国際協力事業団
スリ・ランカ民主社会主義共和国
セイロン電力庁

No. 5
別 冊

スリ・ランカ民主社会主義共和国
ケラワラピティヤコンバインドサイクル
発電所建設計画調査

環境影響評価書
(添付資料)

平成11年1月

東電設計株式会社

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スリ・ランカ民主社会主義共和国
セイロン電力庁

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ANNEX 1　参考資料

[1] MASTER PLAN OF MUTHURAJAWELA AND NEGOMBO LAGOON (1991) Greater Colombo Economic Commission, Euroconsult, the Netherlands.

[2] ENVIRONMENTAL PROFILE OF MUTHURAJAWELA AND NEGOMBO LAGOON (1991) Greater Colombo Economic Commission, Euroconsult, the Netherlands.

[3] REPORT ON SOIL INVESTIGATION FOR FEASIBILITY STUDY ON THE COMBINED CYCLE POWER DEVELOPMENT PROJECT AT KERAWALAPITIYA (1998) Central Engineering Consultancy Bureau

[4] STUDY ON THE DEVELOPMENT OF NEW PORT OF COLOMBO (1996) Japan International Cooperation Agency (JICA), Sri Lanka Ports Authority.

[5] FEASIBILITY STUDIES FOR KERAWALAPITIYA COMBINED CYCLE POWER PLANT, Bathymetric Survey, Sea Water Temperature and Salinity Survey, Tidal Current Observations (1998) Lanka Hydraulic Institute Ltd.

[6] PROPOSED LPG IMPORT TERMINAL - SRI LANKA AT KERAWALAPITIYA ENVIRONMENTAL IMPACT ASSESSMENT (1996) Engineering Consultants Limited, Sri Lanka

[7] NATURAL RESOURCES OF SRI LANKA, CONDITIONS AND TRENDS (1991) Natural Resources, Energy and Science Authority of Sri Lanka

[8] COMBINED CYCLE POWER PLANT PROJECT AT KELANITISSA, ENVIRONMENTAL IMPACT ASSESSMENT REPORT (1995) Ministry of Irrigation, Power and Energy, and Ceylon Electricity Board.

ANNEX 2　関係者一覧

CEYLON ELECTRICITY BOARD

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) STUDY TEAM

Mr. Zenjiro TSUTSUI	Team Leader
Mr. Osami IIDA	Power and Fuel Supply Plans
Mr. Yoshiaki ISHIZUKA	Economic and Financial Analyses
Mr. Akira KOJIMA	Marine Civil Engineering/Survey
Mr. Hideyo SUZUKI	Civil Engineering
Mr. Hitoshi KAMIYAMA	Architecture
Mr. Naohiro HIRATA	Instrument & Control
Mr. Shinichi MOGI	Generation/Substation Equipment
Mr. Kenji MIKATA	Gas Turbine Facilities
Mr. Hideyuki OKANO	ST/HRSG Facilities
Mr. Masayoshi ONO	BOP Facilities
Mr. Kiyoshi KIKUCHI	Environment (Ambient Air and Marine)
Mr. Mitsutake KUDO	Environment (Biological, Social and Economic)

CEYLON INSTITUTE OF SCIENTIFIC & INDUSTRIAL RESEARCH

Dr. Azeez M. MUBARAK	Head, Chemical and Environmental Technology Division
Ms. Sharmini WICKRAMARATNE	Senior Research Officer

NATIONAL BUILDING RESEARCH ORGANISATION

Dr. V. T. L. BOGAHAWATTA	Head, Environmental Division
Mr. A.R.P. SAMARAKKODY	Environmental Division
Mr. S.S.B. YALEGAMA	Environmental Division

CONSULTANTS IN TECHNOLOGY MANAGEMENT & DEVELOPMENT STUDIES

Mr. O.C. ABEYSEKERA	Executive Director
Mr. K.B. VARANASOORIYA	Senior Consultant

LANKA HYDRAULIC INSTITUTE LTD.

Dr. Ranjit GALAPPATTI	General Manager/Director
Dr. Nalin WIKRAMANAYAKE	Senior Research Engineer

ANNEX 3　住民、NGO、その他機関からの意見

ANNEX 4

TERMS OF REFERENCE
FOR THE
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

TERMS OF REFERENCE
FOR THE
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

PROJECT TITLE	:	150 MW Combined Cycle power plant at Kerawalapitiya
PROJECT PROPONENT	:	Ceylon Electricity Board
PROJECT APPROVING AGENCY	:	Ministry of Irrigation, Power & Energy
OUTLINE OF THE EIA REPORT	:	

Executive Summary

Chapter 1 -	Introduction
Chapter 2 -	Description of the Project
Chapter 3 -	Description of the Existing Environment
Chapter 4 -	Assessment of the Anticipated Environmental Impacts
Chapter 5 -	Proposed Mitigatory Measures
Chapter 6 -	Monitoring Programme
Chapter 7 -	Recommendations/ Conclusions

Annex

I	-	Source of Data, Information & Computer printouts of atmospheric dispersion model
II	-	References
III	-	List of persons responsible for the study including their work allocations
IV	-	Comments made by the public, NGOs and other agencies.

STUDY AREA: The study areas for the assessment will be considered to be 10 km from the boundaries of the project site for air quality appraisal and 2 km from the boundaries of the project site for other studies. Study area for the transmission line is 100 m (50 m either side from the centerline) wide corridor along the line route. If a sea terminal is envisaged to supply the plant with fuel, the study area will include the sea terminal and 10 km around it and the pipe line.

EXECUTIVE SUMMARY:

The summary should be a concise non-technical description of the salient features of the proposal, alternatives, existing environment, anticipated environmental impacts and mitigatory measures adequately and accurately covered. A one page summary table indicating main pollutants, their present levels, their accepted standards, the additions due to proposed project without mitigatory measures and the expected levels of pollution in the environment after mitigation should be presented in a matrix form. The summary should indicate in brief the responses to the issues raised by the public and other agencies. The summary should not normally exceed five pages.

CHAPTER 1: INTRODUCTION

This chapter should include the following;

- Objective of the project
- Objective of the EIA report
- Government policy regarding power development
- Consistency with Muthurajawela master plan development
- Extent and scope of the study
- Brief outline of the contents
- The approval necessary for this development
- The conditions laid down by Government Agencies in granting preliminary clearance for the project.

CHAPTER 2: THE DESCRIPTION OF THE PROJECT

2.1 Aim and Scope of the Project

The project's main objectives, main beneficiaries and the expected socio-economic effects should be stated.

2.2 Nature of Project

A description of the major features of the project including a location map indicating the project site, accessibility to the site, surrounding development activities & infrastructure (scale 1:50,000), drawings showing project layout plan including access roads (scale 1:5,000), components of the project etc. in order to give a clear picture of the project. This should include the brief description of the process of power generation, details of fuel Supply System, Fresh water Supply System, Cooling water usage and disposal system, air emission control system, Stack height and emissions, effluent discharge, Solid waste disposal, treatment systems, Noise Control measures and the description of transmission system and switchyard. If any phased development activities are envisaged give the details. Time schedule should also be given. Surrounding development activities should be included.

2.3 Justification of the project

This section should consider justification of this project indicating phased developments, forecast power & energy requirement of the country, timing & size of plant.

2.4 Evaluation of Alternatives

This section should briefly state the basic environmental, engineering and economic parameters and criteria used in the investigation and evaluation of alternatives. The probable adverse impacts for each alternative including "no action" alternative should be summarized. Alternative fuels, use of land, site and technologies should be addressed.

2.5 Methodology of Construction and Operation

This section should include methods to be adopted for earth moving, rock blasting, waste disposal, operational maintenance of complex.

2.6 Work force

- Labour requirements (during construction and operation)

- Employment of local people during construction and operation
- Availability of labour
- Occupational health and safety
- Facilities required or provided

CHAPTER 3: DESCRIPTION OF THE EXISTING ENVIRONMENT

This chapter should provide information on physical features, resources, socio - economic, archaeological and cultural considerations likely to be affected by any aspect of the proposal during its construction or operation phases.

The information should be presented in a comprehensive format using tables, maps, and diagrams. The methods used to collect data should be clearly stated under each category. Any technical terms used should be clearly defined. The existing environment should be described under the following;

3.1 Physical features

3.1.1 Topography and Drainage

The most recent topographical data including reserve areas, water bodies, rivers, streams.

3.1.2 Climatic & Meteorological Conditions

Adequate data for the evaluation of any impacts should be given.

- rainfall data,
- relative humidity and temperature,
- wind speed, direction

3.1.3 Geology/Soil

- general geology of the area,
- soil type/s and distribution, land use capabilities, soil profile
- erosion trends

3.1.4 Hydrology

- surface drainage
- surface water availability, quality
- availability of ground water, safe extraction limits,

3.1.5 Air Quality

- Inventory of existing emission sources
- Ambient air quality measurements

  SO_2 and NO_2 Monitoring data should be collected with continuous monitoring instrumentation for at least 30 days to cover all meteorological conditions at selected locations. Suspended Particulate Matters (SPM) monitoring (24 hr averages) data should be collected at least one week day and one week end at a location . Maximum 1 hour average should be used for modeling purposes.

3.1.6 Noise

- Inventory of existing noise sources
- Existing noise levels

3.1.7 Oceanography

- Data on tidal level, wave height , current characteristics and nearshore bathymetry

3.2 Ecological Resources

3.2.1 Terrestrial Ecology

- Identification, classification and mapping all existing habitats of fauna & and flora distribution and density in and around the project site.

- Identification of rare threatened and endemic plants and animal species, if any.

3.2.2 Aquatic Ecology

- identification of aquatic fauna and flora
- identification of endemic fresh and sea water species, if any.
- distribution pattern of aquatic species

3.3 Human Settlement and Land Use

- Present land use pattern
- Population characteristics such as population distribution by age groups, education, health conditions, employment and income profiles.
- income generating sources,
- Existing infrastructure facilities
- transportation
- communication
- power
- housing and sanitation
- health care (hospitals)
- schools
- water supply
- main economic activities (Fisheries, Agriculture, Salt production etc.)
- archaeological, cultural components
- religious places

3.4 Environmental Consideration/Problems/Issues in the Area

- physical (water, air)
- ecological
- social & cultural
- economical

CHAPTER 4: ASSESSMENT OF THE ANTICIPATED ENVIRONMENTAL IMPACTS

This chapter should show the overall effects on the individual environmental components (ie Physical, Ecological and Human & Socio-economic) due to stressors (impacting agents) identified below and any other stresses identified during the study. Impacts should include the foreseeable direct and indirect, long and short term effects.

In all cases where an assessment is made it should be quite clear what criteria have been employed to assess impacts. Where possible effects should be quantified and

uncertainties highlighted. Basis of predictions should be stated and justified by using case studies/models/literature etc. Nature of impact should be considered in terms of magnitude, severity, duration, frequency, risk and indirect effects.

4.1 Impacts During Construction Phase

4.1.1 Solid waste

- Sources
- Impacts on the Environment

4.1.2 Transport

- Transport of materials and equipment
- Air quality impacts from traffic

4.1.3 Noise

- Noise from traffic
- Noise due to construction activities

4.1.4 Water & other liquid effluent

- Impacts of sewage, waste oils, oil spills, surface runoffs, waste water disposal on the environment

4.1.5 Any other activities interfere with natural processes

- Hydrology, drainage and coastal processes (beach stability etc.)

4.1.6 Human, Economic and Socio - Economic Impacts

- Population and communities
- Employment and income
- Land use and land use planning
- Agriculture
- Industrial development
- Road development
- Historical sites
- Health
- right of way to beach, prohibited areas for fishing activities around sea terminal and pipeline

4.2 Operational Impacts

4.2.1 Solid Wastes

- Impacts due to oil sludge, sludge from waste water treatment plant, garbage including any other solid waste generating during operation

4.2.2 Water and other liquid Effluent

- Impacts of sewage, waste oils, oil spills, surface runoffs, waste water and water ballast disposal on the environment

4.2.3 Thermal effluent impact

- Diffusion estimate and impact analysis of thermal effluent
- Impact analysis of intake and out let of cooling water

4.2.4 Air Pollutants

- Stack emissions
- Dispersion model input data (in detail)
- Dispersion model results
- Atmospheric impact analysis

4.2.5 Noise

- Sources of noise generation
- Predicted noise levels
- Noise impacts

4.2.6 Human, Economic and Socio - Economic Impacts

- Population and communities
- Employment and income
- Land use and land use planning
- Agriculture
- Industrial development
- Road development
- Historical sites
- Health
- right of way to beach, prohibited areas for fishing activities around sea terminal and pipeline

4.3 Other Impacts During Construction and Operational Phases due to :

- Drainage
- Pipe lines
- Transmission lines

At the end of this section an overview or synthesis should be made to show how the proposed project will interact with the total eco-system and its elements including impact on proposed/planned state or private sector development activities in the vicinity. This synthesis should also include an assessment of the significance of the various impacts identified.

CHAPTER 5: MITIGATION OF SIGNIFICANT ENVIRONMENTAL IMPACTS

5.1 Proposed Mitigatory Measures

This chapter should set out the proposed measures to minimize the significant impacts identified in chapter 4. This should also outline the effectiveness of the proposed measures that are to be provided. The "mitigation" includes;

- Avoiding the impacts altogether by not taking certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impacts by repairing, rehabilitating or restoring the environment.
- Reducing or elirninating the impact over time by preservation and maintenance operations during the life of the action.

The mitigatory measures should be defined in specific practical terms and its effectiveness should be evaluated. This chapter should also present rationale for selection of chosen mitigatory measure.

5.2 Contingency Plan

Suitable contingency plan should be evolved covering accidental leaks, fire hazards and explosions. Capacity to deal with such disasters, early warning systems where rapid evacuation is warranted, compensation should be detailed.

5.3 Financial Commitments

Financial commitments to incorporate the mitigatory measures and compensation should be stated. Improvements to the social infrastructure in the vicinity if any and their financial allocations may also be indicated

CHAPTER 6: MONITORING PROGRAMME

A suitable monitoring programme should be evolved to monitor the changes, implementation of mitigatory measures. An effective reporting procedure should be outlined. Safety measures for employees against fire hazards, explosion, oil spills and other accidents should be outlined. An emergency action plan should be encompassed to execute this plan. Availability of funds, expertise, facilities should be stated. Any programme to improve general environmental conditions also can be here.

CHAPTER 7: RECOMMENDATIONS/ CONCLUSIONS

The acceptability of the proposed project and the alternatives to be analysed through an environmental cost/benefit analysis (see attached guidelines).

Further studies to analyse any long term effects should be indicated in this chapter.

GENERAL ITEMS

1. The terms of reference (TOR) is a guideline underline the minimum expectations of the project Approving Agency (PAA).

2. All communications to the PAA should be forwarded through the Project Proponent (PP).

3. The PP is free to make any amendments to the TOR with the prior consent of the PAA.

4. The final draft of the report should be submitted to the PAA for checking of adequacy, after which the document should be translated into Sinhala and Tamil languages. 15 copies of the English version and five copies of the Sinhala and Tamil versions should be submitted to the PAA .

5. The original document should be submitted duly authenticated by the preparers

6. The maximum number of pages of the report is expected to be within 100 pages.

7. The report will be made available for public inspection for 30 days.

GUIDELINE TO INCORPORATE ENV. ECONOMICS INTO TERMS OF REFERENCE FOR EIA

1. Use the financial analysis as a basis to conduct the Extended Benefit Cost Analysis (EBCA)

2. Calculate the cost of suggested mitigation measures as of the EIAR.

3. Value all the significant impacts considering the incremental effects over time. This may include the residual impacts after adopting mitigatory measures.

4. Incorporate values identified in 2 and 3 above to the financial analysis.

5. Use appropriate shadow prices and discount rate (follow NPD guidelines) to carry out the economic analysis of the project.

6. Based on the above analysis show the Economic Internal Rate of Return (EIRR). Economic Net Present Value (ENPV). On request of the TEC, the project proponent should be able to provide the spread-sheet of the above analysis.

7. Conduct a sensitivity analysis on the critical parameters.

8. Clearly state all the assumptions made in the analysis.

MEMORANDUM OF UNDERSTANDINGS

ON

AGREEMENT FOR LOCAL SURVEY ON AIR QUALITY

BETWEEN

JICA STUDY TEAM

AND

NATIONAL BUILDING RESEARCH ORGANISATION

Regarding the AGREEMENT for LOCAL SURVEY on AIR QUALITY between JICA STUDY TEAM and NATIONAL BUILDING RESEARCH ORGANISATION. signed dated February 18th, 1998 for the Feasibility Study on Combined Cycle Power Development at Kerawalapitiya in the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "MAIN AGREEMENT"), the JICA Study Team represented by Mr. Zenjiro TSUTSUI of Tokyo Electric Power Services CO., Ltd. (hereinafter referred to as "JICA Study Team") and NATIONAL BUILDING RESEARCH ORGANISATION. (hereinafter referred to as "NBRO") (hereinafter collectively referred to as the "Parties") herewith agree with each other that the Parties will sign an agreement for the Air Quality Survey Works for Japanese fiscal year 1998 with similar scope of work and terms and conditions to those of the Agreement mentioned above and with the estimated contract price of JP¥820,000-, when Japan International Cooperation Agency approves JICA Study Team to sign such an agreement.

Date: February 18th, 1998

Mr. Zenjiro TSUTSUI
Team Leader
JICA Study Team

Mr. R. P. P. SAMARAKKODY
Scientist/Coordinator
Air Quality Programme
Environmental Division
National Building Research Organisation

Environmental Division
National Building Research Organisation
99/1, Jawatte Road,
Colombo - 5.

දුරකථන/Telephones
අමාත්‍යවරයා / Minister } 687350
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විදුලිබල හා බලශක්ති නියෝජ්‍ය අමාත්‍යවරයා / வலு, சக்தி பிரதி அமைச்சர் / Deputy Minister of Power and Energy } 687352
ලේකම් / செயலாளர் / Secretary } 687370
කාර්යාලය / அலுவலகம் / Office } 687491-6
ෆැක්ස් / பக்ஸ் / Fax } 684598

වාරිමාර්ග, විදුලිබල හා බලශක්ති අමාත්‍යාංශය
நீர்ப்பாசன, வலு, சக்தி அமைச்சு
MINISTRY OF IRRIGATION, POWER & ENERGY

අංක 500, ටී. බී. ජයා මාවත, කො. ඩබ්. 512, කොළඹ 10.
No. 500, T.B. Jayah Mawatha, P.O. Box 512, Colombo 10.
இல. 500, ரி. பி. ஜயா மாவத்தை, த. பெ. 512, கொழும்பு 10.

මගේ අංකය / எனது இல. / My Ref. No. } IPE/EN/4/59

ඔබේ අංකය / உமது இல. / Your Ref. No. }

දිනය / திகதி / Date } 12 February 1998

General Manager,
Ceylon Electricity Board,
Sir Chittampalam A. Gardiner Mawatha,
Colombo 2.

150 MW Combined Cycle Plant at Kerawalapitiya

This refers to your proposal seeking Environmental Clearence to install a 150 MW Combined Cycle Power Plant at Kerawalapitiya.

Further to the Terms of Reference (TOR) issued to you on the Environment Impact Assessment Study for the above project, the following specifications for the Monitoring programme are issued:

Specification for Pre construction Ambient Air Quality Monitoring Programme - 150MW Combined Cycle Power Plant at Kerawalapitiya

1) Background

As no baseline data is available on air quality, for comparison with all applicable Short-term standards, it is necessary to collect data over a short period of time. Maximum values should be used for this comparison. However metrological data over a one year period is to be considered for modelling purposes.

2) Monitoring Period

The monitoring programme is to be carried out before this power plant is put into operation, in order to assess the background concentration levels.

The monitoring period shall be at least 15 days.

3) Monitoring locations

Monitoring locations shall be selected by considering meteorological parameters. Each location is to be monitored continuously for at least 3 days.

The party responsible for the measurements and equipment will select the actual locations based on above and practical considerations, such as: to minimize local interference (eg. traffic emmission) availability of electric power and possibility of protecting measurement equipment.

4) Parameters to be monitored

For each monitoring location the following parameters should be monitored:

NO_x (NO, NO_2) concentration in mg/m^3,
SO_2 Concentration in mg/m^3,
SPM concentration in mg/m^3,
O_3 Concentration in mg/m^3.

In addition to meteorological data, in particular wind direction and wind speed, are to be noted/recorded during the monitoring period.

5) Methods of measurements

The gaseous components (NO_x, SO_2 and O_3) are to be monitored on a continuous basis. SPM is to be monitored at least on one weekday and one day in the weekend at each location.

Measurement should comply with the SCHEDULE 1 of the National Ambient Airquality Standards in Gazette (Extraodinary) on 20/12/1994.

G B A Fernando
Director Energy Planning
for Secretary
(Tel 687354, Fax 687357)

THE FEASIBILITY STUDY (F/S)
ON
COMBINED CYCLE POWER DEVELOPMENT PROJECT
AT
KERAWALAPITIYA

THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

MINUTES OF A MEETING

(HELD IN COLOMBO ON FEBRUARY 13, IN 1998)

AGREED UPON

AMONG

CENTRAL ENVIRONMENTAL AUTHORITY(CEA),
CEYLON ELECTRICITY BOARD(CEB),
NATIONAL BUILDING RESEARCH ORGANISATION(NBRO)
AND
JICA STUDY TEAM

Mr. C. K. AMARATUNGA
Environmental Officer
Central Environmental Authority

Mr. Ajitha RANASIGHE
Electrical Engineer,
Generation Planning
CEYLON ELECTRICITY BOARD

Mr. R. P. SAMARAKKODY
Scientist/Coordinator
Environmental Division
NATIONAL BUILDING
RESEACH ORGANISATION

Mr. Zenjiro TSUTSUI
Leader,
JICA Study Team

The meeting was held at NBRO's Jawatta Office afternoon on February 13, 1998.

1. It was confirmed among all participants that ambient air monitoring for environmental impact assessment for this F/S shall be carried out in strict accordance with the requirements stipulated in the letter dated February 12, 1998 issued by Ministry of Irrigation, Power and Energy(MOIPE) who is nominated as Project Approving Agency(PAA) for Kerawalapitiya 150MW Combined Cycle Power Plant by CEA, to the General Manager of CEB, applying the measuring methods duly stipulated in the relevant regulations of Sri Lanka.

2. It was confirmed that in view of the requirements in the above mentioned letter, the number of monitoring position shall be four(4); a position within or in the vicinity of each of Points B, C, D and E shown in the attached map.
   An exact position for each point shall be decided through field survey to be conducted by the people concerned next week.

3. Since only NBRO has an environmental measuring vehicle equipped with all necessary measuring instruments which is inevitable to monitoring ambient air quality items in such a spacious area as the proposed site within the limited time of period, NBRO is only an institute who can undertake this monitoring works.

4. JICA Study Team requested NBRO reasonably to estimate cost for this monitoring works for each of NE-monsoon season and SW-monsoon season, referring to the estimated cost submitted to JICA Study Team before, and further to submit them to JICA Study Team in Hilton Hotel within this day by telefax.
   NBRO agreed to the above.

5. It was agreed upon that all participants shall again take part in a meeting to be held at NBRO's Office on February 16, 1998, to discuss and settle contractual matters and future schedule.

මධ්‍යම පරිසර අධිකාරිය
மத்திய சுற்றாடல் அதிகாரசபை
Central Environmental Authority

Your Ref: EIA/CC/Muthu

Our Ref: 07/05/67/98

Date: June 08, 1998

Mr R K W Wijerathne,
Environmental Officer,
Ceylon Electricity Board,
No. 50, Sir Chittampalam A Gardiner Mw.,
Colombo 02.

Dear Sir,

Environmental Impact Assessment for Proposed 150 MW C/C Power Plant at Muthurajawela.

This has reference to your fax dated 05th June, 1998 regarding above.

In relation to SPM measurement, continuous collection of SPM over a period of at least 18 hours (not hourly averages separately) is the requirement in accordance with the National ambient Air Quality Standards gazetted on 20th December, 1994.

The reason for having at least 18 hours is to retain the sampling capture rate over 75% for the 24 hour period. Please note that the sampling capture rate should however be kept at its maximum (i.e 100%) whenever possible, but there may be instances where the sampling capture rate can not be kept at its maximum (i.e 100%) due to unavoidable reasons such as power failure, instrument failure etc. In such instances, at least 18 hour collection of SPM (not consecutive 18-hr continuous collection) is accepted, but the reasons including the time periods for not collecting the sample should be mentioned in the report.

Yours faithfully,

K. G. D. Bandaratilake
Deputy Director General (Technical)
CENTRAL ENVIRONMENTAL AUTHORITY

CEB/CKA/n

මධ්‍යම පරිසර අධිකාරිය
மத்திய சுற்றாடல் அதிகாரசபை
Central Environmental Authority

FIA/CC/Muthu

07/05/67/98

June 08, 1998

Mr R K W Wijerathne,
Environmental Officer,
Ceylon Electricity Board,
No. 50, Sir Chittampalam A Gardiner Mw.,
Colombo 02.

Dear Sir,

Environmental Impact Assessment for Proposed 150 MW C/C Power Plant at Muthurajawela.

This has reference to your fax dated 05th June, 1998 regarding above.

In relation to SPM measurement, continuous collection of SPM over a period of at least 18 hours (not hourly averages separately) is the requirement in accordance with the National ambient Air Quality Standards gazetted on 20th December, 1994.

The reason for having at least 18 hours is to retain the sampling capture rate over 75% for the 24 hour period. Please note that the sampling capture rate should however be kept at its maximum (i.e 100%) whenever possible, but there may be instances where the sampling capture rate can not be kept at its maximum (i.e 100%) due to unavoidable reasons such as power failure, instrument failure etc. In such instances, at least 18 hour collection of SPM (not consecutive 18-hr continuous collection) is accepted, but the reasons including the time periods for not collecting the sample should be mentioned in the report.

