 21.6 | 20.1 | 25.7 | 17.1 | 35.2 |
| Detergent | mg/l | 0.12 | 0.12 | 0.13 | 0.12 | 0.12 | 0.14 |
| Fecal Coliform | MPN/100ml | 260 | 273 | 94 | 123 | 64 | 137 |

^adata from 1992 to 1995

(Source: Water Quality Monitoring Data Base of CNA)

c) Marismas Lagoon (B)

Table B.5 Water Quality Data of Marismas Lagoon

| Item | unit | May 10, 1996 |
|-----------------------|------------|--------------|
| Electric Conductivity | micro S/cm | 62,510 |
| Hardness | mg/l | 7,480 |
| Calcium | mg/l | 221 |
| Magnesium | mg/l | 1,690 |
| Potassium | mg/l | 11,900 |
| Sodium | mg/l | 11,900 |
| Chloride | mg/l | 18,700 |
| Bicarbonate | mg/l | 188 |
| Sulfate | mg/l | 6,330 |
| Ammonium-N | mg/l | <0.03 |
| Total Phosphorus | mg/l | 0.09 |
| Disolved Oxygen | mg/l | 0.6 |
| Grease and Oil | mg/l | 4.7 |
| TSS | mg/l | 125 |
| BOD ₅ | mg/l | 22.9 |
| Detergent | mg/l | 0.1 |
| Fecal Coliform | MPN/100ml | 8 |

Source: CNA

B.1.2 Quality and Quantity of Industrial Wastewater

(1) Altamira Industrial Port (A)

a) Administracion Portuaria Integral de Altamira (A/1)

Table B.6 Water Quality of Wastewater (Administracion Portuaria Integral de Altamira)

| Parameter | Property of Wastewater | |
|--|------------------------|-------------------|
| | Unit | |
| pH | - | 7.6 |
| Temperature | °C | 26 |
| Settleable solid | ml/l | 1 |
| Floating material | - | Absent |
| Grease and oil | mg/l | 12 |
| Color | Pt-Co scale | 45 |
| COD | mg/l | 117.6 |
| Total suspended solid | mg/l | 37 |
| BOD | mg/l | 28 |
| Active substance toward methylene blue | mg/l | 0.01 |
| Total coliform | MPN/100ml | 110000 |
| Electric Conductivity | micro S/cm | 1048 |
| Claimed annual discharge volume | m ³ /year | 4000 (28,000*) |

Source: Document on Wastewater Quality and Discharge (CNA)

* worker number has increased to 7 times as many as that on reported day, and therefore, the discharge volume is corrected

b) Pittsburgh Plate Glass (PPG) Industries (A/2)

Table B.7 Water Quality of Wastewater of Pittsburgh Plate Glass (PPG) Industries

| Parameter | Unit | Value | Parameter | Unit | Value |
|-----------------------|------|--------|--------------------------|--------------------------|--------|
| pH | - | 6.06 | Volatiles | | |
| Temperature | °C | --- | 1,1- Dichloro Ethylene | mg/l | <0.05 |
| Settleable solid | ml/l | 0.1 | 1,2-Dichloro Ethane | mg/l | <0.05 |
| Floating material | - | Absent | Benzene | mg/l | <0.05 |
| Grease and oil | mg/l | 5 | Tetrachlorocarbon | mg/l | <0.05 |
| Color | mg/l | 22.1 | Chloro Benzene | mg/l | <0.05 |
| COD* | mg/l | 17 | Chloroform | mg/l | <0.05 |
| Total suspended solid | mg/l | 1,000 | Methyl Ethyl Ketone | mg/l | <0.10 |
| BOD* | mg/l | 1.2 | Tetrachloroethylene | mg/l | <0.05 |
| Extractable arsenic | mg/l | <0.1 | Trichloroethylene | mg/l | <0.05 |
| Extractable barium | mg/l | 2.6 | Vinyl chloride | mg/l | <0.10 |
| Extractable cadmium | mg/l | <0.005 | Reactive cyanide | mg/kg | <0.5 |
| Extractable chromium | mg/l | 0.01 | Reactive sulfide | mg/kg | <5 |
| Extractable lead | mg/l | <0.05 | Flow rate | l/s | 34.9 |
| Extractable mercury | mg/l | 0.0011 | Authorized annual volume | 1000m ³ /year | 1,100 |
| Extractable silver | mg/l | <0.01 | Monthly volume | m ³ /month | 91,600 |
| Extractable selenium | mg/l | <0.1 | | | |

---: not measured, *COD and BOD were analyzed on different day

Source: Document on Wastewater Quality and Discharge (CNA)

c) POLYCYD (C/3/1)

Table B.8 Monthly Average of Wastewater Quality of POLYCYD in 1996-1998

| Parameter | Unit | 1996 | | | | | | | | |
|-------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| | | Apr | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
| Temperature | °C | 32.8 | 32.0 | 35.0 | 33.3 | 33.7 | 30.3 | 32.4 | 31.3 | |
| pH | - | 6.88 | 7.10 | 7.03 | 6.98 | 7.10 | 6.89 | 7.13 | 6.94 | |
| Phenols | mg/l | 0.007 | 0.003 | 0.014 | <0.008 | <0.006 | <0.006 | 0.010 | 0.010 | |
| Settleable solid | ml/l | 0.47 | <0.1 | <0.1 | <0.1 | <.1 | <0.1 | <0.1 | <0.1 | |
| TSS | mg/l | 24.1 | 19.7 | 10.3 | 13.3 | 15.7 | 25.5 | 22.0 | 13.0 | |
| Grease and oil | mg/l | 13.8 | 7.1 | 12.6 | 9.0 | 16.6 | <5 | <5 | <5 | |
| Floating material | - | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | |
| COD | mg/l | 47.6 | 54.7 | 46.1 | 21.2 | 35.1 | 46.0 | 32.7 | 56.0 | |
| BOD ₅ | mg/l | 15.4 | 26.0 | 26.1 | 12.8 | 16.1 | 16.5 | 13.8 | 17.8 | |
| Total Coliform | MPN/100ml | 1.63 | 5.50 | 1.71 | 0.00 | 5.57 | 1.14 | 4.57 | 8.43 | |
| Discharge volume | m ³ /month | 33,400 | 26,600 | 25,500 | 24,900 | 23,000 | 16,800 | 35,300 | 18,400 | |

| Parameter | Unit | 1997 | | | | | | | | | | | |
|-------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| | | Jan | Feb | Mar | Apr | May | Jun | Aug | Sep | Oct | Nov | Dec | |
| Grease and Oil | mg/l | <5 | 4.4 | 7.8 | 13.7 | 5.26 | <2.5 | 6.9 | 14.1 | 7.5 | 14.3 | 34.9 | |
| Floating Material | - | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | |
| Settleable Solid | ml/l | 0.2 | 0.5 | 0.3 | 0.8 | 0.2 | 0.1 | <0.1 | 0.2 | 0.4 | 0.2 | <0.1 | |
| TSS | mg/l | 13.2 | 22.5 | 11.0 | 17.7 | 21.3 | 16.0 | 13.8 | 16.5 | 17.1 | 13.3 | 8.5 | |
| BOD ₅ | mg/l | 11.3 | 14.8 | 39.8 | 34.2 | 17.7 | 18.2 | 19.5 | 19.0 | 17.0 | 10.4 | 15.5 | |
| Total Nitrogen | mg/l | - | 1.18 | 1.1 | 1.65 | 1.52 | 0.05 | 1.49 | 1.51 | 1.52 | 0.77 | 1.68 | |
| Nitrate | mg/l | - | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| Nitrite | mg/l | - | - | - | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| Total Phosphorus | mg/l | - | 0.24 | 0.05 | 0.07 | 0.11 | 0.34 | 0.09 | 0.99 | 0.31 | 0.52 | 7.83 | |
| Cyanide | mg/l | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.01 | <0.1 | <0.01 | <0.01 | <0.01 | |
| pH | - | - | - | 7.43 | 7.22 | 7.08 | 6.95 | 7.51 | 6.88 | 7.48 | 7.2 | 6.69 | |
| Fecal Coliform | UFC/100ml | 6.81 | 6.57 | 3.5 | 9.5 | 0 | 1 | 19 | 2.34 | 215 | 2430 | 11 | |
| Discharge volume | m ³ /month | 36,500 | 33,800 | 7,000 | 35,500 | 35,600 | 29,200 | 19,800 | 25,500 | 37,900 | 34,700 | 16,700 | |
| Operation days | days/month | 42 | 47 | 37 | 34 | 37 | 31 | 22 | 32 | 37 | 24 | 15 | |
| Arsenic | mg/l | - | - | <0.005 | - | - | 0.0055 | - | <0.1 | - | - | <0.01 | |
| Cadmium | mg/l | - | - | <0.01 | - | - | <0.01 | - | <0.1 | - | - | <0.01 | |
| Copper | mg/l | - | - | <0.04 | - | - | <0.04 | - | <0.04 | - | - | <0.04 | |
| Chromium | mg/l | - | - | <0.1 | - | - | <0.1 | - | <0.1 | - | - | <0.1 | |
| Mercury | mg/l | - | - | <0.005 | - | - | <0.005 | - | <0.1 | - | - | <0.01 | |
| Nickel | mg/l | - | - | <0.1 | - | - | <0.01 | - | <0.1 | - | - | <0.1 | |
| Lead | mg/l | - | - | <0.07 | - | - | <0.07 | - | <0.1 | - | - | <0.1 | |
| Zinc | mg/l | - | - | 0.06 | - | - | 0.15 | - | 0.20 | - | - | <0.05 | |
| Temperature | °C | 29.3 | 30.3 | 32.3 | 34.3 | 33.5 | 36.2 | 39.1 | 37.6 | 35.8 | 33.3 | 31.6 | |
| COD | mg/l | 32.7 | - | - | - | - | - | - | - | - | - | - | |
| Flow | l/s | - | 18 | - | - | - | - | - | - | - | - | - | |
| Phenols | mg/l | <0.006 | - | - | - | - | - | - | - | - | - | - | |
| Total Coliform | UFC/100ml | 5000 | - | - | - | - | - | - | - | - | - | - | |

| Parameter | Unit | 1998 | | | | | | | | | | | |
|-------------------|-----------------------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--|
| | | Jan | Feb | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
| Grease and Oil | mg/l | 7.50 | 7.25 | <5 | 7.25 | 6.33 | <5.0 | 5.25 | <5 | 5 | 9.25 | 7.56 | |
| Floating Material | - | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | |
| Settleable Solid | ml/l | 0.2 | 1.6 | <0.1 | 0.4 | 0.2 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | |
| TSS | mg/l | 18.5 | 19.1 | 9.3 | 52.1 | 20.0 | 15.7 | 22.2 | 15.0 | 59.5 | 7.5 | 20.0 | |
| BOD ₅ | mg/l | 10.4 | 6.2 | 6.2 | 7.4 | 23.0 | 7.4 | 23.6 | 18.8 | 21.4 | 25.2 | 37.6 | |
| Total Nitrogen | mg/l | 1.62 | 1.38 | 1.60 | 2.33 | 1.44 | 1.49 | 11.74 | 4.02 | 1.86 | 1.63 | 4.20 | |
| Nitrate | mg/l | - | - | <0.05 | <0.05 | <0.05 | 0.6 - 1 | 0.11 | <0.05 | <1.0 | <1.0 | <1.0 | |
| Nitrite | mg/l | - | - | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | |
| Total Phosphorus | mg/l | 0.34 | 0.53 | 0.12 | 3.61 | 0.36 | 0.18 | 0.42 | 0.84 | 1.59 | 0.53 | 0.54 | |
| Cyanide | mg/l | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.0046 | <0.002 | <0.002 | 0.075 | 0.047 | 0.045 | |
| pH | - | 7.17 | 7.10 | 6.40 | 6.22 | 7.14 | 6.60 | 6.77 | 7.00 | 6.55 | 6.57 | 6.94 | |
| Fecal Coliform | UFC/100ml | 8.5 | 73.8 | 14.6 | 120 | 0 | 46.6 | 149 | 54.5 | 378 | 418 | 4.4 | |
| Discharge volume | m ³ /month | 45,500 | 36,400 | 36,500 | 31,000 | 39,600 | 42,400 | 31,500 | 24,300 | 35,000 | 25,600 | 45,600 | |
| Operation days | days/month | 48 | 37 | 35 | 28 | 35 | 31 | 28 | 27 | 37 | 23 | 41 | |
| Arsenic | mg/l | - | - | - | - | <0.005 | - | - | <0.005 | - | - | - | |
| Cadmium | mg/l | - | - | - | - | <0.05 | - | - | <0.05 | - | - | - | |
| Copper | mg/l | - | - | - | - | <0.16 | - | - | <0.16 | - | - | - | |
| Chromium | mg/l | - | - | - | - | <0.5 | - | - | <0.5 | - | - | - | |
| Mercury | mg/l | - | - | - | - | <0.005 | - | - | <0.005 | - | - | - | |
| Nickel | mg/l | - | - | - | - | <0.28 | - | - | <0.28 | - | - | - | |
| Lead | mg/l | - | - | - | - | <0.26 | - | - | <0.26 | - | - | - | |
| Zinc | mg/l | - | - | - | - | 0.1 | - | - | 0.19 | - | - | - | |
| Temperature | °C | 27.8 | - | 31.7 | 31.3 | 34.8 | 35.7 | 35 | 34.2 | 33.3 | 33.3 | 35.4 | |

Source: Document on Wastewater Quality and Discharge (CNA)

d) Thermal Power Plant of Comision Federal de Electricidad (A/3/2)

Table B.9 Wastewater Quality of Thermal Power Plant of CFE in 1993, 1995 and 1998

| Parameter | Unit | May-93 | Jun-93 | Aug-93 | Jul-95 | Aug-98 | Dec-98 |
|--------------------------|-----------------------|---------|---------|--------|--------|---------|---------|
| PH | - | 7.0 | 7.8 | 8.3 | 8.3 | 8.0 | 7.9 |
| Total suspended solid | mg/l | 44.5 | 87.0 | 86.0 | 242.0 | 25.0 | 33.0 |
| Grease and oil | mg/l | 5.26 | 5.76 | 6.70 | 19.50 | 4.16 | 5.90 |
| Copper | mg/l | 0.63 | 0.35 | - | - | 0.08 | 0.10 |
| Iron | mg/l | 1.00 | 0.80 | - | - | 0.07 | 0.10 |
| Phosphates | mg/l | 0.13 | 0.12 | - | 0.33 | 1.10 | 2.20 |
| Temperature | °C | 31.8 | 34.8 | 43.0 | 35.0 | 32.0 | 24.0 |
| COD | mg/l | 64 | 32 | 147 | 125 | - | - |
| Total coliform | MPN/100ml | 2,400 | 2 | - | 3,280 | 280 | 300 |
| Total nitrogen | mg/l | - | - | - | 4.31 | - | - |
| BOD | mg/l | - | - | - | 41.8 | 5.6 | 4.8 |
| Monthly discharge volume | m ³ /month | 185,902 | 182,640 | - | - | 191,883 | 103,929 |

Source: Document on Wastewater Quality and Discharge (CNA)

e) NEGROMEX (A/3/3)

Table B.10(a) Monthly Average of Wastewater Quality of Industrial NEGROMEX in 1995 to 1999

| Parameter | Unit | 1995 | | 1996 | | | |
|--|-----------------------|--------|--------|--------|--------|--------|--------|
| | | Jun | Nov | Jan | Feb | Jul | Dec |
| Temperature | °C | 34.3 | 31.5 | 25.1 | 28.6 | 33.9 | 23.0 |
| pH | - | 7.18 | 7.35 | 7.11 | 6.96 | 7.00 | 7.23 |
| Total coliform | MPN/100ml | 5,960 | 9,120 | 18,700 | 4,250 | 404 | 1,880 |
| Color | Pt-Co scale | 12 | 16 | 14 | 25 | 10 | 17 |
| Phenol | mg/l | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Active substance toward methylene blue | mg/l | 0.07 | 0.064 | 0.05 | 0.06 | 0.09 | 0.13 |
| BOD ₅ | mg/l | 24.3 | 21.0 | 19.7 | 20.8 | 8.2 | 40.5 |
| COD | mg/l | 51.2 | 53.6 | 37.7 | 48.7 | 35.5 | 114.3 |
| Hexavalent chromium | mg/l | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Settleable solid | ml/l | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 | <0.1 |
| Total suspended solid | mg/l | 25.0 | 20.8 | 12.9 | 20.8 | 26.5 | 8.5 |
| Grease and oil | mg/l | 3.63 | 4.19 | 3.75 | 4.19 | 3 | 1.23 |
| Acidity | mg/l | 10.4 | 10.5 | 9.0 | 7.6 | 10.2 | 18.1 |
| Alkalinity | mg/l | 55.1 | 65.5 | 51.8 | 28.0 | 36.3 | 129.6 |
| Electric Conductance | micro S/cm | 5,880 | 2,870 | 3,260 | 4,290 | 4,860 | 1,280 |
| Floating material | - | Absent | Absent | Absent | Absent | Absent | Absent |
| Monthly discharge volume | m ³ /month | 21,100 | 16,000 | 35,400 | 6,880 | 29,000 | 22,400 |

| Parameter | Unit | 1997 | | | | | |
|--------------------------|-----------------------|--------|--------|--------|---------|---------|---------|
| | | May | Jun | Jul | Oct | Nov | Dec |
| Temperature | °C | 32.0 | 34.1 | 34.0 | 32.0 | 29.7 | 28.5 |
| pH | - | 6.98 | 7.15 | 7.79 | 7.49 | 7.12 | 7.78 |
| Fecal coliform | MPN/100ml | 493 | 229 | 572 | 210 | 460 | 200 |
| BOD ₅ | mg/l | 49.8 | 41.1 | 47.7 | 14.1 | 14.5 | 10.0 |
| Settleable solid | ml/l | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Total suspended solid | mg/l | 12.5 | 19.1 | 10.0 | 6.5 | 9.7 | 9.0 |
| Grease and oil | mg/l | 3.0 | 2.0 | 2.1 | 1.4 | 1.0 | 1.1 |
| Floating material | - | Absent | Absent | Absent | Absent | Absent | Absent |
| Total phosphorus | mg/l | <0.2 | 3.0 | 1.2 | 1.5 | 20.7 | 3.2 |
| Total nitrogen | mg/l | 3.3 | 3.1 | 0.6 | 0.2 | 0.8 | 0.2 |
| Cyanides | mg/l | <0.001 | <0.001 | <0.001 | <0.0175 | <0.0175 | <0.0175 |
| Arsenic | mg/l | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cadmium | mg/l | 0.0384 | 0.0021 | 0.0064 | <0.05 | <0.1 | <0.06 |
| Copper | mg/l | 0.0096 | 0.0078 | 0.0051 | <0.12 | <0.22 | <0.22 |
| Chromium | mg/l | 0.0132 | 0.0270 | <0.007 | <0.06 | <0.32 | <0.08 |
| Mercurie | mg/l | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Nickel | mg/l | 0.0224 | 0.0127 | <0.05 | <0.25 | <0.69 | <0.175 |
| Lead | mg/l | 0.0550 | 0.0270 | 0.0344 | <0.2 | <0.15 | <0.132 |
| Zinc | mg/l | 0.0389 | 0.0107 | 0.0556 | <0.2 | <0.95 | <0.175 |
| Monthly discharge volume | m ³ /month | 7,864 | 11,785 | 15,000 | 15,000 | 15,000 | 15,000 |

Flow meter is not functioned

Source: Document on Wastewater Quality and Discharge (CNA)

Table B.10(b) Monthly Average of Wastewater Quality of Industrial NEGROMEX
in 1995 to 1999

| Parameter | Unit | 1998 | | | | | | | | | 1999 |
|--------------------------|-----------------------|------------------------------|---------|---------|---------|---------|---------|---------|---------|--------|------|
| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Jan | |
| Temperature | °C | 21.5 | 25.9 | 25.9 | 29.3 | 30.9 | 32.8 | 31.5 | 31.0 | 26.3 | |
| pH | - | 8.12 | 7.25 | 8.65 | 8.08 | 7.95 | 7.40 | 7.64 | 7.27 | 7.70 | |
| Fecal coliform | MPN/100 ml | 42 | 122 | 305 | 134 | 268 | 335 | 135 | 780 | 25.5 | |
| BOD ₅ | mg/l | 5.5 | 6.1 | 8.6 | 2.2 | 9.4 | 3.0 | 7.8 | 11.2 | 5.0 | |
| Settleable solid | mVl | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | |
| Total suspended solid | mg/l | 4.5 | 14.5 | 14.0 | 7.0 | 6.5 | 5.0 | 4.0 | 5.5 | 8.5 | |
| Grease and oil | mg/l | 1.3 | 2.6 | 1.2 | 0.8 | 1.8 | 0.6 | 0.9 | 1.0 | 2.3 | |
| Floating material | - | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | |
| Total phosphorus | mg/l | 0.91 | 1.49 | 2.89 | 1.40 | 1.31 | 0.68 | <0.1 | 1.10 | <0.56 | |
| Total nitrogen | mg/l | 0.28 | 0.76 | 0.35 | 0.37 | 0.61 | 0.31 | 0.13 | 0.70 | 0.91 | |
| Cyanides | mg/l | <0.0175 | <0.0175 | <0.0175 | <0.0175 | <0.004 | <0.004 | <0.0039 | <0.0039 | <0.002 | |
| Arsenic | mg/l | <0.007 | <0.007 | <0.007 | <0.007 | <0.002 | <0.01 | <0.01 | <0.01 | <0.02 | |
| Cadmium | mg/l | <0.015 | <0.1 | <0.094 | <0.1 | <0.062 | <0.02 | <0.02 | <0.02 | <0.02 | |
| Copper | mg/l | <0.45 | <0.24 | <0.13 | <0.2 | <0.8 | <0.08 | <0.084 | <0.084 | <0.087 | |
| Chromium | mg/l | <0.47 | <0.5 | <0.23 | <0.3 | <0.43 | <0.035 | <0.052 | <0.035 | <0.059 | |
| Mercurie | mg/l | <0.005 | <0.005 | <0.007 | <0.005 | <0.0007 | <0.0007 | <0.0007 | <0.0007 | <0.003 | |
| Nickel | mg/l | <0.83 | <0.85 | <0.85 | <1 | <0.15 | <0.17 | <0.05 | <0.05 | <0.14 | |
| Lead | mg/l | <0.11 | <0.15 | <0.11 | <0.2 | <0.2 | <0.08 | <0.08 | <0.08 | 0.08 | |
| Zinc | mg/l | <0.57 | <0.33 | <0.055 | <0.1 | <0.07 | 0.015 | 0.128 | 0.044 | 0.350 | |
| Monthly discharge volume | m ³ /month | 15,000 | 15,000 | 15,000 | 15,000 | 9,618 | 1,871 | 21,530 | 20,075 | 15,486 | |
| | | Flow meter is not functioned | | | | | | | | | |

Source: Document on Wastewater Quality and Discharge (CNA)

(2) Conejo Lagoon (B/1)

a) BASF (B/1/1)

Table B.11(a) Wastewater Quality of BASF Mexicana in 1996-1998

| Parameter | Unit | 1996 | | | | | | |
|--------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|
| | | Apr | Jul | Aug | Sep | Oct | Nov | Dec |
| Grease and Oil | mg/l | 2.9 | 13.2 | 11.9 | 9.1 | 10.2 | 15.0 | 18.5 |
| Sedimentable Solid | ml/l | 0.2 | 0.3 | 0.1 | 0.2 | 0.2 | 0.1 | <0.1 |
| Total Suspended Solid | mg/l | 46.7 | 24.6 | 18.1 | 38.6 | 40.7 | 37.0 | 25.0 |
| BOD ₅ | mg/l | 20.7 | 5.4 | 32.0 | 4.4 | 6.0 | 6.0 | 4.0 |
| pH | - | 7.47 | 7.07 | 7.16 | 7.79 | 7.34 | 6.91 | 7.07 |
| COD | mg/l | 100 | 186 | 206 | 169 | 97 | 170 | 96 |
| Phenols | mg/l | <0.001 | 0.002 | 0.010 | 0.003 | 0.002 | 0.001 | <0.05 |
| Total Coliform | UFC/100ml | 29,100 | 21,700 | 17,700 | 11,000 | 1,840 | 19,500 | 10,600 |
| Monthly Discharge Volume | m ³ /month | 5,790 | 19,938 | 17,062 | 14,585 | 14,632 | 17,495 | 15,023 |
| operation days | Days/month | 9 | 30 | 30 | 30 | 30 | 30 | 29 |

Source: Document on Wastewater Quality and Discharge (CNA)

Table B.11(b) Wastewater Quality of BASF Mexicana in 1996-1998

| Parameter | Unit | 1997 | | | | | | | | | | | |
|--------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Grease and Oil | mg/l | 20.0 | 14.0 | 10.5 | 11.3 | 11.8 | 7.5 | 46.0 | 4.5 | 4.8 | 8.8 | 13.5 | 13.3 |
| Floating Material | mg/l | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| Settleable Solid | ml/l | <0.1 | <0.1 | 0.6 | 0.3 | 0.2 | 1.0 | 3.8 | <0.1 | 0.3 | 1.3 | 2.4 | 1.3 |
| Total Suspended Solid | mg/l | 36 | 33 | 120 | 152.5 | 52 | 120 | 334 | 115.5 | 62.5 | 53.5 | 26.3 | 59.5 |
| BOD ₅ | mg/l | 4.7 | 10.6 | 5.2 | 8.5 | 114.6 | 30.1 | 9.6 | 19.8 | 13.7 | 10.9 | 27.4 | 47.0 |
| Total Nitrogen | mg/l | 5.68 | - | - | - | - | - | - | - | - | - | - | - |
| Total Phosphorus | mg/l | 0.23 | - | - | - | - | - | - | - | - | - | - | - |
| Cyanide | mg/l | - | 0.11 | 0.12 | 0.10 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| pH | - | 6.75 | 6.98 | 7.28 | 7.40 | 7.38 | 7.47 | 7.65 | 7.26 | 7.09 | 6.95 | 6.00 | 7.30 |
| Fecal Coliform | UFC/100ml | 43,200 | 27,900 | 313 | 443 | 38.5 | 5.29 | 731 | 67.1 | 14.4 | 5.98 | 19.7 | 8.45 |
| Arsenic | mg/l | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Cadmium | mg/l | 0.01 | 0.01 | 0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Copper | mg/l | 0.016 | 0.021 | 0.033 | 0.028 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.05 |
| Chromium | mg/l | 0.02 | 0.01 | 0.02 | 0.02 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Mercury | mg/l | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.0065 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Nickel | mg/l | 0.05 | 0.06 | 0.07 | 0.06 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Lead | mg/l | 0.04 | 0.03 | 0.05 | 0.04 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 |
| Zinc | mg/l | 0.000 | 0.062 | 0.054 | 0.039 | 0.053 | 0.048 | 0.085 | 0.095 | 0.075 | 0.625 | 0.060 | 0.073 |
| Temperature | - | 20 | 23 | 22 | 23 | 31 | 32 | 31 | 31.5 | 30.5 | 29.5 | 25 | 23 |
| COD | mg/l | 155 | - | - | - | - | - | - | - | - | - | - | - |
| Flow | l/s | 8.9 | 8.8 | 8.3 | 9.7 | 9.7 | 9 | 10.85 | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 |
| Phenols | mg/l | 0.002 | - | - | - | - | - | - | - | - | - | - | - |
| Total Coliform | UFC/100ml | 138250 | - | - | - | - | - | - | - | - | - | - | - |
| Egg of Helintos | org/l | nd | nd | nd | nd | - | - | - | - | - | - | - | - |
| Monthly Discharge Volume | m ³ /month | 15,427 | 15,109 | 15,515 | 16,317 | 16,666 | 21,579 | 17,838 | 20,530 | 19,040 | 23,945 | 25,213 | 26,173 |
| Operation days | days/month | 23 | 22 | 24 | 21 | 21 | 29 | 25 | 27 | 24 | 27 | 21 | 20 |
| Parameter | Unit | 1998 | | | | | | | | | | | |
| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Oct | Nov | Dec-98 | Jan-99 | |
| Grease and Oil | mg/l | 17.5 | 7.7 | 6.5 | 8.7 | 7.3 | 28.0 | 12.0 | 14.6 | 24.0 | 12.0 | 11.0 | |
| Floating Material | mg/l | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| Settleable Solid | ml/l | 0.075 | <0.1 | <0.1 | <0.1 | 0.73 | 0.125 | <0.1 | <0.1 | 1 | <0.1 | 0.05 | |
| Total Suspended Solid | mg/l | 63.5 | 23.5 | 35.5 | 58.5 | 66.0 | 64.5 | 41.0 | 11.0 | 44.0 | 24.0 | 27.5 | |
| BOD ₅ | mg/l | 17.5 | 16.9 | 6.7 | 29.8 | 269.3 | 9.0 | 22.8 | 9.7 | 64.0 | 25.0 | 20.0 | |
| Cyanide | mg/l | <0.01 | <0.01 | <0.01 | <0.01 | 0.018 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| pH | - | 6.53 | 6.65 | 7.08 | 7.05 | 7.33 | 6.84 | 7.39 | 6.77 | 7.13 | 6.68 | 7.19 | |
| Fecal Coliform | UFC/100ml | 2 | 2 | 25 | 0 | 315 | 0 | 0 | 37 | <3 | 26 | <3 | |
| Arsenic | mg/l | <0.028 | <0.028 | <0.028 | <0.028 | <0.028 | <0.028 | <0.028 | <0.028 | <0.028 | <0.028 | <0.028 | |
| Cadmium | mg/l | <0.015 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | <0.01 | 0.01 | <0.015 | |
| Copper | mg/l | <0.025 | 0.035 | 0.019 | <0.025 | 0.036 | <0.025 | 0.030 | <0.025 | <0.025 | <0.025 | <0.025 | |
| Chromium | mg/l | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.1 | |
| Mercury | mg/l | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.003 | 0.007 | <0.002 | <0.002 | <0.002 | <0.002 | |
| Nickel | mg/l | 0.1 | <0.1 | 0.1 | 0.1 | 0.1 | 0.1 | <0.1 | 0.1 | <0.1 | 0.1 | 0.0 | |
| Lead | mg/l | 0.08 | 0.04 | 0.07 | 0.08 | 0.09 | 0.08 | 0.09 | <0.068 | 0.10 | 0.09 | 0.07 | |
| Zinc | mg/l | 0.07 | 0.03 | 0.03 | 0.07 | 0.38 | 0.41 | <0.05 | 0.07 | 0.39 | 0.47 | 0.07 | |
| Temperature | - | 23 | 22.5 | 24 | 26.5 | 29.5 | 32.5 | 31 | 22 | 27.5 | 25 | 21.5 | |
| Flow | l/s | 11.1 | 11.1 | 11.1 | 11.1 | 11.1 | 10.4 | 11.1 | 11.1 | 13.9 | 13.9 | 11.1 | |
| Monthly Discharge Volume | m ³ /month | 23,812 | 25,701 | 20,961 | 26,268 | 18,644 | 25,020 | 26,891 | 19,017 | 33,528 | 24,170 | 23,992 | |
| Operation days | days/month | 19 | 21 | 20 | 19 | 22 | 20 | 20 | 23 | 18 | 19 | 18 | |

