THE STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITAN AREA IN THE FEDERATIVE REPUBLIC OF BRAZIL

FINAL REPORT
SUMMARY

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

BRAZILIAN COOPERATION AGENCY (ABC),
STATE SECRETARIAT OF PLANNING AND SOCIAL DEVELOPMENT,
STATE OF PERNAMBUCO (SEPLANDES)
FEDERATIVE REPUBLIC OF BRAZIL

THE STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITAN AREA IN THE FEDERATIVE REPUBLIC OF BRAZIL

FINAL REPORT
DATA BOOK

JANUARY 2001

PACIFIC CONSULTANTS INTERNATIONAL, TOKYO

The cost estimate was made based on prevailing market price in July 2000 and expressed in US$ according to the following exchange rate.

US$1.00 = R$ 1.80 = Yen 110.00
(As of June 2000)

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WATER QUALITY AND

SEDIMENT QUALITY SURVEY

DATA BOOK OF WATER QUALITY AND SEDIMENT QUALITY SURVEY

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1. OBJECTIVE

The objective of this technical report is to recount results of analisis of samples of water, effuentes and sendiments to verify the quality.

2. MATERIAL TESTED

74 samples of water and effluents and 24 samples of sedimcnts were collected in several points and places in the Metropolitan area of Recife in the Federative Republic of Brazil.

3 ANALYTICAL PROCEDURE

The analytical procedure based on the 20th Edition of Standard Methods for the Examination of Water and Wastewater - APHA-AWWA-WEF.

4. RESULTS OBTAINED

4.1 Material tested: Water A-001

Sampling Location: Capibaribe river under Princesa Isabel bridge low tide.

Date of Sampling: December 22, 1999 - Time: 9:00h

Environmental Conditions: Sample Temp: 28.6°C - Air Temp: 30°C

Parameter	Unit	Results
pH		7.70
BOD	mg/L	888
COD	mg/L	1280
S.S (Suspended Sediment)	mg/L	298
DO	mg/L	5.38
E.Coli	NMP/100ml	Present
Total Nitrogen	mg/L	4.0
Total Phosphorous	mg/L	1.4
N.Hexane Extract (Oil & Grease)	mg/L	40.0
Chlorine	mg/L	311.0

4.2 Material tested: Water A-003

Sampling Location: Capibaribe river under the bridge on Av. Caxangá.

Date of Sampling: December 22, 1999 - Time: 10:15h

Environmental Conditions: Sample Temp: 31°C - Air Temp: 32°C

Parameter	Unit	Results
pH		7.73

BOD	mg/L	480
COD	mg/L	626
S.S (Suspended Sediment)	mg/L	70
DO	mg/L	7.20
E.Coli	NMP/100ml	Present
Total Nitrogen	mg/L	2.0
Total Phosphorous	mg/L	1.4
N.Hexane Extract (Oil & Grease)	mg/L	72.0
Chlorine	mg/L	20.0

4 3 Material tested: Water A-005

Sampling Location: Capibaribe river under the bridge uptream firm the Tiúma Plant

Date Of Sampling: December 22, 1999 - Time: 11: 25h

Environmental Conditions: Sample Temp: 27.3°C - Air Temp: 30°C

Parameter	Unit	Results
pH		6.67
BOD	mg/L	23
COD	mg/L	80
S.S (Suspended Sediment)	mg/L	20
DO	mg/L	0
E.Coli	NMP/100ml	Present
Total Nitrogen	mg/L	2.0
Total Phosphorous	mg/L	0.25
N.Hexane Extract (Oil & Grease)	mg/L	38
Chlorine	mg/L	86.7

4 .4 Material tested: Water A-007

Sampling Location: Capibaribe river under Princesa Isabel bridge high tide.

Date of Sampling: December 22, 1999 - Time: 14:40h

Environmental Conditions: Sample Temp: 29.2°C - Air Temp: 30°C

Parameter	Unit	Results
pH		8.23
BOD	mg/L	450
COD	mg/L	510
S.S (Suspended Sediment)	mg/L	324
DO	mg/L	6.14
E.Coli	NMP/100ml	Present
Total Nitrogen	mg/L	1.8

Total Phosphorous	mg/L	0.55
N.Hexane Extract (Oil & Grease)	mg/L	14
Chlorine	mg/L	392.6

4.5 Material tested: Water A-036

Sampling Location : Water from the Ipojuca river collected at the river`s estuary at low tide.

Date of Sampling: January 4, 2000 - Time: 10:30h

Environmental Conditions: Sample Temp: 31.4°C - Air Temp: 28°C

Parameter	Unit	Results
pH		6.58
BOD	mg/L	34
COD	mg/L	86
S.S (Suspended Sediment)	mg/L	55.0
DO	mg/L	0
E.Coli	NCMF/mL	$1.6x10^5$
Total Nitrogen	mg/L	38
Total Phosphorous	mg/L	0.92
N.Hexane Extract (Oil & Grease)	mg/L	8.0
Chlorine	mg/L	15.4

4.6 Material tested: Water A-038

Sampling Location : Water from the Ipojuca river collected downstream at the RMK pollution area.

Date of Sampling: January 4, 2000 - Time: 12:00h

Environmental Conditions: Sample Temp: 30.2°C - Air Temp: 29°C

Parameter	Unit	Results
pH		6.93
BOD	mg/L	0.4
COD	mg/L	12
S.S (Suspended Sediment)	mg/L	61
DO	mg/L	3.24
E.Coli	NCMF/mL	$5.0x10^4$
Total Nitrogen	mg/L	64.0
Total Phosphorous	mg/L	0.8
N.Hexane Extract (Oil & Grease)	mg/L	60

Chlorine	mg/L	11.97

4.7 Material tested: Water A-040

Sampling Location : Water from the Ipojuca river collected at the river`s estuary at higt tide.

Date of Sampling: January 4, 2000 - Time: 15:40h

Environmental Conditions: Sample Temp: 40.2°C - Air Temp: 30°C

Parameter	Unit	Results
pH		6.38
BOD	mg/L	41
COD	mg/L	44
S.S (Suspended Sediment)	mg/L	4.0
DO	mg/L	0.95
E.Coli	NCMF/mL	$2.2x10^4$
Total Nitrogen	mg/L	1
Total Phosphorous	mg/L	0.65
N.Hexane Extract (Oil & Grease)	mg/L	7.6
Chlorine	mg/L	26.0

4.8 Material tested: Water A-043

Sampling Location : Water from the Jaboatão river collected at the river's estuary at low tide.

Date of Sampling: January 6, 2000 - Time: 10:10h

Environmental Conditions: Sample Temp: 29.5°C - Air Temp: 32°C

Parameter	Unit	Results
pH		7.95
BOD	mg/L	11
COD	mg/L	91
S.S (Suspended Sediment)	mg/L	68.0
DO	mg/L	1.2
E.Coli	NCMF/mL	0.5 x 10
Total Nitrogen	mg/L	150.0
Total Phosphorous	mg/L	0.60
N.Hexane Extract (Oil & Grease)	mg/L	Not detected
Chlorine	mg/L	2.325

4.9 Material tested: Water A-044

Sampling Location : Water from the Jaboatão river collected downstream at the pollution area.

Date of Sampling: January 6, 2000 - Time: 13:15h

Environmental Conditions: Sample Temp: 28.8°C - Air Temp: 32°C

Parameter	Unit	Results
pH		7.67
BOD	mg/L	100
COD	mg/L	123
S.S (Suspended Sediment)	mg/L	62.0
DO	mg/L	1.0
E.Coli	NCMF/mL	0.6 x 10
Total Nitrogen	mg/L	13.0
Total Phosphorous	mg/L	1.18
N.Hexane Extract (Oil & Grease)	mg/L	Not Detected
Chlorine	mg/L	34.2

4.10 Material tested: Water A-046

Sampling Location : Water from the Beberibe river collected at the river's estuary at low tide (0,1m)

Date of Sampling: January 5, 2000 - Time: 9:30h

Environmental Conditions: Sample Temp: 27.9°C - Air Temp: 28.5°C

Parameter	Unit	Results
pH		7.04
BOD	mg/L	42
COD	mg/L	138
S.S (Suspended Sediment)	mg/L	38
DO	mg/L	0
E.Coli	NCMF/mL	1.6×10^6
Total Nitrogen	mg/L	12
Total Phosphorous	mg/L	2.65
N.Hexane Extract (Oil & Grease)	mg/L	13.8
Chlorine	mg/L	825

4.11 Material tested: Water A-048

Sampling Location : Water from the Beberibe river collected downstream

Date of Sampling: January 5, 2000 - Time: 10:30h

Environmental Conditions: Sample Temp: 26.9°C - Air Temp: 32°C

Parameter	Unit	Results
pH		7.04
BOD	mg/L	77
COD	mg/L	85
S.S (Suspended Sediment)	mg/L	242
DO	mg/L	1.3
E.Coli	NCMF/mL	9.0×10^5
Total Nitrogen	mg/L	12
Total Phosphorous	mg/L	2.2
N.Hexane Extract (Oil & Grease)	mg/L	4.2
Chlorine	mg/L	100.0

4.12 Material tested: Water A-050

Sampling Location : Water from the Beberibe river collected upstream

Date of Sampling: January 5, 2000 - Time: 12:45h

Environmental Conditions: Sample Temp: 26.4°C - Air Temp: 27°C

Parameter	Unit	Results
pH		5.80
BOD	mg/L	22
COD	mg/L	27
S.S (Suspended Sediment)	mg/L	6.0
DO	mg/L	7.0
E.Coli	NCMF/mL	2.4×10^2
Total Nitrogen	mg/L	2.0
Total Phosphorous	mg/L	0.5
N.Hexane Extract (Oil & Grease)	mg/L	15.8
Chlorine	mg/L	21.0

4.13 Material tested: Water A-052

Sampling Location : Water from the Beberibe river collected at the river's estuary at high tide (2,5m).

Date of Sampling: January 5, 2000 - Time: 15:50h

Environmental Conditions: Sample Temp: 27°C - Air Temp: 24°C

Parameter	Unit	Results
pH		7.87
BOD	mg/L	23
COD	mg/L	150
S.S (Suspended Sediment)	mg/L	66
DO	mg/L	6.7
E.Coli	NMP/100ml	Present
Total Nitrogen	mg/L	0.5
Total Phosphorous	mg/L	0.88
N.Hexane Extract (Oil & Grease)	mg/L	4.0
Chlorine	mg/L	11966.7

4.14 Material tested: Water A-068

Sampling Location : Water from the Jaboatão river collected upstream at the pollution area.

Date of Sampling: January 6, 2000 - Time: 12:10h

Environmental Conditions: Sample Temp: 28.8°C - Air Temp: 32.1°C

Parameter	Unit	Results
pH		7.39
BOD	mg/L	6.0
COD	mg/L	18.0
S.S (Suspended Sediment)	mg/L	48.0
DO	mg/L	6.3
E.Coli	NCMF/mL	1.2x10
Total Nitrogen	mg/L	9.0
Total Phosphorous	mg/L	1.08
N.Hexane Extract (Oil & Grease)	mg/L	not detected
Chlorine	mg/L	10.3

4.15 Material tested: Water A-070

Sampling Location : Water from the Jaboatão river collected at the river`s estuary at high tide..

Date of Sampling: January 6, 2000 - Time: 16:40h

Environmental Conditions: Sample Temp: 31.1°C - Air Temp: 30.3°C

Parameter	Unit	Results
pH		7.40
BOD	mg/L	124
COD	mg/L	495

S.S (Suspended Sediment)	mg/L	2.0
DO	mg/L	0.82
E.Coli	NCMF/mL	$1.7x10^2$
Total Nitrogen	mg/L	31.3
Total Phosphorous	mg/L	0.76
N.Hexane Extract (Oil & Grease)	mg/L	8.0
Chlorine	mg/L	3.850

4.16 Material tested: Water A-081

Sampling Location : Water from the Ipojuca river collected upstream at the RMK pollution area, motorway BR 101 South.

Date of Sampling: January 12, 2000 - Time: 10:50h

Environmental Conditions: Sample Temp: 29.1°C - Air Temp: 32.8°C

Parameter	Unit	Results
pH		6.58
BOD	mg/L	26
COD	mg/L	53
S.S (Suspended Sediment)	mg/L	10.0
DO	mg/L	5.8
E.Coli	NCMF/mL	$3.9x10^6$
Total Nitrogen	mg/L	1.3
Total Phosphorous	mg/L	0.17
N.Hexane Extract (Oil & Grease)	mg/L	147.0
Chlorine	mg/L	15.0

4.17 Material tested: Effluent E-008

Sampling Location : Alesoquímica and Petroflex plant's effluent collected at treatment system's outlet.

Date of Sampling: December 22, 1999 - Time: 11:00h

Environmental Conditions: Sample Temp: 28.7°C - Air Temp: 32.5°C

Parameter	Unit	Results
pH		8.0
BOD	mg/L	4
COD	mg/L	38
S.S (Suspended Sediment)	mg/L	24
DO	mg/L	5.10
E.Coli	NMP/100mL	Present

Total Nitrogen	mg/L	1.0
Total Phosphorous	mg/L	0.56
N.Hexane Extract (Oil & Grease)	mg/L	33.0
Chlorine	mg/L	25.5

4.18 Material tested: Effluent E-009

Sampling Location : Residential effluent collected at Compesa's very close Coelhos street in front of Hospital Pedro II; "class C".

Date of Sampling: December 27, 1999 - Time: 12:03h

Environmental Conditions: Sample Temp: 31.0ºC - Air Temp: 32.0ºC

Parameter	Unit	Results
pH		7.9
BOD	mg/L	256
COD	mg/L	797
S.S (Suspended Sediment)	mg/L	156
DO	mg/L	0
E.Coli	NCMF/mL	$1.4x10^2$
Total Nitrogen	mg/L	50.0
Total Phosphorous	mg/L	16.0
N.Hexane Extract (Oil & Grease)	mg/L	40
Chlorine	mg/L	918.5

4.19 Material tested: Effluent E-010

Sampling Location : Residential effluent collected at Compesa's very close crossing of José Alencar street with Esperanto street nr 269 - Boa Vista; "Class A".

Date of Sampling: December 28, 1999 - Time: 13:15h

Environmental Conditions: Sample Temp: 34.0ºC - Air Temp: 32.0ºC

Parameter	Unit	Results
pH		7.0
BOD	mg/L	265
COD	mg/L	1016
S.S (Suspended Sediment)	mg/L	350
DO	mg/L	0
E.Coli	NCMF/mL	$0.9x10^3$
Total Nitrogen	mg/L	50
Total Phosphorous	mg/L	27.8
N.Hexane Extract (Oil & Grease)	mg/L	94
Chlorine	mg/L	408.2

4 .**20** Material tested: Effluent E-011

Sampling Location : Residential effluent collected at Compesa's very close 01 Av. near treatment system`s - Vila Rica Jaboatão; "class B"

Date of Sampling: December 27, 1999 - Time: 16:30h

Environmental Conditions: Sample Temp: 29.0ºC - Air Temp: 32.0ºC

Parameter	Unit	Results
pH		6.90
BOD	mg/L	1058
COD	mg/L	2090
S.S (Suspended Sediment)	mg/L	686.6
DO	mg/L	0
E.Coli	NMP/100mL	Present
Total Nitrogen	mg/L	65.0
Total Phosphorous	mg/L	49.6
N.Hexane Extract (Oil & Grease)	mg/L	194
Chlorine	mg/L	116.2

4 .**21** Material tested: Effluent E-012

Sampling Location : Refrescos Guararapel plant effluent collected at treatment system's outlet.

Date of Sampling: December 27, 1999 - Time: 10:15h

Environmental Conditions: Sample Temp: 30.1ºC - Air Temp: 30.0ºC

Parameter	Unit	Results
pH		8.9
BOD	mg/L	16
COD	mg/L	104
S.S (Suspended Sediment)	mg/L	82
DO	mg/L	6.7
E.Coli	NCMF/mL	$1.2x10^2$
Total Nitrogen	mg/L	15
Total Phosphorous	mg/L	1.0
N.Hexane Extract (Oil & Grease)	mg/L	108.0
Chlorine	mg/L	60.3

4 .**22** Material tested: Effluent E-013

Sampling Location : Ondunorte II - Igarassu plant effluent collected at treatment system's outlet.

Date of Sampling: December 28, 1999 - Time: --

Environmental Conditions: Sample Temp: 36.6°C - Air Temp: 33.0°C

Parameter	Unit	Results
pH		5.6
BOD	mg/L	563
COD	mg/L	1480
S.S (Suspended Sediment)	mg/L	552.4
DO	mg/L	0
E.Coli	NCMF/mL	$1.6x10^2$
Total Nitrogen	mg/L	15
Total Phosphorous	mg/L	1.7
N.Hexane Extract (Oil & Grease)	mg/L	96
Chlorine	mg/L	107.6

4 .23 Material tested: Effluent E-014

Sampling Location : Cia Agro Industrial de Igarassu CA 11 plant Effluent collected at treatment system's outlet.

Date of Sampling: December 29, 1999 - Time: 14:25h

Environmental Conditions: Sample Temp: 34.4°C - Air Temp: 31.5°C

Parameter	Unit	Results
pH		6.8
BOD	mg/L	53
COD	mg/L	158
S.S (Suspended Sediment)	mg/L	36
DO	mg/L	7.3
E.Coli	NCMF/mL	$3.9x10^2$
Total Nitrogen	mg/L	2.1
Total Phosphorous	mg/L	0.4
N.Hexane Extract (Oil & Grease)	mg/L	56
Chlorine	mg/L	105

4 .24 Material tested: Effluent E-015

Sampling Location : Residential Effluent collected at Compesa's very close Cardeal street in front of house nr 76 - Rio Doce - Olinda; "Class B"

Sampling: December 29, 1999 - Time: 11:30h

Environmental Conditions: Sample Temp: 31.9°C - Air Temp: 29.0°C

Parameter	Unit	Results
pH		6.8
BOD	mg/L	275
COD	mg/L	1188
S.S (Suspended Sediment)	mg/L	237.5
DO	mg/L	2.2
E.Coli	NCMF/mL	$1.8x10^2$
Total Nitrogen	mg/L	13.0
Total Phosphorous	mg/L	7.5
N.Hexane Extract (Oil & Grease)	mg/L	62
Chlorine	mg/L	68.9

4 .25 Material tested: Effluent E-016

Sampling Location : Residential effluent collected at Compesa's very close crossing of Elesbão de Castro street with Maria Ramos street bairro Nova-Olinda "Class A".

Date of Sampling: December 30, 1999 - Time: 12:15h

Environmental Conditions: Sample Temp: 30.6°C - Air Temp: 30.5°C

Parameter	Unit	Results
pH		6.8
BOD	mg/L	209
COD	mg/L	693
S.S (Suspended Sediment)	mg/L	125
DO	mg/L	0
E.Coli	NCMF/mL	$1.2x10^2$
Total Nitrogen	mg/L	37.9
Total Phosphorous	mg/L	7.56
N.Hexane Extract (Oil & Grease)	mg/L	40.0
Chlorine	mg/L	51.7

4 .26 Material tested: Effluent E-017

Sampling Location : Residential effluent collected at Compensa's very close Golfinho street in front of house nr 19 - Ouro Preto Olinda; "Class C".

Date of Sampling: December 29, 1999 - Time: 13:15h

Environmental Conditions: Sample Temp: 29.9°C - Air Temp: 29°C

Parameter	Unit	Results

pH		6.94
BOD	mg/L	244
COD	mg/L	990
S.S (Suspended Sediment)	mg/L	190
DO	mg/L	2.0
E.Coli	NCMF/mL	$1.0x10^3$
Total Nitrogen	mg/L	23.2
Total Phosphorous	mg/L	7.76
N.Hexane Extract (Oil & Grease)	mg/L	52.0
Chlorine	mg/L	99.0

4.27 Material tested: Effluent E-018

Sampling Location : Residential Effluent collected at Compesa's very close crossing of Triunfo street with Bom Conselho Arruda street; "class C".