Yours faithfully,

K. G. D. Bandaratilake
Deputy Director General (Technical)
CENTRAL ENVIRONMENTAL AUTHORITY

CEB/CKA/n

ANNEX 5　風向・風速分布

Table A5-1 (1) Frequency of Wind Direction and Speed (Monthly in 1996 and 1997)

1996	(m/s)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	calm	
Jan.	1.54–	2.02%	5.38%	5.51%	3.23%	0.54%	0.27%	0.27%	0.27%	0.00%	0.00%	0.40%	0.54%	0.13%	0.00%	0.00%	0.13%		18.68%
	3.09–	1.21%	5.65%	4.57%	1.61%	0.40%	0.13%	0.00%	0.00%	0.13%	0.00%	0.13%	0.13%	0.40%	0.13%	0.13%	0.54%		15.19%
	5.14–	2.55%	22.04%	12.50%	1.34%	0.40%	0.13%	0.00%	0.00%	0.00%	0.00%	0.13%	0.67%	1.88%	0.81%	1.08%	2.55%		46.10%
	8.23–	0.40%	4.84%	2.42%	0.00%	0.27%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.27%	0.94%		9.27%
	10.8–	0.00%	0.40%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%		0.67%
	calm																	10.08%	
	sum	6.18%	38.31%	25.00%	6.32%	1.61%	0.54%	0.27%	0.27%	0.13%	0.00%	0.67%	1.34%	2.42%	1.08%	1.61%	4.17%	10.08%	1
Feb.	1.54–	1.15%	3.30%	3.16%	2.59%	2.87%	1.29%	0.57%	0.14%	0.14%	0.00%	0.00%	0.43%	0.86%	0.29%	0.72%	0.86%		18.39%
	3.09–	1.29%	4.45%	3.16%	1.01%	0.29%	0.43%	0.43%	0.14%	0.00%	0.00%	0.00%	0.14%	0.57%	0.14%	0.29%	0.72%		13.07%
	5.14–	2.44%	15.37%	9.34%	1.58%	0.14%	0.29%	0.00%	0.00%	0.00%	0.14%	0.29%	1.72%	5.75%	1.58%	1.87%	1.44%		41.95%
	8.23–	0.72%	3.74%	1.01%	0.57%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.29%	0.00%	0.43%	0.57%	2.16%		9.63%
	10.8–	0.00%	0.29%	0.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%		0.72%
	calm																	16.24%	
	sum	5.60%	27.16%	16.95%	5.75%	3.30%	2.01%	1.01%	0.29%	0.14%	0.14%	0.43%	2.59%	7.18%	2.44%	3.45%	5.32%	16.24%	1
Mar.	1.54–	0.81%	2.28%	1.88%	1.48%	3.63%	3.09%	2.42%	0.81%	0.40%	0.54%	1.48%	2.02%	0.94%	1.08%	1.08%	1.08%		25.00%
	3.09–	0.27%	1.21%	1.61%	1.08%	0.67%	0.40%	0.27%	0.00%	0.00%	0.13%	0.54%	1.88%	2.28%	1.48%	0.67%	0.40%		12.90%
	5.14–	0.40%	1.48%	1.48%	0.67%	0.13%	0.00%	0.00%	0.00%	0.00%	0.13%	1.48%	6.05%	12.10%	3.63%	2.02%	1.08%		30.65%
	8.23–	0.13%	0.00%	0.54%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.13%	0.13%	0.13%	0.27%		1.48%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%		0.27%
	calm																	29.57%	
	sum	1.61%	4.97%	5.51%	3.23%	4.44%	3.49%	2.69%	0.81%	0.54%	0.81%	3.63%	10.08%	15.46%	6.32%	3.90%	2.82%	29.57%	0.99
Apr.	1.54–	0.28%	0.28%	0.69%	1.67%	5.28%	5.97%	4.03%	2.22%	3.33%	0.42%	1.11%	1.11%	2.22%	0.14%	0.14%	0.42%		29.31%
	3.09–	0.00%	0.14%	0.28%	0.14%	0.69%	0.83%	0.42%	0.69%	0.97%	0.83%	2.36%	3.06%	1.94%	0.00%	0.00%	0.00%		12.36%
	5.14–	0.14%	0.28%	0.00%	0.14%	0.14%	0.00%	0.00%	0.14%	0.00%	1.67%	4.03%	10.42%	11.11%	0.83%	0.00%	0.28%		29.17%
	8.23–	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.14%	0.97%	0.42%	0.00%	0.00%	0.00%		1.81%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%		0.28%
	calm																	27.08%	
	sum	0.42%	0.83%	0.97%	1.94%	6.25%	6.81%	4.44%	3.06%	4.31%	3.06%	7.64%	15.56%	15.83%	0.97%	0.14%	0.69%	27.08%	1

Table A5-1 (2) Frequency of Wind Direction and Speed (Monthly in 1996 and 1997)

1996	(m/s)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	calm	
May	1.54-	0.00%	0.00%	0.00%	0.00%	0.40%	1.75%	4.30%	4.84%	2.55%	2.55%	2.96%	0.94%	0.40%	0.00%	0.00%	0.00%		20.70%
	3.09-	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.13%	0.27%	0.94%	2.69%	4.70%	3.63%	0.40%	0.00%	0.00%	0.00%		13.04%
	5.14-	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.13%	0.27%	0.67%	6.72%	18.95%	19.89%	2.42%	0.13%	0.00%	0.00%		49.33%
	8.23-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.54%	0.94%	0.27%	0.00%	0.00%	0.00%		1.88%
	10.8-	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%		0.27%
	calm																	14.78%	
	sum	0.00%	0.13%	0.00%	0.00%	0.54%	2.02%	4.57%	5.38%	4.17%	12.10%	27.15%	25.54%	3.49%	0.13%	0.00%	0.00%	14.78%	1
Jun.	1.54-	0.42%	0.83%	0.00%	0.56%	0.69%	1.67%	3.19%	5.00%	3.33%	2.64%	2.22%	1.67%	0.42%	0.00%	0.14%	0.00%		22.78%
	3.09-	0.42%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.42%	1.11%	3.19%	7.36%	5.28%	0.28%	0.00%	0.00%	0.28%		18.47%
	5.14-	0.56%	0.28%	0.14%	0.00%	0.00%	0.00%	0.28%	0.14%	0.42%	4.03%	10.14%	15.69%	6.11%	0.69%	0.56%	0.00%		39.03%
	8.23-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.28%	0.00%	0.14%	0.42%	1.81%	0.42%	0.14%	0.00%		3.19%
	10.8-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.42%	0.42%	0.00%	0.00%		0.83%
	calm																	15.69%	
	sum	1.39%	1.11%	0.14%	0.69%	0.69%	1.67%	3.47%	5.56%	5.14%	9.86%	19.86%	23.06%	9.03%	1.53%	0.83%	0.28%	15.69%	1
Jul.	1.54-	0.00%	0.00%	0.00%	0.00%	0.00%	0.67%	0.81%	2.96%	2.15%	2.42%	3.09%	3.23%	0.54%	0.00%	0.00%	0.00%		15.86%
	3.09-	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	1.75%	3.49%	6.32%	1.21%	0.00%	0.00%	0.00%		13.04%
	5.14-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.13%	0.27%	2.69%	13.58%	26.08%	11.29%	0.27%	0.00%	0.00%		54.44%
	8.23-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.40%	2.96%	2.82%	0.13%	0.13%	0.00%		6.45%
	10.8-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.00%	0.00%	0.00%		0.27%
	calm																	9.95%	
	sum	0.00%	0.13%	0.00%	0.00%	0.00%	0.67%	0.94%	3.09%	2.55%	6.85%	20.56%	38.58%	16.13%	0.40%	0.13%	0.00%	9.95%	1
Aug.	1.54-	0.00%	0.00%	0.00%	0.13%	0.00%	0.67%	0.81%	1.08%	0.54%	2.56%	3.36%	2.83%	0.94%	0.00%	0.00%	0.00%		12.92%
	3.09-	0.00%	0.00%	0.00%	0.00%	0.13%	0.13%	0.00%	0.13%	0.40%	1.88%	6.33%	7.67%	1.08%	0.13%	0.00%	0.00%		17.90%
	5.14-	0.00%	0.13%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	1.21%	10.90%	37.15%	11.31%	0.00%	0.00%	0.00%		60.83%
	8.23-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.67%	1.62%	1.21%	0.00%	0.00%	0.00%		3.50%
	10.8-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%
	calm																	4.85%	
	sum	0.00%	0.13%	0.00%	0.13%	0.27%	0.81%	0.81%	1.21%	0.94%	5.65%	21.27%	49.26%	14.54%	0.13%	0.00%	0.00%	4.85%	1

Table A5-1 (3) Frequency of Wind Direction and Speed (Monthly in 1996 and 1997)

1996	(m/s)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	calm	
Sep.	1.54-	0.00%	0.14%	0.00%	0.00%	0.14%	0.69%	0.83%	1.67%	1.11%	2.22%	3.47%	2.92%	0.28%	0.00%	0.00%	0.00%		13.47%
	3.09-	0.00%	0.00%	0.14%	0.00%	0.28%	0.00%	0.00%	0.14%	0.28%	1.53%	7.22%	5.14%	0.83%	0.00%	0.00%	0.00%		15.56%
	5.14-	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.28%	0.00%	0.00%	1.39%	13.47%	33.19%	9.31%	0.28%	0.00%	0.00%		58.06%
	8.23-	0.00%	0.00%	0.00%	0.00%	0.28%	0.00%	0.00%	0.00%	0.00%	0.14%	0.42%	2.50%	0.69%	0.00%	0.00%	0.00%		4.03%
	10.8-	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.14%	0.00%	0.00%	0.00%		0.42%
	calm																	8.47%	
	sum	0.14%	0.14%	0.14%	0.00%	0.83%	0.69%	1.11%	1.81%	1.39%	5.28%	24.58%	43.89%	11.25%	0.28%	0.00%	0.00%	8.47%	1
Oct.	1.54-	0.00%	0.00%	0.00%	0.67%	0.94%	1.75%	1.61%	0.40%	0.40%	1.75%	2.96%	4.84%	5.51%	0.67%	0.27%	0.00%		21.77%
	3.09-	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.94%	3.63%	7.39%	3.63%	0.40%	0.00%	0.00%		16.26%
	5.14-	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.13%	0.00%	0.27%	7.66%	15.46%	7.66%	0.13%	0.13%	0.00%		31.72%
	8.23-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	1.61%	0.67%	0.00%	0.00%	0.00%		2.42%
	10.8-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%
	calm																	27.82%	
	sum	0.13%	0.00%	0.13%	0.67%	0.94%	1.75%	1.75%	0.54%	0.54%	2.96%	14.38%	29.30%	17.47%	1.21%	0.40%	0.00%	27.82%	1
Nov.	1.54-	1.39%	6.39%	2.64%	2.22%	1.25%	2.22%	0.69%	0.28%	0.14%	0.28%	1.11%	3.33%	2.50%	1.25%	0.42%	0.69%		26.81%
	3.09-	1.11%	3.19%	0.56%	0.14%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.69%	2.92%	5.14%	0.97%	0.56%	0.42%		15.83%
	5.14-	0.69%	2.22%	1.67%	0.28%	0.00%	0.42%	0.14%	0.00%	0.00%	0.00%	0.14%	5.69%	12.78%	0.83%	0.69%	1.39%		26.94%
	8.23-	0.00%	0.56%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.28%	0.28%	0.00%	0.00%	0.28%		1.53%
	10.8-	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.14%
	calm																	28.47%	
	sum	3.19%	12.36%	5.14%	2.64%	1.25%	2.64%	0.83%	0.42%	0.14%	0.28%	1.94%	12.22%	20.69%	3.06%	1.67%	2.78%	28.47%	0.99
Dec.	1.54-	1.61%	6.18%	2.28%	0.67%	1.34%	1.34%	0.67%	0.27%	0.40%	0.27%	0.40%	1.88%	3.09%	1.75%	0.00%	1.21%		23.39%
	3.09-	1.61%	5.11%	2.82%	0.13%	0.00%	0.40%	0.00%	0.00%	0.00%	0.00%	0.40%	0.67%	2.28%	0.54%	0.40%	1.48%		15.86%
	5.14-	2.96%	15.73%	3.76%	0.40%	0.13%	0.00%	0.00%	0.00%	0.00%	0.13%	0.13%	0.40%	2.02%	0.94%	0.67%	2.42%		29.70%
	8.23-	0.00%	1.48%	0.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%		2.02%
	10.8-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%
	calm																	29.03%	
	sum	6.18%	28.49%	9.27%	1.21%	1.48%	1.75%	0.67%	0.27%	0.40%	0.40%	0.94%	2.96%	7.39%	3.23%	1.21%	5.11%	29.03%	1

Table A5-1 (4) Frequency of Wind Direction and Speed (Monthly in 1996 and 1997)

1997	(m/s)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	calm	
Jan.	1.54-	1.48%	12.37%	8.06%	4.97%	2.02%	0.54%	0.00%	0.00%	0.13%	0.27%	0.00%	0.13%	0.54%	0.94%	0.27%	0.67%		32.39%
	3.09-	1.21%	6.45%	5.51%	1.75%	0.54%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.27%	1.61%	0.27%	0.27%	1.08%		19.09%
	5.14-	2.42%	15.32%	3.49%	0.94%	0.40%	0.00%	0.00%	0.00%	0.00%	0.13%	0.40%	0.81%	3.63%	2.55%	1.75%	3.76%		35.62%
	8.23-	0.13%	0.67%	0.13%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.40%	0.67%		2.42%
	10.8-	0.00%	0.13%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.27%
	calm																	10.22%	
	sum	5.24%	34.95%	17.34%	7.80%	2.96%	0.54%	0.00%	0.00%	0.13%	0.54%	0.40%	1.21%	5.78%	4.03%	2.69%	6.18%	10.22%	1
Feb.	1.54-	1.49%	8.18%	4.17%	3.27%	2.98%	2.98%	0.15%	0.60%	0.15%	0.45%	0.45%	0.60%	1.49%	0.60%	0.30%	1.04%		28.87%
	3.09-	1.19%	3.13%	2.08%	0.30%	0.30%	0.30%	0.00%	0.00%	0.30%	0.15%	0.15%	0.45%	1.93%	0.74%	0.30%	0.60%		11.90%
	5.14-	1.04%	3.27%	2.98%	0.45%	0.15%	0.00%	0.00%	0.00%	0.15%	0.45%	0.45%	1.04%	7.29%	4.02%	4.46%	3.72%		29.46%
	8.23-	0.15%	0.15%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	0.45%	0.89%	0.89%		2.83%
	10.8-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	0.00%	0.00%		0.15%
	calm																	26.64%	
	sum	3.87%	14.73%	9.38%	4.02%	3.42%	3.27%	0.15%	0.60%	0.60%	1.04%	1.04%	2.08%	10.86%	5.95%	5.95%	6.25%	26.64%	0.99
Mar.	1.54-	0.54%	1.75%	1.75%	2.28%	4.03%	6.18%	2.55%	1.08%	0.40%	0.94%	0.81%	1.75%	2.55%	0.94%	0.00%	0.54%		28.09%
	3.09-	0.00%	1.08%	0.40%	0.40%	0.27%	0.00%	0.00%	0.13%	0.00%	0.27%	0.67%	2.02%	3.23%	0.67%	0.27%	0.13%		9.54%
	5.14-	0.00%	0.54%	0.54%	0.40%	0.67%	0.00%	0.13%	0.00%	0.00%	0.00%	1.08%	5.51%	14.25%	1.88%	1.88%	0.27%		27.15%
	8.23-	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.13%	0.40%	0.13%	0.13%		1.08%
	10.8-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.13%
	calm																	33.74%	
	sum	0.54%	3.36%	2.82%	3.09%	4.97%	6.18%	2.82%	1.21%	0.40%	1.21%	2.55%	9.41%	20.16%	3.90%	2.28%	1.08%	33.74%	0.99
Apr.	1.54-	0.14%	0.69%	1.25%	2.08%	5.28%	9.03%	2.36%	0.97%	0.69%	1.11%	1.53%	2.22%	2.36%	0.42%	0.00%	0.00%		30.14%
	3.09-	0.14%	0.56%	0.28%	0.42%	0.56%	0.69%	0.28%	0.14%	0.56%	1.11%	1.53%	1.81%	2.08%	0.56%	0.14%	0.00%		10.83%
	5.14-	0.14%	0.28%	0.28%	0.56%	0.42%	0.14%	0.00%	0.28%	0.00%	0.28%	1.25%	10.97%	12.64%	1.53%	0.14%	0.14%		29.03%
	8.23-	0.14%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.42%	0.14%	0.00%	0.00%	0.00%		0.83%
	10.8-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%		0.14%
	calm																	29.03%	
	sum	0.56%	1.53%	1.81%	3.06%	6.39%	9.86%	2.64%	1.39%	1.25%	2.50%	4.31%	15.42%	17.36%	2.50%	0.28%	0.14%	29.03%	1

Table A5-1 (5) Frequency of Wind Direction and Speed (Monthly in 1996 and 1997)

1997	(m/s)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	calm	
May	1.54–	0.13%	0.54%	0.27%	0.40%	3.63%	5.11%	2.42%	2.29%	3.36%	2.69%	2.02%	2.02%	1.88%	0.67%	0.00%	0.13%		27.59%
	3.09–	0.13%	0.00%	0.00%	0.13%	0.40%	0.54%	0.13%	0.00%	0.67%	1.75%	2.83%	3.23%	2.02%	0.40%	0.00%	0.00%		12.25%
	5.14–	0.00%	0.40%	0.00%	0.27%	0.54%	0.13%	0.13%	0.00%	0.27%	3.50%	13.19%	9.29%	4.58%	0.54%	0.00%	0.00%		32.84%
	8.23–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.08%	0.00%	0.00%	0.00%	0.00%		1.08%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%
	calm																	26.24%	
	sum	0.27%	0.94%	0.27%	0.81%	4.58%	5.79%	2.69%	2.29%	4.31%	7.94%	18.03%	15.61%	8.48%	1.62%	0.00%	0.13%	26.24%	1
Jun.	1.54–	0.00%	0.00%	0.00%	0.00%	0.56%	2.50%	2.22%	5.00%	5.42%	3.19%	3.47%	2.08%	0.69%	0.00%	0.00%	0.00%		25.14%
	3.09–	0.00%	0.00%	0.00%	0.00%	0.14%	0.14%	0.14%	0.56%	1.11%	2.50%	3.75%	5.97%	0.97%	0.00%	0.00%	0.00%		15.28%
	5.14–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.28%	0.14%	3.06%	8.61%	15.00%	6.25%	0.14%	0.00%	0.00%		33.47%
	8.23–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.14%	0.42%	0.42%	0.14%	0.00%	0.00%	0.00%		1.25%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%		0.14%
	calm																	24.72%	
	sum	0.00%	0.00%	0.00%	0.00%	0.69%	2.64%	2.36%	5.97%	6.67%	8.89%	16.25%	23.61%	8.06%	0.14%	0.00%	0.00%	24.72%	1
Jul.	1.54–	0.00%	0.00%	0.00%	0.00%	0.13%	1.61%	0.94%	5.24%	1.61%	2.96%	2.42%	2.69%	0.54%	0.13%	0.13%	0.00%		18.41%
	3.09–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.27%	0.13%	2.82%	2.82%	6.59%	2.55%	0.00%	0.00%	0.00%		15.46%
	5.14–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.94%	2.02%	9.01%	23.66%	13.17%	1.08%	0.00%	0.00%		49.87%
	8.23–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	1.08%	3.36%	0.40%	0.00%	0.00%		4.97%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%
	calm																	11.29%	
	sum	0.00%	0.00%	0.00%	0.00%	0.13%	1.61%	1.21%	5.51%	2.69%	7.80%	14.38%	34.01%	19.62%	1.61%	0.13%	0.00%	11.29%	1
Aug.	1.54–	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.67%	0.94%	2.15%	1.61%	3.49%	2.69%	0.54%	0.00%	0.00%	0.00%		12.37%
	3.09–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	2.15%	4.57%	7.93%	1.61%	0.00%	0.00%	0.00%		16.40%
	5.14–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.02%	12.37%	34.95%	8.60%	0.13%	0.00%	0.00%		58.06%
	8.23–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	3.23%	1.34%	0.00%	0.00%	0.00%		4.84%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%
	calm																	8.33%	
	sum	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.67%	0.94%	2.28%	5.78%	20.70%	48.79%	12.10%	0.13%	0.00%	0.00%	8.33%	1

Table A5-1 (6) Frequency of Wind Direction and Speed (Monthly in 1996 and 1997)

1997	(m/s)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	calm	
Sep.	1.54–	0.00%	0.00%	0.00%	0.00%	0.42%	4.31%	2.22%	4.31%	5.42%	4.72%	2.50%	1.11%	0.69%	0.00%	0.28%	0.14%		26.11%
	3.09–	0.14%	0.00%	0.00%	0.00%	0.00%	0.28%	0.00%	0.69%	1.11%	3.47%	3.06%	4.58%	0.83%	0.14%	0.00%	0.14%		14.44%
	5.14–	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.42%	3.47%	10.00%	12.22%	4.31%	0.42%	0.00%	0.00%		30.97%
	8.23–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	1.11%	1.94%	0.00%	0.00%	0.00%		3.19%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%		0.14%
	calm																	25.14%	
	sum	0.14%	0.00%	0.00%	0.00%	0.42%	4.72%	2.22%	5.00%	6.94%	11.67%	15.83%	19.03%	7.78%	0.56%	0.28%	0.28%	25.14%	1
Oct.	1.54–	0.13%	0.54%	0.67%	0.54%	4.17%	4.30%	0.94%	1.88%	0.81%	0.81%	1.21%	2.28%	3.36%	0.81%	0.40%	0.00%		22.85%
	3.09–	0.00%	0.40%	0.13%	0.27%	0.81%	0.40%	0.00%	0.27%	0.00%	0.27%	1.34%	3.90%	5.38%	0.54%	0.13%	0.00%		13.84%
	5.14–	0.13%	0.00%	0.13%	0.00%	0.54%	0.27%	0.13%	0.13%	0.00%	0.40%	0.67%	3.90%	5.65%	1.61%	0.13%	0.00%		13.71%
	8.23–	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%		0.40%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%
	calm																	49.19%	
	sum	0.27%	1.08%	0.94%	0.81%	5.51%	4.97%	1.21%	2.28%	0.81%	1.48%	3.23%	10.08%	14.36%	2.96%	0.81%	0.00%	49.19%	1
Nov.	1.54–	0.14%	1.25%	1.94%	2.50%	4.86%	3.61%	1.81%	2.78%	1.81%	1.39%	0.69%	1.81%	1.81%	0.83%	0.42%	0.00%		27.64%
	3.09–	0.14%	0.14%	0.28%	0.14%	0.28%	0.28%	0.14%	0.69%	0.28%	0.69%	1.11%	1.94%	3.33%	0.56%	0.14%	0.00%		10.14%
	5.14–	0.14%	0.28%	0.42%	0.00%	0.56%	0.14%	0.28%	0.14%	0.28%	0.56%	1.11%	3.06%	5.97%	1.67%	0.00%	0.14%		14.72%
	8.23–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.00%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		0.28%
	calm																	47.22%	
	sum	0.42%	1.67%	2.64%	2.64%	5.69%	4.03%	2.22%	3.61%	2.36%	2.92%	2.92%	6.81%	11.11%	3.06%	0.56%	0.14%	47.22%	1
Dec.	1.54–	0.67%	4.97%	5.38%	4.30%	7.53%	2.82%	0.27%	0.40%	0.27%	0.40%	0.27%	1.08%	2.02%	0.67%	0.54%	0.27%		31.85%
	3.09–	0.67%	3.90%	2.42%	0.94%	0.81%	0.27%	0.00%	0.00%	0.00%	0.00%	0.27%	1.48%	2.82%	0.40%	0.13%	0.13%		14.25%
	5.14–	1.21%	4.84%	2.42%	1.75%	0.27%	0.00%	0.13%	0.00%	0.13%	0.00%	0.13%	1.34%	4.84%	1.08%	0.67%	0.27%		19.09%
	8.23–	0.13%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%		0.40%
	10.8–	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%		0.13%
	calm																	34.27%	
	sum	2.69%	13.84%	10.22%	6.99%	8.60%	3.09%	0.40%	0.40%	0.40%	0.40%	0.67%	3.90%	9.95%	2.15%	1.34%	0.67%	34.27%	1

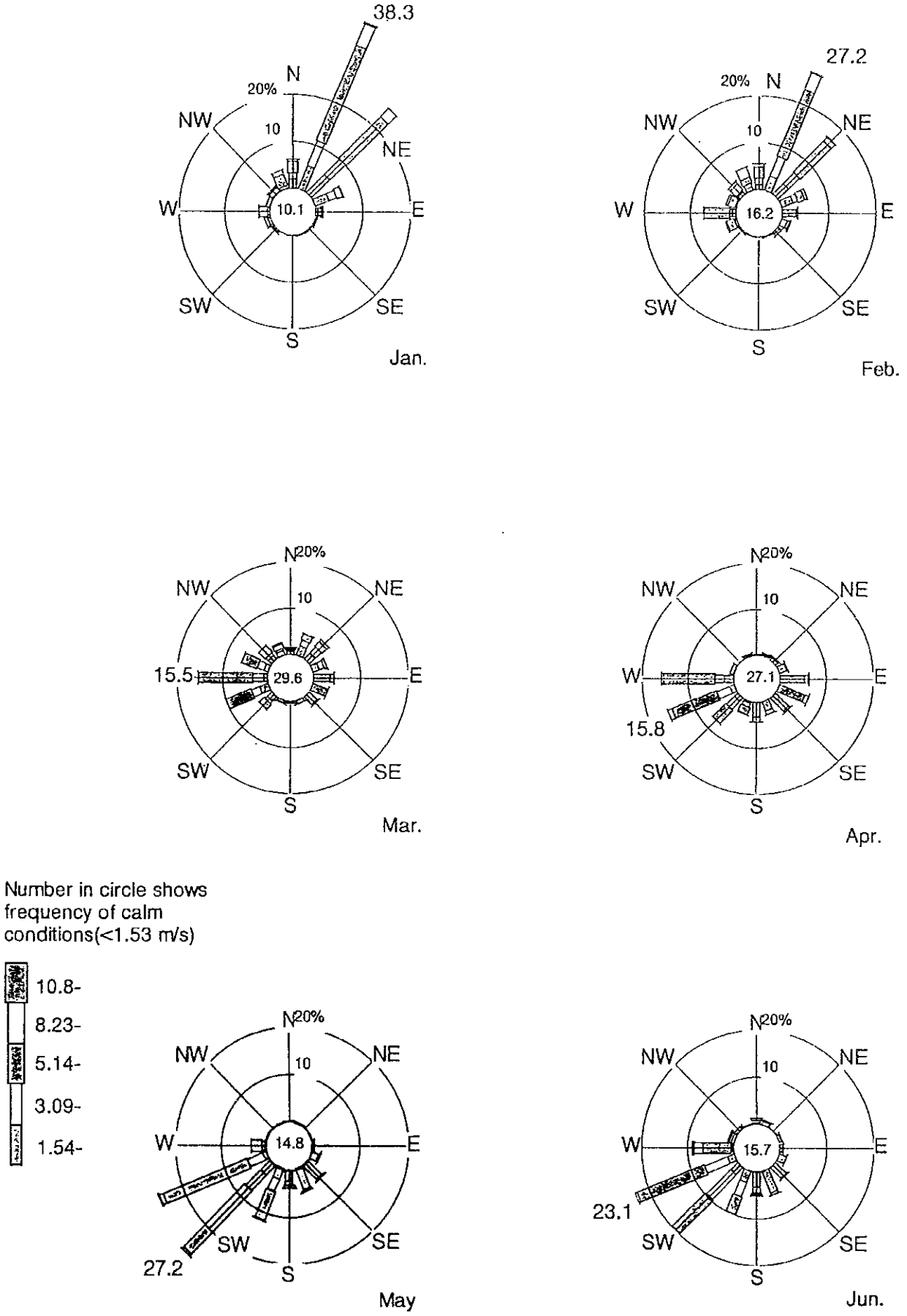

Figure A5.1 (1) Wind Roses (Monthly, 1996)

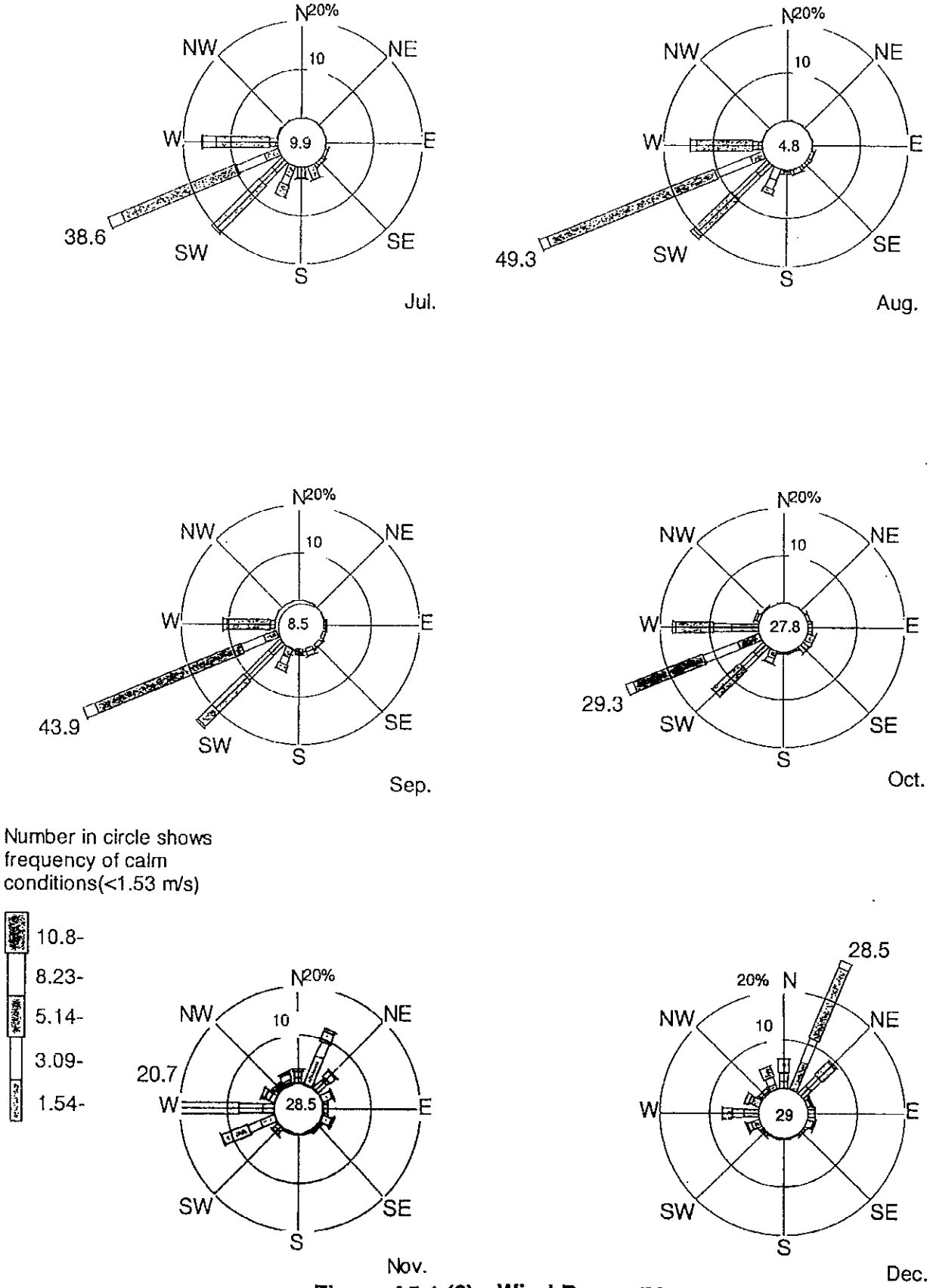

Figure A5.1 (2) Wind Roses (Monthly, 1996)