Source: Document on Wastewater Quality and Discharge (CNA)

nd: not detected

b) Grupo Primex (B/1/2)

Table B.12 Wastewater Quality of Grupo Primex in 1994-1995 and 1998

| Parameter | Unit | 1994* | | | 1995* | | |
|--|-------------|---------|---------|---------|---------|--------|--------|
| | | Oct | Nov | Dec | Jan | Feb | Mar |
| Temperature | °C | 31 | 31 | 29 | 26 | 25 | 26 |
| pH | - | 8.1 | 7.6 | 7.3 | 7 | 6.6 | 7.3 |
| Electric conductance | Micro S/cm | 2,780 | 2,681 | 2,674 | 1,695 | 2,232 | 2,008 |
| Total suspended solid | mg/l | 95 | 53 | 63 | 69 | 238 | 122 |
| Settleable solid | ml/l | 0.99 | 0.1 | 0.11 | 0.14 | 0.99 | 0.79 |
| Color | Pt-Co scale | 12 | 13 | 12 | 16 | 18 | 18 |
| Phosphates | mg/l | 2.05 | 1.7 | 0.83 | 0.64 | 1.19 | 1.33 |
| Grease and oil | mg/l | 13 | 34 | 32 | 29.5 | 17.7 | 62.4 |
| Total nitrogen | mg/l | 1.37 | 0.54 | 0.2 | 0.12 | 0.62 | 1.07 |
| Hexavalent chromium | mg/l | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |
| Active substance toward methylene blue | mg/l | 0.09 | 0.25 | 0.13 | 0.1 | 0.1 | 0.2 |
| Cadmium | mg/l | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Phenols | mg/l | 0.044 | 0.062 | 0.059 | 0.111 | 0.072 | 0.093 |
| BOD ₅ | mg/l | 255 | 287 | 345 | 357 | 181 | 349 |
| Total coliform | MPN/100ml | 112,700 | 233,750 | 192,250 | 112,000 | 46,850 | 34,000 |
| COD | mg/l | 508 | 482 | 685 | 572 | 462 | 912 |

| Parameter | Unit | 1998** | | |
|-----------------------|------------------------|---------|---------|---------|
| | | Jan-Mar | Apr-Jun | Oct-Dec |
| Fecal coliform | MPN/100ml | 2.3 | 11.8 | 92.2 |
| pH | - | 7.31 | 6.5 | 6.5 |
| Grease and oil | mg/l | 7.66 | 17.3 | 17.38 |
| Total suspended solid | mg/l | 105 | 38.3 | 70.2 |
| BOD ₅ | mg/l | 600 | 301 | 609 |
| Total nitrogen | mg/l | 1.09 | 1 | 6.96 |
| Total phosphorus | mg/l | 0.18 | 0.54 | 0.7 |
| Arsenic | mg/l | 0.003 | 0.0025 | 0.005 |
| Cadmium | mg/l | 0.027 | 0.025 | 0.026 |
| Cyanides | mg/l | 0.005 | 0.005 | 0.025 |
| Copper | mg/l | 0.08 | 0.18 | 0.08 |
| Chromium | mg/l | 0.25 | 0.25 | 0.24 |
| Mercury | mg/l | 0.003 | 0.0025 | 0.005 |
| Nickel | mg/l | 0.14 | 0.14 | 0.13 |
| Lead | mg/l | 0.13 | 0.18 | 0.25 |
| Zinc | mg/l | 0.721 | 0.68 | 0.304 |
| Three months volume | m ³ /3month | 369,409 | 300,288 | 310,066 |

Source: Document on Wastewater Quality and Discharge (CNA)

* Monthly average

** Quarterly average

c) Internacional de Papeles del Golfo (B/1/3)

Table B.13 Water Quality of Wastewater (Internacional de Papeles del Golfo)

| Parameter | Unit | Concentration |
|--|-----------------------|---------------|
| pH | - | 7.7 |
| Temperature | °C | 30 |
| Settleable solid | ml/l | 5 |
| Floating material | - | Absent |
| Grease and oil | mg/l | 22.5 |
| Color | mg/l | 70 |
| COD | mg/l | 400 |
| Total suspended solid | mg/l | 154 |
| BOD ₅ | mg/l | 172 |
| Active substance toward methylene blue | mg/l | 1.3 |
| Total coliform | NMP/100ml | 110,000 |
| Electric conductivity | micro S/cm | 1298 |
| Flow rate | l/s | 3.425 |
| Authorized annual volume | m ³ /year | 108,000 |
| Monthly discharge volume | m ³ /month | 9,000 |

Source: Document on Wastewater Quality and Discharge (CNA)

d) Fibras Nacionales de Acrilico (Finacril) (B/1/4)

Table B.14 (a) Wastewater Quality of Fibras Nacionales de Acrilico in 1996-1998

| Parameter | Unit | 1996* | | | | | | | | 1997* | | |
|--------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| | | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | |
| Temperature | °C | 25.0 | 24.7 | 25.6 | 25.3 | 24.5 | 22.1 | 19.6 | 20.7 | 21.7 | 23.2 | |
| pH | - | 6.96 | 7.6 | 8.35 | 8.14 | 7.54 | 7.65 | 8.02 | 7.51 | 7.70 | 7.12 | |
| Electric conductivity | Micro S/cm | 4,770 | 5,506 | 4,274 | 3,248 | 2,909 | 2,272 | 2,378 | 1,882 | 1,781 | 2,606 | |
| Color | - | 1.40 | 1.45 | 3.91 | 2.14 | 1.61 | 1.18 | 1.68 | 1.55 | 0.98 | 1.20 | |
| Total phosphates | mg/l | 0.11 | 0.40 | 0.14 | 0.09 | 0.11 | 0.18 | 0.29 | 0.43 | 0.40 | 0.42 | |
| Total nitrogen | mg/l | 2.64 | 1.22 | 2.84 | 2.09 | 3.60 | 2.98 | 2.36 | 3.70 | 2.88 | 1.58 | |
| BOD | mg/l | 26.4 | 46.6 | 45.8 | 49.8 | 51.0 | 39.2 | 50.0 | 39.8 | 47.8 | 36.1 | |
| COD | mg/l | 85 | 95 | 112 | 120 | 108 | 100 | 106 | 75 | 105 | 100 | |
| Grease and oil | mg/l | 6.1 | 6.7 | 6.2 | 9.4 | 4.7 | 3.3 | 7.7 | 7.1 | 4.8 | 9.9 | |
| Total suspended solid | mg/l | 42.0 | 55.0 | 59.5 | 69.3 | 55.1 | 57.9 | 54.5 | 40.5 | 43.1 | 41.0 | |
| Phenols | mg/l | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | |
| Settleable solid | ml/l | 0.6 | 0.9 | 0.6 | 0.7 | 0.8 | 0.3 | 0.5 | 0.8 | 0.6 | 0.8 | |
| Cyanides | mg/l | 0.013 | 0.020 | 0.018 | 0.009 | 0.020 | 0.017 | 0.020 | 0.019 | 0.018 | 0.018 | |
| Coliform | MPN/100ml | 1,230 | 3,520 | 3,170 | 3,890 | 4,050 | 2,960 | 2,900 | 3,150 | 2,750 | 3,240 | |
| Floating matter | - | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | |
| Monthly discharge Volume | m ³ /month | 95,466 | 92,310 | 84,282 | 82,214 | 81,891 | 74,910 | 82,720 | 87,307 | 64,858 | 77,497 | |

Source: Document on Wastewater Quality and Discharge (CNA)

* Monthly average

** Quarterly average

Table B.14 (b) Wastewater Quality of Fibras Nacionales de Acrilico in 1996-1998

| Parameter | Unit | Maximum limit Monthly average | 1997** | | 1998** | | | |
|-----------------------|------------------------|-------------------------------------|---------|---------|---------|---------|---------|---------|
| | | | Jul-Sep | Oct-Dec | Jan-Mar | Apr-Jun | Jul-Sep | Oct-Dec |
| Fecal coliform | MPN/100ml | 1,000 | 403 | 96 | 286 | 309 | 4,450 | 7 |
| p | - | 5-10 | 6.78 | 7.00 | 6.30 | 7.80 | 7.15 | 7.35 |
| Temperature | °C | 40 | 23.5 | 21.2 | 22.4 | 25.7 | 26.5 | 20.1 |
| Grease and oil | mg/l | 15 | 5.6 | 66 | 7.5 | <5 | <5 | 10.5 |
| Floating material | - | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| Settleable solid | ml/l | 1.0 | 3.3 | 0.8 | 0.1 | 0.2 | 0.2 | <0.1 |
| Total suspended solid | mg/l | 75 | 96.2 | 33.1 | 21.0 | 32.7 | 17.0 | 24.0 |
| BOD ₅ | mg/l | 75 | 86.6 | 99.2 | 84.7 | 40.6 | 72.1 | 27.1 |
| Total nitrogen | mg/l | 40 | 21.7 | 35.8 | 15.7 | 4.2 | 13.0 | 32.7 |
| Total phosphorus | mg/l | 20 | 2.47 | 4.03 | 2.52 | 1.69 | 3.07 | 8.64 |
| Arsenic | mg/l | 0.2 | <0.01 | <0.01 | 0.005 | <0.005 | <0.005 | <0.005 |
| Cadmium | mg/l | 0.2 | <0.01 | <0.01 | 0.052 | <0.05 | <0.05 | <0.027 |
| Cyanides | mg/l | 2 | <0.01 | <0.01 | 0.01 | <0.01 | <0.002 | 0.045 |
| Copper | mg/l | 4 | <0.04 | 0.06 | 0.17 | <0.16 | <0.16 | <0.08 |
| Chromium | mg/l | 1 | 0.055 | <0.1 | 0.5 | <0.5 | <0.5 | <0.24 |
| Mercury | mg/l | 0.01 | <0.01 | <0.01 | 0.01 | <0.005 | <0.005 | <0.005 |
| Nickel | mg/l | 2 | <0.1 | <0.1 | 0.28 | <0.28 | <0.28 | 0.147 |
| Lead | mg/l | 0.5 | <0.1 | <0.1 | 0.26 | <0.26 | <0.26 | <0.26 |
| Zinc | mg/l | 10 | 0.471 | 0.35 | 0.23 | 0.23 | 0.185 | 0.26 |
| Discharge Volume | m ³ /3month | - | 294,282 | 241,127 | 189,923 | 262,935 | 195,116 | 122,815 |

Source: Document on Wastewater Quality and Discharge (CNA)

* Monthly average

** Quarterly average

e) GE Plastics (Polimar) (B/1/5)

Table B.15 Monthly Average of Wastewater Quality of GE Plastics (Polimar) in 1995

| Parameter | Unit | 1995 | | | | | |
|--------------------------|-----------------------|--------|--------|--------|--------|--------|--------|
| | | Jan | Feb | Mar | Apr | May | Jun |
| Temperature | °C | 21.6 | 23.4 | 25.8 | 25.1 | 26.3 | 25.9 |
| pH | | 8.26 | 8.20 | 8.65 | 8.77 | 8.43 | 8.35 |
| Total suspended solid | mg/l | 36.5 | 31.5 | 41.5 | 40.5 | 27.1 | 34.0 |
| COD | mg/l | 52.1 | 36.3 | 45.9 | 36.3 | 44.6 | 54.3 |
| BOD ₅ | mg/l | 17.8 | 4.3 | 5.5 | 7.8 | 7.5 | 8.2 |
| Settleable solid | ml/l | <0.1 | <1.0 | <1 | <1 | | <0.1 |
| Fluorides | mg/l | 0.34 | 0.41 | 0.31 | 0.28 | 0.08 | 0.34 |
| Grease and oil | mg/l | 5.9 | 6.1 | 2.8 | 6.7 | 0 | 6.8 |
| Phenols | mg/l | 0.011 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Flow rate | l/s | 9.81 | 8.00 | 8.60 | 9.25 | 9.18 | 8.71 |
| Monthly discharge volume | m ³ /month | 26,275 | 19,354 | 23,034 | 23,976 | 24,588 | 22,576 |

Source: Documents on Wastewater Quality and Discharge (CNA)

f) Industries in Small and Medium Scale Industrial Estate (B/1/6)

Table B.16 Wastewater Quality of Industries in Small and Medium Scale Industrial Estate

| Parameter | Unit | Operadora y Comercializadora Trevi Plus (B/1/6 (1)) | Johns Manville Industrial (B/1/6 (2)) | Tectno Asfalto del Golfo (B/1/6 (3)) | Asfaltos y Derivados Mexicanos (B/1/6 (4)) |
|--|----------------------|---|---------------------------------------|--------------------------------------|--|
| Total coliform | MPN/100ml | 0 | - | 360,000 | 110,000 |
| Fecal coliform | MPN/100ml | - | 2 | - | - |
| Color | Pt-Co scale | 10 | - | >500 | 30 |
| Electric conductivity | micro S/cm | 3,020 | 2,423 | 1,559 | 956 |
| BOD ₅ | mg/l | 0.81 | 26.4 | 125 | 4.2 |
| COD | mg/l | 36.1 | 197 | 261 | 30 |
| Grease and oil | mg/l | 17.5 | 5 | 24 | 1.9 |
| Floating material | - | Absent | Absent | Absent | Absent |
| pH | - | 7.8 | 5.8 | 7.5 | 7.7 |
| Active substance toward methylene blue | mg/l | <0.1 | 3.90 | 7.43 | 0.09 |
| Settleable solid | mg/l | - | - | 5.0 | 0.1 |
| Total suspended solid | mg/l | 6.0 | 19.5 | 150 | 20.0 |
| Temperature | °C | 29 | 33 | 30 | 30 |
| Annual discharge volume | m ³ /year | - | 2,765 | 303 | 438 |

Source: Document on Wastewater Quality and Discharge (CNA)

(3) Panuco River (C)

a) Sea-food Processing Industries (C/3/1)

Table B.17 (a) Wastewater Quality of Sea-food Processing Industries

| Parameter | Unit | Camarones de Golfo | | Basilio Reynaga Martínez | | Restaurant el Pollo Marino |
|--|----------------------|--------------------|-------------|--------------------------|-------------|----------------------------|
| | | discharge 1 | discharge 2 | Discharge 1 | discharge 2 | |
| pH | - | 7.26 | 7.87 | 7.60 | 7.40 | 8.52 |
| Temperature | °C | 30 | 25 | 28 | 29 | 27 |
| Settleable solid | ml/l | <0.1 | 1.5 | 0.2 | 0.9 | 0.2 |
| Floating material | - | Absence | Absence | Absence | Absence | Absence |
| Grease and oil | mg/l | <1.0 | 1.0 | 9.8 | 20.8 | 2.3 |
| Color | units | 20 | 10 | 10 | 10 | 10 |
| COD | mg/l | 312 | 564 | 1,008 | 484 | 69 |
| Total suspended solid | mg/l | 67 | 146 | 109 | 96 | 76 |
| BOD ₅ | mg/l | 287 | 545 | 935 | 467 | - |
| Active substance toward methylene blue | mg/l | 3.8 | 40.8 | 2.5 | 4.7 | 0.3 |
| Total coliform | MPN/100 ml | 110,000 | 110,000 | 110,000 | 110,000 | 11,000 |
| Electric conductivity | micro S/cm | 1,348 | 24.1 | 4,330 | 2,220 | 950 |
| Total phosphorus | mg/l | - | - | - | - | - |
| Ammonia N | mg/l | - | - | - | - | - |
| Kjeldhal N | mg/l | - | - | - | - | - |
| Fecal coliform | MPN/100 ml | - | - | - | - | - |
| Annual discharge Volume | m ³ /year | 207 | 2,193 | 1,683 | 4,862 | 3,636 |

Source: document on Wastewater Quality and Discharge (CNA)

Table B.17 (b) Wastewater Quality of Sea-food Processing Industries

| Parameter | Unit | Luis Gonzalez Aranda | Impulsora de Pescados y Mariscos | Exportadores Asociados | Pescafina Tampico | Francisco Javier Marquez |
|--|----------------------|----------------------|----------------------------------|------------------------|-------------------|--------------------------|
| pH | | - | 7.85 | 7.50 | 7.10 | 7.79 |
| Temperature | °C | - | - | - | 18 | - |
| Settleable solid | ml/l | - | 0.1 | 0.1 | 3.0 | - |
| Floating material | | Absence | Absence | - | Absence | - |
| Grease and oil | mg/l | 10.9 | 11.5 | 6.3 | 3.9 | <5 |
| Color | units | - | - | 95 | 60 | - |
| COD | mg/l | 258 | 203 | 1,440 | 2,526 | - |
| Total suspended solid | mg/l | 67 | 5 | - | 170 | 11 |
| BOD ₅ | mg/l | 234 | 37 | 405 | 1,860 | 8.1 |
| Active substance toward methylene blue | mg/l | 5.9 | - | 0.0 | 0.2 | - |
| Total coliform | MPN/100 ml | >110,000 | - | 110,000 | 4 | 388 |
| Electric conductivity | micro S/cm | - | - | 1,420 | 1,895 | - |
| Total phosphorus | mg/l | 11.8 | - | 32.5 | - | - |
| Ammonia N | mg/l | <0.1 | - | - | - | - |
| Kjeldhal N | mg/l | 64.1 | - | - | - | - |
| Fecal coliform | MPN/100 ml | 2,295 | - | - | - | - |
| Annual discharge Volume | m ³ /year | 455 | 14,602 | 2,400 | 3,600 | 2,090 |

Source: document on Wastewater Quality and Discharge (CNA)

b) Refineria Madero (PEMEX) (C/10)

Table B.18 (a) Monthly Average of Wastewater Quality of Siete y Media (Refineria Madero, PEMEX) in 1996-1999

| Parameter | Unit | 1996 | | | | | 1997 |
|--------------------------|-----------------------|--------|--------|--------|--------|--------|--------|
| | | Jul | Aug | Sep | Oct | Nov | Jan |
| BOD ₅ | mg/l | 27.5 | 22.0 | 28.0 | 22.9 | 32.6 | 33.5 |
| COD | mg/l | 447 | 297 | 227 | 343 | 418 | 558 |
| Grease and Oil | mg/l | 21.8 | 6.3 | 20.0 | 11.6 | 50.8 | 17.3 |
| Ammonia N | mg/l | 1.4 | 0.7 | 1.5 | 2.2 | 3.0 | 5.2 |
| TSS | mg/l | 20.4 | 30.3 | 26.0 | 34.8 | 31.2 | 34.3 |
| Phenols | mg/l | 1.57 | 0.10 | 0.11 | 0.10 | 0.20 | 0.27 |
| Monthly discharge Volume | m ³ /month | 60,197 | 42,346 | 42,995 | 40,504 | 30,622 | 58,754 |

Source: Document on Wastewater Quality and Discharge (CNA)

Table B.18 (b) Monthly Average of Wastewater Quality of Siete y Media (Refineria Madero, PEMEX) in 1996-1999

| Parameter | Unity | 1998 | | | | | | | | | | 1999 |
|--------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Nov | Dec | Jan |
| Grease and Oil | mg/l | 131 | 10.5 | 14.5 | 9.0 | 41.5 | 18.0 | 27.2 | 80.0 | 20.0 | 51.5 | 73.5 |
| Floating Material | mg/l | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| Settleable Solid | ml/l | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| TSS | mg/l | 33.0 | 27.4 | 30.9 | 55.3 | 110.0 | 23.0 | 44.5 | 102.7 | 29.0 | 69.2 | 64.0 |
| BOD ₅ | mg/l | 25.3 | 18.4 | 27.9 | 33.4 | 48.2 | 58.8 | 31.0 | 74.5 | 53.0 | 45.8 | 74.5 |
| Total Nitrogen | mg/l | 8.2 | 6.6 | 7.2 | 12.6 | 22.4 | 7.7 | 11.8 | 7.4 | 12.4 | 10.7 | 12.4 |
| Total Phosphorus | mg/l | 0.23 | 1.90 | 0.48 | 0.67 | 0.50 | 1.38 | 1.24 | 0.28 | 1.16 | 0.85 | 2.81 |
| Cyanide | mg/l | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.025 | <0.01 | <0.02 |
| pH | - | 7.4 | 7.5 | 7.8 | 7.95 | 7.4 | 6.9 | 7.45 | 7.4 | 7.4 | 7.7 | 7.7 |
| Fecal Coliform | UFC/100 ml | 7,676 | 9,160 | 4,129 | 8,782 | 2,411 | 2,408 | 329 | 3,920 | 1,656 | 5,957 | 1,106 |
| Arsenic | mg/l | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.006 | <0.01 | 0.007 |
| Cadmium | mg/l | <0.054 | <0.054 | <0.054 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.038 | <0.01 | <0.026 |
| Copper | mg/l | <0.16 | <0.16 | <0.16 | <0.16 | <0.16 | <0.16 | <0.16 | <0.16 | 0.12 | <0.04 | 0.116 |
| Chromium | mg/l | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.05 | <0.037 | <0.1 | <0.024 |
| Mercury | mg/l | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.01 | 0.009 |
| Nickel | mg/l | <0.28 | <0.28 | <0.28 | <0.28 | <0.28 | <0.28 | <0.28 | 0.47 | <0.21 | <0.1 | <0.14 |
| Lead | mg/l | <0.259 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.18 | <0.2 | <0.2 | <0.1 | <0.2 |
| Zinc | mg/l | 0.19 | 0.39 | 0.40 | 0.41 | 0.61 | 0.47 | 0.17 | 0.31 | <0.05 | 0.32 | 0.56 |
| Temperature | °C | 51.6 | 27.4 | 25.3 | 28.0 | 32.8 | 31.3 | 30.7 | 31.0 | 27.0 | 25.0 | 19.0 |
| Monthly discharge Volume | m ³ /month | 42,075 | 20,417 | 22,632 | 24,106 | 23,032 | 22,418 | 27,668 | 39,196 | 40,574 | 22,072 | 30,922 |

Source: Document on Wastewater Quality and Discharge (CNA)

Table B.19 (a) Monthly Average of Wastewater Quality of Varadero (Refineria Madero, PEMEX) (in 1996-1998)

| Parameter | Unit | 1996 | | | | | 1997 |
|--------------------------|-----------------------|---------|---------|---------|---------|---------|---------|
| | | Jul | Aug | Sep | Oct | Nov | Jan |
| BOD ₅ | mg/l | 75.8 | 72.3 | 81 | 73.4 | 65 | 100 |
| COD | mg/l | 451 | 367 | 383 | 630 | 700 | 1,078 |
| Grease and Oil | mg/l | 30.3 | 29.8 | 135 | 84.1 | 172 | 47 |
| Ammonia N | mg/l | 18.4 | 17.2 | 10.1 | 35.7 | 32.5 | 50.9 |
| TSS | mg/l | 30.1 | 20.7 | 26.3 | 56.5 | 141 | 54 |
| Phenols | mg/l | 5.2 | 2.9 | 4.0 | 3.8 | 3.4 | 5.9 |
| Monthly discharge Volume | m ³ /month | 368,586 | 381,426 | 293,432 | 277,405 | 253,251 | 179,323 |

Source: Document on Wastewater Quality and Discharge (CNA)

Table B.19 (b) Monthly Average of Wastewater Quality of Varadero (Refineria Madero, PEMEX) (in 1996-1998)

| Parameter | Unity | 1998 | | | | | | | | | |
|--------------------------|-----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | Jan-98 | Feb-98 | Mar-98 | Apr-98 | May-98 | Jun-98 | Jul-98 | Aug-98 | Nov-98 | Dec-98 |
| Grease and Oil | mg/l | 164 | 9.5 | 26.5 | 12.5 | 21.5 | 29.5 | 22.4 | 18.5 | 29 | 89 |
| Floating Material | mg/l | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| Settleable Solid | ml/l | <0.1 | 0.25 | 0.2 | <0.1 | 0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.2 |
| TSS | mg/l | 44.0 | 11.0 | 25.0 | 18.0 | 50.3 | 37.4 | 43.5 | 30.5 | 27.5 | 44.2 |
| BOD ₅ | mg/l | 56.0 | 23.4 | 80.2 | 84.9 | 168.4 | 69.5 | 106.6 | 68.3 | 170.0 | 74.2 |
| Total Nitrogen | mg/l | 42.3 | 34.9 | 73.9 | 73.1 | 100.1 | 27.3 | 49.6 | 33.4 | 69.9 | 34.2 |
| Total Phosphorus | mg/l | 0.23 | 0.50 | 0.63 | 0.91 | 0.52 | 1.77 | 1.68 | 0.20 | 1.60 | 1.90 |
| Cyanide | mg/l | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.07 | <0.01 |
| pH | - | 7.9 | 8.9 | 8.5 | 9.0 | 8.4 | 8.8 | 8.8 | 7.2 | 8.7 | 9.0 |
| Fecal Coliform | UFC/100ml | 6,742 | 162 | 109 | 71.5 | 614 | 38 | 438 | 161 | 147 | 2,672 |
| Arsenic | mg/l | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.01 |
| Cadmium | mg/l | <0.054 | <0.0054 | <0.054 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.039 | <0.01 |
| Copper | mg/l | <0.16 | <0.16 | <0.16 | <0.16 | <0.16 | <0.16 | <0.16 | <0.16 | <0.12 | <0.04 |
| Chromium | mg/l | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.38 | <0.1 |
| Mercury | mg/l | <0.005 | <0.005 | <0.005 | <0.005 | 0.009 | <0.005 | <0.005 | <0.005 | <0.005 | <0.01 |
| Nickel | mg/l | <0.28 | <0.28 | <0.28 | <0.28 | <0.28 | <0.28 | <0.28 | <0.28 | <0.21 | <0.1 |
| Lead | mg/l | <0.259 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.18 | <0.2 | <0.2 | <0.1 |
| Zinc | mg/l | 0.24 | 0.08 | 0.33 | 1.90 | 0.24 | 0.25 | 0.27 | 0.19 | <0.21 | 0.19 |
| Temperature | - | 32.8 | 32.0 | 31.3 | 33.5 | 31.5 | 39.6 | 34.2 | 34.0 | 31.5 | 31.5 |
| Monthly Discharge Volume | m ³ /month | 109,720 | 135,739 | 160,200 | 166,525 | 190,364 | 152,323 | 183,032 | 179,335 | 276,984 | 108,016 |

Source: Document on Wastewater Quality and Discharge (CNA)

(4) Coastal Water of Gulf of Mexico

a) Petrocel (D)

Table B.20 Monthly Average of Wastewater Quality of Petrocel (D) in 1995-1997

| Parameter | Unit | 1995 | | 1996 | | | | 1997 |
|--|-----------------------|---------|---------|---------|---------|---------|---------|---------|
| | | Nov-95 | Dec-95 | Sep-96 | Oct-96 | Nov-96 | Dec-96 | Jan-97 |
| pH | - | 7.29 | 7.56 | 7.51 | 7.69 | 7.54 | 7.06 | 7.06 |
| Temperature | °C | 33.0 | 31.1 | 33.1 | 33.8 | 33.3 | 33.4 | 31.5 |
| Color | Pt-Co scale | 18 | 19 | 30 | 34 | 31 | 33 | 31 |
| Settleable solid | ml/l | 0.5 | 0.4 | 0.2 | 0.2 | 0.2 | 0.5 | 0.1 |
| Grease and oil | mg/l | 5.0 | 5.9 | 6.0 | 5.0 | 4.8 | 6.9 | 7.3 |
| Kjeldahl nitrogen | mg/l | 1.28 | 1.4 | 0.34 | 0.29 | 0.31 | 0.36 | 0.19 |
| Total suspended solid | mg/l | 31.4 | 27.5 | 19.8 | 27.5 | 23.8 | 26.9 | 31.1 |
| COD | mg/l | 87.4 | 91.1 | 83.8 | 88.1 | 62.4 | 70.6 | 93.1 |
| BOD ₅ | mg/l | 43.0 | 42.6 | 34.3 | 38.5 | 27.4 | 29.8 | 37.1 |
| Active substance toward methylene blue | mg/l | 0.02 | 0.04 | <0.001 | <0.001 | <0.001 | <0.001 | 0.02 |
| Total coliform | MPN/100ml | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total chromium | mg/l | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Hexavalent chromium | mg/l | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Floating material | - | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| Sulfides | mg/l | 0.34 | 0.24 | 0.17 | 0.08 | 0.12 | 0.17 | 0.20 |
| Copper | mg/l | 0.0036 | 0.0044 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Zinc | mg/l | 0.0066 | 0.0075 | 0.003 | 0.0031 | 0.0028 | 0.0035 | 0.0035 |
| Nickel | mg/l | 0.0046 | 0.006 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Phenols | mg/l | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Flow rate | l/s | 108 | 111 | 65 | 94 | 111 | 125 | 118 |
| Monthly discharge volume | m ³ /month | 265,626 | 173,053 | 178,233 | 179,092 | 320,143 | 212,952 | 432,579 |

Source: Document on Wastewater Quality and Discharge (CNA)

b) NOVAQUIM (E)

Table B.21 Monthly Average of Wastewater Quality of NOVAQUIM in 1996

| Parameter | Unit | 1996 | | | | | | | | | | | |
|--|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Temperature | °C | 28.5 | 30.5 | 30.8 | 31.6 | 32.9 | 35.3 | 36.4 | 35.3 | 35.0 | 33.3 | 31.9 | 26.0 |
| PH | - | 7.80 | 7.05 | 7.49 | 8.33 | 7.74 | 7.30 | 6.54 | 5.92 | 5.80 | 7.44 | 6.63 | 6.81 |
| Floating material | - | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| Settleable solid | ml/l | 0.0 | 0.3 | 1.3 | 0.1 | 3.6 | 1.8 | 2.7 | 0.2 | 0.2 | 0.7 | 0.1 | 0.1 |
| Total suspended solid | mg/l | 86 | 92 | 48 | 75 | 95 | 66 | 67 | 85 | 50 | 84 | 39 | 101 |
| Grease and oil | mg/l | 43.0 | 25.7 | 18.0 | 11.0 | 6.4 | 27.0 | 6.7 | 9.0 | 10.2 | 8.0 | 20.3 | 23.1 |
| COD | mg/l | 716 | 701 | 466 | 463 | 540 | 616 | 628 | 670 | 431 | 464 | 596 | 639 |
| BOD ₅ | mg/l | 267 | 372 | 427 | 239 | 365 | 288 | 268 | 293 | 280 | 281 | 318 | 152 |
| Color | Pt-Co scale | 6.9 | 15.6 | 6.9 | 15.5 | 12.5 | 19.4 | 7.5 | 6.3 | 9.4 | 7.5 | 6.3 | 8.9 |
| Total nitrogen | mg/l | 93 | 80 | 113 | 71 | 75 | 25 | 27 | 37 | 38 | 35 | 32 | 38 |
| Hexavalent Chromium | mg/l | 0.03 | 0.04 | 0.03 | 0.02 | 0.17 | 0.12 | 0.13 | 0.11 | 0.08 | 0.12 | 0.05 | 0.02 |
| Active substance toward methylene blue | mg/l | 1.22 | 0.29 | 0.21 | 0.05 | 0.05 | 2.24 | 2.82 | 3.62 | 2.74 | 2.3 | 3.53 | 8.75 |
| Total coliform | MPN/100 ml | | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Copper | mg/l | 0.43 | 0.04 | 0.08 | 0.08 | 0.03 | 0.09 | 0.1 | 0.34 | 0.29 | 0.22 | 0.15 | 0.24 |
| Flow rate | l/s | 3.22 | 4.85 | 5.30 | 5.12 | 3.36 | 4.16 | 3.91 | 4.16 | 4.66 | 4.51 | 4.10 | 2.35 |
| Monthly discharge volume | m ³ /month | 10,637 | 12,795 | 13,100 | 11,667 | 9,797 | 9,336 | 8,305 | 10,667 | 12,441 | 11,821 | 10,061 | 6,593 |

