PN-AAA-425

RENEWABLE ENERGY RESOURCES
FIELD TESTING

STATEMENT OF WORK FOR FIELD TEST # 10
WIND POWERED DESALINATION SYSTEM AT HURGHADA

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FINAL

Prepared for

New and Renewable Energy Authority
Cairo, Egypt

And

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Design, Installation and Operation/Maintenance Training
For a Wind Powered Desalination System at Hurghada, Egypt

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Design, Installation and Operation/Maintenance Training
For a Wind Powered Desalination System at Hurghada, Egypt

1.0 PROJECT DESCRIPTION

1.1 Background of the Renewable Energy Resources Field Testing Project

The Government of Egypt herein referred to as (GOE) and the U.S. Agency for International Development (USAID) have initiated a four year renewable energy resource field demonstration project (REFT). The New and Renewable Energy Authority (NREA) and Louis Berger International, inc. are leading a team of subcontractors in the REFT project activities that encompass solar industrial process heat, wind and photovoltaic system applications.

The specific objectives of the GOE/USAID project are twofold: (i) to demonstrate, analyze and evaluate the viability of commercially available renewable energy technologies in Egypt. (2) to establish the infrastructure necessary to ensure that successful renewable technologies are available for widespread use in-country. Three tasks are planned:

(1) Field Tests - Assessment of some selected renewable energy systems/applications which could be suitable for commercial use in Egypt; develop detailed engineering design hardware specifications and system performance requirements; prepare RFP packages for procuring equipment; supervise the work of hardware contractors; and collect and evaluate data generated from the field tests.

(2) Supporting Analysis - Conduct technical, social, financial, economic, and market analysis of renewable energy systems related to the field tests. Develop a computerized Renewable Energy Information System (REIS).

(3) Training - Improve the skills of the GOE and the private sector in evaluating renewable energy technologies, applications, economics and markets, and provide technical assistance in systems design, installation, operation and maintenance.

The field test task consists of a number of separate renewable system application demonstrations. One wind system field test is a demonstration of a wind powered desalination system at Hurghada along the Red Sea coast in Egypt.

1.2 Summary of Bidder Requirements

The contractor shall submit a proposal for the design, purchase and installation of an instrumented wind powered desalination system at Hurghada, Egypt. The complete system shall be capable of desalting seawater delivering 80 m3 of potable water per day. The power system will use the nearby 11.0 KV grid line as a back up but the operation mode will demonstrate stand-alone operation using diesel as a back-up. Hence adequate battery storage is envisioned. The proposal shall also include training programs with appropriate classroom, field and in-factory sessions including training materials and manuals, for NREA engineers as well as local Egyptian operators of the wind powered desalination plant and maintenance technicians.

The contractor shall support operation of the system for a period of two years after the system is accepted by the NREA.

The hardware shall be commercially available and proven by reliable use in similar applications. Packaging and shipment of all required hardware to Alexandria/Egypt shall be the responsibility of the contractor. Transportation from Alexandria to the Hurghada desalination plant site is also the responsibility of the contractor. The NREA will assist with custom clearance and arrangements for required construction or transportation permits, as needed.

The tender shall be made on a turn-key basis. The contractor proposal shall define in detail all site preparation procedures, specifications and interconnect requirements for installation of the wind powered desalination plant. All site preparation, including the construction of intake beach well and turbine tower foundations and access roads will be the responsibility of the NREA to contractor's drawings and specifications. Purchase of transformers, switch gear and interconnect of wind powered desalination plant to the Hurghada grid is the responsibility of the contractor who will also be responsible for provision and erection of the water pipeline to the Marine Institute water tanks as well as adequate potable storage tanks at the field test site for water tanker loading. For each

component offered, the tenderer shall state in his offer the exact type and model number. He shall also submit a complete set of catalogues and drawings for each hardware item offered indicating its detailed technical specifications. All hardware offered shall be commercially available and proven by reliable use in similar applications.

A list of components envisioned to be offered is included in Appendix F. The Contractor shall complete to the best of his ability these forms as applicable to components offered in his bid.

The tenderer shall include in his offer a preliminary design; system layout drawing; functional schematic; system electrical circuit diagram including the performance monitoring instrumentation system; typical daily power and load operating curve for the wind turbines, back-up power source, battery, and desalination plant; and maintenance requirements for each major equipment item. In addition the proposal should include details of the installation design.

The Contractor shall also submit as a separate cost item the construction of the beach well and wind tower foundation although it is expected at this time that this task will be the responsibilty of the NREA.

1.3 Description of the Wind Powered Desalination Plant Site

The location for this wind powered desalination plant is a coastal strip of flat land sandwitched between the Red Sea Shore and the Hurghada/Ras Ghareb Highway near the Marine Biological Station in Hurghada, approximately 450 kilometers from Cairo (Exhibit 1 and Appendix A).

The Marine Biological Station at Hurghada currently has 200 people living/working at its facilities. Current water requirements are approximately 25m3/day. The station plan to extend its size to 450 people within one year, resulting in increased potable water requirements.

Potable water supply is presently provided by a 220 kilometer pipeline from the Nile River through Saffaga.

The Biological Station will be the primary user of the water produced by the desalination system. Its future requirements will account for over 60% of the demand from the desalination system. The remaining 40% will be consumed by people living and working in surrounding areas, such as the youth center, school and family recreation area located adjacent to the station.

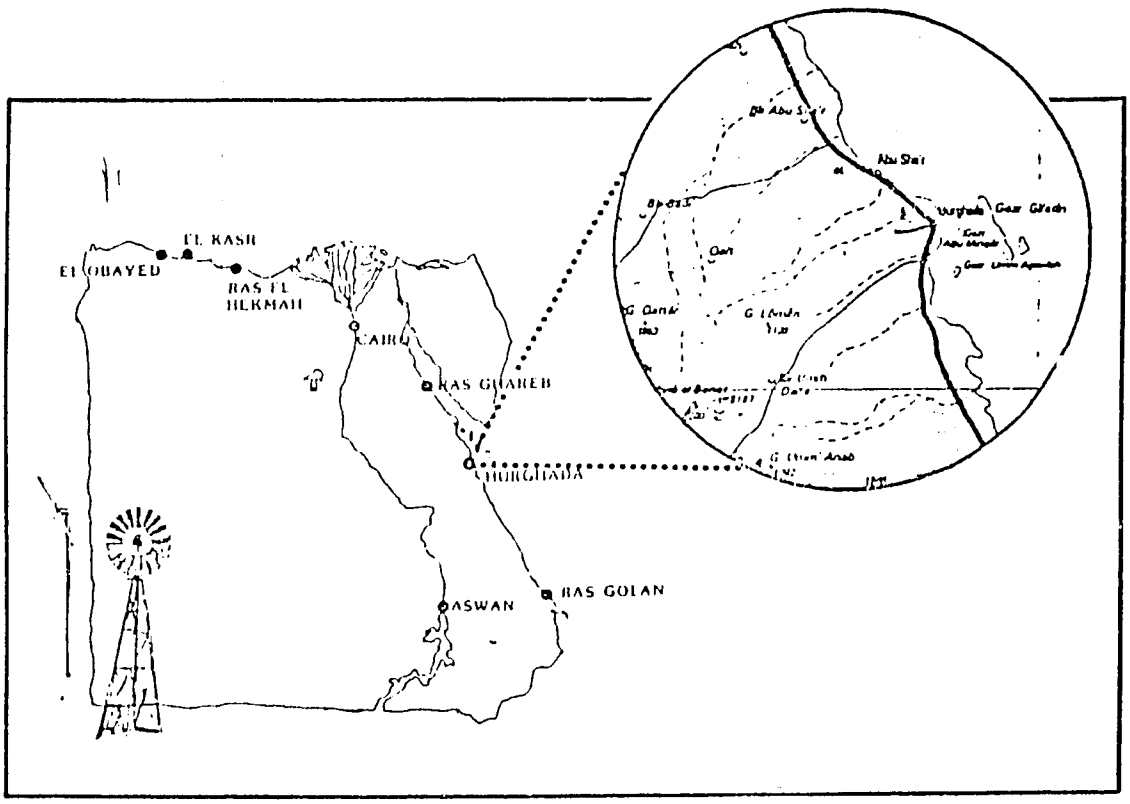


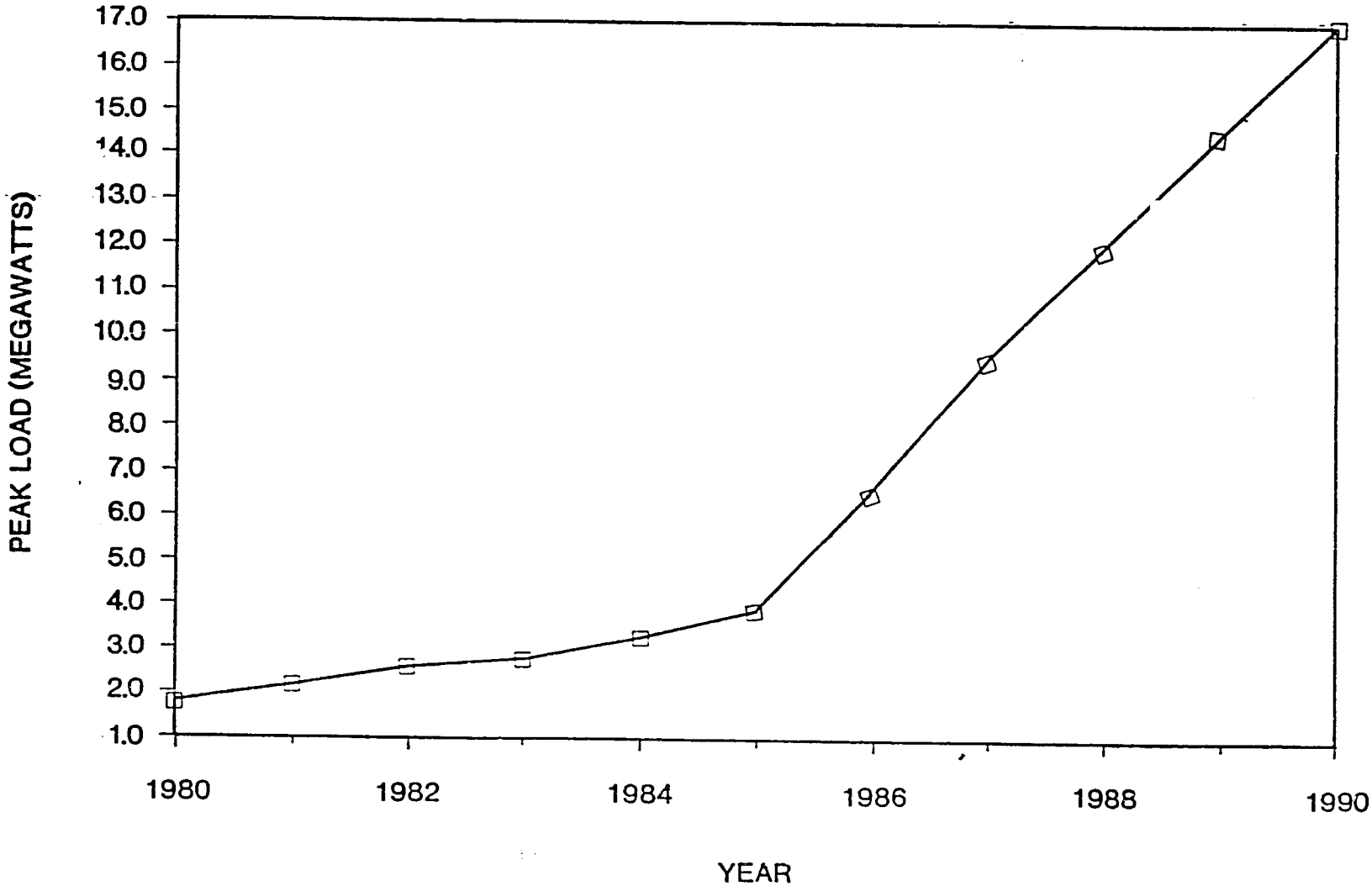
Exhibit 1

LOCATION OF HURGHADA, EGYPT

1.4 Existing Energy System at Hurghada

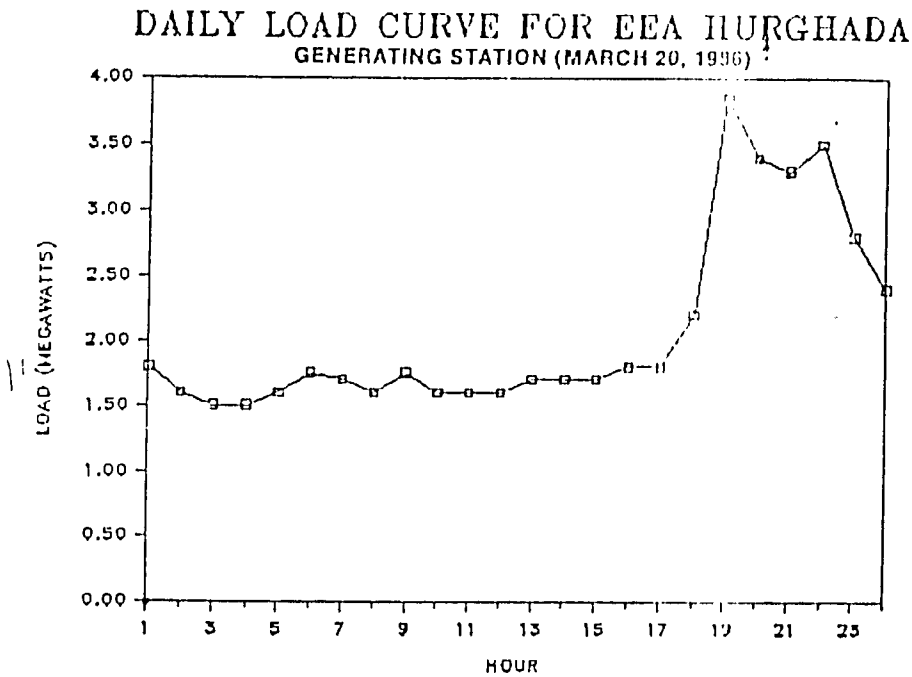
All electricity currently used by the Marine Institute is purchased from the Canal Distribution Company (the EEA). Power is produced at EEA's Hurghada Generating Station by two 5MW gas turbine, with a third 5MW unit as standby. Five year expansion plans by EEA call for 15MW of installed primary capacity with 10 to 15MW of backup. Historical and projected load growth at the Hurghada Generating Station is shown in Exhibit 2. Typical daily load curve (March 20, 1986) is shown in Exhibit 3 which indicates that peak power requirements on the local grid occur in the evening.

The Marine Institute receives its power from EEA via an 11kV overhead transmission line. Power is stepped down to 380/220 volts by an 80kVA transformer located at the Biological Station. EEA indicated that no spare capacity exists in the transformer. As a result, a separate transformer will be required for connecting the wind turbines to the grid.



Source: EEA

Exhibit 2
HISTORICAL LOAD GROWTH AT EEA
HURGHADA GENERATING STATION



DAILY LOAD FOR EEA HURGHADA GENERATING STATION

1.5 Summary of Wind Resource at Hurghada

The primary source of wind data used for the conceptual design is the 1985-1986 Battelle data. The source of these data is a wind measurement tower (10 meters) installed in April 1985 adjacent to the Biological Station. Other available data, collected in 1979, are provided by EEA. This second set of data is most likely from the airport at Hurghada. The Battelle data was collected using state-of-art anemometer equipment designed specifically for evaluating wind energy applications.

The EEA data, on the other hand, was not recorded for the purpose of wind resource assessment, but rather weather prediction. Exhibit 4 shows a comparison of the annual wind speed frequency distribution for both sets of data. The (1985-1986) Battelle data shows a much better wind speed distribution than the 1979 EEA data. The Battelle data will result in higher predictions of wind turbine energy output than if the 1979 EEA data were used. According to the 1979 EEA data, the wind speed in the Hurghada area averages 6.2 m/s at a 20 meter height, with the wind direction predominantly from the northwest. The Battelle data, measured at the proposed location of this Field Test indicates an annual average wind speed of 6.2 m/s at a 10 meter height (6.8 m/s at a 20 meter height), with the wind direction from the northwest about 40% of the time.

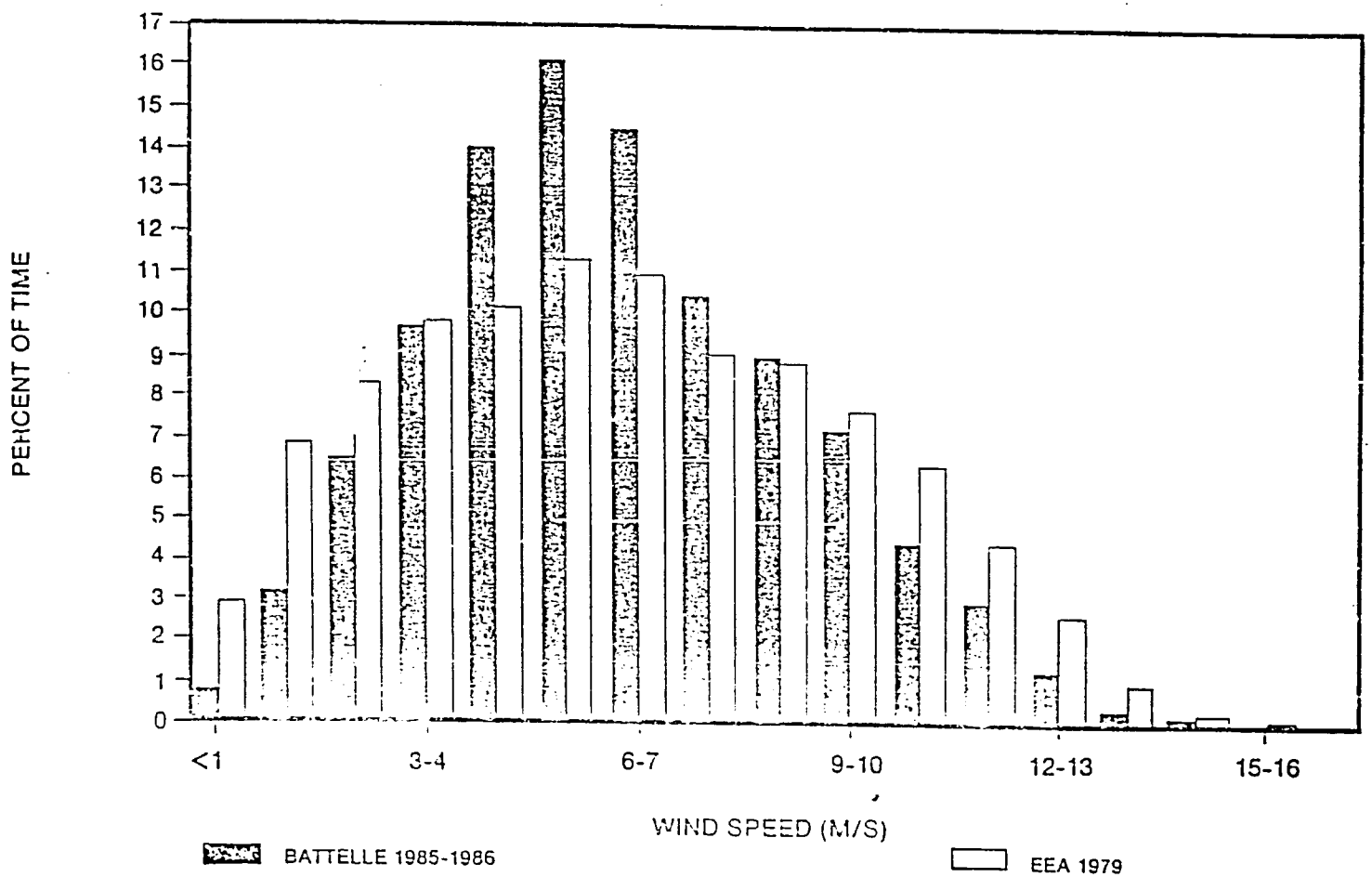


Exhibit 4
ANNUAL WIND SPEED FREQUENCY DISTRIBUTIONS

Exhibit 5 shows daily wind speed profiles for both September and November 1985, the best and worst wind resource months respectively. The curves represent typical days during these months. Both curves indicate that wind speeds are highest during the late morning and early afternoon hours and lowest in the late evening. This means that sufficient battery storage and backup power capacity must be available during the afternoon and evening to supplement the wind power.

Detailed wind resource data for the Hurghada area for use by contractors in response to this request for proposal are presented in Appendix B.

1.6 Water Chemistry Data

The Seawater Desalination plant shall provide 80cu.m/day of potable water. Feedwater will be provided from a beach well to be drilled at the Field Test site. A water analysis for seawater at Hurghada is provided in Appendix E. Water analysis for sea water at Zafarana, a town 200 Km north of Hurghada, is also given to show possible variations in Red Sea water salinity.