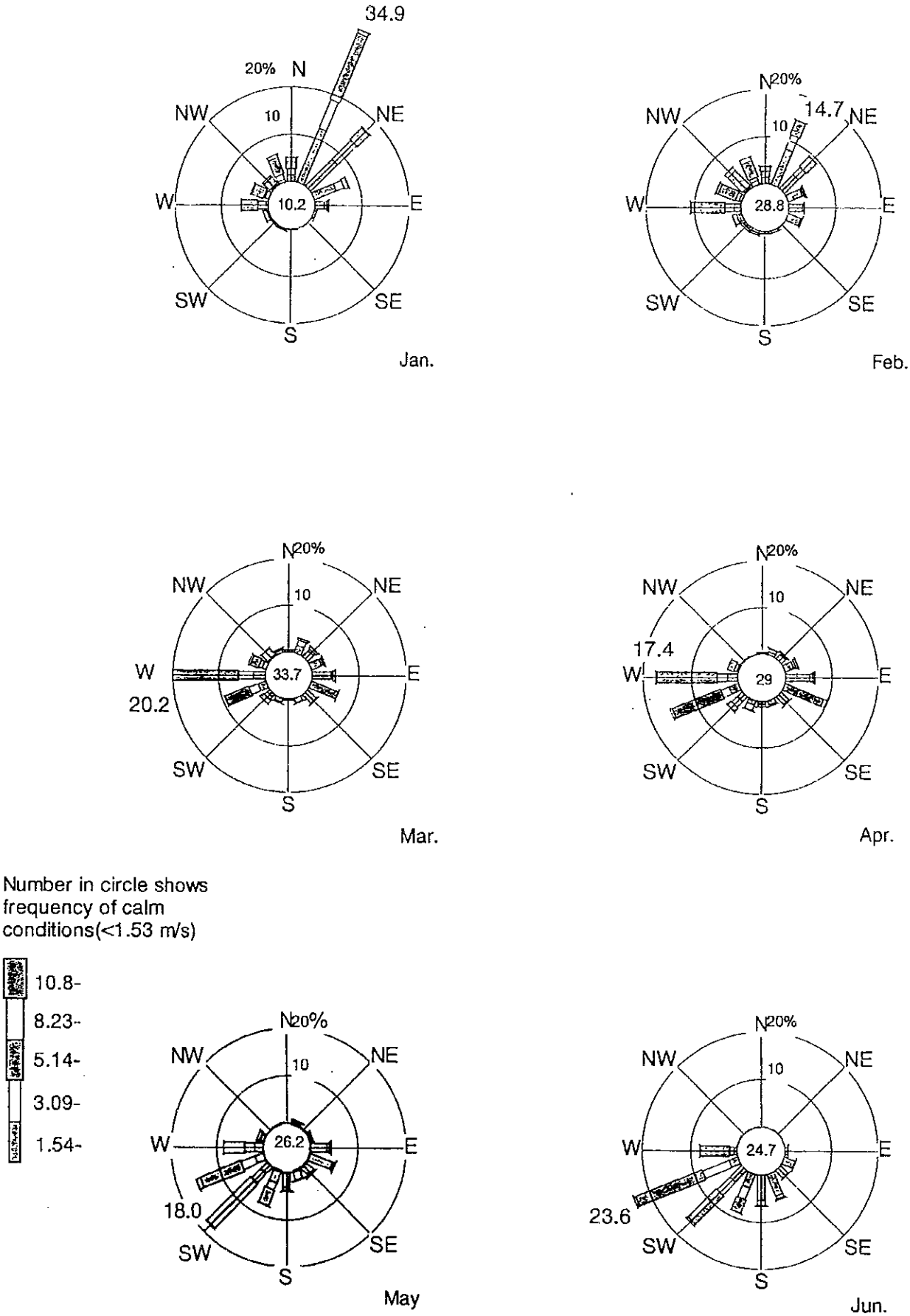

Figure A5.1 (3) Wind Roses (Monthly, 1997)

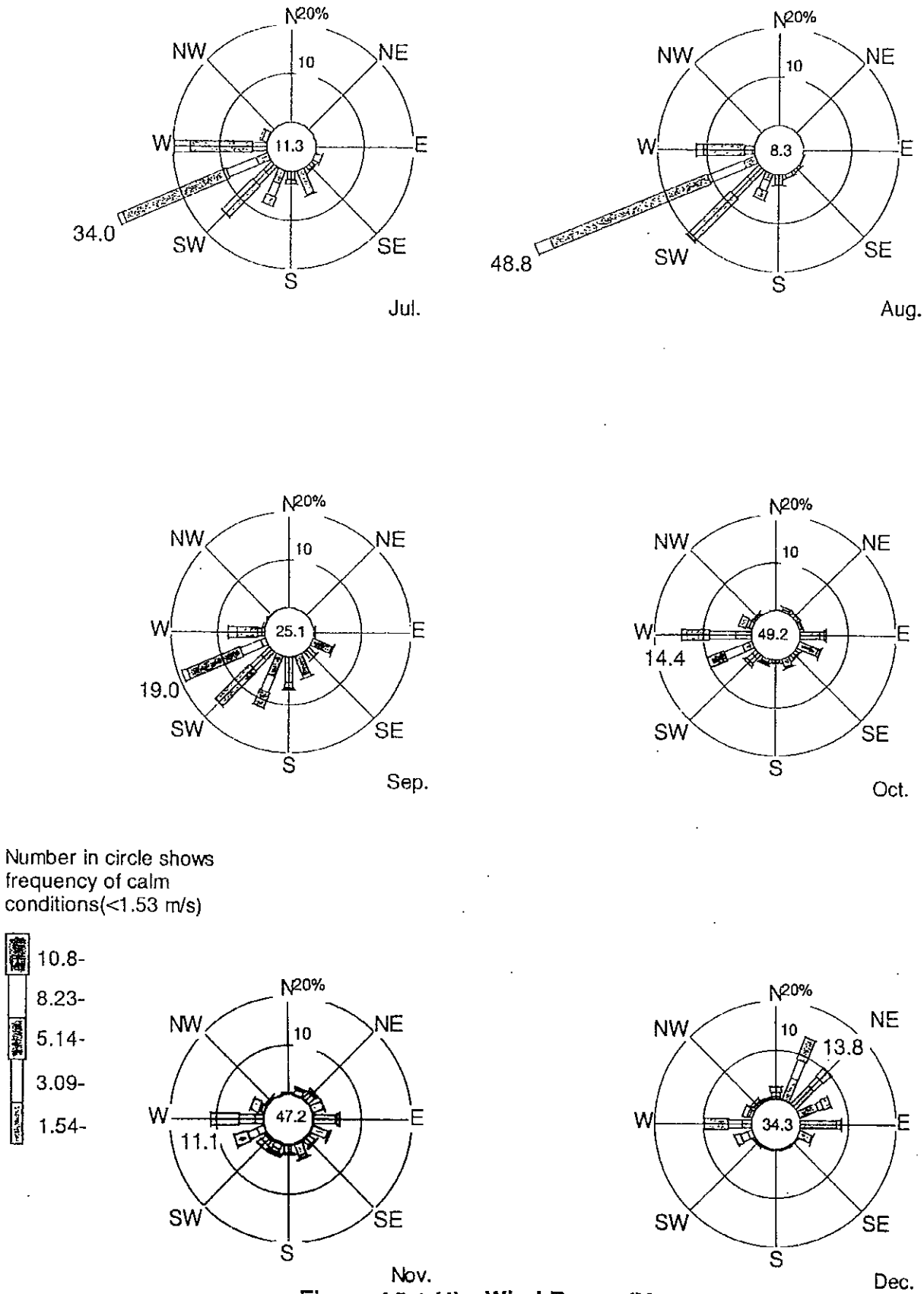

Figure A5.1 (4) Wind Roses (Monthly, 1997)

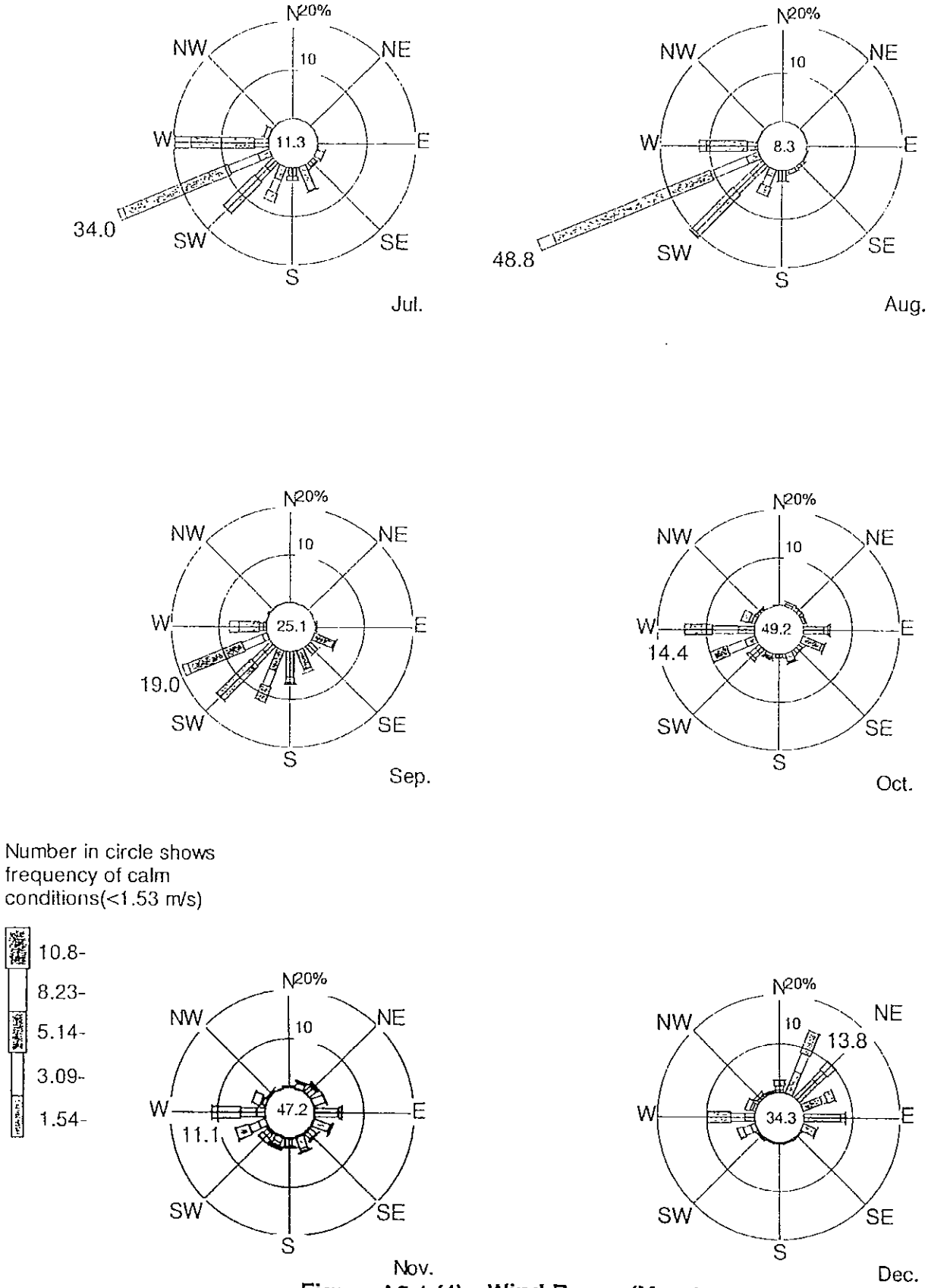

Figure A5.1 (4) Wind Roses (Monthly, 1997)

ANNEX 6　水質調査結果(CISIR)

Ceylon Institute of Scientific and Industrial Research
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WATER QUALITY SURVEY

CP 13960

TO:

Tokyo Electric Power Station
3-3-3, Higashi -- Ueno
Taito -- ku, Tokyo 110,
JAPAN

18th May, 1998

This report replaces the Report No. CP 13960 issued on 02nd March, 1998

THE REPORT IS ISSUED SUBJECT TO CONDITIONS MENTIONED OVERLEAF.

"PLEASE ADDRESS ALL COVERS TO THE DIRECTOR"

Ceylon Institute of Scientific and Industrial Research
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WATER QUALITY SURVEY

CP 13960

CLIENT	:	Tokyo Electric Power Station 3-3-3, Higashi -- Ueno Taito -- ku, Tokyo 110, JAPAN
BACKGROUND	:	A Feasibility study is being carried out to set up a Combined cycle power development project at Kerawalapitiya. This survey was carried out to determine the present water quality of the Hamilton canal that passes close to the proposed site, and the sea in the proximity of the site.
SAMPLING LOCATIONS & PARAMETERS	:	Sampling locations and parameters measured for this study are as given in the Technical Specifications (Annexure 1) given by the client. Locations are indicated in Figure 1.
SAMPLING VISITS	:	Sampling and field measurements were carried out on 21st January, 1998 and 17th February, 1998. Analysis for BOD, COD, TSS and Oil and Grease were carried out in the Laboratory. All other parameters were measured in the field. Weather conditions and results of field measurements including flow rate are given in Tables 1 and 2. Values for Salinity and Electrical Conductivity which were subsequently measured on April 07th 1998 are given in Table 3. Methodology utilised for analysis is given in Table 4. Details of flow measurement and vertical section measurements are given in Figures 1, 2, 3 & 4. It was observed that there was a discharge to the canal between points 1 and 2, so contributing to a higher flow rate at point 2.

THE REPORT IS ISSUED SUBJECT TO CONDITIONS MENTIONED OVERLEAF.

"PLEASE ADDRESS ALL COVERS TO THE DIRECTOR"

FIG 1 LOCATION MAP FOR WATER QUALITY SURVEY WORK
S=1:30,000
THE FEASIBILITY STUDY ON COMBINED CYCLE
POWER DEVELOPMENT PROJECT AT KERAWALAPITIYA

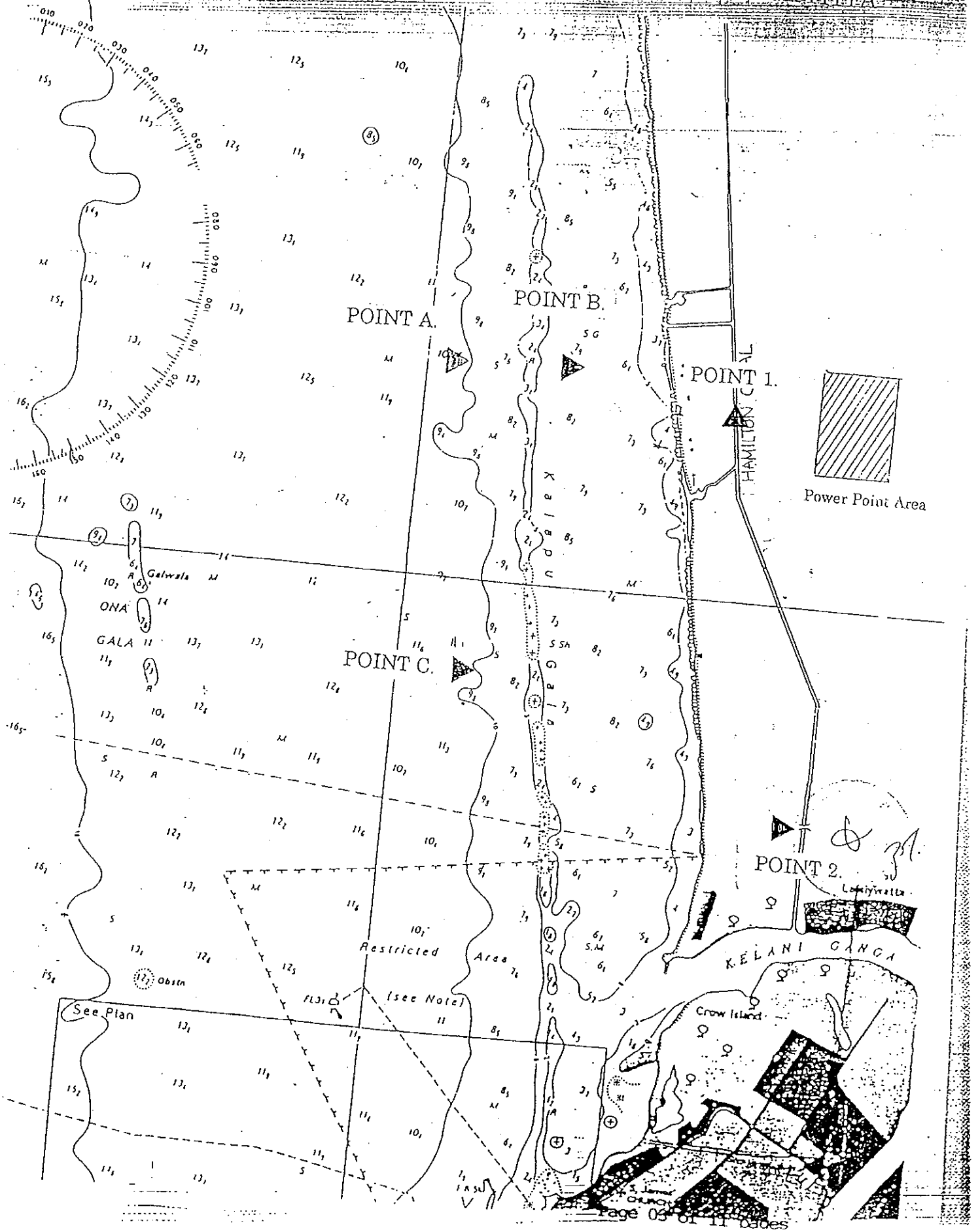

Table 1

Water quality of Hamilton canal and sea - 21st January, 1998

Location	Time of sampling	Depth m	Atmospheric Temperature, °C	Water Temperature °C	Flow rate m^3/sec	Salinity, ‰	pH	DO mg/l	Transp-arency, m	Conduc-tivity mS/cm	COD mg/l	BOD_3, mg/l at 30°C	Oil & Grease mg/l	Total Suspended Solids at 103-105°C, mg/l
C_1 SURF	12.30 p.m.	-	29.2	30.1	2.47	-*	6.8	4.0	-	-*	23	20	<2	11
C_1 MID		0.75		30.1		-*	6.9	4.0	-	-*	18	<15	<2	14
C_2 SURF	12.00 noon	-	29.7	30.2	3.33	-*	6.9	3.4	-	-*	32	20	<2	<5
C_2 MID		0.5		29.2		-*	7.3	3.5	-	-*	23	20	<2	12
S_A SURF	10.30 a.m.	-	27.7	29.5	-	-*	7.8	7.2	7.5	-*	-	-	6	<2.5
S_A MID	11.00 a.m.	5.5		29.4		-*	8.0	6.1		-*	-	-	<2	<2.5
S_B SURF	11.15 a.m.	-	30.2	30.2	-	-*	8.0	6.9	4.4	-*	-	-	<2	<5
S_C SURF	11.30 a.m.	-	30.1	30.2	-	-*	8.0	6.8	9.0	-*	-	-	<2	<2.5
S_C MID		5.0		29.2		-*	8.0	7.1		-*	-	-	<2	<2.5

* Could not be determined due to instrument failure

C_1 and C_2 - Canal S_A, S_B and S_C - Sea SURF - Surface MID - Middle

Note :
1. Flow direction was from the lagoon towards the Kelani river. i.e. from point 1 to point 2.
2. Weather condition at time of sampling - clear sky
3. Sea condition at time of sampling - Calm

Table 2
Water quality of Hamilton canal and sea - 17th February,1998

Location	Time of sampling	Depth m	Atmospheric Temperature °C	Water Temperature °C	Flow rate m^3/sec	Salinity, ‰	pH	DO mg/l	Transp-arency m	Conduc-tivity mS/cm	COD mg/l	BOD_3 mg/l at 30°C	Oil & Grease mg/l	Total Suspended Solids at 103-105°C, mg/l
C_1 SURF	1.15 p.m	-	29.7	30.3	2.31	-*	7.0	2.8	-	-*	25	<15	<2	<10
C_1 MID	1.15 p.m	0.75		30.3		-*	7.1	3.2	-	-*	22	<15	<2	<10
C_2 SURF	12.15 p.m	-	29.7	30.1	3.69	-*	7.0	3.1	-	-*	44	<15	3	21
C_2 MID	12.15 p.m	0.75		30.1		-*	7.2	3.6	-	-*	40	<15	<2	20
S_A SURF	10.50 a.m	-	28.7	29.8	-	-*	8.0	7.3	7.3	-*	-	-	<2	<10
S_A MID	10.50 a.m	5.5		29.2		-*	7.9	6.5		-*	-	-	<2	<10
S_B SURF	11.25 a.m	-	30.2	29.9	-	-*	8.0	6.9	4.5	-*	-	-	<2	<10
S_C SURF	11.40 a.m	-	30.1	29.8	-	-*	8.0	7.3	8.5	-*	-	-	<2	<10
S_C MID	11.40 a.m	5.0		29.2		-*	8.0	6.3		-*	-	-	<2	<10

* Could not be determined due to instrument failure

C_1 and C_2 - Canal S_A, S_B and S_C . Sea SURF - Surface MID - Middle

Note :
1. Flow direction was from the lagoon towards the Kelani river. i.e. from point 1 to point 2.
2. Weather condition at time of sampling - cloudy sky
3. Sea condition at time of sampling - Slightly rough

Table 3

Electrical Conductivity and Salinity values of 07th April, 1998

Location	Conductivity, mS/cm	Salinity, ‰
C_1 SURF	5.97	3.1
C_1 MID	6.22	3.2
C_2 SURF	1.33	0.6
C_2 MID	1.41	0.6
S_A SURF	52.7	34.7
S_A MID	52.8	34.8
S_B SURF	52.4	34.6
S_C SURF	52.4	34.5
S_C MID	52.6	34.7

C_1 and C_2 - Canal S_A, S_B and S_C - Sea SURF - Surface MID - Middle

Figure 1

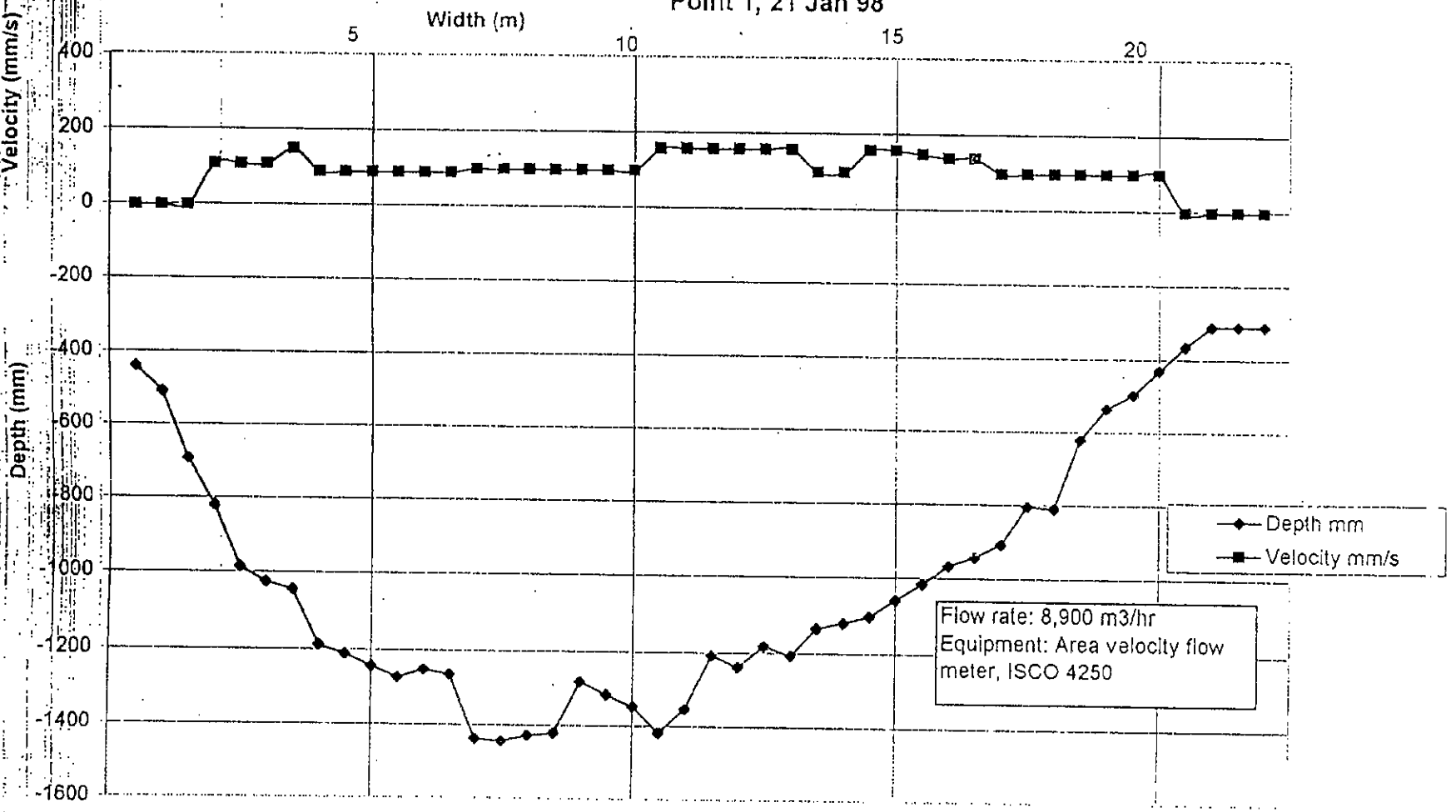
Average Velocity and Depth Profile of Hamilton Canal
Point 1, 21 Jan 98
Width (m)
5
10
15
20
Velocity (mm/s)
400
200
0
-200
Depth (mm)
-400
-600
-800
-1000
-1200
-1400
-1600
Depth mm
Velocity mm/s
Flow rate: 8,900 m3/hr
Equipment: Area velocity flow meter, ISCO 4250

Figure 2

Average Velocity and Depth Profile of Hamilton Canal
Point 1, 17 Feb 98

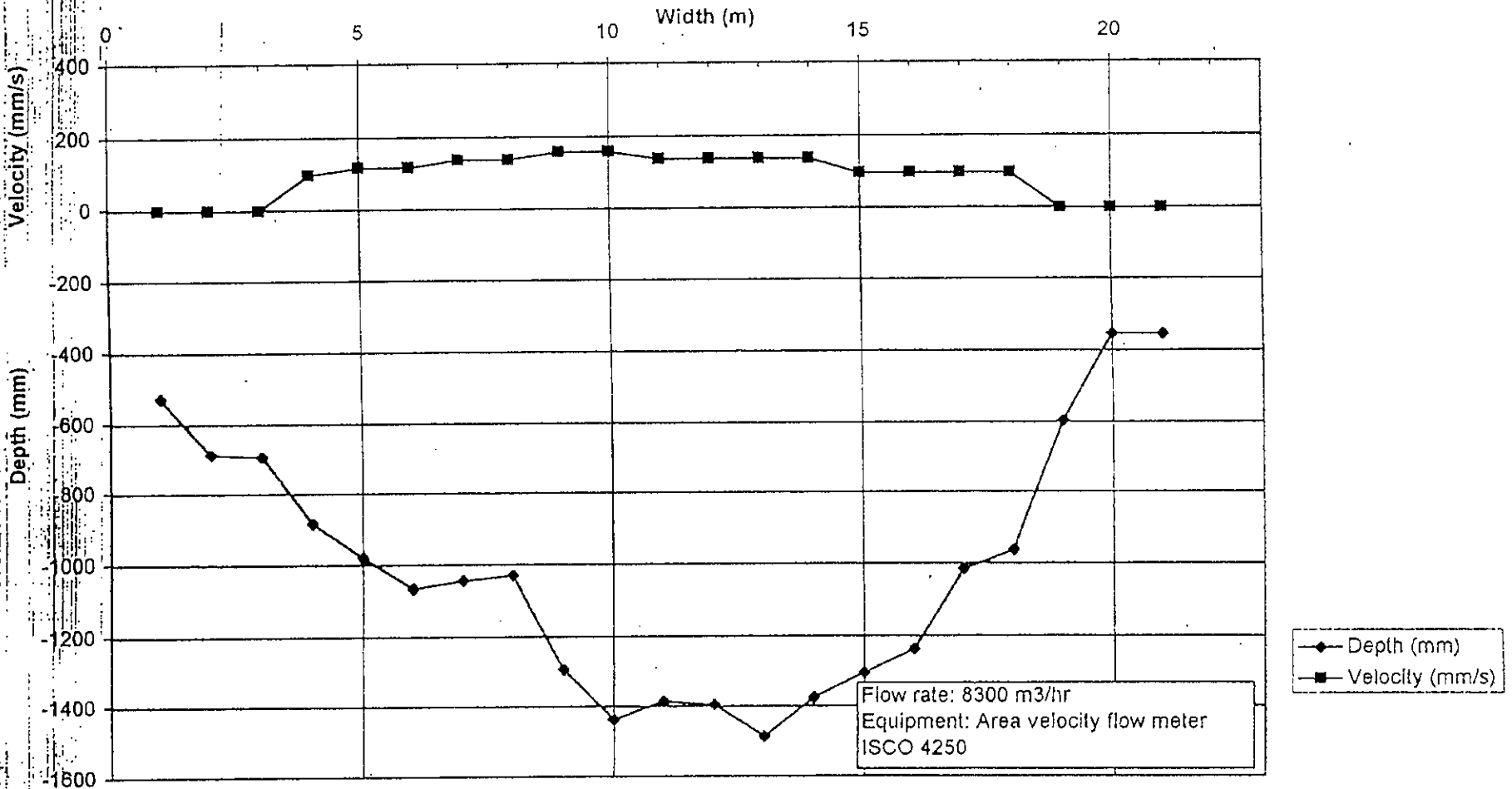

Figure 3

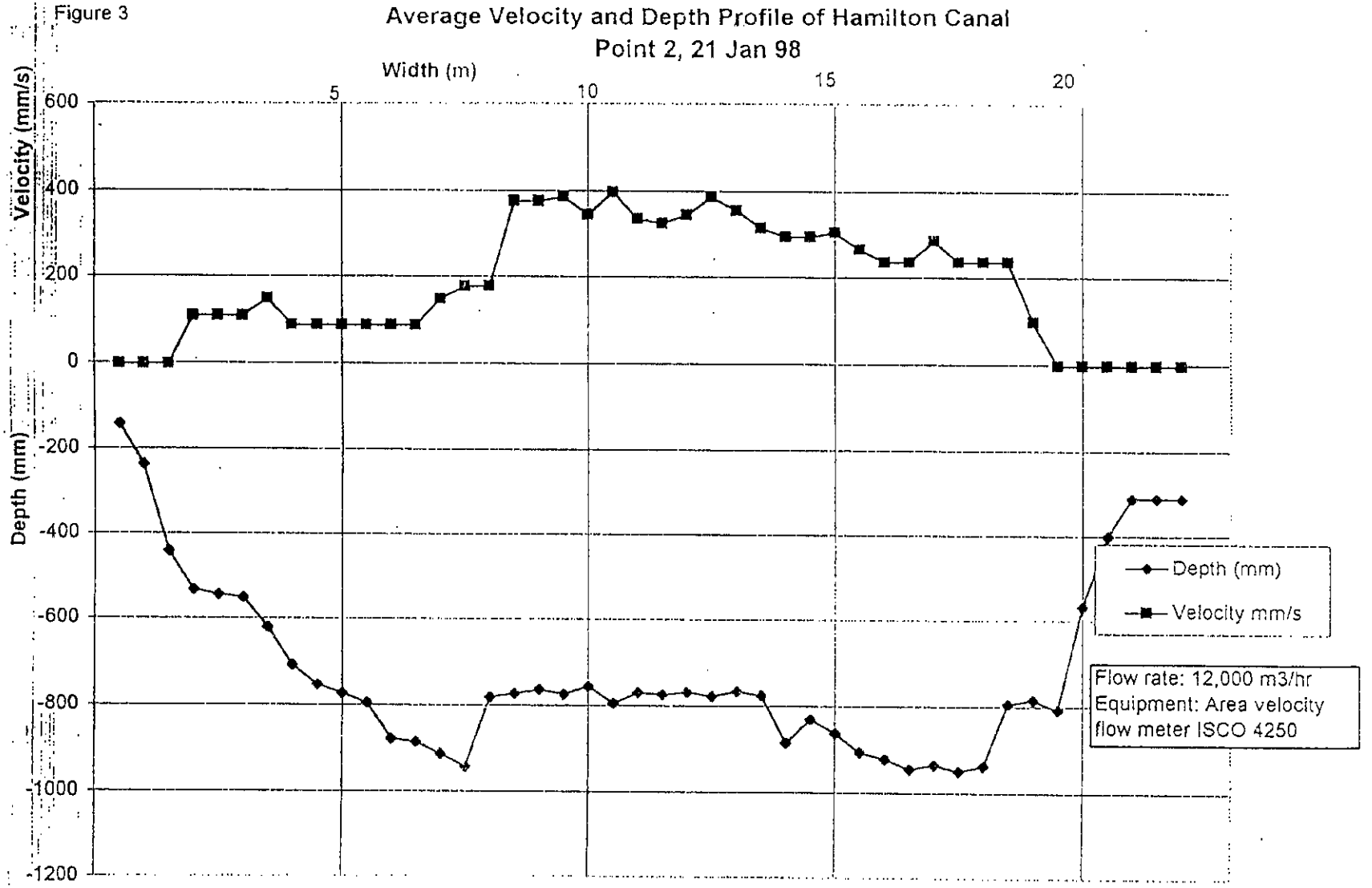
Average Velocity and Depth Profile of Hamilton Canal
Point 2, 21 Jan 98
Width (m)
5
10
15
20
Velocity (mm/s)
600
400
200
0
Depth (mm)
-200
-400
-600
-800
-1000
-1200
Depth (mm)
Velocity mm/s
Flow rate: 12,000 m3/hr
Equipment: Area velocity
flow meter ISCO 4250