Source: Document on Wastewater Quality and Discharge (CNA)

c) NEGROMEX (F(1))

Table B.22 Monthly Average of Wastewater Quality of NEGROMEX (Hules Mexicanos) in 1995

| Parameter | Unit | 1995 | | | | |
|--|-----------------------|--------|--------|--------|--------|--------|
| | | Apr | May | Jun | Sep | Oct |
| Temperature | °C | 34.8 | 37.5 | 36.5 | 26.3 | 34.9 |
| pH | - | 7.55 | 7.90 | 7.10 | 7.35 | 7.63 |
| Color | Co-Pt scale | 58 | 49 | 78 | 86 | 113 |
| Settleable solid | ml/l | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Suspended solid | mg/l | 103.1 | 124.3 | 55.0 | 63.8 | 68.3 |
| Grease and oil | mg/l | 15.0 | 32.7 | 15.4 | 13.5 | 20.1 |
| Floating material | - | Absent | Absent | Absent | Absent | Absent |
| BOD ₅ | mg/l | 66.3 | 74.2 | 51.3 | 67.5 | 57.8 |
| Total coliform | MPN/100 ml | 35,600 | 24,300 | 18,000 | 33,400 | 33,500 |
| COD | mg/l | 335 | 627 | 458 | 496 | 511 |
| Total nitrogen | mg/l | 23.1 | 25.8 | 17.0 | 21.7 | 19.6 |
| Active substance toward Methylene blue | mg/l | 1.22 | 0.87 | 1.08 | 0.86 | 0.95 |
| Cyanides | mg/l | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Phenols | mg/l | 0.030 | 0.060 | 0.084 | 0.078 | 0.038 |
| Hexavalent chromium | mg/l | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Fluorides | mg/l | 0.21 | 0.21 | 0.20 | 0.25 | 0.10 |
| Lead | mg/l | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Monthly discharge volume | m ³ /month | 86,610 | 96,572 | 93,874 | 42,688 | 83,022 |

Source: Document on Wastewater Quality and Discharge (CNA)

f) NHUMO (F(2))

Table B.23 Wastewater Quality of NHUMO

| Parameter | Unit | Value |
|--|-------------|---------|
| pH | - | 6-9 |
| Temperature | °C | 35 |
| Settleable solid | ml/l | 1 |
| Floating material | - | Absent |
| Grease and oil | mg/l | 15 |
| Color | Pt-Co scale | 100 |
| COD | mg/l | 100 |
| Total suspended solid | mg/l | 70 |
| BOD ₅ | mg/l | 50 |
| Active substance toward Methylene blue | mg/l | 1 |
| Total coliform | MPN/100ml | 100,000 |
| Electric conductivity | micro S/cm | 4,000 |
| Nitrogen | mg/l | 3 |
| Phenols | mg/l | 0.1 |

Source: Document on Wastewater Quality and Discharge (CNA)

e) Dupont (G)

Table B.24 (a) Wastewater Quality of Dupont in 1992-1993 and 1997-1999

| Parameter | Unit | 1992 | | | 1993 | | |
|----------------------|----------------|---------|---------|---------|------|---------|---------|
| | | Dec | Jan-Mar | Apr-May | Dec | Jan-Mar | Apr-May |
| pH | - | 1.9 | 1.0 | 1.15 | | | |
| Settleable solid | ml/l | 4.8 | 1.3 | 3.2 | | | |
| TSS | mg/l | 653 | 314 | 480 | | | |
| BOD ₅ | mg/l | 20.4 | 22.5 | 19.05 | | | |
| COD* | mg/l | 1,250 | 1,280 | 1,510 | | | |
| Grease and oil | mg/l | 2.0 | 1.1 | 2.3 | | | |
| Hexa-valent chromium | mg/l | 0.0 | 0.0 | 0 | | | |
| Vanadium | mg/l | 114 | 169 | 106 | | | |
| Chromium | mg/l | 31.2 | 43.7 | 30.6 | | | |
| Manganese | mg/l | 398 | 428 | 412 | | | |
| Iron | mg/l | 4,240 | 6,880 | 7,170 | | | |
| Titanium | mg/l | 175 | 242 | 211 | | | |
| Aluminum | mg/l | 178 | 191 | 272 | | | |
| Discharge volume | m ³ | 174,028 | 522,084 | 348,056 | | | |

Source: Document on Wastewater Quality and Discharge (CNA)

Table B.24 (b) Wastewater Quality of Dupont in 1992-1993 and 1997-1999

| Parameter | Unit | 1997 | 1998 | | | | | Jul |
|--------------------------|-----------------------|---------|---------|---------|---------|---------|---------|-----|
| | | Dec | Mar | Apr | May | Jun | | |
| Iron | mg/l | 8,330 | 12,500 | 11,400 | 10,500 | 11,000 | 12,200 | |
| Manganese | mg/l | 394 | 613 | 521 | 460 | 616 | 74 | |
| Chromium | mg/l | 53.3 | 82.6 | 70.1 | 65.7 | 108 | 129 | |
| Vanadium | mg/l | 79.1 | 42.6 | 72.0 | 70.4 | 94.5 | 279.5 | |
| Titanium | mg/l | 205 | 116 | 138 | 141 | 191 | 167 | |
| Aluminum | mg/l | 196 | 236 | 201 | 239 | 298 | 584 | |
| Monthly discharge volume | m ³ /month | 187,790 | 288,800 | 651,700 | 213,300 | 221,200 | 231,800 | |

| Parameter | Unit | 1998 | | | | | 1999 |
|--------------------------|-----------------------|---------|---------|---------|---------|---------|---------|
| | | Aug | Sep | Oct | Nov | Dec | Jan |
| Iron | mg/l | 12,300 | 10,700 | 11,900 | 11,100 | 12,000 | 11,300 |
| Manganese | mg/l | 495 | 481 | 509 | 462 | 520 | 391 |
| Chromium | mg/l | 143.1 | 80.7 | 87.3 | 84.4 | 98.2 | 142.9 |
| Vanadium | mg/l | 77.1 | 57.7 | 44.7 | 55.4 | 63.7 | 60.1 |
| Titanium | mg/l | 150.6 | 39.9 | 43.2 | 54.5 | 115.2 | 173.3 |
| Aluminum | mg/l | 262 | 277 | 216 | 176 | 249 | 317 |
| Monthly discharge volume | m ³ /month | 174,200 | 245,400 | 238,000 | 256,300 | 223,600 | 164,200 |

Source: Document on Wastewater Quality and Discharge (CNA)

B.1.3 Quality and Quantity of Municipal Wastewater

(1) Altamira Oxidation Pond

Table B.25 Water Quality of Influent to Oxidation Pond in Altamira

| Parameter | | Feb-3-95 | Mar-8-95 | Apr-11-95 | Jun-5-95 | Jul-10-95 | Aug-16-95 | Nov-9-95 | Apr-8-95 | Average |
|-----------------------------|----------|----------|----------|-----------|----------|-----------|-----------|----------|----------|---------|
| TSS (mg/l) | Influent | 176 | 184 | 196 | 128 | 144 | 320 | 136 | 237 | 190 |
| | Effluent | 108 | 180 | 176 | 78 | 136 | 36 | 96 | 164 | 121 |
| | r* | 0.614 | 0.978 | 0.898 | 0.609 | 0.944 | 0.113 | 0.706 | 0.692 | 0.694 |
| BOD ₅ (mg/l) | Influent | 209 | 180 | 505.8 | 172 | 288 | 102 | 451 | 318 | 278 |
| | Effluent | 95.5 | 41.9 | 156.8 | 67.4 | 94.5 | 34.7 | 85 | 89.4 | 83 |
| | r* | 0.457 | 0.233 | 0.31 | 0.392 | 0.328 | 0.34 | 0.188 | 0.281 | 0.316 |
| COD (mg/l) | Influent | 549 | 455 | 823 | 489 | 593 | 194 | 459 | 563 | 516 |
| | Effluent | 274 | 285 | 348 | 348 | 257 | 131 | 216 | 277 | 267 |
| | r* | 0.499 | 0.626 | 0.423 | 0.712 | 0.433 | 0.675 | 0.471 | 0.492 | 0.541 |
| Fecal Coliform (MPN/100 ml) | Influent | 4.0E+07 | 4.0E+07 | 9.3E+07 | 4.4E+07 | 3.4E+07 | - | 4.6E+08 | 6.0E+07 | 1.1E+08 |
| | Effluent | 4.9E+06 | 4.3E+06 | 5.9E+06 | 7.9E+05 | 5.9E+05 | - | 1.0E+05 | 6.7E+05 | 2.5E+06 |
| | r* | 0.122 | 0.108 | 0.064 | 0.018 | 0.017 | - | 0 | 0.011 | 0.049 |
| Grease and oil (mg/l) | Influent | 34.2 | 29.6 | 68.5 | 14.8 | 17.8 | 12.4 | 69.1 | 55.4 | 37.7 |
| | Effluent | 19.2 | 12.6 | 12.3 | 2.7 | 3.9 | 5.7 | 42.4 | 16.5 | 14.4 |
| | r* | 0.561 | 0.426 | 0.18 | 0.182 | 0.219 | 0.46 | 0.614 | 0.298 | 0.368 |

Source: Memorandum of CNA

* r = (effluent)/(influent)

(2) Tieranegra Oxidation Pond

Table B.26 Water Quality of Influent and Effluent of Tieranegra Oxidation Pond

| Parameter | | Jan-18-95 | Mar-8-95 | Apr-11-95 | Jun-6-95 | Jul-6-95 | Sep-6-95 | Nov-9-95 | Feb-13-95 | Average |
|-------------------------------|----------|-----------|----------|-----------|----------|----------|----------|----------|-----------|---------|
| TSS (mg/L) | Influent | 145 | 66 | 116 | 160 | 211 | 104 | 112 | 110 | 128 |
| | Effluent | 43 | 130 | 128 | 136 | 120 | 124 | 87 | 120 | 111 |
| | r* | 0.297 | 1.970 | 1.103 | 0.850 | 0.569 | 1.192 | 0.777 | 1.091 | 0.867 |
| BOD ₅ (mg/L) | Influent | 35.8 | 141 | 135 | 154 | 172 | 268 | 162 | 155 | 153 |
| | Effluent | 116 | 84.8 | 121.4 | 97.3 | 125 | 76.4 | 201 | 143 | 121 |
| | r* | 3.240 | 0.601 | 0.899 | 0.632 | 0.727 | 0.285 | 1.241 | 0.923 | 0.789 |
| COD (mg/L) | Influent | 98 | 232 | 300 | 314 | 385 | 440 | 198 | 230 | 275 |
| | Effluent | 186 | 223 | 310 | 268 | 198 | 210 | 207 | 260 | 233 |
| | r* | 1.898 | 0.961 | 1.033 | 0.854 | 0.514 | 0.477 | 1.045 | 1.130 | 0.848 |
| Fecal Coliform (MPN/100ml) | Influent | 2.3E+06 | 2.5E+07 | 7.9E+07 | 3.7E+07 | 4.4E+07 | 5.1E+07 | 2.0E+07 | 4.8E+07 | 3.8E+07 |
| | Effluent | 2.2E+07 | 1.2E+07 | 4.2E+07 | 3.6E+06 | 2.8E+07 | 5.4E+06 | 1.6E+07 | 8.5E+06 | 1.7E+07 |
| | r* | 9.466 | 0.476 | 0.529 | 0.098 | 0.642 | 0.106 | 0.787 | 0.179 | 0.449 |
| Grease and oil (mg/L) | Influent | 6.2 | 13.4 | 11.2 | 1.6 | 20.3 | 19.5 | 18.3 | 29 | 14.9 |
| | Effluent | 9.9 | 11.1 | 12.1 | 1.2 | 4.5 | 9.8 | 39 | 29.7 | 14.7 |
| | r* | 1.597 | 0.828 | 1.080 | 0.750 | 0.222 | 0.503 | 2.131 | 1.024 | 0.982 |

Source: Memorandum of CAN:

* r = (concentration of parameter in effluent)/(concentration of parameter in influent)

(3) Municipal Wastewater flowing into Panuco River

Table B.27 Quality of Municipal Wastewater which flows into the Panuco River

| Parameter | Unit | C/4/1, M | C/4/2, M | C/4/3, M | C/4/4, M | C/4/5, M |
|------------------|---------------------|------------------|--------------|--------------|--------------|-------------|
| | | Planta Altavista | Carcamo No.1 | Carcamo No.2 | Carcamo No.3 | Bombas No.6 |
| Grease and oil | mg/l | 31.3 | 65.1 | 77.4 | 50 | 89.2 |
| COD | mg/l | 80 | 470 | 400 | 440 | 870 |
| TSS | mg/l | 130 | 140 | 86 | 92 | 364 |
| BOD ₅ | mg/l | 55.4 | 202 | 188.33 | 166.33 | 599 |
| Detergent | mg/l | 0.187 | 21.36 | 16.8 | 5.99 | 24.88 |
| Total coliform | MPN/100 ml | 9,300 | 240,000 | 240,000 | 240,000 | 240,000 |
| Flow | m ³ /day | 7,580 | 3,161 | 4,827 | 2,067 | 3,751 |
| | m ³ /sec | 0.088 | 0.037 | 0.056 | 0.024 | 0.043 |

| Parameter | Unit | C/5/1, M | C/5/2, M | C/5/3, M | C/5/4, M | C/8/1, M | C/8/2, M |
|------------------|---------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | | Bombas No.1 | Bombas No.7 | Bombas No.8 | Grav. No.12 | Grav. No.11 | Bombas No.9 |
| Grease and oil | mg/l | 61.7 | 71.8 | 81.7 | 75.1 | 71.7 | 86.8 |
| COD | mg/l | 430 | 550 | 450 | 280 | 470 | 420 |
| TSS | mg/l | 140 | 150 | 140 | 82 | 170 | 126 |
| BOD ₅ | mg/l | 320 | 398 | 415 | 125.3 | 207.33 | 205 |
| Detergent | mg/l | 17.15 | 28.82 | 15.31 | 14.97 | 8.62 | 8.77 |
| Total coliform | MPN/100 ml | 240,000 | 240,000 | 240,000 | 240,000 | 240,000 | 240,000 |
| Flow | m ³ /day | 34,884 | 9,725 | 7,218 | 1,383 | 11,383 | 11,675 |
| | m ³ /sec | 0.404 | 0.113 | 0.084 | 0.016 | 0.132 | 0.135 |

Source: Document on Wastewater Quality and Discharge (CNA)

(3) Wastewater from Altamira and Puerta Water Supply Plants

Table B.28 Wastewater Quality of Altamira and Puerta Water Supply Plants

| Parameter | Unit | Altamira | Puerta |
|--|----------------------|----------|--------|
| pH | - | 7.6 | 7.4 |
| Temperature | °C | 26 | 24 |
| Settleable solid | ml/l | 0.5 | 1 |
| Floating material | - | Absent | Absent |
| Grease and oil | mg/l | - | 20.2 |
| Color | Co-Pt scale | 70 | 65 |
| COD (dichromate) | mg/l | 30 | 80 |
| Total suspended solid | mg/l | 46 | 104 |
| BOD ₅ | mg/l | - | 56 |
| Active substance toward methylene blue | mg/l | - | 0.1 |
| Total coliform | MPN/100 ml | <2 | 2 |
| Electric Conductivity | micro S/cm | 859 | 940 |
| Annual discharge volume | m ³ /year | 154395 | 506255 |

Source: Wastewater Quality and Discharge (CNA)

B.1.4 Pollution Loads

(1) Point Pollution Source

a) Altamira Industrial Port Area (A)

Table B.29 shows the daily discharge volume and the daily pollution loads in the Altamira Industrial Port (A).

Table B.29 Flow Rate and Daily Pollution Load into Altamira Industrial Port

| Code | Name | Flow rate m ³ /s | BOD ₅ kg/day | COD kg/day | Total Nitrogen kg/day | Total Phosphate kg/day | Reference Table |
|----------|--|--------------------------------|----------------------------|------------|--------------------------|---------------------------|-----------------|
| A/1, S | Administración Portuaria Integral del Altamira | 0.00091 | 2.15 | 9.03 | - | - | Table B.6 |
| A/2, I | Pittsburgh Plate Glass (PPG) Industry | 0.035 | 3.6 | 51.2 | - | - | Table B.7 |
| A/3/1, I | POLICYD | 0.012 | 18.5 | 41.0 | 2.21 | 0.77 | Table B.8 |
| A/3/2, I | Comision Federal de Electricidad | 0.055 | 25.0 | 386 | 2.50 | 7.09 | Table B.9 |
| A/3/3, I | NEGROMEX (Planta Solucion) | 0.005 | 6.73 | 18.9 | 0.34 | 1.25 | Table B.10 |

b) Marismas Lagoon (B) and Conejo Lagoon (B/1)

Table B.30 shows the daily discharge volume and daily pollution loads, which flow into Conejo Lagoon.

Table B.30 Flow Rate and Daily Pollution Loads into Conejo Lagoon

| Pollution source number | Point Pollution Source | Flow rate m ³ /s | BOD ₅ kg/day | COD kg/day | Total Nitrogen kg/day | Total Phosphorus kg/day | Reference Data |
|-------------------------|---|--------------------------------|----------------------------|---------------------|--------------------------|----------------------------|-------------------|
| B/1/1, I | BASF Mexicano | 0.0083 | 24.4 | 110 ^a | 15.1 ^{**} | 0.62 ^{**} | Table B.11 |
| B/1/2, I | Grupo Primex | 0.0415 | 1836 | 3441 ^{***} | 10.4 | 1.64 | Table B.12 |
| B/1/3, I | Internacional de Papeles del Golfo | 0.0034 | 52.1 | 117.8 | - | - | Table B.13 |
| B/1/4, I | Fibras Nacionales de Acrilico | 0.0276 | 170 | 329 ^{****} | 46.6 | 7.95 | Table B.14 |
| B/1/5, I | GE Plastic | 0.0089 | 6.8 | 35.6 | - | - | Table B.15 (1995) |
| B/1/6(1), I | Operadora y Comercializadora Trevi Plus | - | - | - | - | - | Table B.16 |
| B/1/6(2), I | Johns Manville Industry | 0.000088 | 0.200 | 1.479 | - | - | Table B.16 |
| B/1/6(3), I | Tecno Asfalto del Golfo | 0.000010 | 0.104 | 0.216 | - | - | Table B.16 |
| B/1/6(4), I | Asfaltos y Derivados Mexicanos | 0.000014 | 0.005 | 0.036 | - | - | Table B.16 |

c) Panuco River Upstream(C/1)

The daily pollution loads at El Alamo Station (between Las Adjuntas in the upstream and Panuco City in the downstream of Panuco River) are shown in Table B.31.

Table B.31 Daily Pollution Loads from Panuco River Upstream

| Parameter | Unit | Average value from 1990 to 1997 | | |
|--|--------------------------|---------------------------------|-----------------------------------|---------|
| | | Dry Season (from Nov to May) | Rainy Season (from Jun to Oct) | Annual |
| (Concentration) | | | | |
| BOD ₅ | mg/l | 1.81 | 1.02 | 1.51 |
| COD | mg/l | 20.7 | 24.7 | 22.3 |
| Total N | mg/l | 0.788 | 1.036 | 0.835 |
| Soluble P | mg/l | 0.09 | 0.149 | 0.114 |
| Average value from 1975 to 1994 | | | | |
| Flow rate | m ³ /s | 185.2 | 771 | 421 |
| Daily discharge volume | 1000 m ³ /day | 16001 | 66614 | 36374 |
| (Pollution Load) | | | | |
| BOD ₅ | kg/day | 29,000 | 68,000 | 45,300 |
| COD | kg/day | 332,000 | 1,645,000 | 882,000 |
| Total N | kg/day | 12,600 | 17,500 | 36,300 |
| Soluble P | kg/day | 1,440 | 9,930 | 5000 |

d) Tamesi River and Freshwater Lagoons (C/2)

The daily pollution loads from Tamesi River are shown in Table B.32.

Table B.32 Daily Pollution Loads from Freshwater Area (Tamesi River) to Estuarine Area (Panicu River)

| Parameter | Dry Season (from November to May) | | | |
|--|-------------------------------------|--------|------------|-----------|
| | BOD5 | COD | T-nitrogen | Phosphate |
| Concentration (mg/l) | | | | |
| Chairel Lagoon (Toma de agua) | 1.6 | 16.2 | 0.64 | 0.06 |
| Tamesi River (Tamesi) | 2.2 | 14.3 | 0.97 | 0.089 |
| Average value | 1.9 | 15.25 | 0.805 | 0.0745 |
| Flow rate (m ³ /s) | 13.9 | | | |
| Daily discharge volume (m ³ /day) | 1,201,000 | | | |
| Daily pollution load (kg/day) | 2,282 | 18,315 | 967 | 89 |
| Parameter | Rainy Season (from June to October) | | | |
| | BOD5 | COD | T-nitrogen | Phosphate |
| Concentration (mg/l) | | | | |
| Chairel Lagoon (Toma de agua) | 1.6 | 17.9 | 0.49 | 0.046 |
| Tamesi River (Tamesi) | 0.75 | 14.8 | 0.75 | 0.1 |
| Average value | 1.175 | 16.35 | 0.62 | 0.073 |
| Flow rate (m ³ /s) | 42 | | | |
| Daily discharge volume (m ³ /day) | 3,629,000 | | | |
| Daily pollution load (kg/day) | 4,264 | 59,331 | 2,250 | 265 |

e) Sea-food Processing Industries (C/3/1)

The daily pollution loads by each sea-food processing factory are shown in Table B.33.

Table B.33 Daily Pollution Loads from Sea-food Processing Industries

| Sea-food Processing Industry | Discharge l/s | COD kg/day | BOD ₅ Kg/day | Kjeldhal N kg/day | Total phosphorus kg/day |
|----------------------------------|------------------|---------------|----------------------------|----------------------|----------------------------|
| Camarones del Golfo | 0.055 | 2.58 | 2.48 | - | - |
| Basilio Reynaga Martinez | 0.161 | 9.16 | 8.66 | - | - |
| Restaurant el Pollo Marino | 0.093 | 0.552 | - | - | - |
| Luis Gonzalez Aranda | 0.015 | 0.343 | 0.311 | 0.085 | 0.016 |
| Impulsora de Pescados y Mariscos | 0.463 | 8.12 | 1.47 | - | - |
| Exportadores Asociados | 0.200 | 24.9 | 7.00 | - | - |
| Pescafina Tampico | 0.116 | 25.3 | 18.6 | - | - |
| Francisco Javier Marquez Zapata | 0.066 | - | 0.046 | - | - |
| Average | 0.146 | 10.1 | 5.51 | - | - |
| Total (=20*average) | 2.92 | 202 | 110 | - | - |

*20 is the number of pier in the Sea-food Process Industry Zone

f) Municipal Wastewater (the southern part of Tampico and southern part of Madero)

The daily pollution loads from each discharge point of municipal wastewater from the southern part of Tampico and southern part of Madero are shown in Table B.34.

Table B.34 Daily Pollution Loads from Municipal Wastewater into Panuco River

| Parameter | Unit | C/4/1, M | C/4/2, M | C/4/3, M | C/4/4, M | C/4/5, M |
|------------------------|---------------------|---------------------|-----------------|-----------------|-----------------|----------------|
| | | Planta Altavista | Carcamo No.1 | Carcamo No.2 | Carcamo No.3 | Bombas No.6 |
| Daily discharge volume | m ³ /day | 7,580 | 3,161 | 4,827 | 2,067 | 3,751 |
| Flow rate | m ³ /sec | 0.0877 | 0.0366 | 0.0559 | 0.0239 | 0.0434 |
| Daily pollution loads | | | | | | |
| COD | kg/day | 606 | 1,486 | 1,931 | 909 | 3,263 |
| BOD ₅ | kg/day | 420 | 639 | 909 | 344 | 2,247 |
| Total nitrogen | kg/day | - | 202 | 276 | 116 | 587 |
| Total phosphorus | kg/day | - | 25 | 35 | 14 | 73 |

| Parameter | Unit | C/5/1, M | C/5/2, M | C/5/3, M | C/5/4, M | C/8/1, M | C/8/2, M |
|------------------------|---------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | | Bombas No.1 | Bombas No.7 | Bombas No.8 | Grav. No.12 | Grav. No.11 | Bombas No.9 |
| Daily discharge volume | m ³ /day | 34,884 | 9,725 | 7,218 | 1,383 | 11,383 | 11,675 |
| Flow rate | m ³ /sec | 0.4038 | 0.1126 | 0.0835 | 0.0160 | 0.1317 | 0.1351 |
| Daily pollution loads | | | | | | | |
| COD | kg/day | 15,000 | 5,349 | 3,248 | 387 | 5,350 | 4,904 |
| BOD ₅ | kg/day | 11,163 | 3,871 | 2,995 | 173 | 2,360 | 2,393 |
| Total nitrogen | kg/day | 2,840 | 994 | 712 | 54 | 739 | 716 |
| Total phosphorus | kg/day | 356 | 124 | 89 | 6.8 | 92 | 90 |

g) Refineria Madero (C/10)

The daily pollution loads from Refineria Madero are shown in Table B.35.

Table B.35 Daily Pollution Loads from Refineria Madero

| Parameter | Average concentration | | | |
|------------------|-----------------------|---------------|----------|-------|
| | Unit | Siete y Media | Vanadero | |
| BOD ₅ | mg/l | 43.1 | 99.7 | |
| COD* | mg/l | 599 | 1,093 | |
| Total Nitrogen | mg/l | 10.5 | 57.0 | |
| Total Phosphorus | mg/l | 0.81 | 1.03 | |
| Flow rate | m ³ /s | 0.0108 | 0.0633 | |
| | m ³ /day | 935 | 5,468 | |
| Parameter | Daily pollution load | | | |
| | Unit | Siete y Media | Vanadero | Total |
| BOD ₅ | kg/day | 40 | 545 | 586 |
| COD* | kg/day | 560 | 5,979 | 6,539 |
| Total Nitrogen | kg/day | 9.8 | 311.6 | 321 |
| Total Phosphorus | kg/day | 0.75 | 5.61 | 6.37 |

h) Gulf of Mexico

The daily pollution loads which flow into the Gulf of Mexico are shown in Table B.36.

Table B.36 Daily Pollution Loads from Industries which Discharge Wastewater into Coastal Water

| Pollution Source Number | Pollution Source | Flow rate (m ³ /s) | Daily pollution load | | | |
|-------------------------|------------------------|-------------------------------|---------------------------|--------------|------------------|------------------|
| | | | BOD ₅ (kg/day) | COD (kg/day) | Total N (kg/day) | Total P (kg/day) |
| D | Petrocel* | 0.096 | 296 | 681 | 4.5 | - |
| E | Novaquim** | 0.004 | 106 | 199 | 20.2 | - |
| F(1) | Negromex (Emulcion)*** | 0.031 | 167 | 1290 | 57 | - |
| F(2) | NHUMO | | 34.05 | 68.1 | 2.04 | - |
| G | Dupont**** | 0.099 | 120 | - | - | - |

* Data from Nov/95 to Jan/97

** Data from Jan/96 to Dec/96

*** Data from Apr/95 to Oct/95

**** Data from Dec/92 to Mar/93

(2) Non-point Pollution Sources

Pollution loads from the following non-point pollution sources are estimated:

a) Watershed of Garrapatas Stream (A/3/4)

The daily pollution loads in dry and rainy season are shown in Table B.37.

Table B.37 Daily Pollution Loads from Watershed of Garrapatas Stream (Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|-----------|--------|-----------------------------|------|-------|-----|--------------------------------|-----|-------|--------|-------------------------------|------|-------|-------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 6,550 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 2,005 | 298 | 3,285 | 9,856 | 9.46 | 1.40 | 15.50 | 46 |
| Low density Residential | 50 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 30 | 4 | 83 | 158 | 0.14 | 0.02 | 0.39 | 1 |
| Industrial | 240 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 444 | 77 | 2379 | 4520 | 2.09 | 0.36 | 11.22 | 21.32 |
| Total | 6,840 | | | | | | 2,478 | 378 | 5,748 | 14,534 | 12 | 2 | 27 | 69 |

(Rainy Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|-----------|--------|-----------------------------|------|-------|-----|----------------------------------|-------|--------|--------|-------------------------------|------|------|-------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 6,550 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 7,541 | 1,120 | 12,359 | 37,076 | 49.3 | 7.3 | 80.8 | 242.3 |
| Low density Residential | 50 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 112 | 14 | 313 | 595 | 0.7 | 0.1 | 2.0 | 3.9 |
| Industrial | 240 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 1,669 | 289 | 8,950 | 17,005 | 10.9 | 1.89 | 58 | 111 |
| Total | 6,840 | | | | | | 9,322 | 1,423 | 21,622 | 54,677 | 61 | 9 | 141 | 357 |

*R: Reduction Parameter

b) Area around Conejo Lagoon (B/1/7)

The daily pollution loads in dry and rainy seasons are shown in Table B.38.