Sampling: December 29, 1999 - Time: 15:15h

Environmental Conditions: Sample Temp: 30.0°C - Air Temp: 29.0°C

Parameter	Unit	Results
pH		6.7
BOD	mg/L	1025
COD	mg/L	1545
S.S (Suspended Sediment)	mg/L	446.7
DO	mg/L	0
E.Coli	NCMF/mL	$1.6x10^7$
Total Nitrogen	mg/L	40
Total Phosphorous	mg/L	8.8
N.Hexane Extract (Oil & Grease)	mg/L	352
Chlorine	mg/L	111.9

4.28 Material tested: Effluent E-019

Sampling Location : Brahma plant effluent collected at treatment system's outlet.

Date of Sampling: December 29, 1999 - Time: 11:10h

Environmental Conditions: Sample Temp: 30.0°C - Air Temp: 30.0°C

Parameter	Unit	Results
pH		8.2
BOD	mg/L	23
COD	mg/L	89
S.S (Suspended Sediment)	mg/L	0
DO	mg/L	5.6

E.Coli	NCMF/mL	$1.6x10^2$
Total Nitrogen	mg/L	35.8
Total Phosphorous	mg/L	4.2
N.Hexane Extract (Oil & Grease)	mg/L	42
Chlorine	mg/L	51.7

4 .29 Material tested: Effluent E-021

Sampling Location : Corn Product's plant effluent collected at treatment system's outlet.

Date of Sampling: December 29, 1999 - Time: 13:30h

Environmental Conditions: Sample Temp: 30.0°C - Air Temp: 31.0°C

Parameter	Unit	Results
pH		6.75
BOD	mg/L	1300
COD	mg/L	1820
S.S (Suspended Sediment)	mg/L	1080
DO	mg/L	0
E.Coli	NCMF/mL	$2.0x10^4$
Total Nitrogen	mg/L	34
Total Phosphorous	mg/L	29.8
N.Hexane Extract (Oil & Grease)	mg/L	62
Chlorine	mg/L	17.2

4 .30 Material tested: Effluent E-022

Sampling Location : Effluent from ETE-Peixinho collected at treatment system's inlet.

Sampling: December 28, 1999 - Time: 10:30h

Environmental Conditions: Sample Temp: 30.6°C - Air Temp: 27.5°C

Parameter	Unit	Results
pH		6.7
BOD	mg/L	229
COD	mg/L	922
S.S (Suspended Sediment)	mg/L	440
DO	mg/L	0
E.Coli	NCMF/mL	$1.4x10^2$
Total Nitrogen	mg/L	30.0
Total Phosphorous	mg/L	12.7
N.Hexane Extract (Oil & Grease)	mg/L	76.0
Chlorine	mg/L	77.5

4 .31 Material tested: Effluent E-023

Sampling Location : Effluent from ETE-Peixinho collected at treatment system's outlet.

Date of Sampling: December 28, 1999 - Time: 11:00h

Environmental Conditions: Sample Temp: 31°C - Air Temp: 29°C

Parameter	Unit	Results
pH		7.1
BOD	mg/L	20
COD	mg/L	86
S.S (Suspended Sediment)	mg/L	38
DO	mg/L	2.03
E.Coli	NCMF/mL	$1.1x10^3$
Total Nitrogen	mg/L	16.0
Total Phosphorous	mg/L	15.5
N.Hexane Extract (Oil & Grease)	mg/L	114
Chlorine	mg/L	111.9

4 .32 Material tested: Effluent E-025

Sampling Location : Effluent from ETE-Peixinho collected at treatment system's outlet.

Date of Sampling: December 29, 1999 - Time: 13:30h

Environmental Conditions: Sample Temp: 34.4°C - Air Temp: 31°C

Parameter	Unit	Results
pH		7.3
BOD	mg/L	32
COD	mg/L	87
S.S (Suspended Sediment)	mg/L	36
DO	mg/L	7.3
E.Coli	NCMF/mL	$1.8x10^2$
Total Nitrogen	mg/L	16.0
Total Phosphorous	mg/L	14.0
N.Hexane Extract (Oil & Grease)	mg/L	146
Chlorine	mg/L	111.9

4 .33 Material tested: Effluent E-026

Sampling Location : Effluent from ETE-Peixinho, collected at treatment system's inlet.

Date of Sampling: December 28, 1999 - Time: 14:00h

Environmental Conditions: Sample Temp: 30.8°C - Air Temp: 30°C

Parameter	Unit	Results

pH		6.6
BOD	mg/L	215
COD	mg/L	505
S.S (Suspended Sediment)	mg/L	176.6
DO	mg/L	0
E.Coli	NCMF/mL	$1.9x10^2$
Total Nitrogen	mg/L	25.0
Total Phosphorous	mg/L	11.0
N.Hexane Extract (Oil & Grease)	mg/L	114
Chlorine	mg/L	150.7

4 .34 Material tested: Effluent E-028

Sampling Location : Effluent from ETE-Peixinho collected at treatment system's outlet.

Date of Sampling: December 28, 1999 - Time: 16:00h

Environmental Conditions: Sample Temp: 33.4°C - Air Temp: 30°C

Parameter	Unit	Results
pH		8.02
BOD	mg/L	538
COD	mg/L	1485
S.S (Suspended Sediment)	mg/L	22
DO	mg/L	1.5
E.Coli	NCMF/mL	$1.6x10^2$
Total Nitrogen	mg/L	30.0
Total Phosphorous	mg/L	13.0
N.Hexane Extract (Oil & Grease)	mg/L	56
Chlorine	mg/L	111.9

4 .35 Material tested: Effluent E-029

Sampling Location : Residential effluent collected at ETE-Peixinho at treatment system's inlet.

Date of Sampling: December 29, 1999 - Time: 16:30h

Environmental Conditions: Sample Temp: 30.1°C - Air Temp: 28.5°C

Parameter	Unit	Results
pH		6.71
BOD	mg/L	309
COD	mg/L	1089
S.S (Suspended Sediment)	mg/L	125
DO	mg/L	0
E.Coli	NCMF/mL	$1.8x10^2$

Total Nitrogen	mg/L	1.6
Total Phosphorous	mg/L	12.5
N.Hexane Extract (Oil & Grease)	mg/L	88
Chlorine	mg/L	107.6

4 .36 Material tested: Effluent E-031

Sampling Location : Ondunorte III - Moreno plant effluent collected at treatment system's outlet.

Date of Sampling: January 03, 2000 - Time: 11:45h

Environmental Conditions: Sample Temp: 32.9°C - Air Temp: 32.5°C

Parameter	Unit	Results
pH		7.28
BOD	mg/L	200
COD	mg/L	1215
S.S (Suspended Sediment)	mg/L	586.7
DO	mg/L	2.0
E.Coli	NCMF/mL	$3.4x10^2$
Total Nitrogen	mg/L	4.1
Total Phosphorous	mg/L	4.2
N.Hexane Extract (Oil & Grease)	mg/L	36
Chlorine	mg/L	46.2

4 .37 Material tested: Effluent E-032

Sampling Location : Portela plant effluent collected at treatment system's outlet.

Date of Sampling: January 04, 2000 - Time: 13:15h

Environmental Conditions: Sample Temp: 34.2°C - Air Temp: 28.0°C

Parameter	Unit	Results
pH		7.47
BOD	mg/L	146
COD	mg/L	692
S.S (Suspended Sediment)	mg/L	190
DO	mg/L	0
E.Coli	NCMF/mL	$0.7x10^2$
Total Nitrogen	mg/L	8.2
Total Phosphorous	mg/L	11.1
N.Hexane Extract (Oil & Grease)	mg/L	44
Chlorine	mg/L	92.3

4 .38 Material tested: Effluent E-033

Sampling Location : Sorvane plant effluent collected at treatment system's outlet.

Date of Sampling: January 04, 2000 - Time: --

Environmental Conditions: Sample Temp: 35.0°C - Air Temp: 29.0°C

Parameter	Unit	Results
pH		7.94
BOD	mg/L	118
COD	mg/L	1001
S.S (Suspended Sediment)	mg/L	190
DO	mg/L	2.6
E.Coli	NCMF/mL	$0.2x10^2$
Total Nitrogen	mg/L	9.2
Total Phosphorous	mg/L	9.2
N.Hexane Extract (Oil & Grease)	mg/L	128
Chlorine	mg/L	25.6

4 .39 Material tested: Effluent E-034

Sampling Location : Fibrasil plant effluent collected at treatment system's outlet.

Date of Sampling: January 04, 2000 - Time: 9:50h

Environmental Conditions: Sample Temp: 32.5°C - Air Temp: 28.5°C

Parameter	Unit	Results
pH		7.07
BOD	mg/L	37
COD	mg/L	840
S.S (Suspended Sediment)	mg/L	10
DO	mg/L	7.4
E.Coli	NCMF/mL	$4.0x10^3$
Total Nitrogen	mg/L	22
Total Phosphorous	mg/L	35.5
N.Hexane Extract (Oil & Grease)	mg/L	156
Chlorine	mg/L	444.5

4 .40 Material tested: Effluent E-035

Sampling Location : Norton Lixa's plant effluent collected at treatment system's outlet.

Date of Sampling: January 04, 2000 - Time: 12:20h

Environmental Conditions: Sample Temp: 30.5°C - Air Temp: --

Parameter	Unit	Results

pH		8.52
BOD	mg/L	106
COD	mg/L	131
S.S (Suspended Sediment)	mg/L	240
DO	mg/L	6.8
E.Coli	NCMF/mL	$4.0x10^3$
Total Nitrogen	mg/L	44
Total Phosphorous	mg/L	7.8
N.Hexane Extract (Oil & Grease)	mg/L	80
Chlorine	mg/L	51.3

4 .41 Material tested: Effluent E-041

Sampling Location : Effluent from ETE-Janga collected at treatment system`s inlet.

Date of Sampling: January 5, 2000 - Time: 10:20h

Environmental Conditions: Sample Temp: 30.9ºC - Air Temp: 28.0ºC

Parameter	Unit	Results
pH		6.98
BOD	mg/L	225
COD	mg/L	287
S.S (Suspended Sediment)	mg/L	84
DO	mg/L	7.5
E.Coli	NCMF/mL	$1.6x10^6$
Total Nitrogen	mg/L	60
Total Phosphorous	mg/L	5.70
N.Hexane Extract (Oil & Grease)	mg/L	18.0
Chlorine	mg/L	130

4 .42 Material tested: Effluent E-042

Sampling Location : Effluent from ETE-Janga collected at treatment system`s outlet.

Date of Sampling: January 5, 2000 - Time: 10:30h

Environmental Conditions: Sample Temp: 30.4ºC - Air Temp: 28.0ºC

Parameter	Unit	Results
pH		7.22
BOD	mg/L	33
COD	mg/L	52
S.S (Suspended Sediment)	mg/L	36
DO	mg/L	1.90

E.Coli	NCMF/mL	$1.6x10^6$
Total Nitrogen	mg/L	30
Total Phosphorous	mg/L	3.75
N.Hexane Extract (Oil & Grease)	mg/L	5.8
Chlorine	mg/L	97

4 **.43** Material tested: Effluent E-044

Sampling Location : Galvatex plant effluent collected at treatment system's outlet.

Date of Sampling: January 04, 2000 - Time: 13:30h

Environmental Conditions: Sample Temp: 28.1°C - Air Temp: 30.0°C

Parameter	Unit	Results
pH		7.2
BOD	mg/L	390
COD	mg/L	3390
S.S (Suspended Sediment)	mg/L	258
DO	mg/L	0
E.Coli	NMP/100mL	Ausent
Total Nitrogen	mg/L	520
Total Phosphorous	mg/L	1.6
N.Hexane Extract (Oil & Grease)	mg/L	7.2
Chlorine	mg/L	1000

4 **.44** Material tested: Effluent E-053

Sampling Location : Effluent from the Antartica's plant collected at treatment system's outlet.

Date of Sampling: January 05, 2000 - Time: 11:30h

Environmental Conditions: Sample Temp: 33.2°C - Air Temp: 28.5°C

Parameter	Unit	Results
pH		7.16
BOD	mg/L	85
COD	mg/L	147
S.S (Suspended Sediment)	mg/L	66
DO	mg/L	2.10
E.Coli	NCMF/mL	$5.0x10^3$
Total Nitrogen	mg/L	10.0
Total Phosphorous	mg/L	2.0
N.Hexane Extract (Oil & Grease)	mg/L	18.6
Chlorine	mg/L	42.0

4.45 Material tested: Effluent E-055

Sampling Location : Effluent from ETE-Janga collected at treatment system`s inlet.

Date of Sampling: January 5, 2000 Time: 13:15h.

Environmental Conditions: Sample Temp: 31.9°C - Air Temp: 24.0°C

Parameter	Unit	Results
pH		6.98
BOD	mg/L	211
COD	mg/L	282
S.S (Suspended Sediment)	mg/L	124
DO	mg/L	0
E.Coli	NCMF/mL	$1.6x10^6$
Total Nitrogen	mg/L	40
Total Phosphorous	mg/L	5.70
N.Hexane Extract (Oil & Grease)	mg/L	17.2
Chlorine	mg/L	125

4.46 Material tested: Effluent E-056

Sampling Location : Effluent from ETE-Janga collected at treatment system`s outlet.

Date of Sampling: January 5, 2000 - Time: 13:25h

Environmental Conditions: Sample Temp: 30.9°C - Air Temp: 24.0°C

Parameter	Unit	Results
pH		7.10
BOD	mg/L	39
COD	mg/L	71
S.S (Suspended Sediment)	mg/L	42
DO	mg/L	1.1
E.Coli	NCMF/mL	$9.0x10^5$
Total Nitrogen	mg/L	26
Total Phosphorous	mg/L	2.30
N.Hexane Extract (Oil & Grease)	mg/L	9.6
Chlorine	mg/L	97

4.47 Material tested: Effluent E-058

Sampling Location : Effluent from ETE-Janga collected at treatment system`s inlet.

Date of Sampling: January 6, 2000 - Time: 16:15h

Environmental Conditions: Sample Temp: 31.4°C - Air Temp: 29.5°C

Parameter	Unit	Results
pH		7.06
BOD	mg/L	420
COD	mg/L	896
S.S (Suspended Sediment)	mg/L	325
DO	mg/L	0
E.Coli	NCMF/mL	$0.2x10^2$
Total Nitrogen	mg/L	96
Total Phosphorous	mg/L	1
N.Hexane Extract (Oil & Grease)	mg/L	78
Chlorine	mg/L	113

4.48 Material tested: Effluent E-059

Sampling Location : Effluent from ETE-Janga collected at treatment system`s outlet.

Date of Sampling: January 6, 2000 Time:16:30h

Environmental Conditions: Sample Temp: 31.7°C - Air Temp: 29.0°C

Parameter	Unit	Results
pH		7.33
BOD	mg/L	1.000
COD	mg/L	2.650
S.S (Suspended Sediment)	mg/L	1.667
DO	mg/L	0
E.Coli	NCMF/mL	$0.5x10^2$
Total Nitrogen	mg/L	160.0
Total Phosphorous	mg/L	31.5
N.Hexane Extract (Oil & Grease)	mg/L	208.0
Chlorine	mg/L	88.9

4.49 Material tested: Effluent E-061

Sampling Location : Usina Bom Jesus plant effluent collected at treatment system's.

Date of Sampling: January 06, 2000 - Time: 10:30h

Environmental Conditions: Sample Temp: 26.7°C - Air Temp: 27.0°C

Parameter	Unit	Results
pH		6.67

BOD	mg/L	5
COD	mg/L	14
S.S (Suspended Sediment)	mg/L	42
DO	mg/L	4.7
E.Coli	NCMF/mL	6.0x10
Total Nitrogen	mg/L	1.0
Total Phosphorous	mg/L	2.8
N.Hexane Extract (Oil & Grease)	mg/L	16.0
Chlorine	mg/L	13.7

4.50 Material tested: Effluent E-062

Sampling Location : Usina Salgado plant effluent collected at treatment system's.

Date of Sampling: January 07, 2000 - Time: 13:00h

Environmental Conditions: Sample Temp: 30.0°C - Air Temp: 34.5°C

Parameter	Unit	Results
pH		5.90
BOD	mg/L	40
COD	mg/L	175
S.S (Suspended Sediment)	mg/L	156
DO	mg/L	0.81
E.Coli	NCMF/mL	$0.9x10^2$
Total Nitrogen	mg/L	1
Total Phosphorous	mg/L	0.4
N.Hexane Extract (Oil & Grease)	mg/L	26
Chlorine	mg/L	34.2

4.51 Material tested: Effluent E-063

Sampling Location : Suape Textil plant effluent collected at treatment system's outlet.

Date of Sampling: January 06, 2000 - Time: 11:30h

Environmental Conditions: Sample Temp: 34.5°C - Air Temp: 33.0°C

Parameter	Unit	Results
pH		8.38
BOD	mg/L	80
COD	mg/L	510
S.S (Suspended Sediment)	mg/L	60
DO	mg/L	4.66
E.Coli	NCMF/mL	7.1x10

Total Nitrogen	mg/L	85
Total Phosphorous	mg/L	9.6
N.Hexane Extract (Oil & Grease)	mg/L	20
Chlorine	mg/L	85.5

4 .52 Material tested: Effluent E-071

Sampling Location : Effluent from ETE-Mangueira collected at treatment system's inlet.

Date of Sampling: January 11, 2000 - Time: 10:30h

Environmental Conditions: Sample Temp: 30.2°C - Air Temp: 32.1°C

Parameter	Unit	Results
pH		7.34
BOD	mg/L	196
COD	mg/L	517
S.S (Suspended Sediment)	mg/L	180
DO	mg/L	0
E.Coli	NCMF/mL	4.9x10
Total Nitrogen	mg/L	70.1
Total Phosphorous	mg/L	1.26
N.Hexane Extract (Oil & Grease)	mg/L	36.0
Chlorine	mg/L	193.7

4 .53 Material tested: Effluent E-073

Sampling Location : Effluent from ETE-Mangueira collected at treatment system's outlet.

Date of Sampling: January 10, 2000 - Time: 10:55h

Environmental Conditions: Sample Temp: 32.1°C - Air Temp: 32.0°C

Parameter	Unit	Results
pH		8.18
BOD	mg/L	18
COD	mg/L	130
S.S (Suspended Sediment)	mg/L	88.0
DO	mg/L	1.3
E.Coli	NCMF/mL	3.1x10
Total Nitrogen	mg/L	80.6
Total Phosphorous	mg/L	9.6
N.Hexane Extract (Oil & Grease)	mg/L	2.0
Chlorine	mg/L	172.2

4 .54 Material tested: Effluent E-074

Sampling Location : Effluent from ETE-Mangueira collected at treatment system's inlet.

Date of Sampling: January 11, 2000 - Time: 14:15h

Environmental Conditions: Sample Temp: 30.6°C - Air Temp: 31.2°C

Parameter	Unit	Results
pH		7.21
BOD	mg/L	294
COD	mg/L	622
S.S (Suspended Sediment)	mg/L	10.0
DO	mg/L	0
E.Coli	NCMF/mL	$1.4x10^2$
Total Nitrogen	mg/L	54.8
Total Phosphorous	mg/L	1.08
N.Hexane Extract (Oil & Grease)	mg/L	136.0
Chlorine	mg/L	258.3

4 .55 Material tested: Effluent E-076

Sampling Location : Effluent from ETE-Mangueira collected at treatment system's outlet.

Date of Sampling: January 10, 2000 - Time: 14:35h

Environmental Conditions: Sample Temp: 34.0°C - Air Temp: 32.8°C

Parameter	Unit	Results
pH		8.43
BOD	mg/L	25
COD	mg/L	146
S.S (Suspended Sediment)	mg/L	170
DO	mg/L	1.4
E.Coli	NCMF/mL	3.9x10
Total Nitrogen	mg/L	28.9
Total Phosphorous	mg/L	9.8
N.Hexane Extract (Oil & Grease)	mg/L	42
Chlorine	mg/L	170

4 .56 Material tested: Effluent E-077

Sampling Location : Effluent from the Jaboatão river - Usina Bulhões plant, collected at treatment system's outlet.