Figure 4

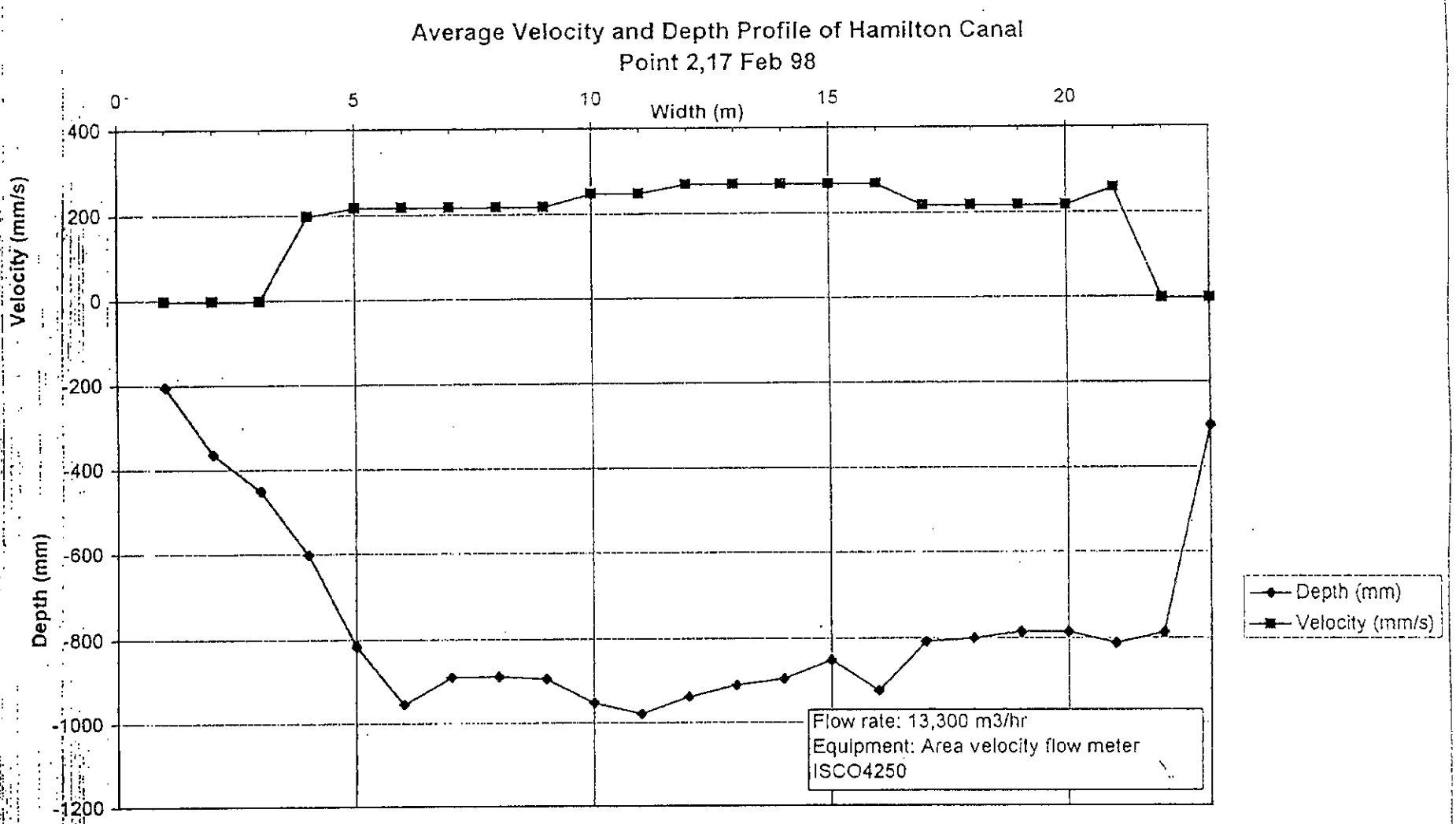
Average Velocity and Depth Profile of Hamilton Canal
Point 2,17 Feb 98
Width (m)
0
5
10
15
20
Velocity (mm/s)
400
200
0
Depth (mm)
-200
-400
-600
-800
-1000
-1200
Depth (mm)
Velocity (mm/s)
Flow rate: 13,300 m3/hr
Equipment: Area velocity flow meter
ISCO4250

Table 4

PARAMETER	TEST METHOD	METHOD PRINCIPLE
pH	APHA* 4500 H^+B	Glass Electrode
Salinity	In-house method	Calculated from conductivity values
Temperature	In-house method	Digital thermometer
Transparency	In-house method	Secchi disc reading
TSS	APHA* 2540 D	Gravimetry
COD	APHA * 5220 B	Dichromate, Open reflux
BOD	In-house method	Mercury Manometer
Oil & Grease	APHA * 5520 B	Gravimetry

* Standard methods for the examination of water and waste water, APHA, AWWA. WEF. 18th Edition, 1992.

- The names of the project team members involved in this survey are given in Annexure II.

Dr. A.M. Mubarak
HEAD, CHEMICAL & ENVIRONMENTAL
TECHNOLOGY DIVISION

SW/rl
18th May, 1998

ANNEXTURE I

1. Water Quality Survey

1.1 Objectives of the Survey

Survey is carried out in order to grasp current water quality condition at the Hamilton canal and the sea in front of the proposed power plant.

1.2 Measurement Items

The water quality observation items are Temperature (℃), Salinity (‰), DO (mg/l), BOD (mg/l), COD (mg/l), Transparency (-), pH (-), OIL & Grease (mg/l) and TSS (mg/l) by the standard of Sri Lanka. Measurements of flow rate (m^3/sec), water level (m) and vertical section of canal at the measurement point are carried out.

1.3 Location on Measurement

Canal : 2 points at the Hamilton canal. (See Location Map)
- Point 1: In front of the proposed power plant site.
- Point 2 ; Point side to the Kelani Ganga.
- Water sampling point is at the center of the canal width.

Sea : 3 points in front of the proposed power plant site. (See Location Map)
- Point A ; About 1 km (10m depth) from coast line in front of the proposed power plant.
- Point B ; About 0.25 km (5m depth) from coast line in front of the proposed power plant.
- Point C ; About 1 km (10m depth) from coast line at the place between the proposed power plant site and Kelani Ganga.
- If the sea condition is not suitable for working with a boat, sampling is carried out from the beach directly.

1.4 Depth on Measurement Point

Canal : 2 fixed layers of the surface and middle depth.

Sea : Point A ; 2 fixed layers of the surface and middle depth.
- Point B ; 1 fixed layer of the surface.
- Point C ; 2 fixed layers of the surface and middle depth.

1.5 Measurement Periods

Both canal and sea surveys are carried out during the period as follows.

1) 2 times during Jan.~Feb. 1998

2) 1 time during May~June 1998

Select suitable day for measurement. Avoid special day such as having extreme rising canal water amount and/or abnormal weather condition. The measurement at sea will be done at the middle tidal water level.

1.6 Instruments / Methods / Procedures

(1) Use instruments and procedures regulated by the Standard of Sri Lanka.
Calibration for instruments is carried out before survey.
Sampling bottles rinsed by distilled water are used for water sampling.

atmospheric temperature and sea conditions during the respective observation period at the same time.

(4) The Contractor submits eight (8) copies of the final (water quality) observation report to the Employer.

1.8 Permission of Water Quality Survey

Prior to starting the work, the Contractor obtains a permission from the relevant Government or local authority and so forth under his responsibility.

Annexure II

Project team

1. Ms. S. Wickramaratne, SRO, (Co-ordinator)
2. Mr. K. Pavananthan, RO
3. Ms. K de Alwis, TO
4. Mr. U.N.T. Weerasekara, TO
5. Mr. S.K.D. Sarath Kumara, TA
6. Ms. W.R.L. Wijesekera, TA

Ceylon Institute of Scientific and Industrial Research
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Telephone : 693807 - 9, 698621/3, 683127 - 9 Fax : 686567

ITI

Industrial Technology Institute (Successor to CISIR) As per Act of Parliament No. 11 of 1994

WATER QUALITY SURVEY

CP 16047

TO:

Tokyo Electric Power Station
3-3-3, Higashi -- Ueno
Taito -- ku, Tokyo 110,
JAPAN

14th July, 1998

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March, 1996.

Ceylon Institute of Scientific and Industrial Research
P.O. Box 787, 363, Bauddhaloka Mawatha, Colombo 7, Sri Lanka.
Telephone : 693807 - 9, 698621/3, 683127 - 9 Fax : 686567

ITI

IndustrialTechnology Institute (Successor to CISIR) As per Act of Parliament No. 11 of 1994

WATER QUALITY SURVEY

CP 16047

CLIENT	:	Tokyo Electric Power Station 3-3-3, Higashi -- Ueno Taito -- ku, Tokyo 110, JAPAN
BACKGROUND	:	Following the survey carried out in January/February, 1998 to obtain water quality data in the Kerawalapitiya area (CP 13960), the client requested that sampling be repeated in the rainy season.
SAMPLING LOCATIONS & PARAMETERS	:	Sampling locations and parameters for this study were given by the client. (Annexure 1 and Fig 1) However, due to the prevailing rough weather conditions, all the requirements of the client could not be carried out.

SAMPLING VISITS :

1. Sampling carried out by Industrial Technology Institute (ITI) staff.

   The 4 canal samples were collected according to the client specifications on 19th June, 1998. One Sea water sample was also collected on this day from the shore, at a location approximately in front of the proposed site. (B)

2. Samples submitted by staff of Lanka Hydraulic Institute (LHI).

   Since ITI staff could not collect samples away from the shore, LHI staff were requested to collect these samples. The following samples were collected and submitted by them under refrigerated conditions

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CISIR ACCEPTS NO LEGAL RESPONSIBILITY FOR WHICH THE CLIENT USES THE CISIR RESULTS/REPORT.

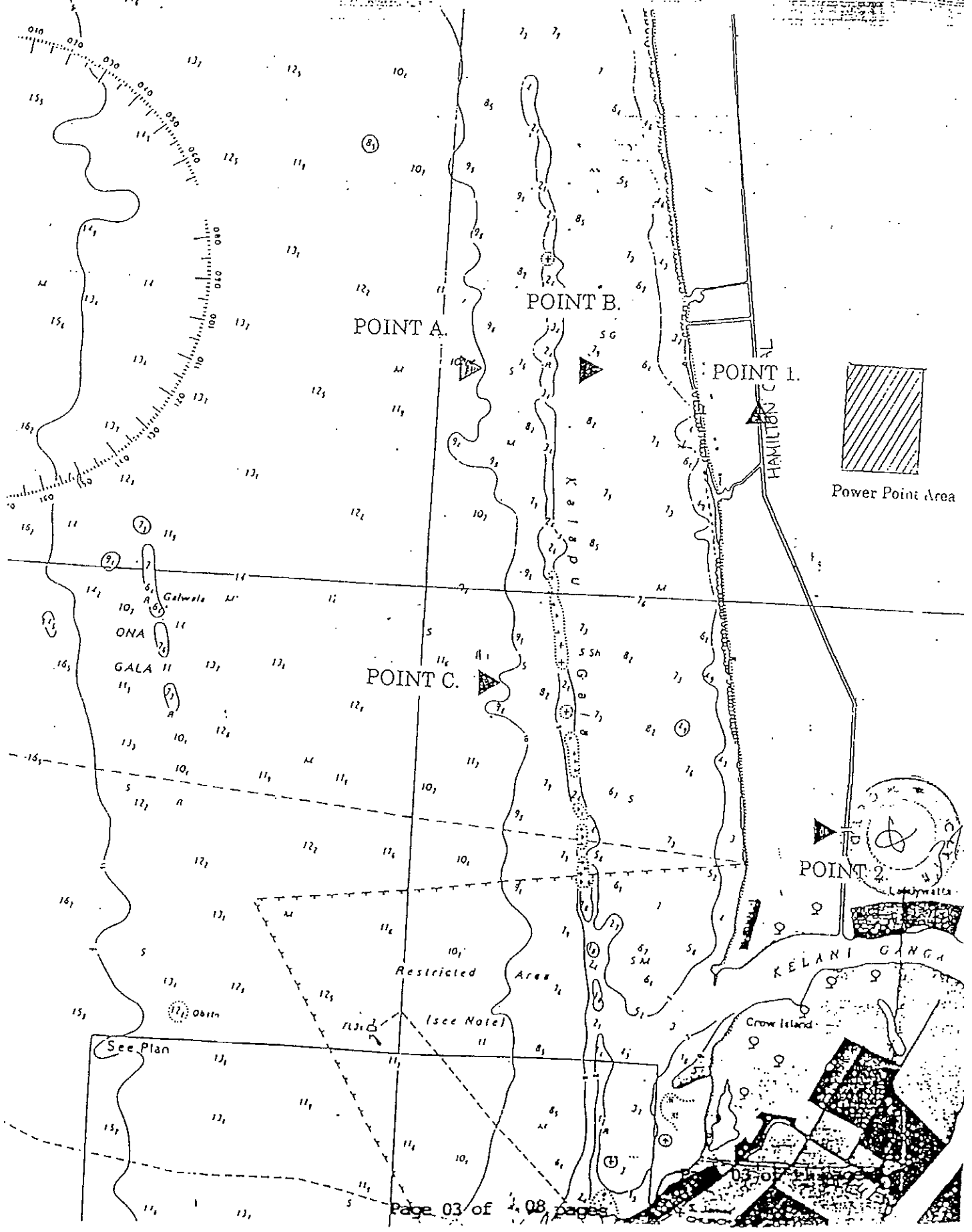
March, 1996.

FIG 1

LOCATION MAP FOR WATER QUALITY SURVEY WORK

S=1:30,000

THE FEASIBILITY STUDY ON COMBINED CYCLE POWER DEVELOPMENT PROJECT AT KERAWALAPITIYA



CP 16047

Approximately 2 litres were submitted in plastic cans on 18th June, 1998 from

A - 10 m depth, approximately 1.5km from shore (beyond reef) in front of proposed plant.

2 samples - Surface
Mid depth

C - Point approximately half way between location of A and Kelani river mouth.

1 Sample - Surface

Subsequently on 26th June, 1998 approximately 1 litre of water from point C mid - depth was submitted in a plastic bottle.

MESUREMENTS & ANALYSIS : Flow measurements and pH, DO, Temperature, Electrical Conductivity and Salinity measurements were carried out by ITI staff for all samples in the field collected by them. Analysis for all other parameters and for pH, Temperature, DO, Electrical Conductivity and Salinity for samples collected by LHI were carried out in the laboratory.

Results are given in Table 1. Velocity and depth profiles are given in Fig 2 and 3.

Test methods and principles of methods are given in Table 2.

Table 1. Water quality of Hamilton canal and sea - 19th June, 1998

Location	Time of sampling	Depth m	Atmospheric Temperature, °C	Water Temperature °C	Flow rate m^3/sec	Salinity, ‰	pH	DO mg/l	Conduc -tivity mS/cm	COD mg/l	BOD_3, mg/l at 30°C	Oil & Grease mg/l	Total Suspended Solids at 103-105°C, mg/l
C_1 SURF	10.30 a.m	-	32	30.8	2.25	0.5	6.7	2.0	1.25	6	< 1	1.3	15
C_1 MID		0.75		31.1		0.5	6.6	2.0	1.29	9.4	< 1	< 0.5	39
C_2 SURF	12.00 noon	-	30	27.0	1.53	< 0.1	7.7	4.8	0.06	7.2	< 1	0.8	2
C_2 MID		0.5		27.8		< 0.1	7.3	4.7	0.06	8.3	1	< 0.5	3
A SURF	-	-	-	-	-	31.5	8.2	5.2*	48.1	-	-	+	9
A MID	-	10.0	-	-	-	34.1	8.2	5.1*	51.7	-	-	+	8
B SURF	1.00 p.m	-	31	30.0	-	31.3	8.4	5.1	47.9	-	-	< 0.5	4
C SURF	-	-	-	-	-	31.4	8.3	5.1*	47.8	-	-	+	5
C MID	-	10.0	-	-	-	34.1	8.3	4.4*	51.8	-	-	+	10

* Measured in the laboratory

\+ Could not be measured since appropriate samples could not be obtained

C_1 and C_2 - Canal S_A, S_B and S_C . Sea SURF - Surface MID - Middle

Note :
1. Flow direction was from the Kelani river towards the lagoon. i.e. from point 2 to point 1.
2. Weather condition at time of sampling - cloudy sky
3. Sea condition at time of sampling – rough

Figure 1

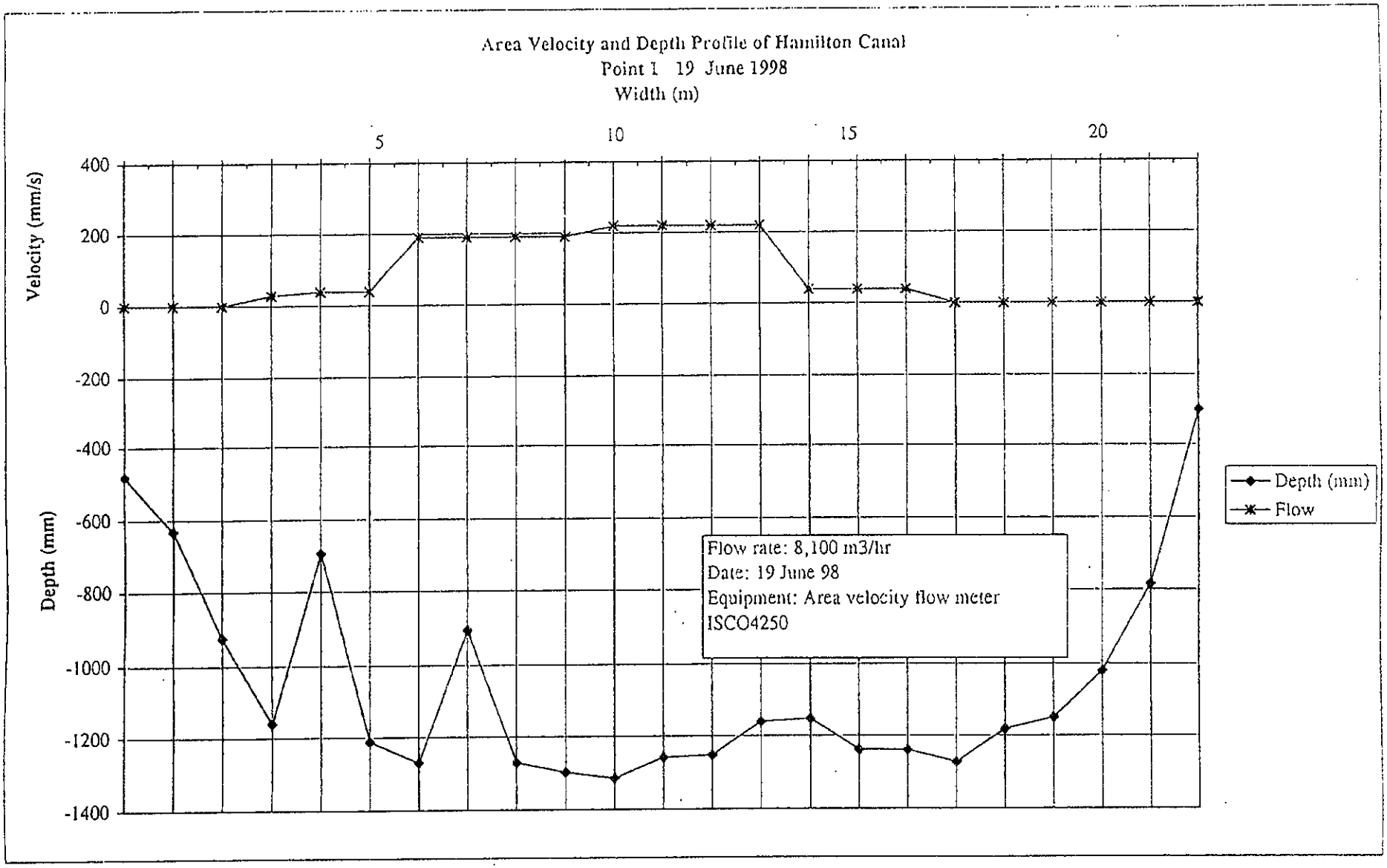

Area Velocity and Depth Profile of Hamilton Canal
Point 1 19 June 1998
Width (m)
5
10
15
20
Velocity (mm/s)
400
200
0
-200
-400
-600
-800
-1000
-1200
-1400
Depth (mm)
Depth (mm)
Flow
Flow rate: 8,100 m3/hr
Date: 19 June 98
Equipment: Area velocity flow meter
ISCO4250

Figure 2

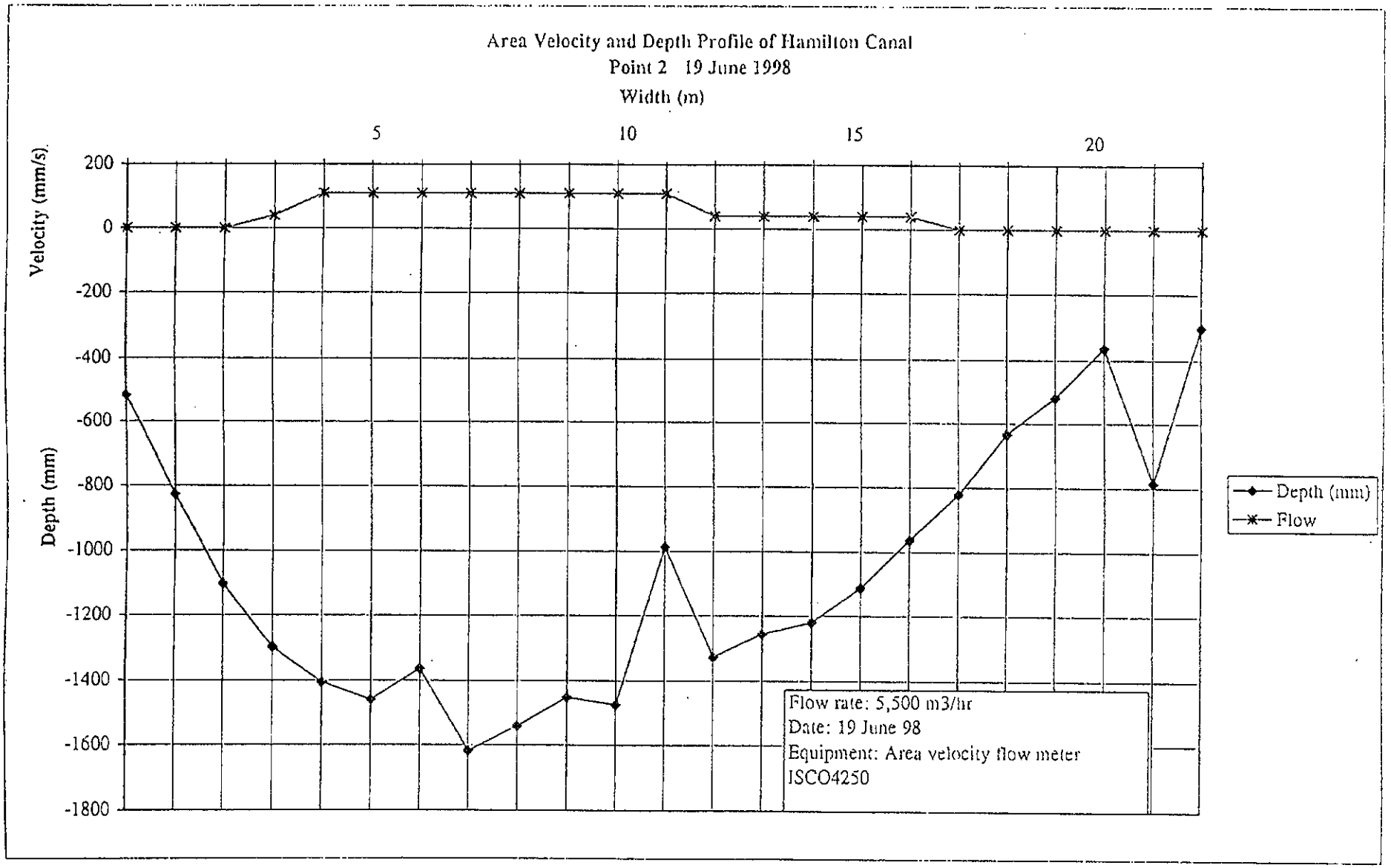

Area Velocity and Depth Profile of Hamilton Canal
Point 2 19 June 1998
Width (m)
5
10
15
20
Velocity (mm/s)
200
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
-1800
Depth (mm)
Depth (mm)
Flow
Flow rate: 5,500 m3/hr
Date: 19 June 98
Equipment: Area velocity flow meter
ISCO4250

Table 2

PARAMETER	TEST METHOD	METHOD PRINCIPLE
pH	APHA* 4500 H^+B	Glass Electrode
Salinity	In-house method	Calculated from conductivity values
Temperature	In-house method	Digital thermometer
TSS	APHA* 2540 D	Gravimetry
COD	APHA * 5220 B	Dichromate, Open reflux
BOD	APHA * 5210 B	Electrode
Oil & Grease	APHA * 5520 B	Gravimetry
D O	APHA 4500-O G	Electrode

* Standard methods for the examination of water and waste water, APHA, AWWA. WEF. 18th Edition, 1992.

Sampling flow measurements and analysis were carried out by Mr. K. Pavanandan, Ms. K de Alwis, Mr. S.K.D. Sarath Kumara and Ms. W.R.L. Wijesekera.

Dr. A.M. Mubarak
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TECHNOLOGY DIVISION

SW/rl
14 July, 1998

ANNEXURE I

TECHNICAL SPECIFICATIONS OF SURVEY

1. Water Quality Survey

1.1 Objectives of the Survey

Survey is carried out in order to grasp current water quality condition at the Hamilton canal and the sea in front of the proposed power plant.

1.2 Measurement Items

The water quality observation items are Temperature (℃), Salinity (‰), DO (mg/l), BOD (mg/l), COD (mg/l), Transparency (-), pH (-), OIL & Grease (mg/l) and TSS (mg/l) by the standard of Sri Lanka. Measurements of flow rate (m^3/sec), water level (m) and vertical section of canal at the measurement point are carried out.

1.3 Location on Measurement

Canal : 2 points at the Hamilton canal. (See Location Map)
- Point 1: In front of the proposed power plant site.
- Point 2 : Point side to the Kelani Ganga.
- Water sampling point is at the center of the canal width.

Sea : 3 points in front of the proposed power plant site. (See Location Map)
- Point A ; About 1 km (10m depth) from coast line in front of the proposed power plant.
- Point B ; About 0.25 km (5m depth) from coast line in front of the proposed power plant.
- Point C ; About 1 km (10m depth) from coast line at the place between the proposed power plant site and Kelani Ganga.
- If the sea condition is not suitable for working with a boat, sampling is carried out from the beach directly.

1.4 Depth on Measurement Point

Canal : 2 fixed layers of the surface and middle depth

Sea : Point A ; 2 fixed layers of the surface and middle depth.
- Point B ; 1 fixed layer of the surface
- Point C ; 2 fixed layers of the surface and middle depth.