Table B.38 Daily Pollution Loads from Watershed of Conejo Lagoon (Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily pollution load (kg/day) | | | |
|--------------|-----------|--------|-----------------------------|------|-------|-----|--------------------------------|-----|-----|-------|-------------------------------|------|------|------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 260 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 80 | 12 | 130 | 391 | 0.38 | 0.06 | 0.62 | 1.85 |
| Industrial | 80 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 148 | 26 | 793 | 1,507 | 0.70 | 0.12 | 3.74 | 7.11 |
| Total | 340 | | | | | | 227 | 37 | 923 | 1,898 | 1.07 | 0.18 | 4.36 | 9 |

(Rainy Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|--------------|-----------|--------|-----------------------------|------|-------|-----|----------------------------------|-----|-------|-------|-------------------------------|------|-------|-------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 260 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 299 | 44 | 491 | 1,472 | 1.96 | 0.29 | 3.21 | 9.62 |
| Industrial | 80 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 556 | 96 | 2,983 | 5,668 | 3.64 | 0.63 | 19.50 | 37.05 |
| Total | 340 | | | | | | 856 | 141 | 3,474 | 7,140 | 5.59 | 0.92 | 22.71 | 47 |

*R: Reduction Parameter

c) Watershed of Costa Lagoon (C/2/1)

The daily pollution loads in dry and rainy season are shown in Table B.39.

Table B.39 Daily Pollution Loads from Watershed of Costa Lagoon

(Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|--------------|--------|-----------------------------|------|------|-----|--------------------------------|------------|--------------|---------------|-------------------------------|-------------|--------------|-----------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 4,000 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 1,224 | 182 | 2,006 | 6,019 | 5.77 | 0.86 | 9.46 | 28 |
| Wetland | 1,700 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 797 | 95 | 2,340 | 7,021 | 3.76 | 0.45 | 11.04 | 33 |
| Lagoon | 300 | 0.6 | 6.75 | 0.57 | 8.8 | 26 | 255 | 21 | 331 | 994 | 1.20 | 0.10 | 1.56 | 5 |
| Low density Residential | 60 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 36 | 5 | 100 | 190 | 0.17 | 0.02 | 0.47 | 1 |
| Total | 6,060 | | | | | | 2,312 | 303 | 4,778 | 14,223 | 10.91 | 1.43 | 22.54 | 67 |

(Rainy Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|--------------|--------|-----------------------------|------|-------|-----|----------------------------------|--------------|---------------|---------------|-------------------------------|------------|--------------|--------------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 4,000 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 4,605 | 684 | 7,547 | 22,642 | 30.1 | 4.5 | 49.3 | 148.0 |
| Wetland | 1,700 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 2,998 | 357 | 8,804 | 26,412 | 19.6 | 2.3 | 57.5 | 172.6 |
| Lagoon | 300 | 0.6 | 6.75 | 0.57 | 8.8 | 26 | 960 | 80 | 1,246 | 3,738 | 6.3 | 0.5 | 8.1 | 24.4 |
| Low density Residential | 60 | 0.6 | 4.72 | 0.61 | 13.21 | 25 | 134 | 17 | 376 | 714 | 0.88 | 0.11 | 2.5 | 4.7 |
| Total | 6,060 | | | | | | 8,698 | 1,138 | 17,973 | 53,506 | 56.9 | 7.4 | 117.5 | 349.7 |

*R: Reduction Parameter

d) Morelos (Tampico) (C/3/1)

The daily pollution loads in dry and rainy seasons are shown in Table B.40.

Table B.40 Daily Pollution Sources in Morelos

(Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|-----------|--------|-----------------------------|------|-------|-----|--------------------------------|-----|-----|-----|-------------------------------|------|------|------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Low density Residential | 150 | 0.6 | 4.72 | 0.61 | 13.21 | 25 | 89 | 11 | 250 | 474 | 0.42 | 0.05 | 1.18 | 2.24 |

(Rainy Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|-----------|--------|-----------------------------|------|-------|-----|----------------------------------|-----|-----|-------|-------------------------------|------|-----|------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Low density Residential | 150 | 0.6 | 4.72 | 0.61 | 13.21 | 25 | 336 | 43 | 939 | 1,785 | 2.19 | 0.28 | 6.1 | 11.7 |

*R: Reduction Parameter

e) Tampico Solid Waste Landfill Site (C/4/7)

Tampico Solid Waste Landfill Site (approximately 32 ha) and its surrounding (18 ha) are regarded as one of the industrial land use. The daily pollution loads in dry and rainy season is shown in Table B.41.

Table B.41 Daily Pollution Sources around Tampico Solid Waste Landfill Site (Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily Pollution Load (kg/day) | | | |
|-----------------|------------|--------|-----------------------------|------|------|-----|--------------------------------|-----------|------------|------------|-------------------------------|-------------|-------------|----------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Industrial | 50 | 0.6 | 14.67 | 2.54 | 78.7 | 149 | 92 | 16 | 496 | 942 | 0.44 | 0.08 | 2.34 | 4.44 |
| Recreation/open | 50 | 0.6 | 2.26 | 0.10 | 2.62 | 5 | 14 | 1 | 17 | 31 | 0.07 | 0.00 | 0.08 | 0.15 |
| Total | 100 | | | | | | 107 | 17 | 512 | 973 | 0.50 | 0.08 | 2.42 | 5 |

(Rainy Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|-----------------|------------|--------|-----------------------------|------|------|-----|----------------------------------|-----------|--------------|--------------|-------------------------------|-------------|--------------|-----------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Industrial | 50 | 0.6 | 14.67 | 2.54 | 78.7 | 149 | 348 | 60 | 1,855 | 3,543 | 2.27 | 0.39 | 12.19 | 23.16 |
| Recreation/open | 50 | 0.6 | 2.26 | 0.10 | 2.62 | 5 | 54 | 2 | 62 | 118 | 0.35 | 0.02 | 0.41 | 0.77 |
| Total | 100 | | | | | | 401 | 63 | 1,927 | 3,661 | 2.62 | 0.41 | 12.59 | 24 |

*R: Reduction Parameter

f) Southwest Part of Tampico City (C/4/6)

The daily pollution loads in dry and rainy seasons are shown in Table B.42.

Table B.42 Daily Pollution Loads from Southwestern Part of Tampico (Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily Pollution Load (kg/day) | | | |
|-------------------------|-----------|--------|-----------------------------|------|-------|-----|--------------------------------|-----|-----|-------|-------------------------------|------|------|------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Low density Residential | 510 | 0.6 | 4.72 | 0.61 | 13.21 | 25 | 303 | 39 | 849 | 1,613 | 1.43 | 0.18 | 4.00 | 7.61 |

(Rainy Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|-----------|--------|-----------------------------|------|-------|-----|----------------------------------|-----|-------|-------|-------------------------------|------|------|-----|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Low density Residential | 510 | 0.6 | 4.72 | 0.61 | 13.21 | 25 | 1141 | 147 | 3,194 | 6,069 | 7.5 | 0.96 | 20.9 | 40 |

*R: Reduction Parameter

g) Southern Part of Tampico City and Southern Part of Madero City (C/5/5 and C/8/3)

The daily pollution loads in dry and rainy seasons are shown in Table B.43.

Table B.43 Non-point Pollution Loads from Southern Part of Tampico and Southern part of Madero

(Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily pollution load (kg/day) | | | |
|----------------------------|-----------|--------|-----------------------------|------|--------|-----|--------------------------------|-----|-------|--------|-------------------------------|------|-------|-------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Low density Residential | 1278 | 0.6 | 4.72 | 0.61 | 13.21 | 25 | 760 | 98 | 2,128 | 4,042 | 3.59 | 0.46 | 10.04 | 19.07 |
| Medium density Residential | 267 | 0.6 | 8.28 | 1.34 | 30.51 | 58 | 278 | 45 | 1,026 | 1,950 | 1.31 | 0.21 | 4.84 | 9.20 |
| Commercial | 106 | 0.6 | 17.29 | 2.57 | 107.29 | 204 | 231 | 34 | 1,433 | 2,723 | 1.09 | 0.16 | 6.76 | 12.84 |
| Industrial | 304 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 562 | 97 | 3,014 | 5,726 | 2.65 | 0.46 | 14.22 | 27.01 |
| Recreational/open | 126 | 0.6 | 2.26 | 0.10 | 2.62 | 5 | 36 | 2 | 42 | 79 | 0.17 | 0.01 | 0.20 | 0.37 |
| Lake | 80 | 0.6 | 6.75 | 0.57 | 8.76 | 26 | 68 | 6 | 88 | 265 | 0.32 | 0.03 | 0.42 | 1.25 |
| Total | 2,161 | 0.6 | | | | | 1,936 | 282 | 7,730 | 14,785 | 9.13 | 1.33 | 36.46 | 70 |

(Rainy Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|----------------------------|-----------|--------|-----------------------------|------|--------|-------|----------------------------------|-------|--------|--------|-------------------------------|------|-----|-----|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Low density Residential | 1,278 | 0.6 | 4.72 | 0.61 | 13.21 | 25.10 | 2,860 | 367 | 8,004 | 15,207 | 18.7 | 2.40 | 52 | 99 |
| Medium density Residential | 267 | 0.6 | 8.28 | 1.34 | 30.51 | 58 | 1,048 | 169 | 3,861 | 7,336 | 6.8 | 1.11 | 25 | 48 |
| Commercial | 106 | 0.6 | 17.29 | 2.57 | 107.29 | 204 | 869 | 129 | 5,391 | 10,242 | 5.7 | 0.85 | 35 | 67 |
| Industrial | 304 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 2,114 | 366 | 11,337 | 21,540 | 13.8 | 2.39 | 74 | 141 |
| Recreational/open | 126 | 0.6 | 2.26 | 0.10 | 2.62 | 5 | 135 | 6 | 157 | 298 | 0.9 | 0.04 | 1 | 2 |
| Lake | 80 | 0.6 | 6.75 | 0.57 | 8.76 | 26 | 256 | 21 | 332 | 997 | 1.7 | 0.14 | 2 | 7 |
| Total | 2,161 | 0.6 | | | | | 7,282 | 1,059 | 2,9081 | 55,620 | 47.6 | 6.92 | 190 | 364 |

*R: Reduction Parameter

h) Northern Part of Pueblo Viejo Municipality (C/6)

The daily pollution loads in dry and rainy seasons are shown in Table B.44.

Table B.44 Daily Pollution Loads from the Northern Part of Pueblo Viejo

(Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|-----------|--------|-----------------------------|------|-------|-----|--------------------------------|-----|-------|-------|-------------------------------|------|------|-----|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 580 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 169 | 25 | 277 | 831 | 0.80 | 0.12 | 1.31 | 4 |
| Wetland | 25 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 11 | 1 | 33 | 98 | 0.05 | 0.01 | 0.15 | 0 |
| Low density Residential | 140 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 79 | 10 | 222 | 422 | 0.37 | 0.05 | 1.05 | 2 |
| Industrial | 120 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 211 | 37 | 1,133 | 2,153 | 1.00 | 0.17 | 5.34 | 10 |
| Total | 865 | | | | | | 471 | 73 | 1,665 | 3,504 | 2.22 | 0.35 | 7.85 | 17 |

(Rainy Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|-----------|--------|-----------------------------|------|-------|-----|----------------------------------|-----|-------|--------|-------------------------------|------|------|-----|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 580 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 676 | 100 | 1,108 | 3,325 | 4.42 | 0.66 | 7.2 | 22 |
| Wetland | 25 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 45 | 5 | 131 | 393 | 0.29 | 0.03 | 0.9 | 3 |
| Low density Residential | 140 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 317 | 41 | 888 | 1,687 | 2.07 | 0.27 | 5.8 | 11 |
| Industrial | 120 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 845 | 146 | 4,532 | 8,610 | 5.52 | 0.96 | 29.6 | 56 |
| Total | 865 | | | | | | 1,883 | 293 | 6,659 | 14,015 | 12.31 | 1.91 | 43.5 | 92 |

*R: Reduction Parameter

i) Watershed of Pueblo Viejo Lagoon (C/7/1)

The daily pollution loads in dry and rainy seasons are shown in Table B.45.

Table B.45 Daily Pollution Loads from Watershed of Pueblo Viejo Lagoon

(Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|--------------|--------|-----------------------------|------|------|-----|--------------------------------|--------------|---------------|---------------|-------------------------------|--------------|------------|------------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 94100 | 0.1 | 7.29 | 1.08 | 11.9 | 36 | 13,713 | 2,036 | 22,475 | 67,425 | 64.69 | 9.60 | 106 | 318 |
| Wetland | 4,160 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 1,858 | 221 | 5,454 | 16,362 | 8.76 | 1.04 | 26 | 77 |
| Low density Residential | 310 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 176 | 23 | 492 | 934 | 0.83 | 0.11 | 2.32 | 4.40 |
| Total | 98570 | | | | | | 15,746 | 2,280 | 28,421 | 84,721 | 74.28 | 10.75 | 134 | 400 |

(Rainy Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|--------------|--------|-----------------------------|------|------|-----|----------------------------------|--------------|----------------|----------------|-------------------------------|-----------|------------|--------------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 94100 | 0.1 | 7.29 | 1.08 | 11.9 | 36 | 54,853 | 8,145 | 89,900 | 269,699 | 359 | 53 | 588 | 1,763 |
| Wetland | 4160 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 7,430 | 884 | 21,816 | 65,449 | 49 | 5.78 | 143 | 428 |
| Low density Residential | 310 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 702 | 90 | 1,966 | 3,735 | 5 | 0.59 | 13 | 24 |
| Total | 98570 | | | | | | 62,986 | 9,119 | 113,682 | 338,883 | 412 | 60 | 743 | 2,215 |

*R: Reduction Parameter

j) Chijol Channel (C/9)

The daily pollution loads in dry and rainy seasons are shown in Table B.46.

Table B.46 Non-point Pollution Loads from Watershed of Chijol Channel

(Dry Season)

| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/dry season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|--------------|--------|-----------------------------|------|------|-----|--------------------------------|------------|--------------|--------------|-------------------------------|-------------|-------------|-----------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 2,130 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 621 | 92 | 1,017 | 3,052 | 2.93 | 0.43 | 4.80 | 14 |
| Wetland | 370 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 165 | 20 | 485 | 1,455 | 0.78 | 0.09 | 2.29 | 7 |
| Lagoon | 60 | 0.6 | 6.75 | 0.57 | 8.8 | 26 | 49 | 4 | 63 | 189 | 0.23 | 0.02 | 0.30 | 1 |
| Low density Residential | 90 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 51 | 7 | 143 | 271 | 0.24 | 0.03 | 0.67 | 1 |
| Total | 2,650 | | | | | | 886 | 122 | 1,708 | 4,968 | 4.18 | 0.58 | 8.06 | 23 |

(Rainy Season)

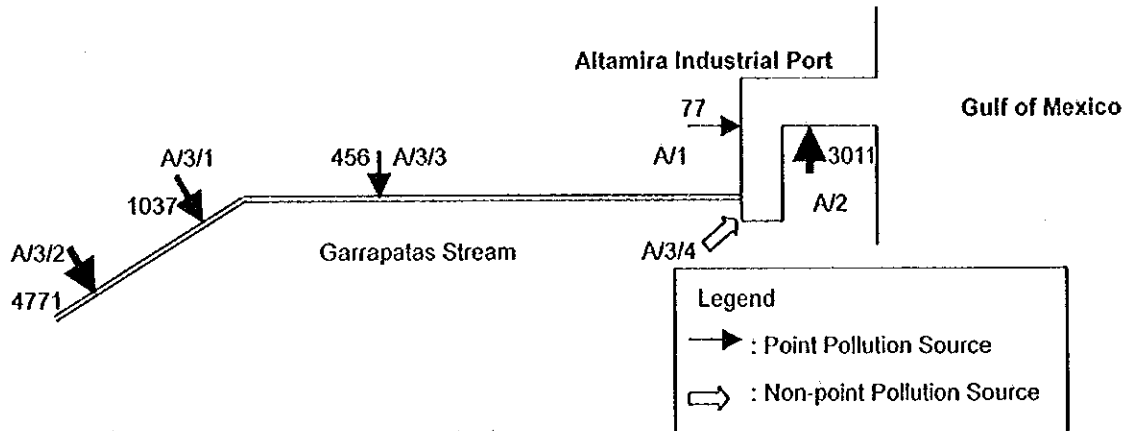
| Type | Area (ha) | (1-R*) | Loading rate (kg/(ha*year)) | | | | Pollution load (kg/rainy season) | | | | Daily pollution load (kg/day) | | | |
|-------------------------|--------------|--------|-----------------------------|------|------|-----|----------------------------------|------------|--------------|---------------|-------------------------------|-------------|--------------|------------|
| | | | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD | T-N | T-P | BOD | COD |
| Crop/Pasture | 2,130 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 2,483 | 369 | 4,070 | 12,210 | 16.23 | 2.41 | 26.60 | 80 |
| Wetland | 370 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 661 | 79 | 1,940 | 5,821 | 4.32 | 0.51 | 12.68 | 38 |
| Lagoon | 60 | 0.6 | 6.75 | 0.57 | 8.8 | 26 | 194 | 16 | 252 | 757 | 1.27 | 0.11 | 1.65 | 5 |
| Low density Residential | 90 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 204 | 26 | 571 | 1,084 | 1.33 | 0.17 | 3.73 | 7 |
| Total | 2,650 | | | | | | 3,543 | 490 | 6,833 | 19,872 | 23.15 | 3.20 | 44.66 | 130 |

*R: Reduction Parameter

B.1.5 Total Amount of Pollution Load

(1) Altamira Industrial Port (A)

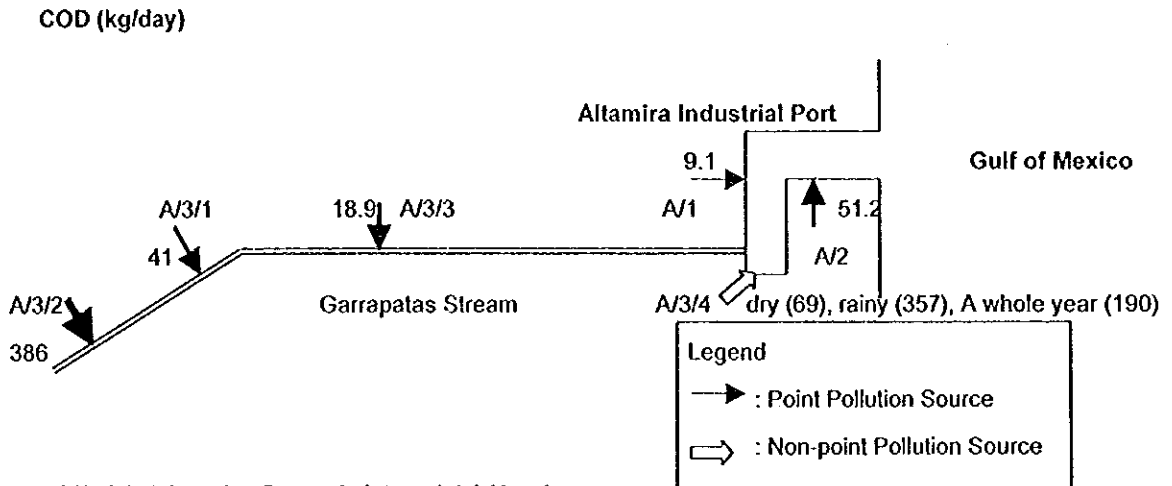
Daily Discharge Volume (m³/day)



- A/1: Administracion Portuaria Integral del Altamira
- A/2: Pittsburgh Plate Glass (PPG) Industry
- A/3/1: Polycyd
- A/3/2: Thermal Power Plant (Comision Federal Electricidad)
- A/3/3: Negromex (Planta Solucion)
- A/3/4: Non-point sources of Watershed of Garrapatas Stream

| Pollution Source | Type | Daily Discharge Volume (m ³ /day) | Ratio (%) |
|------------------|-------|--|--------------|
| A/1 | Point | 77 | 0.8 |
| A/2 | Point | 3011 | 32.2 |
| A/3/1 | Point | 1037 | 11.1 |
| A/3/2 | Point | 4771 | 51.0 |
| A/3/3 | Point | 456 | 4.9 |
| Total | | 9352 | 100.0 |

Figure B.1 Daily Discharge Volume into Altamira Industrial Port



A/1: Administracion Portuaria Integral del Altamira

A/2: Pittsburgh Plate Glass (PPG) Industry

A/3/1: Polycyd

A/3/2: Thermal Power Plant (Comision Federal Electricidad)

A/3/3: Negromex (Planta Solucion)

A/3/4: Non-point sources of Watershed of Garrapatas Stream

(Dry Season)

| Pollution Source | Type | Daily Pollution Loads (kg/day) | Ratio (%) |
|------------------|-----------|--------------------------------|--------------|
| A/1 | Point | 9.1 | 1.6 |
| A/2 | Point | 51.2 | 8.9 |
| A/3/1 | Point | 41.0 | 7.1 |
| A/3/2 | Point | 386.0 | 67.1 |
| A/3/3 | Point | 18.9 | 3.3 |
| A/3/4 | Non-point | 69.0 | 12.0 |
| Total | | 575.2 | 100.0 |

(Rainy Season)

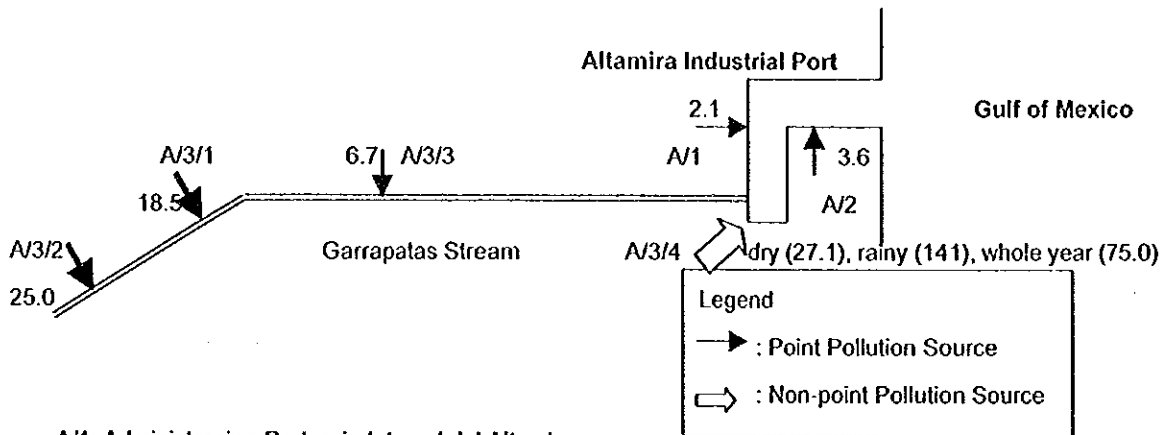
| Pollution Source | Type | Daily Pollution Loads (kg/day) | Ratio (%) |
|------------------|-----------|--------------------------------|--------------|
| A/1 | Point | 9.1 | 1.1 |
| A/2 | Point | 51.2 | 5.9 |
| A/3/1 | Point | 41.0 | 4.7 |
| A/3/2 | Point | 386.0 | 44.7 |
| A/3/3 | Point | 18.9 | 2.2 |
| A/3/4 | Non-point | 357.0 | 41.4 |
| Total | | 863.2 | 100.0 |

(A Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | 9.1 | 1.3 |
| A/2 | Point | 51.2 | 7.4 |
| A/3/1 | Point | 41.0 | 5.9 |
| A/3/2 | Point | 386.0 | 55.4 |
| A/3/3 | Point | 18.9 | 2.7 |
| A/3/4 | Non-point | 190.0 | 27.3 |
| Total | | 696.2 | 100.0 |

Figure B.2 Daily Pollution Load of COD into Altamira Industrial Port

BOD₅ (kg/day)



A/1: Administracion Portuaria Integral del Altamira

A/2: Pittsburgh Plate Glass (PPG) Industry

A/3/1: Polycyd

A/3/2: Thermal Power Plant (Comision Federal Electricidad)

A/3/3: Negromex (Planta Solucion)

A/3/4: Non-point sources of Watershed of Garrapatas Stream

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|-----------|
| A/1 | Point | 2.1 | 2.5 |
| A/2 | Point | 3.6 | 4.3 |
| A/3/1 | Point | 18.5 | 22.3 |
| A/3/2 | Point | 25.0 | 30.1 |
| A/3/3 | Point | 6.7 | 8.1 |
| A/3/4 | Non-point | 27.1 | 32.7 |
| Total | | 83 | 100.0 |

(Rainy Season)

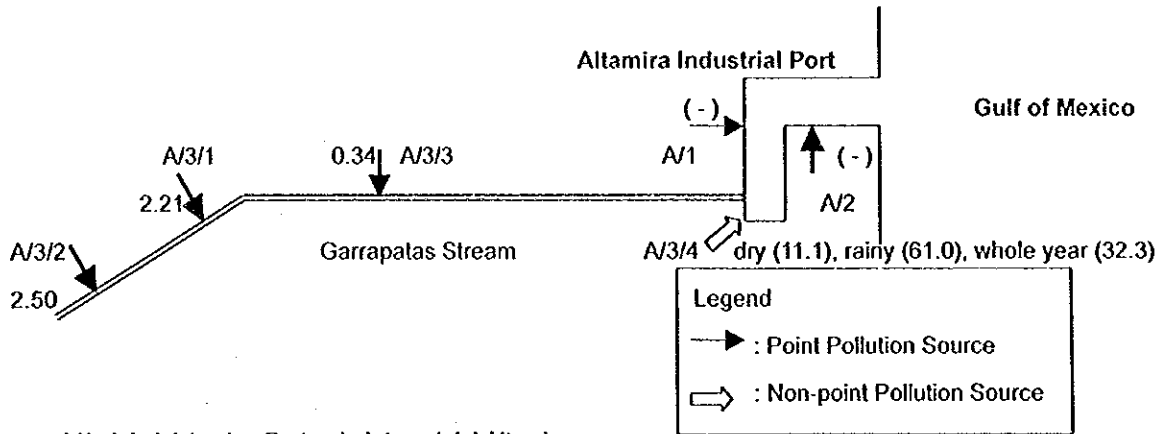
| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|-----------|
| A/1 | Point | 2.1 | 1.1 |
| A/2 | Point | 3.6 | 1.8 |
| A/3/1 | Point | 18.5 | 9.4 |
| A/3/2 | Point | 25.0 | 12.7 |
| A/3/3 | Point | 6.7 | 3.4 |
| A/3/4 | Non-point | 141 | 71.6 |
| Total | | 196.9 | 100.0 |

(A Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|-----------|
| A/1 | Point | 2.1 | 1.6 |
| A/2 | Point | 3.6 | 2.8 |
| A/3/1 | Point | 18.5 | 14.1 |
| A/3/2 | Point | 25.0 | 19.1 |
| A/3/3 | Point | 6.7 | 5.1 |
| A/3/4 | Non-point | 75.0 | 57.3 |
| Total | | 130.9 | 100.0 |

Figure B.3 Daily Pollution Load of BOD₅ into Altamira Industrial Port

Total Nitrogen (kg/day)



A/1: Administracion Portuaria Integral del Altamira

A/2: Pittsburgh Plate Glass (PPG) Industry

A/3/1: Polycyd

A/3/2: Thermal Power Plant (Comision Federal Electricidad)

A/3/3: Negromex (Planta Solucion)

A/3/4: Non-point sources of Watershed of Garrapatas Stream

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 2.2 | 13.2 |
| A/3/2 | Point | 2.5 | 14.9 |
| A/3/3 | Point | 0.3 | 2.0 |
| A/3/4 | Non-point | 11.7 | 69.9 |
| Total | | 16.8 | 100.0 |

(Rainy Season)

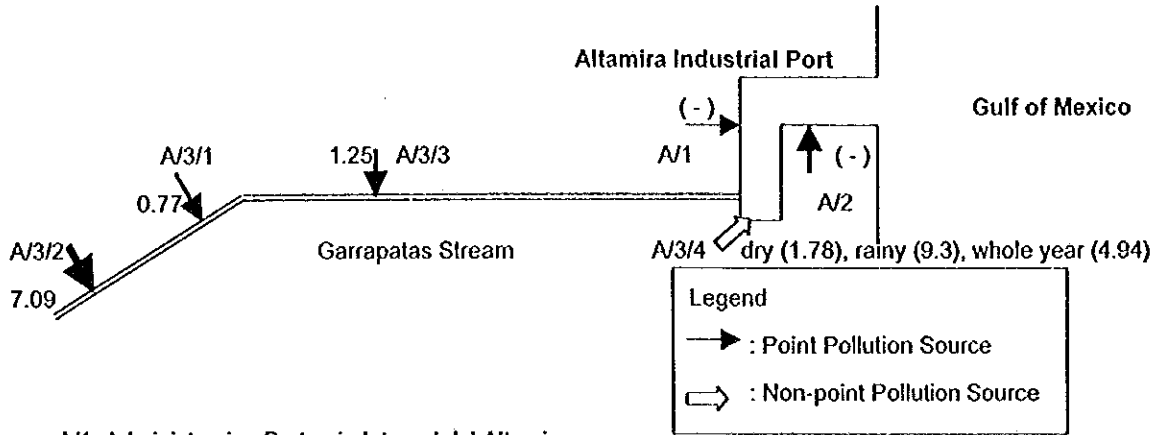
| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 2.2 | 3.3 |
| A/3/2 | Point | 2.5 | 3.8 |
| A/3/3 | Point | 0.3 | 0.5 |
| A/3/4 | Non-point | 61.0 | 92.4 |
| Total | | 66.1 | 100.0 |

(A Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 2.2 | 5.9 |
| A/3/2 | Point | 2.5 | 6.7 |
| A/3/3 | Point | 0.3 | 0.9 |
| A/3/4 | Non-point | 32.3 | 86.5 |
| Total | | 37.4 | 100.0 |

Figure B.4 Daily Pollution Load of Total Nitrogen into Altamira Industrial Port

Total Phosphorus (kg/day)



A/1: Administracion Portuaria Integral del Altamira

A/2: Pittsburgh Plate Glass (PPG) Industry

A/3/1: Polycyd

A/3/2: Thermal Power Plant (Comision Federal Electricidad)

A/3/3: Negromex (Planta Solucion)

A/3/4: Non-point sources of Watershed of Garrapatas Stream

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 0.77 | 7.1 |
| A/3/2 | Point | 7.09 | 65.1 |
| A/3/3 | Point | 1.25 | 11.5 |
| A/3/4 | Non-point | 1.78 | 16.3 |
| Total | | 10.89 | 100.0 |

(Rainy Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 0.77 | 4.2 |
| A/3/2 | Point | 7.09 | 38.5 |
| A/3/3 | Point | 1.25 | 6.8 |
| A/3/4 | Non-point | 9.3 | 50.5 |
| Total | | 18.41 | 100.0 |