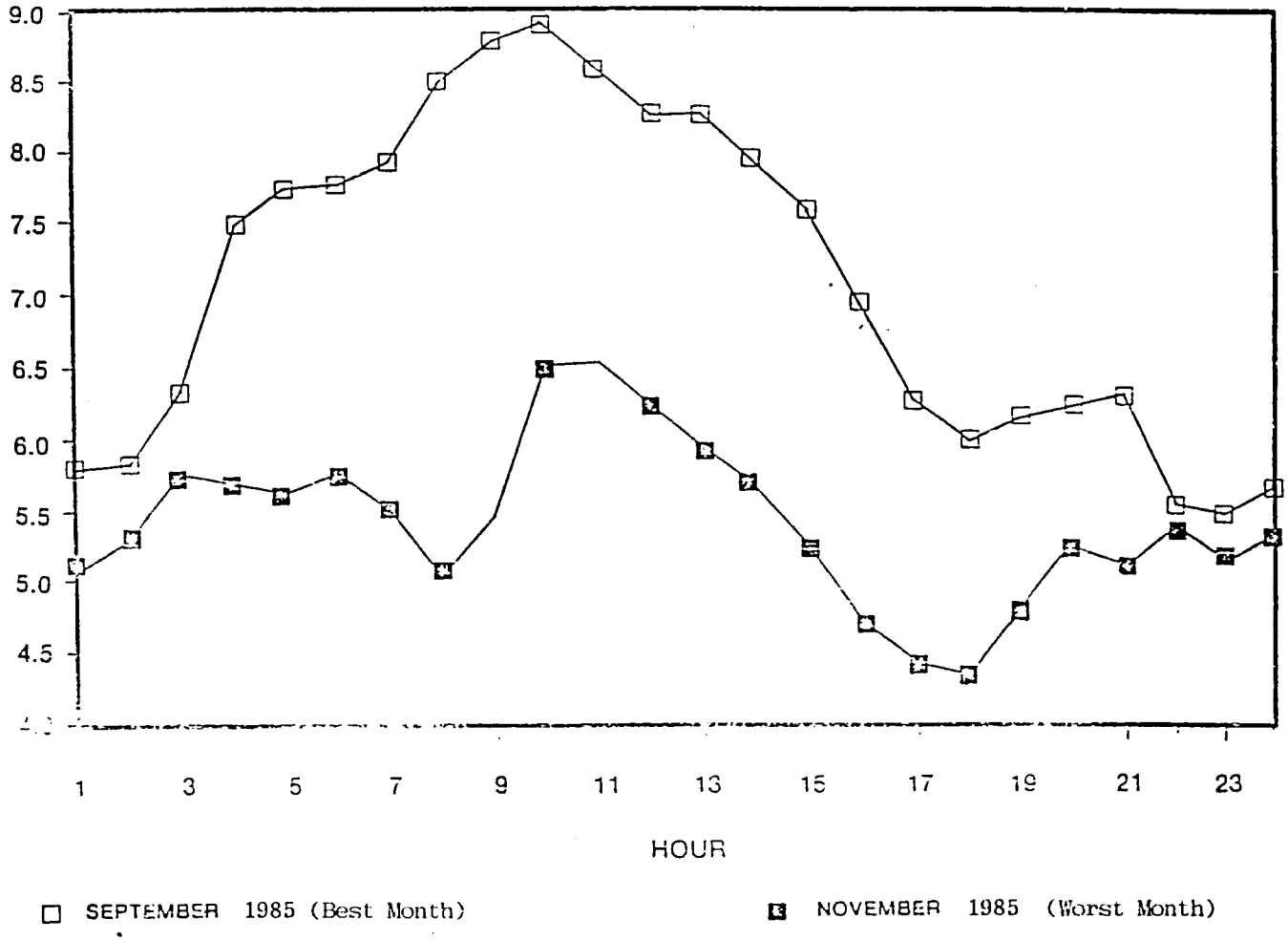


Exhibit 5

DIURNAL WIND SPEED PROFILES FOR BEST AND WORST WIND RESOURCE MONTHS

2.0 WIND POWERED DESALINATION PLANT SYSTEM DESIGN

2.1 Schedule for Wind Powered Desalination Plant Design

Within 14-days after contract award, the Contractor shall submit a schedule for design manufacture, factory testing, transporation, installation, start-up and acceptance testing of the proposed wind powered desalination plant for NREA/USAID review. The schedule for design will be approved in writing (or an alternate recommended) by the Contracting Officer within 14-days of receipt in Cairo. The Contractor shall complete a preliminary design within 30-days of notification by NREA/USAID of the design schedule approval. As a minimum, the preliminary design for the wind powered desalination plant shall include:

(1) an illustration of the wind powered desalination plant equipment and layout

(2) a functional block diagram

(3) a description with specifications of all major assemblies and sub-assemblies

(4) wiring diagrams and schematics as appropriate to understand the installation and operation of the wind powered desalination plant and its control system

(5) site preparation requirements and foundation specifications and drawings as well as specifications, dimensions and location of intake beach well

(6) tables listing equipment supplied and equipment required but not supplied

(7) a schematic and equipment list (including technical specifications) for the desalination plant and for the interconnect of the wind turbines to the Hurghada grid

(8) a detailed description of the data acquisition system

This design shall be reviewed by NREA/USAID and/or its authorized representative and approval to proceed given before the initiation of system fabrication as outlined below.

2.2 Design Reviews

The NREA/USAID, or its authorized representative, shall have the right to review drawings and specifications pertaining to the design of the wind powered desalination plant and its components. Submission of the drawings and specifications for review and the completion of the review will be in accordance with the "Schedule for wind powered desalination plant design" (Section 2.1) submitted by the Contractor and approved by the NREA/USAID. The NREA/USAID shall have the right to require modifications to the designs for specified cause, namely: for minimum safety, prevention of harm to personnel and the environment, prevention of significant harm to property or equipment, meeting of minimum specifications, or jeopardy of Hurghada Marine Station operations. Included will be the review of the design of

electrical generation and water production facilities and their interconnecting systems. The NPEA/USAID shall have the right to require modification to design as it deems necessary for proper operation of the wind power system in parallel with EEA power system and for disconnect of the wind power system in the event of power outages of either the existing power system or the wind power system.

The Contracting Officer, or authorized representative, shall have the right to be present during the time of major component or system performance testing at the point of manufacture. The Contractor shall notify the Contracting Officer of the date, time and location of such tests at least 10 days prior to testing. Written results of the tests shall be supplied to the Contracting Officer within two weeks of completion.

2.3 General Design Requirements

The wind powered desalination plant design shall conform to acceptable commercial and standard U.S. industry practice with all equipment sited and sized for efficient and functional use. The American Wind Energy Association standards shall be used as a guideline. Operating and maintenance personnel safety shall be an integral part of the system design. All proposed equipment shall be commercially available and of demonstrated reliability

(see Section 4.2); the use of prototype or one-of-a-kind hardware is not acceptable. A minimum operational lifetime expectancy of 25 years in the local Egyptian environment is required except for the battery system which may be designed for a 10 year life based on one charge/discharge cycle per day and the reverse osmosis membranes which may be designed for a minimum of 5 year life under design condition. All hardware is to be treated to withstand the environmental conditions specified in Section 4.4.

2.4 Technical Design Requirements

2.4.1 Wind Power System Sizing

The Contractor shall size the wind power system based on the measured Hurghada wind resource characteristics given in Appendix B. Power generated will be fed to the desalination plant to produce 80 cu.m/day of drinking water and excess power will be fed to the existing EEA grid distribution system at 11.0 K.V. The wind power system sizing must satisfy the following design constraints or the contractor must clearly state noncompliance with specific constraints and explain why the noncompliance should be acceptable to the NREA/USAID.

Total Capacity	200 KW - 220 KW
Preferred Unit Size	50 KW (approximately)
Minimum Survival	54 meters/second (averaged over a period of 15 minutes)

2.4.2 Battery Storage Sizing

The Contractor shall size the Battery Storage for a Wind/Diesel/Battery stand alone operation. Lead acid deep cycle batteries, sealed or vented are desired. They could be supplied with recombination caps and an easy method of determining electrolyte level. The proposal shall describe battery operation including required equalization periods and duration and any special procedures for operation in high temperature environment.

2.4.3 Desalination System Sizing

The desalination plant shall include all necessary equipment to provide the required 80 cu.m/day of potable water of a quality meeting the World Health Organization (WHO) standards and of not more than 500 ppm salinity. RO membranes must be chosen that can accommodate the operating pressures required to desalt 48,000 ppm of TDS feed water while still performing in an efficient manner at the lower salinity levels.

The proposal shall include the provision of water treatment equipment which may be necessary to produce quality drinking water and to minimize the level of maintenance of the RO unit. The proposal should clearly describe any water treatment requirements including needed chemical treatment and disposal of any

residues. The system should be equipped with appropriate apparatus for the determination of the Silt Density Index at appropriate points of the system.

2.4.4 Control System Design

The wind energy conversion system shall employ fail-safe controls to protect the rotor from overspeeding in winds greater than its rated speed. The control system shall also provide for automatic starting when the wind speed drops below the cut-out value. A manual control for shutting the machine down to allow for system maintenance and repair shall be a part of the control system.

The control system has to be designed to simulate Wind/ Diesel/Battery stand-alone system operation. This will take into consideration required conditions of optimal operation of the diesel.

2.4.5 Grid Stability

The design and operation of the wind power system must cause no instability to the existing Hurghada's electrical grid system. The tolerances shown in Sections 2.4.5.1 must be met at

all times when the wind turbines are coming on or off-line. Any instabilities caused by the wind turbines will be treated as failure to deliver power per Section 4.1.

2.4.5.1 Electrical Tolerances

The following tolerances must be met to deliver power of acceptable quality:

- o Frequency: 50 Hertz ± 0.5%
- o Voltage: 380 Volts ± 10 Volts
- o Power Factor: Maximum of 0.8 lagging
- o Harmonics: Maximum of 3% of the fundamental

EMI characteristics of the wind turbines will conform to general standards established for the California wind farms. The Contractor at his own expense will correct any EMI levels found unacceptable at any time during construction or operations. Rotor blades must be constructed of wood or fiberglass. No metal blades are acceptable.

2.4.5.2 Electrical Interface

Although the grid is used as a back up to the Wind/Battery power system, its operation should simulate that of a Diesel Generator. Power flow to and from the grid should be recorded.

All electrical connectors and terminals including slip rings must have high resistance to temperature, dust, and corrosion. Other equipment such as lightning arrestors, and safety features (breakers, fuse, etc.) must be compatible with EEA electrical codes and be located at ground level for easy operation and maintenance. The contractor shall furnish and install all required equipment to configure the wind power system for electrical interconnect to the existing grid distribution system at 11.0 K.V. and to insure personnel safety. Such equipment shall include, but not be limited to, relays, meters, power circuit breakers, cables, power transformer, sychronizers and any control and/or protective devices.

Connections to the Grid and their instrumentation will be such that separate measurements will be made for the KWH flow to and from the system as well as duration of the flow in each direction.

2.4.5 Additional Equipment

o <u>Inverter (if proposed)</u>

If inverter(s) are to be supplied they must conform to U.S. industry standards or equivalent and have a demonstrated reliable field performance history. Operating procedures should be simple and clear. NREA/USAID or their representatives

reserves the option to request and to witness full load testing of the inverter prior to shipment. Documentation of past experience with proposed inverters is required.

- Battery Charger/Rectifier

  A commercially available battery charger/rectifier is required so that the battery bank can be charged adequately.

- On-Site Data Acquisition System (O DAS)

  An ODAS shall be designed, purchased and installed by the Contractor as specified in Section 5 of this Statement of Work

- Tools

  A set of tools and instruments necessary to trouble shoot usual problems and make repairs utilizing the spare parts supplied shall be provided.

- Energy Recovery System

  An Energy Recovery System shall be provided for the Desalination Plant which will use the energy stored in the brine discharge.

o Water Storage Tank

An elevated water storage tank (elevation to be determined by contractor) capable of holding 24-Hour Production of potable water will be provided by the contractor with the necessary piping and valves. In addition piping from the reverse osmosis plant to the existing storage tank will be provided by the contractor including necessary valves.

2.4.7 Building(s)

Modified shipping containers or prefabricated building(s) shall be supplied by the tenderer and be of size to permit housing and maintenance of the desalination system, battery banks, power conditioning system, control system and spare parts as well as office space for the operators and classroom training. The building should be provided with adequate ventilation.

2.5 Proof of Performance

The NREA/USIAD and/or its appointed representatives reserve the right to witness the inspectation and performance tests for all hardware equipment at the manufacturer's (or Contractor's) facilities prior to shipment. The Contractor shall provide 30 days notice of performance testing for components. As mentioned under section 2.4.3 and 2.4.6 the Power

Control System and Inverter, if supplied, shall be required to undergo full load testing prior to shipment. The proposal should address this issue by explaining what tests will be preformed to assure field and reliable operational performance of components prior to shipment. This testing is the responsibility of the Contractor. It may be witnessed by NREA/USAID or appointed representatives.

3.0 WIND POWERED DESALINATION PLANT INSTALLATION

3.1 Plan and Schedule for Construction

Within two weeks of NREA/USAID approval of the design c the wind powered desalination plant the Contractor shall submi a "Plan and Schedule for Construction" to the Contractin Officers for approval. The plan shall identify any specia needs such as specialized equipment, etc. The Contractin Officer will approve the Plan/Schedule, or recommend change required for approval within two weeks of receipt in Cairo. Al construction work shall be completed and the wind powere desalination plant shall be operational within 30 days o completion by NREA of site preparation activities and notifica tion to the Contractor that the wind powered desalination plan hardware is at Hurghada.

The NREA/USAID, and/or an authorized representative reserves the right to periodically inspect all phases of th work while in progress or after completion of the whole or an part thereof to insure that the work is performed in compliance with the terms of the contract. If NREA/USAID determines tha the work is not performed in accordance with the specifications, they reserve the right to require that the work be corrected o deficiencies or be redone if corrections cannot be made accept-able or are too extensive to economically correct. Any part o

the work that is redone shall be at the Contractor's expense. All work related shall be available at all times for examination by the NREA/USAID Contracting Officer. The Contractor shall provide all necessary facilities for such inspection during contractors regular working hours, if necessary. It should be clearly understood that such inspection shall not constitute acceptance by the Contracting Officer of any part of the work, but will be for the purpose of coordination and assistance in interpretation of specifications and technical requirements.

3.2 Site Planning and Construction

It is envisioned at this time that all site preparation including the construction of intake beach well and turbine tower foundations and access roads will be the responsibility of the NREA based on Contractor's drawings and specifications.

Soil boring data was collected in June, 1986 by a consulting company for the NREA. Soil data was collected at the site of the Wind Power Desalination Plant. Two standard penetration test (SPT) borings were conducted. Each SPT boring was terminated at a depth of 10.45m - 14m. Representative soil samples were analysed to obtain descriptions of existing soil strata. A detailed report is provided in appendix C.

A site grading plan shall be provided by the contractor within 10 weeks of the contract award as part of the Preliminary Design.

Installation of utility lines and/or conduit pipes to the point of connection to the existing lines, including all transformations from distribution to utilization of power and water as may be required, will be the responsibility of the contractor. The contractor shall furnish all material, complete required excavation work and make the final connections, under the supervision of GOE engineers.

Within one month of system acceptance and commencement of water production (see Section 7), the Contractor shall enter all changes and corrections to the original wind powered desalination plant during installation on the original tracings. Changes and corrections so entered shall be indicated by a lettered circle, and noted as "As-Built" in the revision. In the case where no revisions or corrections to an individual drawing were necessary, the notation "As-Built-No Changes" shall be made directly below the revision block. Where several manufacturers' brands, types or classes of items listed have been used in the project, the specific areas where each item was used shall be designated. Designations shall be keyed to the area and space designations on the contract drawings. Information shall be furnished, typewritten, for the listed materials. Copies of the "As-built" drawings shall be given to the Contracting Officer.

The Contractor is encouraged to use local Egyptian labor and in-country fabrication of subsystems whenever possible. Low-cost fabrication techniques should be emphasized. The proposal shall discuss the extent to which the proposed system can be constructed and installed by local labor using local materials should the system be replicated elsewhere in Egypt. The contractor shall indicate where this approach has been taken with this or similar equipment in other developing countries.

3.3 Drilling of the Beach Well

NREA will drill a beach well, if required, based on contractor's specifications. The contractor may oversee the drilling operations.

4.0 OPERATION AND MAINTENANCE

4.1 Schedule of Energy Production

The Contractor shall include in the proposal an "Initial Energy Production Plan and Schedule." This document shall contain, but is not necessarily limited to, monthly projections for twelve months of electrical power generation from the wind power system based on the wind data in Appendix B. A complete description of how these projections were computed, including descriptions of any computer models used, is required. Input parameters to any model shall be given including turbine power curves and tables of power output and energy production. Tables should be presented as output parameter values versus wind speed in one meter/second increments. Operating characteristics (cut-in, cut-out, rated velocities, etc.) for the turbine used to estimate the power production should also be included. In addition, a table of expected daily energy production (kWh) versus 10 minutes concurrent average wind speed is required for performance verification and system test acceptance Section 7).

Planned scheduled outages during the upcoming year and planned changes in equipment, control mode, or operation characteristics significantly impacting the energy production of the wind power system and affect water output from the desalination system will be given, if applicable. The wind power system

shall be operated with all the appropriate protective apparatus in service whenever any of the wind generators are connected to, or are operated in parallel with, the base electrical system. The wind power system and its protective apparatus shall be operated and maintained in accordance with applicable standards and engineering practices, including, but not limited to, control of line synchronization, voltage, power factor, frequency, and harmonic content to meet the specifications outlined in Section 2.4.5.

4.2.0 Wind Powered Desalination Plant availability

A 90% availability must be previously demonstrated for the proposed equipment in conditions similar to those in Section 4.4 for a period of at least 6-months. Ease of maintenance and repair should be a priority consideration in the wind powered desalination system design.

4.2.1 Schedule of Water Production

The proposal shall include information showing very clearly the effect on the unit output capacity due to changes on the inlet water chemistry and in particular the Silt Density Index and Total Desolved Solids. These have to be illustrated in tables and graphs.

4.3 Guarantee/Spare Parts Requirements

The contractor shall provide at least a two-year guarantee on all parts from the time of NREA/USAID system acceptance. An option for a 5-year guarantee shall be included as a separately costed option. The contractor shall separately cost an itemized list of spare parts that should be purchased by NREA/USAID and made available to insure trouble-free operation (90% availability) for five years. Any specialized, custom manufactured tools, equipment or instrumentation required for operation and maintenance of the wind powered desalination plant shall be specified and provided by the contractor.

4.4 Environmental/Climatic Conditions

The contractor shall unequivocally state in the proposal that the proposed wind powered desalination plant will operate as specified below. The contractor shall describe in detail measures that would be taken to protect all hardware installed in an environment of airborne dust and sand and salt spray typical of near-shore applications. The contractor shall describe measures to protect hardware in an environment that has caused moderate to severe corrosion to unprotected and simple galvanized metals. All parts shall be certified to withstand these conditions for this life expectancy.

Wind

The wind turbine shall operate in wind speeds from any direction greater than the specified cut-in windspeed and less than the cut-out wind speed for the turbines proposed. The turbine and tower shall be capable of withstanding wind speeds of up to 54 meters/second averaged over a period of 15 minutes.

Temperature Range

Ambient air temperature range of -5 to 55 degrees centigrade.

Humidity

Up to 95%.

Other

Protection of wiring and/or tubing from desert rodents.

4.5 Operations Support

The contractor is required to provide technical support of the operation of the system for a period of 2-years after system acceptance by NREA/USAID. The contractor's proposal shall describe the level of support offered, the procedures for management and control of the technical support and related support issues such as availability of spare parts, anticipated response time to a request for support, etc. This technical support shall be costed as a separate cost item in the contractor's cost proposal.

5.0 PERFORMANCE MONITORING

5.1 Field Test Data Acquisition System

The contractor will provide an on-site data acquisition system (ODAS) for monitoring the performance of hardware installed for this field test. This requirement is in addition to any other requirement for system control instrumentation and instrumentation necessary for routine test and maintenance checks as specified in Sections 2.4.2 and 4.3 of this statement-of-work.

The ODAS will comply with the specifications listed in Appendix D. of this statement-of-work and will monitor, as a minimum, the data parameters listed in Appendix D. The contractor will provide output ports and transducers to sample and measure each data parameter as specified in Appendix D. and to insure compatibility with the data storage system proposed.

The contractor will also provide a separate meteorological station which will have its own data recording system that is compatible with the ODAS.

If an exception must be taken to any of these instrumentation requirements, the Contractor will clearly note the exception and explain why the exception should be acceptable to the NREA/USAID.

5.2 ODAS Installation and Training

The contractor will install the ODAS at the same time that the field test hardware is being installed. Training for Egyptian engineers and technicians in the installation and operation of the ODAS will be included in the on-the-job training program described in Section 6 of this statement-of-work.

The ODAS instrumentation and installation shall be a separate item in the cost proposal for this field test. The NREA/USAID reserves the right to replace or modify the proposed ODAS during contract negotiation if required to maximize compatibility with other data collection, analysis and storage requirements of the REFT Project.

5.3 Log Sheets/Maintenance Records

The contractor shall develop, as part of the proposal, a log sheet of pertinent data that should be manually recorded on each major subsystem to document operations and maintenance history. The recommended frequency for maintenance of each item shall be stated. These logs/records should comply with the specifications outlined in Section 8. In addition, the Contractor shall include in the proposal maintenance records (including cost of parts and labor) of proposed equipment

installed in similar wind powered desalination plants, if available, as an example of actual maintenance history for this type of equipment.

6.0 TRAINING REQUIREMENTS

The Contractor is required to support the operation of the wind powered desalination plant by Egyptian engineers and technicians for a period of two years after system acceptance by the NREA/USAID.

In addition, a series of training programs will be developed and presented by the contractor for this project. These training programs fall into three general areas; classroom training in Cairo, in-factory training in the U.S. and on-the-job training at Hurghada, Egypt. Training sessions and materials vary in content and presentation from informal "one-on-one" type instruction to more formal group "lectures and workshops". The sections below describe the training requirements in as much detail as possible at this time. The proposed training program must be flexible enough to conform with the inevitable changes and revisions in the wind powered desalination plant field test as the project proceeds. All training sessions will be conducted in English and all materials will be written in English and Arabic.

6.1 Operator Training Program

The contractor is required to operate the wind powered desalination plant for an acceptance testing period of 30 days

after the wind powered desalination plant is designated as operational by NREA/USAID (see Section 7). This activity shall be accomplished by on-site contractor personnel. During the acceptance testing time period, the contractor will provide a training program in Hurghada and Cairo in the operation of the wind powered desalination plant to selected operating personnel. The operations program shall consist of a minimum of 20 hours of classroom training and 80 hours of on-the-job (OJT) field training.

As part of this proposal, the Contractor shall develop a syllabus that briefly summarizes topics and content of the classroom design training program. It is assumed that the OJT field training will consist of selected Egyptian personnel accompanying the contractor personnel during normal daily operational tasks. The contractor shall briefly describe, as part of this proposal, the itinerary of wind powered desalination plant personnel on an average day. The itinerary should take into account the demonstration nature of this field test, i.e., the wind powered desalination may be more carefully instrumented and monitored than the average U.S. "operational" wind Powered desalination plant and Egyptian engineers and technicians must understand the function and operation of any specialized equipment and instrumentation.

6.2 Maintenance Training Program

During the 30-day acceptance testing operation of the wind powered desalination plant by the contractor, the contractor shall provide on-the-job (OJT) training programs for maintenance of the wind powered desalination plant to selected Egyptian maintenance personnel. The OJT maintenance program shall consist of a minimum of 20 hours of classroom training and 140 hours of field training.

As part of this proposal, the contractor shall develop a syllabus that briefly summarizes topics and content of the classroom maintenance training program. It is assumed that the field training will consist of selected Egyptian personnel accompanying the contractor personnel during normal daily maintenance tasks. The contractor shall briefly describe, as part of this proposal, the itinerary of wind powered desalination plant maintenance personnel on an average day.

6.3 In-Factory Training Program

The contractor is required to provide a training program on the Hurghada wind powered desalination plant design methodology and results. The training program will be conducted in the contractors facilities for selected Egyptian engineers and authorized representatives (approximately 2 to 4 personnel) for

approximately 2 weeks. An additional part of this in-factory program will be a tour of the contractor's facility and the opportunity for visiting Egyptian engineers to observe U.S. turbine manufacturing procedures and factory tests on subsystem and system components. The factory visit and training program will be completed over a period of 21 to 30 days. All the personal expenses for the visiting engineers are the responsibility of NREA/USAID. As part of this proposal, the contractor shall develop a syllabus for the in-factory conceptual design classroom training program and a suggested itinerary for the visit.