Date of Sampling: January 10, 2000 - Time: 12:45h

Environmental Conditions: Sample Temp: 27.6°C - Air Temp: 31.0°C

Parameter	Unit	Results
pH		5.80
BOD	mg/L	154
COD	mg/L	257
S.S (Suspended Sediment)	mg/L	80.0
DO	mg/L	5.1
E.Coli	NCMF/mL	2.1x10
Total Nitrogen	mg/L	3.2
Total Phosphorous	mg/L	1.1
N.Hexane Extract (Oil & Grease)	mg/L	0.2
Chlorine	mg/L	21.5

4 .57 Material tested: Effluent E-078

Sampling Location : Effluent from ETE-Mangueira collected at treatment system's inlet.

Date of Sampling: January 10, 2000 - Time: 16:50h

Environmental Conditions: Sample Temp: 30.9°C - Air Temp: 32.1°C

Parameter	Unit	Results
pH		7.10
BOD	mg/L	324
COD	mg/L	556
S.S (Suspended Sediment)	mg/L	144
DO	mg/L	0
E.Coli	NCMF/mL	$2.4x10^5$
Total Nitrogen	mg/L	50
Total Phosphorous	mg/L	3.0
N.Hexane Extract (Oil & Grease)	mg/L	22
Chlorine	mg/L	365

4 .58 Material tested: Effluent E-080

Sampling Location : Effluent from ETE-Mangueira collected at treatment system's outlet.

Date of Sampling: January 11, 2000 - Time: 17:20h

Environmental Conditions: Sample Temp: 33.2°C - Air Temp: 30.8°C

Parameter	Unit	Results
pH		7.36
BOD	mg/L	44

COD	mg/L	170
S.S (Suspended Sediment)	mg/L	44
DO	mg/L	1.1
E.Coli	NCMF/mL	$1.7x10^4$
Total Nitrogen	mg/L	36
Total Phosphorous	mg/L	1.22
N.Hexane Extract (Oil & Grease)	mg/L	22.0
Chlorine	mg/L	215

4 **.59** Material tested: Effluent E-083

Sampling Location : Brasperola plant effluent collected at treatment system's outlet.

Date of Sampling: January 12, 2000 - Time: 10:00h

Environmental Conditions: Sample Temp: 32°C - Air Temp: 31.3°C

Parameter	Unit	Results
pH		7.37
BOD	mg/L	9
COD	mg/L	76
S.S (Suspended Sediment)	mg/L	165
DO	mg/L	4.2
E.Coli	NCMF/mL	$1.9x10^2$
Total Nitrogen	mg/L	1.6
Total Phosphorous	mg/L	7.5
N.Hexane Extract (Oil & Grease)	mg/L	10
Chlorine	mg/L	94.7

4 **.60** Material tested: Effluent E-084

Sampling Location : Residential Effluent collected at Rafe-Praia Grande-Candeias at treatment system`s inlet.

Sampling: January 11, 2000 - Time: 10:15h

Environmental Conditions: Sample Temp: 29.7°C - Air Temp: 29.4°C

Parameter	Unit	Results
pH		6.73
BOD	mg/L	161
COD	mg/L	307
S.S (Suspended Sediment)	mg/L	127
DO	mg/L	6.2
E.Coli	NCMF/mL	$2.8x10^6$
Total Nitrogen	mg/L	69
Total Phosphorous	mg/L	4

N.Hexane Extract (Oil & Grease)	mg/L	146
Chlorine	mg/L	150

4.61 Material tested: Effluent E-085

Sampling Location : Residential effluent collected at Rafe-Praia Grande-Candeia at treatment system`s outlet.

Date of Sampling: January 11, 2000 - Time: 10:30h

Environmental Conditions: Sample Temp: 29.2°C - Air Temp: 30.1°C

Parameter	Unit	Results
pH		6.72
BOD	mg/L	181
COD	mg/L	245
S.S (Suspended Sediment)	mg/L	37
DO	mg/L	6.7
E.Coli	NCMF/mL	$2.8x10^6$
Total Nitrogen	mg/L	31
Total Phosphorous	mg/L	0
N.Hexane Extract (Oil & Grease)	mg/L	163
Chlorine	mg/L	110.0

4.62 Material tested: Effluent E-087

Sampling Location : Residential effluent collected at Rafe-Praia Grande-Candeias at treatment system`s inlet.

Date of Sampling: January 11, 2000 - Time: 13:15h

Environmental Conditions: Sample Temp: 29.8°C - Air Temp: 31.8°C

Parameter	Unit	Results
pH		6.50
BOD	mg/L	219
COD	mg/L	442
S.S (Suspended Sediment)	mg/L	60
DO	mg/L	4.5
E.Coli	NCMF/mL	$4.6x10^7$
Total Nitrogen	mg/L	33
Total Phosphorous	mg/L	0.31
N.Hexane Extract (Oil & Grease)	mg/L	86.0
Chlorine	mg/L	170.0

4.63 Material tested: Effluent E-088

Sampling Location : Residential effluent collected at Rafe-Praia Grande-Candeias at treatment system`s outlet.

Date of Sampling: January 11, 2000 - Time: 13:30h

Environmental Conditions: Sample Temp: 29.8°C - Air Temp: 31.0°C

Parameter	Unit	Results
pH		6.73
BOD	mg/L	55
COD	mg/L	125
S.S (Suspended Sediment)	mg/L	4.0
DO	mg/L	5.30
E.Coli	NCMF/mL	$7.5x10^6$
Total Nitrogen	mg/L	29.0
Total Phosphorous	mg/L	0.08
N.Hexane Extract (Oil & Grease)	mg/L	12.0
Chlorine	mg/L	100.0

4.64 Material tested: Effluent E-089

Sampling Location : Residential effluent collected at Rafe-Praia Grande-Candeias at treatment system`s inlet.

Date of Sampling: January 12, 2000 Time: 16:10h

Environmental Conditions: Sample Temp: 29.3°C - Air Temp: 30.1°C

Parameter	Unit	Results
pH		6.93
BOD	mg/L	233
COD	mg/L	523
S.S (Suspended Sediment)	mg/L	195
DO	mg/L	0
E.Coli	NCMF/mL	$2.3x10^2$
Total Nitrogen	mg/L	23.7
Total Phosphorous	mg/L	9.9
N.Hexane Extract (Oil & Grease)	mg/L	58.0
Chlorine	mg/L	142.1

4.65 Material tested: Effluent E-090

Sampling Location : Residential effluent collected at Rafe - Praia Grande - Candeias at treatment system's outlet.

Date of Sampling: January 12, 2000 - Time: 16:35h

Environmental Conditions: Sample Temp: 29.5°C - Air Temp: 30°C

Parameter	Unit	Results
pH		7.17
BOD	mg/L	40
COD	mg/L	120
S.S (Suspended Sediment)	mg/L	90
DO	mg/L	0
E.Coli	NCMF/mL	$1.7x10^2$
Total Nitrogen	mg/L	79.6
Total Phosphorous	mg/L	0.94
N.Hexane Extract (Oil & Grease)	mg/L	10
Chlorine	mg/L	94.7

4.66 Material tested: Effluent E-091

Sampling Location : Mars Chocolates plant effluent collected at treatment system's outlet.

Date of Sampling: January 12, 2000 - Time: 11:15h

Environmental Conditions: Sample Temp: 30.9°C - Air Temp: 34.7°C

Parameter	Unit	Results
pH		8.55
BOD	mg/L	4
COD	mg/L	62
S.S (Suspended Sediment)	mg/L	76
DO	mg/L	7.4
E.Coli	NCMF/mL	4.7x10
Total Nitrogen	mg/L	1.58
Total Phosphorous	mg/L	8.76
N.Hexane Extract (Oil & Grease)	mg/L	32
Chlorine	mg/L	86

4.67 Material tested: Effluent E-092

Sampling Location : Motoguia plant effluent collected at treatment system's outlet.

Date of Sampling: January 12, 2000 - Time: 10:30h

Environmental Conditions: Sample Temp: 26.9°C - Air Temp: 32.5°C

Parameter	Unit	Results
PH		7.96

BOD	mg/L	7
COD	mg/L	19
S.S (Suspended Sediment)	mg/L	42.5
DO	mg/L	6.98
E.Coli	NCMF/mL	8.4x10
Total Nitrogen	mg/L	1.58
Total Phosphorous	mg/L	0
N.Hexane Extract (Oil & Grease)	mg/L	38.0
Chlorine	mg/L	602.7

4 **.68** Material tested: Effluent E-093

Sampling Location : Residential Efluent collected at Compesa`s very close Desembargador João Paes street nr 197 Boa Viagem; "class A".

Date of Sampling: January 12, 2000 Time: 11:30h

Environmental Conditions: Sample Temp: 29.8 Air Temp: 32.1°C

Parameter	Unit	Results
pH		6.49
BOD	mg/L	397
COD	mg/L	1074
S.S (Suspended Sediment)	mg/L	395
DO	mg/L	0
E.Coli	NCMF/mL	$4.1x10^2$
Total Nitrogen	mg/L	21.1
Total Phosphorous	mg/L	11.2
N.Hexane Extract (Oil & Grease)	mg/L	114
Chlorine	mg/L	150.7

4 **.69** Material tested: Effluent E-096

Sampling Location : Residential effluent collected at Vila Rica - Jaboatão ; "class C".

Date of Sampling: December 12, 1999 Time: 15:00h.

Environmental Conditions: Sample Temp: 31.2°C Air Temp: 31.4°C

Parameter	Unit	Results
pH		6.49
BOD	mg/L	708
COD	mg/L	1613
S.S (Suspended Sediment)	mg/L	330
DO	mg/L	0
E.Coli	NCMF/mL	$9.3x10^{10}$
Total Nitrogen	mg/L	88
Total Phosphorous	mg/L	22.6

N.Hexane Extract (Oil & Grease)	mg/L	182
Chlorine	mg/L	17.0

4.70 Material tested: Effluent E-097

Sampling Location : Alcoa Plant effluent collected at treatment system's outlet.

Date of Sampling: January 13, 2000 - Time: 15:35h

Environmental Conditions: Sample Temp: 31.8°C - Air Temp: 32.5°C

Parameter	Unit	Results
pH		7.55
BOD	mg/L	10
COD	mg/L	35
S.S (Suspended Sediment)	mg/L	0
DO	mg/L	5.5
E.Coli	NCMF/mL	2.5x10
Total Nitrogen	mg/L	4.7
Total Phosphorous	mg/L	0.16
N.Hexane Extract (Oil & Grease)	mg/L	56.0
Chlorine	mg/L	160

4.71 Material tested: Sediment S-002

Sampling Location : Sediment from Capibaribe river under Princesa Isabel bridge.

Date of Sampling: December 21, 1999 - Time: 9:00 AM

Parameter	Unit	Results
Cadmium	mg/kg	1.96
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.04
Lead	mg/kg	32.4
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	Not detected
Total Mercury	mg/kg	0.35
PCB	µg/kg	< 216
Total Nitrogen	mg/kg	0.37
Total Phosphorous	mg/kg	714.1
Ignition Loss	%	20.51

4 .72 Material tested: Sediment S-004

Sampling Location : Sediment collected at capibaribe river under bridge on Av. Caxangá.

Date of Sampling: December 21, 1999 - Time: 10:15 AM

Parameter	Unit	Results
Cadmium	mg/kg	1.25
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.003
Lead	mg/kg	63.2
Chromium (Hexavalent)	mg/kg	0.81
Arsenic	mg/kg	0.23
Total Mercury	mg/kg	1.60
PCB	µg/kg	< 239
Total Nitrogen	mg/kg	1.13
Total Phosphorous	mg/kg	1683.6
Ignition Loss	%	20.03

4 .73 Material tested: Sediment S-006

Sampling Location : Sediment collected at Capibaribe river under bridge uptream firm the Tiúma plant.

Date of Sampling: December 21, 1999 - Time: 11:25 AM

Parameter	Unit	Results
Cadmium	mg/kg	0.78
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.87
Lead	mg/kg	38.2
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	0.12
Total Mercury	mg/kg	1.81
PCB	µg/kg	< 291
Total Nitrogen	mg/kg	0.28
Total Phosphorous	mg/kg	1149.2
Ignition Loss	%	26.8

4 .74 Material tested: Sediment S-020

Sampling Location : Sediment from Brahma plant collected at treatment system's decanter.

Date of Sampling: December 29, 1999 - Time: 12:15 PM

Parameter	Unit	Results
Cadmium	mg/kg	Not detected

Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.68
Lead	mg/kg	2.42
Chromium (Hexavalent)	mg/kg	0.53
Arsenic	mg/kg	0.001
Total Mercury	mg/kg	0.15
PCB	µg/kg	< 1675
Total Nitrogen	mg/kg	19
Total Phosphorous	mg/kg	460
Ignition Loss	%	45.5

4 .75 Material tested: Sediment S-024

Sampling Location : Sediment collected at ETE - Peixinho.

Date of Sampling: December 28, 1999 - Time: 11:15 AM

Parameter	Unit	Results
Cadmium	mg/kg	0.93
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.93
Lead	mg/kg	76.3
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	0.008
Total Mercury	mg/kg	10.64
PCB	µg/kg	< 100
Total Nitrogen	mg/kg	0.36
Total Phosphorous	mg/kg	5200
Ignition Loss	%	61.6

4 .76 Material tested: Sediment S-027

Sampling Location : Sediment collected at ETE - Peixinho.

Date of Sampling: December 28, 1999 - Time: 2:15 PM

Parameter	Unit	Results
Cadmium	mg/kg	Not detected
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.63
Lead	mg/kg	1.48
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	0.003
Total Mercury	mg/kg	1.056
PCB	µg/kg	< 353

Total Nitrogen	mg/kg	0.88
Total Phosphorous	mg/kg	1336.1
Ignition Loss	%	67.1

4.77 Material tested: Sediment S-030

Sampling Location : Sediment collected ETE - Peixinho.

Date of Sampling: December 28, 1999 - Time: 4:45 PM

Parameter	Unit	Results
Cadmium	mg/kg	2.11
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	1.3
Lead	mg/kg	63.1
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	0.009
Total Mercury	mg/kg	8.08
PCB	µg/kg	< 957
Total Nitrogen	mg/kg	1.44
Total Phosphorous	mg/kg	1132
Ignition Loss	%	68.9

4.78 Material tested: Sediment S-037

Sampling Location : Sediment from Ipojuca river collected at river's estuary at low tide.

Date of Sampling: January 04, 2000 - Time: 10:45 AM

Parameter	Unit	Results
Cadmium	mg/kg	0.91
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	8
Lead	mg/kg	33.7
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	0.38
Total Mercury	mg/kg	0.32
PCB	µg/kg	< 223
Total Nitrogen	mg/kg	0.2
Total Phosphorous	mg/kg	1331.2
Ignition Loss	%	21.6

4.79 Material tested: Sediment S-039

Sampling Location : Sediment collected downstream at RMK pollution area.

Date of Sampling: January 04, 2000 - Time: 12:25 PM

Parameter	Unit	Results
Cadmium	mg/kg	0.039
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	1.3
Lead	mg/kg	6.6
Chromium (Hexavalent)	mg/kg	0.99
Arsenic	mg/kg	0.036
Total Mercury	mg/kg	0.159
PCB	µg/kg	< 99
Total Nitrogen	mg/kg	0.47
Total Phosphorous	mg/kg	373.7
Ignition Loss	%	3.94

4 **.80** Material tested: Sediment S-043

Sampling Location : Sediment collected at Worton-Lixa's plant at centrifuge after.

Date of Sampling: January 04, 2000 - Time: 12:20 PM

Parameter	Unit	Results
Cadmium	mg/kg	0.67
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	9
Lead	mg/kg	22.8
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	0.11
Total Mercury	mg/kg	0.41
PCB	µg/kg	< 279
Total Nitrogen	mg/kg	3.75
Total Phosphorous	mg/kg	22000
Ignition Loss	%	79.1

4 **.81** Material tested: Sediment S-045

Sampling Location : Sediment from Galvatex plant collected at treatment system's.

Date of Sampling: January 04, 2000 - Time: 2:30 PM

Parameter	Unit	Results
Cadmium	mg/kg	0.26
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	1.3
Lead	mg/kg	0.004

Chromium (Hexavalent)	mg/kg	0.07
Arsenic	mg/kg	< 0.01
Total Mercury	mg/kg	0.0048
PCB	µg/kg	< 419
Total Nitrogen	mg/kg	28.9
Total Phosphorous	mg/kg	1.8
Ignition Loss	%	86.04

4 **.82** Material tested: Sediment S-047

Sampling Location : Sediment from Beberibe river collected at river's estuary.

Date of Sampling: January 05, 2000 - Time: 9:30 AM

Parameter	Unit	Results
Cadmium	mg/kg	0.092
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.61
Lead	mg/kg	0.116
Chromium (Hexavalent)	mg/kg	0.01
Arsenic	mg/kg	< 0.01
Total Mercury	mg/kg	0.0041
PCB	µg/kg	< 160
Total Nitrogen	mg/kg	16.9
Total Phosphorous	mg/kg	2.4
Ignition Loss	%	57.2

4 **.83** Material tested: Sediment S-049

Sampling Location : Sediment from Beberibe river collected downstream.

Date of Sampling: January 05, 2000 - Time: 10:30 AM

Parameter	Unit	Results
Cadmium	mg/kg	0.36
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.20
Lead	mg/kg	0.02
Chromium (Hexavalent)	mg/kg	0.05
Arsenic	mg/kg	< 0.01
Total Mercury	mg/kg	0.0066
PCB	µg/kg	< 223
Total Nitrogen	mg/kg	54
Total Phosphorous	mg/kg	0.8
Ignition Loss	%	75.93

4 **.84** Material tested: Sediment S-051

Sampling Location : Sediment from Beberibe river collected upstream.

Date of Sampling: January 05, 2000 - Time: 12:45 PM

Parameter	Unit	Results
Cadmium	mg/kg	0.044
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.23
Lead	mg/kg	0.008
Chromium (Hexavalent)	mg/kg	0.01
Arsenic	mg/kg	< 0.01
Total Mercury	mg/kg	0.0046
PCB	µg/kg	< 96
Total Nitrogen	mg/kg	61.6
Total Phosphorous	mg/kg	0.31
Ignition Loss	%	44.69

4 **.85** Material tested: Sediment S-054

Sampling Location : Sediment from ETE - Janga collected at treatment system's.

Date of Sampling: January 05, 2000 - Time: 10:40 AM

Parameter	Unit	Results
Cadmium	mg/kg	0.086
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	1.3
Lead	mg/kg	0.023
Chromium (Hexavalent)	mg/kg	0.02
Arsenic	mg/kg	< 0.01
Total Mercury	mg/kg	0.19
PCB	µg/kg	< 100
Total Nitrogen	mg/kg	38.5
Total Phosphorous	mg/kg	2.9
Ignition Loss	%	84.4

4 **.86** Material tested: Sediment S-057

Sampling Location : Sediment from ETE - Janga collected at treatment system's.

Date of Sampling: January 05, 2000 - Time: 1:30 PM

Parameter	Unit	Results
Cadmium	mg/kg	0.32

Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.13
Lead	mg/kg	0.063
Chromium (Hexavalent)	mg/kg	0.11
Arsenic	mg/kg	< 0.01
Total Mercury	mg/kg	0.0995
PCB	µg/kg	< 100
Total Nitrogen	mg/kg	26.7
Total Phosphorous	mg/kg	0.4
Ignition Loss	%	89.76

4 .87 Material tested: Sediment S-060

Sampling Location : Sediment from ETE - Janga collected at treatment system's.

Date of Sampling: January 05, 2000 - Time: 4:50 PM

Parameter	Unit	Results
Cadmium	mg/kg	2.6
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	7
Lead	mg/kg	68.3
Chromium (Hexavalent)	mg/kg	7.54
Arsenic	mg/kg	0.36
Total Mercury	mg/kg	32.96
PCB	µg/kg	< 2
Total Nitrogen	mg/kg	16.9
Total Phosphorous	mg/kg	22690
Ignition Loss	%	64.7

4 .88 Material tested: Sediment S-065

Sampling Location : Sediment from Jaboatão river, collected at river's estuary.