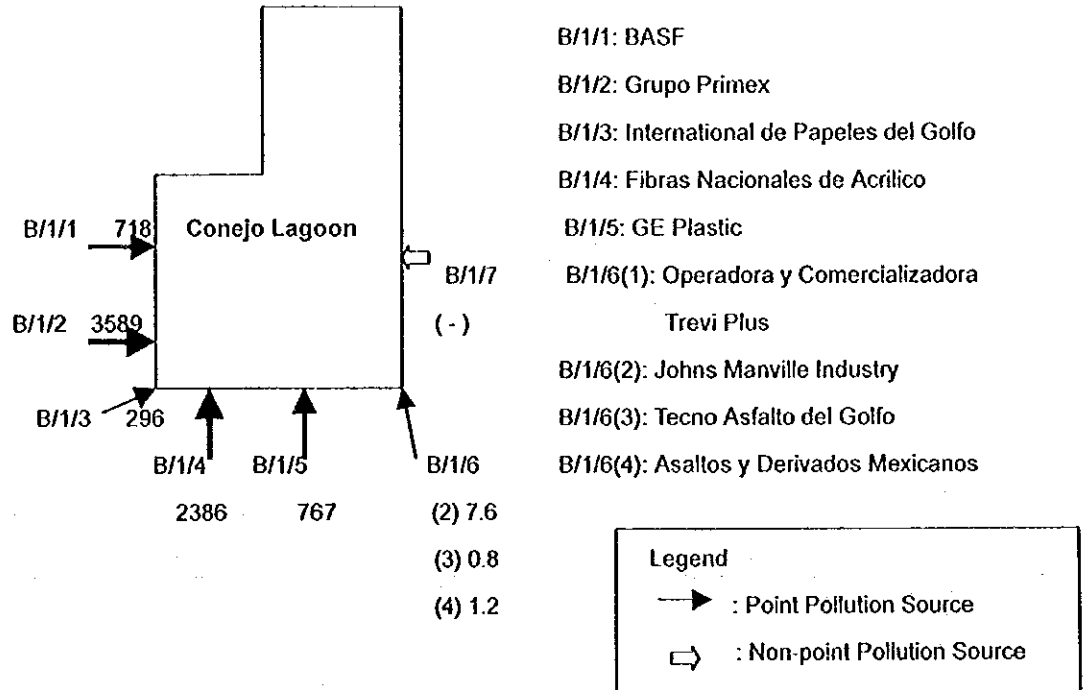
(Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 0.77 | 5.5 |
| A/3/2 | Point | 7.09 | 50.5 |
| A/3/3 | Point | 1.25 | 8.9 |
| A/3/4 | Non-point | 4.94 | 35.2 |
| Total | | 14.05 | 100.0 |

Figure B.5 Daily Pollution Load of Total Phosphorus into Altamira Industrial Port

(2) Conejo Lagoon

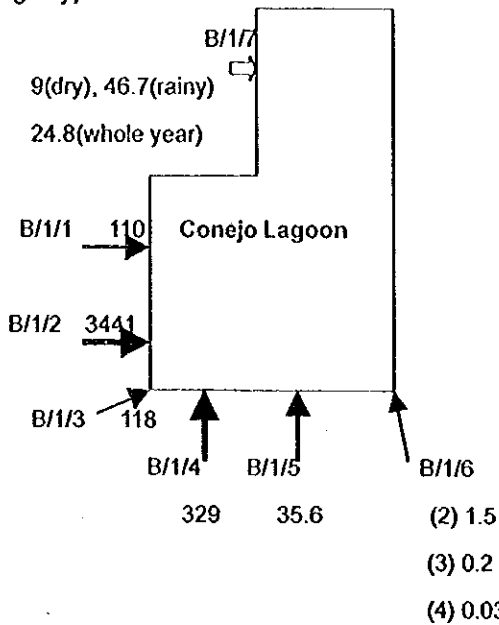
Discharge Volume (m³/day)



| Pollution Source | Type | Discharge Volume (m ³ /day) | Ratio (%) |
|------------------|-----------|--|--------------|
| B/1/1 | Point | 718 | 9.2 |
| B/1/2 | Point | 3,589 | 46.2 |
| B/1/3 | Point | 296 | 3.8 |
| B/1/4 | Point | 2,386 | 30.7 |
| B/1/5 | Point | 767 | 9.9 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 7.6 | 0.1 |
| B/1/6(3) | Point | 0.8 | 0.0 |
| B/1/6(4) | Point | 1.2 | 0.0 |
| B/1/7 | Non-point | - | - |
| Total | | 7,766 | 100.0 |

Figure B.6 Daily Discharge Volume into Conejo Lagoon

COD (kg/day)



- B/1/1: BASF
- B/1/2: Grupo Primex
- B/1/3: Internacional de Papeles del Golfo
- B/1/4: Fibras Nacionales de Acrilico
- B/1/5: GE Plastic
- B/1/6(1): Operadora y Comercializadora Trevi Plus
- B/1/6(2): Johns Manville Industry
- B/1/6(3): Tecno Asfalto del Golfo
- B/1/6(4): Asaltos y Derivados Mexicanos

(Dry Season)

| Pollution Source | Type | Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 110 | 2.7 |
| B/1/2 | Point | 3441 | 85.1 |
| B/1/3 | Point | 118 | 2.9 |
| B/1/4 | Point | 329 | 8.1 |
| B/1/5 | Point | 35.6 | 0.9 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 1.5 | 0.0 |
| B/1/6(3) | Point | 0.2 | 0.0 |
| B/1/6(4) | Point | 0.036 | 0.0 |
| B/1/7 | Non-point | 9.0 | 0.2 |
| Total | | 4044 | 100.0 |

(Rainy Season)

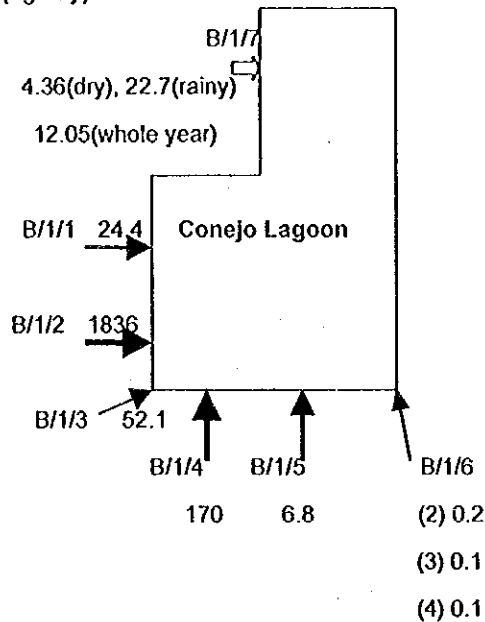
| Pollution Source | Type | Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 110 | 2.7 |
| B/1/2 | Point | 3441 | 84.3 |
| B/1/3 | Point | 118 | 2.9 |
| B/1/4 | Point | 329 | 8.1 |
| B/1/5 | Point | 35.6 | 0.9 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 1.5 | 0.0 |
| B/1/6(3) | Point | 0.2 | 0.0 |
| B/1/6(4) | Point | 0.036 | 0.0 |
| B/1/7 | Non-point | 46.7 | 1.1 |
| Total | | 4082 | 100.0 |

(Whole Year)

| Pollution Source | Type | Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 110 | 2.7 |
| B/1/2 | Point | 3441 | 84.8 |
| B/1/3 | Point | 118 | 2.9 |
| B/1/4 | Point | 329 | 8.1 |
| B/1/5 | Point | 35.6 | 0.9 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 1.5 | 0.0 |
| B/1/6(3) | Point | 0.2 | 0.0 |
| B/1/6(4) | Point | 0.036 | 0.0 |
| B/1/7 | Non-point | 24.8 | 0.6 |
| Total | | 4060 | 100.0 |

Figure B.7 Daily Pollution Load of COD into Conejo Lagoon

BOD₅ (kg/day)



- B/1/1: BASF
- B/1/2: Grupo Primex
- B/1/3: International de Papeles del Golfo
- B/1/4: Fibras Nacionales de Acrílico
- B/1/5: GE Plastic
- B/1/6(1): Operadora y Comercializadora Trevi Plus
- B/1/6(2): Johns Manville Industry
- B/1/6(3): Tecno Asfalto del Golfo
- B/1/6(4): Asaltos y Derivados Mexicanos

(Dry Season)

| Pollution Source | Type | Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 24.4 | 1.2 |
| B/1/2 | Point | 1836 | 87.7 |
| B/1/3 | Point | 52.1 | 2.5 |
| B/1/4 | Point | 170 | 8.1 |
| B/1/5 | Point | 6.80 | 0.3 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 0.20 | 0.0 |
| B/1/6(3) | Point | 0.10 | 0.0 |
| B/1/6(4) | Point | 0.01 | 0.0 |
| B/1/7 | Non-point | 4.36 | 0.2 |
| Total | | 2094 | 100.0 |

(Rainy Season)

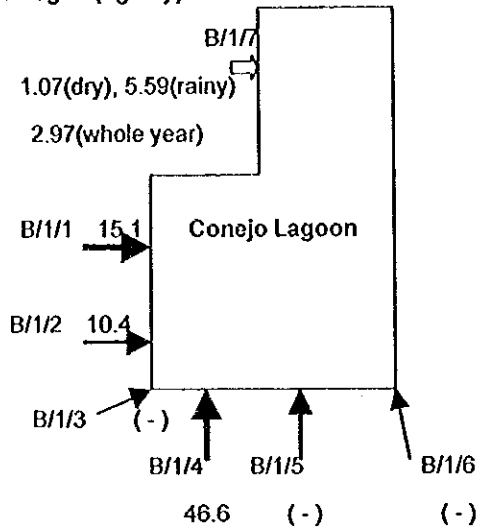
| Pollution Source | Type | Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 24.4 | 1.2 |
| B/1/2 | Point | 1836 | 86.9 |
| B/1/3 | Point | 52.1 | 2.5 |
| B/1/4 | Point | 170 | 8.0 |
| B/1/5 | Point | 6.80 | 0.3 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 0.20 | 0.0 |
| B/1/6(3) | Point | 0.10 | 0.0 |
| B/1/6(4) | Point | 0.01 | 0.0 |
| B/1/7 | Non-point | 22.7 | 1.1 |
| Total | | 2112 | 100.0 |

(Whole Year)

| Pollution Source | Type | Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 24.4 | 1.2 |
| B/1/2 | Point | 1836 | 87.4 |
| B/1/3 | Point | 52.1 | 2.5 |
| B/1/4 | Point | 170 | 8.1 |
| B/1/5 | Point | 6.80 | 0.3 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 0.20 | 0.0 |
| B/1/6(3) | Point | 0.10 | 0.0 |
| B/1/6(4) | Point | 0.01 | 0.0 |
| B/1/7 | Non-point | 12.05 | 0.6 |
| Total | | 2102 | 100.0 |

Figure B.8 Daily Pollution Load of BOD₅ into Conejo Lagoon

Total Nitrogen (kg/day)



- B/1/1: BASF
- B/1/2: Grupo Primex
- B/1/3: International de Papeles del Golfo
- B/1/4: Fibras Nacionales de Acrilico
- B/1/5: GE Plastic
- B/1/6(1): Operadora y Comercializadora Trevi Plus
- B/1/6(2): Johns Manville Industry
- B/1/6(3): Tecno Asfalto del Golfo
- B/1/6(4): Asaltos y Derivados Mexicanos

(Dry Season)

| Pollution Source | Type | Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 15.1 | 20.6 |
| B/1/2 | Point | 10.4 | 14.2 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 46.6 | 63.7 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 1.07 | 1.5 |
| Total | | 73.2 | 100.0 |

(Rainy Season)

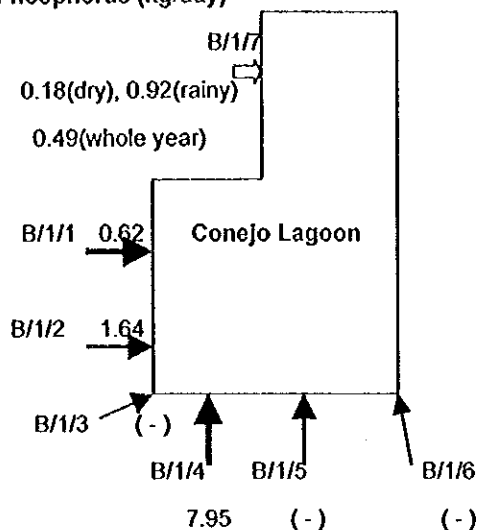
| Pollution Source | Type | Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 15.1 | 19.4 |
| B/1/2 | Point | 10.4 | 13.4 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 46.6 | 60.0 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 5.59 | 7.2 |
| Total | | 77.7 | 100.0 |

(A Whole Year)

| Pollution Source | Type | Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 15.1 | 20.1 |
| B/1/2 | Point | 10.4 | 13.9 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 46.6 | 62.1 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 2.97 | 4.0 |
| Total | | 75.1 | 100.0 |

Figure B.9 Daily Pollution Load of Total Nitrogen into Conejo Lagoon

Total Phosphorus (kg/day)



- B/1/1: BASF
- B/1/2: Grupo Primex
- B/1/3: Internacional de Papeles del Golfo
- B/1/4: Fibras Nacionales de Acrilico
- B/1/5: GE Plastic
- B/1/6(1): Operadora y Comercializadora Trevi Plus
- B/1/6(2): Johns Manville Industry
- B/1/6(3): Tecno Asfalto del Golfo
- B/1/6(4): Asaltos y Derivados Mexicanos

(Dry Season)

| Pollution Source | Type | Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 0.62 | 6.0 |
| B/1/2 | Point | 1.64 | 15.8 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 7.95 | 76.5 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 0.18 | 1.7 |
| Total | | 10.39 | 100.0 |

(Rainy Season)

| Pollution Source | Type | Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 0.62 | 5.6 |
| B/1/2 | Point | 1.64 | 14.7 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 7.95 | 71.4 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 0.92 | 8.3 |
| Total | | 11.13 | 100.0 |

(A Whole Year)

| Pollution Source | Type | Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------|--------------|
| B/1/1 | Point | 0.62 | 5.8 |
| B/1/2 | Point | 1.64 | 15.3 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 7.95 | 74.3 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 0.49 | 4.6 |
| Total | | 10.7 | 100.0 |

Figure B.10 Daily Pollution Load of Total Phosphorus into Conejo Lagoon

(3) Panuco River

a) Dry Season

Table B.47 Flow Rate (Daily Discharge Volume) and Daily Pollution Load from Point and Non-Point Pollution Sources to Panuco River in Dry Season

Point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | | Flow rate (m ³ /s) | Daily Discharge Volume (1000m ³ /day) |
|-------------------------------|---|---------------------------|--------------|-------------------------|---------------------------|-------------------------------|--|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) | | |
| C/1 | Panuco River (Las Adjuntas, El Alamo) | 29,000 | 332,000 | 12,600 | 1,440 | 185 | 16,000 |
| C/2 | Tamesi River System | 2,285 | 18,315 | 967 | 89 | 13.9 | 1,201 |
| C/3/1 | Sea-food Process Industries Area | 110 | 202 | 30.2 | 5.4 | 0.0029 | 0.25 |
| C/4/1 | Altavista Water Supply Plant | 420 | 606 | - | - | 0.088 | 7.58 |
| C/4/2-5 C/5/1-4 C/8/1-2 | Municipal Waste-Water of Tampico And Madero | 27,100 | 41,800 | 7,240 | 906 | 1.043 | 90.12 |
| C/10 | Refineria Madero (PEMEX) | 586 | 4,490 | 321 | 6.4 | 0.074 | 6.4 |
| | Total | 59,501 | 397,413 | 21,158 | 2,447 | 200 | 17,305 |

Non-point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | |
|-------------------------|---|---------------------------|--------------|-------------------------|---------------------------|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) |
| C/3 | Morelos | 1.18 | 2.24 | 0.42 | 0.05 |
| C/4/6 | Tampico Solid Waste Landfill Site | 2.42 | 4.59 | 0.5 | 0.08 |
| C/4/7 | Southwest Part of Tampico | 4 | 7.61 | 1.43 | 0.18 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | 36.5 | 70 | 9.13 | 1.33 |
| C/6 | Northern Part of Pueblo Viejo | 7.85 | 17 | 2.22 | 0.35 |
| | Total | 51.95 | 101.44 | 13.7 | 1.99 |

Table B.48 Ratio of Daily Pollution Load from each Pollution Source (Including Rivers) in Total Daily Pollution Load from Pollution Sources into Panuco River in Dry Season

| Pollution Source Number | Water System | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|-------------------------------|---|-----------|-------------------------|------------|-----------------------|-------------------------|
| C/1 | Panuco River (Las Adjuntas, El Alamo) | River | 48.70 | 83.52 | 59.51 | 58.80 |
| C/2 | Tamesi River System | River | 3.84 | 4.61 | 4.57 | 3.63 |
| C/3/1 | Sea-food Process Industries Area | Point | 0.18 | 0.05 | 0.14 | 0.22 |
| C/A/1 | Altavista Water Supply Plant | Point | 0.71 | 0.15 | | |
| C/A/2-5 C/5/1-4 C/7/1-2 | Municipal Waste- Water of Tampico And Madero | Point | 45.51 | 10.52 | 34.20 | 37.00 |
| C/10 | Refineria Madero (PEMEX) | Point | 0.98 | 1.13 | 1.52 | 0.26 |
| C/3 | Morelos | Non-point | 0.00 | 0.00 | 0.00 | 0.00 |
| C/A/6 | Tampico Solid Waste Landfill Site | Non-point | 0.00 | 0.00 | 0.00 | 0.00 |
| C/A/7 | Southwest Part of Tampico | Non-point | 0.01 | 0.00 | 0.01 | 0.01 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | Non-point | 0.06 | 0.02 | 0.04 | 0.05 |
| C/6 | Northern Part of Pueblo Viejo | Non-point | 0.01 | 0.00 | 0.01 | 0.01 |
| | Total | | 100.00 | 100.00 | 100.00 | 100.00 |

Table B.49 Contribution of Rivers, Point Pollution Sources, and Non-point Pollution Sources on Pollution Loading into Panuco River in Dry Season

| Season | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|--------|-----------------------------|-------------------------|------------|-----------------------|-------------------------|
| Dry | Rivers | 52.53 | 88.13 | 64.08 | 62.44 |
| | Point Pollution Sources | 47.38 | 11.85 | 35.86 | 37.48 |
| | Non-point Pollution Sources | 0.09 | 0.03 | 0.06 | 0.08 |

b) Rainy Season

Table B.50 Flow Rate (Daily Discharge Volume) and Daily Pollution Load from Point and Non-point Pollution Sources to Panuco River in Rainy Season

Point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | | Flow rate (m ³ /s) | Daily Discharge Volume (1000m ³ /day) |
|-------------------------------|---|---------------------------|--------------|-------------------------|---------------------------|-------------------------------|--|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) | | |
| C/1 | Panuco River (Las Adjuntas, El Alamo) | 68,000 | 1,646,000 | 17,490 | 9,930 | 771 | 66,600 |
| C/2 | Tamesi River System | 4,264 | 59,331 | 2,250 | 265 | 42 | 3,630 |
| C/3/1 | Sea-food Process Industries Area | 110 | 202 | 30.2 | 5.4 | 0.0029 | 0.25 |
| C/4/1 | Altavista Water Supply Plant | 420 | 606 | - | - | 0.088 | 7.58 |
| C/4/2-5 C/5/1-4 C/8/1-2 | Municipal Waste-Water of Tampico And Madero | 27,100 | 41,800 | 7,240 | 906 | 1.043 | 90.1 |
| C/10 | Refineria Madero (PEMEX) | 586 | 4,490 | 321 | 6.4 | 0.074 | 6.4 |
| Total | | 100,480 | 1,752,429 | 27,331 | 11,113 | 814 | 70,334 |

Non-point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | |
|-------------------------|---|---------------------------|--------------|-------------------------|---------------------------|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) |
| C/3 | Morelos | 6.1 | 11.7 | 2.19 | 0.28 |
| C/4/6 | Tampico Solid Waste Landfill Site | 12.6 | 23.9 | 2.62 | 0.41 |
| C/4/7 | Southwest Part of Tampico | 20.9 | 40 | 7.5 | 0.96 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | 190 | 364 | 47.6 | 6.92 |
| C/6 | Northern Part of Pueblo Viejo | 43.5 | 92 | 12.3 | 1.9 |
| Total | | 273.1 | 531.6 | 72.21 | 10.47 |

Table B.51 Ratio of Daily Pollution Load from each Pollution Source (Including Rivers) in Total Pollution Load from Pollution Sources into Panuco River in Rainy Season

| Pollution Source Number | Water System | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|-------------------------------|---|-----------|-------------------------|------------|-----------------------|-------------------------|
| C/1 | Panuco River (Las Adjuntas, El Alamo) | River | 67.49 | 93.90 | 63.82 | 89.27 |
| C/2 | Tamesi River System | River | 4.23 | 3.38 | 8.21 | 2.38 |
| C/3/1 | Sea-food Process Industries Area | Point | 0.11 | 0.01 | 0.11 | 0.05 |
| C/4/1 | Altavista Water Supply Plant | Point | 0.42 | 0.03 | - | - |
| C/4/2-5 C/5/1-4 C/8/1-2 | Municipal Waste- Water of Tampico And Madero | Point | 26.90 | 2.38 | 26.42 | 8.15 |
| C/10 | Refineria Madero (PEMEX) | Point | 0.58 | 0.26 | 1.17 | 0.06 |
| C/3 | Morelos | Non-point | 0.01 | 0.00 | 0.01 | 0.00 |
| C/4/6 | Tampico Solid Waste Landfill Site | Non-point | 0.01 | 0.00 | 0.01 | 0.00 |
| C/4/7 | Southwest Part of Tampico | Non-point | 0.02 | 0.00 | 0.03 | 0.01 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | Non-point | 0.19 | 0.02 | 0.17 | 0.06 |
| C/6 | Northern Part of Pueblo Viejo | Non-point | 0.04 | 0.01 | 0.04 | 0.02 |
| Total | | | 100 | 100 | 100 | 100 |

Table B.52 Contribution of Rivers, Point Pollution Sources, and Non-point Pollution Sources on Pollution Loading into Panuco River in Rainy Season

| Season | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|--------|-----------------------------|-------------------------|------------|-----------------------|-------------------------|
| Rainy | Rivers | 71.72 | 97.28 | 72.03 | 91.65 |
| | Point Pollution Sources | 28.01 | 2.69 | 27.70 | 8.25 |
| | Non-point Pollution Sources | 0.27 | 0.03 | 0.26 | 0.09 |

c) A Whole Year

Table B.53 Flow Rate (Daily Discharge Volume) and Daily Pollution Load from Point and Non-Point Pollution Sources to Panuco River in Whole Year

Point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | | Flow Rate (m ³ /s) | Daily Discharge Volume (1000m ³ /day) |
|-------------------------------|---|---------------------------|--------------|-------------------------|---------------------------|-------------------------------|--|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) | | |
| C/1 | Panuco River (Las Adjuntas, Et Alamo) | 45,300 | 883,000 | 14,600 | 5,000 | 431 | 37,200 |
| C/2 | Tamesi River System | 3,110 | 35,500 | 1,500 | 163 | 25.7 | 2,220 |
| C/3/1 | Sea-food Process Industries Area | 110 | 202 | 30.2 | 5.4 | 0.0029 | 0.25 |
| C/4/1 | Altavista Water Supply Plant | 420 | 606 | - | - | 0.088 | 7.58 |
| C/4/2-5 C/5/1-4 C/8/1-2 | Municipal Waste-Water of Tampico And Madero | 27,100 | 41,800 | 7,240 | 906 | 1.043 | 90.12 |
| C/10 | Refineria Madero (PEMEX) | 586 | 4,490 | 321 | 6.4 | 0.074 | 6.4 |
| | Total | 76,626 | 965,598 | 23,691 | 6,081 | 458 | 39,524 |

Non-point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | |
|-------------------------|--|---------------------------|--------------|-------------------------|---------------------------|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) |
| C/3 | Morelos | 3.24 | 6.21 | 1.16 | 0.146 |
| C/4/6 | Tampico Solid Waste Landfill Site | 6.69 | 12.7 | 1.39 | 0.218 |
| C/4/7 | Southwest Part of Tampico | 11.1 | 21.2 | 3.97 | 0.507 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | 101 | 193 | 25.3 | 3.67 |
| C/6 | Northern Part of Pueblo Viejo | 22.8 | 48.4 | 6.45 | 1 |
| | Total | 144.83 | 281.51 | 38.27 | 5.541 |

Table B.54 Ratio of Daily Pollution Load from each Pollution Source (Including Rivers) in Total Daily Pollution Load from Pollution Sources into Panuco River in Whole Year

| Pollution Source Number | Water System | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|-------------------------------|---|-----------|----------------------|---------|--------------------|----------------------|
| C/1 | Panuco River (Las Adjuntas, El Alamo) | River | 59.01 | 91.42 | 61.53 | 82.15 |
| C/2 | Tamesi River System | River | 4.05 | 3.68 | 6.32 | 2.68 |
| C/3/1 | Sea-food Process Industries Area | Point | 0.14 | 0.02 | 0.13 | 0.09 |
| C/4/1 | Altavista Water Supply Plant | Point | 0.55 | 0.06 | - | - |
| C/4/2-5 C/5/1-4 C/7/1-2 | Municipal Waste-Water of Tampico And Madero | Point | 35.30 | 4.33 | 30.51 | 14.89 |
| C/10 | Refineria Madero (PEMEX) | Point | 0.76 | 0.46 | 1.35 | 0.11 |
| C/3 | Morelos | Non-point | 0.00 | 0.00 | 0.00 | 0.00 |
| C/4/6 | Tampico Solid Waste Landfill Site | Non-point | 0.01 | 0.00 | 0.01 | 0.00 |
| C/4/7 | Southwest Part of Tampico | Non-point | 0.01 | 0.00 | 0.02 | 0.01 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | Non-point | 0.13 | 0.02 | 0.11 | 0.06 |
| C/6 | Northern Part of Pueblo Viejo | Non-point | 0.03 | 0.01 | 0.03 | 0.02 |
| Total | | | 100.00 | 100.00 | 100.00 | 100.00 |

Table B.55 Contribution of Rivers, Point Pollution Sources, and Non-point Pollution Sources on Pollution Loading into Panuco River

| Season | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|------------|-----------------------------|----------------------|---------|--------------------|----------------------|
| Whole Year | Rivers | 63.06 | 95.09 | 67.85 | 84.83 |
| | Point Pollution Sources | 36.75 | 4.88 | 31.99 | 15.08 |
| | Non-point Pollution Sources | 0.19 | 0.03 | 0.16 | 0.09 |

Table B.56 Daily Discharge Volume and Daily Pollution Loads from Pollution Sources and Rivers to Coastal Area in Dry Season

| Pollution Source Number | Pollution Source | BOD ₅ (kg/day) | COD (kg/day) | Total N (kg/day) | Total P (kg/day) | Daily Discharge Volume (1000 m ³ /day) |
|-------------------------|--------------------------|------------------------------|-----------------|---------------------|---------------------|--|
| A | Altamira Industrial Port | 83 | 575 | 17.1 | 11.1 | - |
| D | Petrocel | 296 | 681 | 4.5 | - | 8.27 |
| E | Novaquim | 106 | 199 | 20.2 | - | 0.349 |
| F(1) | Negromex (Emulcion) | 167 | 1,290 | 57 | - | 2.65 |
| F(2) | NHUMO | 34 | 68.1 | 2.04 | - | 0.681 |
| G | Dupont | 120 | - | - | - | 5.72 |
| C | Panuco River | 59,600 | 398,000 | 21,200 | 2,450 | 17,300 |

Table B.57 Daily Discharge Volume and Daily Pollution Loads from Pollution Sources and Rivers to Coastal Area in Rainy Season

| Pollution Source Number | Pollution Source | BOD ₅ (kg/day) | COD (kg/day) | Total N (kg/day) | Total P (kg/day) | Daily Discharge Volume (1000 m ³ /day) |
|-------------------------|--------------------------|------------------------------|-----------------|---------------------|---------------------|--|
| A | Altamira Industrial Port | 197 | 863 | 66 | 18.4 | - |
| D | Petrocel | 296 | 681 | 4.5 | - | 8.27 |
| E | Novaquim | 106 | 199 | 20.2 | - | 0.349 |
| F(1) | Negromex (Emulcion) | 167 | 1,290 | 57 | - | 2.65 |
| F(2) | NHUMO | 34 | 68.1 | 2.04 | - | 0.681 |
| G | Dupont | 120 | - | - | - | 5.72 |
| C | Panuco River | 101,000 | 1,750,000 | 27,400 | 11,100 | 70,300 |

Table B.58 Daily Discharge Volume and Daily Pollution Loads from Pollution Sources and Rivers to Coastal Area in Whole Year

| Pollution Source Number | Pollution Source | BOD ₅ (kg/day) | COD (kg/day) | Total N (kg/day) | Total P (kg/day) | Daily Discharge Volume (1000 m ³ /day) |
|-------------------------|--------------------------|------------------------------|-----------------|---------------------|---------------------|--|
| A | Altamira Industrial Port | 131 | 696 | 37.4 | 14.1 | - |
| D | Petrocel | 296 | 681 | 4.5 | - | 8.27 |
| E | Novaquim | 106 | 199 | 20.2 | - | 0.349 |
| F(1) | Negromex (Emulcion) | 167 | 1,290 | 57 | - | 2.65 |
| F(2) | NHUMO | 34 | 68.1 | 2.04 | - | 0.681 |
| G | Dupont | 120 | - | - | - | 5.72 |
| C | Panuco River | 76,800 | 966,000 | 23,700 | 6,090 | 39,500 |

B.1.6 Pollution Load Analysis by Each Pollution Source in Future

(1) Point Pollution Sources

a) Altamira Industrial Port Area (A)

Table B.59 shows the daily discharge volume and daily pollution load into the Altamira Industrial Port Area in 2010.

Table B.59 Daily Discharge Volume and Daily Pollution Loads into Altamira Industrial Port in 2010

| Pollution Source Number | Name | Discharge Volume M ³ /s | BOD ₅ kg/day | COD kg/day | Total Nitrogen kg/day | Total Phosphorus kg/day |
|-------------------------|--|------------------------------------|-------------------------|------------|-----------------------|-------------------------|
| A/1, S | Administración Portuaria Integral del Altamira | 0.0015 | 3.58 | 15.1 | - | - |
| A/2, I | Pittsburgh Plate Glass (PPG) Industry | 0.0580 | 6.0 | 85.2 | - | - |
| A/3/1, I | POLICYD | 0.0200 | 30.8 | 68.2 | 3.68 | 1.28 |
| A/3/2, I | Comisión Federal De Electricidad | 0.0552 | 25.0 | 386.0 | 2.50 | 7.09 |
| A/3/3, I | NEGROMEX (Planta Solucion) | 0.0088 | 11.20 | 31.42 | 0.57 | 2.08 |
| A/4 | New thermal plant (Comisión Federal De Electricidad) | 0.0552 | 25.0 | 386.0 | 2.50 | 7.09 |

b) Conejo Lagoon (B/1) and Marismas Lagoon (B)

Table B.60 shows the daily discharge volume and daily pollution loads in 2010, which flow into Conejo Lagoon.