7.0 SYSTEM ACCEPTANCE TEST CRITERIA

As stated in Section 6.1, the contractor is required to operate the wind powered desalination plant with on-site personnel for an acceptance testing period of 30 days after it is designated operational by NREA/USAID. This designation will be based on the contractor's certification that the wind turbines, reverse osmosis desalination system and control system are operational and the NREA/USAID's certification that the interconnect with the existing grid is completed. The contractor must demonstrate a 90 percent availability for the wind power system and reverse osmosis desalination system over any continuous 14 day period within the 30 day acceptance testing period of performance. If the water production for the period is lower than that specified, the contractor must demonstrate, to the satisfaction of NREA/USAID and/or its authorized representative, that the reason for the lower water production was the wind resource over the period of time and not the fault of the wind turbines and reserve osmosis plant or the control system. The energy and water production will be measured by the ODAS supplied by the Contractor as described in Appendix D.

In addition, daily energy production for each turbine as recorded by the ODAS during the continuous 14 day period must be no less than 90% of the manufacturers performance data provided in the proposal in the "Initial Energy Production Plan and

Schedule" (Section 4.1). The performance comparison will be based on measured average daily wind speed for each applicable day during the 30 day performance period. A curve such as that shown in Exhibit 6 will be used to compare the manufacturer's performance specification for each turbine with the measured power production.

The Contractor shall fully document any and all operating and maintenance activities that occur during the 30 days acceptance testing period of performance and submit a report to the Contracting Officer within 30 days of the completion of the system acceptance test.

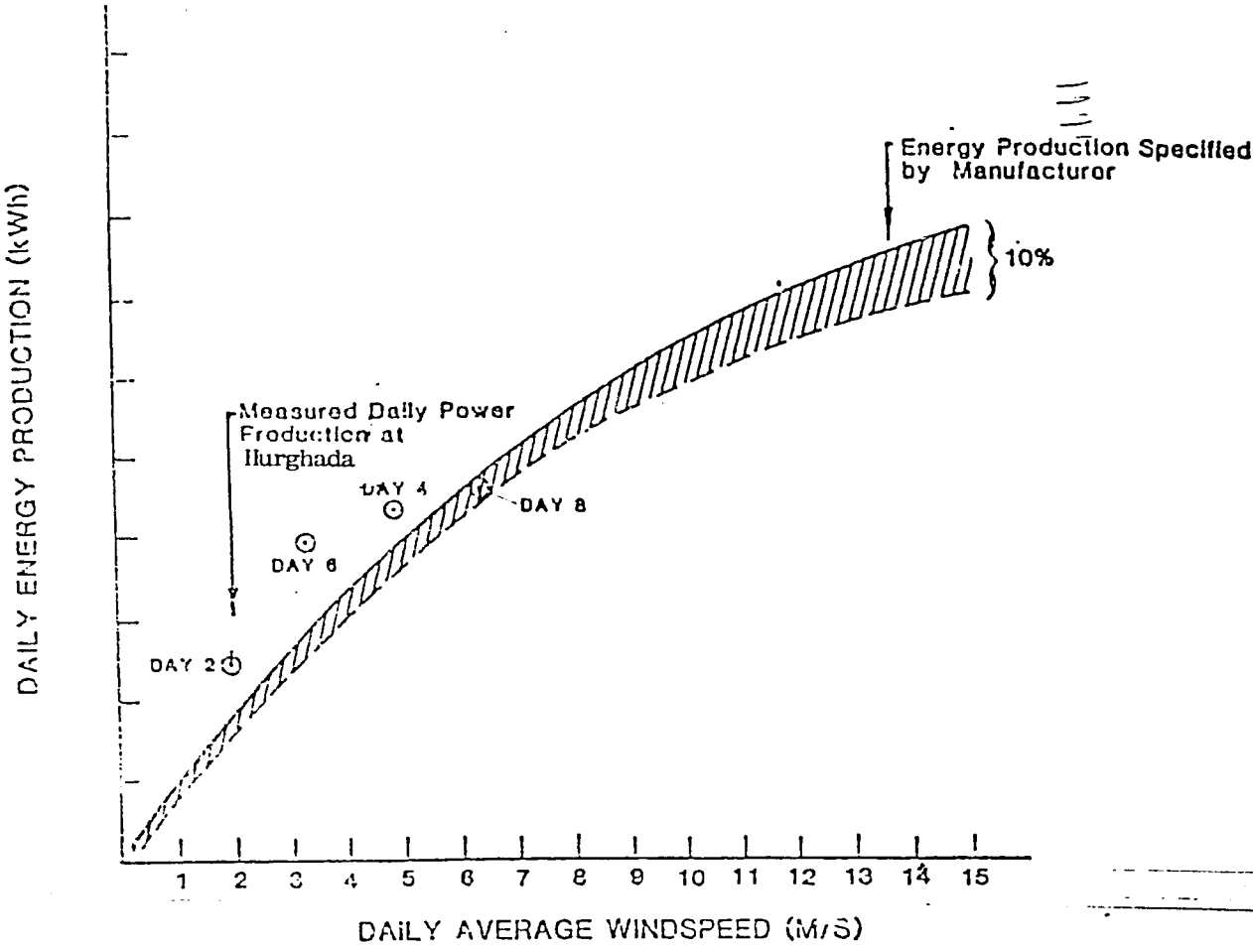


EXHIBIT 6 *TURBINE PERFORMANCE VERIFICATION*

8.0 WIND POWERED DESALINATION PLANT OPERATIONS AND MAINTENANCE MANUALS

The Contractor shall provide a manual prepared to the minimum content listed below. The manual is to be used for operation, maintenance and logistic support of the wind powered desalination plant. The manual shall be delivered to NREA/USAID for review at least 30 days prior to arrival of equipment in Egypt. All manuals shall be in English with emergency instructions written in both English and Arabic. Manuals will be revised as needed and a final set submitted not later than 30 days after completion of the 30 day testing period. The minimum requirements for the manual shall include chapters on the following subjects:

1) System Description

This chapter shall include but not be limited to the following:

- a full page composite illustration of the wind powered desalination plant equipment and layout.
- Illustrations calling out the major assemblies and sub-assemblies.
- A comprehensive description of the type of equipment and its purpose.
- A function block diagram.
- Tables listing equipment supplies and equipment required but not supplied, if any.
- Tables of technical, environmental and physical characteristics, as appropriate.

2) System Installation

This chapter shall include:

- Information on unpacking and proper location of equipment.
- Interconnections and initial pre-operational adjustments.
- Details of cables and ground requirements and cable fabrication (as applicable).
- Waveforms of voltage at significant points in the system circuity.
- Pressures, temperatures, water and brine quantities.

3) System Operation

This chapter shall include:

- Step-by-step procedures for starting, operating and stopping the equipment.
- Meter readings and/or results expected from properly adjusted and operated equipment.
- Tables and illustrations calling out all operational control and indicators and their functions (all references to controls and indicators throughout the manual shall follow these designations).

4) Principals (or Theory) of Operation

This chapter shall include:

- A functional description features, a complete explanation block diagram.
- For complex mechanical features, a complete explanation using block diagram, exploded views or cutaway drawings.
- Major assemblies broken into individual circuits, accompanied by complete circuit analysis keyed to simplified schematic.

- Brief description of conventional circuits.

6) Parts List

The parts list shall consist of a tabulation of descriptive data on all electrical components or vendor mechanical components in the equipment. All parts shall be sufficiently described to implement reorder/replacement. The parts list shall contain at least the following information:

(a) Reference designation

(b) Name and description of part

(c) True Manufacturer's code and part number (and list of manufacturer's codes and addresses)

(d) Quantity

7) Drawings

In addition to drawings previously specified, the following shall be included:

(a) Schematic diagrams of individual major components, printed wiring boards and/or the completed equipment

(b) Logic diagrams

(c) Interconnection diagrams

(d) cabling diagrams

(e) Wiring diagrams

(f) Piping diagrams

(g) Dimensional drawings of all important components with material specifications

9.0 SPECIAL PROVISIONS

9.1 Egyptian New and Renewable Energy Authority

The GOE shall make available to the Contractor, for use in connection with and under the terms of this Contract, the NREA property agreed to during contract negotiations and described as Government-Furnished Property. The schedule dates for the services to be furnished by the Contractor under this Contract are based upon the expectation that Government Furnished Property suitable for intended use will be delivered to the Contractor in sufficient time to enable the Contractor to meet such schedule dates. In event that Government-Furnished Property is received by the Contractor in a condition not suitable for the intended use, the Contractor shall, upon receipt thereof, notify the Contracting Officer of such fact and, as directed by the Contracting Officer, effect repairs or modifications at Government expense. The GOE shall not be liable to suit for breach of contract by reason of any delay in delivery of Government-Furnished Property or delivery of such property in a condition not suitable for its intended use.

Title to all property furnished by the GOE for use in the performance of this Contract shall remain in the Government. In consideration for the Contractor's use of GOE property, the Contractor shall maintain and administer, in accordance with sound industrial practice, a program for the utilization,

maintenance, repair, protection and preservation of Government property so as to assure its full availability and usefulness for the performance of this contract. The contractor shall take all reasonable steps to comply with all appropriate directions or instructions which the Contracting Officer may prescribe as reasonably necessary for the protection for the Government property. The contractor shall promptly report any loss, theft, misuse, or material damage to the GOE property to the Contracting Officer. Use of GOE property shall be returned to the Government at that time, or earlier if the property is no longer needed.

9.2 Site Access and Local Labor Provision

Employees and representatives of the Contractor and personnel conducting business with the Contractor relating to this Contract, will be granted a revocable permit to enter Hurghada for the purpose of installation, operation, and/or maintenance of the facilities and equipment providing electrical energy and drinking water under this Contract. Access to and movement within this area are subject to restrictions and provisions of the security instruction in effect.

It is the Contractor's responsibility to maintain satisfactory labor relations with employees. Representatives of the Contracting Officer will not participate in labor relations matters unless disputes develop that interfere with the proper

performance of the contract at which time the representative may endeavor to assist in settling the difficulty. The contractor is encouraged to hire local labor whenever possible.

9.3 Protection of the Environment and Personnel

During all operations, all GOE and local environmental and labor requirements shall be rigorously observed. The GOE will retain the right to suspend any operation judged to present an imminent threat to the environment or personnel, or a violation of applicable labor laws and regulations or natural resources management agreements, after giving notice to the Contractor.

9.4 Public Release Information

There shall be no public release of information or photographs concerning the aspects of this Contract without prior written approval of the Government of Egypt.

9.5 Pre-Award Survey

The NREA/USAID may make a pre-award survey of the facilities of any apparently successful bidder to determine whether or not such bidder is adequately qualified to perform the requirements of any Contract that may be awarded on the basis of this specification. Investigation may be conducted to determine

that the contractor does regularly engage in the performance of the type covered by the specification and has a satisfactory record of performance in this field. The bidder is required to submit information, as well as any other related material, requested by NREA/USAID audit agencies during the course of the pre-award survey.

9.6 Minimum Proposal Requirements

The contractor is required to submit as part of the proposal the following:

- Organization Chart. Show the organization for accomplishing and managing the project. Explain briefly the responsibilities of each element shown on the organizational chart. Identify key personnel by name in each element and submit their curriculum vitae (resumes). Show the lines of authority within the organization. If important portions of the project are to be subcontracted (e.g., design of the system), identify the subcontracted function, the subcontractor(s), the subcontractor's key personnel, and which elements of the organization will manage the subcontract(s).

- Key Personnel and Resumes Provide resumes of key personnel, including those of the subcontractor(s). Be explicit in identifying past training and experience of each individual which qualifies him/her for the position to be held in the organization.

- Staffing Plan Indicate the type and approximate number of skilled personnel required in each element of the organization chart. State whether or not the required personnel are available within the organization. If not, comment on the availability of needed skilled personnel within the labor force and outline a schedule and plan for recruitement and/or training.

- Related Experience For each of the categories of experience below, list and describe projects or contracts which have provided your firm or that of your proposed subcontractor with related, qualifying experience. The descriptions should include: (1) dates during which the work was accomplished; (2) the scope and price of the total project or contract; (3) statement of what portion of the total project or contract was accomplished by your firm, i.e., an explicit description of the responsibilities or role of your firm; (4) financing arrangements; (5) reference; (6) approximate payment for your service.

- Construction Projects List and discuss projects or contracts providing experience in the construction of facilities, particularly those using wind for desalination.

- Operation and Maintenance of Wind Powered Desalination System List and discuss projects or contracts providing experience in the operation and/or maintenance of Wind Powered Desalination system. For each of the items listed, state which of the following functions were the responsibility of your firm;

  (a) start-up of facilities;

  (b) operation of facilities;

  (c) routine maintenance;

  (d) periodic overhaul of facilities

  Also, state what type of facilities were included; (e) wind turbines; (f) controls; (g) electrical switchgear and protection equipment (h) reverse osmosis system; (i) other. If "other" is listed, please identify or explain.

9.7 Post-Award Site Visit

Upon contract award, winning contractor personnel are expected to inspect the wind powered desalination plant site to satisfy themselves as to all general and local conditions that

may affect the design and installation of the wind powered desalination plant NREA/USAID, and/or authorized representative personnel will be available at that time for detailed discussions prior to initiation by the contractor of detailed wind powered desalination plant design which must be completed within 10 weeks of contract award (see Section 2.1)

9.8 Summary of Deliverables

(1) Contract Documentation Schedule

ACTIVITY	WEEKS AFTER CONTRACT AWARDED 1/	DURATION(WEEKS) OF ACTIVITY
(a) Schedule for Wind Powered Desalination Plant System Design..	2	2
(b) NREA/USAID Approval for Wind Powered Desalination Plant System Design	5	2
(c) Plan and Schedule for Construction	8	2
(d) Wind Powered Desalination Plant Grading Plan, Foundations and Intake Beach Well Design and Specifications	10	(Part of Prelim. Design)
(e) Preliminary Design Complete	10	4
(f) NREA/USAID Design Review Complete (Authorization to proceed)	13	2
(g) Written Results of Component/ Subsystem In-Factory Testing	Within 2 weeks of test completion	

(h) Wind Powered Desalination Plant Operation & Maintenance Manual....	Draft: at least 30 days prior to arrival of equipment in Egypt. Final: within 4 weeks of system acceptance.
(i) Unscheduled Maintenance Reports	As required to document unscheduled maintenance throughout the 2-year support period.

(2) Contract Hardware Installation Schedule

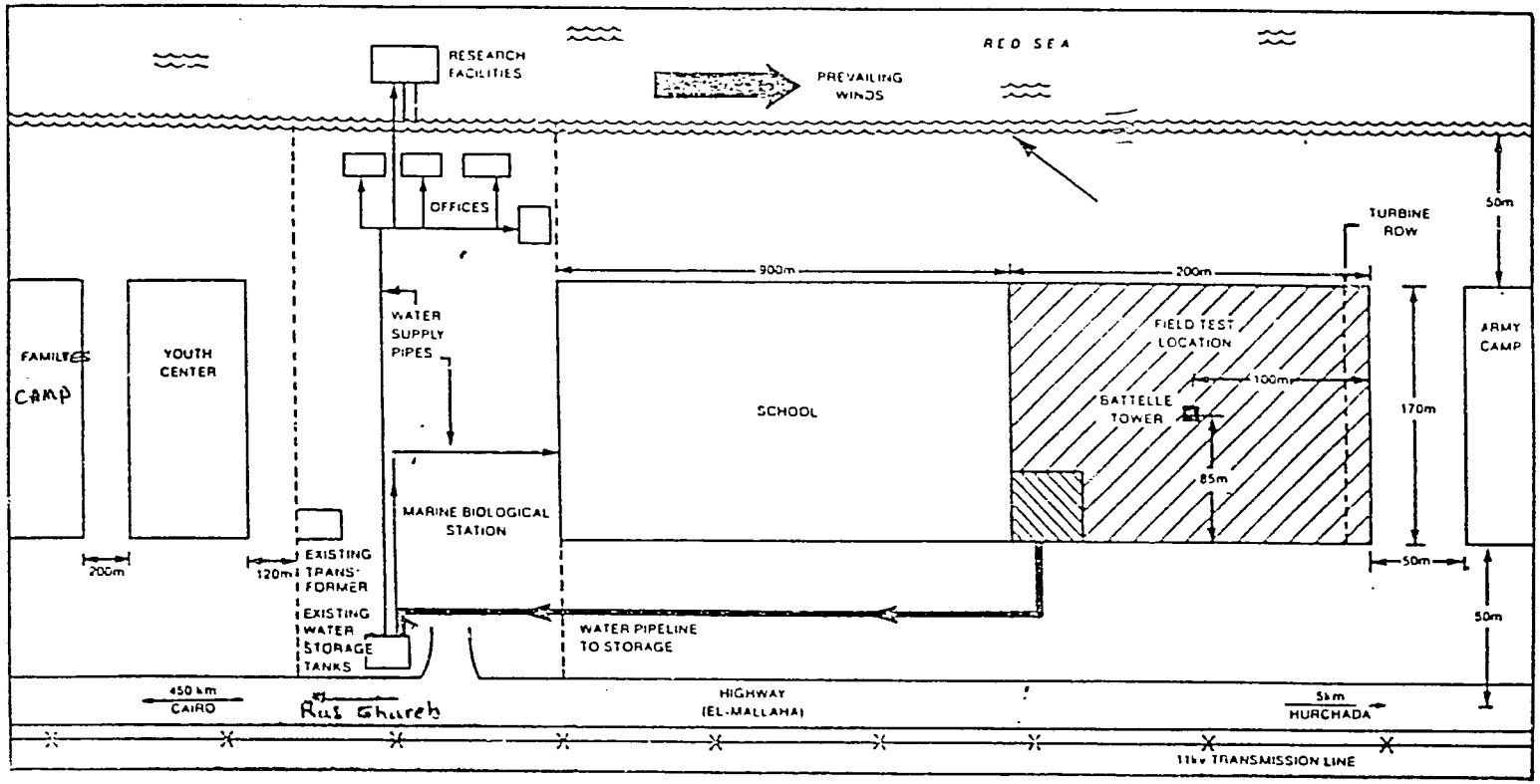
(a) Site Preparation Complete, Hardware Delivered to Site	Day 0 (D)2/
(b) Construction Completed, Wind Power System Interconnected with the grid and RO Unit	D+30 days (30 days)
(c) System Acceptance Test Complete	D+60 days (60 days)
(d) Final System Drawings and System Operations & Maintenance Manual Submitted	D+90 days(90 days)

1/ In this schedule, one week is allowed for transmittal and receipt of documents mailed from either the United States or Cairo.

2/ Contractor to state in his offer time needed to deliver hardware to the site from date of contract signing.

APPENDIX A

SCHEMATIC LAYOUT OF WIND POWERED DESALINATION PLANT



NOTE: THIS EXHIBIT IS NOT DRAWN TO SCALE

DESALINATION UNIT, BATTERIES, CONTROLLERS REGULATORS, MONITORING SYSTEM, GRID INTERCONNECTION EQUIPMENT, ETC.

FIELD TEST LOCATION
AND POSSIBLE SYSTEM LAY-OUT

APPENDIX B

WIND CHARACTERISTIC DATA FOR HURGHADA, EGYPT

FROM APRIL 1985 THROUGH MARCH 1986

(Ref.: Battelle Pacific Northwest Laboratories and NREA)