1.5 Measurement Periods

Both canal and sea surveys are carried out during the period as follows.

1) 2 times during Jan.~Feb. 1998

2) 1 time during May~June 1998

Select suitable day for measurement. Avoid special day such as having extreme rising canal water amount and/or abnormal weather condition. The measurement at sea will be done at the middle tidal water level

1.6 Instruments / Methods / Procedures

(1) Use instruments and procedures regulated by the Standard of Sri Lanka.
Calibration for instruments is carried out before survey.
Sampling bottles rinsed by distilled water are used for water sampling.

If abnormal data is obtained, check on the procedure and repeat sampling and chemical analysis.

(2) Measurement Items, Location and Frequency for each measurement period are shown in the following table. There are 3 measurement periods as described in the section 1.5.

Table : The measurement Items, Location and Frequency for Each Period

Location / Item	Area	Canal				Sea					Total
	Point	Point 1		Point 2		Point A		Point B	Point C		
	Layer	Surf.	Mid.	Surf.	Mid.	Surf.	Mid.	Surf.	Surf.	Mid.	
Temperature (°C)		○	○	○	○	○	○	○	○	○	9
Salinity (‰)		○	○	○	○	○	○	○	○	○	9
DO (mg/l)		○	○	○	○	○	○	○	○	○	9
BOD (mg/l)		○	○	○	○	-	-	-	-	-	4
COD (mg/l)		○	○	○	○	*	*	*	*	*	4
Transparency (-)		-	-	-	-	○	○	○	○	○	5
pH (-)		○	○	○	○	○	○	○	○	○	9
OIL & Grease (mg/l)		○	○	○	○	○	○	○	○	○	9
TSS (mg/l)		○	○	○	○	○	○	○	○	○	9
Total		8	8	8	8	8	8	8	8	8	68
Flow rate (m^3/s)		○		○		-	-	-	-	-	2
water level (m)		○	○	○	○	-	-	-	-	-	4
vertical section **		○		○		-	-	-	-	-	2

* If COD of sea water can be measured by standard of Sri Lanka, COD should be measured.

** Vertical section measurement is carried out only at the first measurement period.

(3) During the Monsoon season in May through June, the measurement is carried out with utmost care, and by all means the instruments are installed and dismantled on fine days.
If it becomes inevitable to extend the dismantling period, the Contractor reports the said effect to the Employer and follows his instruction. Meanwhile, any cost and expense to be incurred for extension of the dismantling period is borne by the Contractor totally under his responsibility.

(4) During the measurement period, the measurement area is marked with buoys and so forth. Any cost and expense resulting from a damage of the measurement instrument caused by fishing boat and so forth is borne by the Contractor totally under his responsibility.

1.7 Reporting

(1) After completion of measurement during the first observation period, the Contractor compiles the measurement data and submits the same in writing to the Employer before the end of February 1998.

(2) After completion of observation during the second observation period, the Contractor compiles the measurement data and submits the same in writing to the Employer before the end of June 1998.

(3) The final measurement report covers the positions, instrument, method and period of observation, measurement data and so forth and contains the weather conditions,

atmospheric temperature and sea conditions during the respective observation period at the same time.

(4) The Contractor submits eight (8) copies of the final (water quality) observation report to the Employer.

1.8 Permission of Water Quality Survey

Prior to starting the work, the Contractor obtains a permission from the relevant Government or local authority and so forth under his responsibility.

ANNEX 7　大気質調査結果(NBRO)

REPORT ON

AMBIENT AIR POLLUTION MONITORING DATA

FOR

150 MW COMBONED CYCLE POWER PLANT

AT

KERAWALAPITIYA

MONTH : February, 1998

REPORT NO. : NBRO/ENV/15050/98/1204
JOB NO. : AQP 98/17

REPORT TO :
Tokyo Electric Power Services UENO Center.
3-3, Higashi – Ueno 3 – chome, Taito-ku,
Tokyo 110,
Japan.

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1, JAWATTA ROAD,
COLOMBO-05.
SRI LANKA

ANNEX 7　大気質調査結果(NBRO)

REPORT ON

AMBIENT AIR POLLUTION MONITORING DATA

FOR

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REPORT NO. : NBRO/ENV/15050/98/1204
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REPORT TO :
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3-3, Higashi – Ueno 3 – chome, Taito-ku,
Tokyo 110,
Japan.

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1, JAWATTA ROAD,
COLOMBO-05.
SRI LANKA

නිවාස, ඉදිකිරීම් සහ මහජන උපයෝගිතා අමාත්‍යාංශය
வீடமைப்பு, கட்டட, பொதுசன உபயோகங்கள் அமைச்சு
MINISTRY OF HOUSING, CONSTRUCTION & PUBLIC UTILITIES

ජාතික ගොඩනැගිලි පර්යේෂණ සංවිධානය
தேசிய கட்டட ஆராய்ச்சி நிலையம்
NATIONAL BUILDING RESEARCH ORGANISATION

99/1, ජාවත්ත පාර, කොළඹ - 5, ශ්‍රී ලංකාව. 99/1, ஜாவத்தை வீதி, கொழும்பு - 5. இலங்கை. 99/1, JAWATTA ROAD, COLOMBO - 5, SRI LANKA.

අපේ අංකය / எமது இல. / OUR REF. .....
මගේ අංකය / உமது இல. / YOUR REF. .....
දුරකථන / தொலைபேசி / TELEPHONE 588946, 501834, 503826, 500354

E-mail: nabro@ slt.lk.

April 24, 1998

Client: Mr. Zenjiro Tsutsui
Deputy General Manager
Tokyo Electric Power Services UENO Center.

1. SCOPE :

At the request of the client, the Environmental Division of NBRO monitored the existing ambient Air Quality and Meteorological Parameters at four locations around the Kerawalapitiya area using a Mobile Air Quality Monitoring Laboratory. This survey was carried out as per the clients requirements, to provide data for the feasibility study of proposed 150 MW Combined Cycle Diesel Power Plant at Kerawalapitiya.

2. SAMPLING :

For the fulfillment of the client's requirement, the monitoring of air quality and meteorological parameters were carried out at 4 distinct locations within about 7.5 km from the proposed power plant site in the approximate directions of N, NE, E & SE. In this event SO_2, NO_2, NO_X, CO, O_3 and meteorological parameters such as Wind Speed, Wind Direction, Vertical Wind Speed, Solar Radiation, Ambient Temperature and Rainfall were monitored continuously, and the averages were compiled from 5 minutes data. However monitoring of SPM was carried out as an average over 24 hours.

3. DESCRIPTION OF LOCATIONS :

The four locations (B, C, D and E) were selected along with the Ceylon Electricity Board officials to satisfy the clients requirements, approximately 7500 meters away from the proposed construction site of the project in the direction of N, NE, E & SE respectively.

LOCATION	DIRECTION	MONITORED PERIOD
D - Polwatta, Mahara, Nugegoda	East	18-02-98 to 21-02-98
C - Ragama North	North - East	22-02-98 to 28-02-98
B - Indivitiya, Mahara	North	01-03-98 to 05-03-98
E - Hunupitiya South	South - East	06-03-98 to 09-03-98

4. METHODOLOGY :

Each location was monitored continuously using fully automated ambient Air Quality monitoring system, for primary and secondary gas pollutants, meteorological parameters & SPM. The monitored data was stored in data acquisition system as 5 minutes and one hour averages except SPM. The SPM was measured manually for 24 hours.

PARAMETER	METHODOLOGY	INSTRUMENT		
		Make	Model No:	Serial No:
Nitric Oxide	Chemiluminisence	Monitor Lab	9841A	2078
Nitrogen Dioxide	Chemiluminisence	Monitor Lab	9841A	2078
Sulphur Dioxide	Flourometric	Monitor Lab	9850	1950
Carbon Monoxide	IR photometric	Monitor Lab	9830	2087
Ozone	Photometric	Monitor Lab	9812	2006
SPM	Gravimetric	Ecotech	HV 2000	314

5. RESULTS :

PARAMETER	LOCATION	TABLES/FIGURES
Nitric Oxide	B, C, D & E	Table. 1
Nitrogen Dioxide	- do -	Table. 2
Oxides of Nitrogen	- do -	Table. 3
Sulphur Dioxide	- do -	Table. 4
Carbon Monoxide	- do -	Table. 5
Ozone	- do -	Table. 6
SPM	- do -	Table. 7
Wind Rose	- do -	Fig. 1
Vertical Wind Speed	- do -	Fig. 2
Solar Radiation	- do -	Fig. 3
Ambient Temperature	- do -	Fig. 4
Rain Fall	Not reported during the monitoring period	

Co-ordinator
Air Quality Programme

Project Scientist
Air Quality Programme

Head, Environmental Division
HEAD/ENVIRONMENTAL DIVISION
National Building Research Organisation
99/1, Jawatta Road
COLOMBO-5.

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
.99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@slt.lk

Site : Mobile Station
Parameter : Nitric Oxide NO
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
19-Feb-98	0.007	0.007	C/L	0.002	0.001	0.005	0.004	0.011	0.014	0.013	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.005	0.011	0.004	0.014
20-Feb-98	0.005	0.001	C/L	0.004	0.004	0.005	0.001	0.005	0.007	0.002	0.002	0.010	0.006	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.010
21-Feb-98	0.002	0.007	C/L	0.001	0.002	0.001	0.001	0.006	0.012	0.005	0.004	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.002	0.003	0.012

22

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
23-Feb-98	0.001	0.001	C/L	0.001	0.002	0.002	0.004	0.019	0.022	0.008	0.011	0.007	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.004	0.022
24-Feb-98	0.001	0.001	C/L	0.001	0.002	0.001	0.004	0.010	0.011	0.004	0.001	0.005	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.004	0.005	0.010	0.003	0.011
25-Feb-98	0.001	0.002	C/L	0.004	0.002	0.002	0.004	0.014	0.018	0.005	N/D	N/D	0.001	0.002	0.002	0.004	N/D	N/D	0.001	0.001	0.001	0.011	0.004	0.004	0.004	0.018
26-Feb-98	0.001	0.001	C/L	0.001	0.001	0.001	0.005	0.018	0.013	0.005	0.005	0.004	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.005	0.014	0.004	0.018
27-Feb-98	0.002	0.002	C/L	0.001	0.001	0.001	0.004	0.010	0.007	0.008	0.005	0.002	N/D	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.008	0.008	0.003	0.010
28-Feb-98	0.007	0.002	C/L	0.006	0.004	0.002	0.002	0.010	0.017	N/D	N/D	0.001	0.001	0.002	0.002	0.001	0.001	0.001	N/D	N/D	0.001	0.002	0.013	0.004	0.003	0.017

01

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
02-Mar-98	0.022	0.023	C/L	0.012	0.010	0.004	0.004	0.013	0.013	0.006	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.005	0.023
03-Mar-98	0.012	0.008	C/L	0.007	0.006	0.002	0.004	0.008	0.012	0.005	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	N/D	0.004	0.012
04-Mar-98	0.001	0.002	C/L	0.001	0.001	0.001	0.002	0.004	0.021	0.006	0.002	0.001	0.001	0.001	0.001	0.001	N/D	0.001	0.002	0.002	0.004	0.002	0.001	N/D	0.003	0.021

05

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
06-Mar-98	N/D	N/D	C/L	0.001	N/D	N/D	0.001	0.005	0.001	0.004	0.008	0.006	0.002	0.001	0.001	0.001	0.001	0.001	N/D	0.001	0.001	0.007	0.014	0.001	0.003	0.014
07-Mar-98	0.001	0.001	C/L	N/D	0.001	0.001	0.001	0.004	0.010	0.010	0.001	0.002	0.004	0.001	N/D	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.010
08-Mar-98	0.001	N/D	C/L	0.001	N/D	0.001	0.001	0.001	0.001	N/D	0.001	N/D	0.002	0.001	0.001	0.001	0.001	N/D	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002

C/L : Calibration Cycle
N/D[1] : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1204

Table 1

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@slt.lk

Site : Mobile Station
Parameter : Nitrogen Dioxide NO_2
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
19-Feb-98	0.022	0.019	C/L	0.017	0.013	0.013	0.013	0.013	0.015	0.020	0.011	0.009	0.009	0.006	0.004	0.004	0.004	0.004	0.004	0.007	0.013	0.022	0.031	0.028	0.012	0.031
20-Feb-98	0.026	0.019	C/L	0.009	0.007	0.007	0.011	0.017	0.017	0.013	0.009	0.019	0.026	0.009	0.007	0.006	0.004	0.006	0.007	0.009	0.019	0.022	0.024	0.026	0.013	0.026
21-Feb-98	0.028	0.024	C/L	0.020	0.017	0.015	0.015	0.020	0.022	0.015	0.013	0.007	0.006	0.004	0.004	0.002	0.002	0.002	0.004	0.007	0.017	0.022	0.020	0.020	0.013	0.028

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
23-Feb-98	0.015	0.013	C/L	0.013	0.009	0.009	0.011	0.017	0.019	0.019	0.020	0.020	0.015	0.006	0.006	0.004	0.002	0.004	0.004	0.007	0.009	0.009	0.009	0.015	0.011	0.020
24-Feb-98	0.015	0.015	C/L	0.011	0.013	0.011	0.011	0.015	0.015	0.013	0.006	0.004	0.004	0.004	0.004	0.002	0.002	0.002	0.002	0.006	0.007	0.019	0.024	0.024	0.009	0.024
25-Feb-98	0.017	0.015	C/L	0.019	0.019	0.017	0.017	0.017	0.020	0.015	N/D	0.011	0.013	0.006	0.004	0.004	N/D	N/D	0.004	0.006	0.017	0.026	0.024	0.020	0.012	0.026
26-Feb-98	0.022	0.022	C/L	0.007	0.009	0.019	0.022	0.022	0.022	0.017	0.019	0.019	0.015	0.009	0.006	0.004	0.002	0.004	0.004	0.006	0.011	0.017	0.030	0.026	0.014	0.030
27-Feb-98	0.020	0.017	C/L	0.011	0.020	0.011	0.015	0.020	0.020	0.013	0.015	0.013	0.007	0.006	0.004	0.004	0.002	0.004	0.007	0.007	0.026	0.024	0.026	0.022	0.015	0.026
28-Feb-98	0.020	0.017	C/L	0.017	0.017	0.015	0.011	0.015	0.015	N/D	0.006	0.006	0.004	0.004	0.004	0.004	0.002	0.002	N/D	0.007	0.007	0.013	0.022	0.020	0.009	0.022

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
02-Mar-98	0.022	0.019	C/L	0.019	0.017	0.017	0.019	0.022	0.022	0.019	0.011	0.007	0.006	0.004	0.004	0.004	0.002	0.002	0.002	0.002	0.004	0.009	0.013	0.020	0.011	0.022
03-Mar-98	0.033	0.028	C/L	0.024	0.022	0.019	0.019	0.024	0.024	0.019	0.011	0.007	0.006	0.004	0.004	0.004	0.004	0.002	0.004	0.004	0.004	0.002	0.002	0.002	0.011	0.033
04-Mar-98	0.015	0.017	C/L	0.013	0.011	0.011	0.019	0.022	0.028	0.020	0.011	0.011	0.007	0.006	0.006	0.006	0.007	0.011	0.017	0.015	0.043	0.017	0.013	0.011	0.014	0.043

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
06-Mar-98	0.015	0.017	C/L	0.013	0.009	0.007	0.009	0.013	0.017	0.015	0.031	0.031	0.026	0.019	0.011	0.007	0.006	0.006	0.006	0.009	0.024	0.037	0.037	0.030	0.016	0.037
07-Mar-98	0.017	0.019	C/L	0.011	0.013	0.015	0.015	0.019	0.024	0.028	0.009	0.019	0.026	0.013	0.007	0.006	0.006	0.006	0.009	0.019	0.024	0.026	0.030	0.024	0.016	0.030
08-Mar-98	0.028	0.020	C/L	0.011	0.011	0.013	0.019	0.020	0.009	0.007	0.011	0.011	0.006	0.004	0.004	0.004	0.004	0.004	0.004	0.007	0.013	0.017	0.017	0.019	0.011	0.028

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1204

Table 2

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@sit.lk

Site : Mobile Station
Parameter : Oxides of Nitrogen NO_x
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
19-Feb-98	0.029	0.026	C/L	0.019	0.014	0.018	0.017	0.024	0.029	0.034	0.012	0.010	0.010	0.008	0.006	0.005	0.005	0.005	0.005	0.009	0.014	0.023	0.036	0.039	0.017	0.039
20-Feb-98	0.031	0.020	C/L	0.013	0.011	0.012	0.012	0.021	0.024	0.015	0.012	0.028	0.032	0.012	0.010	0.008	0.005	0.007	0.009	0.010	0.020	0.023	0.025	0.027	0.016	0.032
21-Feb-98	0.030	0.031	C/L	0.022	0.019	0.016	0.016	0.026	0.034	0.020	0.017	0.009	0.007	0.005	0.005	0.003	0.003	0.003	0.005	0.010	0.019	0.025	0.022	0.023	0.015	0.034

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
23-Feb-98	0.016	0.014	C/L	0.014	0.012	0.012	0.015	0.036	0.040	0.027	0.031	0.028	0.017	0.008	0.007	0.005	0.003	0.005	0.006	0.009	0.010	0.010	0.010	0.016	0.015	0.040
24-Feb-98	0.016	0.018	C/L	0.012	0.015	0.012	0.015	0.024	0.026	0.017	0.007	0.009	0.007	0.006	0.005	0.003	0.003	0.003	0.003	0.008	0.010	0.022	0.029	0.034	0.013	0.034
25-Feb-98	0.018	0.017	C/L	0.022	0.021	0.019	0.020	0.031	0.038	0.020	N/D	0.011	0.014	0.008	0.006	0.007	N/D	N/D	0.005	0.007	0.018	0.037	0.028	0.024	0.015	0.038
26-Feb-98	0.023	0.023	C/L	0.009	0.010	0.020	0.027	0.040	0.035	0.021	0.023	0.022	0.016	0.012	0.008	0.006	0.003	0.005	0.006	0.008	0.012	0.018	0.034	0.040	0.018	0.040
27-Feb-98	0.023	0.019	C/L	0.012	0.022	0.012	0.018	0.030	0.028	0.021	0.020	0.015	0.007	0.007	0.006	0.006	0.004	0.005	0.009	0.009	0.028	0.026	0.034	0.031	0.016	0.034
28-Feb-98	0.028	0.019	C/L	0.023	0.020	0.017	0.014	0.024	0.032	N/D	0.006	0.007	0.005	0.006	0.006	0.005	0.003	0.003	N/D	0.007	0.009	0.015	0.035	0.024	0.013	0.035

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
02-Mar-98	0.044	0.041	C/L	0.031	0.026	0.020	0.022	0.035	0.035	0.025	0.014	0.009	0.007	0.006	0.006	0.005	0.003	0.003	0.004	0.004	0.005	0.010	0.014	0.022	0.016	0.044
03-Mar-98	0.045	0.036	C/L	0.031	0.028	0.021	0.022	0.032	0.036	0.023	0.012	0.009	0.007	0.005	0.006	0.005	0.005	0.004	0.006	0.005	0.005	0.003	0.003	0.002	0.015	0.045
04-Mar-98	0.016	0.019	C/L	0.014	0.012	0.012	0.021	0.026	0.048	0.026	0.014	0.012	0.009	0.007	0.007	0.007	0.007	0.012	0.019	0.017	0.046	0.019	0.014	0.011	0.017	0.048

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
06-Mar-98	0.015	0.017	C/L	0.014	0.009	0.007	0.010	0.018	0.018	0.018	0.040	0.037	0.028	0.020	0.012	0.009	0.007	0.007	0.006	0.010	0.025	0.044	0.051	0.031	0.019	0.051
07-Mar-98	0.018	0.020	C/L	0.011	0.014	0.016	0.016	0.022	0.034	0.037	0.010	0.021	0.030	0.014	0.007	0.007	0.007	0.007	0.010	0.020	0.025	0.027	0.031	0.025	0.018	0.037
08-Mar-98	0.029	0.020	C/L	0.012	0.011	0.014	0.020	0.022	0.010	0.007	0.012	0.011	0.008	0.005	0.005	0.005	0.005	0.004	0.005	0.009	0.014	0.018	0.018	0.020	0.012	0.029

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1204

Table 3

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@slt.lk

Site : Mobile Station
Parameter : Sulphur Dioxide
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
19-Feb-98	0.008	0.008	C/L	0.005	0.003	0.003	0.003	0.005	0.005	0.010	0.013	0.013	0.008	0.005	0.005	0.003	0.003	0.003	0.003	0.005	0.008	0.013	0.015	0.010	0.006	0.015
20-Feb-98	0.013	0.008	C/L	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.008	0.031	0.036	0.010	0.005	0.005	0.005	0.005	0.008	0.005	0.013	0.013	0.010	0.010	0.009	0.036
21-Feb-98	0.008	0.010	C/L	0.010	0.005	0.005	0.005	0.015	0.018	N/D	0.023	0.010	0.008	0.005	0.005	0.003	0.003	0.005	0.005	0.018	0.010	0.010	0.008	0.008	0.008	0.023

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
23-Feb-98	0.008	0.008	C/L	0.010	0.005	0.005	0.005	0.023	0.018	0.021	0.036	0.028	0.018	0.008	0.005	0.005	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.008	0.010	0.036
24-Feb-98	0.008	0.008	C/L	0.005	0.005	0.005	0.005	0.018	0.023	0.013	0.008	0.005	0.005	0.005	0.003	0.005	0.003	0.003	0.003	0.003	0.005	0.008	0.013	0.015	0.007	0.023
25-Feb-98	0.008	0.010	C/L	0.010	0.013	0.010	0.013	0.018	0.028	0.015	N/D	N/D	0.015	0.010	0.008	0.008	N/D	N/D	0.005	0.008	0.010	0.031	0.023	0.021	0.011	0.031
26-Feb-98	0.018	0.008	C/L	0.005	0.003	0.005	0.013	0.028	0.023	0.018	0.023	0.023	0.018	0.010	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.008	0.010	0.010	0.010	0.028
27-Feb-98	0.008	0.010	C/L	0.010	0.015	0.013	0.018	0.023	0.021	0.015	0.013	0.010	N/D	0.005	0.005	0.005	0.005	0.005	0.008	0.008	0.008	0.010	0.013	0.013	0.010	0.023
28-Feb-98	0.010	0.005	C/L	0.005	0.003	0.003	0.003	0.003	0.005	N/D	N/D	0.003	0.003	0.003	0.005	0.003	0.003	0.005	N/D	N/D	0.003	0.005	0.008	0.010	0.004	0.010

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
02-Mar-98	0.013	0.008	C/L	0.008	0.005	0.008	0.008	0.015	0.021	0.013	0.010	0.008	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.006	0.021
03-Mar-98	0.010	0.010	C/L	0.013	0.010	0.008	0.010	0.021	0.031	0.026	0.015	0.008	0.005	0.005	0.005	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.008	0.031
04-Mar-98	0.005	0.003	C/L	0.003	0.003	0.003	0.008	0.010	0.031	0.023	0.008	0.005	0.005	0.005	0.003	0.003	0.003	0.005	0.008	0.008	0.031	0.008	0.010	0.010	0.008	0.031

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
06-Mar-98	0.008	0.005	C/L	0.005	0.005	0.005	0.003	0.005	0.005	0.008	0.010	0.018	0.010	0.008	0.008	0.008	0.008	0.005	0.005	0.005	0.008	0.018	0.028	0.015	0.008	0.028
07-Mar-98	0.008	0.008	C/L	0.005	0.008	0.008	0.008	0.010	0.021	0.051	0.021	0.023	0.036	0.021	0.013	0.010	0.010	0.008	0.010	0.018	0.018	0.018	0.015	0.021	0.015	0.051
08-Mar-98	0.018	0.013	C/L	0.010	0.008	0.008	0.008	0.010	0.010	0.008	0.010	N/D	0.003	0.003	0.003	0.003	0.005	0.005	0.003	0.003	0.003	0.010	0.013	0.010	0.007	0.018

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.002 mg/m^3 or No Data

NBRO/ENV/15050/98/1204

Table 4

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5.
Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@sltlk

Site : Mobile Station
Parameter : Carbon Monoxide
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
19-Feb-98	1.191	0.996	C/L	0.719	0.654	0.879	0.936	1.497	1.492	1.123	0.551	0.485	0.532	0.469	0.392	0.389	0.377	0.333	0.303	0.339	0.605	0.937	1.200	1.627	0.751	1.627
20-Feb-98	1.300	0.702	C/L	0.313	0.228	0.195	0.495	0.898	0.924	0.610	0.259	0.294	0.313	0.521	0.481	0.289	0.219	0.298	0.373	0.454	0.740	0.974	1.296	1.264	0.560	1.300
21-Feb-98	1.535	1.290	C/L	0.881	1.007	1.050	1.096	1.454	1.548	N/D	0.503	0.546	0.318	0.186	0.286	0.409	0.449	0.443	0.445	1.225	0.868	1.701	1.368	1.567	0.841	1.701

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
23-Feb-98	0.659	0.528	C/L	0.670	0.345	0.333	0.612	0.962	1.423	1.012	0.605	0.477	0.470	0.420	0.392	0.364	0.363	0.332	0.132	0.344	0.479	0.560	0.568	0.894	0.539	1.423
24-Feb-98	0.802	0.631	C/L	0.297	0.315	0.299	0.514	0.635	1.229	0.732	0.415	0.296	0.339	0.334	0.306	0.277	0.255	0.242	0.235	0.270	0.396	0.483	0.842	0.931	0.462	1.229
25-Feb-98	0.698	0.822	C/L	0.959	0.901	0.913	1.115	1.381	1.716	1.084	N/D	N/D	0.667	0.487	0.328	0.325	N/D	N/D	0.579	0.551	0.678	0.910	1.179	1.311	0.692	1.716
26-Feb-98	1.361	1.127	C/L	0.567	0.727	0.990	1.182	1.477	1.862	1.024	0.540	0.496	0.599	0.557	0.276	0.484	0.272	0.224	0.251	0.286	0.616	0.788	0.849	0.941	0.729	1.862
27-Feb-98	0.947	1.122	C/L	0.671	0.635	0.617	0.766	1.094	1.589	0.936	0.480	0.414	N/D	0.532	0.316	0.401	0.407	0.436	0.538	0.585	0.919	0.971	1.194	1.532	0.713	1.589
28-Feb-98	1.389	1.196	C/L	1.288	1.166	0.992	0.911	0.966	1.214	N/D	0.777	0.472	0.408	0.399	0.530	0.505	0.392	0.438	N/D	N/D	0.505	0.907	1.469	1.208	0.714	1.469

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
02-Mar-98	2.113	1.964	C/L	1.481	1.202	0.876	1.011	1.279	1.087	0.837	0.460	0.454	0.431	0.354	0.362	0.345	0.348	0.324	0.320	0.330	0.488	0.791	1.072	1.223	0.799	2.113
03-Mar-98	1.330	1.785	C/L	1.286	1.145	0.968	1.131	1.210	1.129	0.931	0.609	0.556	0.539	0.475	0.449	0.385	0.377	0.401	0.414	0.396	0.469	0.234	0.126	0.124	0.686	1.785
04-Mar-98	0.492	0.636	C/L	0.429	0.643	0.516	0.657	0.897	1.271	0.720	0.549	0.528	0.507	0.514	0.546	0.259	0.275	0.355	0.514	0.684	0.898	0.525	0.469	0.348	0.551	1.271

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
06-Mar-98	0.571	0.687	C/L	0.568	0.462	0.488	0.616	1.007	1.050	0.766	0.612	0.586	0.549	0.693	0.586	0.310	0.207	0.228	0.339	0.538	1.246	1.635	1.645	1.096	0.687	1.645
07-Mar-98	0.660	0.642	C/L	0.590	0.722	0.789	1.172	1.321	1.413	1.026	0.574	0.581	0.707	0.728	0.652	0.591	0.591	0.582	0.547	0.742	1.159	1.006	1.042	0.864	0.779	1.413
08-Mar-98	0.979	0.838	C/L	0.594	0.653	0.866	0.956	0.686	0.425	0.371	0.531	0.059	0.493	0.441	0.414	0.276	0.231	0.167	0.312	0.444	0.757	0.671	0.515	0.771	0.519	0.979

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1204

Table 5

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@sit.lk

Site : Mobile Station
Parameter : Ozone
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
19-Feb-98	0.002	0.002	C/L	0.002	0.002	0.004	0.002	0.004	0.006	0.012	0.033	0.052	0.077	0.069	0.058	0.048	0.039	0.041	0.039	0.041	0.035	0.019	0.006	0.004	0.025	0.077
20-Feb-98	0.002	0.006	C/L	0.008	0.008	0.008	0.008	0.010	0.004	0.023	0.035	0.042	0.050	0.102	0.104	0.077	0.050	0.044	0.031	0.031	0.014	0.014	0.012	0.004	0.029	0.104
21-Feb-98	0.004	0.002	C/L	0.004	0.006	0.004	0.004	0.006	0.012	N/D	0.021	0.029	0.039	0.046	0.042	0.041	0.037	0.052	0.052	0.041	0.033	0.019	0.010	0.008	0.021	0.052