Table B.60 Daily Discharge Volume and Daily Pollution Load into Conejo Lagoon in 2010

| Pollution Source Number | Point Pollution Source | Discharge Volume m ³ /s | BOD ₅ kg/day | COD kg/day | Total Nitrogen kg/day | Total Phosphorus kg/day |
|-------------------------|---|------------------------------------|-------------------------|------------|-----------------------|-------------------------|
| B/1/1, I | BASF Mexicano | 0.0138 | 40.6 | 182.8 | 25.1 | 1.03 |
| B/1/2, I | Grupo Primex | 0.0692 | 314 | 588 | 1.79 | 0.28 |
| B/1/3, I | Internacional de Papeles Del Golfo | 0.0057 | 25.9 | 60.1 | - | - |
| B/1/4, I | Fibras Nacionales de Acrílico | 0.0460 | 209 | 405 | 57.2 | 4.88 |
| B/1/5, I | GE Plastic | 0.0148 | 11.4 | 59.3 | - | - |
| B/1/6(1), I | Operadora y Comercializadora Trevi Plus | - | - | - | - | - |
| B/1/6(2), I | Johns Manville Industry | 0.000146 | 0.332 | 2.48 | - | - |
| B/1/6(3), I | Tecno Asfalto del Golfo | 0.000016 | 0.073 | 0.15 | - | - |
| B/1/6(4), I | Asfaltos y Derivados Mexicanos | 0.000023 | 0.008 | 0.06 | - | - |

c) Panuco River Upstream (C/1)

The daily discharge volume and daily pollution loads in 2010 which pass at El Alamo Station are shown in Table B.31.

d) Tamesi River and Freshwater Lagoons (C/2)

The daily discharge volume and daily pollution loads from Tamesi River in 2010 is shown in Table B.32.

e) Sea-food Processing Industries (C/3/1)

The daily pollution loads by sea-food processing factories are shown in Table B.33.

f) Municipal Wastewater (Tampico City, Madero City and Miramar)

The daily discharge volume and daily pollution loads of municipal wastewater from Tampico City, Madero City and Miramar in 2010 are shown in Table B.61.

Table B.61 Daily Discharge Volume and Daily Pollution Loads of Wastewater from Tampico, Madero and Miramar in 2010

| Item | Unit | Tampico City and Madero City | Miramar |
|-----------------------------|---------------------|------------------------------|---------|
| Daily discharge volume | m ³ /day | 182,164 | 18,100 |
| Flow rate | m ³ /s | 2.11 | 0.19 |
| Daily BOD ₅ load | kg/day | 41,000 | 4,030 |
| Daily COD load | kg/day | 63,300 | 7,440 |
| Daily total nitrogen load | kg/day | 11,000 | 688 |
| Daily total phosphorus load | kg/day | 1,380 | 82 |

g) Cuauhtemoc Oxidation Pond (C/7/2)

The daily discharge volume and daily pollution loads of municipal wastewater from Pueblo Viejo Municipality in 2010 are shown in Table B.62. Coverage of drainage system is 11% (only in Cuauhtemoc Area).

If wastewater treatment facility is reinforced and most of treated wastewater is infiltrated into underground as in 1999, the pollution loads from the Cuauhtemoc oxidation pond into Pueblo Viejo Lagoon is negligible.

Table B.62 Daily Discharge Volume and Daily Pollution Loads of Wastewater from Pueblo Viejo in 2010

| Item | Unit | Pueblo Viejo |
|-----------------------------|---------------------|--------------|
| Daily discharge volume | m ³ /day | 1,390 |
| Flow rate | m ³ /s | 0.0161 |
| Daily BOD ₅ load | kg/day | 355 |
| Daily COD load | kg/day | 647 |
| Daily total nitrogen load | kg/day | 60 |
| Daily total phosphorus load | kg/day | 7 |

h) Refineria Madero (C/10, I)

The flow rate and daily pollution loads from Refineria Madero in 2010 are shown in Table B.63.

Table B.63 Flow Rate and Daily Pollution Loads From Refineria Madero in 2010

| Parameter | Pollution Load | | | |
|------------------|-------------------|---------------|----------|-------|
| | Unit | Siete y Media | Vanadero | Total |
| BOD ₅ | kg/day | 67 | 168 | 235 |
| COD | kg/day | 932 | 1,830 | 2,762 |
| Total nitrogen | kg/day | 16.4 | 95.6 | 112 |
| Total phosphorus | kg/day | 1.17 | 1.73 | 2.90 |
| Flow rate | m ³ /s | 0.0180 | 0.105 | 0.123 |

i) Quimica del Mar (C/11, I)

This factory is supposed not to be operated in 2010.

j) Gulf of Mexico

The discharge volume and pollution loads which flow into the coastal water of Gulf of Mexico are shown in Table B.64.

Table B.64 Flow Rate and Daily Pollution Load from Industries which Discharge Wastewater into Coastal Water of Gulf of Mexico in 2010

| Pollution Source Number | Pollution Source | Pollution Load | | | | |
|-------------------------|---------------------|---------------------|------------------|----------|----------|----------|
| | | Flow rate | BOD ₅ | COD | Total N | Total P |
| | | (m ³ /s) | (kg/day) | (kg/day) | (kg/day) | (kg/day) |
| D | Petrocel | 0.160 | 494 | 1,136 | 6.9 | - |
| E | Novaquim | 0.0067 | 30.5 | 57 | 5.8 | - |
| F(1) | Negromex (Emulsion) | 0.0531 | 241 | 1,859 | 82.2 | - |
| F(2) | NHUMO | 0.0131 | 57.6 | 113 | 3.39 | - |
| G | Dupont | 0.124 | 224 | - | - | - |

(2) Non-point Pollution Sources

Pollution loads from the following non-point pollution sources are estimated:

- Watershed of Conejo Lagoon (B/1/7): the pollution loads in dry and rainy seasons in 2010 are shown in Table B.38.
- Watershed of Garrapatas Stream (A/3/4, R): the pollution loads in dry and rainy season are shown in Table B.65.
- Watershed of Costa Lagoon (C/2/1): the pollution loads in dry and rainy seasons in 2010 are shown in Table B.66.

Table B.65 Non-point Pollution Loads from Watershed of Garrapatas Stream in 2010 (Dry Season)

| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Unit | Pollution Load (kg/dry season) | | | | Daily Pollution Load (kg/day) | | | |
|-------------------------|--------------|--------|-------------------------------|------|------------------|-----|--------------|--------------------------------|--------------|---------------|-------------|-------------------------------|-------------|------------------|-----|
| | | | T-N | | T-P | | | BOD ₅ | COD | T-N | | T-P | | BOD ₅ | COD |
| | | | T-N | T-P | BOD ₅ | COD | | | | T-N | T-P | BOD ₅ | COD | | |
| Crop/Pasture | 6,520 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 1,995 | 296 | 3,270 | 9,811 | 9.41 | 1.40 | 15.43 | 46 | |
| Low density Residential | 80 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 47.6 | 6.1 | 133 | 253 | 0.22 | 0.03 | 0.63 | 1.19 | |
| Industrial | 240 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 444 | 77 | 2,379 | 4,520 | 2.09 | 0.36 | 11.22 | 21.32 | |
| Total | 6,840 | | | | | | 2,487 | 379 | 5,783 | 14,584 | 11.7 | 1.79 | 27.3 | 69.5 | |

(Rainy Season)

| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Unit | Pollution Load (kg/rainy season) | | | | Daily Pollution Load (kg/day) | | | |
|-------------------------|--------------|--------|-------------------------------|------|------------------|-----|--------------|----------------------------------|---------------|---------------|-----------|-------------------------------|------------|------------------|-----|
| | | | T-N | | T-P | | | BOD ₅ | COD | T-N | | T-P | | BOD ₅ | COD |
| | | | T-N | T-P | BOD ₅ | COD | | | | T-N | T-P | BOD ₅ | COD | | |
| Crop/Pasture | 6,520 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 7,506 | 1,115 | 12,302 | 36,907 | 49.1 | 7.3 | 80.4 | 241.2 | |
| Low density Residential | 80 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 179 | 23 | 501 | 952 | 1.2 | 0.2 | 3.3 | 6.2 | |
| Industrial | 240 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 1,669 | 289 | 8,950 | 17,005 | 10.9 | 1.89 | 58 | 111 | |
| Total | 6,840 | | | | | | 9,354 | 1,427 | 21,753 | 54,864 | 61 | 9.4 | 142 | 359 | |

*R: Reduction Parameter

Table B.66 Non-point Pollution Loads from Watershed of Costa Lagoon in 2010 (Dry Season)

| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Unit | Pollution Load (kg/dry season) | | | | Daily Pollution Load (kg/day) | | | |
|-------------------------|--------------|--------|-------------------------------|------|------------------|-----|--------------|--------------------------------|--------------|---------------|--------------|-------------------------------|--------------|------------------|-----|
| | | | T-N | | T-P | | | BOD ₅ | COD | T-N | | T-P | | BOD ₅ | COD |
| | | | T-N | T-P | BOD ₅ | COD | | | | T-N | T-P | BOD ₅ | COD | | |
| Crop/Pasture | 3,990 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 1,221 | 181 | 2,001 | 6,004 | 5.76 | 0.86 | 9.44 | 28 | |
| Wetland | 1,700 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 797 | 95 | 2,340 | 7,021 | 3.76 | 0.45 | 11.04 | 33 | |
| Lagoon | 300 | 0.6 | 6.75 | 0.57 | 8.8 | 26 | 255 | 21 | 331 | 994 | 1.20 | 0.10 | 1.56 | 5 | |
| Low density Residential | 70 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 42 | 5 | 117 | 221 | 0.20 | 0.03 | 0.55 | 1 | |
| Total | 6,060 | | | | | | 2,315 | 303 | 4,789 | 14,240 | 10.92 | 1.43 | 22.59 | 67 | |

(Rainy Season)

| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Unit | Pollution Load (kg/rainy season) | | | | Daily Pollution Load (kg/day) | | | |
|-------------------------|--------------|--------|-------------------------------|------|------------------|-----|--------------|----------------------------------|---------------|---------------|-------------|-------------------------------|--------------|------------------|-----|
| | | | T-N | | T-P | | | BOD ₅ | COD | T-N | | T-P | | BOD ₅ | COD |
| | | | T-N | T-P | BOD ₅ | COD | | | | T-N | T-P | BOD ₅ | COD | | |
| Crop/Pasture | 3,990 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 4,594 | 682 | 7,528 | 22,585 | 30.0 | 4.5 | 49.2 | 147.6 | |
| Wetland | 1,700 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 2,998 | 357 | 8,804 | 26,412 | 19.6 | 2.3 | 57.5 | 172.6 | |
| Lagoon | 300 | 0.6 | 6.75 | 0.57 | 8.8 | 26 | 960 | 80 | 1,246 | 3,738 | 6.3 | 0.5 | 8.1 | 24.4 | |
| Low density Residential | 70 | 0.6 | 4.72 | 0.61 | 13.21 | 25 | 157 | 20 | 438 | 833 | 1.02 | 0.13 | 2.9 | 5.4 | |
| Total | 6,060 | | | | | | 8,709 | 1,139 | 18,017 | 53,568 | 56.9 | 7.4 | 117.8 | 350.1 | |

*R: Reduction Parameter

- Morelos (Tampico) (C/3/1, U): the pollution loads in dry and rainy seasons in 2010 are shown in Table B.40.
- Area around Tampico Solid Waste Landfill Site (C/4/7, M): Tampico Solid Waste Landfill Site (approximately 32 ha) and its surrounding (18 ha) will be transformed into public park for recreation. However, its area will be regarded as one of the industrial land use until 2010. The pollution loads in dry and rainy season in 2010 is shown in Table B.41.
- Southwest Part of Tampico City (C/4/6, U): the pollution loads in dry and rainy

seasons in 2010 are shown in Table B.42.

- Southern Part of Tampico City and Southern Part of Madero City (C/5/5, U and C/8/3, U): the pollution loads in dry and rainy seasons in 2010 are shown in Table B.43.
- Northern Part of Pueblo Viejo Municipality (C/6): the pollution loads in dry and rainy seasons in 2010 are shown in Table B.67.

Table B.67 Non-point Pollution Loads from the Northern Part of Pueblo Viejo in 2010 (Dry Season)

| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Pollution Load (kg/dry season) | | | | Daily Pollution Load (kg/day) | | | | | | | |
|-------------------------|------------|--------|-------------------------------|------|-------|-----|--------------------------------|-----------|--------------|--------------|-------------------------------|-------------|-------------|-----------|------------------|--|-----|--|
| | | | T-N | | T-P | | BOD ₅ | | COD | | T-N | | T-P | | BOD ₅ | | COD | |
| | | | | | | | | | | | | | | | | | | |
| Crop/Pasture | 555 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 162 | 24 | 265 | 795 | 0.76 | 0.11 | 1.25 | 4 | | | | |
| Welland | 25 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 11 | 1 | 33 | 98 | 0.05 | 0.01 | 0.15 | 0 | | | | |
| Low density Residential | 165 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 93 | 12 | 262 | 497 | 0.44 | 0.06 | 1.23 | 2 | | | | |
| Industrial | 120 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 211 | 37 | 1,133 | 2,153 | 1.00 | 0.17 | 5.34 | 10 | | | | |
| Total | 865 | | | | | | 478 | 74 | 1,692 | 3,543 | 2.25 | 0.35 | 7.98 | 17 | | | | |

(Rainy Season)

| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Pollution Load (kg/rainy season) | | | | Daily Pollution Load (kg/day) | | | | | | | |
|-------------------------|------------|--------|-------------------------------|------|-------|-----|----------------------------------|------------|--------------|---------------|-------------------------------|-------------|-------------|-----------|------------------|--|-----|--|
| | | | T-N | | T-P | | BOD ₅ | | COD | | T-N | | T-P | | BOD ₅ | | COD | |
| | | | | | | | | | | | | | | | | | | |
| Crop/Pasture | 555 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 647 | 96 | 1,060 | 3,181 | 4.23 | 0.63 | 6.9 | 21 | | | | |
| Welland | 25 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 45 | 5 | 131 | 393 | 0.29 | 0.03 | 0.9 | 3 | | | | |
| Low density Residential | 165 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 374 | 48 | 1,046 | 1,988 | 2.44 | 0.31 | 6.8 | 13 | | | | |
| Industrial | 120 | 0.6 | 14.67 | 2.54 | 78.68 | 149 | 845 | 146 | 4,532 | 8,610 | 5.52 | 0.96 | 29.6 | 56 | | | | |
| Total | 865 | | | | | | 1,911 | 296 | 6,770 | 14,173 | 12.49 | 1.93 | 44.2 | 93 | | | | |

*R: Reduction Parameter

- Watershed of Pueblo Viejo Lagoon (C/7/1): the pollution loads in dry and rainy seasons in 2010 are shown in Table B.68.

Table B.68 Non-point Pollution Loads from Watershed of Pueblo Viejo Lagoon in 2010 (Dry Season)

| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Pollution Load (kg/dry season) | | | | Daily Pollution Load (kg/day) | | | | | | | |
|-------------------------|---------------|--------|-------------------------------|------|------|----|--------------------------------|--------------|---------------|---------------|-------------------------------|--------------|------------|------------|------------------|--|-----|--|
| | | | T-N | | T-P | | BOD ₅ | | COD | | T-N | | T-P | | BOD ₅ | | COD | |
| | | | | | | | | | | | | | | | | | | |
| Crop/Pasture | 94,044 | 0.1 | 7.29 | 1.08 | 11.9 | 36 | 13,705 | 2,035 | 22,462 | 67,385 | 64.65 | 9.60 | 106 | 318 | | | | |
| Welland | 4,160 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 1,858 | 221 | 5,454 | 16,362 | 8.76 | 1.04 | 26 | 77 | | | | |
| Low density Residential | 366 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 207 | 27 | 580 | 1,103 | 0.98 | 0.13 | 2.74 | 5.20 | | | | |
| Total | 98,570 | | | | | | 15,770 | 2,283 | 28,496 | 84,849 | 74.39 | 10.77 | 134 | 400 | | | | |

(Rainy Season)

| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Pollution Load (kg/rainy season) | | | | Daily Pollution Load (kg/day) | | | | | | | |
|-------------------------|---------------|--------|-------------------------------|------|------|----|----------------------------------|--------------|----------------|----------------|-------------------------------|-----------|------------|--------------|------------------|--|-----|--|
| | | | T-N | | T-P | | BOD ₅ | | COD | | T-N | | T-P | | BOD ₅ | | COD | |
| | | | | | | | | | | | | | | | | | | |
| Crop/Pasture | 94,044 | 0.1 | 7.29 | 1.08 | 11.9 | 36 | 54,820 | 8,140 | 89,846 | 269,538 | 358 | 53 | 587 | 1,762 | | | | |
| Welland | 4,160 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 7,430 | 884 | 21,816 | 65,449 | 49 | 5.78 | 143 | 428 | | | | |
| Low density Residential | 366 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 829 | 107 | 2,321 | 4,410 | 5 | 0.70 | 15 | 29 | | | | |
| Total | 98,570 | | | | | | 63,080 | 9,130 | 113,984 | 339,398 | 412 | 60 | 745 | 2,218 | | | | |

*R: Reduction Parameter

- Chijol Channel (C/9): the pollution loads in dry and rainy seasons in 2010 are shown in Table B.69.

Table B.69 Non-point Pollution Loads from Watershed of Chijol Channel in 2010
(Dry Season)

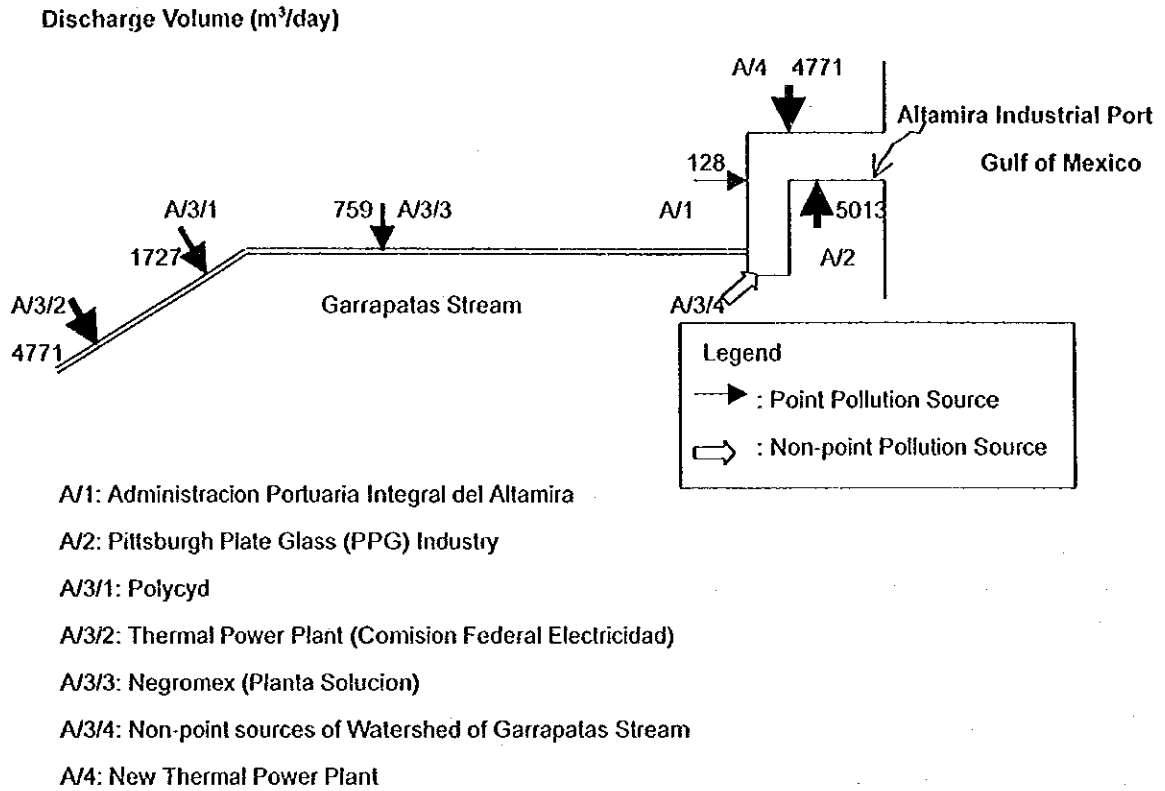
| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Unit | Pollution Load (kg/dry season) | | | | Daily Pollution Load (kg/day) | | | |
|-------------------------|--------------|--------|----------------------------------|------|------------------|-----|------------|--------------------------------|--------------|------------------|-------------|-------------------------------|-------------|------------------|-----|
| | | | T-N | T-P | BOD ₅ | COD | | T-N | T-P | BOD ₅ | COD | T-N | T-P | BOD ₅ | COD |
| Crop/Pasture | 2,114 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 616 | 91 | 1,010 | 3,029 | 2.91 | 0.43 | 4.76 | 14 | |
| Wetland | 370 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 165 | 20 | 485 | 1,455 | 0.78 | 0.09 | 2.29 | 7 | |
| Lagoon | 60 | 0.6 | 6.75 | 0.57 | 8.8 | 26 | 49 | 4 | 63 | 189 | 0.23 | 0.02 | 0.30 | 1 | |
| Low density Residential | 106 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 60 | 8 | 168 | 319 | 0.28 | 0.04 | 0.79 | 2 | |
| Total | 2,650 | | | | | | 890 | 123 | 1,726 | 4,993 | 4.20 | 0.58 | 8.14 | 24 | |

(Rainy Season)

| Type | Area Ha | (1-R*) | Pollution Load (kg/(ha*year)) | | | | Unit | Pollution Load (kg/rainy season) | | | | Daily Pollution Load (kg/day) | | | |
|-------------------------|--------------|--------|----------------------------------|------|------------------|-----|--------------|----------------------------------|--------------|------------------|--------------|-------------------------------|--------------|------------------|-----|
| | | | T-N | T-P | BOD ₅ | COD | | T-N | T-P | BOD ₅ | COD | T-N | T-P | BOD ₅ | COD |
| Crop/Pasture | 2,114 | 0.2 | 7.29 | 1.08 | 11.9 | 36 | 2,465 | 366 | 4,039 | 12,118 | 16.11 | 2.39 | 26.40 | 79 | |
| Wetland | 370 | 0.6 | 3.72 | 0.44 | 10.9 | 33 | 661 | 79 | 1,940 | 5,821 | 4.32 | 0.51 | 12.68 | 38 | |
| Lagoon | 60 | 0.6 | 6.75 | 0.57 | 8.8 | 26 | 194 | 16 | 252 | 757 | 1.27 | 0.11 | 1.65 | 5 | |
| Low density Residential | 106 | 0.6 | 4.72 | 0.61 | 13.2 | 25 | 240 | 31 | 672 | 1,277 | 1.57 | 0.20 | 4.39 | 8 | |
| Total | 2,650 | | | | | | 3,560 | 492 | 6,904 | 19,973 | 23.27 | 3.21 | 45.13 | 131 | |

*R: Reduction Parameter

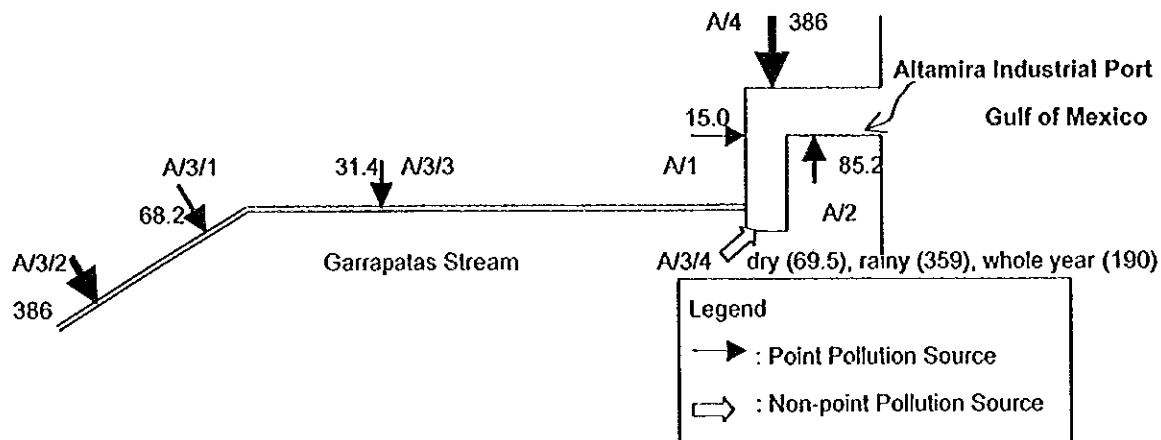
(3) Total Amount of Pollution Load
 a) Altamira Industrial Port (A)



| Pollution Source | Type | Daily Discharge Volume (m ³ /day) | Ratio % |
|------------------|-------|--|---------|
| A/1 | Point | 128 | 0.7 |
| A/2 | Point | 5013 | 29.2 |
| A/3/1 | Point | 1727 | 10.1 |
| A/3/2 | Point | 4771 | 27.8 |
| A/3/3 | Point | 759 | 4.4 |
| A/4 | Point | 4771 | 27.8 |
| Total | | 17169 | 100.0 |

Figure B.11 Daily Discharge Volume into Altamira Industrial Port in 2010

COD (kg/day)



A/1: Administracion Portuaria Integral del Altamira

A/2: Pittsburgh Plate Glass (PPG) Industry

A/3/1: Polycyd

A/3/2: Thermal Power Plant (Comision Federal Electricidad)

A/3/3: Negromex (Planta Solucion)

A/3/4: Non-point sources of Watershed of Garrapatas Stream

A/4: New Thermal Power Plant

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|---------|
| A/1 | Point | 15.1 | 1.4 |
| A/2 | Point | 85.2 | 8.2 |
| A/3/1 | Point | 68.2 | 6.5 |
| A/3/2 | Point | 386.0 | 37.1 |
| A/3/3 | Point | 31.4 | 3.0 |
| A/3/4 | Non-point | 69.5 | 6.7 |
| A/4 | Point | 386.0 | 37.1 |
| Total | | 1041.4 | 100.0 |

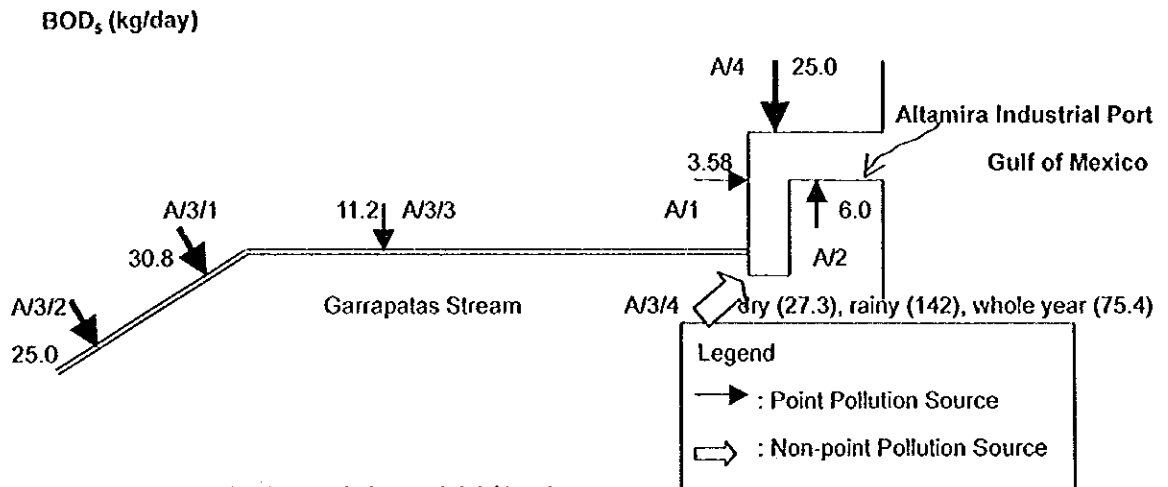
(Rainy Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|-----------|
| A/1 | Point | 15.1 | 1.1 |
| A/2 | Point | 85.2 | 6.4 |
| A/3/1 | Point | 68.2 | 5.1 |
| A/3/2 | Point | 386.0 | 29.0 |
| A/3/3 | Point | 31.4 | 2.4 |
| A/3/4 | Non-point | 359.0 | 27.0 |
| A/4 | | 386.0 | 29.0 |
| Total | | 1330.9 | 100.0 |

(Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|---------|
| A/1 | Point | 15.1 | 1.3 |
| A/2 | Point | 85.2 | 7.3 |
| A/3/1 | Point | 68.2 | 5.9 |
| A/3/2 | Point | 386.0 | 33.2 |
| A/3/3 | Point | 31.4 | 2.7 |
| A/3/4 | Non-point | 190.0 | 16.4 |
| A/4 | Point | 386.0 | 33.2 |
| Total | | 1161.9 | 100.0 |

Figure B.12 Daily Pollution Load of COD into Altamira Industrial Port in 2010



A/1: Administracion Portuaria Integral del Altamira

A/2: Pittsburgh Plate Glass (PPG) Industry

A/3/1: Polycyd

A/3/2: Thermal Power Plant (Comision Federal Electricidad)

A/3/3: Negromex (Planta Solucion)

A/3/4: Non-point sources of Watershed of Garrapatas Stream

A/4: New Thermal Power Plant

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | 3.58 | 2.8 |
| A/2 | Point | 6 | 4.7 |
| A/3/1 | Point | 30.8 | 23.9 |
| A/3/2 | Point | 25.0 | 19.4 |
| A/3/3 | Point | 11.2 | 8.7 |
| A/3/4 | Non-point | 27.3 | 21.2 |
| A/4 | Point | 25 | 19.4 |
| Total | | 128.88 | 100.0 |

(Rainy Season)