HURGHADA, EGYPT APRIL 1985 10M AGL SNW DATA(M/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	7.8	7.5	10.7	9.2	7.3	10.7	11.4	12.3	11.6	11.4	12.1	12.4	11.8	11.6	11.2	12.7	10.5	10.7	11.3	10.6	11.0	11.5	12.0	12.5	10.9
2	12.9	12.0	12.1	12.0	11.5	11.5	11.2	11.0	10.2	8.9	9.2	8.5	8.3	8.9	9.1	8.4	7.4	6.7	7.5	6.6	6.5	6.9	5.9	5.6	9.1
3	5.5	4.9	4.9	5.4	5.4	5.4	5.7	6.1	6.4	3.4	8.8	8.0	7.8	6.9	9.5	9.1	8.5	7.3	6.7	7.7	6.4	4.7	4.9	4.6	6.7
4	6.1	5.4	4.9	4.0	4.6	5.6	6.9	5.6	8.6	8.5	8.0	8.2	7.9	7.7	6.7	5.0	2.1	0.7	1.8	2.8	3.7	2.6	2.0	2.1	5.0
5	4.6	4.9	5.8	7.3	6.6	5.3	5.4	4.2	5.7	6.5	6.3	7.5	9.8	10.6	8.7	5.2	5.4	3.4	3.9	3.7	4.4	5.8	4.4	6.0	6.0
6	6.1	5.6	5.1	5.9	5.7	5.3	5.5	3.6	7.0	7.2	7.3	7.2	6.5	6.4	6.7	5.3	7.0	5.9	8.9	6.4	8.0	8.6	7.8	6.6	6.7
7	5.7	6.1	5.8	6.9	7.0	6.6	6.8	6.0	7.5	7.4	5.4	4.4	5.3	4.5	4.4	5.3	5.4	5.3	5.8	6.9	4.6	4.9	4.9	5.5	5.7
8	6.0	5.4	4.7	4.3	6.5	6.5	5.4	4.1	7.5	7.0	6.5	6.7	5.7	5.1	5.3	4.0	4.9	5.7	6.4	4.9	4.8	5.7	5.6	6.0	5.7
9	6.3	5.9	6.3	2.2	4.6	2.7	3.6	2.6	2.1	4.4	3.5	3.1	4.2	3.5	4.7	5.0	5.5	5.4	5.4	3.5	3.5	5.6	6.1	8.0	4.5
10	7.5	7.4	8.3	7.6	6.5	5.8	11.0	11.2	11.3	13.6	7.8	6.2	7.9	3.6	7.9	5.4	5.5	5.0	4.7	4.1	3.5	4.8	5.7	6.0	7.4
11	7.7	5.8	4.7	4.7	4.4	4.0	3.7	3.6	4.1	4.8	3.8	2.9	2.6	2.0	1.5	1.1	0.7	2.3	2.1	3.2	3.7	3.5	4.5	4.5	3.6
12	4.9	5.1	5.4	4.8	5.0	5.0	3.8	2.1	2.7	3.9	3.5	2.8	2.3	2.7	3.2	3.3	2.2	1.0	1.8	3.2	4.0	2.2	1.2	1.3	3.2
13	4.0	4.6	5.4	5.0	6.7	5.4	3.4	1.7	4.2	4.1	3.2	2.5	2.8	3.6	4.1	5.1	4.4	3.5	4.0	5.6	5.0	3.8	4.8	2.3	4.2
14	4.7	5.7	4.3	4.5	4.1	6.3	11.8	12.1	10.5	9.5	8.4	3.1	8.6	7.8	8.4	5.0	[illegible]	3.9	6.3	3.5	10.7	11.7	10.5	6.1	8.3
15	11.2	5.9	4.7	7.6	11.2	8.9	9.8	6.3	3.9	8.4	8.8	9.5	3.3	7.4	6.1	5.5	2.0	4.1	2.9	2.8	3.9	5.0	5.0	4.4	6.9
16	5.3	5.1	6.3	6.7	5.9	4.3	3.8	2.7	4.8	4.4	5.0	4.4	3.7	3.5	2.2	2.5	[illegible]	2.7	3.2	[illegible]	4.1	2.0	1.5	0.9	3.9
17	3.4	4.1	4.2	4.7	4.9	3.9	3.1	1.0	1.0	2.3	2.3	3.9	3.7	4.6	4.7	4.5	[illegible]	4.4	4.2	5.4	5.7	4.5	2.1	0.6	3.7
18	4.6	4.1	4.2	4.6	2.9	2.9	3.6	1.2	5.5	7.6	7.7	7.4	6.4	4.7	4.5	3.7	2.5	4.5	6.1	7.6	3.7	10.4	11.8	12.3	5.9
19	11.3	11.6	11.2	13.3	14.3	14.6	15.4	12.3	11.4	12.1	11.2	11.3	9.6	13.2	11.4	11.0	[illegible]	7.5	7.6	5.5	8.7	7.5	5.5	5.5	10.4
20	5.4	8.3	9.5	11.1	9.3	6.3	3.4	3.5	5.3	5.0	5.9	7.2	6.2	9.5	6.7	3.1	2.2	3.6	3.6	4.0	4.1	2.9	0.9	1.3	5.5
21	1.5	1.9	2.0	3.1	3.9	4.2	3.8	3.4	5.5	6.9	8.6	9.5	10.6	11.7	12.2	13.2	11.8	10.3	8.5	7.3	7.3	7.8	5.6	7.3	7.0
22	7.6	7.4	5.2	3.8	2.2	3.7	5.6	9.5	9.3	8.3	6.9	13.3	8.7	3.7	10.3	[illegible]	[illegible]	[illegible]	7.0	9.3	9.1	3.5	8.9	6.3	8.1
23	7.4	6.3	6.0	5.3	10.1	7.4	5.9	6.9	6.7	7.3	7.6	7.3	6.5	6.6	7.0	5.9	[illegible]	1.5	1.6	2.5	1.9	0.8	2.0	2.2	5.3
24	2.8	2.9	1.2	1.7	1.5	2.5	2.1	2.1	4.5	6.3	7.2	8.2	9.1	13.5	11.1	11.8	[illegible]	9.1	6.0	3.9	9.5	8.0	3.9	2.2	6.0
25	1.9	5.1	3.6	4.2	4.8	5.1	4.5	2.9	3.0	5.3	6.1	6.3	5.4	5.6	5.9	[illegible]	[illegible]	8.0	7.3	3.2	7.9	7.8	5.3	4.5	5.5
26	5.7	9.2	10.4	11.1	10.7	10.1	10.1	10.5	9.1	9.6	9.7	9.2	9.2	8.5	8.3	[illegible]	[illegible]	10.3	8.8	9.6	9.7	7.9	5.8	5.5	9.1
27	5.7	6.3	11.8	8.9	8.8	4.2	10.7	9.9	9.1	7.7	7.4	5.4	5.6	3.7	2.6	[illegible]	[illegible]	1.6	3.5	[illegible]	4.5	4.2	3.9	5.4	5.7
28	9.3	4.4	3.1	5.1	5.1	5.8	4.9	4.2	3.8	3.9	2.8	3.2	3.8	3.6	2.5	[illegible]	[illegible]	2.7	1.3	3.2	2.9	4.4	3.1	3.5	3.7
29	3.1	3.4	4.0	5.3	3.5	2.9	3.0	1.3	0.8	2.5	3.4	3.4	3.7	[illegible]	[illegible]	[illegible]	[illegible]	4.0	3.1	3.4	2.6	2.2	1.1	2.3	3.2
30	3.9	4.2	1.7	2.6	2.0	3.2	3.5	1.7	0.7	1.3	2.1	3.5	5.4	4.2	4.7	[illegible]	[illegible]	4.7	5.5	[illegible]	2.5	1.5	4.3	5.9	3.4
AVG	5.9	5.0	5.0	6.1	6.1	5.9	6.2	5.6	5.2	6.6	6.7	5.7	5.6	5.3	5.4	[illegible]	[illegible]	5.4	5.5	5.7	5.8	5.6	5.1	4.9	6.0
STD	2.6	2.3	2.9	2.9	3.0	2.3	3.4	3.8	3.2	2.7	2.0	2.7	2.5	2.8	3.2	[illegible]	[illegible]	2.5	2.7	1.5	2.5	2.8	2.9	2.8	2.1
MAX	12.9	12.3	12.1	13.3	14.3	14.6	15.4	12.3	11.4	12.1	12.1	12.4	11.0	11.7	13.2	[illegible]	[illegible]	11.2	11.3	13.6	11.0	11.7	12.0	12.5	13.9
MIN	1.5	1.9	1.2	1.7	1.5	2.5	2.1	1.0	0.7	1.3	2.1	2.5	2.3	2.0	1.9	[illegible]	[illegible]	0.7	1.5	2.5	1.9	0.8	0.9	0.8	3.2

HURGHADA,EGYPT MAY 1985 12M AGL BNW DATA(M/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	5.7	8.5	7.8	8.2	6.9	7.5	9.0	6.5	3.8	9.5	8.7	7.7	6.3	7.8	6.1	5.1	8.3	8.2	7.7	5.5	9.6	11.2	10.5	9.4	8.1
2	13.2	12.0	11.2	13.5	8.8	11.4	12.5	11.5	11.2	9.1	10.4	11.8	11.0	11.1		11.6	13.4	10.1	8.5	10.6	10.7	5.7	3.6	6.8	9.6
3	7.7	9.7	12.0	11.2	9.3	13.7	13.2	12.0	11.3	10.1	9.6	9.3	8.3	7.9	8.1	5.9	7.4	7.6	5.9	7.4	6.9	6.3	5.3	5.3	8.7
4	4.4	4.0	5.5	4.9	4.2	5.0	3.6	6.6	9.3	9.1	9.3	8.4	7.7	7.5	7.2	7.5	7.9	8.8	8.2	6.6	9.4	6.9	7.0	5.5	6.9
5	5.7	3.2	3.7	4.2	3.0	4.2	6.6	6.7	7.2	7.2	6.3	7.6	6.5	5.7	5.3	3.7	2.7	2.8	2.6	1.8	1.5	0.8	2.2	3.9	4.5
6	5.3	4.5	5.1	5.0	3.1	2.1	3.5	1.5	1.5	3.5	4.1	2.8	2.3	2.2	2.3	2.9	1.7	1.1	1.0	1.5	2.8	2.5	1.6	0.9	2.7
7	0.6	0.8	2.9	3.9	3.0	3.4	2.7	1.9	1.9	1.5	1.8	1.9	1.6	2.0	2.8	2.2	2.5	1.1	0.9	1.0	1.0	2.0	2.3	1.1	2.0
8	0.3	2.3	3.2	1.5	2.0	1.2	1.0	1.2	1.6	1.2	1.7	1.7	2.0	2.5	2.9	1.7	1.5	2.5	0.9	1.6	3.1	3.6	3.8	4.6	2.1
9	4.7	3.2	3.6	3.0	4.0	4.6	4.5	3.7	3.7	3.0	2.5	2.9	2.7	3.0	3.5	5.3	4.5	3.6	3.5	3.8	1.9	1.0	4.2	2.3	3.5
10	4.1	4.4	4.5	4.5	2.9	1.3	2.3	2.6	2.0	2.0	3.0	5.6	6.3	6.4	6.3	7.0	3.4	5.0	2.7	2.9	1.9	2.1	3.1	3.9	3.8
11	3.0	3.2	3.9	3.3	7.3	9.5	9.2	8.7	9.4	8.5	7.6	6.3	5.0	7.4	5.8	5.7	6.3	6.4	5.3	5.0	7.5	8.5	7.7	4.9	6.6
12	5.1	7.4	8.9	9.3	9.0	9.9	10.2	9.0	9.2	9.3	9.1	9.4	9.2	7.5	7.9	7.0	5.3	7.3	5.4	5.0	9.7	10.3	9.7	9.6	6.4
13	11.0	11.7	12.0	11.3	12.2	12.2	11.3	10.7	13.2	10.4	11.5	12.4	11.5	10.2	8.8	7.7	6.9	5.1	7.5	6.5	6.2	5.7	5.1	4.4	9.4
14	2.8	7.5	5.1	5.3	5.3	3.0	5.5	9.5	10.5	9.9	9.5	9.4	9.5	9.9	9.3	3.2	5.0	5.4	4.5	5.0	9.7	7.2	7.3	6.1	7.4
15	4.5	9.4	5.0	5.1	5.5	7.0	4.4	5.3	7.3	7.5	7.4	7.7	7.8	6.9	8.4	8.4	8.0	7.3	7.7	8.4	7.9	7.8	4.7	4.5	7.8
16	3.0	5.4	7.5	7.5	4.7	5.0	7.7	7.3	7.4	8.2	6.5	7.0	4.9	3.9	2.9	2.3	1.9	2.5	3.2	3.2	4.1	5.9	5.5	5.5	5.1
17	5.1	5.9	3.6	3.4	3.5	3.8	4.1	4.0	5.0	3.7	3.7	4.1	4.1	3.1	2.9	2.7	2.2	1.9	1.3	3.1	3.4	5.3	4.6	6.0	3.7
18	4.5	4.3	4.5	4.1	3.1	2.6	2.3	3.5	4.5	4.8	4.2	3.4	3.2	3.5	4.8	4.1	2.8	3.6	4.5	3.1	2.5	1.9	3.8	2.2	3.3
19	1.6	1.7	1.3	4.5	5.8	5.1	2.3	2.7	2.3	3.1	2.3	2.3	3.9	3.6	3.0	3.0	2.2	3.5	1.3	0.7	1.0	3.2	2.8	1.7	2.5
20	3.2	1.5	3.5	5.3	6.4	7.4	7.0	7.3	6.3	4.4	3.6	4.1	4.9	5.4	4.1	3.2	1.7	0.9	3.1	3.7	3.7	3.5	4.7	5.3	4.3
21	5.4	4.2	4.5	4.0	4.7	4.5	4.0	5.4	7.4	7.2	7.4	7.9	7.7	7.9	5.4	5.2	5.2	7.2	5.9	4.5	4.2	2.7	2.5	4.2	5.0
22	1.6	3.0	3.2	2.5	2.0	1.7	1.5	1.3	1.9	2.1	2.6	2.3	2.7	4.1	4.5	3.0	3.1	2.7	2.5	2.9	2.3	3.6	3.4	3.2	2.7
23	2.9	2.5	0.6	1.9	2.3	3.0	3.9	4.2	4.4	3.5	5.3	5.9	5.5	5.6	4.3	5.3	3.0	3.9	2.7	3.1	1.5	1.9	2.3	3.1	3.9
24	2.3	3.9	5.5	7.4	7.8	9.8	10.2	9.7	8.9	9.7	8.7	9.1	9.5	5.3	6.6	9.2	8.7	9.4	8.2	8.2	7.4	6.5	6.4	5.1	7.5
25	4.1	5.7	6.9	7.5	7.7	7.9	7.7	7.3	6.4	6.6	3.2	3.7	9.9	9.2	7.5	5.2	3.[illegible]	[illegible]	[illegible]	4.2	2.1	9.2	9.7	9.5	7.7
26	4.6	6.1	5.0	5.0	5.0	4.1	6.6	4.1	7.2	7.7	5.0	4.5	6.1	5.3	6.4	7.5	7.6	7.5	9.[illegible]	6.4	7.2	3.6	5.1	2.3	6.4
27	2.2	5.9	4.1	2.9	4.1	2.0	2.0	1.1	1.9	2.5	2.3	3.0	3.9	3.3	4.0	4.4	5.3	5.5	6.[illegible]	4.4	5.1	4.7	4.5	2.9	3.7
28	1.3	2.1	2.7	4.9	1.3	3.5	3.1	8.3	7.7	3.0	5.7	5.1	4.0	3.2	3.[illegible]	1.7	8.5	1.5	9.7	8.2	3.5	7.[illegible]	6.5	4.2	4.8
29	3.[illegible]	4.0	5.6	10.2	7.7	7.0	7.5	9.2	9.2	9.3	8.7	9.2	15.7	9.5	9.2	3.4	7.4	4.5	[illegible]	7.4	7.4	8.5	3.5	6.9	7.5
30	4.0	5.4	8.7	11.1	12.2	12.0	10.2	10.7	11.3	9.5	9.5	6.7	8.8	6.4	5.5	6.3	6.6	7.5	7.7	9.1	7.2	3.5	5.8	5.8	8.5
31	7.0	7.2	4.2	4.5	4.7	5.0	6.7	10.4	9.5	9.2	9.3	3.9	3.6	7.5	6.3	6.5	7.7	3.2	[illegible]	3.[illegible]	3.3	13.5	7.3	6.8	7.7
AVG	4.6	5.1	5.6	5.9	5.9	6.1	6.3	6.5	6.7	6.5	6.5	6.5	6.3	5.1	5.4	5.7	5.4	5.1	4.7	4.7	5.3	5.6	5.2	4.8	5.7
STD	2.7	2.3	2.8	2.8	2.8	3.5	3.4	3.4	3.2	3.3	2.9	3.0	2.3	2.5	2.5	2.6	2.5	3.3	2.7	2.3	3.1	2.9	2.4	2.3	2.3
MAX	13.2	12.3	12.3	11.3	12.2	13.7	13.2	12.0	13.3	10.4	11.5	12.4	11.5	11.1	9.4	11.3	13.4	[illegible]	[illegible]	13.6	10.7	11.2	10.5	9.8	9.6
MIN	0.3	0.3	0.5	1.5	2.0	1.2	1.0	1.1	1.5	1.3	1.7	1.7	1.6	2.2	2.3	1.7	0.0	2.3	0.[illegible]	0.7	1.0	3.0	1.6	0.9	2.0

HURGHADA,EGYPT JUNE 1966 124 ACL DNW DATA(W/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	5.9	5.9	3.4	3.0	6.3	7.3	9.9	8.9	7.4	7.5	5.4	6.7	6.6	5.8	5.7	6.3	5.9	8.6	4.6	3.6	1.9	3.4	3.2	2.3	5.6
2	2.7	2.9	4.2	1.5	2.8	2.2	3.0	3.9	3.4	3.5	3.5	3.2	3.4	3.1	2.7	2.3	2.3	2.7	3.2	3.6	3.6	5.0	6.0	4.0	3.3
3	2.5	3.2	4.0	4.9	2.9	0.9	2.3	0.3	1.5	3.1	3.2	2.5	3.0	3.6	3.2	3.5	3.2	4.1		3.6	5.0	5.7	6.8	6.4	3.4
4	8.9	9.5	10.4	12.5	12.5	12.5	11.5	10.4	11.4	11.4	10.4	10.6	12.9	11.3	12.8	11.4	10.3	9.1	9.6	9.3	9.6	8.7	5.0	5.1	10.1
5	8.8	7.4	5.3	9.1	5.6	5.8	7.0	7.3	10.1	9.7	9.2	9.2	8.4	7.5	8.8	10.3	10.5	10.6	10.4	11.2	10.5	9.4	9.8	8.9	8.8
6	5.5	5.5	6.2	6.3	7.6	7.6	7.9	6.6	6.4	9.1	8.7	8.7	9.9	9.9	10.3	13.3	9.4	9.7	10.9	10.8	8.2	7.3	8.5	8.5	8.5
7	9.5	7.3	7.5	7.2	4.7	5.8	7.3	7.2	5.1	5.9	4.6	2.8	2.5	3.2	3.1	2.3	2.8	1.5	5.0	7.4	7.4	4.8	4.2	3.9	5.1
8	3.3	3.9	3.0	5.0	7.3	7.7	7.3	5.6	5.3	5.5	5.8	5.3	6.3	5.1	5.1	4.[illegible]	2.7	2.0	0.7	1.8	3.4	6.6	5.0	6.5	4.9
9	4.0	3.6	9.5	5.6	3.9	6.2	7.2	3.0	7.8	7.2	7.4	6.6	6.3	5.5	4.9	5.3	4.9	4.7	5.4	6.8	7.6	8.2	4.9	2.2	6.1
10	4.5	8.3	8.9	3.8	4.3	6.5	6.9	9.4	8.6	7.9	7.5	6.7	7.3	7.3	5.6	8.2	9.9	9.9	10.4	10.6	10.6	10.2	7.0	4.9	7.9
11	3.6	4.2	5.0	3.9	6.3	7.8	12.5	10.1	9.1	6.2	7.4	7.0	7.3	7.2	7.3	7.4	7.6	7.7	7.9	8.2	8.5	5.8	5.3	4.6	7.0
12	4.5	5.3	7.2	6.3	5.9	5.3	9.2	9.5	7.5	5.3	7.2	5.8	5.5	4.7	4.9	3.6	3.1	5.3	5.4	4.0	6.0	7.0	6.0	7.9	6.0
13	5.4	5.3	6.5	5.6	5.1	5.2	6.7	7.5	5.7	4.2	5.4	4.8	4.7	4.7	5.1	3.2	[illegible]	[illegible]	4.5	6.4	8.9	7.5	10.6	12.0	8.1
14	11.2	12.5	7.0	5.5	7.2	5.3	5.0	2.9	5.3	5.4	5.7	6.0	8.3	8.6	8.5	7.2	7.5	7.9	3.5	9.9	11.3	11.1	11.8	10.6	8.0
15	5.7	6.7	9.3	8.3	6.3	4.2	1.8	2.5	4.6	6.1	3.5	7.2	7.8	8.7	5.9	7.8	[illegible]	[illegible]	8.7	7.0	7.4	5.7	5.4	7.6	7.1
16	9.2	7.4	9.5	9.2	8.3	10.1	10.4	10.5	9.7	9.2	9.4	9.6	8.1	9.1	8.4	8.2	7.7	7.2	5.7	5.0	4.0	4.4	4.2	5.1	8.0
17	5.7	6.5	7.2	8.4	6.0	3.6	2.6	5.0	8.0	6.4	3.3	5.6	6.1	5.6	5.3	5.1	4.2	3.1	3.7	3.9	5.0	5.9	6.6	4.8	5.4
18	4.7	5.3	4.2	5.1	6.3	4.2	4.2	4.5	4.9	2.2	2.0	3.2	2.6	4.2	5.0	4.2	3.1	4.5	3.1	3.7	4.4	5.1	4.1	4.4	4.3
19	4.5	5.4	5.5	5.7	5.3	5.5	4.4	5.1	6.6	5.3	5.9	5.1	5.5	2.8	4.4	3.4	3.0	6.7	4.1	7.2	7.3	8.1	5.6	6.7	5.2
20	7.3	7.9	10.1	10.1	10.6	10.2	12.5	11.6	10.0	9.8	10.1	10.1	9.2	10.2	9.0	10.2	9.3	10.8	8.9	7.7	9.7	7.9	6.5	5.9	9.4
21	9.9	11.4	11.3	5.7	10.6	12.0	11.5	5.6	8.9	3.5	7.4	4.1	5.3	4.5	3.6	2.9	3.0	2.5	2.2	2.5	3.5	4.6	5.9	5.6	6.7
22	5.3	3.5	4.9	4.8	4.8	4.5	3.0	2.7	3.1	4.0	3.5	2.6	2.3	3.1	2.9	3.1	3.1	4.2	4.1	2.6	1.3	3.5	2.9	5.6	3.7
23	4.6	3.6	3.3	10.1	11.2	10.1	10.4	10.7	9.1	3.5	7.2	8.5	8.2	7.2	9.0	5.3	7.0	5.3	5.6	7.9	7.5	5.9	5.7	8.8	7.7
24	5.5	5.1	9.4	11.5	10.1	11.2	6.7	9.5	10.2	9.6	9.4	11.1	11.5	10.2	9.5	7.7	9.1	5.3	5.0	4.7	8.3	4.4	5.6	6.0	8.2
25	5.4	4.2	3.6	3.2	3.4	4.5	5.3	3.3	3.5	3.3	3.1	3.2	7.4	5.9	5.1	5.4	5.1	3.1	4.2	5.0	5.7	4.9	4.1	4.4	5.4
26	4.1	4.4	5.1	3.5	4.1	4.5	7.3	10.3	11.0	9.2	9.7	11.4	13.2	8.6	7.9	7.[illegible]	5.3	[illegible]	5.9	5.3	7.5	5.7	3.1	3.5	5.9
27	3.5	5.3	3.5	3.0	7.5	11.6	13.3	13.3	13.0	10.5	11.2	10.7	9.6	7.9	7.7	9.[illegible]	4.2	[illegible]	5.3	7.5	8.6	6.5	4.2	3.6	7.8
28	4.4	4.1	5.9	11.2	10.5	10.1	10.4	9.9	9.3	[illegible]	5.9	9.5	5.1	8.7	5.2	3.5	5.2	[illegible]	7.4	9.5	9.1	5.9	7.8	6.4	8.4
29	7.5	4.7	5.7	4.7	7.5	10.7	11.2	10.5	9.5	9.2	5.9	8.3	5.2	5.7	3.7	3.[illegible]	[illegible]	[illegible]	7.7	6.9	9.3	7.9	8.3	9.6	8.4
30	11.3	12.1	9.9	3.8	6.7	9.3	7.5	7.3	9.5	10.5	9.7	9.2	8.8	9.2	10.4	11.[illegible]	10.[illegible]	[illegible]	7.5	7.9	7.2	6.4	6.6	7.4	8.7
AVG	6.2	6.2	7.0	5.7	7.2	7.2	7.5	7.6	7.7	7.5	7.3	7.1	7.1	6.7	6.0	5.6	5.5	[illegible]	5.1	5.4	5.9	6.3	6.1	6.2	6.3
STD	2.5	2.3	2.2	2.8	2.4	2.9	3.0	2.9	2.5	2.4	2.3	2.6	2.8	2.4	2.4	2.[illegible]	2.7	[illegible]	2.7	2.0	2.6	1.8	2.1	2.4	[illegible].8
MAX	11.3	12.1	11.3	12.5	12.6	12.5	11.0	11.6	11.4	11.4	11.2	11.4	12.9	11.3	12.9	11.0	10.[illegible]	[illegible]	13.8	11.2	11.0	11.1	11.8	12.6	15.1
MIN	2.5	2.9	3.0	1.5	2.6	0.9	1.5	0.3	1.5	2.2	2.0	2.5	2.5	2.3	2.7	2.0	2.2	[illegible]	3.7	1.3	1.0	3.4	2.9	2.2	3.3