Date of Sampling: January 06, 2000 - Time: 10:15 AM

Parameter	Unit	Results
Cadmium	mg/kg	0.019
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	6.8
Lead	mg/kg	0.497
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	0.23
Total Mercury	mg/kg	0.23
PCB	µg/kg	< 126
Total Nitrogen	mg/kg	3.6
Total Phosphorous	mg/kg	880.2

Ignition Loss	%	10.06

4 .**89** Material tested: Sediment S-067

Sampling Location : Sediment from the Jaboatão river collected downstream at pollution area.

Date of Sampling: January 06, 2000 - Time: 1:50 PM

Parameter	Unit	Results
Cadmium	mg/kg	0.56
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	0.4
Lead	mg/kg	33.6
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	0.040
Total Mercury	mg/kg	0.66
PCB	µg/kg	< 2
Total Nitrogen	mg/kg	2.11
Total Phosphorous	mg/kg	326.2
Ignition Loss	%	10.68

4 .**90** Material tested: Sediment S-069

Sampling Location : Sediment from Jaboatão river collected upstream at pollution area.

Date of Sampling: January 06, 2000 - Time: 12:15 PM

Parameter	Unit	Results
Cadmium	mg/kg	0.04
Total Cyanide	mg/kg	< 0.01
Organic Phosphorous	mg/kg	2
Lead	mg/kg	6.1
Chromium (Hexavalent)	mg/kg	Not detected
Arsenic	mg/kg	0.014
Total Mercury	mg/kg	0.115
PCB	µg/kg	< 103
Total Nitrogen	mg/kg	9.5
Total Phosphorous	mg/kg	136.2
Ignition Loss	%	1.48

4 .**91** Material tested: Sediment S-082

Sampling Location : Sediment from Ipojuca river collected upstream at the RMK pollution

area.

Date of Sampling: January 11, 2000 - Time: 11:00 AM

Parameter	Unit	Results
Cadmium	mg/kg	Not detected
Total Cyanide	mg/kg	< 0.2
Organic Phosphorous	mg/kg	100
Lead	mg/kg	15.53
Chromium (Hexavalent)	mg/kg	1.56
Arsenic	mg/kg	0.066
Total Mercury	mg/kg	0.157
PCB	µg/kg	< 2
Total Nitrogen	mg/kg	408
Total Phosphorous	mg/kg	355
Ignition Loss	%	8.59

4 **.92** Material tested: Sediment S-086

Sampling Location : Sediment from Rafe - Praia Grande.

Date of Sampling: January 11, 2000 - Time: 10:45 AM

Parameter	Unit	Results
Cadmium	mg/kg	3.54
Total Cyanide	mg/kg	< 0.2
Organic Phosphorous	mg/kg	152
Lead	mg/kg	55.5
Chromium (Hexavalent)	mg/kg	6.23
Arsenic	mg/kg	0.31
Total Mercury	mg/kg	47.23
PCB	µg/kg	< 479
Total Nitrogen	mg/kg	2855
Total Phosphorous	mg/kg	2926
Ignition Loss	%	72.39

4 **.93** Material tested: Sediment S-094

Sampling Location : Sediment from Rafe - Praia Grande - Candeias.

Date of Sampling: January 12, 2000 - Time: 12:30 PM

Parameter	Unit	Results
Cadmium	mg/kg	3.57
Total Cyanide	mg/kg	< 0.2
Organic Phosphorous	mg/kg	74

Lead	mg/kg	65.26
Chromium (Hexavalent)	mg/kg	7.63
Arsenic	mg/kg	0.33
Total Mercury	mg/kg	12.84
PCB	µg/kg	< 319
Total Nitrogen	mg/kg	3142
Total Phosphorous	mg/kg	6900
Ignition Loss	%	71.02

4 **.94** Material tested: Sediment S-095

Sampling Location : Sediment from Rafe - Praia Grande - Candeias.

Date of Sampling: January 12, 2000 - Time: 4:00 PM

Parameter	Unit	Results
Cadmium	mg/kg	2.29
Total Cyanide	mg/kg	< 0.2
Organic Phosphorous	mg/kg	188
Lead	mg/kg	49.19
Chromium (Hexavalent)	mg/kg	6.94
Arsenic	mg/kg	0.14
Total Mercury	mg/kg	8.72
PCB	µg/kg	< 2
Total Nitrogen	mg/kg	2068
Total Phosphorous	mg/kg	47900
Ignition Loss	%	65.78

DATA BOOK B

SOIL INVESTIGATIONS

DATA BOOK OF SOIL INVESTIGATIONS

1. CONCEICAO
2. JANGA
3. CABANGA
4. BOA VIAGEM
5. CORDEIRO
6. PRAZERES
7. CURCURANA
8. RESULTS OF LABORATORY TESTS

1. CONCEICAO

PERCUSSION (SPT)			WASHING BY TIME	INFILTRATION STUDY		DEPTH (m)			DESCRIPTION OF THE MATERIAL	REVEST. ◊
— 30cm INITIAL — 30cm LAST BLOWS / 30cm 10 20 30	BLOWS 30 cm INITIAL	LAST	cm/min	TEST Nº	ABSORPTION K= cm/seg	GRAPHICS	CHANGE OF LAYER	CONVENTION GRAPHICS		
	4	5				0,00			Fine sand, not too copact, brownish gray.	◊ = 100mm
	5	5					0,95			
	5	6				2,00				
	6	6					2,46	WL	Same as above, light gray.	
	5	6				4,00				
	34	41					4,65		Fine sand, not very silty, very compact, yellowish gray.	
	30	34				6,00	6,00		Same as above, compact.	
	21	23					6,87			
	16	19				8,00			Fine sand silty, compact, mixed light gray colors.	
	16	18					9,00			
	17	19				10,00			Same as above, averagely compact to compact.	
	20	27								
	38	48/20	4/30			12,00	11,88	DN	Silty clay, hard, dark yellow and greenish gray. (Calcareous alteration)	
							12,60		End of Perforation	
						14,00			IMPENETRABLE BY PERCUSSION - WASHING BY TIME TIME (minutes) ADVANC. (meters) 10 0,02 10 0,01 10 0,01	
						16,00				
						18,00				
						20,00				

OBSERVATION: DN Sample taken from the DENISON method

LOCALIZATION:

COORDINATES	QUOTA:	OPERATOR:	DATE	VERIFIED BY:
N= E=		ABDIAS	I = 28/08/00 F= 28/08/00	

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	PROFILE OF SOIL INVESTIGATION
	LOCATE: CONCEIÇÃO SUB - SYSTEM PAULISTA		SOUNDING Nº SP-13

PERCUSSION (SPT)			WASHING BY TIME	INFILTRATION STUDY		DEPTH (m)			DESCRIPTION OF THE MATERIAL	REVEST.
--- 30cm INITIAL — 30cm LAST BLOWS / 30cm 10 20 30	BLOWS 30 cm INITIAL	 LAST	cm/min	TEST Nº	ABSORPTION K= cm/seg	GRAPHICS	CHANGE OF LAYER	CONVENTION GRAPHICS		
	4	4				0,00			Fine sand, soft, dark gray.	
	5	5					0,78			
	5	6					1,49	W	Fine sand, not too compact, light gray.	
	5	5				2,00				
	6	6				4,00				
	28	33					4,47		Fine sand, not very silt, compact, yellowish gray.	
	30	33				6,00				
	21	27					6,65		Fine sand, silty, with rare fragments of shells, compact, mixed light gray colors.	
	19	24				8,00				
	17	22								
	18	25				10,00				
	9	2					11,15		Fine sand, silty clay, with fragments of shells, soft, mixed light gray colors.	
	2	2				12,00				
	11	13					12,50	DN	Silty clay, firm, dark yellow and greenish gray. - Alteration soil.	
	15	17				14,00				
	17	19								
	19	22				16,00			Same as above, hard. (Calcareous alteration)	
			3/30				16,64		End of Perforation	
						18,00			IMPENETRABLE BY PERCUSSION - WASHING BY TIME TIME (minutes) 10 10 10 ADVANC. (meters) 0,02 0,01 0,00	
						20,00				

φ = 100mm

OBSERVATION: DN Sample taken from the DENISON method

LOCALIZATION:

COORDINATES	QUOTA:	OPERATOR:	DATE	VERIFIED BY:
N= E=		ABDIAS	I = 29/08/00 F= 29/08/00	

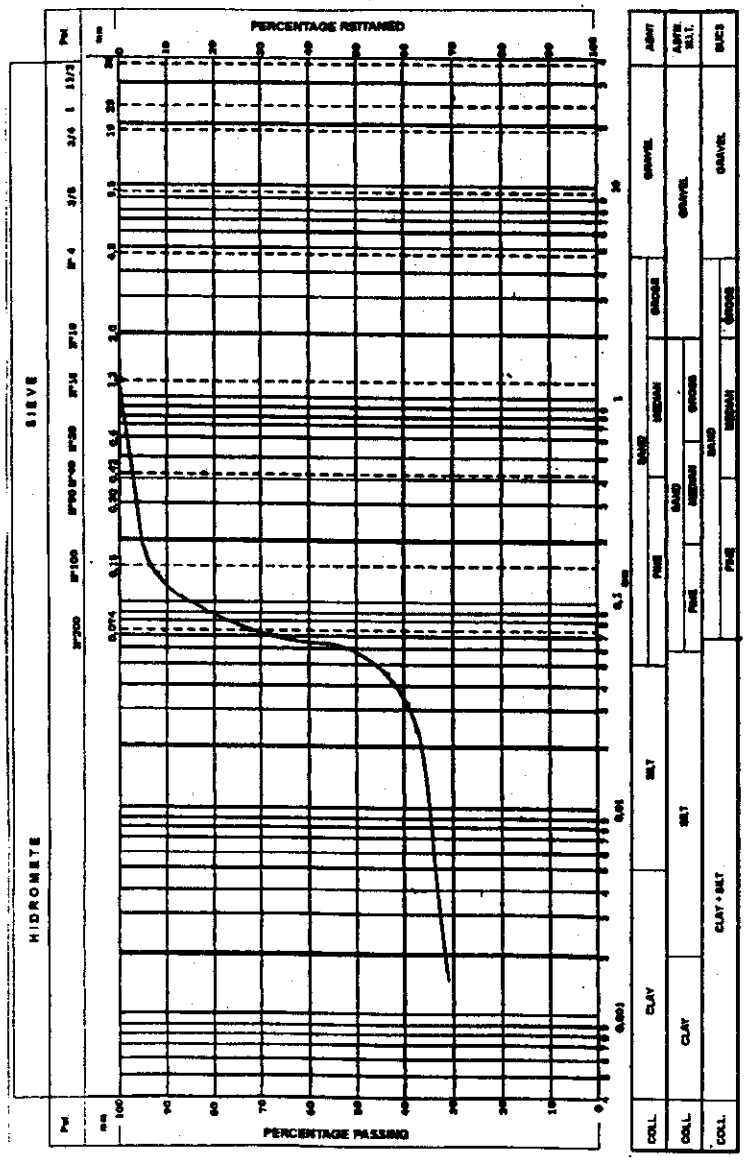
JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	PROFILE OF SOIL INVESTIGATION
	LOCATE: CONCEIÇÃO SUB - SYSTEM PAULISTA		SOUNDING Nº SP-14

Identification	Hole		SP-13	SP-14	SP-14								
	Sample Depth	from	1200	1250	1460								
		to	1260	1310	1510								
	Register Nº		5311	5312	5313								
Gradation Analysis	Sieve - % Total Passing	2"											
		1"											
		3/8											
		Nº 4											
		Nº 8											
		Nº 10											
		Nº 16	100	100									
		Nº 30	99	98	100								
		Nº 40	98	97	99								
		Nº 50	97	96	99								
		Nº 100	95	94	97								
		Nº 200	73	90	94								
	Hidron. %	Silt	13	29	17								
		Clay	35	54	68								
Liquid limit			62	60	86								
Plasticity index			40	38	56								
Degree of contraction													
Specific graerty of soil particles			2,57	2,45	2,55								
Unifed classification			CH	CH	CH								
Uniconfined Compression Test	Water content		28,7	25,8	25,1								
	Compressive Strength (kgf / cm²)		2,30	1,67	1,96								
	Cohesion (kgf / cm²)		1,15	0,83	0,98								
Direct Shear	Cohesion (kgf / cm²)												
	Angle of internal friction (°)												
Free Expanding (%)	Water content												
	Degree of saturation												
	Expanding												
Field	Natural water content		27,5	24,6	24,1								
	Wet density		2,014	1,932	1,947								
	Dryness density												

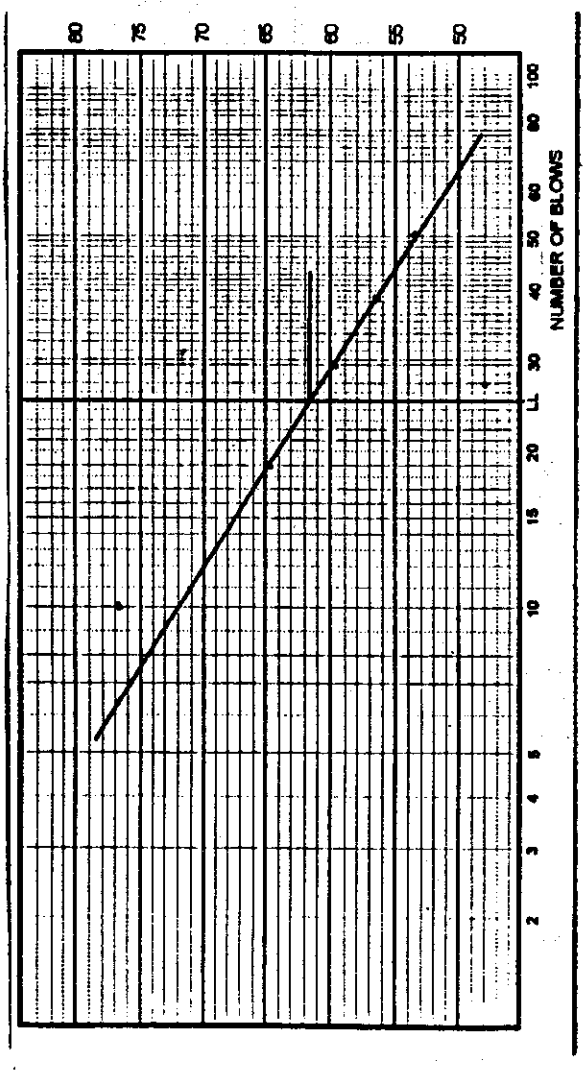
Observation:

JICA	Work: STUDY ON STORNWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	SUMARY OF SOIL TEST
	Locate: CONCEIÇÃO SUB - SYSTEM PAULISTA		PAGE Nº:

PHYSICS AND MECHANICS CHARACTERISTICS	RESULT
NATURAL WATER CONTENT - %	27,5
WET DENSITY - g / cm³	2,014
DRYNESS DENSITY - g / cm³	
GRAVEL	-
SAND — GROSS	-
SAND — MEDIAN	2
SAND — FINE	50
SILT	13
CLAY	36
LIQUID LIMIT	62
PLASTICITY INDEX	40
DEGREE OF CONTRACTION	
SPECIFIC GRAVITY OF SOIL PARTICLES - (g / cm³)	2,57
UNICONFINED COMPRESSION TEST — WATER CONTENT - (%)	28,7
UNICONFINED COMPRESSION TEST — COMPRESSIVE STRENGTH - Kgf / cm²	2,3
DIRECT SHEAR — COHESION - Kgf / cm²	1,15
DIRECT SHEAR — COHESION	
DIRECT SHEAR — ANGLE OF INTERNAL FRICTION	
FREE EXPANDING - % — WATER CONTENT	
FREE EXPANDING - % — DEGREE OF SATURATION	
FREE EXPANDING - % — EXPANDING	
UNIFED CLASSFICATION	CH
OBSERVATION:	



GRADATION ANALYSIS

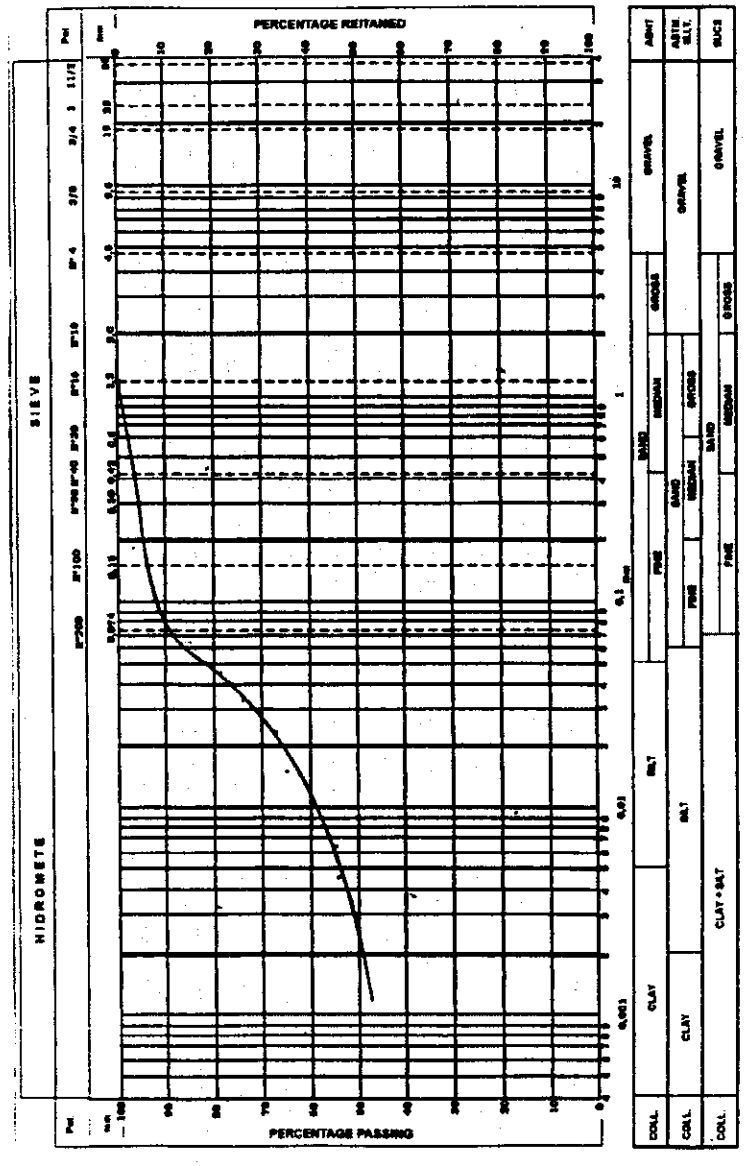


LIQUID LIMIT

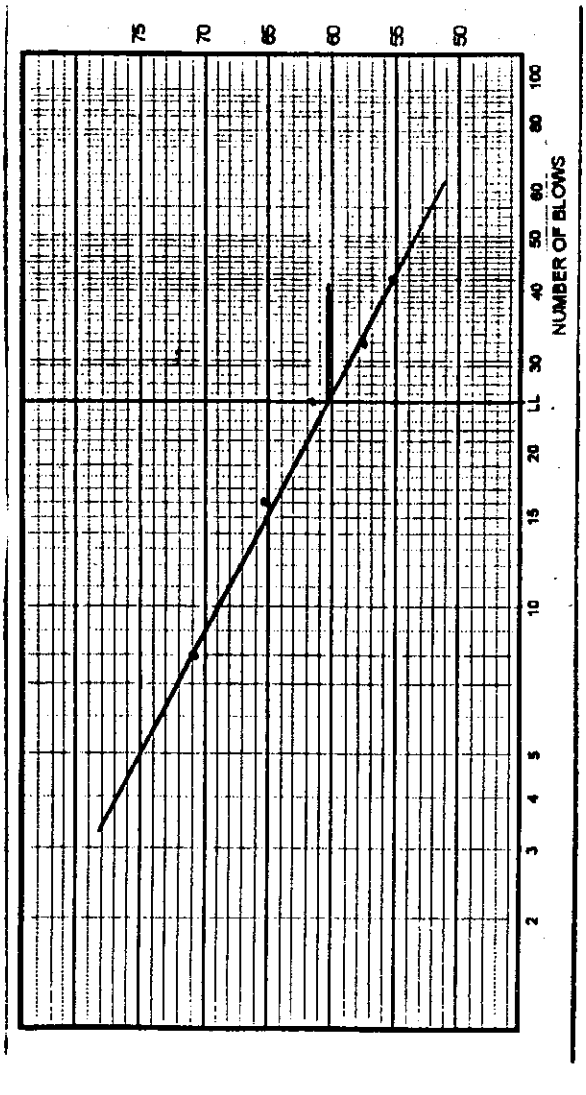
ORIGIN:	HOLE: SP-13	STAKE:	SAMPLES:	POSITION:	SAMPLE DEPTH: 1200 - 1260	DATE:

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	ESSAY GRÁPHIC
	LCOATE: CONCEIÇÃO SUB - SYSTEM PAULISTA		REGISTER Nº: 5311

PHYSICS AND MECHANICS CHARACTERISTICS																					
TEST OR DETERMINATION	NATURAL WATER CONTENT - %	WET DENSITY - g / cm³	DRYNESS DENSITY - g / cm³	GRAVEL	GROSS	MEDIAN	FINE	SILT	CLAY	LIQUID LIMIT	PLASTICITY INDEX	DEGREE OF CONTRACTION	SPECIFIC GRAVITY OF SOIL PARTICLES - (g / cm³)	WATER CONTENT - (%)	COMPRESSIVE STRENGTH - Kgf / cm²	COHESION	COHESION	ANGLE OF INTERNAL FRICTION	WATER CONTENT	DEGREE OF SATURATION	EXPANDING	UNIFIED CLASSIFICATION	OBSERVATION:
RESULT	24,6	1,932			-	3	14	29	54	60	38		2,45	25,8	1,67	0,83						CH	
	FIELD	GRADATION ANALYSIS %								SOIL CONSISTENCY TEST			SPECIFIC GRAVITY OF SOIL PARTICLES - (g / cm³)	UNICONFINED COMPRESSION TEST			DIRECT SHEAR	FREE EXPANDING - %					



GRADATION ANALYSIS

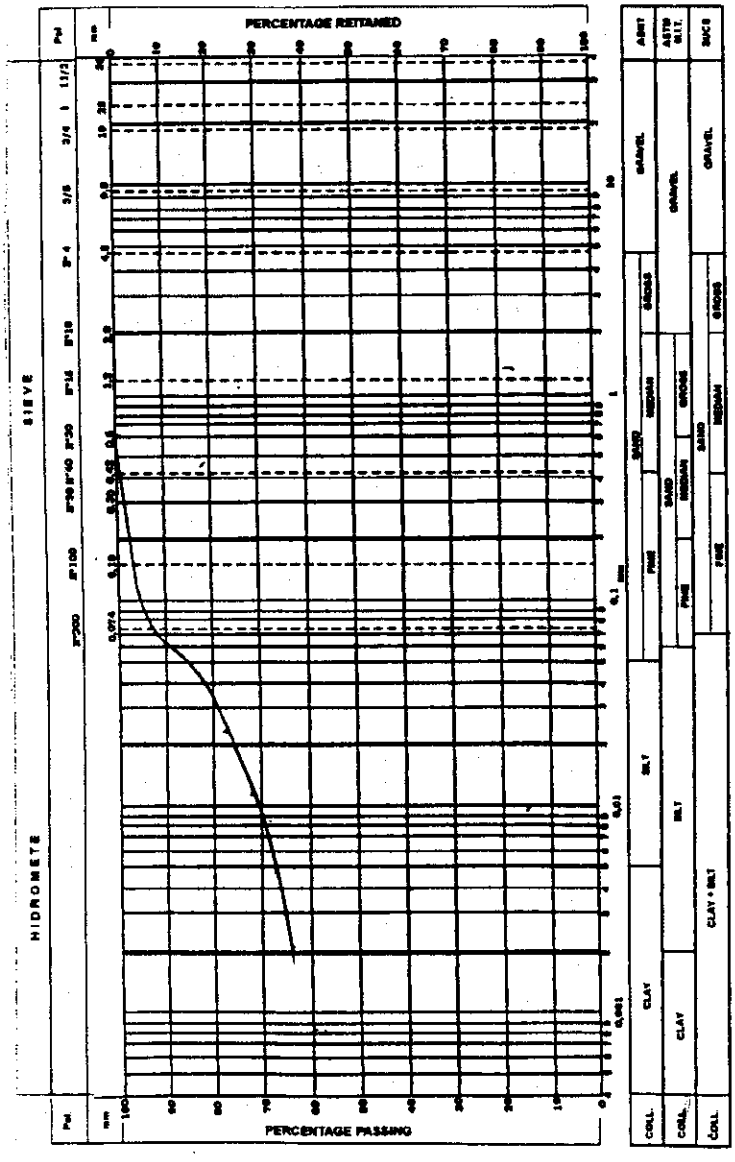


LIQUID LIMIT

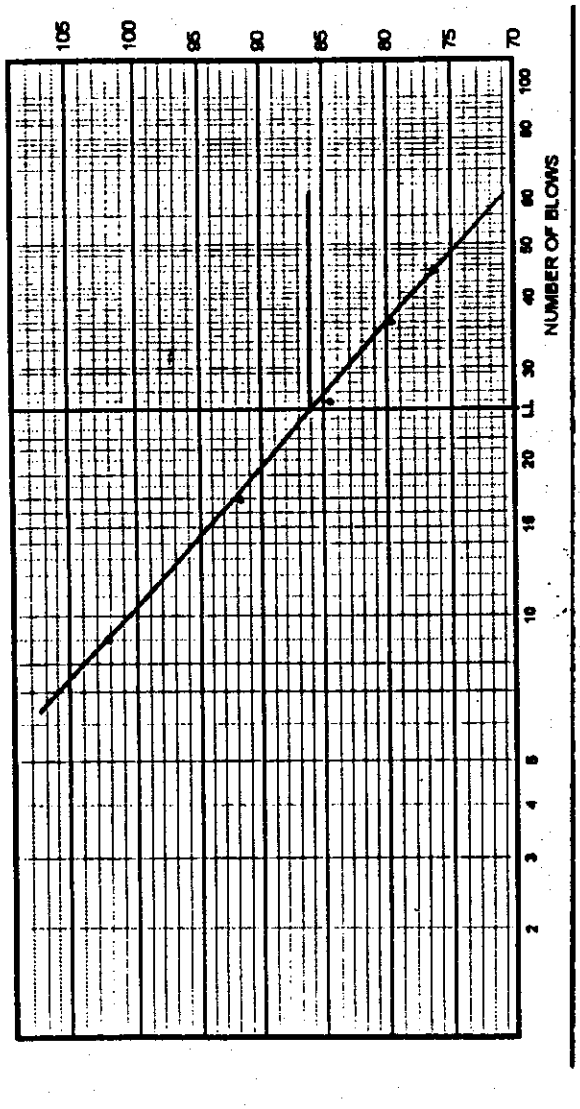
ORIGIN:	HOLE: SP-14	STAKE:	SAMPLES:	POSITION:	SAMPLE DEPTH: 1250 -1310	DATE:

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	ESSAY GRÁPHIC
	LCOATE: CONCEIÇÃO SUB - SYSTEM PAULISTA		REGISTER Nº: 5312

PHYSICS AND MECHANICS CHARACTERISTICS	RESULT
NATURAL WATER CONTENT - %	24,1
WET DENSITY - g / cm³	1,947
DRYNESS DENSITY - g / cm³	
GRAVEL	-
SAND — GROSS	-
SAND — MEDIAN	1
SAND — FINE	14
SILT	17
CLAY	68
LIQUID LIMIT	86
PLASTICITY INDEX	56
DEGREE OF CONTRACTION	
SPECIFIC GRAVITY OF SOIL PARTICLES - (g / cm³)	2,55
UNICONFINED COMPRESSION TEST — WATER CONTENT - (%)	25,1
UNICONFINED COMPRESSION TEST — COMPRESSIVE STRENGTH Kgf / cm²	1,96
UNICONFINED COMPRESSION TEST — COHESION	0,98
DIRECT SHEAR — COHESION	
DIRECT SHEAR — ANGLE OF INTERNAL FRICTION	
FREE EXPANDING - % — WATER CONTENT	
FREE EXPANDING - % — DEGREE OF SATURATION	
FREE EXPANDING - % — EXPANDING	
UNIFIED CLASSFICATION	CH
OBSERVATION:	



GRADATION ANALYSIS

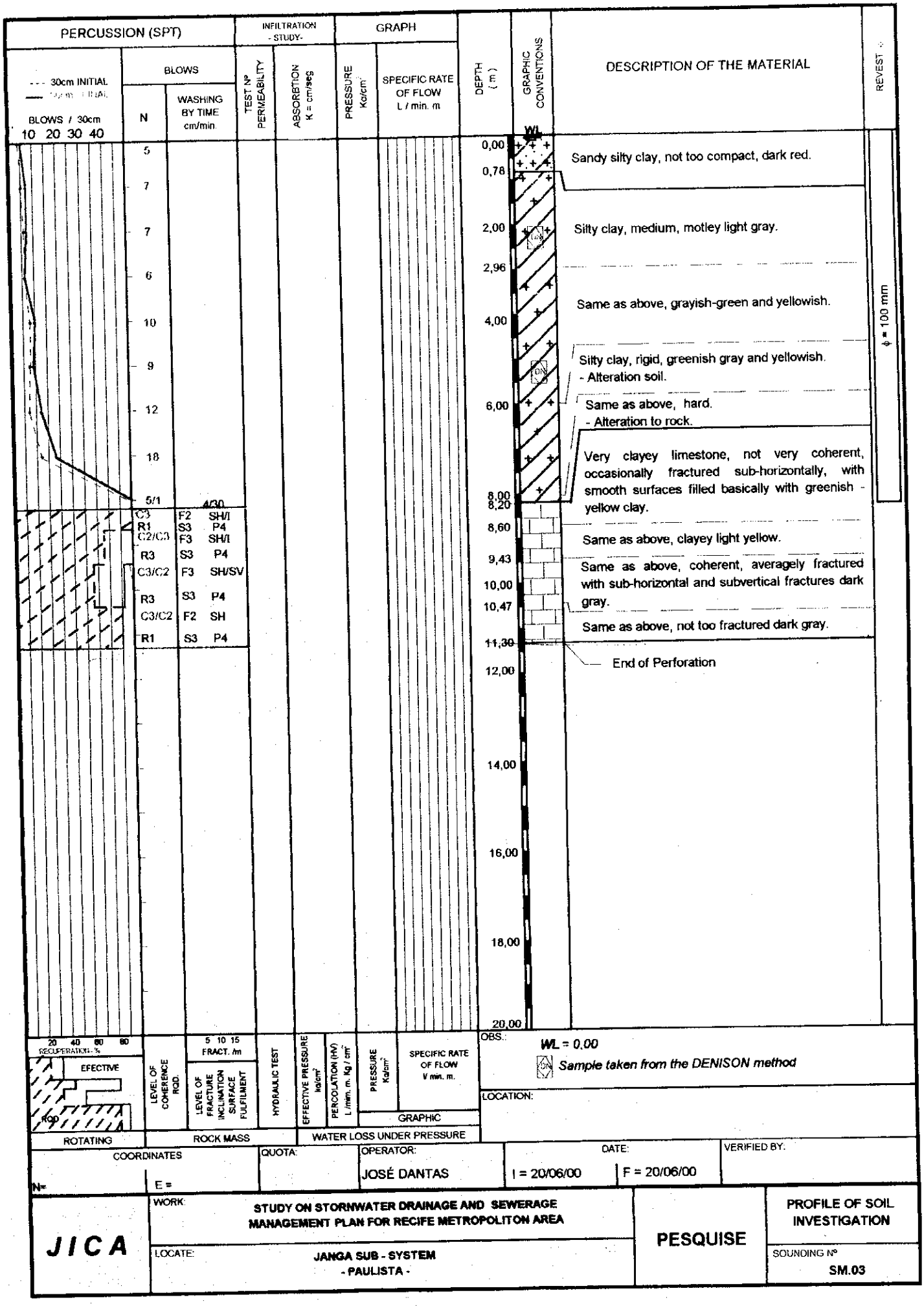


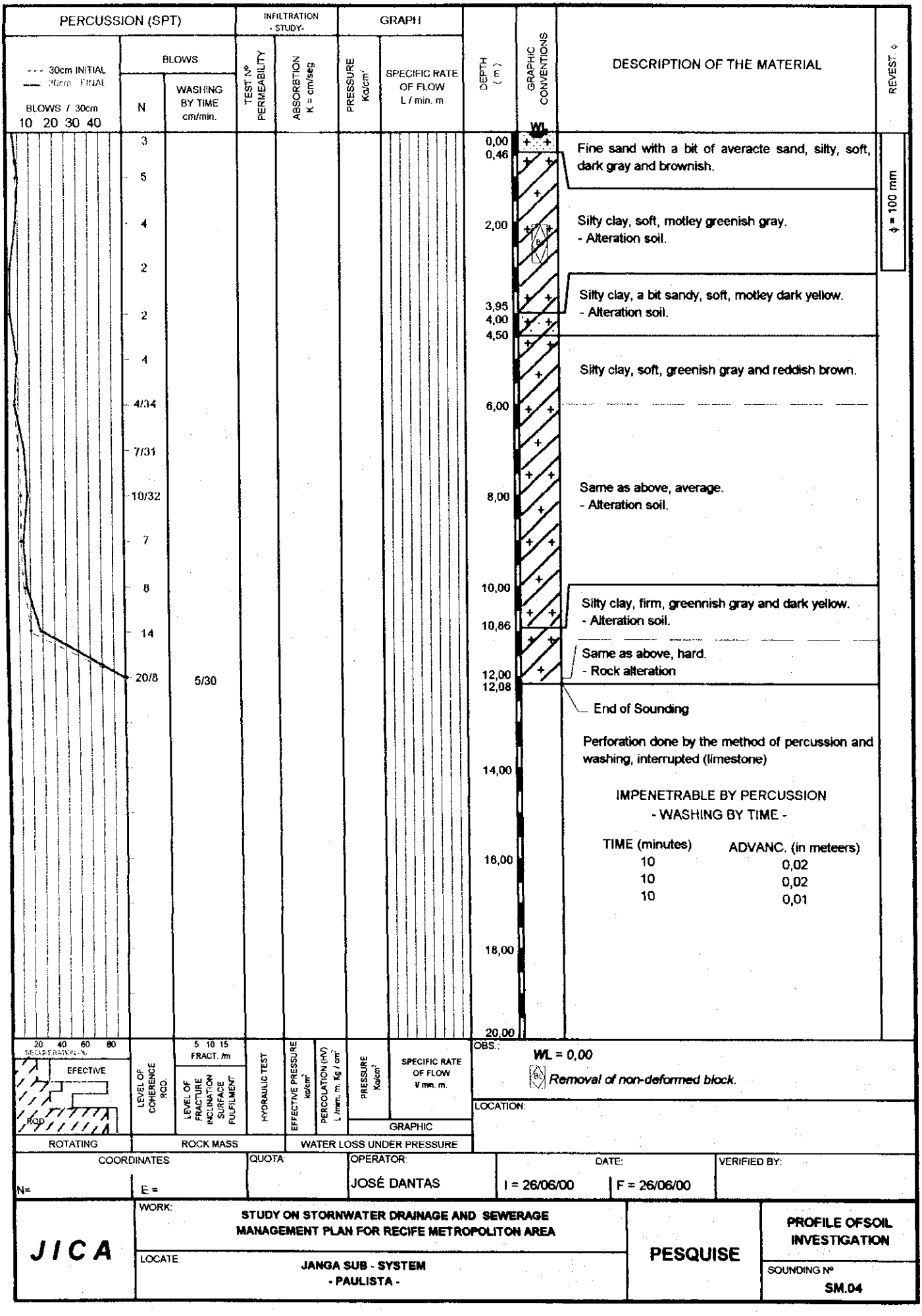
LIQUID LIMIT

ORIGIN:	HOLE: SP-14	STAKE:	SAMPLES:	POSITION:	SAMPLE DEPTH: 1450 - 1510	DATE:

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	ESSAY GRÁPHIC
	LCOATE: CONCEIÇÃO SUB - SYSTEM PAULISTA		REGISTER Nº: 5313

2. JANGA


PERCUSSION (SPT)
INFILTRATION - STUDY-
GRAPH
--- 30cm INITIAL
BLOWS / 30cm
10 20 30 40
BLOWS
N
WASHING BY TIME cm/min
TEST Nº PERMEABILITY
ABSORBTION K = cm/sec
PRESSURE Kg/cm²
SPECIFIC RATE OF FLOW L / min. m
DEPTH (m)
GRAPHIC CONVENTIONS
DESCRIPTION OF THE MATERIAL
REVEST.
WL
0,00
0,78
2,00
2,96
4,00
6,00
8,00
8,20
8,60
9,43
10,00
10,47
11,30
12,00
14,00
16,00
18,00
20,00
5
7
7
6
10
9
12
18
5/1
4/30
Sandy silty clay, not too compact, dark red.
Silty clay, medium, motley light gray.
Same as above, grayish-green and yellowish.
Silty clay, rigid, greenish gray and yellowish.
- Alteration soil.
Same as above, hard.
- Alteration to rock.
Very clayey limestone, not very coherent, occasionally fractured sub-horizontally, with smooth surfaces filled basically with greenish - yellow clay.
Same as above, clayey light yellow.
Same as above, coherent, averagely fractured with sub-horizontal and subvertical fractures dark gray.
Same as above, not too fractured dark gray.
End of Perforation
ϕ = 100 mm
C3 F2 SH/I
R1 S3 P4
C2/C3 F3 SH/I
R3 S3 P4
C3/C2 F3 SH/SV
R3 S3 P4
C3/C2 F2 SH
R1 S3 P4
20 40 60 80
RECUPERATION - %
EFECTIVE
RQD
ROTATING
LEVEL OF COHERENCE RQD.
5 10 15
FRACT. /m
LEVEL OF FRACTURE INCLINATION SURFACE FULFILMENT
ROCK MASS
HYDRAULIC TEST
EFFECTIVE PRESSURE Kg/cm²
PERCOLATION (HV) L /min. m. Kg / cm²
PRESSURE Kg/cm²
SPECIFIC RATE OF FLOW V min. m.
GRAPHIC
WATER LOSS UNDER PRESSURE
OBS.:
WL = 0,00
Sample taken from the DENISON method
LOCATION:
COORDINATES
N=
E =
QUOTA:
OPERATOR:
JOSÉ DANTAS
DATE:
I = 20/06/00
F = 20/06/00
VERIFIED BY:
JICA
WORK:
STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA
LOCATE:
JANGA SUB - SYSTEM
- PAULISTA -
PESQUISE
PROFILE OF SOIL INVESTIGATION
SOUNDING Nº
SM.03


PERCUSSION (SPT)
INFILTRATION - STUDY-
GRAPH
--- 30cm INITIAL
— 30cm FINAL
BLOWS / 30cm
10 20 30 40
BLOWS
N
WASHING BY TIME cm/min.
TEST Nº PERMEABILITY
ABSORBTION K = cm/seg
PRESSURE Kg/cm²
SPECIFIC RATE OF FLOW L / min. m
DEPTH (m)
GRAPHIC CONVENTIONS
DESCRIPTION OF THE MATERIAL
REVEST. Φ
WL
3
5
4
2
2
4
4/34
7/31
10/32
7
8
14
20/8
5/30
0,00
0,46
2,00
3,95
4,00
4,50
6,00
8,00
10,00
10,86
12,00
12,08
14,00
16,00
18,00
20,00
Fine sand with a bit of averacte sand, silty, soft, dark gray and brownish.
Silty clay, soft, motley greenish gray.
- Alteration soil.
Silty clay, a bit sandy, soft, motley dark yellow.
- Alteration soil.
Silty clay, soft, greenish gray and reddish brown.
Same as above, average.
- Alteration soil.
Silty clay, firm, greennish gray and dark yellow.
- Alteration soil.
Same as above, hard.
- Rock alteration
End of Sounding
Φ = 100 mm
Perforation done by the method of percussion and washing, interrupted (limestone)
IMPENETRABLE BY PERCUSSION
- WASHING BY TIME -
TIME (minutes) ADVANC. (in meteers)
10 0,02
10 0,02
10 0,01
20 40 60 80
RECUPERATION %
EFECTIVE
RQD
ROTATING
LEVEL OF COHERENCE RQD
5 10 15
FRACT. /m
LEVEL OF FRACTURE INCLINATION SURFACE FULFILMENT
ROCK MASS
HYDRAULIC TEST
EFFECTIVE PRESSURE Kg/cm²
PERCOLATION (HV) L /min. m. Kg / cm²
WATER LOSS UNDER PRESSURE
PRESSURE Kg/cm²
SPECIFIC RATE OF FLOW V mn. m.
GRAPHIC
OBS.:
WL = 0,00
Removal of non-deformed block.
LOCATION:
COORDINATES
N=
E =
QUOTA:
OPERATOR:
JOSÉ DANTAS
DATE:
I = 26/06/00
F = 26/06/00
VERIFIED BY:
JICA
WORK:
STUDY ON STORNWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA
LOCATE:
JANGA SUB - SYSTEM
- PAULISTA -
PESQUISE
PROFILE OFSOIL INVESTIGATION
SOUNDING Nº
SM.04