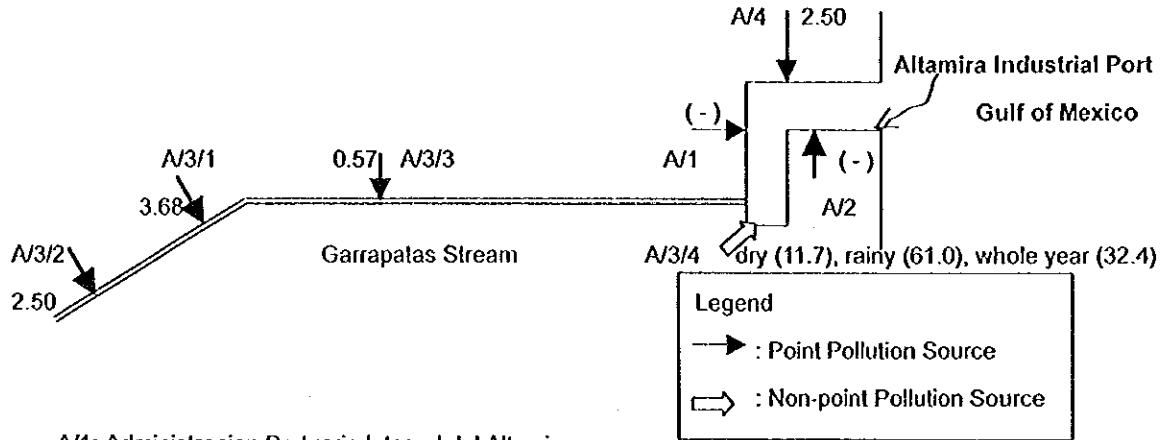
| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | 3.58 | 1.5 |
| A/2 | Point | 6 | 2.5 |
| A/3/1 | Point | 30.8 | 12.6 |
| A/3/2 | Point | 25.0 | 10.3 |
| A/3/3 | Point | 11.2 | 4.6 |
| A/3/4 | Non-point | 142 | 58.3 |
| A/4 | Point | 25 | 10.3 |
| Total | | 243.58 | 100.0 |

(Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | 3.6 | 2.0 |
| A/2 | Point | 6.0 | 3.4 |
| A/3/1 | Point | 30.8 | 17.4 |
| A/3/2 | Point | 25.0 | 14.1 |
| A/3/3 | Point | 11.2 | 6.3 |
| A/3/4 | Non-point | 75.4 | 42.6 |
| A/4 | Point | 25.0 | 14.1 |
| Total | | 177.0 | 100.0 |

Figure B.13 Daily Pollution Load of BOD₅ into Altamira Industrial Port in 2010

Total Nitrogen (kg/day)



- A/1: Administracion Portuaria Integral del Altamira
- A/2: Pittsburgh Plate Glass (PPG) Industry
- A/3/1: Polycyd
- A/3/2: Thermal Power Plant (Comision Federal Electricidad)
- A/3/3: Negromex (Planta Solucion)
- A/3/4: Non-point sources of Watershed of Garrapatas Stream
- A/4: New Thermal Power Plant

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|---------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 3.68 | 17.6 |
| A/3/2 | Point | 2.50 | 11.9 |
| A/3/3 | Point | 0.57 | 2.7 |
| A/3/4 | Non-point | 11.7 | 55.8 |
| A/4 | Point | 2.50 | 11.9 |
| Total | | 21.0 | 100.0 |

(Rainy Season)

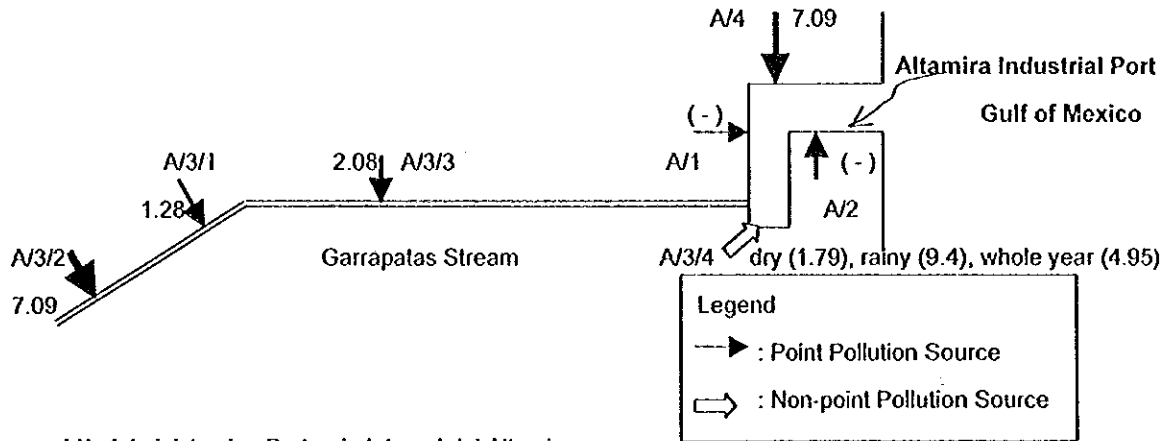
| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|---------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 3.68 | 5.2 |
| A/3/2 | Point | 2.50 | 3.6 |
| A/3/3 | Point | 0.57 | 0.8 |
| A/3/4 | Non-point | 61.0 | 86.8 |
| A/4 | Point | 2.50 | 3.6 |
| Total | | 70.3 | 100.0 |

(Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|---------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 3.68 | 8.8 |
| A/3/2 | Point | 2.50 | 6.0 |
| A/3/3 | Point | 0.57 | 1.4 |
| A/3/4 | Non-point | 32.4 | 77.8 |
| A/4 | Point | 2.50 | 6.0 |
| Total | | 41.7 | 100.0 |

Figure B.14 Daily Pollution Load of Total Nitrogen into Altamira Industrial Port in 2010

Total Phosphorus (kg/day)



A/1: Administracion Portuaria Integral del Altamira

A/2: Pittsburgh Plate Glass (PPG) Industry

A/3/1: Polycyd

A/3/2: Thermal Power Plant (Comision Federal Electricidad)

A/3/3: Negromex (Planta Solucion)

A/3/4: Non-point sources of Watershed of Garrapatas Stream

A/4: New Thermal Power Plant

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 1.28 | 6.6 |
| A/3/2 | Point | 7.09 | 36.7 |
| A/3/3 | Point | 2.08 | 10.8 |
| A/3/4 | Non-point | 1.79 | 9.3 |
| A/4 | Point | 7.09 | 36.7 |
| Total | | 19.33 | 100.0 |

(Rainy Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 1.28 | 4.8 |
| A/3/2 | Point | 7.09 | 26.3 |
| A/3/3 | Point | 2.08 | 7.7 |
| A/3/4 | Non-point | 9.4 | 34.9 |
| A/4 | Point | 7.09 | 26.3 |
| Total | | 26.94 | 100.0 |

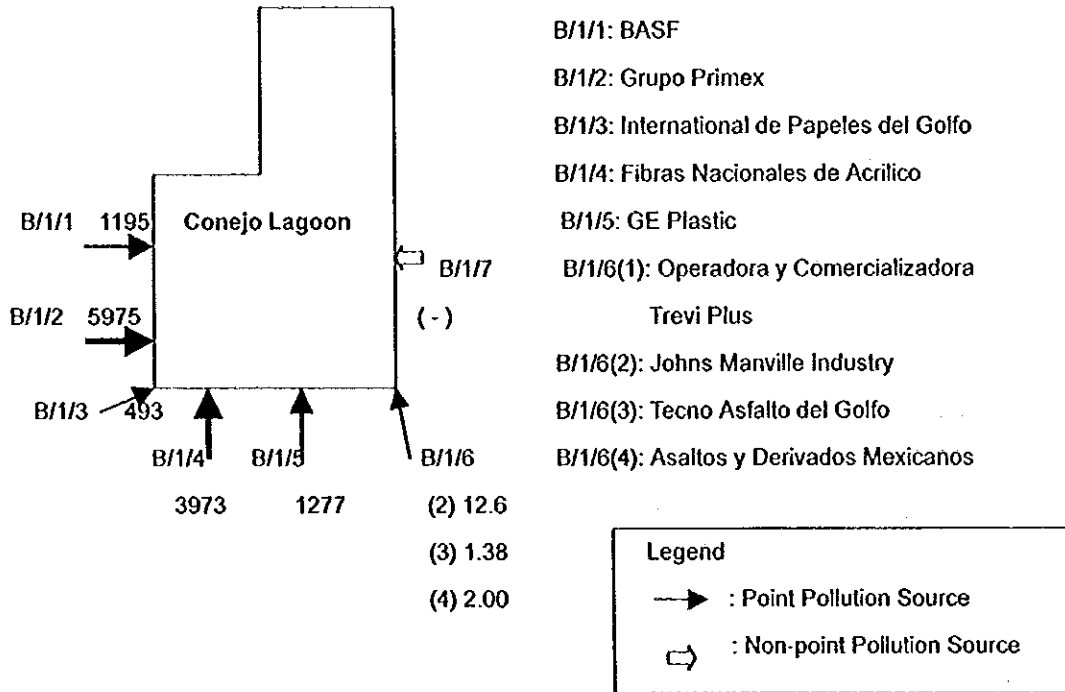
(Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|--------------|
| A/1 | Point | - | - |
| A/2 | Point | - | - |
| A/3/1 | Point | 1.28 | 5.7 |
| A/3/2 | Point | 7.09 | 31.5 |
| A/3/3 | Point | 2.08 | 9.2 |
| A/3/4 | Non-point | 4.95 | 22.0 |
| A/4 | Point | 7.09 | 31.5 |
| Total | | 22.49 | 100.0 |

Figure B.15 Daily Pollution Load of Total Phosphorus into Altamira Industrial Port in 2010

b) Conejo Lagoon

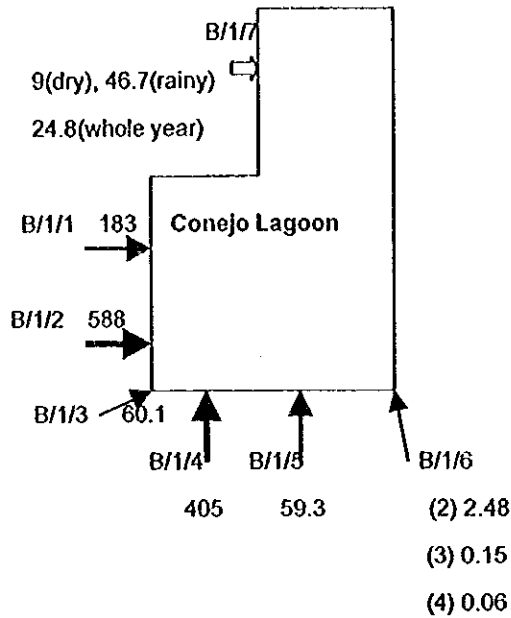
Discharge Volume (m³/day)



| Pollution Source | Type | Daily Discharge Volume (m ³ /day) | Ratio (%) |
|------------------|-----------|--|--------------|
| B/1/1 | Point | 1195 | 9.2 |
| B/1/2 | Point | 5975 | 46.2 |
| B/1/3 | Point | 493 | 3.8 |
| B/1/4 | Point | 3973 | 30.7 |
| B/1/5 | Point | 1277 | 9.9 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 12.6 | 0.1 |
| B/1/6(3) | Point | 1.4 | 0.0 |
| B/1/6(4) | Point | 2.0 | 0.0 |
| B/1/7 | Non-point | - | - |
| Total | | 12929.0 | 100.0 |

Figure B.16 Daily Discharge Volume into Conejo Lagoon in 2010

COD (kg/day)



- B/1/1: BASF
- B/1/2: Grupo Primex
- B/1/3: Internacional de Papeles del Golfo
- B/1/4: Fibras Nacionales de Acrilico
- B/1/5: GE Plastic
- B/1/6(1): Operadora y Comercializadora Trevi Plus
- B/1/6(2): Johns Manville Industry
- B/1/6(3): Tecno Asfalto del Golfo
- B/1/6(4): Asaltos y Derivados Mexicanos

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 183 | 14.0 |
| B/1/2 | Point | 588 | 45.0 |
| B/1/3 | Point | 60.1 | 4.6 |
| B/1/4 | Point | 405 | 31.0 |
| B/1/5 | Point | 59.3 | 4.5 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 2.48 | 0.2 |
| B/1/6(3) | Point | 0.15 | 0.0 |
| B/1/6(4) | Point | 0.06 | 0.0 |
| B/1/7 | Non-point | 9.0 | 0.7 |
| Total | | 1306.8 | 100.0 |

(Rainy Season)

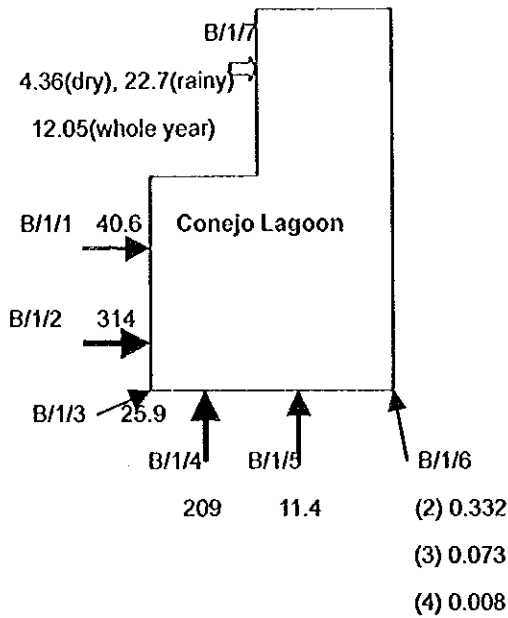
| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 183 | 13.6 |
| B/1/2 | Point | 588 | 43.7 |
| B/1/3 | Point | 60.1 | 4.5 |
| B/1/4 | Point | 405 | 30.1 |
| B/1/5 | Point | 59.3 | 4.4 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 2.48 | 0.2 |
| B/1/6(3) | Point | 0.15 | 0.0 |
| B/1/6(4) | Point | 0.06 | 0.0 |
| B/1/7 | Non-point | 46.7 | 3.5 |
| Total | | 1344.5 | 100.0 |

(Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 183 | 13.8 |
| B/1/2 | Point | 588 | 44.5 |
| B/1/3 | Point | 60.1 | 4.5 |
| B/1/4 | Point | 405 | 30.6 |
| B/1/5 | Point | 59.3 | 4.5 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 2.48 | 0.2 |
| B/1/6(3) | Point | 0.15 | 0.0 |
| B/1/6(4) | Point | 0.06 | 0.0 |
| B/1/7 | Non-point | 24.8 | 1.9 |
| Total | | 1322.6 | 100.0 |

Figure B.17 Daily Pollution Load of COD into Conejo Lagoon in 2010

BOD₅ (kg/day)



(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 40.6 | 6.7 |
| B/1/2 | Point | 314 | 51.8 |
| B/1/3 | Point | 25.9 | 4.3 |
| B/1/4 | Point | 209 | 34.5 |
| B/1/5 | Point | 11.4 | 1.9 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 0.332 | 0.1 |
| B/1/6(3) | Point | 0.073 | 0.0 |
| B/1/6(4) | Point | 0.008 | 0.0 |
| B/1/7 | Non-point | 4.36 | 0.7 |
| Total | | 605.67 | 100.0 |

(Rainy Season)

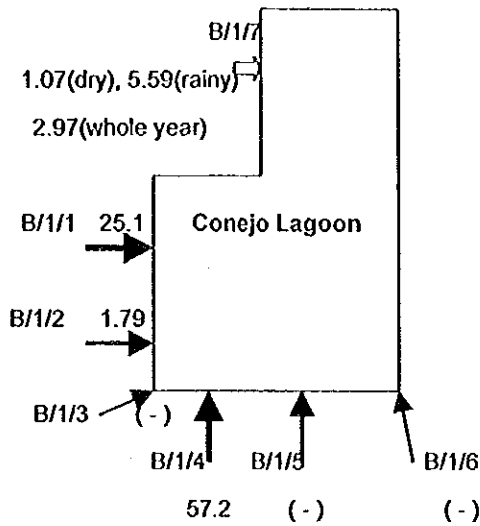
| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 40.6 | 6.5 |
| B/1/2 | Point | 314 | 50.3 |
| B/1/3 | Point | 25.9 | 4.2 |
| B/1/4 | Point | 209 | 33.5 |
| B/1/5 | Point | 11.4 | 1.8 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 0.332 | 0.1 |
| B/1/6(3) | Point | 0.073 | 0.0 |
| B/1/6(4) | Point | 0.008 | 0.0 |
| B/1/7 | Non-point | 22.71 | 3.6 |
| Total | | 624.02 | 100.0 |

(Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 40.6 | 6.6 |
| B/1/2 | Point | 314 | 51.2 |
| B/1/3 | Point | 25.9 | 4.2 |
| B/1/4 | Point | 209 | 34.1 |
| B/1/5 | Point | 11.4 | 1.9 |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | 0.332 | 0.1 |
| B/1/6(3) | Point | 0.073 | 0.0 |
| B/1/6(4) | Point | 0.008 | 0.0 |
| B/1/7 | Non-point | 12.05 | 2.0 |
| Total | | 613.36 | 100.0 |

Figure B.18 Daily Pollution Load of BOD₅ into Conejo Lagoon in 2010

Total Nitrogen (kg/day)



- B/1/1: BASF
- B/1/2: Grupo Primex
- B/1/3: Internacional de Papeles del Golfo
- B/1/4: Fibras Nacionales de Acrilico
- B/1/5: GE Plastic
- B/1/6(1): Operadora y Comercializadora Trevi Plus
- B/1/6(2): Johns Manville Industry
- B/1/6(3): Tecno Asfalto del Golfo
- B/1/6(4): Asaltos y Derivados Mexicanos

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 25.1 | 29.5 |
| B/1/2 | Point | 1.79 | 2.1 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 57.2 | 67.2 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 1.07 | 1.3 |
| Total | | 85.16 | 100.0 |

(Rainy Season)

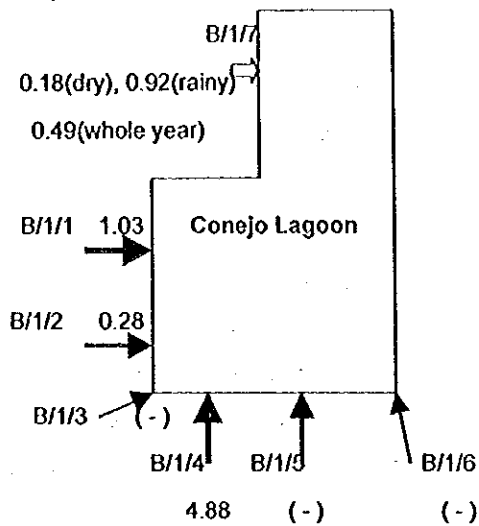
| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 25.1 | 28.0 |
| B/1/2 | Point | 1.79 | 2.0 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 57.2 | 63.8 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 5.59 | 6.2 |
| Total | | 89.68 | 100.0 |

(Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio % |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 25.10 | 28.8 |
| B/1/2 | Point | 1.79 | 2.1 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 57.20 | 65.7 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 2.97 | 3.4 |
| Total | | 87.06 | 100.0 |

Figure B.19 Daily Pollution Load of Total Nitrogen into Conejo Lagoon in 2010

Total Phosphorus (kg/day)



- B/1/1: BASF
- B/1/2: Grupo Primex
- B/1/3: Internacional de Papeles del Golfo
- B/1/4: Fibras Nacionales de Acrilico
- B/1/5: GE Plastic
- B/1/6(1): Operadora y Comercializadora Trevi Plus
- B/1/6(2): Johns Manville Industry
- B/1/6(3): Tecno Asfalto del Golfo
- B/1/6(4): Asaltos y Derivados Mexicanos

(Dry Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 1.03 | 16.2 |
| B/1/2 | Point | 0.28 | 4.4 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 4.88 | 76.6 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 0.18 | 2.8 |
| Total | | 6.37 | 100.0 |

(Rainy Season)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 1.03 | 14.5 |
| B/1/2 | Point | 0.28 | 3.9 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 4.88 | 68.6 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 0.92 | 12.9 |
| Total | | 7.11 | 100.0 |

(Whole Year)

| Pollution Source | Type | Daily Pollution Load (kg/day) | Ratio (%) |
|------------------|-----------|-------------------------------|--------------|
| B/1/1 | Point | 1.03 | 15.4 |
| B/1/2 | Point | 0.28 | 4.2 |
| B/1/3 | Point | - | - |
| B/1/4 | Point | 4.88 | 73.1 |
| B/1/5 | Point | - | - |
| B/1/6(1) | Point | - | - |
| B/1/6(2) | Point | - | - |
| B/1/6(3) | Point | - | - |
| B/1/6(4) | Point | - | - |
| B/1/7 | Non-point | 0.49 | 7.3 |
| Total | | 6.68 | 100.0 |

Figure B.20 Daily Pollution Load of Total Phosphorus into Conejo Lagoon in 2010

c) Panuco River

Table B.70 Flow Rate (Daily Discharge Volume) and Daily Pollution Load from Point and Non-Point Pollution Sources to Panuco River in Dry Season in 2010

Point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | | Flow rate (m ³ /s) | Daily Discharge Volume (1000m ³ /day) |
|-------------------------------|--|---------------------------|--------------|-------------------------|---------------------------|-------------------------------|--|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total Phosphorus (kg/day) | | |
| C/1 | Panuco River (Las Adjuntas, El Alamo) | 29,000 | 332,000 | 12,600 | 1,440 | 185 | 16,000 |
| C/2 | Tamesi River System | 2,285 | 18,315 | 967 | 89 | 13.9 | 1,201 |
| C/3/1 | Sea-food Process Industries Area | 110 | 202 | 30.2 | 5.4 | 0.0029 | 0.25 |
| C/4/1 | Altavista Water Supply Plant* | 720 | 1,040 | | | 0.151 | 13.0 |
| C/4/2-5 C/5/1-4 C/8/1-2 | Municipal Wastewater of Tampico and Madero | 21,400 | 33,000 | 5,730 | 704 | 1.10 | 95.0 |
| C/10 | Refineria Madero (PEMEX) | 235 | 2,760 | 112 | 2.90 | 0.116 | 10.0 |
| | Total | 53,750 | 387,317 | 19,439 | 2,241 | 200 | 17,319 |

Non-point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | |
|-------------------------|---|---------------------------|--------------|-------------------------|---------------------------|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) |
| C/3 | Morelos | 1.18 | 2.24 | 0.42 | 0.05 |
| C/4/6 | Tampico Solid Waste Landfill Site | 2.42 | 4.59 | 0.5 | 0.08 |
| C/4/7 | Southwest Part of Tampico | 4 | 7.61 | 1.43 | 0.18 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | 36.5 | 70 | 9.13 | 1.33 |
| C/6 | Northern Part of Pueblo Viejo | 7.98 | 17 | 2.25 | 0.35 |
| | Total | 52.08 | 101.44 | 13.73 | 1.99 |

* Daily discharge volume and pollution loads of Altavista water supply plant is supposed to be in proportion to the discharge volume of Municipal Wastewater from Tampico and Madero.

Table B.71 Ratio of Daily Pollution Loads from each Pollution Source (Including Rivers) In Total Daily Pollution Load from Pollution Sources into Panuco River in Dry Season in 2010

| Pollution Source Number | Water System | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|-------------------------------|---|-----------|----------------------|---------|--------------------|----------------------|
| C/1 | Panuco River (Las Adjuntas, El Alamo) | River | 53.90 | 85.70 | 64.77 | 64.19 |
| C/2 | Tamesi River System | River | 4.25 | 4.73 | 4.97 | 3.97 |
| C/3/1 | Sea-food Process Industries Area | Point | 0.20 | 0.05 | 0.16 | 0.24 |
| C/4/1 | Altavista Water Supply Plant | Point | 1.34 | 0.27 | - | - |
| C/4/2-5 C/5/1-4 C/7/1-2 | Municipal Wastewater of Tampico and Madero | Point | 39.78 | 8.52 | 29.46 | 31.38 |
| C/10 | Refineria Madero (PEMEX) | Point | 0.44 | 0.71 | 0.58 | 0.13 |
| C/3 | Morelos | Non-point | 0.00 | 0.00 | 0.00 | 0.00 |
| C/4/6 | Tampico Solid Waste Landfill Site | Non-point | 0.00 | 0.00 | 0.00 | 0.00 |
| C/4/7 | Southwest Part of Tampico | Non-point | 0.01 | 0.00 | 0.01 | 0.01 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | Non-point | 0.07 | 0.02 | 0.05 | 0.06 |
| C/6 | Northern Part of Pueblo Viejo | Non-point | 0.01 | 0.00 | 0.01 | 0.02 |
| Total | | | 100.00 | 100.00 | 100.00 | 100.00 |

Table B.72 Contribution of Rivers, Point Pollution Sources, and Non-point Pollution Sources on Pollution Loading into Panuco River in Dry Season in 2010

| Season | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|--------|-----------------------------|----------------------|---------|--------------------|----------------------|
| Dry | Rivers | 58.15 | 90.42 | 69.74 | 68.16 |
| | Point Pollution Sources | 41.75 | 9.55 | 30.19 | 31.75 |
| | Non-point Pollution Sources | 0.10 | 0.03 | 0.07 | 0.09 |

Table B.73 Flow Rate (Daily Discharge Volume) and Daily Pollution Load from Point And Non-point Pollution Sources to Panuco River in Rainy Season

Point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | | Flow rate (m ³ /s) | Daily Discharge Volume (1000m ³ /day) |
|-------------------------------|---|---------------------------|--------------|-------------------------|---------------------------|-------------------------------|--|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) | | |
| C/1 | Panuco River (Las Adjuntas, El Alamo) | 68,000 | 1,646,000 | 17,490 | 9,930 | 771 | 66,600 |
| C/2 | Tamesi River System | 4,264 | 59,331 | 2,250 | 265 | 42 | 3,630 |
| C/3/1 | Sea-food Process Industries Area | 110 | 202 | 30.2 | 5.4 | 0.0029 | 0.25 |
| C/4/1 | Altavista Water Supply Plant* | 720 | 1,040 | - | - | 0.151 | 13.0 |
| C/4/2-5 C/5/1-4 C/8/1-2 | Municipal Waste-Water of Tampico And Madero | 21,400 | 33,000 | 5,730 | 704 | 1.10 | 95.0 |
| C/10 | Refinería Madero (PEMEX) | 235 | 2,762 | 112 | 2.90 | 0.123 | 10.7 |
| Total | | 94,729 | 1,742,335 | 25,612 | 10,907 | 814 | 70,349 |

Non-point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Discharge Volume | | | |
|-------------------------|---|---------------------------|--------------|-------------------------|---------------------------|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) |
| C/3 | Morelos | 6.1 | 11.7 | 2.19 | 0.28 |
| C/4/6 | Tampico Solid Waste Landfill Site | 12.6 | 23.9 | 2.62 | 0.41 |
| C/4/7 | Southwest Part of Tampico | 20.9 | 40 | 7.5 | 0.96 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | 190 | 364 | 47.6 | 6.92 |
| C/6 | Northern Part of Pueblo Viejo | 44.2 | 93 | 12.49 | 1.93 |
| Total | | 273.8 | 532.6 | 72.4 | 10.5 |

* Daily discharge volume and pollution loads from Altavista water supply plant is supposed to be in proportion to the discharge volume of Municipal Wastewater from Tampico and Madero.

Table B.74 Ratio of Daily Pollution Loads from each Pollution Source (Including Rivers) in Total Daily Pollution Load from Pollution Sources into Panuco River in Rainy Season in 2010

| Pollution Source Number | Water System | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|-------------------------------|---|-----------|----------------------|---------|--------------------|----------------------|
| C/1 | Panuco River (Las Adjuntas, El Alamo) | River | 71.58 | 94.44 | 68.10 | 90.95 |
| C/2 | Tamesi River System | River | 4.49 | 3.40 | 8.76 | 2.43 |
| C/3/1 | Sea-food Process Industries Area | Point | 0.12 | 0.01 | 0.12 | 0.05 |
| C/4/1 | Altavista Water Supply Plant | Point | 0.76 | 0.06 | | |
| C/4/2-5 C/5/1-4 C/8/1-2 | Municipal Waste-Water of Tampico And Madero | Point | 22.53 | 1.89 | 22.31 | 6.45 |
| C/10 | Refineria Madero (PEMEX) | Point | 0.25 | 0.16 | 0.44 | 0.03 |
| C/3 | Morelos | Non-point | 0.01 | 0.00 | 0.01 | 0.00 |
| C/4/6 | Tampico Solid Waste Landfill Site | Non-point | 0.01 | 0.00 | 0.01 | 0.00 |
| C/4/7 | Southwest Part of Tampico | Non-point | 0.02 | 0.00 | 0.03 | 0.01 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | Non-point | 0.20 | 0.02 | 0.19 | 0.06 |
| C/6 | Northern Part of Pueblo Viejo | Non-point | 0.05 | 0.01 | 0.05 | 0.02 |
| | Total | | 100 | 100 | 100 | 100 |

Table B.75 Contribution of Rivers, Point Pollution Sources, and Non-point Pollution Sources on Pollution Loading into Panuco River in Rainy Season in 2010

| Season | Type | BOD ₅ (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|--------|-----------------------------|----------------------|---------|--------------------|----------------------|
| Rainy | Rivers | 76.07 | 97.85 | 76.86 | 93.38 |
| | Point Pollution Sources | 23.65 | 2.12 | 22.86 | 6.52 |
| | Non-point Pollution Sources | 0.29 | 0.03 | 0.28 | 0.10 |

Table B.76 Flow Rate (Daily Discharge Volume) and Daily Pollution Load from Point and Non-Point Pollution Sources to Panuco River in Whole Year in 2010

Point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | | Flow rate (m ³ /s) | Daily Discharge Volume (1000m ³ /day) |
|-------------------------------|--|---------------------------|--------------|-------------------------|---------------------------|-------------------------------|--|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) | | |
| C/1 | Panuco River (Las Adjuntas, El Alamo) | 45,300 | 883,000 | 14,600 | 5,000 | 431 | 37,200 |
| C/2 | Tamesi River System | 3,110 | 35,500 | 1,500 | 163 | 25.7 | 2,220 |
| C/3/1 | Sea-food Process Industries Area | 110 | 202 | 30.2 | 5.4 | 0.0029 | 0.25 |
| C/4/1 | Altavista Water Supply Plant | 720 | 1,040 | - | - | 0.151 | 13.0 |
| C/4/2-5 C/5/1-4 C/8/1-2 | Municipal Wastewater of Tampico and Madero | 21,400 | 33,000 | 5,730 | 704 | 1.10 | 95.0 |
| C/10 | Refineria Madero (PEMEX) | 235 | 2,760 | 112 | 2.9 | 0.123 | 10.7 |
| | Total | 70,875 | 955,502 | 21,972 | 5,875 | 458 | 39,539 |

Non-point Pollution Sources

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | |
|-------------------------|---|---------------------------|--------------|-------------------------|---------------------------|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total nitrogen (kg/day) | Total phosphorus (kg/day) |
| C/3 | Morelos | 3.24 | 6.21 | 1.16 | 0.146 |
| C/4/6 | Tampico Solid Waste Landfill Site | 6.69 | 12.7 | 1.39 | 0.218 |
| C/4/7 | Southwest Part of Tampico | 11.1 | 21.2 | 3.97 | 0.507 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | 101 | 193 | 25.3 | 3.67 |
| C/6 | Northern Part of Pueblo Viejo | 23.2 | 48.5 | 6.55 | 1.01 |
| | Total | 145.23 | 281.61 | 38.37 | 5.551 |

* Daily discharge volume and pollution loads from Altavista water supply plant is supposed to be in proportion to the discharge volume of Municipal Wastewater from Tampico and Madero.