HURGHADA,EGYPT JULY 1985 12M AGL BNW DATA(M/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	6.6	6.8	6.1	5.1	6.2	5.8	6.4	6.7	10.1	10.3	6.8	9.5	10.3	10.6	8.5	8.3	8.7	7.2	7.5	8.3	5.8	6.4	7.3	5.7	7.8
2	6.3	7.2	6.5	8.2	7.8	9.5	9.5	10.2	9.7	8.5	8.4	7.6	7.6	7.7	8.0	9.2	8.9	7.6	6.1	6.3	5.9	6.9	6.3	5.7	7.8
3	6.4	5.4	5.4	5.6	4.4	4.4	2.3	6.4	6.9	8.3	7.6	7.6	7.8	6.4	5.3	3.1	4.1	4.8	3.9	5.7	7.8	5.7	6.3	5.3	5.6
4	7.8	6.8	5.6	4.4	6.7	5.5	6.6	5.4	8.6	9.4	9.2	9.8	10.3	10.3	9.5	9.6	8.5	8.5	7.8	6.6	7.3	9.4	10.5	6.3	7.9
5	3.7	5.8	4.2	2.6	3.2	3.6	3.5	4.5	6.9	8.0	7.8	7.8	7.9	8.5	7.4	6.8	5.4	5.8	7.3	8.2	7.5	4.8	4.2	5.3	6.0
6	5.5	4.3	6.7	10.4	10.7	9.9	10.5	8.8	9.2	6.7	8.7	6.6	7.6	7.3	6.4	5.5	4.6	5.0	4.7	6.4	6.5	6.8	5.5	5.6	7.2
7	2.9	2.2	3.2	4.4	5.3	9.2	9.2	6.4	8.0	7.6	7.2	6.6	6.4	6.6	6.7	6.6	4.7	3.4	5.8	5.9	6.8	8.2	6.3	6.6	6.1
8	5.3	4.9	5.0	3.1	2.8	2.8	3.8	2.3	3.4	2.7	4.0	5.1	5.6	5.4	6.9	7.3	6.6	8.3	6.4	7.7	9.1	8.2	6.0	5.5	5.4
9	6.9	7.7	6.7	4.7	1.7	4.8	7.6	7.4	6.5	6.8	6.8	7.4	7.8	8.2	8.2	7.7	8.3	9.8	9.8	8.3	7.9	9.7	8.0	7.0	7.3
10	9.1	6.6	9.3	7.5	11.0	11.5	11.8	10.2	10.7	11.1	9.5	9.6	9.4	9.6	9.9	9.2	6.8	6.1	5.5	5.9	5.7	4.6	5.5	3.6	6.2
11	3.9	4.4	4.2	3.3	7.4	9.9	10.7	10.3	9.9	10.4	9.7	9.3	7.6	6.4	5.8	5.8	6.4	5.7	5.0	5.6	5.4	5.7	3.6	3.8	6.3
12	4.3	2.5	3.4	5.4	4.0	3.9	3.5	3.9	3.4	7.4	7.5	6.1	5.3	4.1	4.7	5.1	4.2	3.3	5.5	5.8	6.6	6.7	1.5	3.5	5.4
13	4.2	4.5	1.8	5.0	5.9	6.0	7.5	7.7	4.9	4.6	4.5	3.2	3.4	3.5	3.5	2.5	2.0	1.3	3.6	1.8	1.1	1.6	2.6	2.9	3.6
14	4.9	4.2	6.3	5.7	5.1	5.4	5.4	5.6	5.7	5.4	5.9	4.7	3.5	3.1	2.9	2.5	2.0	2.3	2.5	3.1	4.1	4.0	3.5	3.4	4.3
15	7.7	7.9	9.1	8.6	8.4	7.6	4.0	6.9	7.3	7.9	7.2	8.3	8.2	8.0	7.6	6.4	4.0	4.7	1.6	5.8	5.3	8.4	7.4	7.1	7.0
16	7.7	6.6	5.5	3.8	4.4	4.5	3.3	5.7	4.8	5.9	4.9	5.4	5.5	6.5	6.6	5.0	6.4	3.3	1.2	7.3	7.3	6.0	5.3	4.6	5.8
17	5.7	5.6	4.1	5.0	5.5	8.4	10.7	9.7	13.1	9.2	9.8	10.7	10.3	9.9	9.7	10.6	11.2	9.8	8.3	6.5	9.2	8.5	10.5	10.4	8.9
18	7.3	4.6	5.8	6.1	5.9	4.2	2.3	5.1	6.9	9.6	9.3	9.6	9.3	9.4	9.6	9.2	8.8	9.3	10.2	8.7	7.6	5.5	5.0	6.8	7.4
19	5.8	6.3	6.4	5.4	5.9	7.9	9.6	9.6	9.4	5.6	8.5	5.9	8.9	7.6	6.1	5.5	3.1	3.0	5.2	4.9	5.5	5.9	4.8	6.4	6.6
20	6.2	5.8	4.9	5.4	3.8	4.5	7.7	7.8	6.8	5.5	5.8	4.9	4.6	4.6	4.4	3.2	2.5	3.3	4.2	4.2	3.8	2.5	1.7	3.0	4.5
21	3.4	3.5	4.0	4.9	4.7	4.5	4.4	5.5	6.5	4.8	3.1	3.5	4.4	4.5	4.9	4.6	4.5	4.6	4.4	3.8	3.6	2.9	2.7	2.6	4.2
22	3.9	3.6	4.8	4.8	4.8	4.2	3.4	4.8	5.1	4.1	3.6	2.6	3.4	3.2	3.7	4.8	3.4	3.1	2.2	2.7	1.9	2.9	2.6	3.7	3.5
23	5.8	5.1	4.9	5.6	7.5	6.3	7.2	6.8	7.5	6.3	4.7	3.9	3.9	4.5	5.6	5.3	4.1	1.9	1.7	2.9	4.1	3.6	5.4	6.4	5.6
24	5.4	3.6	4.9	4.5	3.7	4.5	3.6	6.3	6.8	6.1	4.1	3.7	5.6	6.3	5.1	4.9	2.0	1.2	2.3	4.2	5.4	5.3	5.7	6.6	4.6
25	5.8	5.3	3.6	3.7	3.1	3.0	2.9	5.0	5.1	6.9	6.6	6.3	5.3	5.6	7.0	6.7	6.7	4.0	3.4	6.3	6.6	4.9	6.1	6.7	5.4
26	5.0	5.4	5.7	5.4	4.5	5.3	5.8	3.1	7.0	7.0	5.8	7.7	7.6	6.8	5.3	7.9	7.0	5.5	4.7	6.3	5.3	7.7	6.4	5	6.1
27	4.5	6.5	5.3	4.4	5.4	4.2	3.5	3.8	8.7	8.4	7.5	8.2	8.0	7.5	5.9	5.6	5.7	5.3	3.7	7.3	6.4	6.0	6.6	2..	8.4
28	4.5	4.4	3.5	3.8	4.2	5.6	11.1	9.5	9.2	7.5	7.8	7.2	5.5	7.2	6.4	5.3	5.3	5.5	[illegible]	5.5	5.5	5.9	3.7	5.5	6.4
29	4.9	3.2	5.7	7.6	10.4	10.9	12.8	9.4	8.8	7.3	5.7	5.4	5.1	4.3	4.2	3.2	2.5	1.6	1.9	5.3	7.2	3.6	4.0	6.6	5.8
30	5.0	2.9	4.2	5.1	5.8	5.5	5.5	7.8	7.9	9.2	9.4	9.3	10.2	10.3	9.5	6.7	7.4	3.4	3.7	5.5	3.0	7.0	5.0	5.9	7.8
31	5.3	5.3	6.7	5.3	6.9	6.9	3.8	5.5	5.7	5.1	5.0	5.3	5.5	6.3	8.0	6.4	7.8	5.0	3.5	3.7	4.9	4.8	5.1	5.5	5.9
AVG	5.5	5.3	5.2	5.4	5.7	6.2	6.6	7.2	7.6	7.5	6.0	6.9	6.8	6.8	6.7	5.3	5.6	5.0	4.4	5.3	5.9	5.9	5.3	5.3	6.1
STD	1.4	1.5	1.6	1.7	2.2	2.4	2.9	2.1	1.8	1.9	1.9	2.2	2.1	2.1	1.9	2.2	2.3	2.5	2.1	1.9	1.9	2.1	2.1	1.6	1.3
MAX	3.7	7.9	9.3	10.4	11.8	11.6	11.1	10.8	15.7	11.1	9.7	10.7	10.3	10.8	9.9	10.6	11.2	[illegible]	[illegible]	9.5	9.2	9.7	10.5	10.4	8.9
MIN	2.3	2.2	1.0	2.6	1.7	2.3	2.3	2.6	3.4	2.7	3.1	2.6	3.4	3.1	2.9	2.5	2.6	1.2	2.3	1.6	1.1	1.6	1.5	2.6	3.5

HURGHADA,EGYPT AUGUST 1985 12M AGL BNW DATA(M/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	5.8	5.1	4.1	4.8	5.4	3.9	3.6	4.2	3.5	3.6	4.2	5.1	5.3	6.8	5.5	5.9	6.7	3.3	2.9	2.6	1.8	2.5	4.1	5.6	4.4
2	5.3	5.1	4.7	2.5	8.4	6.7	2.8	1.9	2.5	2.7	3.9	3.8	4.4	5.8	5.4	5.5	2.1	4.8	3.1	4.1	5.5	5.9	6.8	6.7	4.1
3	7.4	6.7	4.5	4.7	4.1	4.5	3.7	2.6	3.8	4.4	2.6	2.7	2.9	3.1	3.1	4.9	7.4	5.8	5.6	5.1	5.3	5.8	6.4	6.5	4.7
4	5.8	4.4	4.9	4.2	4.5	4.1	4.8	4.7	3.8	4.5	5.8	4.9	4.1	3.8	4.2	3.4	1.9	2.9	3.7	3.8	4.4	5.8	6.8	6.3	4.2
5	8.4	9.8	10.4	11.8	3.5	6.9	5.8	5.6	8.9	8.8	9.8	7.3	7.3	6.1	5.7	5.1	4.9	4.5	6.5	5.8	6.2	4.7	4.9	4.8	6.9
6	4.5	6.8	5.7	8.3	9.2	7.7	6.8	5.5	7.6	7.9	7.5	7.7	7.2	7.8	6.1	3.4	2.1	1.2	1.5	2.2	3.1	3.5	4.6	5.6	5.4
7	5.3	5.3	6.7	5.9	5.7	4.9	4.4	3.8	3.4	4.9	5.4	5.5	6.4	6.5	4.9	2.1	2.5	2.2	4.1	4.6	7.0	5.8	4.8	4.7	4.8
8	6.1	5.7	5.8	5.4	4.9	4.9	6.6	6.6	4.2	5.1	6.5	7.8	8.8	7.5	7.8	6.2	6.8	5.3	5.9	6.8	8.3	7.5	8.6	7.8	6.6
9	4.9	5.3	5.5	5.7	5.1	4.6	5.5	9.5	9.6	9.5	9.4	9.1	8.4	7.9	6.7	5.7	4.8	3.9		5.8	4.6	4.8	5.7	4.7	6.4
10	1.5	5.6	8.3	10.7	10.3	8.3	8.6	9.1	8.5	8.3	8.3	3.2	6.7	6.7	6.5	5.8	3.4	1.8	2.1	2.3	2.5	3.5	3.7	4.7	6.1
11	4.9	6.9	5.8	3.4	10.6	9.9	9.4	9.8	8.9	8.6	8.7	7.8	6.8	6.8	6.4	5.5	5.3	4.3	4.8	7.8	8.2	5.9	6.4	5.6	7.2
12	4.8	3.6	3.8	3.8	4.7	11.8	10.8	9.9	9.9	9.8	9.7	10.7	13.8	9.7	9.4	8.8	5.9	7.3	8.3	3.4	3.4	10.1	6.5	6.4	8.8
13	5.9	5.8	9.1	9.9	4.8	4.5	6.8	10.1	9.8	10.1	11.1	11.5	13.8	10.7	10.1	8.8	7.3	8.2	9.4	7.2	10.1	8.8	5.8	5.8	8.4
14	5.1	5.5	8.3	7.8	8.8	7.3	9.2	9.1	8.8	8.7	9.4	10.4	10.6	10.4	11.1	10.8	8.5	8.2	8.4	8.2	7.5	8.8	7.4	8.1	8.3
15	5.9	8.8	8.3	6.4	5.7	4.8	6.8	7.7	8.5	10.2	9.5	10.1	10.5	10.7	9.8	10.0	7.7	6.3	7.5	5.9	7.3	7.3	4.1	6.8	7.8
16	7.3	5.7	7.2	9.4	10.3	8.8	5.8	8.8	8.7	8.9	7.4	7.5	7.9	7.4	6.3	7.9	2.4	5.3	5.5	8.2	4.7	4.4	7.7	4.5	7.7
17	6.8	11.3	11.3	10.5	10.3	9.5	4.8	5.4	3.8	9.1	9.6	10.2	10.1	9.7	9.1	8.2	6.5	5.5	7.8	6.4	6.9	5.9	5.5	7.4	8.2
18	3.4	9.1	7.5	8.3	5.8	5.9	7.6	3.5	6.5	7.4	7.2	8.2	9.4	9.5	9.6	8.9	7.4	5.1	5.7	6.1	7.3	5.3	4.4	7.3	7.4
19	9.5	7.3	6.3	6.1	4.8	6.9	8.2	8.5	7.2	8.8	8.5	9.4	9.6	9.9	9.7	8.5	7.9	3.5	8.7	3.8	7.5	9.4	7.8	5.8	7.9
20	10.8	11.7	13.8	13.3	8.5	9.6	12.2	11.7	10.3	9.3	8.2	7.8	6.9	5.9	6.3	5.5	2.9	2.1	2.8	4.9	5.8	5.9	6.5	4.6	7.5
21	6.5	7.3	8.3	8.5	3.2	4.2	3.4	2.9	6.7	6.6	5.7	5.5	5.8	5.4	4.1	2.7	1.7	1.2	3.6	8.0	2.2	2.5	2.7	3.8	4.2
22	4.6	4.7	5.6	7.8	5.1	4.1	3.4	3.7	5.5	5.3	4.1	3.9	3.9	4.5	5.0	3.5	2.5	2.6	2.7	3.1	3.4	3.7	2.8	4.7	4.2
23	4.9	5.4	8.3	9.7	9.6	8.3	7.5	6.7	6.8	5.9	5.9	5.1	5.1	5.3	4.5	2.7	2.5	2.3	3.5	4.1	4.2	5.1	7.4	10.1	5.9
24	11.8	11.1	10.2	9.4	9.2	9.8	10.5	10.1	9.3	8.5	9.7	9.6	7.9	7.5	3.3	3.6	3.4	3.4	5.6	4.5	3.4	8.7	8.6	10.1	8.7
25	12.4	12.4	12.8	11.6	11.8	11.5	11.1	11.3	11.8	10.7	10.7	5.3	10.4	10.6	11.9	10.4	13.6	12.3	8.8	7.5	8.7	9.2	9.1	8.6	10.2
26	3.8	10.8	12.4	11.4	11.5	11.2	11.7	12.5	12.3	11.2	10.5	10.2	11.3	14.2	10.3	9.4	8.7	5.6	9.5	6.3	5.6	5.1	3.9	4.8	9.5
27	4.3	5.1	4.5	4.6	5.8	8.6	9.6	10.6	10.4	10.5	9.3	9.6	9.6	8.5	6.8	5.7	2.8	1.2	1.6	2.8	2.8	2.9	4.7	5.8	5.1
28	5.4	4.8	3.2	5.3	5.8	6.4	6.1	6.5	5.8	5.6	6.1	6.1	6.1	5.5	3.9	2.5	1.2	1.5	1.7	3.9	1.1	2.2	4.7	5.4	4.3
29	5.9	6.1	4.6	4.4	7.7	6.4	9.2	8.9	6.8	8.5	8.8	7.3	6.7	6.7	4.9	5.0	5.7	3.4	4.9	5.1	5.6	3.7	4.2	4.3	6.3
30	4.4	3.5	4.8	4.2	4.7	9.7	12.8	11.5	11.8	9.6	8.7	8.4	7.8	7.5	7.9	9.1	8.5	7.7	8.7	3.4	8.5	3.8	4.7	4.7	7.6
31	5.5	4.9	4.8	8.2	13.6	12.6	13.3	13.2	12.4	12.3	12.3	11.4	12.8	11.5	10.1	9.3	10.1	9.7	8.2	3.7	3.8	9.5	10.5	9.3	10.1
AVG	5.3	5.8	5.9	7.3	7.8	7.2	7.4	7.7	7.8	7.9	7.8	7.8	7.8	7.5	7.1	6.5	5.6	5.1	5.2	5.4	5.9	5.8	5.7	5.9	6.7
STD	2.1	2.4	2.7	2.6	2.9	2.9	3.0	3.0	2.7	2.4	2.3	2.3	2.4	2.2	2.3	2.6	2.7	2.6	2.7	2.3	2.4	2.3	1.8	1.6	1.8
MAX	11.8	12.4	13.8	11.6	13.6	12.6	13.3	13.2	12.4	12.3	12.3	11.5	12.8	11.5	11.1	10.8	13.6	12.3	9.4	9.2	12.1	10.1	10.5	10.1	10.2
MIN	1.8	3.5	3.2	2.5	8.4	8.7	2.6	1.9	2.5	2.7	2.6	2.7	2.9	3.1	3.1	2.1	1.2	3.4	8.6	8.9	1.1	2.2	2.7	3.8	4.1

HURGHADA,EGYPT SEPTEMBER 1985 10M AGL 9NV DATA(M/S)
-OUR

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	7.4	9.4	12.8	12.7	12.2	12.9	12.9	12.4	11.8	11.7	11.1	11.8	9.9	8.8	8.9	9.1	12.1	9.1	9.3	8.8	8.8	8.6	7.3	3.8	9.9
2	2.9	3.8	3.7	7.7	11.8	11.3	11.4	11.4	10.7	10.3	10.1	9.7	7.9	8.2	7.9	6.7	6.1	6.6	7.3	6.7	6.3	6.3	6.1	4.5	7.8
3	4.1	5.6	8.8	12.1	12.3	11.6	12.7	11.7	10.4	10.2	10.2	9.3	10.3	9.9	9.9	9.2	7.9	7.7	7.6	8.6	9.2	8.7	8.5	8.2	9.4
4	11.8	10.5	12.6	14.2	13.2	11.7	12.6	13.6	10.8	10.3	11.8	8.6	10.2	9.8	9.6	9.2	9.3	9.5	8.8	9.5	9.6	8.5	9.3	7.9	10.5
5	9.3	11.3	13.1	13.2	12.1	12.2	12.3	12.8	10.1	9.9	11.8	8.9	9.3	9.5	8.7	8.5	7.6	7.6	9.3	6.9	5.3	4.7	4.5	5.7	9.3
6	6.8	6.3	6.8	5.8	6.3	4.8	5.6	6.5	5.1	6.3	8.9	10.1	10.3	10.2	9.2	8.4	6.8	6.1	6.6	3.4	5.9	5.8	5.8	5.7	6.6
7	5.1	3.9	4.2	5.1	5.7	5.9	4.8	6.6	9.1	8.8	6.3	7.8	7.3	6.8	6.4	7.2	6.8	6.5	7.7	5.7	7.3	4.5	4.6	4.8	5.3
8	5.4	5.6	5.9	8.2	10.9	9.8	9.8	9.9	9.5	8.5	7.6	6.6	6.6	5.6	5.5	4.5	3.4	3.1	4.7	5.6	3.9	3.1	4.9	3.8	6.2
9	4.4	7.5	8.9	3.8	5.4	5.3	4.8	4.6	6.4	6.9	7.2	7.2	7.5	6.8	5.4	4.6	1.1	3.8	1.1	3.8	5.5	5.3	5.5	5.8	5.5
10	5.4	4.9	4.7	5.7	4.6	4.9	4.1	4.8	8.2	5.9	9.3	8.6	9.1	9.2	9.5	9.3	7.7	5.8	7.4	8.4	10.5	8.2	5.8	8.5	7.1
11	7.3	5.9	5.7	5.9	6.8	9.3	9.4	10.4	10.3	11.8	15.6	11.2	12.8	11.3	11.8	10.8	10.1	9.9	9.5	10.1	9.4	7.8	5.5	8.5	9.1
12	8.8	10.6	9.8	9.9	9.5	7.8	8.3	7.8	8.4	10.3	11.2	10.7	10.7	9.9	9.8	9.4	9.4	9.1	7.5	7.2	6.8	6.4	5.9	7.6	8.8
13	7.8	7.8	6.6	6.3	6.1	6.3	5.8	8.2	8.8	9.4	6.6	8.4	8.5	7.7	5.4	3.7	3.0	4.8	4.1	5.8	4.3	5.5	5.7	6.5	6.5
14	5.9	5.5	4.5	5.4	5.7	9.6	9.5	9.1	8.0	8.5	9.1	8.7	9.1	8.8	8.6	8.6	8.5	7.3	5.9	4.9	6.8	5.3	4.9	5.3	7.2
15	5.8	6.9	5.3	5.1	7.6	5.9	4.6	8.3	11.1	10.7	9.4	9.6	10.3	9.8	9.4	9.1	8.7	6.3	6.6	5.7	6.7	8.4	7.5	6.8	7.8
16	5.0	5.1	4.8	11.1	7.8	4.6	6.9	10.1	11.3	11.1	9.4	9.7	8.9	8.4	8.5	9.4	8.5	7.2	7.5	6.6	7.9	4.7	5.7	5.6	7.7
17	4.8	3.4	5.8	9.4	11.5	11.4	12.7	12.1	11.6	11.4	10.5	8.9	9.1	9.1	9.5	7.7	7.8	9.2	5.7	8.2	9.2	4.8	4.6	5.3	8.5
18	6.1	5.4	9.4	12.4	12.5	14.3	14.8	13.2	11.6	11.5	10.7	9.1	10.5	9.8	9.3	9.3	9.4	8.8	3.9	8.5	7.3	4.6	5.1	6.8	9.5
19	3.5	4.9	10.1	12.8	11.5	11.2	12.8	11.1	9.9	9.3	8.3	7.4	7.2	6.5	6.7	6.8	7.3	6.8	5.7	5.7	5.8	6.5	4.8	7.8	7.8
20	8.7	6.4	4.5	4.2	3.9	4.6	3.1	7.9	8.6	5.6	7.8	7.6	7.7	7.6	7.3	7.8	7.2	7.8	7.2	7.5	7.9	4.6	4.4	6.5	6.6
21	7.8	7.8	4.8	5.7	7.3	5.4	6.5	9.2	8.7	7.5	7.3	5.8	5.1	5.8	4.9	3.4	2.7	2.2	2.9	3.1	4.0	5.3	4.6	3.9	5.4
22	3.9	3.8	2.9	4.1	4.9	4.6	4.5	5.8	4.9	5.6	3.7	3.9	3.4	3.5	2.2	2.7	2.2	2.2	2.9	3.2	3.5	2.8	3.9	3.4	3.5
23	4.8	4.7	4.4	4.8	5.9	3.7	3.2	2.8	4.5	5.4	4.9	4.0	4.7	4.6	5.4	4.4	3.7	2.6	1.0	2.6	2.9	3.4	4.8	6.3	4.8
24	5.7	4.6	3.8	6.9	6.8	5.1	6.5	9.7	9.8	9.4	8.2	7.9	9.5	9.9	9.1	9.5	9.4	8.5	9.3	3.3	7.8	4.7	5.4	6.6	7.6
25	5.5	5.7	6.1	4.9	3.6	2.6	3.8	3.5	4.1	5.4	4.5	4.7	4.5	4.4	3.4	3.4	2.5	1.5	1.5	2.1	1.6	2.3	6.1	6.1	3.9
26	3.8	1.3	2.8	1.9	2.1	2.8	2.2	3.7	2.2	3.4	2.7	3.3	3.4	3.5	3.8	2.3	1.3	1.7	3.1	4.4	3.9	5.3	5.7	5.8	3.8
27	7.2	6.7	7.2	8.8	9.4	10.2	9.7	9.6	8.9	7.5	8.7	8.6	7.5	7.7	5.9	4.6	5.8	2.1	3.0	3.7	3.7	5.7	3.5	4.2	4.5
28	4.1	4.5	4.9	4.7	6.1	10.2	9.4	8.7	3.2	8.3	9.3	7.4	5.6	5.9	5.4	5.1	3.2	2.7	5.1	5.3	5.1	4.1	4.4	4.1	5.8
29	3.4	4.6	4.8	5.8	8.2	8.7	9.3	10.2	9.8	10.3	10.4	10.5	10.8	9.9	9.1	7.3	5.5	5.4	3.4	7.7	7.8	5.6	6.5	5.5	7.5
30	4.9	4.4	4.8	4.6	4.2	4.2	4.5	4.4	9.5	7.9	9.5	10.2	10.2	10.2	9.3	7.7	5.8	6.2	7.2	6.1	6.3	5.6	6.9	6.7	7.1
AVG	5.9	5.8	6.3	7.5	7.7	7.8	7.9	8.5	9.6	8.9	9.6	8.2	8.3	7.9	7.6	6.9	6.3	6.0	5.1	5.2	5.3	5.5	5.5	5.7	7.1
STD	2.3	2.2	2.9	3.2	3.2	3.4	3.5	3.2	2.4	2.8	2.2	2.1	2.3	2.2	2.2	2.4	2.8	2.0	2.0	2.2	2.2	1.8	1.5	1.3	1.9
MAX	11.8	11.3	13.1	14.2	13.2	14.3	14.8	13.6	11.8	11.7	11.2	11.2	12.8	11.3	11.0	10.8	10.1	9.9	9.5	10.1	10.5	3.8	9.3	8.2	10.5
MIN	2.9	1.3	2.8	1.9	2.1	2.6	3.8	3.7	2.2	3.4	2.7	3.8	3.4	3.5	2.2	2.3	1.1	1.5	1.1	2.1	1.3	2.3	3.9	3.8	3.8