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
23-Feb-98	0.008	0.008	C/L	0.006	0.010	0.006	0.008	0.004	0.008	0.014	0.017	0.033	0.050	0.060	0.064	0.056	0.048	0.039	0.033	0.025	0.025	0.019	0.027	0.015	0.024	0.064
24-Feb-98	0.006	0.006	C/L	0.010	0.006	0.006	0.006	0.008	0.015	0.025	0.046	0.058	0.075	0.071	0.064	0.060	0.054	0.052	0.048	0.042	0.037	0.025	0.021	0.010	0.031	0.075
25-Feb-98	0.008	0.012	C/L	0.002	0.002	0.002	0.002	0.002	0.008	0.021	N/D	0.037	0.077	0.069	0.056	0.052	N/D	0.031	0.054	0.044	0.025	0.010	0.015	0.010	0.022	0.077
26-Feb-98	0.004	0.004	C/L	0.027	0.015	0.006	0.002	0.006	0.012	0.027	0.041	0.052	0.106	0.129	0.106	0.081	0.056	0.044	0.042	0.050	0.004	0.025	0.008	0.006	0.038	0.129
27-Feb-98	0.008	0.008	C/L	0.015	0.008	0.015	0.012	0.008	0.014	0.021	0.035	0.050	0.054	0.068	0.054	0.046	0.044	0.044	0.042	0.039	0.017	0.015	0.010	0.027	0.027	0.068
28-Feb-98	0.014	0.014	C/L	0.010	0.012	0.012	0.014	0.010	0.025	N/D	0.041	0.062	0.071	0.071	0.220	0.068	0.052	0.046	N/D	0.008	0.054	0.195	0.023	N/D	0.042	0.220

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
02-Mar-98	0.017	0.017	C/L	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
03-Mar-98	0.017	0.017	C/L	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017
04-Mar-98	0.017	0.017	C/L	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.042	0.050	0.064	0.021	0.064

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
06-Mar-98	0.023	0.017	C/L	0.010	0.023	0.019	0.029	0.170	N/D	0.054	0.064	0.073	0.156	0.386	0.369	0.052	0.066	0.066	0.054	0.050	0.145	0.014	0.010	0.006	0.077	0.386
07-Mar-98	0.015	0.012	C/L	0.012	0.010	0.010	0.010	0.002	0.012	0.029	0.044	0.064	0.097	0.118	0.097	0.083	0.083	0.073	0.069	0.060	0.050	0.041	0.029	0.025	0.043	0.118
08-Mar-98	0.015	0.025	C/L	0.031	0.025	0.012	0.012	0.012	0.035	0.044	0.052	0.027	0.058	0.567	0.004	0.068	0.069	0.062	0.068	0.089	0.195	0.041	0.042	0.029	0.066	0.567

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1204

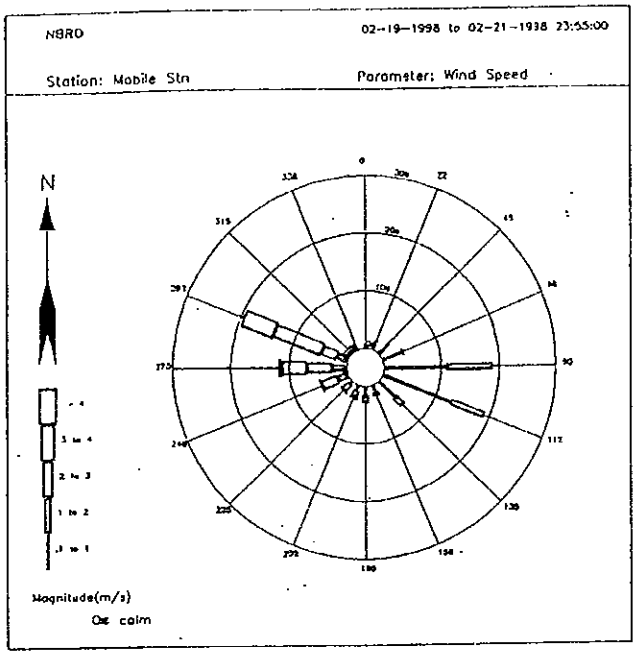
Table 6

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611

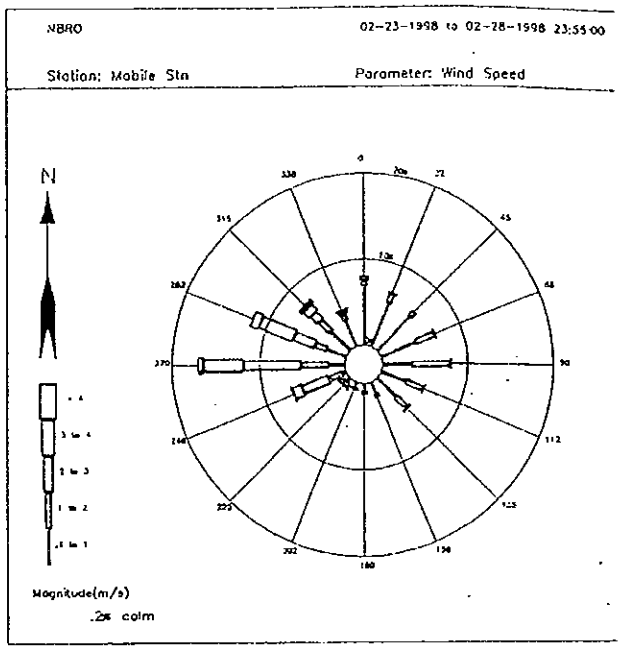
Location : D

Date	Start Time	Run Time (hrs.)	Vol of Air Drawn(m^3)	Conc. (mg/m^3)
Thursday, 19-02-98	0:00	28	1960	0.115
Friday, 20-02-98	6:45	22	1540	0.121
Saturday, 21-02-98	5:15	22	1540	0.120
Location : C				
Sunday, 22-02-98	12:10	16	1120	0.080
Monday, 23-02-98	4:20	23	1610	0.086
Tuesday, 24-02-98	3:35	23	1610	0.085
Wednesday, 25-02-98	3:00	23	1610	0.088
Thursday, 26-02-98	2:30	24	1680	0.074
Saturday, 28-02-98	3:00	22	1540	0.085
Location : B				
Sunday, 01-03-98	8:00	19	1330	0.098
Monday, 02-03-98	3:15	21	1470	0.097
Tuesday, 03-03-98	1:00	20	1400	0.095
Wednesday, 04-03-98	7:20	22	1540	0.102
Location : E				
Friday, 06-03-98	3:50	25	1750	0.112
Saturday, 07-03-98	5:35	24	1680	0.136

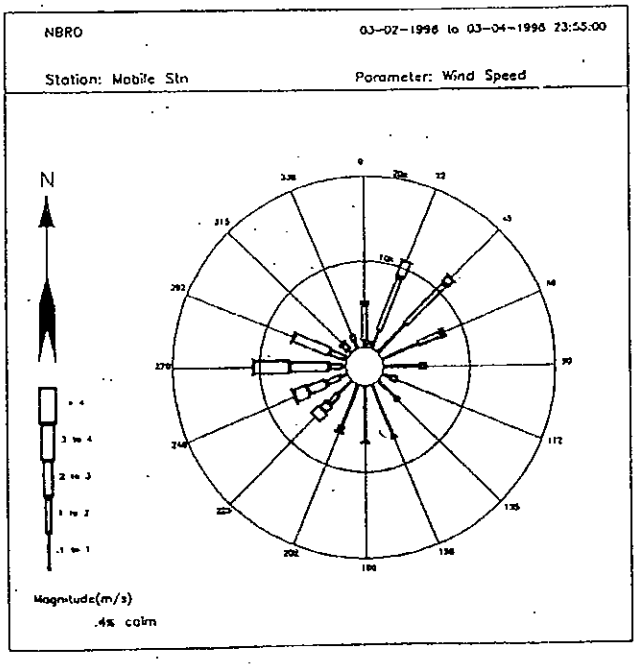
NBRO/ENV/15050/98/1204



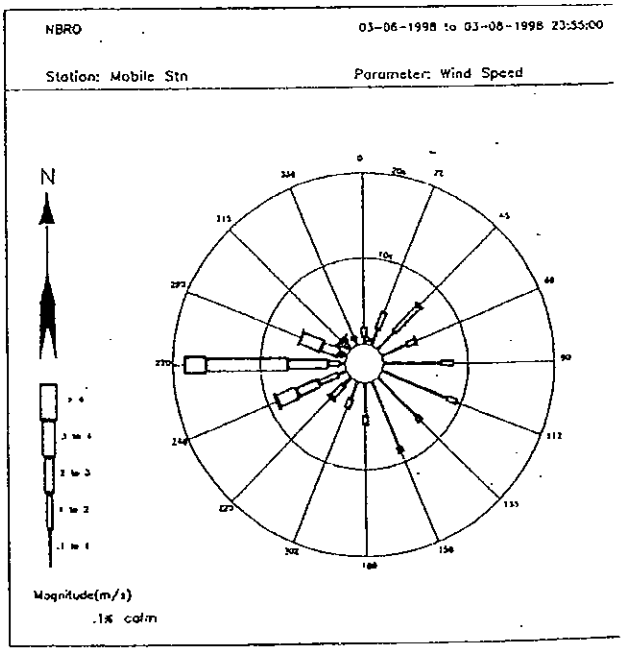
Location : D



Location : C

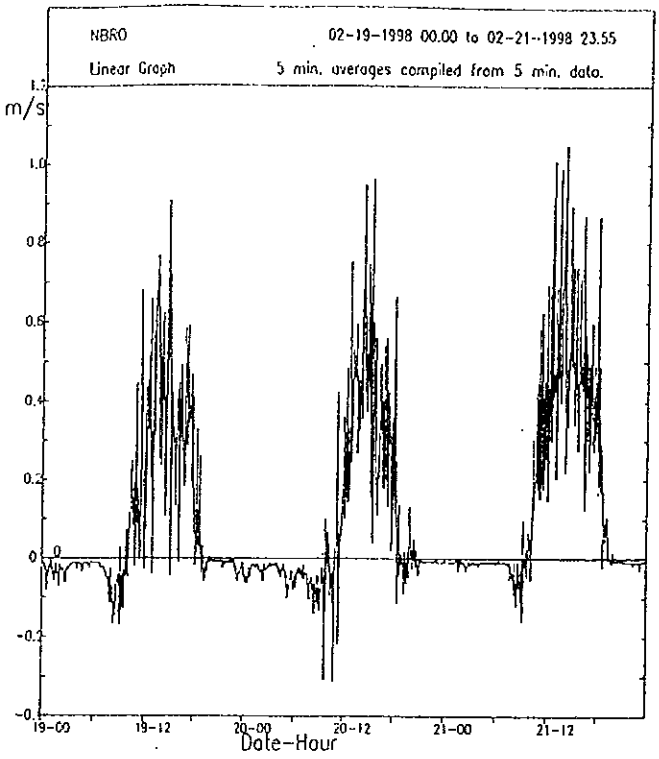


Location : B



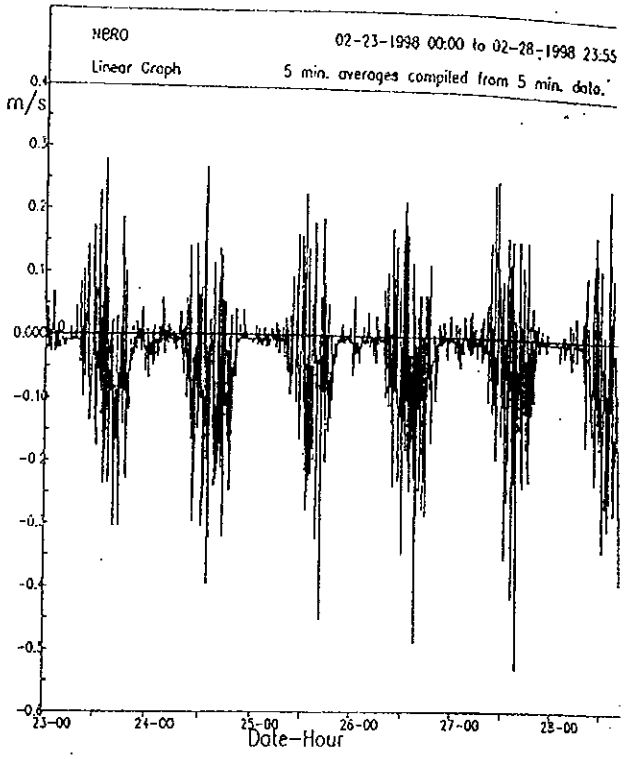
Location : E

Fig 1



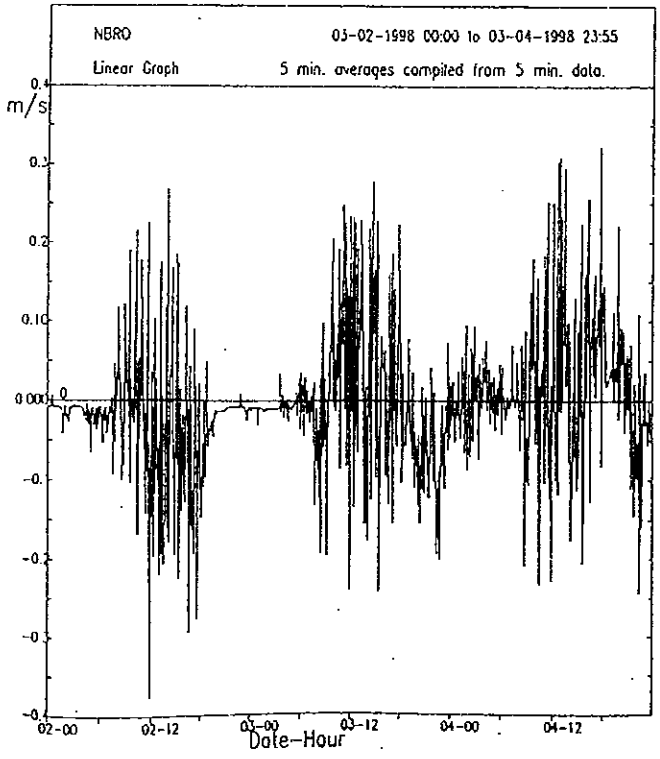
Vertical Wind Speed m/s Station: Mobile Stn

Location : D



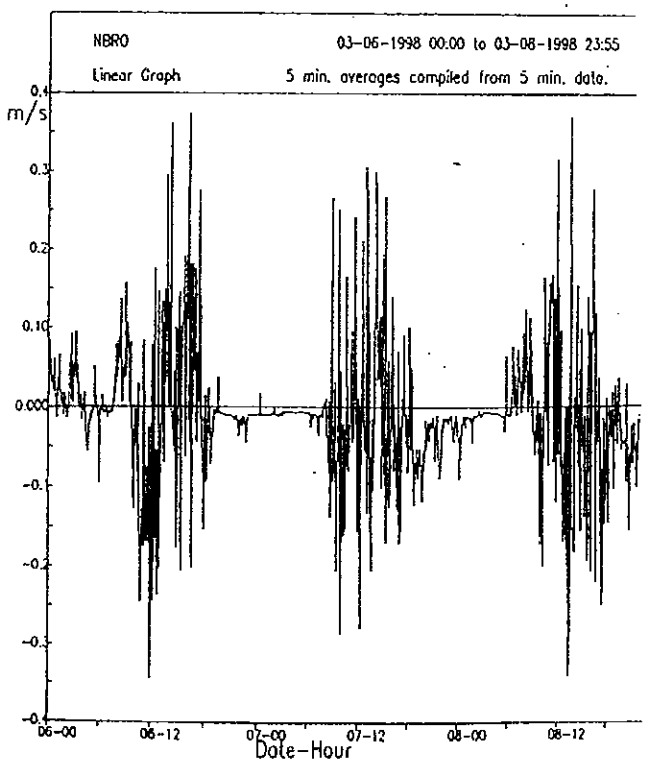
Vertical Wind Speed m/s Station: Mobile Stn

Location : C



Vertical Wind Speed m/s Station: Mobile Stn

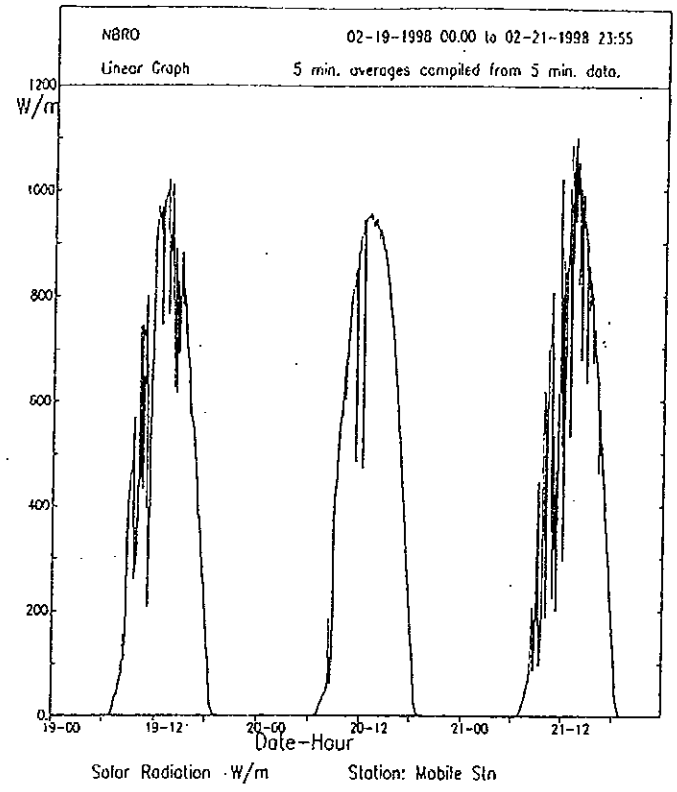
Location : B



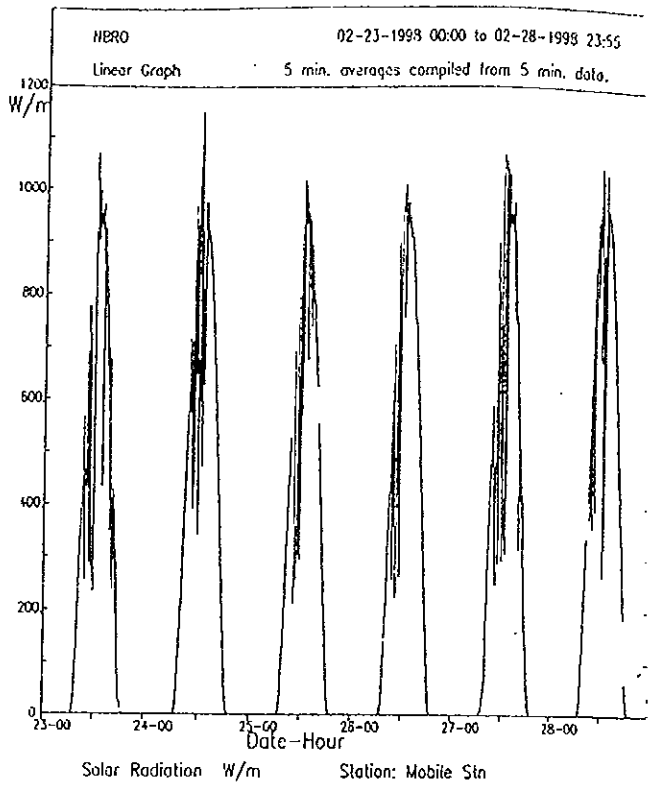
Vertical Wind Speed m/s Station: Mobile Stn

Location : E

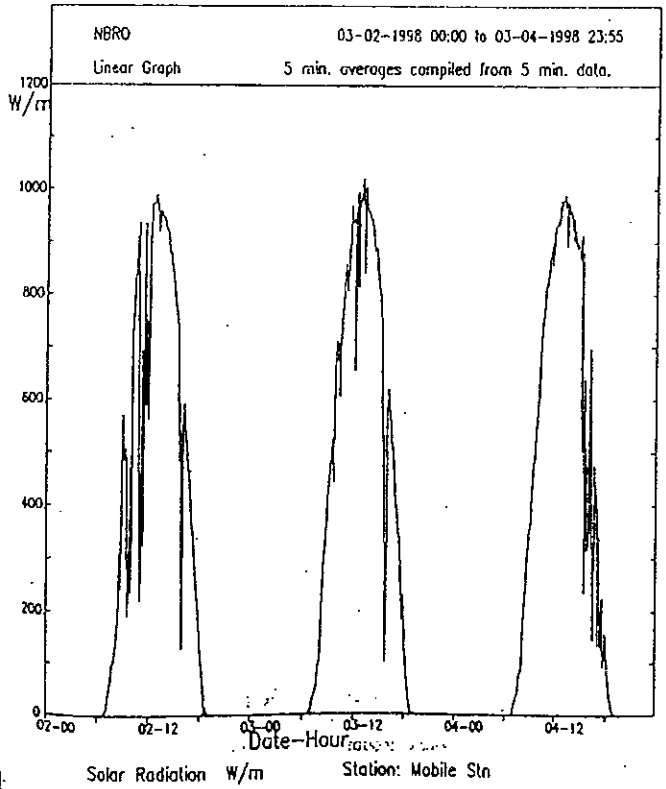
Fig 2



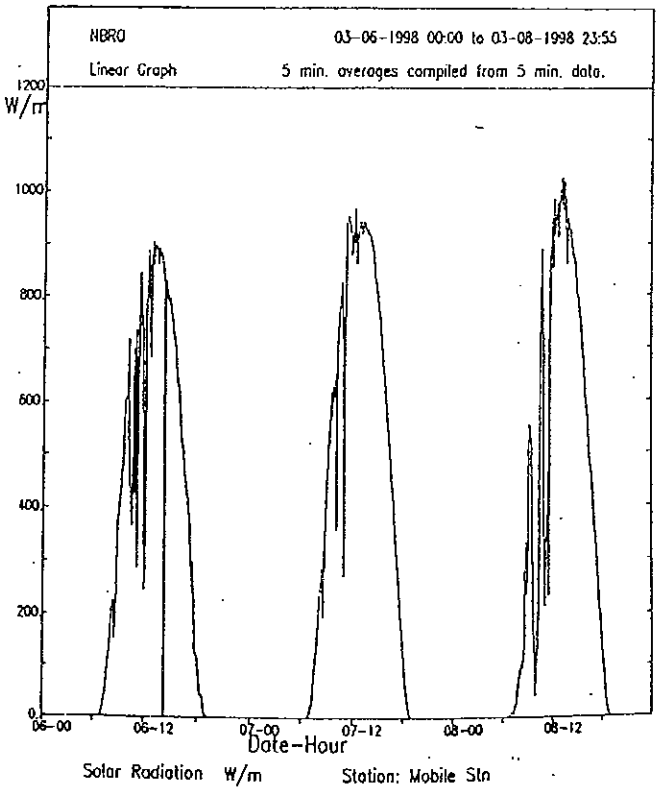
Location : D



Location : C

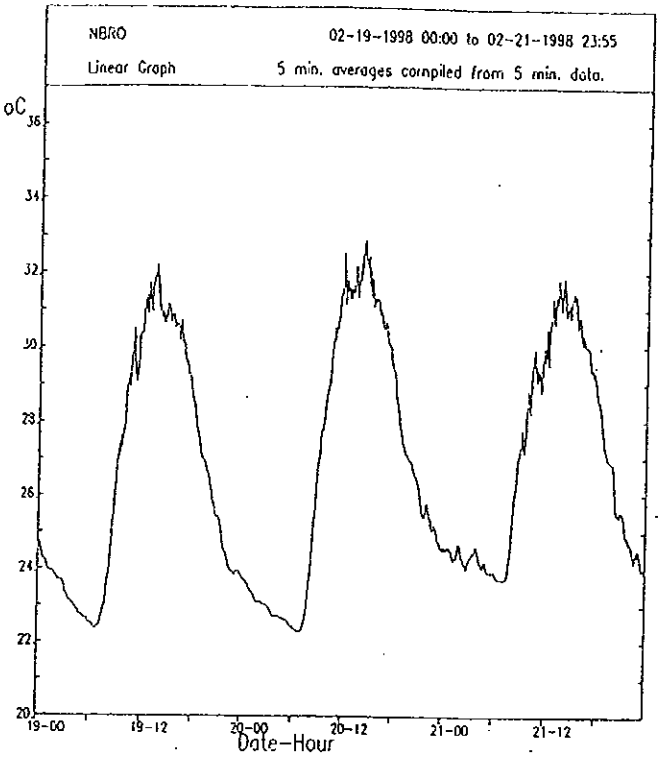


Location : B



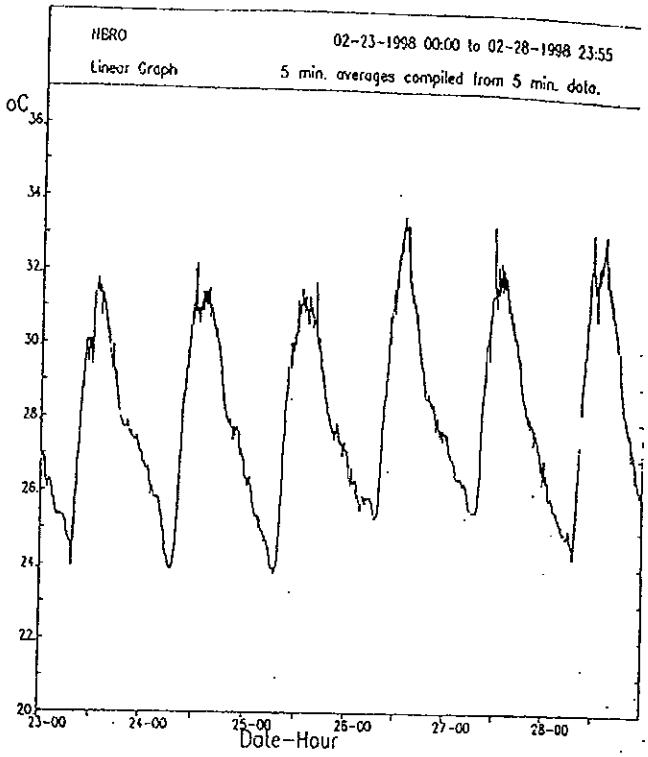
Location : E

Fig 3



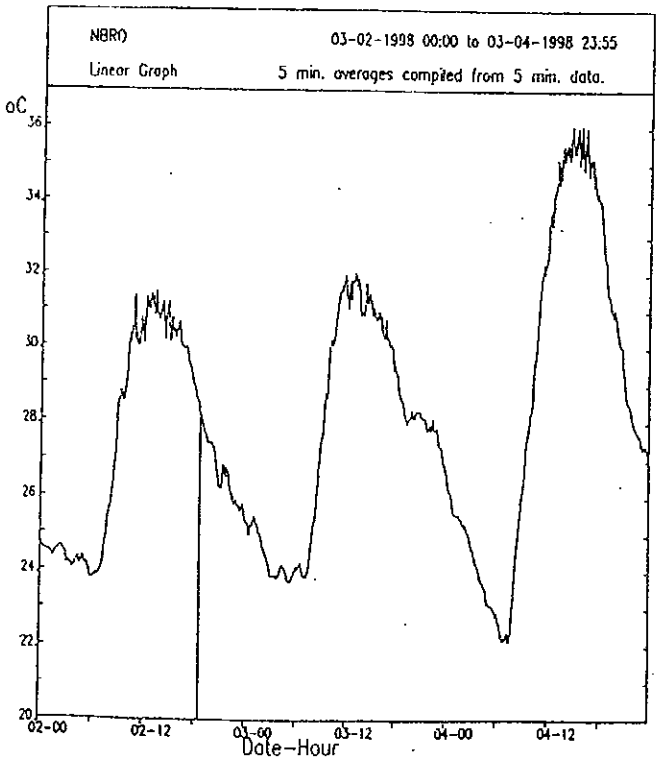
Ambient Temperature oC Station: Mobile Stn

Location : D



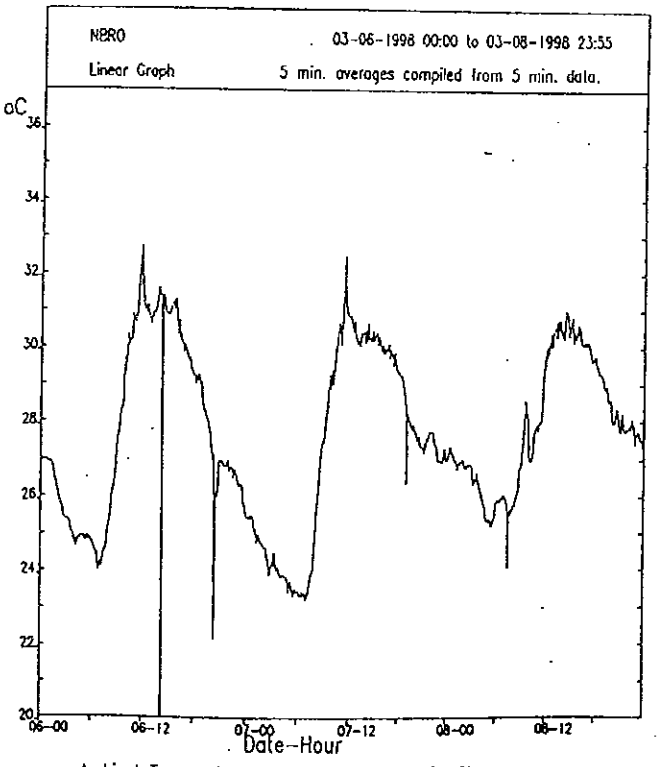
Ambient Temperature oC Station: Mobile Stn

Location : C



Ambient Temperature oC Station: Mobile Stn

Location : B



Ambient Temperature oC Station: Mobile Stn

Location : E

Fig 4

REPORT ON

AMBIENT AIR POLLUTION MONITORING DATA

FOR

150 MW COMBINED CYCLE POWER PLANT

AT

KERAWALAPITIYA

MONTH : JUNE, 1998

REPORT NO. : NBRO/ENV/15050/98/1205
JOB NO. : AQP 98/91

REPORT TO :
Tokyo Electric Power Services UENO Center.
3-3, Higashi – Ueno 3 – chome, Taito-ku,
Tokyo 110,
Japan.