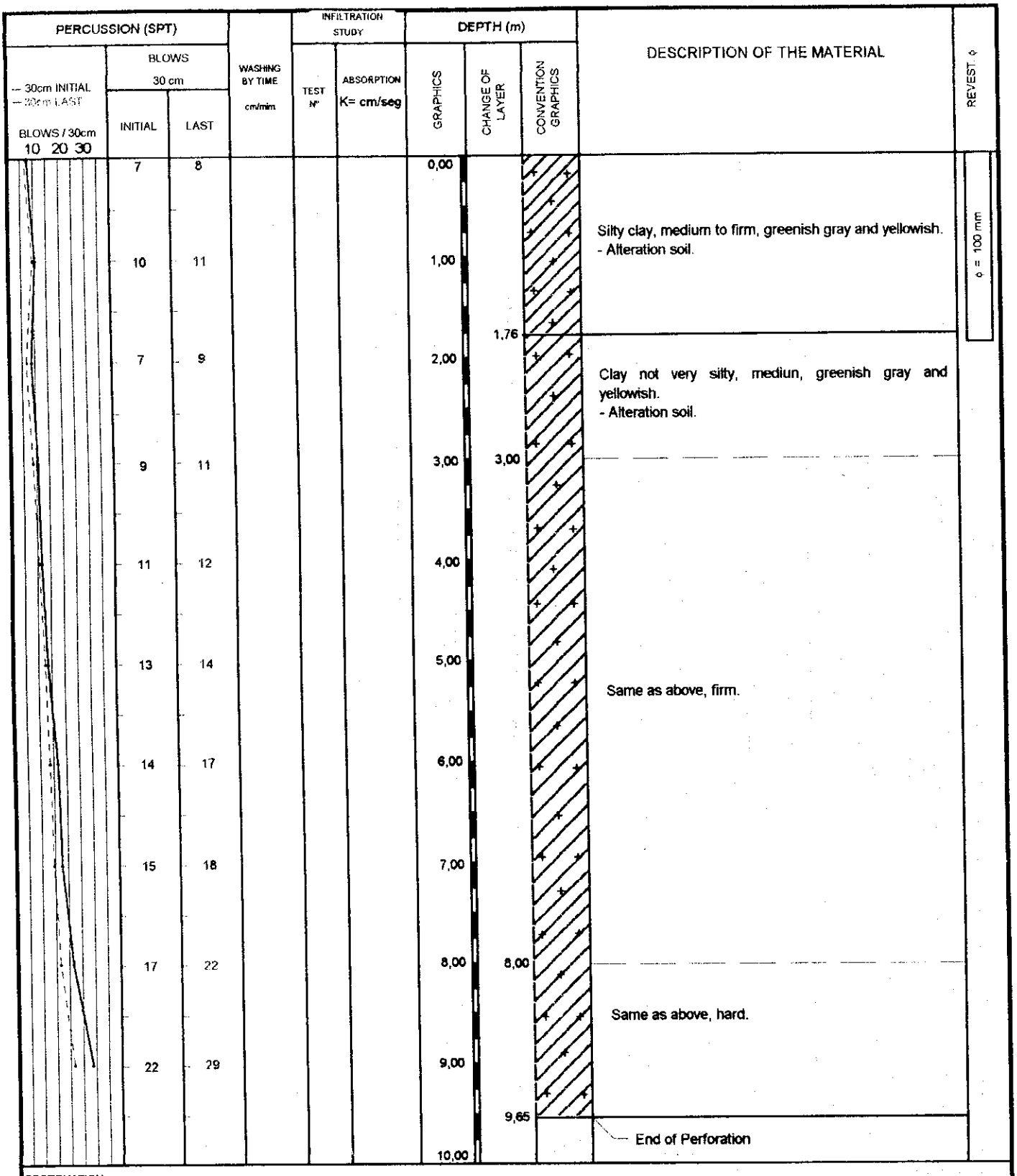
PERCUSSION (SPT)			WASHING BY TIME	INFILTRATION STUDY		DEPTH (m)			DESCRIPTION OF THE MATERIAL	REVEST ◇
-- 30cm INITIAL -- 30cm LAST BLOWS / 30cm 10 20 30	BLOWS 30 cm INITIAL	LAST	cm/min	TEST Nº	ABSORPTION K= cm/seg	GRAPHICS	CHANGE OF LAYER	CONVENTION GRAPHICS		
	6	7				0,00	0,20		Sandy clay silt, not too compact, motley light red.	◇ = 100 mm
	7	9				1,00	0,65		Clay sandy silt, medium, dark yellow and greenish.	
	8	11				2,00	1,85		Silty clay, medium, greenish gray and dark red. - Alteration soil.	
	10	13				3,00				
	9	11				4,00			Silty clay, firm, greenish gray and dark yellow.	
	11	12				5,00				
	10	13				6,00				
	14	17				7,00				
	19	24				8,00	8,00		Same as above, hard. - Alteration soil.	
			5/30			9,00	8,85		End of Perforation IMPENETRABLE BY PERCUSSION - WASHING BY TIME TIME (minutes) / ADVANC. (meters) 10 / 0,02 10 / 0,02 10 / 0,01	
						10,00				

OBSERVATION:

LOCALIZATION:

COORDINATES	QUOTA:	OPERATOR:	DATE	VERIFIED BY:
N= E=		ABDIAS	I = 28/06/00 F= 28/06/00	

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	PROFILE OF SOIL VESTIGATION
	LOCATE: JANGA SUB - SYSTEM - PAULISTA -		SOUNDING Nº SP.05



OBSERVATION: **DRY HOLE**

LOCALIZATION:

COORDINATES	QUOTA:	OPERATOR:	DATE	VERIFIED BY:
N= E=		ABDIAS	I = 26/06/00 F= 29/06/00	

JICA	WORK: STUDY ON STORNWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	PROFILE OF SOIL INVESTIGATION
	LOCATE: JANGA SUB - SYSTEM - PAULISTA -		SOUNDING Nº SP-06

PERCUSSION (SPT)			WASHING FOR TIME	INFILTRATION STUDY		DEPTH (m)			DESCRIPTION OF THE MATERIAL	REVEST. ϕ
— 30cm INITIAL BLOWS / 30cm 10 20 30	BLOWS 30 cm INITIAL	LAST	cm/min	TEST Nº	ABSORPTION K= cm/seg	GRAPHICS	CHANGE OF LAYER	CONVENTION GRAPHICS		ϕ = 100 mm
	6	7				0,00			Silty clay, medium, greenish gray and yellowish.	
	7	9					0,93		Silty clay, medium, greenish gray and reddish yellow. - Alteration soil.	
	7	10				2,00				
	4	5					2,52		Silty clay, soft, mixed light, gray colors.	
	4	4				4,00				
	5	8					4,65		Same as above, medium, greenish gray and dark yellow. - Alteration soil.	
	8	9				6,00				
	9	10								
	8	9				8,00				
	11	13					8,58		Same as above, firm to hard.	
	15	17				10,00				
	18	22					11,87		End by Perforation	
						12,00				
						14,00				
						16,00				
						18,00				
						20,00				

OBSERVATION: **- DRY HOLE**

LOCALIZATION:

COORDINATES	QUOTA:	OPERATOR:	DATE	VERIFIED BY:
N= E=			I = 29/06/00 F= 29/06/00	

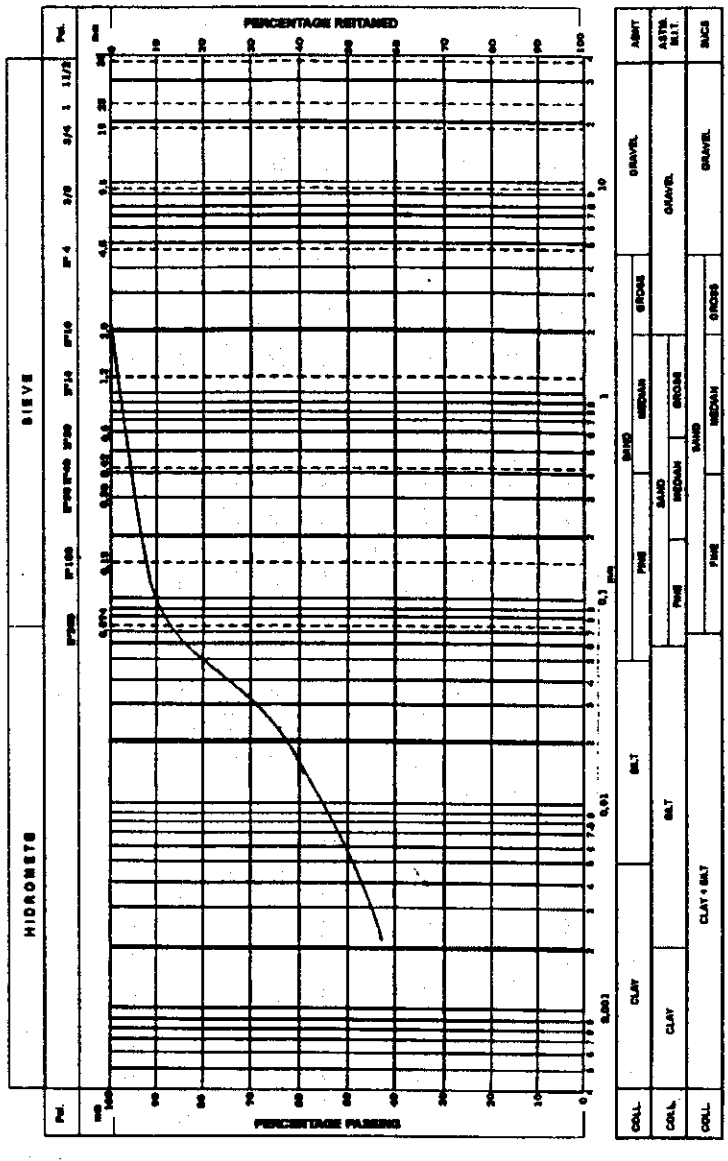
JICA	WORK: **STUDY ON STORNWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA**	PESQUISE	**PROFILE OF SOIL INVESTIGATION**
	LOCATE: **JANGA SUB - SYSTEM - PAULISTA -**		SOUNDING Nº SP-07

Identification	Hole		SM-03	SM-03	SM-04								
	Sample Depth	from	200	500	250								
		to	250	550	280								
	Register N°		5277	5278	5284								
Gradation Analysis	Sieve - % Total Passing	2"											
		1"											
		3/8											
		N° 4											
		N° 8											
		N° 10	100										
		N° 16	98										
		N° 30	96										
		N° 40	94										
		N° 50	92		100								
		N° 100	92		98								
		N° 200	87	100	96								
	Hidron. %	Silt	38	24	24								
		Clay	49	76	72								
Liquid limit			66	80	78								
Plasticity index			33	53	50								
Degree of contraction			-	-	-								
Specific graerty of soil particles			2,45	2,25	2,31								
Unifed classification			MH	CH	CH								
Uniconfined Compression Test	Water content		26,7	36,8	-								
	Compressive Strength (kgf / cm²)		1,99	0,94	-								
	Cohesion (kgf / cm²)		0,99	0,47	-								
Direct Shear	Cohesion (kgf / cm²)		-	-	0,10								
	Angle of internal friction (°)		-	-	25								
Free Expanding (%)	Water content		-	-	8,69								
	Degree of saturation		-	-	37								
	Expanding		-	-	29								
Field	Natural water content		26,4	37,9	29,0								
	Wet density		1,928	1,940	1,873								
	Dryness density		1,525	1,407	1,452								

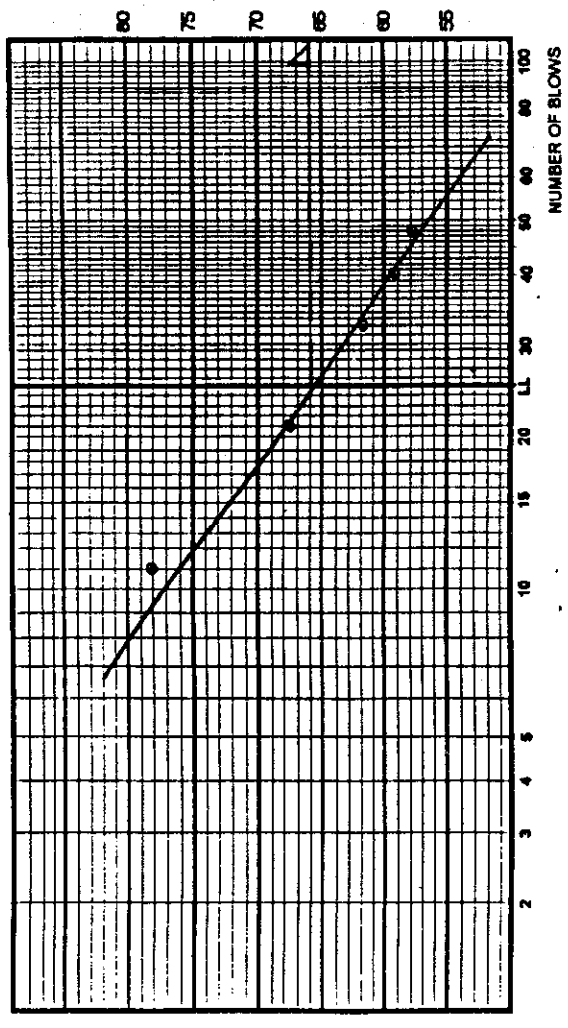
Observation:

JICA	Work: STUDY ON STORNWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	SUMARY OF SOIL TEST
	Locate: JANGA SUB - SYSTEM PAULISTA		PAGE N° :

PHYSICS AND MECHANICS CHARACTERISTICS	RESULT
NATURAL WATER CONTENT - %	37,9
WET DENSITY - g / cm³	1,94
DRYNESS DENSITY - g / cm³	1,407
GRAVEL	-
SAND — GROSS	-
SAND — MEDIAN	-
SAND — FINE	-
SILT	24
CLAY	76
LIQUID LIMIT	80
PLASTICITY INDEX	53
DEGREE OF CONTRACTION	-
SPECIFIC GRAVITY OF SOIL PARTICLES - (g/cm³)	2,25
UNICONFINED COMPRESSION TEST — WATER CONTENT - (%)	36,8
UNICONFINED COMPRESSION TEST — COMPRESSIVE STRENGTH (Kgf / cm²)	0,94
UNICONFINED COMPRESSION TEST — COHESION (Kgf / cm²)	0,47
DIRECT SHEAR — COHESION (Kgf / cm²)	-
DIRECT SHEAR — ANGLE OF INTERNAL FRICTION	-
FREE EXPANDING - % — WATER CONTENT	-
FREE EXPANDING - % — DEGREE OF SATURATION	-
FREE EXPANDING - % — EXPANDING	-
UNIFIED CLASSIFICATION	CH
OBSERVATION:	



GRADATION ANALYSIS

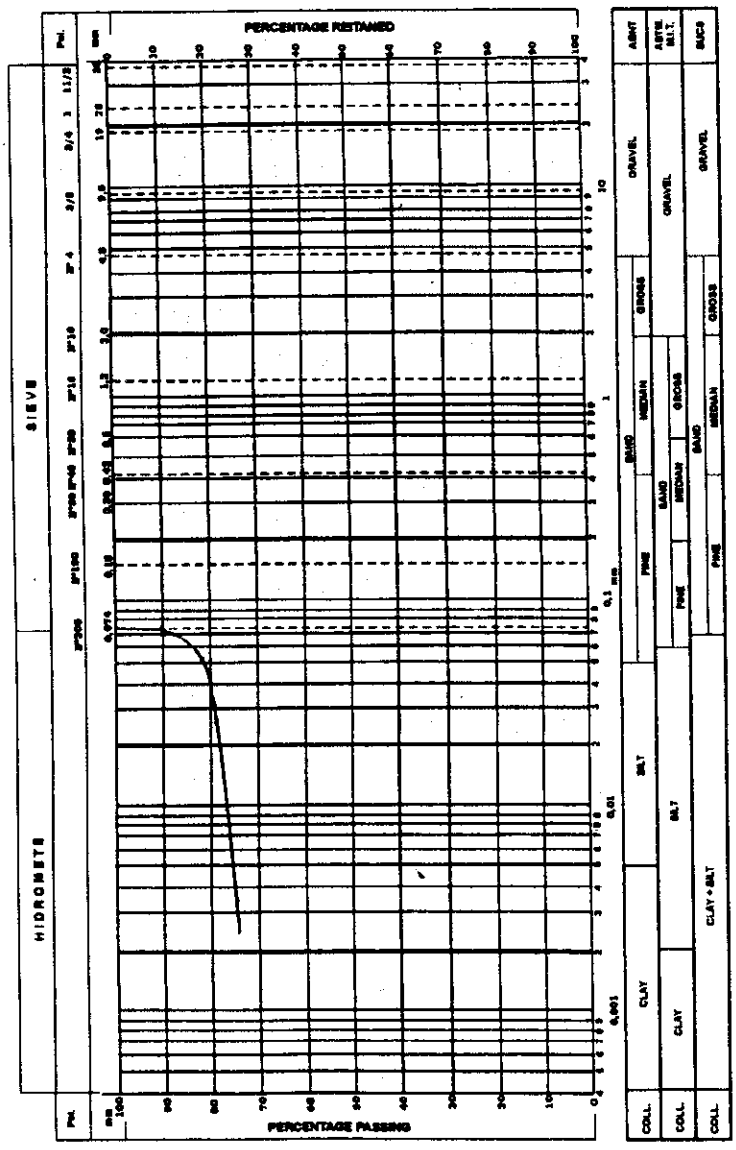


LIQUID LIMIT

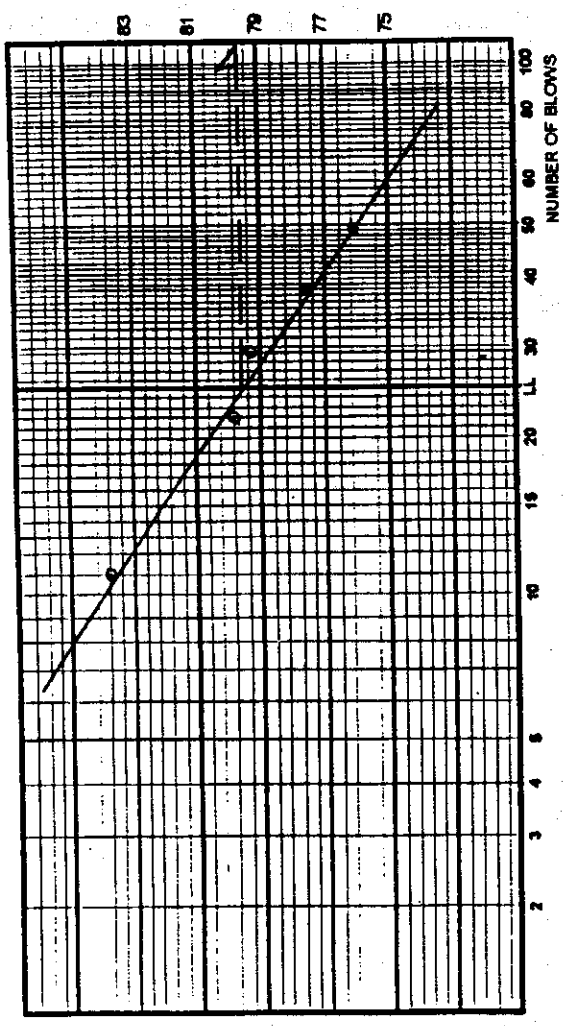
ORIGIN:	HOLE: SM-03	STAKE:	SAMPLES:	POSITION:	SAMPLE DEPTH: 200 - 250	DATE:

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	ESSAY GRÁPHIC
	LCOATE: JANGA SUB - SYSTEM PAULISTA		REGISTER Nº: 5277

PHYSICS AND MECHANICS CHARACTERISTICS		
TEST OR DETERMINATION		RESULT
FIELD	NATURAL WATER CONTENT - %	37,9
	WET DENSITY - g / cm³	1,940
	DRYNESS DENSITY - g / cm³	1,407
GRADATION ANALYSIS %	GRAVEL	-
	SAND — GROSS	-
	SAND — MEDIAN	-
	SAND — FINE	-
	SILT	24
	CLAY	76
SOIL CONSISTENCY TEST	LIQUID LIMIT	80
	PLASTICITY INDEX	53
	DEGREE OF CONTRACTION	-
SPECIFIC GRAVITY OF SOIL PARTICLES - (g / cm³)		2,25
UNICONFINED COMPRESSION TEST	WATER CONTENT - (%)	36,8
	COMPRESSIVE STRENGTH Kgf / cm²	0,94
	COHESION	0,47
DIRECT SHEAR	COHESION	-
	ANGLE OF INTERNAL FRICTION	-
FREE EXPANDING - %	WATER CONTENT	-
	DEGREE OF SATURATION	-
	EXPANDING	-
UNIFIED CLASSIFICATION		CH
OBSERVATION:		



GRADATION ANALYSIS

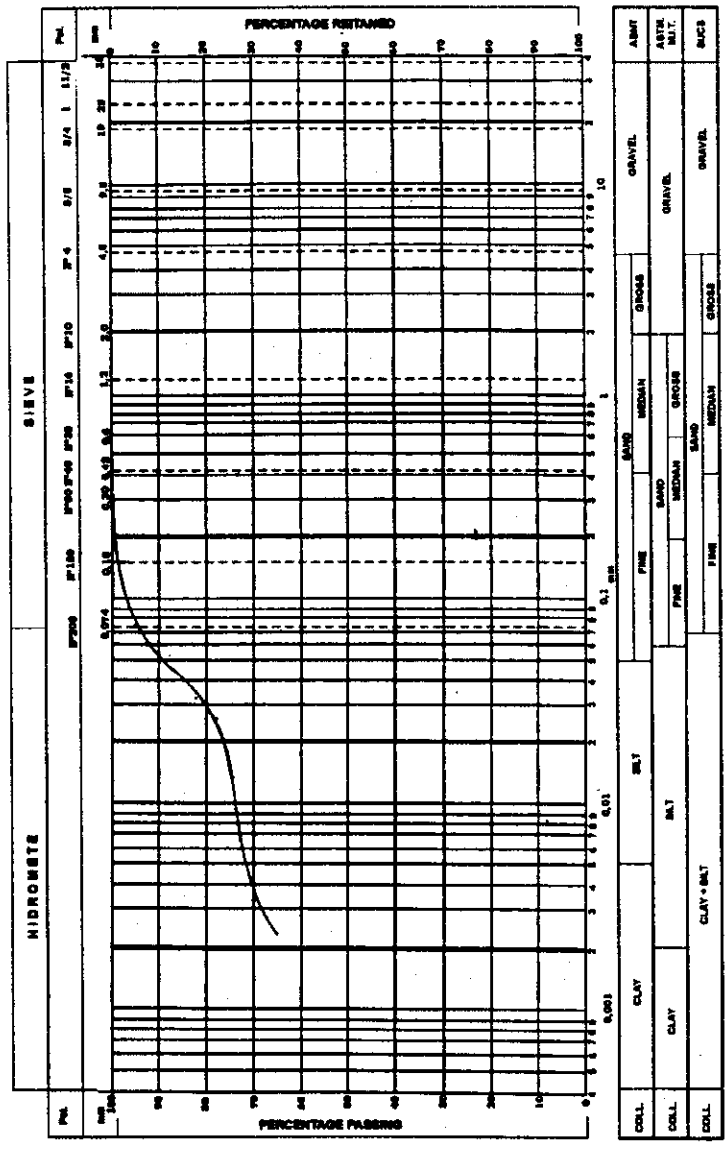


LIQUID LIMIT

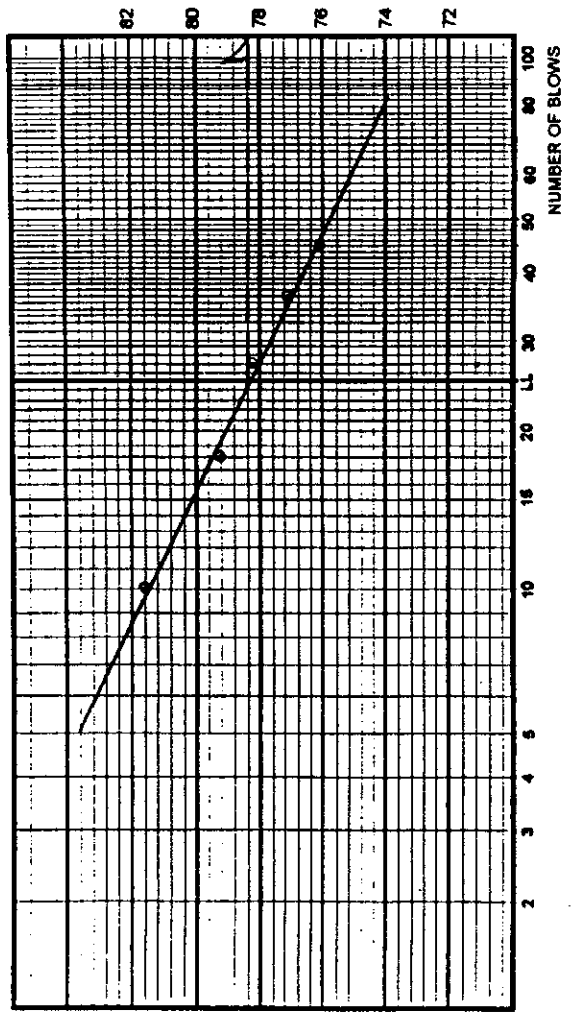
ORIGIN:	HOLE: SM-03	STAKE:	SAMPLES:	POSITION:	SAMPLE DEPTH: 500 - 550	DATE:

JICA	WORK: STUDY ON STORNWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	ESSAY GRÁPHIC
	LCOATE: JANGA SUB - SYSTEM PAULISTA		REGISTER Nº: 5278

PHYSICS AND MECHANICS CHARACTERISTICS	RESULT	OBSERVATION
NATURAL WATER CONTENT - %	29,0	
WET DENSITY - g / cm³	1,873	
DRYNESS DENSITY - g / cm³	1,452	
GRAVEL	-	
SAND — GROSS	-	
SAND — MEDIAN	-	
SAND — FINE	4	
SILT	24	
CLAY	72	
LIQUID LIMIT	78	
PLASTICITY INDEX	50	
DEGREE OF CONTRACTION	-	
SPECIFIC GRAVITY OF SOIL PARTICLES - (g / cm³)	-	
UNICONFINED COMPRESSION TEST — WATER CONTENT - (%)	2,31	
UNICONFINED COMPRESSION TEST — COMPRESSIVE STRENGTH (Kgf / cm²)	-	
UNICONFINED COMPRESSION TEST — COHESION (Kgf / cm²)	-	
DIRECT SHEAR — COHESION (Kgf / cm²)	0,10	
DIRECT SHEAR — ANGLE OF INTERNAL FRICTION	25	
FREE EXPANDING - % — WATER CONTENT	8,69	
FREE EXPANDING - % — DEGREE OF SATURATION	37	
FREE EXPANDING - % — EXPANDING	29	
UNIFIED CLASSIFICATION	CH	



GRADATION ANALYSIS



LIQUID LIMIT

ORIGIN:	HOLE: SM-04	STAKE:	SAMPLES:	POSITION:	SAMPLE DEPTH: 250 - 280	DATE:

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	ESSAY GRÁPHIC
	LCOATE: JANGA SUB - SYSTEM PAULISTA		REGISTER Nº: 5284

3. CABANGA

PERCUSSION (SPT)			WASHING BY TIME	INFILTRATION STUDY		DEPTH (m)			DESCRIPTION OF THE MATERIAL	REVEST. ϕ
— 30cm INITIAL → 30cm LAST BLOWS / 30cm 10 20 30	BLOWS 30 cm INITIAL	LAST	cm/min	TEST N°	ABSORPTION K= cm/seg	GRAPHICS	CHANGE OF LAYER	CONVENTION GRAPHICS		
	2	4				0,00			Fine and average sand, silty clay, with a bit small rocks, soft, dark yellow. - LANDING -	ϕ = 100 mm
	8	9					0,65		Average and fine sand, silty clay, soft, mixed light gray colors.	
	1/65						0,95		Fine sand, silty, averagely compact, dark yellow.	
	1/59					2,00	1,90		Fine and average, silty clay, soft, dark gray.	
	4	5					2,25		Silty clay, with traces of organics material and few fragments of shells, very soft, dark gray.	
	1/53					4,00	2,85		Fine and average sand, not very silty, not too compact, mixed light gray colors and dark.	
	2	2					3,97		Silty clay, with traces of organics material and few fragments of shells, very soft, dark gray.	
	1/50					6,00	4,60		Same as above, soft.	
	1/58						6,00		Organic clay with peat, very soft, dark brown and black.	
	4	5				8,00	6,85		Silty clay, with traces of organic material and fragments of shells, very soft, dark gray.	
	5	6					8,00		Sand clay, soft, greenish gray.	
	3	5				10,00	8,63		Same as above, medium.	
	5	5					10,00		Fine and average sand, silty, a bit clay, not too compact, greenish gray.	
	5	6				12,00	10,95		Average and fine sand, silty clay, not too compact, greenish gray.	
	9	12					12,50		Silty clay, firm, greenish gray and light yellow.	
	11	12				14,00	13,75		Fine sand, silty, averagely compact, motley light yellow.	
	9	11				16,00	18,85			
	12	15								
	13	13				18,00				
	11	12								
	13	13				20,00				

OBSERVATION: Taken from a SHELBY sample

LOCALIZATION:

COORDINATES	QUOTA:	OPERATOR:	DATE	VERIFIED BY:
N= E=		HERONIDES	I = 19/06/00 F= 21/06/00	

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	PROFILE OF SOIL INVESTIGATION
	LOCATE: CABANGA SUB - SYSTEM RECIFE		SOUNDING N° SP.01

PERCUSSION (SPT)			WASHING BY TIME	INFILTRATION STUDY		DEPTH (m)			DESCRIPTION OF THE MATERIAL	REVEST.
— 30cm INITIAL BLOWS / 30cm 10 20 30	BLOWS 30 cm INITIAL	LAST	cm/min	TEST N°	ABSORPTION K= cm/seg	GRAPHICS	CHANGE OF LAYER	CONVENTION GRAPHICS		
	13	13				20,00				
	11	13								
	13	14				22,00			Fine sand, silty, averagely compact, motley light yellow.	
	13	14								
	13	13				24,00	23,80			
	11	13							Same as above, yellowish gray.	
	32	49/23				26,00	25,90		Rusty silt, concrete like, dark brown and reddish.	
	27	34					26,55		Clay silt, with a bit of fine sand, with a bit of mica, hard, mixed light gray and dark gray.	
	32	42				28,00	28,45		End of Perforation	
						30,00				
						32,00				
						34,00				
						36,00				
						38,00				
						40,00				

OBSERVATION:

LOCALIZATION:

COORDINATES	QUOTA:	OPERATOR:	DATE	VERIFIED BY:
N= E=		HERONIDES	I = 19/06/00 F= 21/06/00	

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	PROFILE OF SOIL INVESTIGATION
	LOCATE: CABANGA SUB - SYSTEM RECIFE		SOUNDING N° SP.01

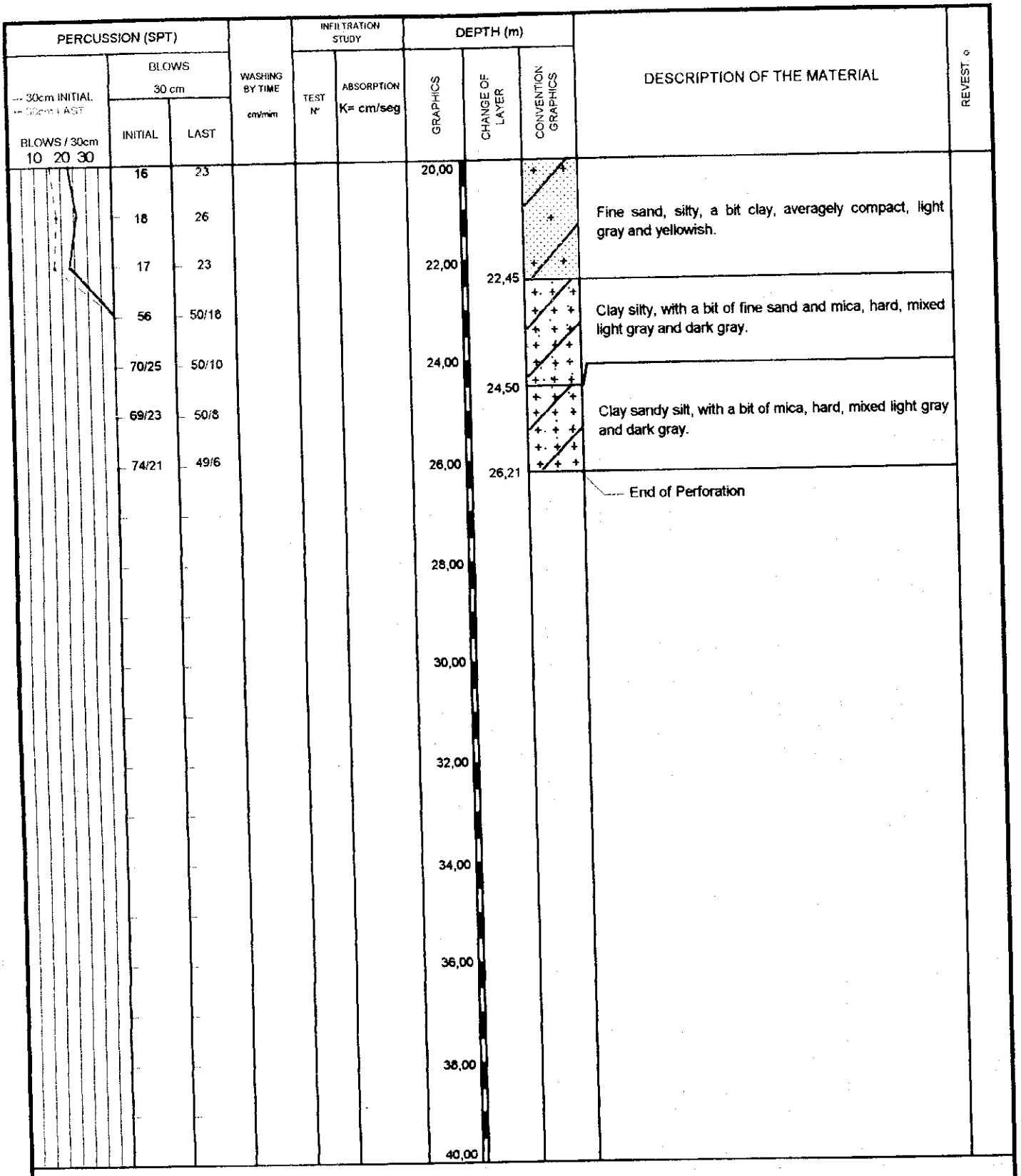
PERCUSSION (SPT)			WASHING BY TIME cm/mm	INFILTRATION STUDY		DEPTH (m)			DESCRIPTION OF THE MATERIAL	REVEST ◊
--- 30cm INITIAL BLOWS / 30cm 10 20 30	BLOWS 30 cm INITIAL	LAST		TEST Nº	ABSORPTION K= cm/seg	GRAPHICS	CHANGE OF LAYER	CONVENTION GRAPHICS		
	3	4				0,00			Fine and average sand, silty clay, soft, dark yellow. - LANDING -	◊ = 100 mm
	4	5					1,00			
							1,32	WL	Fine sand, with a bit fragments of shells, not too compact, mixed light gray and yellowish.	
	5	6				2,00				
	3	4					2,65		Fine and average sand, with few fragments of shells, not too compact, mixed light gray colors.	
	1/62						3,76			
	1/58					4,00				
	1/47									
	1/51					6,00			Silty clay, with traces of organic material and rare fragments of shells, very soft, dark gray.	
	1/58					8,00				
	6	5					8,90		Average and fine sand, silty, a bit clay, not too compact,dark yellow and greenish gray.	
	5	6				10,00	9,60		Silty clay, a bit sand, mediun, greenish gray and dark yellow.	
	7	8								
	18	23				12,00	11,75			
							12,30		Silty sand clay, hard, dark yellow and greenish gray.	
	13	14							Silty clay, firm,greenish gray and dark yellow.	
	13	13				14,00	14,00			
	15	17							Silty clay silt, average compact, greenish gray and dark yellow.	
	13	15				16,00	15,57		Silty clay, firm, dark yellow and greenish gray.	
	15	16								
	13	14					17,68			
	13	14				18,00			Fine sand, silty, a bit clay, averagely compact, light gray and yellowish.	
	16	23				20,00				

OBSERVATION: SH Taken from a SHELBY sample

LOCALIZATION:

COORDINATES	QUOTA:	OPERATOR:	DATE	VERIFIED BY:
N= E=		HERONIDES	I = 21/06/00 F= 23/06/00	

JICA	WORK: STUDY ON STORNWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	PROFILE OF SOIL INVESTIGATION
	LOCATE: CABANGA SUB - SYSTEM RECIFE		SOUNDING Nº SP.02