Table B.77 Ratio of Daily Pollution Load from each Pollution Source (Including Rivers) in Total Daily Pollution Load from Pollution Sources into Panuco River in Whole Year in 2010

| Pollution Source Number | Water System | Type | BOD5 (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|-------------------------------|---|-----------|----------|---------|--------------------|----------------------|
| C/1 | Panuco River (Las Adjuntas, El Alamo) | River | 63.78 | 92.38 | 66.33 | 85.02 |
| C/2 | Tamesi River System | River | 4.38 | 3.71 | 6.81 | 2.77 |
| C/3/1 | Sea-food Process Industries Area | Point | 0.15 | 0.02 | 0.14 | 0.09 |
| C/4/1 | Altavista Water Supply Plant | Point | 1.01 | 0.11 | - | - |
| C/4/2-5 C/5/1-4 C/7/1-2 | Municipal Wastewater of Tampico and Madero | Point | 30.13 | 3.45 | 26.03 | 11.97 |
| C/10 | Refineria Madero (PEMEX) | Point | 0.33 | 0.29 | 0.51 | 0.05 |
| C/3 | Morelos | Non-point | 0.00 | 0.00 | 0.01 | 0.00 |
| C/4/6 | Tampico Solid Waste Landfill Site | Non-point | 0.01 | 0.00 | 0.01 | 0.00 |
| C/4/7 | Southwest Part of Tampico | Non-point | 0.02 | 0.00 | 0.02 | 0.01 |
| C/5/5 and C/8/3 | Southern Part of Tampico Southern Part of Madero | Non-point | 0.14 | 0.02 | 0.11 | 0.06 |
| C/6 | Northern Part of Pueblo Viejo | Non-point | 0.03 | 0.01 | 0.03 | 0.02 |
| Total | | | 100.00 | 100.00 | 100.00 | 100.00 |

Table B.78 Contribution of Rivers, Point Pollution Sources, and Non-point Pollution Sources on Pollution Loading into Panuco River in Whole Year in 2010

| Season | Type | BOD5 (%) | COD (%) | Total nitrogen (%) | Total phosphorus (%) |
|------------|-----------------------------|----------|---------|--------------------|----------------------|
| Whole Year | Rivers | 68.16 | 96.10 | 73.15 | 87.79 |
| | Point Pollution Sources | 31.63 | 3.87 | 26.68 | 12.11 |
| | Non-point Pollution Sources | 0.20 | 0.03 | 0.17 | 0.09 |

d) Coastal Water of Gulf of Mexico

Table B.79 Daily Discharge Volume and Daily Pollution Loads from Pollution Sources and Rivers to Coastal Area in Dry Season in 2010

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | | Daily Discharge Volume (1000 m3/day) |
|-------------------------|--------------------------|---------------------------|--------------|------------------|------------------|--------------------------------------|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total N (kg/day) | Total P (kg/day) | |
| A | Altamira Industrial Port | 129 | 1,040 | 21.0 | 19.3 | - |
| D | Petrocel | 494 | 1,140 | 6.9 | - | 13.8 |
| E | Novaquim | 30.5 | 57 | 5.8 | - | 0.58 |
| F(1) | Negromex (Emulcion) | 241 | 1,860 | 82.2 | - | 4.59 |
| F(2) | NHUMO | 57.6 | 113 | 3.39 | - | 1.13 |
| G | Dupont | 224 | - | - | - | 10.7 |
| C | Panuco River | 53,800 | 387,000 | 19,400 | 2,240 | 17,300 |

Table B.80 Daily Discharge Volume and Daily Pollution Loads from Pollution Sources and Rivers to Coastal Area in Rainy Season in 2010

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | | Daily Discharge Volume (1000 m3/day) |
|-------------------------|--------------------------|---------------------------|--------------|------------------|------------------|--------------------------------------|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total N (kg/day) | Total P (kg/day) | |
| A | Altamira Industrial Port | 244 | 1,331 | 70.3 | 26.9 | - |
| D | Petrocel | 494 | 1,140 | 6.9 | - | 13.8 |
| E | Novaquim | 30.5 | 57 | 5.8 | - | 0.58 |
| F(1) | Negromex (Emulcion) | 241 | 1,860 | 82.2 | - | 4.59 |
| F(2) | NHUMO | 57.6 | 113 | 3.39 | - | 1.13 |
| G | Dupont | 224 | - | - | - | 10.7 |
| C | Panuco River | 94,700 | 1,740,000 | 25,600 | 10,900 | 70,300 |

Table B.81 Daily Discharge Volume and Daily Pollution Loads from Pollution Sources and Rivers to Coastal Area in Whole Year in 2010

| Pollution Source Number | Pollution Source | Daily Pollution Loads | | | | Daily Discharge Volume (1000 m3/day) |
|-------------------------|--------------------------|---------------------------|--------------|------------------|------------------|--------------------------------------|
| | | BOD ₅ (kg/day) | COD (kg/day) | Total N (kg/day) | Total P (kg/day) | |
| A | Altamira Industrial Port | 177 | 1,162 | 41.7 | 22.5 | - |
| D | Petrocel | 494 | 1,140 | 6.9 | - | 13.8 |
| E | Novaquim | 30.5 | 57 | 5.8 | - | 0.58 |
| F(1) | Negromex (Emulcion) | 241 | 1,860 | 82.2 | - | 4.59 |
| F(2) | NHUMO | 57.6 | 113 | 3.39 | - | 1.13 |
| G | Dupont | 224 | - | - | - | 10.7 |
| C | Panuco River | 71,000 | 955,000 | 22,000 | 5,880 | 39,500 |

Appendix B.2 Estimation of Flow Rate from Freshwater Part to Salt Water Part of Tamesi River

B.2.1 Artificial Dikes in Tamesi River and its Lagoons

The freshwater part of Tamesi River and its Lagoons are separated from the salt water part of Tamesi River and its Lagoons with dikes in order to prevent the freshwater from mixing with the salt water as shown in Figure 2.9 in Data Book Chapter 2. Dikes No.4, No.5, No.6, No.7 and El Bull are used in order to protect the freshwater system from the intrusion of salt water. And Dikes El Bull, Camalote, and Mata de la Monteadá are used in order to store the water as shown in Table B.82.

Table B.82 Dikes of Tamesi River and Freshwater Lagoons

| Dikes | Location | Function |
|-----------------|----------------------------------|--|
| Code No.4 | Tamesi River | Protection for Sea Water's Intrusion |
| Code No.5 | Chairel Lagoon | Protection for Sea Water's Intrusion |
| Code No.6 | Chairel Lagoon | Protection for Sea Water's Intrusion |
| Code No.7 | Western Side of American Channel | Protection for Sea Water's Intrusion |
| El Bull | Tamesi River | Protection for Sea Water's Intrusion and Storage |
| Camalote | Camalote Wetland | Storage |
| Mata la Moteada | Camalote Lagoon | Storage |

Source: Estudio Para La Restauracion Ecologica Del Sistema Lagunario del Rio Tamesi , CNA (1992)

B.2.2 Water Level of Chairel Lagoon and Discharge Volume at Tamesi

Artificial constructions such as dikes changed the discharge volume of Tamesi River from the freshwater part to the estuarine part. Now the discharge volume is neither measured nor calculated. It is necessary to estimate the discharge volume in order to calculate the pollution loads from Tamesi River. In Chairel Lagoon, its water level has been measured. The water level of Chairel Lagoon from Jan 1st 1994 to Dec 31st 1998 and the discharge volume of Tamesi Hydrological Station from Jan 1st 1994 to Dec 31st 1997 are shown in Figure B.21:

B.2.3 Estimation of Discharge Volume from Freshwater Part to Salt Water Part

A pattern of water level variation indicates that the water level is strongly related with the discharge volume at Tamesi Hydrological Station. After a high peak of discharge volume, the water level decreases with the reduction of discharge volume. But a constant water level during several days is observed as shown in Figure B.22.

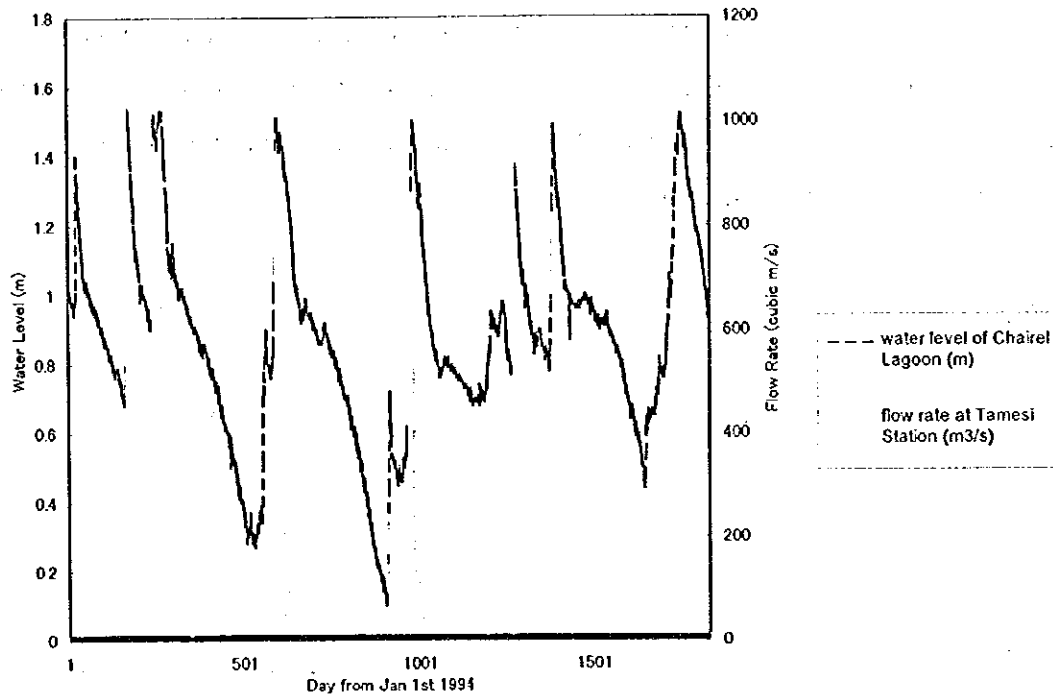


Figure B.21 Water Level of Chairel Lagoon and Flow Rate at Tamesi Station

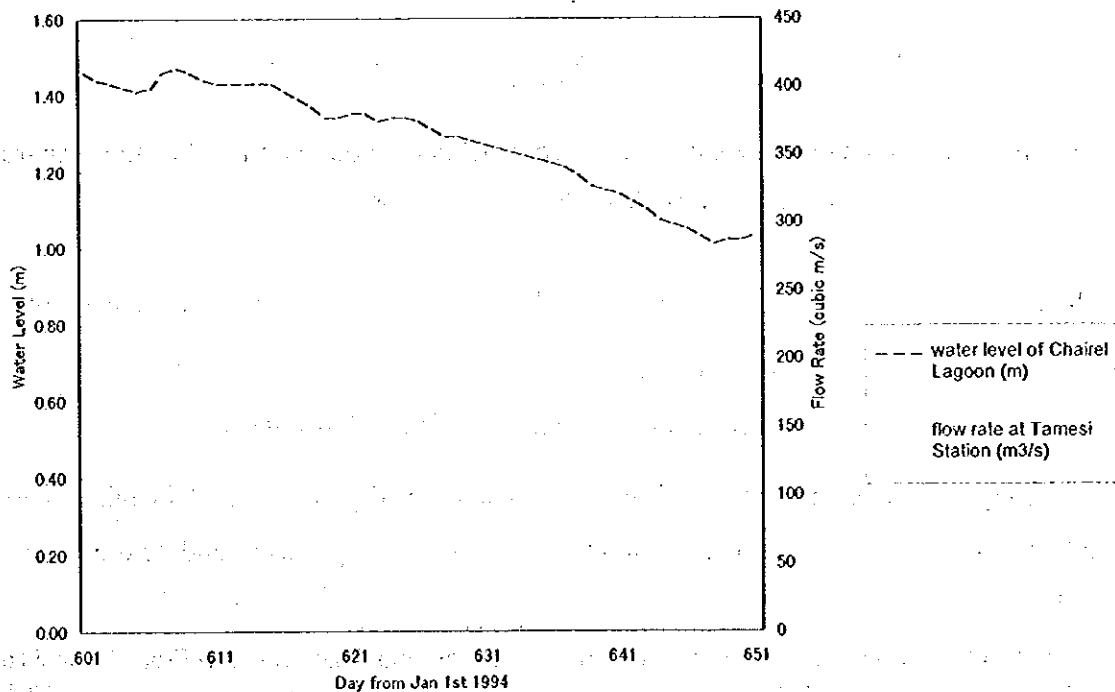


Figure B.22 Water Level of Chairel Lagoon and Flow Rate at Tamesi Station from 601st day to 651st day

The constant water level indicates that the water discharge volume entering into Tamesi River and its freshwater lagoons is equal to that leaving from this system. Therefore discharge volume at Tamesi Hydrological Station during these days, when the water level is constant, is averaged and the obtained value is estimated as a discharge volume from the freshwater part of Tamesi River to the salt water part. A plot of this discharge volume vs. water level of Chairel Lagoon is shown in Figure B.23.

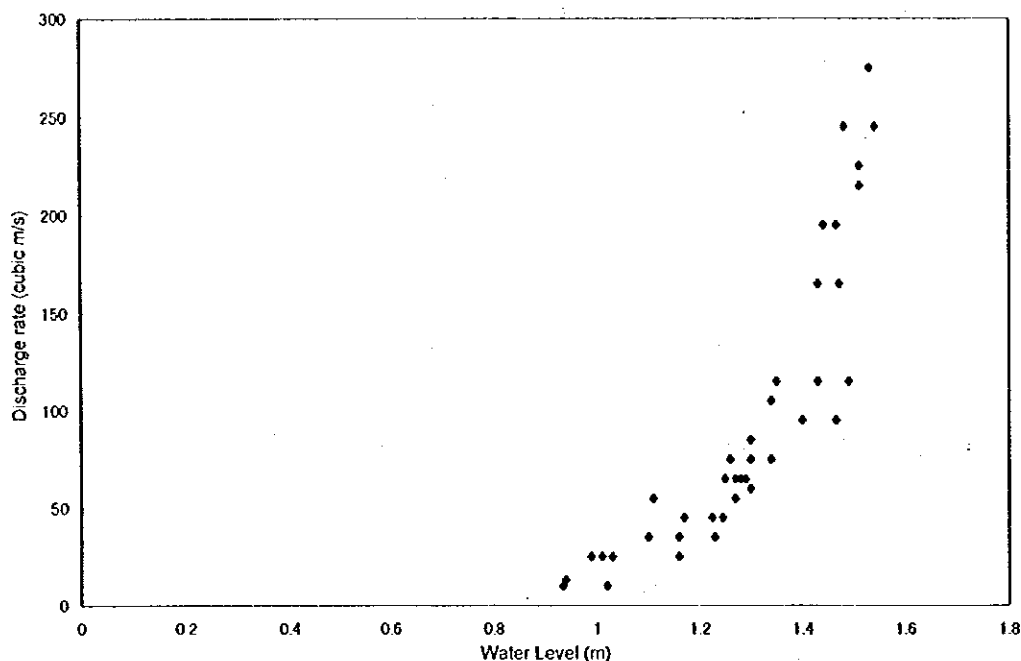


Figure B.23 Relation between Water Level of Chairel Lagoon and Obtained Discharge Volume from Tamesi River to Panuco River

The following relation between discharge volume (V , m^3/s) and water level (h , m) is obtained:

$$V = 259 (h - 0.617)^3 \quad (1)$$

(a correlation coefficient of $V^{1/3}$ and h is 0.937)

Using equation (1), the average discharge volumes in dry season and in rainy season are calculated. The average discharge volume is $13.9 m^3/s$ in dry season and $42.0 m^3/s$ as shown in Table B.83.

Table B.83 Average Discharge Volume in Dry Season and Rainy Season From Tamesi River to Panuco River Unit: m^3/s

| | Jan-94 to Oct-94 | Nov-94 to Oct-95 | Nov-95 to Oct-95 | Nov-96 to Oct-97 | Nov-97 to Oct-98 | Nov-98 to Dec-98 | Average |
|--------------|------------------|------------------|------------------|------------------|------------------|------------------|---------|
| Dry season | 15.1 | 4.5 | 2.7 | 2.4 | 10.3 | 43.9 | 13.9 |
| Rainy season | 69.6 | 40.6 | 29.9 | 29.5 | 40.5 | - | 42.0 |

Appendix B.3 Municipal Wastewater Projection in Tampico Area

In section 2.5.1 (1), population, coverage of drainage system, daily discharge volume per capita, and daily pollution loads per capita in 1999 were estimated for Altamira Municipality, Tampico and Madero Cities, and Pueblo Viejo Municipality. Furthermore, annual growth rate of population, daily discharge volume per capita, and daily pollution loads per capita were estimated. Coverage of drainage system from 1999 to 2010 is also supposed.

In Table B.84, population, coverage of drainage, daily discharge volume per capita, daily BOD₅ load per capita, daily COD load per capita, daily total nitrogen load per capita, daily total phosphorus load per capita, daily discharge volume, daily BOD₅ load, daily COD load, daily total nitrogen load, and daily total phosphorus load for Altamira Municipality from 1999 to 2010 are shown.

Table B.84 Municipal Wastewater Projection for Altamira Municipality

| | Annual Growth Rate (%) | Year | | | | | | | | | | | |
|---|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Population | - | 136,339 | 142,690 | 149,529 | 156,211 | 162,927 | 169,690 | 176,515 | 183,416 | 190,406 | 197,496 | 204,705 | 212,054 |
| Coverage of drainage (%) | - | 75 | 76.5 | 78 | 79.5 | 81 | 82.5 | 84 | 85.5 | 87 | 88 | 89 | 90 |
| Daily discharge volume per capita (l/capita/day) | 3 | 195 | 201 | 207 | 213 | 219 | 226 | 233 | 240 | 247 | 254 | 262 | 270 |
| Daily BOD ₅ load per capita (g/capita/day) | 1.5 | 51 | 51.8 | 52.5 | 53.3 | 54.1 | 54.9 | 55.8 | 56.6 | 57.5 | 58.3 | 59.2 | 60.1 |
| Daily COD load per capita (g/capita/day) | 1.5 | 94 | 95.4 | 96.8 | 98.3 | 99.8 | 101.3 | 102.8 | 104.3 | 105.9 | 107.5 | 109.1 | 110.7 |
| Daily total-N load per capita (g/capita/day) | 1.5 | 8.7 | 8.8 | 9.0 | 9.1 | 9.2 | 9.4 | 9.5 | 9.7 | 9.8 | 9.9 | 10.1 | 10.2 |
| Daily total-P load per capita (g/capita/day) | 1.5 | 1.04 | 1.06 | 1.07 | 1.09 | 1.10 | 1.12 | 1.14 | 1.15 | 1.17 | 1.19 | 1.21 | 1.23 |
| Daily discharge Volume (m ³ /day) | - | 19,940 | 21,955 | 24,128 | 26,462 | 28,964 | 31,647 | 34,524 | 37,610 | 40,920 | 44,219 | 47,745 | 51,515 |
| Daily BOD ₅ load (kg/day) | - | 5,215 | 5,658 | 6,128 | 6,623 | 7,144 | 7,691 | 8,269 | 8,876 | 9,517 | 10,135 | 10,783 | 11,465 |
| Daily COD load (kg/day) | - | 9,612 | 10,429 | 11,295 | 12,207 | 13,166 | 14,176 | 15,240 | 16,360 | 17,541 | 18,679 | 19,875 | 21,132 |
| Daily total-N Load (kg/day) | - | 890 | 965 | 1,045 | 1,130 | 1,219 | 1,312 | 1,411 | 1,514 | 1,623 | 1,729 | 1,839 | 1,956 |
| Daily total-P Load (kg/day) | - | 106 | 115 | 125 | 135 | 146 | 157 | 169 | 181 | 194 | 207 | 220 | 234 |

Those parameters for the South Part of Altamira (near Miramar) are shown in Table B.85.

Table B.85 Municipal Wastewater Projection for the South Part of Altamira Municipality (near Miramar)

| | Annual Growth Rate (%) | Year | | | | | | | | | | | |
|---|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Population | 1.5 | 60,000 | 60,900 | 61,814 | 62,741 | 63,682 | 64,637 | 65,607 | 66,591 | 67,590 | 68,603 | 69,632 | 70,677 |
| Coverage of drainage (%) | - | 80 | 81.5 | 83 | 84.5 | 86 | 87.5 | 89 | 90.5 | 92 | 93 | 94 | 95 |
| Daily discharge volume per capita (l/capita/day) | 3 | 195 | 201 | 207 | 213 | 219 | 226 | 233 | 240 | 247 | 254 | 262 | 270 |
| Daily BOD ₅ load per capita (g/capita/day) | 1.5 | 51 | 51.8 | 52.5 | 53.3 | 54.1 | 54.9 | 55.8 | 56.6 | 57.5 | 58.3 | 59.2 | 60.1 |
| Daily COD load per capita (g/capita/day) | 1.5 | 94 | 95.4 | 96.8 | 98.3 | 99.8 | 101.3 | 102.8 | 104.3 | 105.9 | 107.5 | 109.1 | 110.7 |
| Daily total-N load per capita (g/capita/day) | 1.5 | 8.7 | 8.8 | 9.0 | 9.1 | 9.2 | 9.4 | 9.5 | 9.7 | 9.8 | 9.9 | 10.1 | 10.2 |
| Daily total-P load per capita (g/capita/day) | 1.5 | 1.04 | 1.06 | 1.07 | 1.09 | 1.10 | 1.12 | 1.14 | 1.15 | 1.17 | 1.19 | 1.21 | 1.23 |
| Daily discharge volume (m ³ /day) | - | 9,360 | 9,969 | 10,614 | 11,297 | 12,020 | 12,785 | 13,596 | 14,453 | 15,360 | 16,233 | 17,153 | 18,124 |
| Daily BOD ₅ load (kg/day) | - | 2,448 | 2,569 | 2,696 | 2,827 | 2,964 | 3,107 | 3,256 | 3,411 | 3,572 | 3,720 | 3,874 | 4,034 |
| Daily COD load (kg/day) | - | 4,512 | 4,736 | 4,968 | 5,211 | 5,464 | 5,727 | 6,002 | 6,287 | 6,585 | 6,857 | 7,140 | 7,435 |
| Daily total-N load (kg/day) | - | 418 | 438 | 460 | 482 | 506 | 530 | 555 | 582 | 609 | 635 | 661 | 688 |
| Daily total-P load (kg/day) | - | 50 | 52 | 55 | 58 | 60 | 63 | 66 | 70 | 73 | 76 | 79 | 82 |

Those parameters for the North Part of Altamira are shown in Table B.86.

Table B.86 Municipal Wastewater Projection for the North Part of Altamira Municipality

| | Annual growth rate (%) | Year | | | | | | | | | | | |
|---|------------------------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Population | - | 76,339 | 81,990 | 87,716 | 93,470 | 99,245 | 105,053 | 110,908 | 116,825 | 122,816 | 128,893 | 135,073 | 141,377 |
| Coverage of drainage (%) | - | 71.1 | 72.8 | 74.5 | 76.1 | 77.8 | 79.4 | 81.0 | 82.6 | 84.2 | 85.3 | 86.4 | 87.5 |
| Daily discharge volume per capita (l/capita/day) | 3 | 195 | 201 | 207 | 213 | 219 | 226 | 233 | 240 | 247 | 254 | 262 | 270 |
| Daily BOD ₅ load per capita (g/capita/day) | 1.5 | 51 | 51.8 | 52.5 | 53.3 | 54.1 | 54.9 | 55.8 | 56.6 | 57.5 | 58.3 | 59.2 | 60.1 |
| Daily COD load per capita (g/capita/day) | 1.5 | 94 | 95.4 | 96.8 | 98.3 | 99.8 | 101.3 | 102.8 | 104.3 | 105.9 | 107.5 | 109.1 | 110.7 |
| Daily total-N load per capita (g/capita/day) | 1.5 | 8.7 | 8.8 | 9.0 | 9.1 | 9.2 | 9.4 | 9.5 | 9.7 | 9.8 | 9.9 | 10.1 | 10.2 |
| Daily total-P load per capita (g/capita/day) | 1.5 | 1.04 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| Daily discharge Volume (m ³ /day) | - | 10,580 | 11,986 | 13,515 | 15,165 | 16,944 | 18,862 | 20,928 | 23,157 | 25,559 | 27,986 | 30,591 | 33,391 |
| Daily BOD ₅ load (kg/day) | - | 2,767 | 3,089 | 3,432 | 3,796 | 4,179 | 4,584 | 5,012 | 5,465 | 5,945 | 6,414 | 6,909 | 7,432 |
| Daily COD load (kg/day) | - | 5,100 | 5,694 | 6,326 | 6,996 | 7,703 | 8,449 | 9,238 | 10,073 | 10,957 | 11,822 | 12,734 | 13,698 |
| Daily total-N load (kg/day) | - | 472 | 527 | 586 | 647 | 713 | 782 | 855 | 932 | 1,014 | 1,094 | 1,179 | 1,268 |
| Daily total-P load (kg/day) | - | 56 | 63 | 70 | 77 | 85 | 93 | 102 | 111 | 121 | 131 | 141 | 152 |

Those parameters for Tampico and Madero Cities are shown in Table B.87.

Table B.87 Municipal Wastewater Projection for Tampico and Madero

| | Annual rowth rate (%) | Year | | | | | | | | | | | |
|--|--------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Population | | | | | | | | | | | | | |
| Madero | - | 179,721 | 181,873 | 183,961 | 185,992 | 187,970 | 189,900 | 191,793 | 193,648 | 195,464 | 197,234 | 198,956 | 200,625 |
| Tampico | - | 285,765 | 287,176 | 288,451 | 289,613 | 290,667 | 291,625 | 292,503 | 293,303 | 294,021 | 294,649 | 295,184 | 295,622 |
| Total | | 465,486 | 469,049 | 472,412 | 475,605 | 478,637 | 481,525 | 484,296 | 486,951 | 489,485 | 491,883 | 494,140 | 496,247 |
| Coverage of drainage (%) | - | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Daily discharge volume per capita (l/capita/day) | 4 | 251 | 261 | 271 | 282 | 294 | 305 | 318 | 330 | 344 | 357 | 372 | 386 |
| Daily BOD ₅ load per capita (g/capita/ day) | 2 | 70.0 | 71.4 | 72.8 | 74.3 | 75.8 | 77.3 | 78.8 | 80.4 | 82.0 | 83.7 | 85.3 | 87.0 |
| Daily COD load per capita (g/capita/ day) | 2 | 108 | 110.2 | 112.4 | 114.6 | 116.9 | 119.2 | 121.6 | 124.1 | 126.5 | 129.1 | 131.7 | 134.3 |
| Daily total-N load per capita (g/capita/ day) | 2 | 18.7 | 19.1 | 19.5 | 19.8 | 20.2 | 20.6 | 21.1 | 21.5 | 21.9 | 22.3 | 22.8 | 23.3 |
| Daily total-P load per capita (g/capita/ day) | 2 | 2.35 | 2.40 | 2.44 | 2.49 | 2.54 | 2.59 | 2.65 | 2.70 | 2.75 | 2.81 | 2.86 | 2.92 |
| Daily discharge volume (m ³ /day) | - | 110,995 | 116,319 | 121,839 | 127,569 | 133,517 | 139,896 | 146,120 | 152,797 | 159,736 | 166,940 | 174,414 | 182,164 |
| Daily BOD ₅ load (kg/day) | - | 30,955 | 31,816 | 32,685 | 33,564 | 34,453 | 35,354 | 36,269 | 37,197 | 38,138 | 39,092 | 40,057 | 41,032 |
| Daily COD load (kg/day) | - | 47,759 | 49,087 | 50,428 | 51,784 | 53,156 | 54,547 | 55,958 | 57,390 | 58,842 | 60,313 | 61,802 | 63,306 |
| Daily total-N load (kg/day) | - | 8,269 | 8,499 | 8,731 | 8,966 | 9,204 | 9,445 | 9,689 | 9,937 | 10,188 | 10,443 | 10,701 | 10,961 |
| Daily total-P load (kg/day) | - | 1,039 | 1,068 | 1,097 | 1,127 | 1,157 | 1,187 | 1,218 | 1,249 | 1,280 | 1,312 | 1,345 | 1,377 |

Those parameters for Pueblo Viejo Municipality are shown in Table B.88.

Table B.88 Municipal Wastewater Projection for Pueblo Viejo Municipality

| | Annual Growth Rate (%) | Year | | | | | | | | | | | |
|---|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Population | - | 52,820 | 53,679 | 54,513 | 55,318 | 56,095 | 56,845 | 57,570 | 58,272 | 58,951 | 59,610 | 60,249 | 60,871 |
| Coverage of drainage (%) | - | 5.7 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 | 9.5 | 10 | 10.5 | 11 |
| Daily discharge volume per capita (l/capita/day) | 3 | 150 | 155 | 159 | 164 | 169 | 174 | 179 | 184 | 190 | 196 | 202 | 208 |
| Daily BOD ₅ load per capita (g/capita/day) | 1.5 | 45 | 45.7 | 46.4 | 47.1 | 47.8 | 48.5 | 49.2 | 49.9 | 50.7 | 51.5 | 52.2 | 53.0 |
| Daily COD load per capita (g/capita/day) | 1.5 | 82 | 83.2 | 84.5 | 85.7 | 87.0 | 88.3 | 89.7 | 91.0 | 92.4 | 93.8 | 95.2 | 96.6 |
| Daily total-N load per capita (g/capita/day) | 1.5 | 7.6 | 7.7 | 7.8 | 7.9 | 8.1 | 8.2 | 8.3 | 8.4 | 8.6 | 8.7 | 8.8 | 9.0 |
| Daily total-P load per capita (g/capita/day) | 1.5 | 0.91 | 0.92 | 0.94 | 0.95 | 0.97 | 0.98 | 1.00 | 1.01 | 1.03 | 1.04 | 1.06 | 1.07 |
| Daily discharge volume (m ³ /day) | - | 452 | 498 | 564 | 635 | 710 | 791 | 876 | 968 | 1,064 | 1,167 | 1,275 | 1,390 |
| Daily BOD ₅ load (kg/day) | - | 135 | 147 | 164 | 182 | 201 | 220 | 241 | 262 | 284 | 307 | 330 | 355 |
| Daily COD load (kg/day) | - | 247 | 268 | 299 | 332 | 366 | 402 | 439 | 477 | 517 | 559 | 602 | 647 |
| Daily total-N load (kg/day) | - | 23 | 25 | 28 | 31 | 34 | 37 | 41 | 44 | 48 | 52 | 56 | 60 |
| Daily total-P load (kg/day) | - | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 |