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1, JAWATTA ROAD,
COLOMBO-05.
SRI LANKA

Client: Mr. Zenjiro Tsutsui
Deputy General Manager
Tokyo Electric Power Services UENO Center.

8 July, 1998

1. SCOPE :

At the request of the client, the Environmental Division of NBRO carried out the second phase of ambient Air Quality Monitoring programme at the same four locations where monitoring was carried out in the first phase of the programme. This survey was carried out as per the client's requirements, to provide data for the feasibility study of proposed 150 MW Combined Cycle Diesel Power Plant at Kerawalapitiya.

2. SAMPLING :

For the fulfillment of the client's requirement, the monitoring of air quality and meteorological parameters were carried out at 4 distinct locations within about 7.5 km from the proposed power plant site in the approximate directions of N, NE, E & SE. In this event SO_2, NO_2, NO_X, CO, O_3 and meteorological parameters such as Wind Speed, Wind Direction, Vertical Wind Speed, Solar Radiation, Ambient Temperature and Rainfall were monitored continuously, and the averages were compiled from 5 minutes data. However monitoring of SPM was carried out as an average over 8 hours as per the client's requirement.

3. DESCRIPTION OF LOCATIONS :

The four locations (B, C, D and E) were selected along with the Ceylon Electricity Board officials to satisfy the clients requirements, approximately 7500 meters away from the proposed construction site of the project in the direction of N, NE, E & SE respectively.

LOCATION	DIRECTION	MONITORED PERIOD
D - Polwatta, Mahara, Nugegoda	East	11-06-98 to 13-06-98
C - Ragama North	North - East	15-06-98 to 20-06-98
E - Hunupitiya South	South - East	22-06-98 to 24-06-98
B - Indivitiya, Mahara	North	25-06-98 to 27-06-98

4. METHODOLOGY :

Each location was monitored continuously using fully automated ambient Air Quality monitoring system, for primary and secondary gas pollutants, meteorological parameters & SPM. The monitored data were stored in data acquisition system as 5 minutes and one hour averages except SPM. The SPM was measured manually for 8 hours.

PARAMETER	METHODOLOGY	INSTRUMENT		
		Make	Model No:	Serial No:
Nitric Oxide	Chemiluminisence	Monitor Lab	9841A	2078
Nitrogen Dioxide	Chemiluminisence	Monitor Lab	9841A	2078
Sulphur Dioxide	Flourometric	Monitor Lab	9850	1950
Carbon Monoxide	IR photometric	Monitor Lab	9830	2087
Ozone	Photometric	Monitor Lab	9812	2006
SPM	Gravimetric	Ecotech	HV 2000	314

5. RESULTS:

PARAMETER	LOCATION	TABLES/FIGURES
Nitric Oxide	B, C, D & E	Table. 1
Nitrogen Dioxide	- do -	Table. 2
Oxides of Nitrogen	- do -	Table. 3
Sulphur Dioxide	- do -	Table. 4
Carbon Monoxide	- do -	Table. 5
Ozone	- do -	Table. 6
SPM	- do -	Table. 7
Wind Rose	- do -	Fig. 1
Vertical Wind Speed	- do -	Fig. 2
Solar Radiation	- do -	Fig. 3
Ambient Temperature	- do -	Fig. 4
Rain Fall	- do -	Fig. 5

Co-ordinator
Air Quality Programme

Project Scientist
Air Quality Programme

Head, Environmental Division
National Building Research Organisation

HEAD/ENVIRONMENTAL DIVISION
National Building Research Organisation
99/1, Jawatta Road
COLOMBO-5.

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@sit.lk

Parameter : Nitric Oxide
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
11-Jun-98	0.002	0.002	C/L	0.001	0.001	0.002	0.001	0.006	0.006	0.005	0.002	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.001	0.001	0.001	0.001	0.003	0.006
12-Jun-98	0.002	0.002	C/L	0.002	0.001	0.004	0.004	0.006	0.010	0.008	0.006	0.002	0.004	0.004	0.006	0.005	0.002	0.001	0.001	0.001	0.002	0.002	0.004	0.002	0.004	0.010
13-Jun-98	0.001	0.002	C/L	0.001	0.001	0.002	0.002	0.005	0.008	0.006	0.005	0.004	0.002	0.002	0.004	0.002	0.002	0.001	0.004	0.001	0.002	0.001	0.001	0.001	0.003	0.008

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
15-Jun-98	0.001	0.001	C/L	0.001	0.001	0.001	0.002	0.001	0.007	0.008	0.006	0.002	0.001	0.001	0.001	0.001	0.002	0.005	0.005	0.011	0.017	0.005	0.016	0.024	0.005	0.024
16-Jun-98	0.031	0.021	C/L	0.019	0.024	0.018	0.008	0.024	0.016	0.010	0.023	0.017	0.001	0.002	0.001	0.002	0.001	0.004	0.005	0.004	0.030	0.014	0.004	0.001	0.012	0.031
17-Jun-98	0.001	0.001	C/L	0.001	0.001	0.001	0.002	0.001	0.004	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.005	0.007	0.005	0.010	0.004	0.003	0.010
18-Jun-98	0.001	0.001	C/L	0.001	0.001	0.001	0.001	0.011	0.012	0.023	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.004	0.005	0.004	0.005	0.006	0.004	0.023
19-Jun-98	0.001	0.002	C/L	0.017	0.001	0.007	0.012	0.008	0.017	0.028	0.008	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.004	0.005	0.004	0.007	0.002	0.002	0.006	0.028
20-Jun-98	0.001	0.002	C/L	0.002	0.001	0.001	0.005	0.004	0.012	0.012	0.004	0.006	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.005	0.005	0.004	0.002	0.002	0.003	0.012

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
22-Jun-98	0.001	0.001	C/L	0.001	0.002	0.001	0.001	0.001	0.011	0.005	0.007	0.010	0.007	0.004	0.002	0.002	0.002	0.002	N/D	0.004	0.002	0.001	0.002	0.002	0.003	0.011
23-Jun-98	0.001	0.001	C/L	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.004	0.002	0.002	0.004	0.002	0.001	0.002	0.004
24-Jun-98	0.002	0.005	C/L	0.013	0.005	0.002	0.008	0.024	0.012	0.011	0.006	0.006	0.004	0.001	0.002	0.004	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.007	0.024

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
25-Jun-98	0.002	0.002	C/L	0.001	0.001	0.001	0.002	0.011	0.021	0.031	0.010	N/D	0.008	0.004	0.002	0.002	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005	0.031
26-Jun-98	0.001	0.001	C/L	0.001	0.001	0.002	0.001	0.001	0.005	0.007	0.005	0.005	0.006	0.004	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.003	0.007
27-Jun-98	0.001	0.001	C/L	0.001	0.002	0.002	0.001	0.001	0.002	0.004	0.002	0.002	0.005	0.004	0.005	0.005	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.005

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1205

Table 1

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@slt.lk

Parameter : Nitrogen Dioxide
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
11-Jun-98	0.006	0.006	C/L	0.004	0.002	0.002	0.002	0.004	0.006	0.004	0.004	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.004	0.006	0.006	0.004	0.004	0.006
12-Jun-98	0.004	0.002	C/L	0.002	0.002	0.002	0.002	0.004	0.004	0.006	0.004	0.002	0.002	0.002	0.000	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.004	0.004	0.003	0.006
13-Jun-98	0.004	0.004	C/L	0.004	0.002	0.002	0.004	0.004	0.004	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.006	0.004	0.004	0.004	0.003	0.006

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
15-Jun-98	0.007	0.007	C/L	0.006	0.007	0.007	0.007	0.011	0.013	0.015	0.013	0.007	0.006	0.004	0.004	0.006	0.009	0.011	0.019	0.022	0.031	0.019	0.026	0.028	0.012	0.031
16-Jun-98	0.028	0.024	C/L	0.022	0.020	0.020	0.019	0.022	0.019	0.015	0.028	0.022	0.009	0.009	0.009	0.009	0.009	0.009	0.013	0.013	0.026	0.022	0.015	0.017	0.017	0.028
17-Jun-98	0.013	0.009	C/L	0.002	0.002	0.004	0.004	0.009	0.013	0.004	0.006	0.006	0.002	0.002	0.002	0.004	0.006	0.007	0.013	0.022	0.028	0.024	0.031	0.028	0.010	0.031
18-Jun-98	0.026	0.020	C/L	0.019	0.019	0.020	0.013	0.015	0.017	0.022	0.015	0.007	0.006	0.006	0.004	0.004	0.004	0.004	0.007	0.011	0.020	0.015	0.017	0.022	0.014	0.026
19-Jun-98	0.009	0.011	C/L	0.019	0.009	0.013	0.018	0.011	0.017	0.020	0.013	0.006	0.004	0.002	0.004	0.004	0.004	0.006	0.009	0.015	0.013	0.019	0.015	0.011	0.011	0.020
20-Jun-98	0.011	0.004	C/L	0.006	0.006	0.007	0.020	0.017	0.013	0.017	0.009	0.002	0.006	0.004	0.004	0.004	0.004	0.004	0.006	0.013	0.019	0.017	0.013	0.007	0.009	0.020

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
22-Jun-98	0.007	0.007	C/L	0.006	0.006	0.009	0.011	0.017	0.020	0.015	0.020	0.022	0.017	0.009	0.007	0.007	0.007	0.007	N/D	0.015	0.019	0.017	0.011	0.011	0.012	0.022
23-Jun-98	0.011	0.011	C/L	0.009	0.009	0.004	0.007	0.011	0.013	0.011	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.009	0.017	-0.007	0.019	0.004	0.017	0.020	0.009	0.020
24-Jun-98	0.011	0.017	C/L	0.020	0.017	0.015	0.015	0.017	0.015	0.017	0.015	0.013	0.007	0.006	0.002	0.007	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.013	0.020

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
25-Jun-98	0.000	0.002	C/L	0.006	0.020	0.024	0.020	0.017	0.019	0.024	0.013	N/D	0.000	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.002	0.004	0.002	0.008	0.024
26-Jun-98	0.002	0.002	C/L	0.002	0.002	0.004	0.006	0.002	0.002	0.002	0.002	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.006
27-Jun-98	0.002	0.002	C/L	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.004	0.002	0.002	0.002	0.002	0.004

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1205

Table 2

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@slt.lk

Parameter : Oxides of Nitrogen
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
11-Jun-98	0.008	0.008	C/L	0.005	0.003	0.004	0.003	0.010	0.012	0.009	0.006	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.005	0.007	0.007	0.005	0.006	0.012
12-Jun-98	0.006	0.004	C/L	0.004	0.003	0.005	0.005	0.010	0.013	0.014	0.010	0.004	0.005	0.005	0.006	0.007	0.004	0.003	0.003	0.005	0.006	0.006	0.007	0.006	0.006	0.014
13-Jun-98	0.005	0.006	C/L	0.005	0.003	0.004	0.006	0.009	0.012	0.010	0.007	0.005	0.004	0.004	0.005	0.004	0.004	0.003	0.005	0.005	0.008	0.005	0.005	0.005	0.006	0.012

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
15-Jun-98	0.009	0.009	C/L	0.007	0.009	0.009	0.010	0.012	0.020	0.023	0.019	0.010	0.007	0.005	0.005	0.007	0.012	0.016	0.023	0.033	0.048	0.023	0.042	0.052	0.018	0.052
16-Jun-98	0.059	0.045	C/L	0.042	0.044	0.038	0.027	0.046	0.034	0.024	0.049	0.039	0.010	0.012	0.010	0.012	0.010	0.013	0.018	0.017	0.056	0.037	0.018	0.018	0.030	0.059
17-Jun-98	0.014	0.010	C/L	0.003	0.003	0.005	0.006	0.010	0.017	0.006	0.008	0.008	0.003	0.003	0.003	0.005	0.007	0.009	0.015	0.027	0.035	0.029	0.041	0.031	0.013	0.041
18-Jun-98	0.027	0.022	C/L	0.020	0.020	0.022	0.014	0.026	0.029	0.045	0.018	0.010	0.007	0.007	0.005	0.005	0.005	0.005	0.009	0.015	0.025	0.018	0.021	0.028	0.017	0.045
19-Jun-98	0.010	0.014	C/L	0.035	0.010	0.020	0.031	0.020	0.034	0.048	0.019	0.008	0.008	0.003	0.005	0.005	0.005	0.007	0.013	0.020	0.017	0.026	0.017	0.014	0.017	0.048
20-Jun-98	0.012	0.006	C/L	0.008	0.007	0.009	0.025	0.020	0.025	0.029	0.013	0.008	0.008	0.005	0.005	0.005	0.005	0.005	0.007	0.018	0.023	0.020	0.015	0.010	0.013	0.029

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
22-Jun-98	0.009	0.009	C/L	0.007	0.008	0.010	0.012	0.018	0.031	0.020	0.028	0.032	0.024	0.013	0.010	0.010	0.010	0.010	N/D	0.018	0.021	0.018	0.014	0.014	0.016	0.032
23-Jun-98	0.012	0.012	C/L	0.010	0.010	0.005	0.009	0.012	0.015	0.014	0.008	0.007	0.007	0.007	0.007	0.009	0.010	0.012	0.020	-0.005	0.021	0.007	0.019	0.022	0.011	0.022
24-Jun-98	0.014	0.021	C/L	0.034	0.021	0.017	0.023	0.041	0.027	0.028	0.021	0.019	0.011	0.007	0.004	0.011	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.020	0.041

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
25-Jun-98	0.002	0.004	C/L	0.007	0.022	0.025	0.023	0.028	0.039	0.055	0.023	N/D	0.008	0.007	0.004	0.004	0.005	0.004	0.004	0.004	0.006	0.004	0.006	0.004	0.013	0.055
26-Jun-98	0.003	0.003	C/L	0.003	0.003	0.006	0.007	0.003	0.007	0.009	0.007	0.009	0.008	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.005	0.009
27-Jun-98	0.003	0.003	C/L	0.003	0.004	0.004	0.003	0.003	0.004	0.005	0.004	0.004	0.007	0.005	0.007	0.007	0.004	0.004	0.004	0.003	0.005	0.004	0.004	0.004	0.004	0.007

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1205

Table 3

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@sll.lk

Parameter : Sulphur Dioxide
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
11-Jun-98	0.003	0.003	C/L	0.003	0.003	0.003	0.003	0.005	0.005	0.003	0.003	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.005	0.005	0.005	0.005	0.004	0.005
12-Jun-98	0.005	0.003	C/L	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.003	0.003	0.003	0.008	0.005	0.003	0.003	0.005	0.005	0.005	0.003	0.005	0.003	0.003	0.004	0.008
13-Jun-98	0.003	0.003	C/L	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.003	0.005

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
15-Jun-98	0.008	0.008	C/L	0.003	0.003	0.003	0.003	0.003	0.005	0.015	0.010	0.008	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.008	0.015	0.015	0.015	0.028	0.008	0.028
16-Jun-98	0.044	0.033	C/L	0.033	0.038	0.031	0.015	0.026	0.023	0.021	0.015	0.028	0.013	0.010	0.010	0.010	0.008	0.008	0.008	0.005	0.010	0.021	0.008	0.008	0.018	0.044
17-Jun-98	0.010	0.010	C/L	0.005	0.003	0.003	0.003	0.005	0.008	0.005	0.003	0.005	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.010	0.013	0.013	0.015	0.018	0.007	0.018
18-Jun-98	0.018	0.015	C/L	0.013	0.010	0.010	0.008	0.018	0.031	0.036	0.013	0.010	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.005	0.010	0.036
19-Jun-98	0.005	0.003	C/L	0.003	0.005	0.003	0.008	0.003	0.010	0.021	0.013	0.008	0.010	0.015	0.015	0.015	0.015	0.015	0.018	0.044	0.021	0.023	0.021	0.015	0.013	0.044
20-Jun-98	0.018	0.005	C/L	0.005	0.005	0.008	0.010	0.013	0.013	0.021	0.013	0.008	0.005	0.005	0.003	0.003	0.005	0.003	0.003	0.003	0.005	0.003	0.003	0.003	0.007	0.021

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
22-Jun-98	0.003	0.008	C/L	0.008	0.015	0.018	0.008	0.010	0.013	0.018	0.021	0.021	0.013	0.018	0.015	0.010	0.013	0.005	N/D	0.005	0.008	0.008	0.008	0.010	0.012	0.021
23-Jun-98	0.010	0.003	C/L	0.003	0.005	0.003	0.003	0.005	0.008	0.008	0.005	0.005	0.005	0.008	0.005	0.008	0.008	0.008	0.023	0.123	0.015	0.098	0.008	0.005	0.016	0.123
24-Jun-98	0.003	0.005	C/L	0.023	0.023	0.018	0.033	0.026	0.008	0.015	0.015	0.018	0.013	0.005	0.046	0.008	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.017	0.046

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
25-Jun-98	0.005	0.005	C/L	0.005	0.005	0.005	0.005	0.005	0.013	0.039	0.013	N/D	0.005	0.005	0.005	0.005	0.003	0.005	0.005	0.005	0.005	0.003	0.003	0.005	0.007	0.039
26-Jun-98	0.003	0.005	C/L	0.003	0.003	0.003	0.005	0.005	0.003	0.003	0.003	0.005	0.005	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.003	0.003	0.003	0.003	0.005
27-Jun-98	0.003	0.005	C/L	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.005	0.005	0.003	0.003	0.005	0.005	0.005	0.003	0.003	0.003	0.003	0.003	0.005

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.002 mg/m^3 or No Data

NBRO/ENV/15050/98/1205

Table 4

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5.
Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@slt.lk

Parameter : Carbon Monoxide
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
11-Jun-98	0.016	0.008	C/L	0.068	0.031	0.024	0.010	0.069	0.008	0.002	0.012	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.084	0.021	0.015	0.057	0.030	0.084
12-Jun-98	0.164	0.288	C/L	0.295	0.333	0.281	0.269	0.002	0.021	0.025	0.014	0.068	0.070	0.035	0.567	0.014	0.008	0.025	0.069	0.032	0.035	0.038	0.062	0.060	0.121	0.567
13-Jun-98	0.029	0.010	C/L	0.009	0.018	0.011	0.020	0.014	0.044	0.002	0.006	0.008	0.012	0.011	0.062	0.147	0.029	0.020	0.089	0.007	0.006	0.021	0.005	0.154	0.032	0.154

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
15-Jun-98	0.029	0.076	C/L	0.040	0.042	0.040	0.041	0.115	0.044	0.046	0.063	0.033	0.052	0.025	0.020	0.033	0.037	0.014	0.014	0.025	0.011	0.033	0.043	0.035	0.040	0.115
16-Jun-98	0.031	0.002	C/L	0.034	0.033	0.041	0.043	0.033	0.215	0.160	0.114	0.101	0.014	0.058	0.101	0.080	0.721	0.050	0.045	0.045	0.033	0.031	0.049	0.112	0.093	0.721
17-Jun-98	0.072	0.042	C/L	0.064	0.050	0.069	0.008	0.032	0.014	0.062	0.017	0.017	0.018	0.018	0.018	0.170	0.742	0.024	0.052	0.036	0.028	0.032	0.064	0.017	0.072	0.742
18-Jun-98	0.006	0.005	C/L	0.003	0.003	0.005	0.005	0.010	0.006	0.009	0.009	0.009	0.005	0.021	0.024	0.021	0.023	0.023	0.024	0.025	0.018	0.019	0.033	0.034	0.015	0.034
19-Jun-98	0.010	0.009	C/L	0.048	0.019	0.009	0.008	0.018	0.019	0.017	0.249	0.052	0.047	0.069	0.031	0.020	0.024	0.028	0.017	0.033	0.171	0.475	0.138	0.037	0.067	0.475
20-Jun-98	0.051	0.012	C/L	0.016	0.005	0.036	0.054	0.119	0.881	0.442	0.177	0.377	0.301	0.053	0.050	0.041	0.051	0.038	0.054	0.215	0.305	0.244	0.088	0.027	0.158	0.881

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
22-Jun-98	0.102	0.060	C/L	0.042	0.043	0.044	0.068	0.106	0.371	0.150	0.129	0.324	0.218	0.082	0.077	0.144	0.078	0.085	N/D	0.301	0.251	0.396	0.129	0.153	0.152	0.396
23-Jun-98	0.138	0.124	C/L	0.110	0.081	0.052	0.139	0.179	0.140	0.118	0.060	0.075	0.134	0.156	0.113	0.116	0.173	0.118	0.087	0.670	0.947	0.254	0.112	0.276	0.190	0.947
24-Jun-98	0.120	0.068	C/L	0.055	0.040	0.041	0.054	0.212	0.417	0.596	0.313	0.137	0.064	0.054	0.154	0.045	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.158	0.596

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
25-Jun-98	0.281	0.051	C/L	0.079	0.069	0.073	0.141	0.486	0.548	0.437	0.483	N/D	0.592	0.127	0.070	0.086	0.061	0.077	0.063	0.067	0.097	0.141	0.087	0.072	0.190	0.592
26-Jun-98	0.069	0.043	C/L	0.040	0.042	0.042	0.046	0.042	0.061	0.053	0.051	0.052	0.045	0.054	0.049	0.051	0.051	0.049	0.051	0.052	0.045	0.047	0.071	0.050	0.050	0.071
27-Jun-98	0.053	0.084	C/L	0.063	0.064	0.028	0.099	0.075	0.095	0.092	0.082	0.096	0.089	0.112	0.113	0.114	0.078	0.092	0.098	0.121	0.132	0.106	0.090	0.071	0.089	0.132

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1205

Table 5

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-588946, 501834, 503826 Fax : 94-1-502611 e-mail : nabro@slt.lk

Parameter : Ozone
Unit : mg/m^3

Location : D

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
11-Jun-98	0.044	0.029	C/L	0.033	0.023	0.054	0.044	0.035	0.056	0.042	0.039	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.029	0.044	0.035	0.027	0.038	0.056
12-Jun-98	0.039	0.042	C/L	0.042	0.042	0.035	0.021	0.035	0.039	0.068	0.085	0.064	0.087	0.050	0.052	0.054	0.081	0.050	0.062	0.054	0.052	0.037	0.021	0.035	0.050	0.087
13-Jun-98	0.039	0.025	C/L	0.039	0.064	0.068	0.083	0.081	0.079	0.046	0.091	0.035	0.044	0.062	0.068	0.058	0.041	0.039	0.019	0.035	0.029	0.035	0.062	0.062	0.052	0.091

Location : C

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
15-Jun-98	0.056	0.075	C/L	0.069	0.064	0.068	0.083	0.021	0.060	0.058	0.054	0.125	0.054	0.087	0.081	0.089	0.075	0.079	0.087	0.075	0.042	0.154	0.060	0.052	0.073	0.154
16-Jun-98	0.035	0.014	C/L	0.000	0.010	0.012	0.015	0.017	0.066	0.102	0.042	0.110	0.091	0.116	0.098	0.097	0.062	0.073	0.077	0.062	0.050	0.035	0.041	0.033	0.055	0.116
17-Jun-98	0.052	0.025	C/L	0.050	0.033	0.060	0.062	0.068	0.025	0.068	0.058	0.073	0.069	0.075	0.069	0.079	0.056	0.062	0.058	0.054	0.041	0.048	0.073	0.029	0.056	0.079
18-Jun-98	0.006	0.012	C/L	0.012	0.015	0.008	0.012	0.015	0.019	0.023	0.048	0.046	0.058	0.054	0.056	0.050	0.050	0.046	0.044	0.071	0.066	0.029	0.137	0.110	0.043	0.137
19-Jun-98	0.064	0.027	C/L	0.008	0.004	0.041	0.023	0.031	0.017	0.089	0.081	0.041	0.095	0.017	0.025	0.062	0.064	0.139	0.027	0.037	0.029	0.021	0.012	0.017	0.042	0.139
20-Jun-98	0.019	0.029	C/L	0.023	0.025	0.021	0.010	0.012	0.035	0.023	0.042	0.023	0.093	0.108	0.102	0.091	0.108	0.097	0.079	0.066	0.068	0.068	0.069	0.124	0.058	0.124

Location : E

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
22-Jun-98	0.012	0.012	C/L	0.014	0.012	0.012	0.010	0.008	0.006	0.014	0.012	0.012	0.017	0.025	0.035	0.025	0.025	0.023	N/D	0.015	0.033	0.079	0.060	0.039	0.023	0.079
23-Jun-98	0.042	0.025	C/L	0.035	0.021	0.037	0.044	0.046	0.044	0.044	0.056	0.064	0.068	0.062	0.058	0.058	0.100	0.108	0.041	0.071	0.039	0.004	0.010	0.010	0.047	0.108
24-Jun-98	0.015	0.010	C/L	0.004	0.004	0.006	0.006	0.012	0.066	0.079	0.044	0.037	0.077	0.058	0.050	0.151	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.041	0.151

Location : B

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Average	Maximum
25-Jun-98	0.019	0.010	C/L	0.035	0.015	0.014	0.015	0.029	0.052	0.006	0.056	N/D	0.015	0.041	0.056	0.066	0.089	0.077	0.083	0.083	0.110	0.010	0.079	0.124	0.049	0.124
26-Jun-98	0.031	0.056	C/L	0.064	0.052	0.052	0.048	0.056	0.064	0.079	0.114	0.081	0.071	0.106	0.073	0.085	0.079	0.085	0.083	0.083	0.048	0.066	0.095	0.046	0.070	0.114
27-Jun-98	0.042	0.056	C/L	0.058	0.060	0.097	0.002	0.052	0.064	0.098	0.069	0.050	0.060	0.068	0.079	0.046	0.064	0.097	0.097	0.095	0.091	0.095	0.095	0.039	0.068	0.098

C/L : Calibration Cycle
N/D : Not Detected, Less than 0.001 mg/m^3 or No Data

NBRO/ENV/15050/98/1205

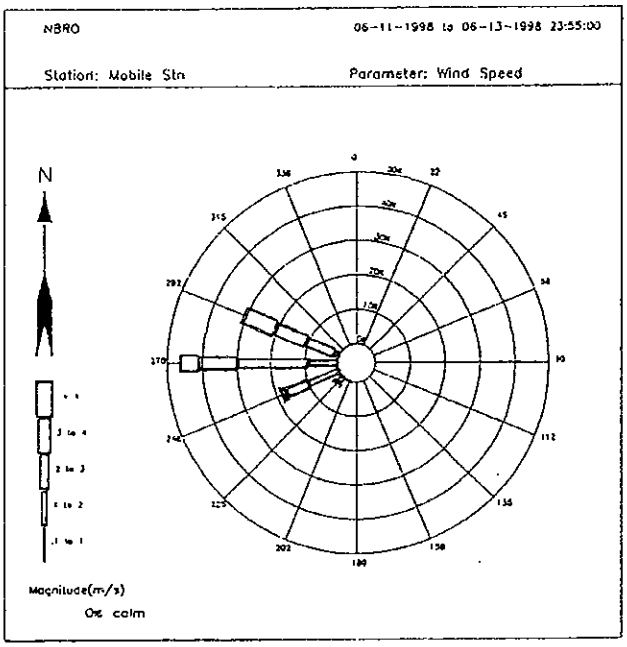
Table 6

ENVIRONMENTAL DIVISION
NATIONAL BUILDING RESEARCH ORGANISATION
99/1,JAWATTA ROAD, COLOMBO-5. Tel : 94-1-5889 Fax : 94-1-502611 e-mail : nabro@slt.lk

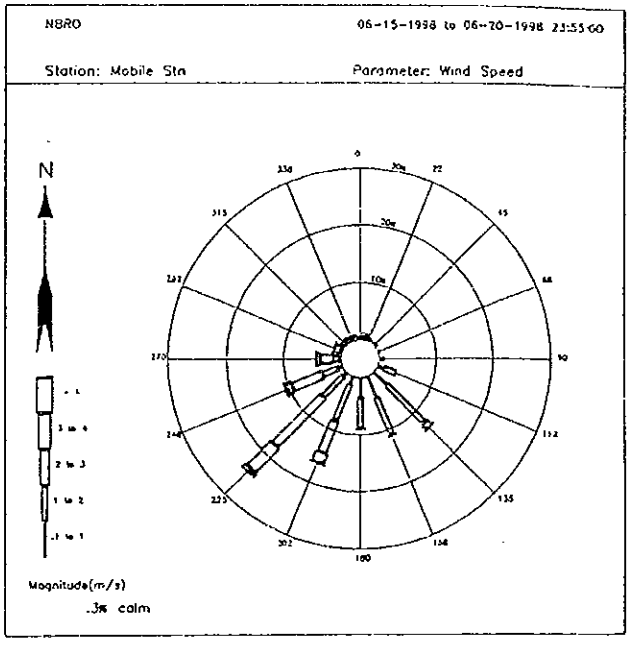
Date	Start Time	Vol. of Air Drawn (m^3)	Run Time (hrs)	Concentration (mg/m^3)
Location : D				
Friday, 12-06-98	4:00	551	8.01	0.081
Friday, 12-06-98	12:00	555	8.02	0.092
Friday, 12-06-98	20:00	558	8.09	0.093
Saturday, 13-06-98	4:15	573	8.32	0.095
Saturday, 13-06-98	12:45	551	7.96	0.098
Saturday, 13-06-98	20:45	554	8.01	0.094
Location : C				
Friday, 19-06-98	0:00	520	7.49	0.052
Friday, 19-06-98	8:00	562	8.07	0.096
Friday, 19-06-98	17:00	595	8.56	0.090
Saturday, 20-06-98	2:30	522	7.54	0.062
Saturday, 20-06-98	10:30	537	7.73	0.082
Saturday, 20-06-98	18:30	558	8.06	0.110
Location : E				
Sunday, 21-06-98	1:30	555	8.01	0.103
Sunday, 21-06-98	9:30	574	8.30	0.083
Sunday, 21-06-98	18:00	551	7.99	0.066
Tuesday, 23-06-98	1:30	580	8.34	0.073
Tuesday, 23-06-98	10:00	548	7.93	0.097
Tuesday, 23-06-98	18:00	554	8.03	0.109
Location : B				
Friday, 26-06-98	1:00	558	8.07	0.078
Friday, 26-06-98	9:15	555	7.98	0.077
Friday, 26-06-98	17:20	562	8.10	0.072
Saturday, 27-06-98	1:30	554	8.00	0.068
Saturday, 27-06-98	9:30	554	7.99	0.084
Saturday, 27-06-98	17:30	578	8.35	0.080