HURGHADA, EGYPT OCTOBER 1985 10M AGL 8HR DATA(M/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	9.8	10.1	12.8	12.2	12.4	11.8	9.2	9.8	9.1	11.2	11.7	11.0	11.0	10.7	10.3	10.4	8.8	9.2	9.2	11.2	8.7	4.2	7.4	5.7	9.9
2	5.9	5.7	5.3	5.3	5.8	5.3	9.1	12.2	11.1	10.3	9.2	8.5	9.3	8.2	8.5	9.3	8.4	7.9	5.4	5.4	6.8	6.7	5.3	6.1	7.5
3	5.3	5.3	4.4	4.9	5.3	3.9	4.4	4.4	9.5	9.4	8.2	8.4	7.8	7.4	7.9	8.8	9.4	9.5	8.8	8.8	8.0	4.7	5.8	4.1	6.7
4	4.8	6.4	6.6	4.4	8.9	11.5	12.5	11.6	11.2	10.7	9.8	10.9	10.7	10.1	9.6	8.4	7.5	8.6	7.4	7.4	7.9	4.6	5.8	5.9	8.3
5	5.4	4.9	4.4	4.3	4.8	4.8	3.7	7.9	9.9	9.1	8.3	8.4	7.8	6.6	5.9	5.8	4.5	3.6	2.9	6.6	5.1	4.9	6.1	4.8	5.5
6	4.4	3.5	4.7	3.9	5.4	8.5	5.5	4.4	7.2	7.5	6.3	6.7	5.3	5.6	5.3	3.8	2.3	2.3	2.3	2.3	1.9	3.7	3.7	3.7	4.6
7	4.4	4.5	4.8	5.8	5.7	7.9	8.4	8.4	9.2	9.2	8.2	8.8	8.7	8.2	7.3	7.5	7.3	7.2	6.3	7.4	7.7	8.8	7.9	8.9	7.4
8	9.1	9.6	11.8	11.8	10.3	10.7	11.4	10.7	11.4	11.3	10.9	10.5	9.5	10.5	10.8	10.4	10.6	9.4	7.6	6.7	7.6	8.2	6.9	8.2	9.7
9	8.5	9.9	9.8	9.1	8.6	8.3	5.7	4.7	6.6	8.7	5.7	7.4	8.9	10.6	11.8	11.3	9.5	8.5	8.9	8.3	6.3	5.5	6.8	7.2	8.2
10	7.9	7.3	7.3	7.8	6.5	6.3	6.3	5.6	7.6	9.2	9.1	9.1	8.7	8.6	8.4	7.5	6.6	8.4	6.7	6.5	7.3	5.8	6.8	6.8	7.3
11	7.4	7.5	8.2	7.9	7.7	8.4	7.4	6.6		9.2	8.9	10.4	11.8	13.6	10.2	9.6	7.3	9.6	8.4	5.7	6.4	6.6	6.9	8.3
12	8.2	6.5	5.8	6.9	6.6	5.9	5.6	6.4	7.7	8.4	6.2	8.9	7.9	9.3	8.2	9.1	7.7	7.4	7.8	7.2	8.4	4.5	4.7	6.6	7.1
13	7.5	6.3	5.7	5.7	6.3	6.8	6.1	4.4	6.3	7.8	9.7	6.1	10.2	10.5	10.5	12.7	[illegible]	9.5	9.0	8.2	7.8	5.4	4.9	5.4	7.8
14	5.4	6.1	6.5	5.4	5.7	6.3	4.9	4.8	8.9	8.2	8.5	7.9	7.3	7.5	7.4	[illegible]	[illegible]	7.6	6.0	7.8	5.3	5.8	6.6	6.5	6.3
15	5.2	5.8	4.5	5.8	3.9	5.1	5.8	5.4	8.7	7.8	7.5	7.5	8.0	7.4	7.3	4.2	4.[illegible]	3.3	2.1	6.8	4.4	3.5	5.6	6.4	5.8
16	5.8	6.1	6.5	6.9	7.4	6.4	6.1	6.8	6.4	7.7	8.4	8.5	8.8	9.4	10.3	7.4	[illegible]	6.3	5.1	5.6	4.8	5.8	5.8	6.8	7.8
17	5.3	4.7	6.9	7.8	6.5	6.6	5.6	5.1	5.8	4.4	5.8	5.7	7.4	8.3	8.4	7.5	[illegible]	5.8	4.2	4.3	5.7	6.1	6.6	6.7	5.2
18	5.5	6.6	6.1	5.3	5.8	5.6	4.5	3.8	6.8	1.9	2.8	3.7	4.3	4.7	3.8	3.4	[illegible]	2.6	2.8	2.7	3.6	2.6	3.1	6.8	4.8
19	6.5	7.3	9.8	9.8	9.9	9.1	7.3	8.6	9.1	9.3	9.1	8.2	7.9	7.3	7.5	3.5	[illegible]	[illegible]	10.8	8.9	7.4	6.8	5.8	6.5	6.4
20	6.8	6.8	6.8	5.6	6.3	6.8	5.5	6.9	6.3	7.7	6.8	6.1	6.3	7.9	8.2	6.8	5.7	5.8	7.5	5.9	5.5	5.6	7.2	5.7	5.6
21	6.7	5.7	5.5	5.7	6.8	5.3	5.3	4.7	5.7	9.4	8.9	9.5	7.8	7.9	3.8	7.3	6.1	7.8	7.4	5.8	5.4	4.9	5.8	5.4	6.6
22	5.4	5.8	6.4	6.8	6.5	4.8	4.7	7.9	10.3	9.9	8.8	8.3	8.8	7.7	7.4	6.5	[illegible]	7.3	8.1	5.5	4.7	4.6	4.8	4.8	6.6
23	4.2	4.4	4.8	4.8	4.4	8.3	9.7	10.5	9.5	9.3	8.3	3.7	7.6	6.7	5.8	5.3	4.6	4.5	4.8	5.6	4.4	4.5	4.8	3.5	6.2
24	5.7	5.8	9.8	10.7	8.2	4.2	4.8	3.9	7.2	3.3	7.9	8.2	6.8	6.3	5.4	5.3	4.8	5.7	8.3	7.8	8.8	5.1	3.1	5.1	6.4
25	7.8	8.7	7.4	6.8	7.6	4.5	4.3	9.1	8.9	9.5	9.1	8.4	8.0	3.4	8.3	5.9	8.4	8.5	7.5	7.5	5.4	4.9	4.6	5.5	7.1
26	4.7	6.9	9.7	10.4	11.5	12.1	10.5	10.8	10.5	11.1	9.5	10.3	10.8	10.7	9.6	8.5	7.3	5.7	10.6	11.3	9.7	5.9	5.8	8.2	9.4
27	11.8	12.3	12.8	13.2	10.3	7.3	8.4	9.9	11.7	10.8	11.4	10.5	10.7	11.1	11.4	10.5	10.1	9.1	3.7	3.3	8.5	4.2	5.6	4.5	9.6
28	5.1	3.7	4.4	4.7	5.1	5.6	7.4	5.5	6.4	9.5	9.2	9.5	9.7	9.9	9.5	9.4	8.4	8.3	8.6	9.1	5.1	4.8	4.7	4.5	7.2
29	5.4	5.7	5.5	5.6	5.5	4.8	5.1	5.3	8.8	8.7	8.5	6.6	7.5	7.9	7.8	7.5	7.1	7.9	7.5	6.1	5.1	3.6	5.4	4.6	6.6
30	4.5	4.4	5.3	5.5	3.8	9.9	8.3	5.8	4.8	7.5	7.3	4.8	6.9	5.3	6.1	5.5	[illegible]	[illegible]	6.8	5.4	6.4	3.9	3.8	4.3	6.2
31	4.2	4.7	4.2	4.5	4.2	4.1	5.8	4.7	4.4	6.8	5.5	6.8	4.5	4.4	3.3	3.3	[illegible]	[illegible]	1.3	3.8	3.4	3.6	4.8	4.1	4.8
AVG	6.3	5.4	6.8	6.8	7.6	6.9	6.8	5.9	8.0	8.8	8.4	8.4	8.2	8.3	8.1	7.3	[illegible]	[illegible]	5.8	6.3	6.8	5.1	5.4	5.9	7.1
STD	1.7	2.8	2.4	2.9	2.1	2.4	2.2	2.5	2.8	2.5	1.7	1.6	1.5	1.3	2.0	2.8	[illegible]	2.5	2.0	2.1	1.3	1.2	1.2	1.3	1.5
MAX	11.8	12.3	12.8	13.2	12.4	12.1	12.5	12.2	11.7	11.3	11.7	11.8	11.8	11.1	11.4	11.0	[illegible]	[illegible]	10.6	11.3	9.7	6.2	7.8	3.9	9.9
MIN	4.0	3.6	4.8	3.9	3.9	3.9	3.7	3.8	3.6	1.9	2.3	3.7	4.3	4.4	3.3	1.9	1.1	0.7	1.3	2.8	1.9	2.5	2.1	3.7	4.8

HURGHADA,EGYPT NOVEMBER 1985 10M AGL BNW DATA(M/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	5.1	5.4	4.9	5.9	4.8	4.7	5.3	4.7	5.5	7.3	6.8	7.3	5.7	6.1	6.1	5.3	3.9	5.8	5.5	7.9	6.8	5.1	5.7	4.4	5.7
2	3.4	3.4	5.6	8.7	7.4	5.4	7.0	9.8	9.3	9.2	9.0	7.9	7.5	6.9	5.8	5.8	3.7	2.9	4.8	7.6	6.3	4.9	4.4	4.7	6.2
3	4.1	3.5	8.9	9.9	10.2	8.4	5.9	5.4	10.3	11.1	10.3	9.1	9.7	9.7	9.5	7.4	7.4	7.0	7.4	6.0	5.3	5.6	5.0	5.8	7.7
4	4.9	5.7	5.1	6.0	5.6	6.9	5.7	5.9	8.5	9.6	9.2	8.4	7.6	7.7	6.9	5.7	5.6	5.4	5.9	4.6	4.2	4.8	6.6	6.9	6.5
5	4.8	5.7	4.9	5.5	5.0	5.8	4.9	5.4	3.9	4.8	5.4	5.9	4.7	2.8	2.2	1.7	1.3	0.7	2.5	3.5	3.9	4.2	5.0	4.1	4.2
6	3.7	4.8	4.7	4.7	4.5	4.7	4.8	5.0	3.8	3.8	4.8	4.2	3.8	3.5	3.7	3.1	2.0	0.8	2.1	3.0	4.1	4.5	4.5	5.1	3.9
7	4.0	3.1	3.5	3.8	4.1	4.1	4.2	4.1	4.0	3.7	4.2	4.7	4.6	4.6	3.7	3.1	0.8	0.7	1.6	1.5	2.3	3.6	3.6	5.0	3.4
8	4.0	2.8	2.3	4.4	4.8	4.6	3.9	2.6	0.8	1.7	2.5	4.0	4.4	5.1	5.4	4.7	4.9	5.4	4.5	3.8	3.9	5.4	5.6	4.4	4.0
9	3.0	4.0	4.5	4.8	4.1	5.7	4.6	4.6	4.6	4.9	3.8	3.4			2.9	1.9	2.5	2.2	5.4	8.9	6.4	9.6	9.6	13.0	5.3
10	12.3	13.1	12.2	11.5	9.5	7.4	8.0	8.5	6.9	7.5	7.5	7.7	8.5	9.3	8.8	9.1	9.9	10.6	10.2	9.9	9.4	7.5	5.4	4.8	8.9
11	4.1	6.3	5.0	6.0	6.3	5.9	5.5	5.0	5.3	5.6	6.3	5.0	5.4	6.0	8.7	8.7	7.4	9.3	7.4	5.4	8.6	7.0	4.7	4.7	6.8
12	5.0	5.9	6.2	3.5	6.4	5.7	5.3	4.9	5.8	7.0	7.4	6.6	6.0	6.0	5.9	5.6	5.8	4.9	4.9	5.4	5.0	4.6	4.1	5.3	5.7
13	5.8	6.4	6.9	6.3	5.3	5.4	4.7	4.7	5.8	7.5	8.8	6.1	4.3	2.9	2.8	1.9	1.0	1.7	3.9	4.8	5.0	4.7	4.6	5.3	4.7
14	4.4	4.7	5.4	5.5	5.0	5.3	5.4	4.9	3.9	6.1	6.1	4.9	3.5	3.4	2.7	2.8	1.8	2.8	3.[illegible]	4.1	4.5	4.0	4.6	5.1	4.4
15	5.7	5.1	5.1	5.6	6.3	5.8	5.6	5.0	5.1	7.4	7.2	5.5	5.1	4.2	3.7	3.1	2.3	2.7	2.[illegible]	2.8	4.5	4.5	4.9	4.5	4.9
16	5.3	4.7	4.3	5.0	5.5	5.4	5.5	4.8	4.1	5.8	6.3	7.9	8.5	3.8	3.3	3.0	0.5	7.4	8.[illegible]	9.4	5.4	5.4	6.9	6.5	6.6
17	5.4	4.7	4.5	4.5	4.2	3.9	4.5	4.3	3.9	8.6	7.8	8.3	8.0	7.9	7.7	7.2	7.4	8.4	8.7	8.2	5.4	6.5	6.0	5.7	6.4
18	4.9	4.8	7.2	4.8	4.6	5.0	4.7	3.6	6.9	9.4	8.8	7.7	6.5	6.7	5.7	5.0	4.2	4.5	3.7	3.9	4.6	4.1	4.9	4.7	5.4
19	4.5	4.4	4.7	5.4	5.4	5.3	5.6	4.7	4.6	4.8	4.5	4.1	2.7	2.5	2.5	1.9	1.7	1.9	2.5	2.8	3.5	4.6	4.1	6.0	3.9
20	5.0	4.5	4.1	5.4	5.1	4.8	5.3	3.6	3.4	5.5	5.4	4.6	3.4	2.3	3.0	2.7	1.6	0.7	1.9	2.6	2.3	3.2	3.2	3.0	3.6
21	4.1	4.5	5.1	5.8	5.5	5.1	4.9	4.3	4.7	5.5	5.0	4.0	3.6	3.5	2.7	1.9	1.6	0.8	0.6	1.7	5.7	6.0	5.9	5.6	4.1
22	4.7	5.1	5.9	5.1	5.6	5.3	5.0	4.6	7.9	9.2	8.4	7.8	7.0	8.3	7.6	6.7	5.3	7.5	3.5	3.9	8.7	8.5	4.0	3.9	6.0
23	5.3	10.5	7.6	4.7	6.5	11.5	11.3	9.5	9.5	9.4	9.0	7.7	8.3	8.3	7.4	6.9	6.2	7.5	7.3	8.0	7.5	7.7	4.2	4.5	7.9
24	4.2	4.8	4.8	4.5	4.7	4.2	4.5	3.6	3.6	3.6	2.7	2.5	2.2	1.8	1.8	1.9	1.0	0.1	1.1	2.1	2.9	2.0	2.9	2.3	3.0
25	2.6	2.1	2.2	1.6	3.4	4.6	2.9	1.0	1.5	3.0	2.7	4.0	3.6	4.2	4.1	3.9	4.0	4.0	3.2	3.4	1.5	5.7	5.9	4.9	3.3
26	5.7	5.7	5.1	5.7	4.9	6.0	6.1	5.0	7.4	8.7	8.5	9.2	9.2	8.6	7.0	5.7	6.3	7.0	7.7	8.0	6.6	5.7	5.9	6.3	7.1
27	5.5	5.5	5.4	6.6	6.3	6.6	5.3	4.6	4.4	5.1	4.4	4.0	4.4	4.2	3.7	3.1	2.8	0.3	0.7	4.2	4.5	5.0	5.6	5.6	4.0
28	5.4	5.6	5.9	5.0	5.5	5.4	5.4	4.7	3.5	4.8	5.3	4.6	4.7	3.7	2.6	2.5	2.5	2.7	3.[illegible]	3.7	3.6	5.1	5.4	6.1	4.6
29	5.5	5.1	5.4	5.4	5.9	6.3	5.8	4.7	3.4	3.8	4.7	5.4	4.4	3.2	2.9	2.7	1.9	1.2	2.7	2.5	1.7	1.9	3.5	5.4	4.0
30	5.6	5.5	6.8	4.7	4.6	5.6	7.0	7.8	9.7	11.8	11.7	11.5	11.8	12.1	12.3	12.7	12.2	11.3	3.0	5.9	7.8	7.0	3.6	5.8	8.8
AVG	5.1	5.3	5.3	5.7	5.6	5.7	5.5	5.0	5.5	5.6	6.5	5.2	5.9	5.7	5.3	4.7	4.4	4.3	4.2	5.3	5.1	5.4	5.2	5.3	5.4
STD	1.7	2.1	1.9	1.3	1.4	1.4	1.4	1.7	2.4	2.6	2.3	2.1	2.3	2.6	2.7	2.7	3.0	3.2	2.3	2.6	2.1	1.7	1.3	1.7	1.6
MAX	12.3	13.1	12.2	12.5	10.2	11.5	11.3	9.8	10.3	11.8	11.7	11.5	11.8	12.1	12.3	12.7	12.2	11.3	12.[illegible]	9.9	9.4	9.8	9.6	13.0	8.9
MIN	2.5	2.1	2.2	1.6	3.4	3.9	2.9	1.0	0.8	1.7	2.5	2.6	2.2	1.6	1.0	1.7	0.8	0.1	0.0	1.5	1.5	1.9	2.9	2.3	3.6