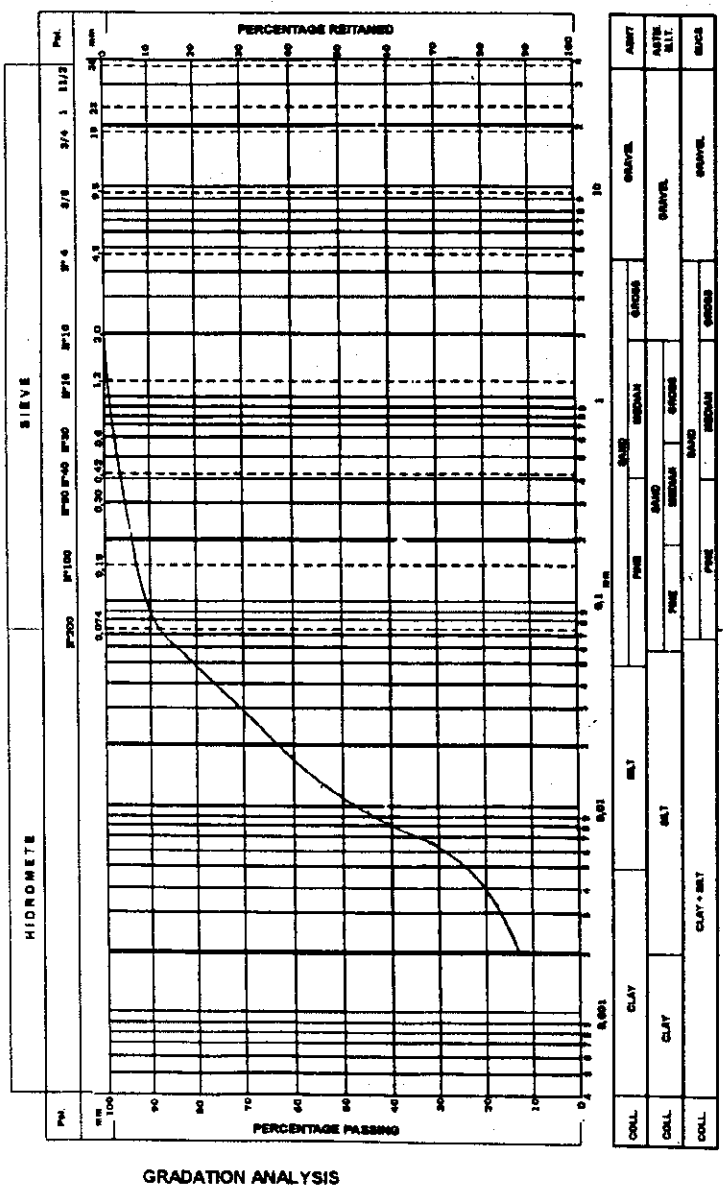

PERCUSSION (SPT)
BLOWS
30 cm
-- 30cm INITIAL
-- 30cm LAST
BLOWS / 30cm
10 20 30
INITIAL
LAST
WASHING BY TIME
cm/min
INFILTRATION STUDY
TEST Nº
ABSORPTION
K= cm/seg
DEPTH (m)
GRAPHICS
CHANGE OF LAYER
CONVENTION GRAPHICS
DESCRIPTION OF THE MATERIAL
REVEST. e
16 23
18 26
17 23
56 50/16
70/25 50/10
69/23 50/8
74/21 49/6
20,00
22,00
24,00
26,00
28,00
30,00
32,00
34,00
36,00
38,00
40,00
22,45
24,50
26,21
Fine sand, silty, a bit clay, averagely compact, light gray and yellowish.
Clay silty, with a bit of fine sand and mica, hard, mixed light gray and dark gray.
Clay sandy silt, with a bit of mica, hard, mixed light gray and dark gray.
End of Perforation
OBSERVATION:
LOCALIZATION:
COORDINATES
N=
E=
QUOTA:
OPERATOR:
HERONIDES
DATE
I = 21/06/00
F= 23/06/00
VERIFIED BY:
JICA
WORK:
STUDY ON STORNWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA
LOCATE:
CABANGA SUB - SYSTEM
RECIFE
PESQUISE
PROFILE OF SOIL INVESTIGATION
SOUNDING Nº
SP.02

Identification	Hole		SP-01	SP-01	SP-02								
	Sample Depth	from	300	1000	500								
		to	360	1060	560								
	Register Nº		5274	5275	5276								
Gradation Analysis	Sieve - % Total Passing	2"											
		1"											
		3/8											
		Nº 4		100									
		Nº 8		97									
		Nº 10	100	97									
		Nº 16	98	93	100								
		Nº 30	97	82	98								
		Nº 40	97	70	98								
		Nº 50	96	64	97								
		Nº 100	93	52	96								
		Nº 200	88	45	87								
	Hidron. %	Silt	63	23	55								
		Clay	25	22	32								
Liquid limit			52	28	58								
Plasticity index			23	10	25								
Degree of contraction			-	-	-								
Specific graerty of soil particles			2,27	2,50	2,51								
Unifed classification			OH	SC	OH								
Uniconfined Compression Test	Water content		54,7	18,9	73,4								
	Compressive Strength (kgf / cm^2)		0,46	0,35	0,25								
	Cohesion (kgf / cm^2)		0,23	0,18	0,12								
Direct Shear	Cohesion (kgf / cm^2)		-	-	-								
	Angle of internal friction (°)		-	-	-								
Free Expanding (%)	Water content		-	-	-								
	Degree of saturation		-	-	-								
	Expanding		-	-	-								
Field	Natural water content		40,9	80,4	44,3								
	Wet density		1,857	1,550	1,871								
	Dryness density		1,318	0,859	1,297								

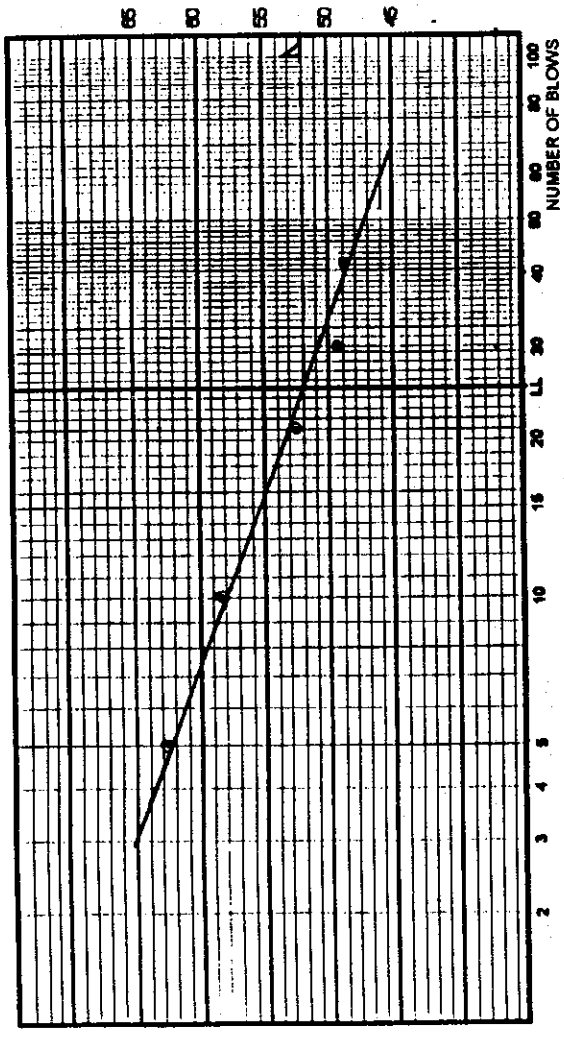
Observation:

JICA	Work: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	SUMARY OF SOIL TEST
	Locate: CABANGA SUB - SYSTEM RECIFE		PAGE Nº :

PHYSICS AND MECHANICS CHARACTERISTICS		RESULT
FIELD	NATURAL WATER CONTENT - %	40,9
	WET DENSITY - g / cm³	1,857
	DRYNESS DENSITY - g / cm³	1,318
GRADATION ANALYSIS %	GRAVEL	-
	SAND — GROSS	-
	SAND — MEDIAN	3
	SAND — FINE	9
	SILT	63
	CLAY	25
SOIL CONSISTENCY TEST	LIQUID LIMIT	52
	PLASTICITY INDEX	23
	DEGREE OF CONTRACTION	-
SPECIFIC GRAVITY OF SOIL PARTICLES - (g / cm³)		2,27
UNICONFINED COMPRESSION TEST	WATER CONTENT - (%)	54,7
	COMPRESSIVE STRENGTH - Kgf / cm²	0,46
	COHESION - Kgf / cm²	0,23
DIRECT SHEAR	COHESION	-
	ANGLE OF INTERNAL FRICTION	-
FREE EXPANDING - %	WATER CONTENT	-
	DEGREE OF SATURATION	-
	EXPANDING	-
UNIFIED CLASSIFICATION		OH
OBSERVATION:		



GRADATION ANALYSIS

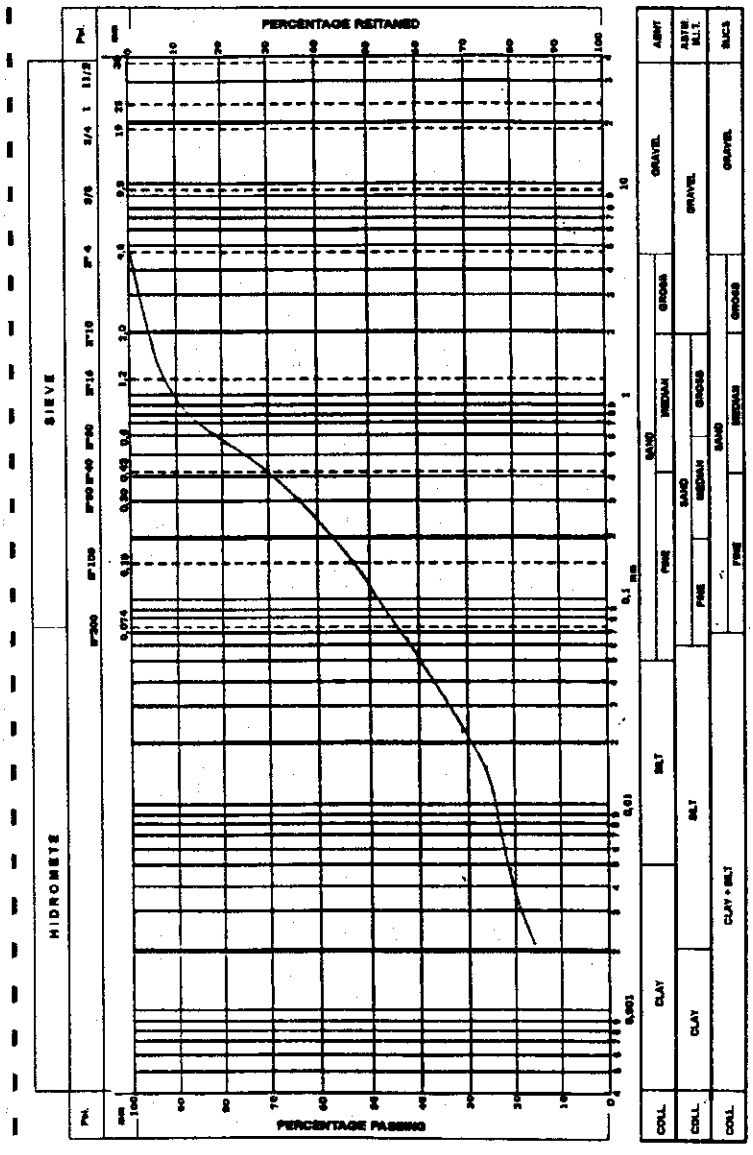


LIQUID LIMIT

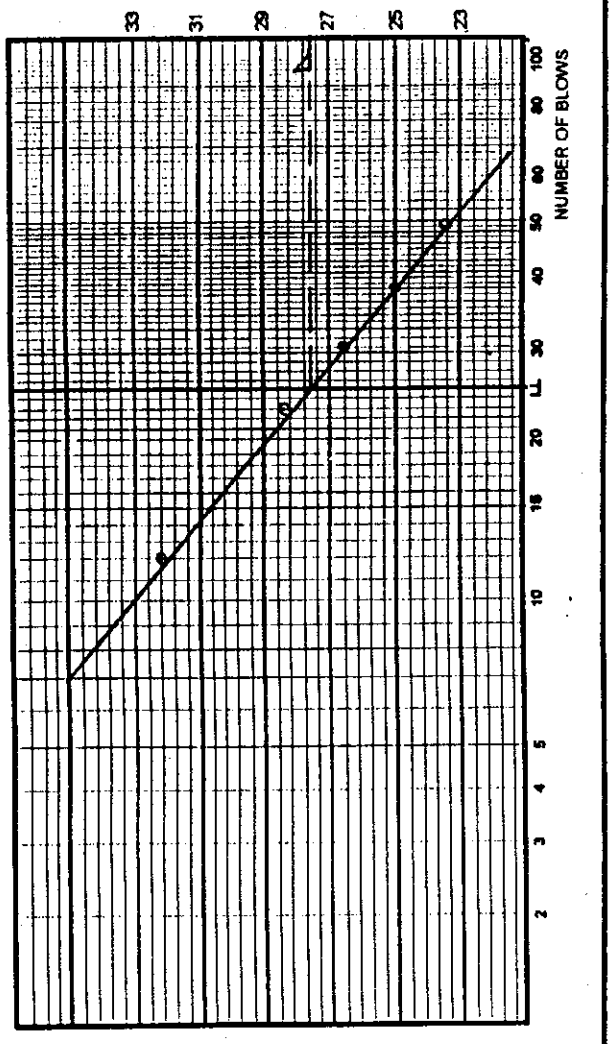
ORIGIN	HOLE: SP-01	STAKE	SAMPLES	POSITION	SAMPLE DEPTH: 300 - 360	DATE

JICA	WORK: STUDY ON STORNWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	ESSAY GRÁPHIC
	LCOATE: CABANGA SUB - SYSTEM RECIFE		REGISTER Nº: 5274

PHYSICS AND MECHANICS CHARACTERISTICS	RESULT
NATURAL WATER CONTENT - %	80,4
WET DENSITY - g / cm	1,550
DRYNESS DENSITY - g / cm³	0,859
GRAVEL	-
SAND — GROSS	3
SAND — MEDIAN	27
SAND — FINE	25
SILT	23
CLAY	22
LIQUID LIMIT	28
PLASTICITY INDEX	10
DEGREE OF CONTRACTION	-
SPECIFIC GRAVITY OF SOIL PARTICLES - (g / cm³)	2,50
UNICONFINED COMPRESSION TEST — WATER CONTENT - (%)	18,9
UNICONFINED COMPRESSION TEST — COMPRESSIVE STRENGTH - Kgf / cm²	0,35
UNICONFINED COMPRESSION TEST — COHESION	0,18
DIRECT SHEAR — COHESION	-
DIRECT SHEAR — ANGLE OF INTERNAL FRICTION	-
FREE EXPANDING - % — WATER CONTENT	-
FREE EXPANDING - % — DEGREE OF SATURATION	-
FREE EXPANDING - % — EXPANDING	-
UNIFIED CLASSFICATION	SC
OBSERVATION	



GRADATION ANALYSIS



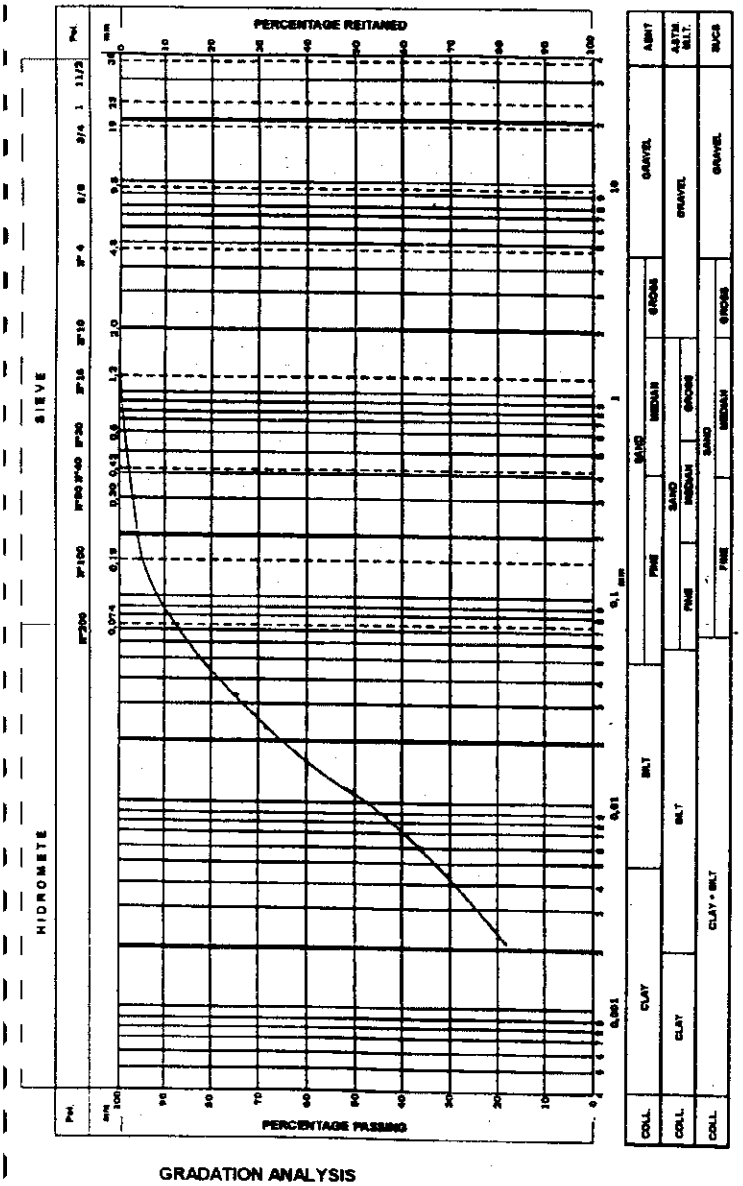
LIQUID LIMIT

ORIGIN:	HOLE: SP-01	STAKE:	SAMPLES:	POSITION:	SAMPLE DEPTH: 1000 - 1060	DATE:

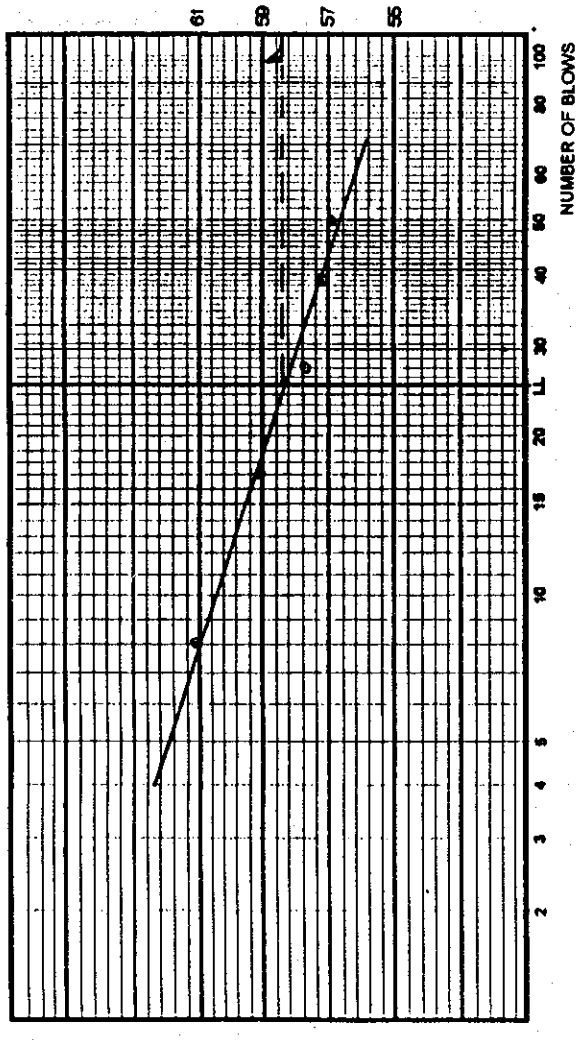
JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	ESSAY GRÁPHIC
	LCOATE: CABANGA SUB - SYSTEM RECIFE		REGISTER Nº: 5275

PHYSICS AND MECHANICS CHARACTERISTICS	RESULT
NATURAL WATER CONTENT - %	44,3
WET DENSITY - g / cm³	1,871
DRYNESS DENSITY - g / cm³	1,297
GRAVEL	-
SAND — GROSS	-
SAND — MEDIAN	2
SAND — FINE	11
SILT	55
CLAY	32
LIQUID LIMIT	58
PLASTICITY INDEX	25
DEGREE OF CONTRACTION	-
SPECIFIC GRAVITY OF SOIL PARTICLES - (g / cm³)	2,51
WATER CONTENT - (%)	73,4
COMPRESSIVE STRENGTH (Kgf / cm²)	0,25
COHESION (Kgf / cm²)	0,12
COHESION	-
ANGLE OF INTERNAL FRICTION	-
WATER CONTENT	-
DEGREE OF SATURATION	-
EXPANDING	-
UNIFIED CLASSFICATION	OH
OBSERVATION:	

FIELD | GRADATION ANALYSIS % | SOIL CONSISTENCY TEST | UNICONFINED COMPRESSION TEST | DIRECT SHEAR | FREE EXPANDING - %



GRADATION ANALYSIS



LIQUID LIMIT

IGIN	HOLE: SP-02	STAKE:	SAMPLES:	POSITION:	SAMPLE DEPTH: 500 - 560	DATE:

JICA	WORK: STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITON AREA	PESQUISE	ESSAY GRÁPHIC
	LCOATE: CABANGA SUB - SYSTEM RECIFE		REGISTER Nº: 5276