NBRO/ENV/15050/98/1205

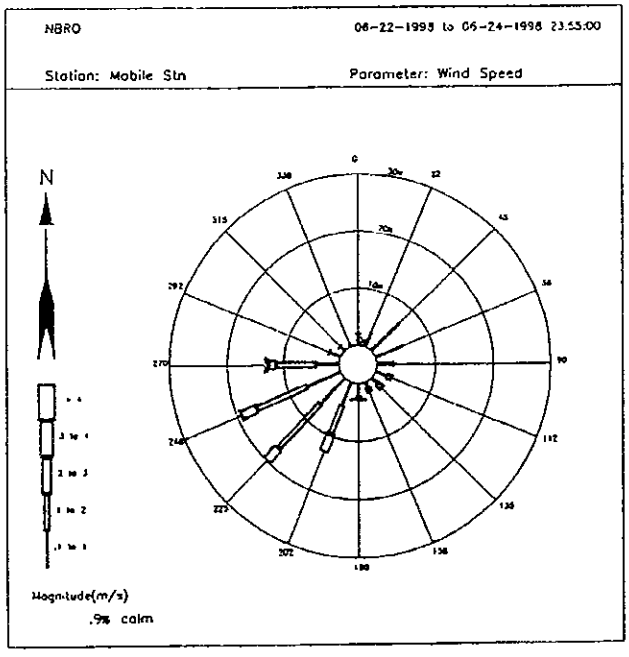
Table 7



Location : D



Location : C



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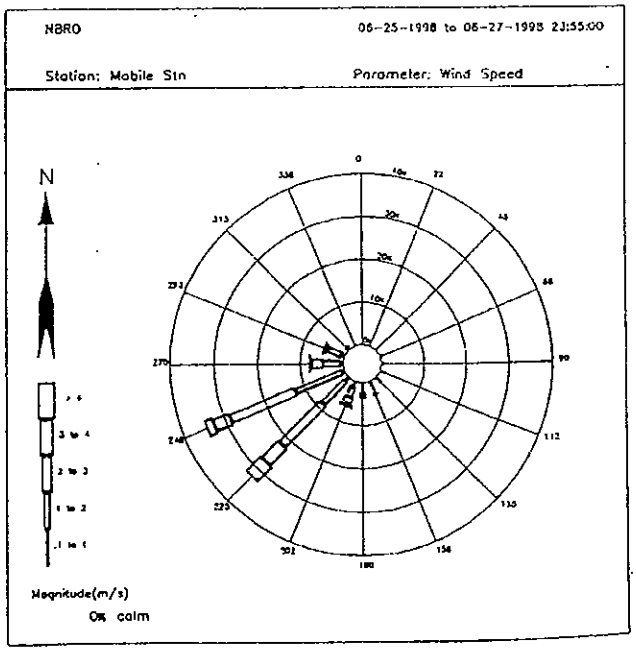
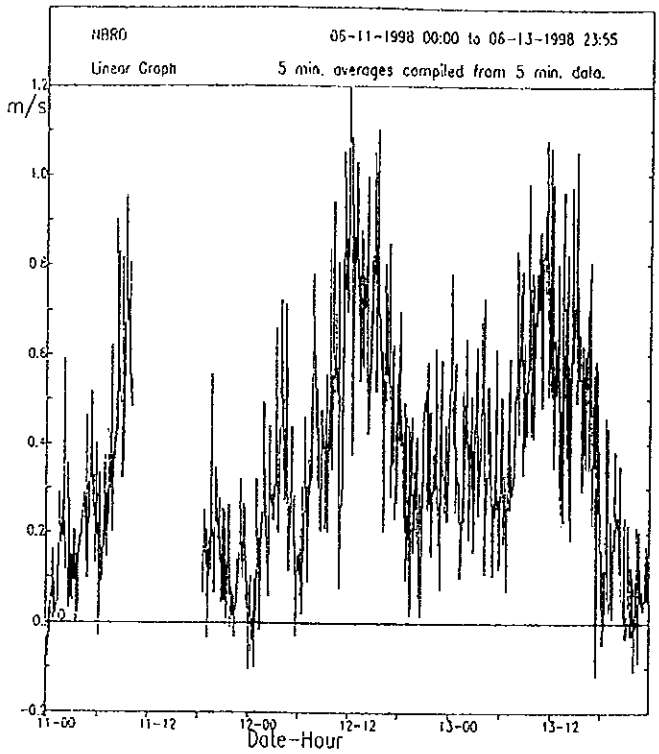


Location : B

Fig.1.



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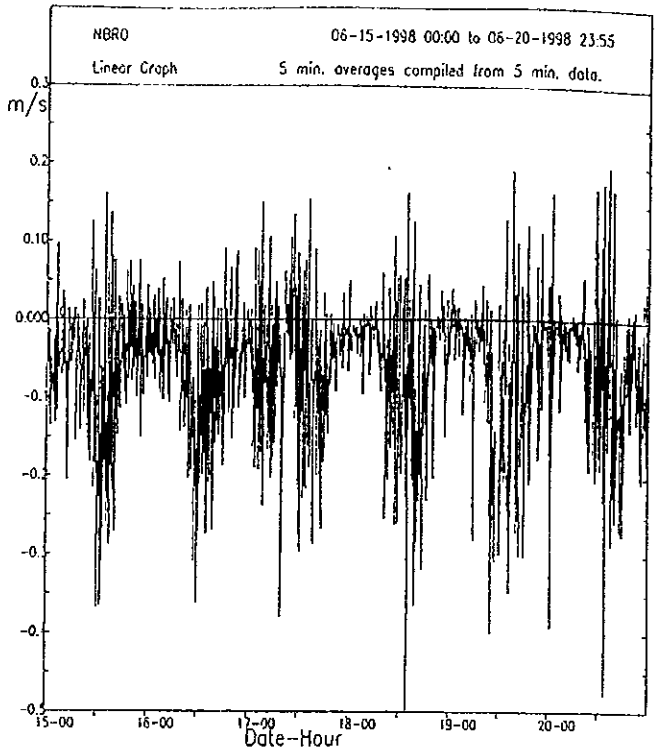

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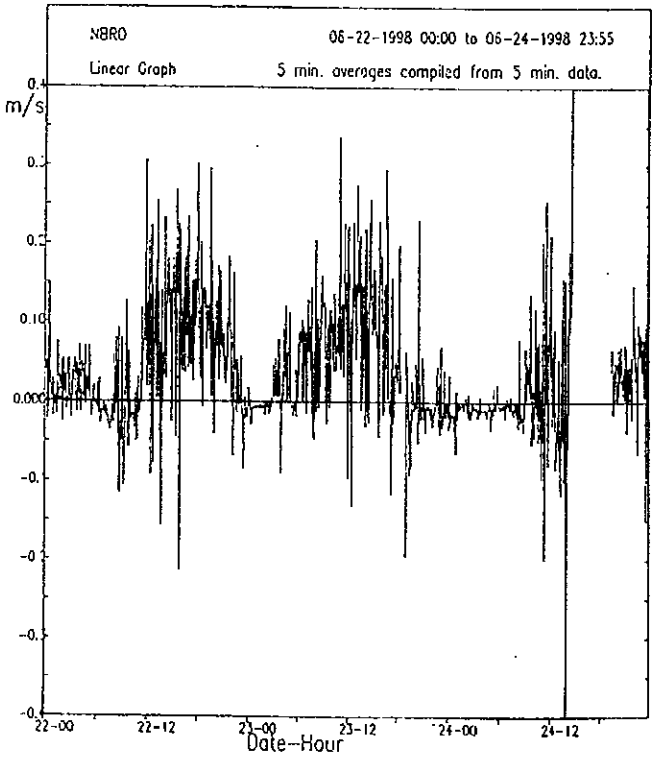

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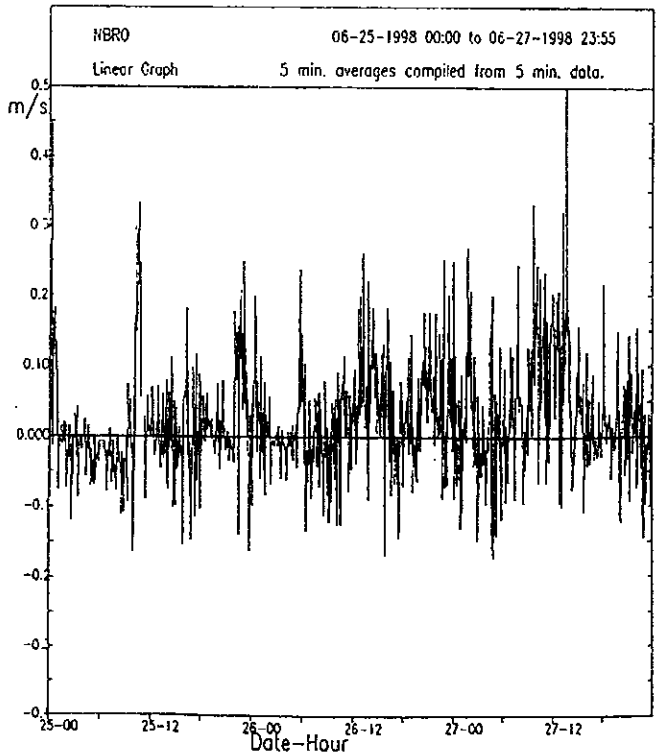
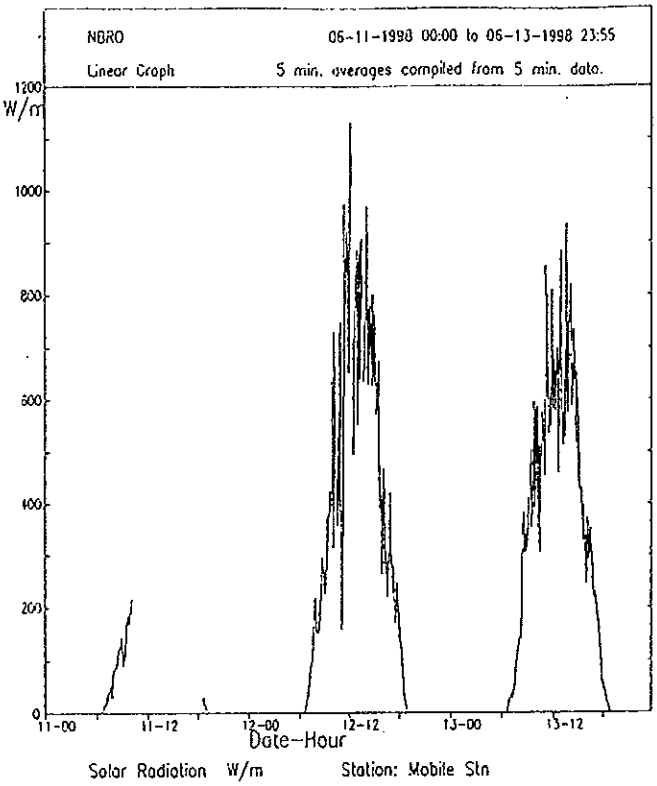
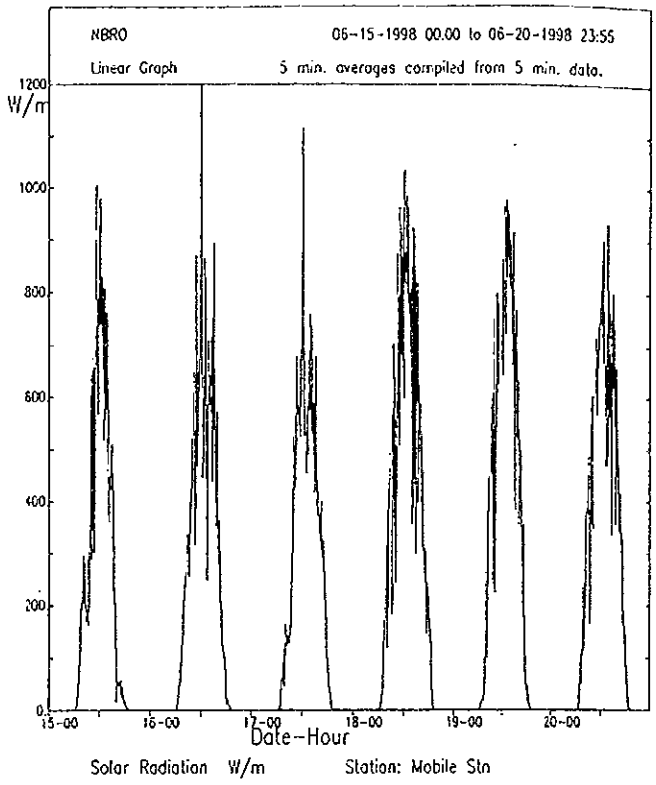


Location : B

Fig.2



Location : D



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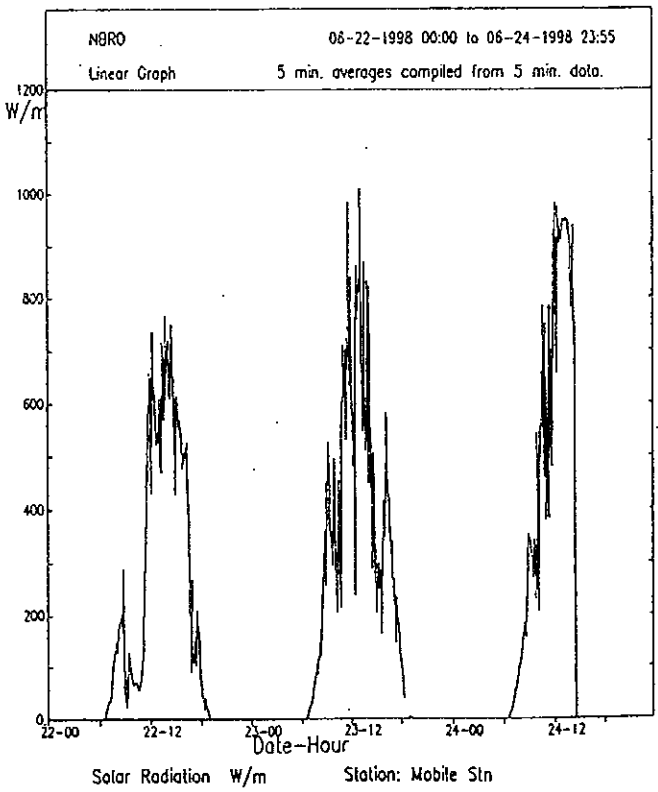
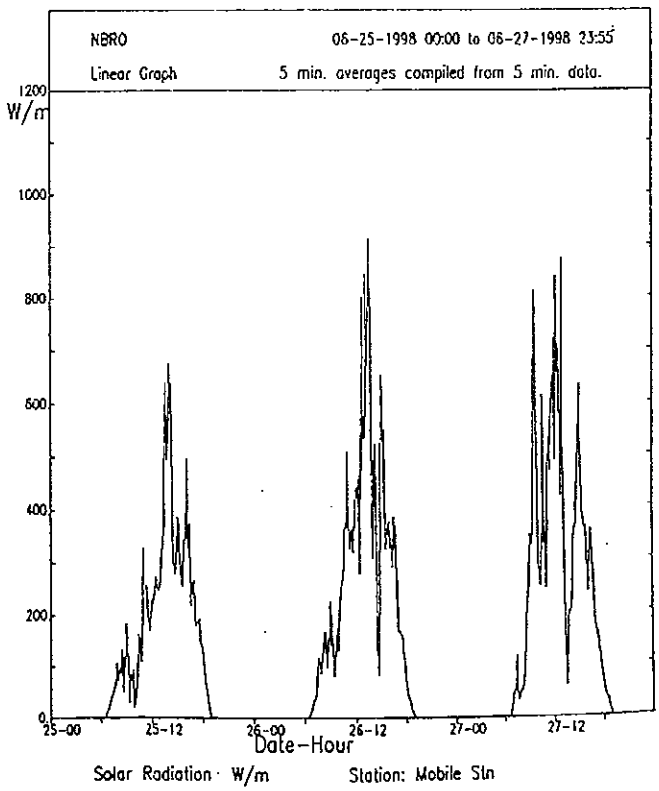
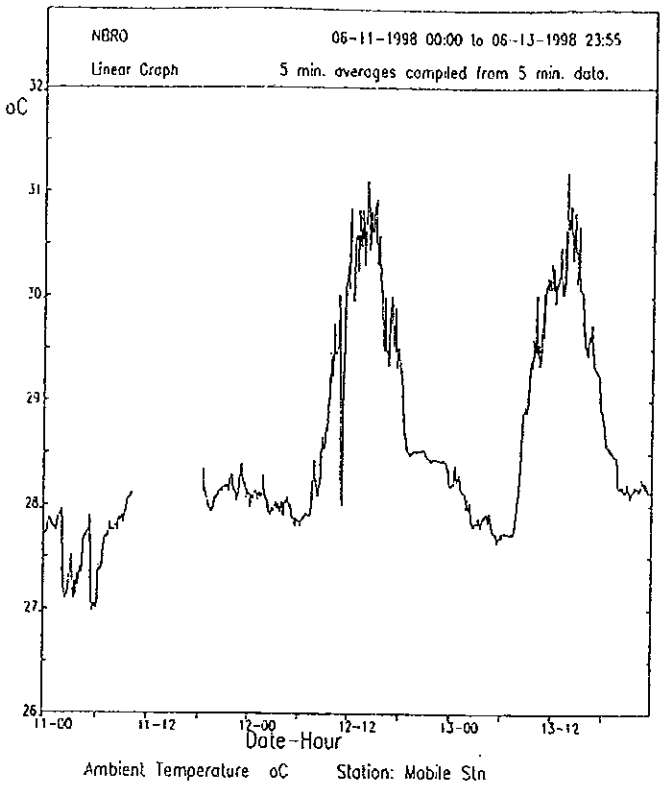


Location : E



Location : B

Fig.3



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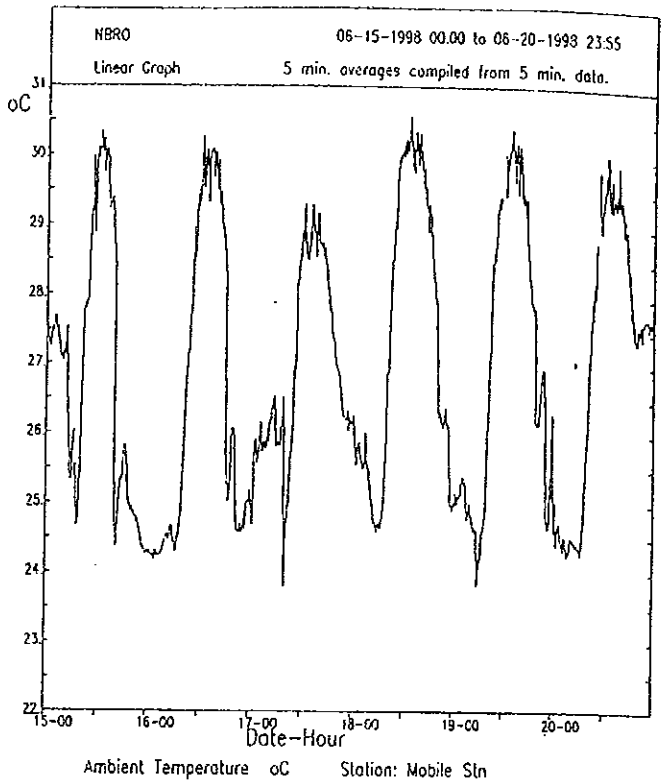
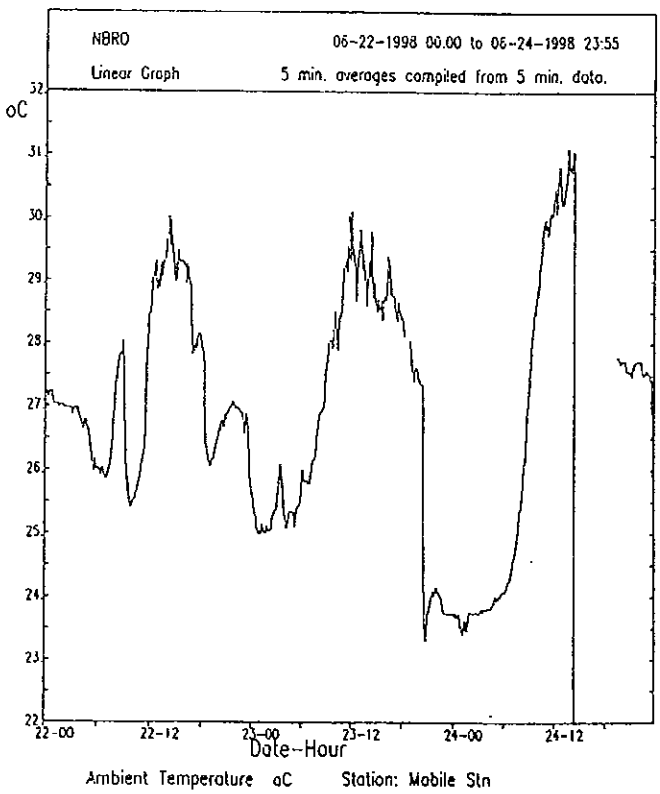
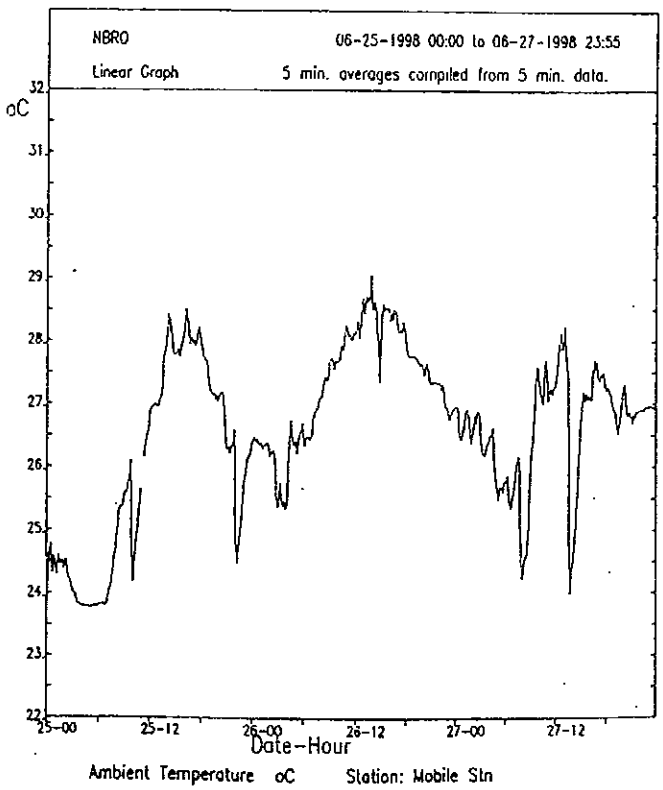


Location : C

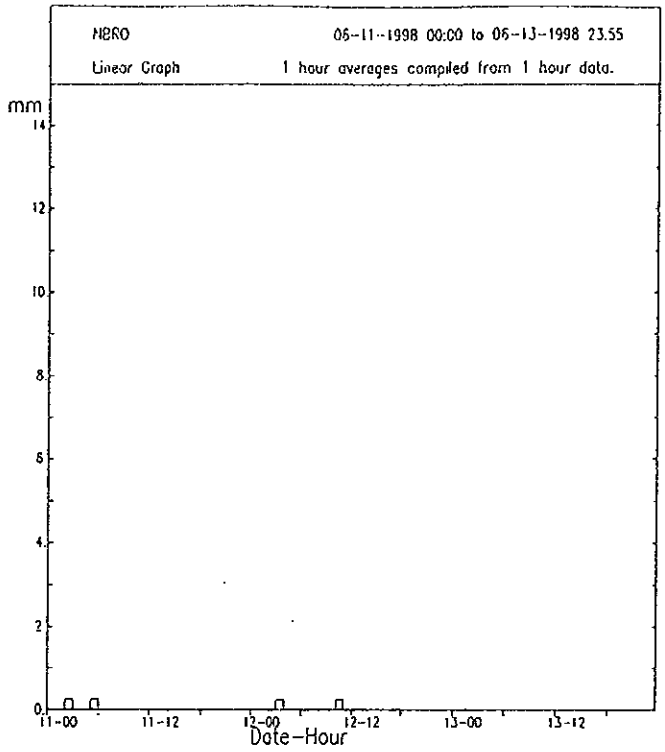


Location : E



Location : B

Fig. 4



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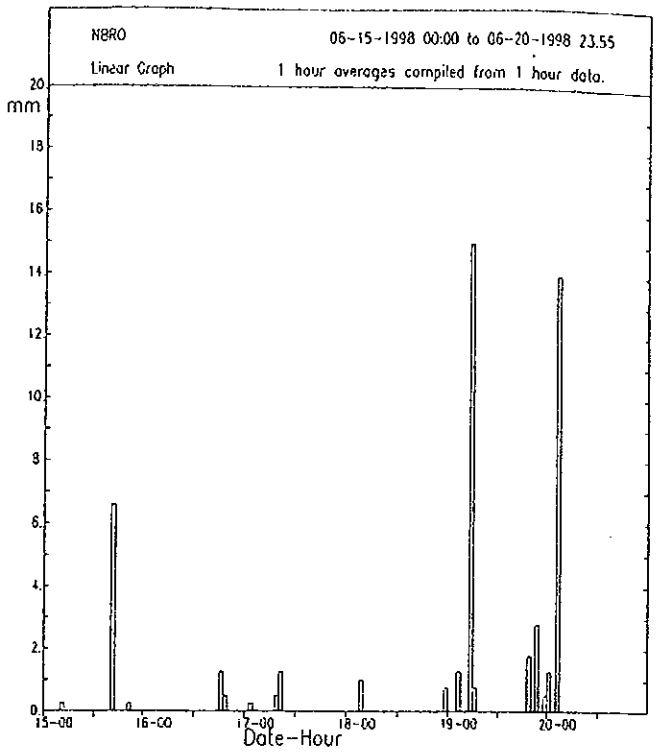

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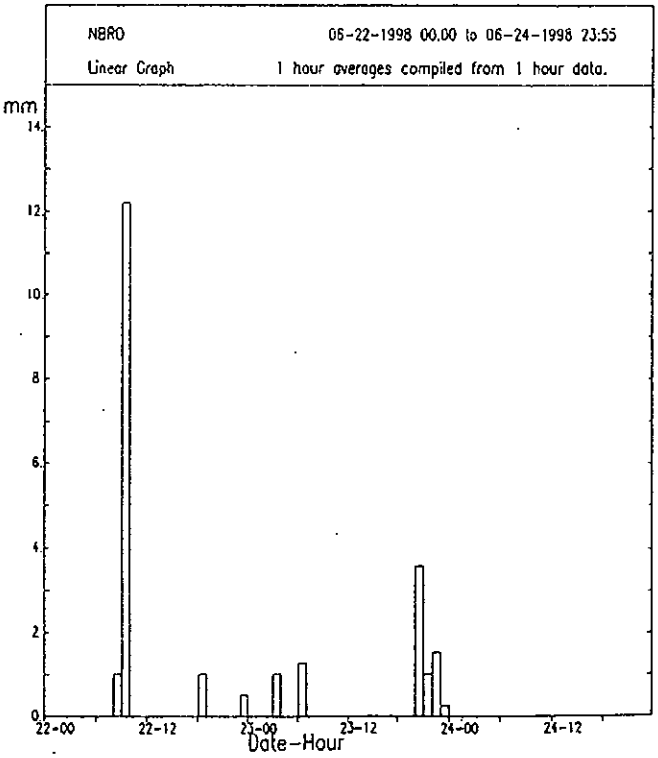

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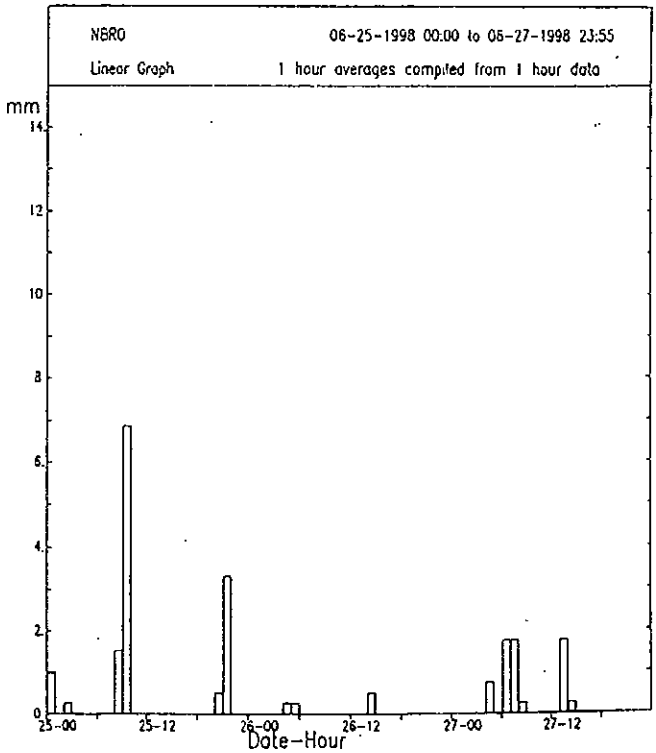

Location : B

Fig.5