HURGHADA, EGYPT DECEMBER 1985 12m 1. DNW DATA(M/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	7.4	7.7	7.8	8.4	7.4	6.7	7.9	8.3	7.8	9.8	9.4	9.4	10.5	10.2	9.1	7.6	8.8	9.3	11.0	10.3	10.8	11.0	11.0	11.7	9.1
2	10.5	11.0	11.6	11.7	12.1	11.5	9.2	8.7	11.7	12.0	11.2	10.6	10.3	9.9	10.2	10.6	11.0	11.6	11.6	8.3	6.1	6.8	7.3	7.4	10.2
3	7.5	8.8	7.5	8.9	7.8	7.5	7.3	7.2	8.6	11.6	12.4	11.4	10.1	9.2	7.5	6.8	8.7	10.5	9.8	6.9	5.8	6.4	7.5	6.5	8.3
4	7.5	7.3	7.6	8.9	8.1	6.9	7.4	7.3	9.5	10.6	8.7	8.2	6.8	6.8	8.3	6.8	7.7	9.5	8.8	8.8	9.7	8.0	7.4	5.9	7.9
5	6.8	5.8	6.5	6.5	6.9	6.7	7.3	7.5	6.4	4.6	5.8	5.3	4.9	5.1	5.3	6.0	5.9	5.8	5.1	5.6	5.4	6.4	6.9	6.6	6.0
6	6.9	7.2	7.2	6.5	6.1	5.8	6.8	6.8	5.8	5.4	4.4	4.2	3.6	2.8	2.3	1.8	1.7	2.5	3.7	4.5	5.0	4.7	5.0	6.0	4.8
7	6.0	6.8	6.4	5.3	6.5	6.3	6.3	5.6	5.8	5.4	5.3	4.6	3.7	3.6	3.5	2.6	2.2	1.8	3.1	3.7	3.9	4.8	4.9	4.8	4.6
8	5.1	5.7	5.9	6.6	6.5	6.6	6.5	6.0	5.8	4.9	3.6	2.8	2.3	2.3	1.9	1.8	1.5	1.8	2.1	3.5	3.8	4.8	5.7	5.1	4.2
9	4.6	5.1	5.9	5.9	5.3	5.1	5.5	5.4	4.6	3.6	3.1	4.5	4.6	4.5	4.4	3.1	1.6	1.7	1.7	3.5	3.9	3.5	4.1	4.7	4.2
10	4.6	4.8	4.3	6.6	5.8	5.0	5.7	5.3	4.8	3.7	4.2	4.0	3.6	3.2	2.8	2.3	1.9	1.1	1.2	3.1	3.0	2.8	4.4	4.0	3.8
11	3.9	4.8	4.1	3.9	4.5	5.3	5.3	4.8	4.7	4.9	6.8	5.8	5.4	5.8	6.5	5.7	2.6	3.5	5.8	4.4	5.8	7.8	3.9	4.6	5.3
12	6.1	4.1	8.0	5.8	4.7	8.3	5.3	5.3	5.4	5.3	5.3	4.5	5.6	5.3	3.6	3.2	[illegible]	[illegible]	1.7	3.2	3.0	2.7	4.7	5.5	4.7
13	4.7	5.5	5.1	5.4	5.4	4.7	4.5	4.2	2.4	2.0	2.7	3.4	3.4	3.4	2.9	1.8	[illegible]	[illegible]	0.3	1.3	2.1	2.3	1.1	1.2	3.0
14	3.2	5.0	4.7	4.9	4.7	5.9	6.3	5.4	3.3	2.5	3.2	4.0	5.4	5.1	5.0	3.6	[illegible]	[illegible]	1.5	3.6	4.4	4.4	6.3	6.7	4.3
15	5.6	7.2	5.0	8.3	5.9	6.6	5.9	5.1	3.8	3.7	5.5	4.9	7.3	6.3	5.9	7.5	[illegible]	[illegible]	9.3	8.4	4.4	5.3	5.0	5.0	6.4
16	5.5	5.6	5.5	6.4	4.9	4.0	3.5	8.9	9.9	8.6	7.4	7.6	7.2	6.6	6.6	6.6	[illegible]	[illegible]	8.0	8.4	5.7	7.8	6.3	7.3	7.1
17	5.7	3.8	5.6	5.3	4.7	5.6	5.3	5.4	4.2	3.7	2.9	3.9	2.3	3.8	3.6	2.5	4.2	5.4	5.3	5.3	2.1	5.0	3.6	2.6	4.4
18	3.4	3.7	5.3	7.3	5.8	6.2	13.1	7.5	5.0	7.7	12.1	12.2	12.3	12.5	11.3	11.5	11.3	[illegible]	8.5	7.9	5.8	6.9	7.[illegible]	7.0	8.5
19	8.8	9.8	7.6	6.9	6.0	5.1	6.7	5.6	5.3	8.0	7.7	5.8	6.5	7.9	8.2	8.3	7.7	[illegible]	5.4	8.7	7.3	5.7	4.1	5.8	8.9
20	5.3	6.0	5.6	5.5	6.7	5.5	5.6	6.1	6.1	5.3	5.9	6.1	6.4	6.5	7.0	7.3	7.7	[illegible]	7.4	6.7	4.6	4.4	5.4	5.3	6.1
21	5.7	5.3	5.0	5.8	5.4	4.9	4.7	4.7	3.5	1.5	1.5	1.8	2.1	2.9	3.1	3.2	2.3	[illegible]	1.6	3.2	2.9	3.6	4.5	4.2	3.6
22	4.8	4.4	3.6	3.9	4.8	5.3	5.4	4.5	4.8	3.8	3.8	2.6	3.1	4.1	3.4	2.7	[illegible]	[illegible]	2.1	3.8	4.1	4.4	4.1	5.0	3.8
23	6.8	4.5	4.1	4.2	5.4	5.0	5.5	5.0	4.5	4.2	6.3	5.0	6.5	6.5	6.5	6.6	3.1	[illegible]	2.4	4.4	4.8	5.1	5.5	5.6	5.2
24	8.4	5.9	5.5	5.8	6.7	6.7	7.0	6.1	6.3	7.6	7.5	5.9	7.5	8.0	4.3	[illegible]	[illegible]	[illegible]	3.8	7.7	6.5	7.0	7.6	7.3	7.2
25	5.5	6.5	6.7	7.3	7.5	7.4	7.3	7.3	7.4	7.3	7.3	7.8	7.8	8.4	7.8	7.8	[illegible]	[illegible]	6.6	7.2	5.6	6.9	7.7	6.7	7.4
26	5.8	5.8	5.8	6.2	6.9	7.0	7.0	5.5	6.9	7.9	7.3	8.2	8.5	9.4	10.1	11.1	11.6	11.7	10.4	8.3	8.3	6.1	6.2	7.6	8.1
27	6.1	7.2	6.8	6.3	5.3	6.5	6.8	6.5	6.3	6.4	6.9	6.3	6.1	5.8	5.9	5.2	5.6	[illegible]	6.1	5.0	4.0	6.1	6.3	6.1	6.2
28	6.7	6.8	6.7	6.5	6.5	6.7	6.7	6.8	6.4	5.5	6.4	6.4	6.4	6.7	6.3	5.6	[illegible]	[illegible]	3.3	5.0	5.1	6.8	7.8	7.0	6.2
29	7.3	7.3	7.0	6.7	6.6	6.4	7.3	6.9	6.7	5.6	4.2	4.7	4.0	3.4	2.2	1.7	[illegible]	[illegible]	2.9	4.4	4.0	5.0	5.1	5.6	5.0
30	5.8	5.5	5.6	5.6	5.5	4.7	5.8	5.6	5.3	4.0	4.0	3.2	2.2	1.6	1.5	1.9	[illegible]	[illegible]	1.2	7.3	3.4	4.2	5.4	5.0	4.7
31	4.6	4.0	5.7	5.3	5.5	6.1	6.0	5.4	4.4	2.0	2.3	1.8	1.0	0.7	1.7	2.2	[illegible]	3.9	0.7	2.2	2.5	2.6	2.2	4.4	3.3
AVG	5.9	6.0	6.2	6.3	6.2	6.4	6.5	6.1	5.9	5.9	5.9	5.7	5.8	5.8	5.6	5.4	[illegible]	[illegible]	5.5	5.5	5.1	5.5	5.6	5.7	5.8
STD	1.5	1.5	1.6	1.4	1.4	1.3	1.7	1.2	1.9	2.7	2.7	2.7	2.7	2.7	2.7	3.2	3.5	[illegible]	3.6	2.4	2.6	1.9	1.9	1.8	1.8
MAX	13.0	11.0	12.3	11.7	12.1	11.5	13.1	8.9	11.7	12.0	12.1	12.3	12.6	12.5	11.3	11.5	11.3	11.7	13.4	12.3	13.6	11.8	11.6	11.7	10.2
MIN	3.2	3.7	3.6	3.9	4.5	4.6	3.5	4.0	3.4	1.5	1.5	0.9	1.6	0.7	1.6	1.7	3.7	3.1	0.3	1.2	2.1	2.3	1.1	1.2	3.0

HURGHADA,EGYPT JANUARY 1986 10M AGL WIND DATA(M/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	4.1	3.7	4.7	4.8	4.3	4.8	4.6	2.9	2.8	8.7	1.1	3.1	3.7	4.2	4.5	3.8	3.9	4.2	3.1	2.9	2.8	3.1	2.8	2.7	3.4
2	3.4	3.8	4.8	3.1	3.6	2.5	2.9	2.2	1.2	2.8	5.4	6.8	7.8	8.2	6.7	5.8	4.6	4.5	5.3	1.7	2.9	4.8	6.3	7.6	4.4
3	6.8	7.5	9.5	11.3	12.4	18.2	18.1	6.9	8.4	9.2	9.9	9.1	9.7	10.6	10.3	10.3	10.7	9.8	9.2	8.8	5.7	6.5	6.9	8.9	9.1
4	6.7	7.8	6.8	5.9	6.9	7.6	6.6	5.8	5.4	4.9	5.8	4.5	3.6	2.8	3.5	3.4	2.5	2.6	2.2	4.8	4.7	4.5	4.8	5.3	4.9
5	4.5	6.1	5.6	6.3	6.3	5.3	6.5	6.3	5.6	4.8	3.7	4.6	4.1	3.2	2.5	1.8	1.2	1.2	1.7	2.1	3.4	3.4	5.3	4.6	4.1
6	5.8	4.7	5.8	5.7	5.8	6.1	5.5	5.1	4.1	3.6	3.7	4.1	3.6	3.6	2.8	3.1	3.5	2.9	2.1	1.9	2.2	2.6	2.9	3.2	3.8
7	4.8	4.6	4.4	4.8	4.8	4.7	3.6	4.5	3.4	2.3	1.5	2.6	7.6	3.6	3.2	3.4	2.5	2.1	1.8	2.1	4.1	3.5	4.0	4.9	3.5
8	4.9	4.4	5.8	5.6	5.5	6.9	5.6	6.3	8.6	11.3	11.1	10.8	10.2	10.8	11.1	10.6	9.9	9.4	10.4	8.8	9.4	6.6	6.6	5.4	8.2
9	5.9	6.4	6.1	5.3	6.9	6.9	5.3	6.6	6.7	5.6	4.5	3.8	3.7	4.2	4.4	4.6	4.2	2.7	2.6	3.4	4.9	5.7	4.9	6.8	5.1
10	5.0	5.6	5.4	5.9	5.5	5.8	7.3	5.7	5.9	4.[illegible]	3.7	2.7	2.7	2.9	3.4	3.2	3.8	2.9	2.2	4.1	4.5	4.8	5.5	6.6	4.6
11	6.7	7.8	7.8	5.4	6.3	5.5	7.8	5.7	7.2	6.6	6.5	7.9	3.5	6.5	9.6	10.2	9.9	5.8	6.2	9.7	6.6	7.7	5.1	5.8	7.6
12	6.3	5.6	6.5	5.5	5.6	5.4	5.4	5.9	7.9	8.2	7.9	8.9	8.8	9.4	9.1	8.6	7.4	7.5	6.8	6.1	5.5	5.5	6.8	6.8	7.2
13	6.9	6.8	6.6	5.4	5.4	6.5	6.5	5.6	4.8	4.6	4.4	4.4	3.8	3.8	3.5	3.2	2.7	1.5	2.7	3.9	3.9	3.7	4.1	4.8	4.6
14	4.8	5.9	6.5	6.3	6.6	6.6	6.3	5.8	5.6		6.1	5.1	5.5	5.4	5.6	7.3	8.5	1.4	5.5	7.5	8.2	5.4	5.6	5.6	6.2
15	6.5	5.1	5.4	7.7	7.2	6.3	6.5	5.7	7.5	8.6	8.5	7.5	7.6	6.3	6.5	7.6	7.8	1.4	7.9	7.5	6.7	4.9	5.8	5.7	6.7
16	6.8	6.9	5.7	6.9	6.5	6.5	6.5	6.8	6.1	5.8	5.5	5.4	4.5	3.7	4.5	5.1	5.1	4.2	3.6	4.8	5.8	5.1	5.4	5.7	5.4
17	6.1	6.3	6.9	6.7	7.8	6.7	6.8	6.9	6.1	5.6	6.1	5.7	5.3	5.8	6.6	6.4	5.5	5.6	5.9	6.8	4.5	5.1	5.6	5.7	6.1
18	6.6	4.9	5.6	6.8	6.8	6.7	6.8	6.5	6.3	5.5	4.0	4.7	6.3	5.4	5.7	5.3	5.3	5.4	4.9	6.9	5.4	6.1	7.2	6.6	5.9
19	6.5	6.9	6.5	10.7	12.9	11.2	9.4	9.8	11.6	11.1	12.8	11.3	13.4	13.4	14.2	14.4	13.7	14.8	14.8	12.9	11.8	9.1	7.2	7.4	11.8
20	8.3	9.4	11.8	11.3	11.7	11.7	8.6	8.2	9.1	10.8	11.8	8.4	5.8	7.3	8.8	8.9	7.2	5.1	8.5	8.7	4.6	6.4	6.6	6.7	8.6
21	6.3	6.7	7.8	7.3	7.8	7.2	7.7	7.6	7.7	6.1	5.6	5.8	3.9	3.7	4.1	4.6	5.0	5.3	4.9	4.5	6.8	5.9	5.5	6.8	5.9
22	5.3	5.7	5.5	6.8	5.5	5.9	6.4	6.5	5.8	3.4	7.7	7.5	6.9	6.1	5.8	5.6	5.8	4.3	5.7	5.7	5.3	3.8	5.8	4.8	5.9
23	5.9	6.4	5.8	6.3	5.3	6.3	5.8	5.2	5.1	5.4	4.6	3.8	1.7	1.8	3.8	5.7	5.6	5.1	4.6	3.1	1.8	2.8	2.3	4.2	4.4
24	5.8	5.1	4.4	5.8	6.7	5.3	4.9	4.5	3.8	3.2	2.9	2.1	1.7	2.3	2.5	2.1	2.7	1.2	1.6	2.2	2.9	3.4	4.1	3.7	3.4
25	3.1	2.7	3.7	3.8	4.7	5.6	5.6	4.6	3.1	2.3	5.4	7.3	7.4	7.9	8.7	8.5	6.2	3.3	3.4	10.2	9.7	7.7	6.5	6.7	6.3
26	7.9	7.2	6.9	5.8	6.8	7.9	7.7	7.6	6.4	7.3	7.3	6.3	5.6	4.7	4.5	5.1	5.4	5.3	6.2	7.5	6.3	4.9	4.7	4.7	6.3
27	5.9	5.6	5.1	7.6	10.3	7.4	5.8	5.5	6.9	5.1	7.3	7.4	7.4	6.3	5.5	10.4	12.2	7.7	9.3	8.6	5.6	5.5	6.3	6.1	7.4
28	5.1	5.3	5.8	5.4	9.5	5.1	5.5	5.5	5.6	4.9	7.4	8.9	8.5	7.0	7.8	7.2	3.3	3.2	5.9	8.5	3.8	7.4	7.2	5.5	7.8
29	5.9	5.5	5.5	6.6	6.7	5.9	6.4	7.6	7.8	8.5	10.2	9.8	10.4	10.1	13.8	11.8	11.6	12.7	3.5	5.8	5.7	6.4	6.5	5.7	7.9
30	5.1	7.5	6.7	6.6	6.7	5.1	6.4	6.9	7.4	8.7	8.2	7.7	7.5	7.3	6.9	5.6	5.7	5.6	6.6	6.3	5.3	5.7	5.1	5.5	6.6
31	5.8	5.4	7.8	6.7	3.8	7.2	5.7	7.8	6.5	5.5	6.7	7.3	6.7	5.3	6.1	6.6	6.4	5.8	6.0	5.3	3.7	4.5	4.9	5.5	6.3
AVG	5.8	.	6.1	6.6	7.8	6.6	6.5	6.3	5.1	5.8	6.3	5.3	6.1	5.1	5.3	5.4	5.3	5.3	5.6	5.3	5.0	5.2	5.3	5.5	6.1
STD	1.1	1.6	5	1.8	2.2	1.8	1.4	1.5	2.1	2.7	2.6	2.5	2.5	2.8	3.8	3.2	3.6	5.3	3.0	2.6	2.2	1.6	1.2	1.1	1.8
MAX	8.3	9.4	6	8	12.9	11.7	10.1	9.8	11.6	11.3	11.1	11.8	13.4	13.4	14.2	14.4	13.7	14.8	14.8	12.9	11.8	9.1	7.2	7.8	11.8
MIN	3.1	2.7	3.7	3.1	3.6	2.5	2.9	2.2	1.2	8.7	1.1	2.1	1.7	1.6	2.5	1.8	1.2	1.2	1.7	1.7	1.8	2.8	2.3	2.7	3.4

HURGHADA, EGYPT FEBRUARY 1986 12M ACL ENV DATA(M/S)

HOUR / DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	6.0	5.6	5.7	5.8	4.8	5.4	5.4	4.5	3.9	4.2	4.8	4.2	3.7	2.5	3.2	3.2	1.7	0.9	0.4	1.5	2.1	3.6	4.7	4.7	3.8
2	5.6	5.9	6.5	6.1	5.1	5.7	5.5	5.0	4.1	3.9	4.4	3.7	3.5	2.5	3.1	2.5	2.1	1.6	1.6	1.9	3.2	4.4	4.1	1.8	3.9
3	2.6	1.7	1.5	2.3	3.0	2.8	1.7	2.1	2.7	4.2	5.8	5.8	6.3	6.5	6.3	5.8	6.1	4.2	3.7	2.5	1.7	2.3	3.6	4.2	3.7
4	4.6	4.2	4.2	3.4	2.5	3.0	4.0	3.8	3.2	2.6	1.8	1.9	2.1	3.2	3.5	4.0	3.5	3.2	2.2	2.1	2.5	2.2	3.2	4.2	3.2
5	3.4	5.3	3.9	4.4	5.3	5.5	2.0	9.6	12.1	11.1	9.8	9.7	10.7	13.0	11.3	10.6	9.9	7.5	5.6	5.5	6.5	6.6	5.0	6.6	7.5
6	5.7	5.4	6.1	7.5	4.4	4.9	6.6	7.8	7.2	6.6	7.0	7.4	7.2	7.3	7.6	6.5	7.4	6.9	6.9	5.5	5.1	4.6	5.3	5.0	6.4
7	4.9	4.7	5.6	6.0	4.9	5.5	5.5	5.8	5.5	4.7	4.7	4.5	4.2	4.1	4.8	3.8	2.5	1.1	2.3	3.2	4.0	3.4	3.5	4.1	4.3
8	3.4	3.7	2.7	1.9	3.2	4.6	4.8	4.5	2.5	1.6	2.2	2.5	3.9	3.7	4.7	3.8	3.8	3.5	2.2	3.1	4.5	3.7	3.6	2.6	3.4
9	5.3	10.1	11.8	15.2	14.8	11.1	9.3	6.6	9.6	8.5	7.8	3.9	9.2	9.1	9.4	9.2	7.3	9.3	8.7	8.5	6.1	6.1	6.7	6.6	9.1
10	6.6	6.8	6.8	6.5	6.6	6.1	6.6	5.7	6.8	7.5	8.0	7.9	6.7	8.5	9.1	9.5	9.2	9.8	9.2	9.8	5.6	5.1	6.1	6.6	7.3
11	6.5	5.9	6.1	6.8	6.6	6.4	6.4	5.9	6.8	7.0	7.3	7.7	6.8	6.1	5.4	5.1	6.6	7.0	6.6	7.9	4.2	4.4	5.9	6.1	6.3
12	5.9	5.1	4.4	4.0	5.1	5.4	5.7	5.3	3.5	5.7	7.0	5.0	6.4	5.3	4.9	3.8	3.9	2.8	3.6	4.0	3.4	3.8	4.7	5.5	4.8
13	5.7	6.6	6.3	5.3	4.7	6.1	6.4	4.6	3.7	3.0	3.7	3.7	4.0	4.2	[illegible]	[illegible]	2.3	3.8	6.9	10.3	9.5	8.0	8.2	6.6	5.8
14	8.5	7.5	6.5	4.9	3.5	5.9	5.0	5.5	6.8	7.5	7.5	7.5	7.6	7.3	[illegible]	[illegible]	5.5	7.2	7.3	6.5	5.8	5.1	5.1	5.3	6.4
15	5.3	5.7	5.9	5.9	6.4	6.4	5.3	5.5	5.7	6.0	5.3	6.8	7.0	8.2	[illegible]	[illegible]	13.2	10.5	9.9	8.7	6.7	5.7	5.4	6.4	7.1
16	7.2	7.0	6.7	6.6	5.5	6.7	7.0	6.7	7.8	5.3	5.1	3.9	3.6	4.8	3.9	[illegible]	1.7	0.6	1.7	2.6	3.1	3.6	3.9	3.2	4.6
17	3.6	3.9	4.4	5.3	5.1	4.2	3.7	2.9	2.5	2.5	3.3	4.8	5.4	9.5	6.7	[illegible]	5.5	5.6	7.3	7.3	5.3	5.6	6.3	5.6	5.6
18	5.5	5.5	5.3	5.8	6.6	6.6	5.5	5.3	4.9	6.6	5.5	5.3	5.5	4.6	4.4	4.2	3.7	2.1	0.3	1.9	3.8	4.8	4.8	5.6	4.9
19	[illegible]	5.7	5.8	5.8	5.9	5.4	5.1	4.4	3.7	2.9	3.0	3.6	3.6	3.2	5.9	5.4	5.1	4.9	3.1	2.1	2.8	3.4	2.7	2.1	4.3
20	3.1	3.9	4.9	4.2	2.0	4.2	4.7	4.6	4.8	2.3	2.6	3.2	3.4	4.2	4.7	4.2	4.0	3.5	3.6	2.5	2.5	1.9	3.5	3.5	3.6
21	3.7	3.0	4.5	4.7	4.6	4.6	5.4	4.7	3.7	3.4	4.0	5.4	4.5	4.2	3.9	3.6	3.6	2.7	2.3	3.8	5.3	5.0	6.7	6.7	4.3
22	5.6	8.6	13.8	8.8	9.1	6.9	5.1	4.7	5.9	7.8	9.6	9.2	2.5	9.2	7.9	7.4	6.9	7.0	3.2	8.6	8.9	5.3	3.9	5.0	7.5
23	4.7	3.3	7.4	6.6	4.5	4.3	4.9	4.0	5.1	7.9	7.7	6.6	4.8	3.9	3.6	3.1	2.1	0.9	1.2	3.0	3.0	2.6	3.7	4.4	4.3
24	5.5	5.3	5.0	5.6	5.7	5.6	5.3	4.5	3.2	3.6	5.7	7.3	8.2	8.7	12.4	11.4	11.5	12.1	13.0	11.9	11.8	8.4	6.0	6.5	7.6
25	5.2	5.5	6.0	7.6	8.6	7.8	8.9	3.8	8.5	8.7	9.1	3.8	9.9	7.7	7.3	5.7	5.4	5.8	5.2	5.6	5.3	6.1	5.5	5.4	7.1
26	5.4	4.6	5.5	5.1	4.6	4.9	4.7	4.2	5.1	7.6	6.4	6.0	5.1	4.2	4.2	3.9	3.9	2.5	1.6	3.5	4.2	4.6	5.1	6.5	4.7
27	7.3	6.1	5.1	6.1	4.8	5.3	5.9	4.4	4.3	6.8	7.2	7.2	5.8	7.8	7.0	6.2	5.6	4.5	5.9	5.9	7.7	5.0	6.1	5.3	6.1
28	5.8	3.8	3.6	3.6	4.5	6.8	11.3	12.4	12.9	12.4	11.8	12.3	11.5	11.5	11.0	11.7	12.5	12.0	13.3	10.3	11.8	12.6	7.3	6.0	9.5
AVG	5.3	5.5	5.7	5.3	5.5	5.6	5.7	5.5	5.5	5.9	6.1	6.2	6.1	6.2	6.3	[illegible]	5.9	5.2	5.1	5.4	5.2	4.9	5.0	5.1	5.6
STD	1.3	1.7	2.0	2.4	2.3	1.5	1.9	2.0	2.5	2.7	2.4	2.3	2.4	2.7	2.6	[illegible]	3.0	3.3	3.3	3.0	2.6	2.1	1.3	1.5	1.7
MAX	8.5	10.1	11.6	15.2	14.8	11.1	11.3	12.4	12.9	12.4	11.8	12.6	11.6	13.3	12.3	11.7	12.6	12.1	13.3	11.8	11.8	12.6	8.2	6.6	9.5
MIN	2.6	1.7	1.5	1.9	2.5	2.8	1.7	2.1	2.6	1.5	1.8	1.9	2.1	2.5	3.1	[illegible]	1.7	0.3	0.4	1.6	1.7	1.9	2.7	1.6	3.2

HURGHADA,EGYPT MARCH 1986 10M ACL 8NW DATA(M/S)

DAY \ HOUR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	AVG
1	8.9	14.0	10.4	3.4	13.4	13.6	14.2	13.5	12.4	12.1	11.7	12.2	12.2	12.3	11.8	11.5	10.4	8.8	9.7	10.5	8.8	4.7	5.7	4.9	10.6
2	11.3	13.9	13.7	14.1	13.6	14.3	9.3	9.6	12.8	11.5	10.5	10.1	9.4	9.3	8.3	8.0	7.9	8.0	7.5	8.2	7.0	5.4	5.5	6.2	9.9
3	9.2	6.3	4.7	5.9	4.6	4.6	4.4	5.3	3.0	6.7	5.9	5.8	5.3	5.4	4.8	2.5	1.5	2.6	2.8	3.2	2.8	3.9	4.6	3.9	4.7
4	3.5	4.8	5.0	5.4	4.6	4.7	4.0	2.7	1.8	1.2	2.5	2.7	2.7	3.4	4.2	6.3	6.3	6.3	6.3	5.6	3.8	2.5	3.6	2.5	4.0
5	1.7	1.8	1.9	6.3	6.7	8.3	5.3	5.3	4.0	4.9	6.9	6.1	6.3	4.4	4.6	2.2	2.9	6.5	5.7	3.6	3.6	2.6	1.3	3.0	4.4
6	6.7	5.0	3.6	4.1	3.9	3.5	3.6	4.6	5.4	5.1	5.4	4.7	4.9	6.0	5.0	4.7	3.6	6.7	4.8	4.2	6.5	7.2	4.7	6.3	5.0
7	5.6	3.0	8.4	9.2	8.9	7.5	6.9	5.0	5.0	5.3	5.1	4.7	4.1	3.6	3.6	3.5	3.8	2.8	1.3	0.9	1.6	2.2	2.7	3.7	4.5
8	3.3	2.6	2.6	3.1	4.2	3.8	4.0	2.1	1.1	2.6	6.4	7.4	7.9	7.9	7.8	7.5	8.6	7.6	6.1	6.4	5.9	4.7	3.4	3.0	6.0
9	2.6	2.0	3.1	3.7	3.2	3.9	4.5	3.2	3.4	2.5	5.5	6.3	4.9	6.8	5.4	4.4	2.5	5.4	5.4	7.0	9.4	8.7	7.9	6.8	4.9
10	6.4	5.6	6.1	4.7	6.0	5.7	7.3	7.3	6.5	6.3	9.1	8.8	8.8	8.9	9.2	7.9	5.5	6.9	7.7	8.3	9.5	7.6	3.6	4.1	7.1
11	5.6	5.3	5.7	5.3	5.8	4.9	5.7	5.0	7.2	8.5	8.6	8.9	9.2	8.8	8.5	8.6	8.3	7.7	7.9	7.3	5.1	4.6	5.5	6.0	6.9
12	4.7	4.0	7.6	8.9	5.0	4.3	5.3	5.1	3.8	8.4	5.4	7.3	5.9	4.0	3.6	4.0	4.5	5.1	5.4	5.0	5.4	3.9	4.0	5.1	5.6
13	4.0	5.4	5.6	5.1	4.8	3.7	3.0	4.2	4.3	4.0	2.9	2.5	2.3	2.3	3.9	3.8	3.4	2.8	2.5	2.5	2.7	3.5	2.6	3.7	3.6
14	3.4	3.5	2.1	5.6	6.6	3.6	5.0	5.5	5.2	8.4	10.1	8.9	9.3	9.1	10.1	9.2	8.9	3.6	10.1	12.2	12.9	11.0	10.4	8.7	8.0
15	5.1	9.0	8.4	7.9	5.9	5.6	6.4	7.2	11.5	10.5	11.1	11.1	11.0	10.7	9.6	9.6	9.2	8.5	7.5	6.7	4.4	4.2	4.2	6.4	7.9
16	7.3	5.2	6.9	7.9	5.7	3.7	4.6	5.7	6.7	9.3	6.8	6.4	8.4	8.5	9.0	7.4	6.1	5.4	7.0	7.8	7.2	4.7	4.4	5.5	6.9
17	5.4	6.4	5.9	5.3	5.0	5.3	4.8	6.0	10.4	10.5	9.3	9.8	10.3	10.2	9.7	10.1	9.6	3.7	7.3	7.2	8.6	9.5	6.8	6.4	8.0
18	9.9	12.0	12.4	11.2	7.8	5.0	3.2	5.3	5.8	7.4	6.4	6.7	5.9	5.4	7.2	7.4	7.3	5.0	5.7	6.4	5.6	6.0	3.0	1.6	6.9
19	2.7	5.7	4.1	3.5	3.7	3.5	3.6	6.4	8.3	7.3	7.2	6.9	6.6	4.9	4.5	3.8	1.9	1.6	4.1	9.3	8.9		4.6	5.7	5.1
20	5.4	5.4	5.5	6.5	7.9	7.0	5.0	5.7	9.1	10.3	10.3	9.7	9.3	9.3	8.9	6.6	8.2	7.5	9.4	9.1	8.9	9.3	5.3	4.1	7.6
21	5.5	6.3	6.0	5.9	5.7	5.7	4.7	7.3	9.1	8.0	8.6	7.3	6.0	6.3	5.1	4.0	3.9	4.0	3.7	3.9	6.0	6.6	6.1	4.6	5.9
22	4.0	3.7	4.2	4.5	4.2	2.9	3.2	2.0	2.0	1.5	2.9	4.1	3.2	3.7	3.6	3.1	3.1	3.3	2.5	1.9	2.0	3.0	2.0	2.7	3.1
23	2.5	2.2	2.5	1.5	1.7	2.6	3.2	2.7	2.1	2.8	3.7	3.7	4.0	6.1	7.3	6.4	7.3	6.9	8.0	6.7	8.5	9.2	8.6	9.1	5.1
24	10.3	10.1	10.2	10.3	11.0	11.6	11.3	10.6	11.2	10.5	10.3	9.2	9.5	8.5	8.5	10.3	11.4	10.5	12.2	12.2	11.5	9.7	9.7	8.6	10.4
25	8.6	10.4	10.3	10.8	10.3	6.7	7.0	8.9	10.4	11.1	12.4	12.5	12.3	12.2	11.2	9.6	9.0	9.6	9.2	9.4	8.9	8.4	7.0	5.0	9.7
26	5.0	5.5	5.5	6.7	6.9	5.0	6.5	8.2	7.7	6.7	5.8	4.0	3.2	2.6	2.3	2.5	2.6	1.3	0.1	2.2	4.0	3.7	4.2	4.2	4.6
27	5.0	5.1	5.1	6.1	5.6	4.5	4.9	4.5	5.9	6.7	5.8	4.9	4.1	3.8	4.0	3.6	2.5	0.7	0.9	2.5	2.7	4.5	7.9	6.0	4.5
28	5.7	5.5	5.3	6.2	6.6	10.2	10.6	9.0	7.1	8.5	7.7	7.5	6.7	6.1	5.5	5.9	4.9	5.0	6.4	5.7	7.0	4.8	5.5	5.8	6.9
29	4.5	5.1	7.9	5.6	4.5	4.0	3.6	4.0	7.2	5.9	6.0	5.7	4.2	2.5	2.0	1.6	1.0	1.0	2.0	3.0	2.3	3.6	1.3	0.7	3.8
30	4.9	7.5	9.9	16.1	11.1	11.4	10.3	8.9	7.3	8.2	8.6	8.0	8.6	10.3	9.9	10.1	10.7	9.8	9.1	9.4	9.4	9.5	7.9	5.9	9.0
31	5.6	4.0	4.4	4.9	5.7	5.5	3.8	4.7	5.5	6.5	6.8	8.2	7.9	8.6	7.8	6.6	5.9	5.0	5.5	5.3	5.1	5.6	4.6	5.4	5.8
AVG	5.6	5.1	5.3	6.7	6.5	6.1	5.5	6.1	7.2	7.1	7.5	7.2	6.9	6.8	6.7	6.3	6.0	5.6	6.3	6.4	6.3	5.8	5.1	5.1	6.3
STD	2.3	3.2	3.0	2.7	2.9	3.0	2.7	2.6	3.0	3.0	2.6	2.6	2.7	2.9	2.7	2.8	3.1	2.7	3.0	2.9	2.9	2.9	2.3	1.9	2.1
MAX	11.3	14.0	13.7	14.1	13.6	14.3	14.2	13.5	12.4	12.1	12.4	12.5	12.3	12.3	11.8	11.5	11.4	10.5	12.2	12.2	12.9	11.0	10.4	9.1	10.6
MIN	1.7	1.8	1.9	1.6	1.7	2.6	3.0	2.1	1.1	1.2	2.5	2.5	2.3	2.3	2.3	1.5	1.0	0.7	0.1	0.9	1.0	2.2	1.3	0.7	3.1

APPENDIX C

SOIL DATA FOR WATER DESALINATION PLANT SITE AT HURGHADA, EGYPT

ARDAMAN - ACE

CONSULTING ENGINEERS IN SOIL MECHANICS, FOUNDATIONS AND MATERIALS TESTING

REPORT FOR

WATER TREATMENT PLANT AT HURGADA

ARDAMAN - ACE

16 Souria Str., Cairo - Tel., 715824- 3480321

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CONSULTING ENGINEERS IN SOIL MECHANICS
FOUNDATIONS, AND MATERIALS TESTING
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TEL. 716024 - 3460123

شركة أردمان - آيس
لهندسة التربة واختبار المواد والتنفيذ
١٨ شارع سوريا بالمهندسين - الجيزة
تليفون : ٧١٨٨٢٤ - ٣٤٨٠١٢٣

September, 1986

FILE NO. 279/S

EGYPTIAN ELECTRICAL AUTHORITY (EEA)

Attention : Eng. Ahmed Abd El Halim

Subject : Water treatment Plant at Hurgad

Gentlemen,

We have completed the following Report of our geotechnical study for the subject project. This report describes the field exploration and laboratory testing program findings and presents our evaluations and recommendations.

The objective of this study was to collect data on the subsurface at the site in order to develop recommendations for the foundations and other subsurface considerations as they affect design and construction of the subject facilities.

The subsurface information was obtained from standard penetration test (SPT) boring sand laboratory tests on the soil samples obtained.

Based on the result of our study we have developped recommendations for site preparation, foundation design and other geotechnical considerations.

We appreciate the opportunity of working with you on this Project and look forward to a continuing relationship.

Please do not hesitate to contact us if you have any questions concerning the Report.

Very Truly Yours
ARDAMAN-ACE

Dr. Mohamed Sheta, P.E.
Geotechnical Manager

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APPENDIX

A. SUMMARY OF LABORATORY TEST RESULTS

B. LOCATION PLAN

Figure (1) Site Key Plan and SPT Borings Locations

C. SOIL PROFILES

D. BOREHOLE LOGS

E. RELATIONSHIP BETWEEN DEPTH & SPT. q_{un}. RQD W/C. L.L. P.L

F. CHEMICAL ANALYSIS

1. SITE LOCATION :

The site for the Proposed Power Station is located at Hurgada , Red Sea

2. PURPOSED AND SCOPE AND STUDY :

2.1. Purpose of Study

The purpose of this study is to collect data so that evaluation and recommendations could be made with respect to foundation design, site preparation and other geotechnical construction consideration related to the construction.

2.2. Scope of Field Exploration

The field exploration program consisted of conducting (2) standard penetration test (SPT) borings of June 21, 1986.

Each of the SPT borings was terminated at a depth varied from 10.45m to 14.0m below the existing ground surface.

2.3. Scope of Laboratory Testing Program

Representative soil samples obtained during our field sampling program were packaged and transfered to our office in Cairo and thereafter, throughly examined and tested in our laboratory to obtain accurate descriptions of the existing soil strata.

The samples were examined according to ASTM (See References) to estimate the USCS (Unified Soil Classification Systems for each Samples)

Our Laboratory conducted -200 Sieve Analysis, Atterberg Limits (Liquid Limit, Plastic Limit) Natural and Moisture Content.
All testing were performed in general accordance with ASTM standard (See References).

3. SUBSURFACE CONDITIONS :

3.1. Soil Description

The general subsurface conditions which were encountered at the exploration locations are shown on the drill hole.

Soil stratification is based on field and Laboratory examination of recovered soil samples and interpretation of field boring.

The stratification lines represents the approximate boundary between soil types. The actual transition may be gradual.
Based on our review of the field and laboratry examination of soil samples, the following general subsurface soil profile is developed.

3.2. Soil Classification :

The soil as shown in the borehole logs is composed of medium dense to very dense sand layer with different percentages of sandstone pieces and silt, this sand layer appeared at the ground surface and varied in thickness between 2.0 and 3.0 meters.
A moderately weathered fossiliferous limestone layer appeared at a depth varried between 3.0 to 3.30 meters below the existing ground surface with thickness between 1.0 and 1.7 meter.

- An interlayer of sandstone fragments appeared in borehole (1) at 2.0 meters depth with 1.3 meter thick.
  A loose to very dense sand layer with a little percentages of silt and clay followed the limetsone layer in Borehole(2) at 4.0 meter depth and extended to the end of the borehole and interlayered by a layer of clayey silt and sand at 5.0 meters depth with 2.0 meters thick.

- In Borheole (1) the limetsone layer is followed by a silty clay layer with a little percentages of sand at 5.0 meters depth and extended to 12.25 meters depth below the existing ground surface, this clay layer is interlayered by a clayey silt layer at 8.0 meters depth with 1.0 meter thick.
  A medium dense to very dense sand layer underlayered the clay layer (BH.1) and extended to the end of the borehole.

<u>Ground Water</u> :

Ground water table is measured during the drilling of the boreholes and it is appeared at 5.50 meters below the existing ground surface.

4. CONCLUSIONS AND RECOMMENDATIONS :

The follwing are our conclusions and recommendations for site foundations design which we feel best suited for the proposed facility with respect to the existing soil conditions. These recommendations are made as a guide for the design Engineer and/or Architect part of which should be incorporated into the Project's Technical specifications.

The recommendations presented in this report are based upon the analysis of field data and laboratory results presented in the appendies and the loading conditions. The recommendations of this report do not reflect any horizontal or vertical stratigraphic variations which may occur between the boring of this investigation.
The nature and extent of horizontal or vertical stratigraphic variations between the borings may not become evident until during the course of construction if any variations then appear evident it will be necessary for a re-evaluation of the recommendations of this report to be made after performing on-site observations during the construction period and noting the characteristics of the variations.

4.1. Recommendations :

- It's recommended to use shallow foundations with maximum allowable bearing capacity at 2.0 kg/cm^2 at foundation level of 2.0 meters below the existing ground surface.

- Foundation pits shall be flooded for 24 hours prior to concreting. Fine material left out after flooding must be removed.

- Sulphate resisting cement must be used in all foundation work.

CONSULTING ENGINEER

Dr. A.H. El Ramli

ARDAMAN-ACE

Dr. Mohamed Sheta. P.E.
Geotechnical Manager

5. REFERENCES :

1. ASTM D-422-63 (Reapproved 1972)
   "Standard method for Particle size Analysis of Soils".

2. ASTM D-423-66 (Reapproved 1972)
   "Standard test method for Liquid Limit of Soils".

3. ASTM D-424-59 (Reapproved 1971)
   "Standard Method for Plastic Limit and Plasticity Index of Soils"

4. ASTM D-1586-84
   "Standard Method for Penetration Test and Split-Barrel Sampling of Soils"

5. ASTM D-2487-69 (Reapproved 1975)
   "Standard Test method for Classifications of Soils for Engineerung Purpose"

6. ASTM D-2488-69 (Reapproved 1975)
   "Standard Recommended Pratice for description of Soils"

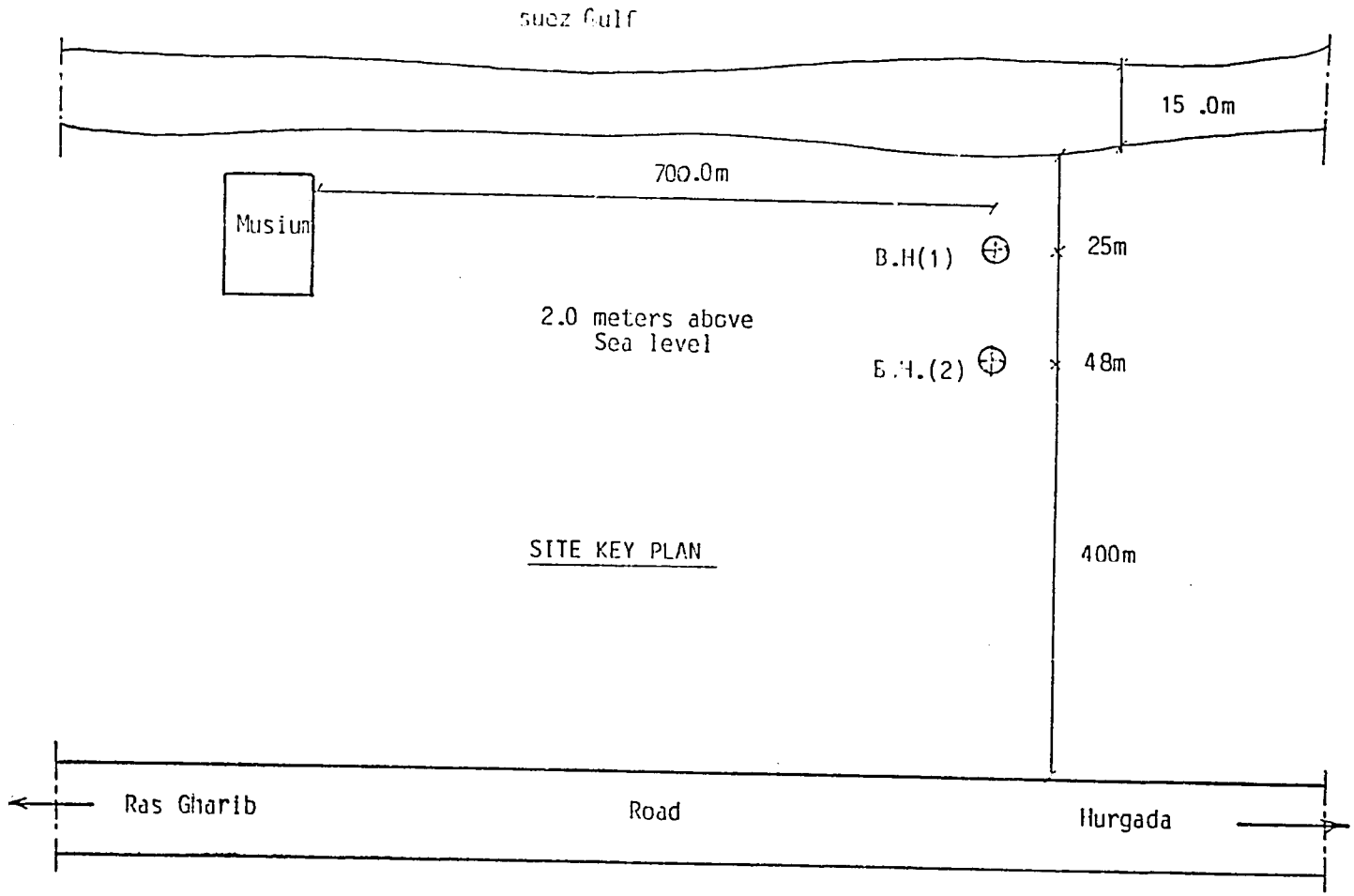
   (Visual-Manual Procedure)

SUMMARY OF LABORATORY TEST RESULTS

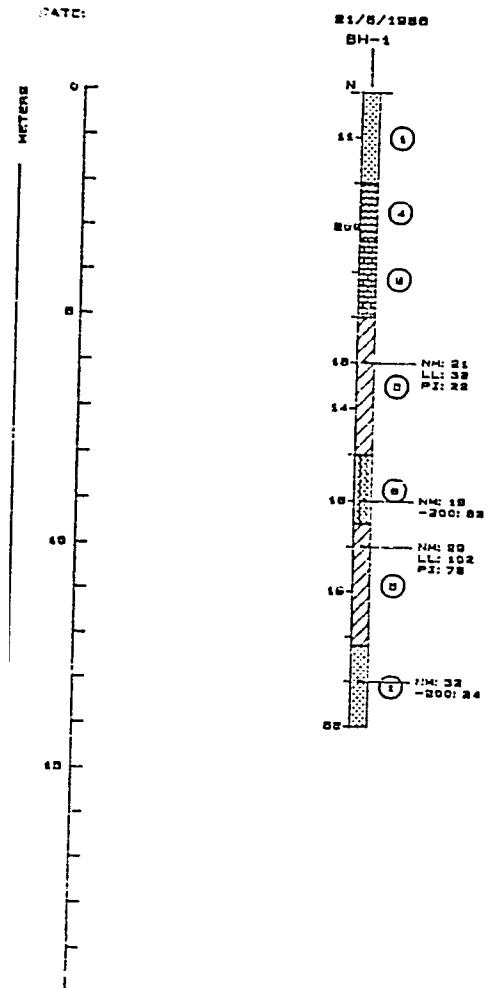
LABORATORY TEST RES S

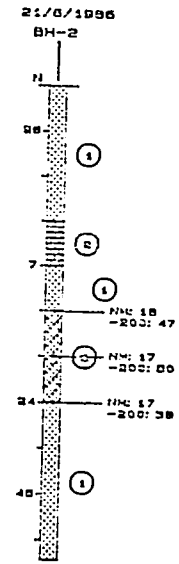
Borehole No.	Sample Number	Depth. (m)	Unified Class.	Bulk Density (t/m^3)	% Passing NO. 200 sieve	Unconfined Compressive Strength (Kg/cm^2)	Atterberg Limits L.L. %	Atterberg Limits P.L. %	Moisture Content %	P.I. %	Sh.L. %	P.P Kg/cm^2	GS
(1)	6	6.0	CL				39	17	21	22			
	8	8.0			82				19				
	10	10.0	CH				102	30	29	72			
	13	13.50			24					32			
(2)	5	5.0			47					18			
	6	6.0			50					17			
	7	7.0			38					17			

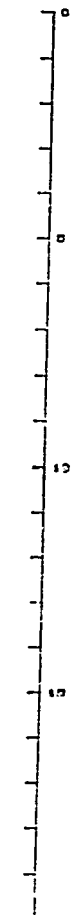
BOREHOLE LOCATIONS


Suez Gulf
15 .0m
700.0m
Musium
B.H(1)
25m
2.0 meters above
Sea level
B.H.(2)
48m
SITE KEY PLAN
400m
Ras Gharib
Road
Hurgada

SOIL PROFILE







LEGEND

1. SAND
2. LIMESTONE
3. CLAYEY SILT AND SAND
4. SANDSTONE
5. CALY
6. SILT

- GROUNDWATER LEVEL
- N - BLOWS PER FOOT
- NM - NATURAL MOISTURE (%)
- -200 - PERCENT PASSING NO. 200 SIEV
- LL - LIQUID LIMIT (%)
- PI - PLASTICITY INDEX (LL-PL)

BOREHOLE LOGS

ARDAMAN ACE

Project: Water Treatment Plant At Hurgada	Borehole NO. (1)	File: 279/S
Ground Level: N/A	W. L. Initial: 5.50m	Date: 21/6/1985
	Final: N/A	Date:
Laboratory Eng. A.ALy	Field Eng. Mbarek	Driller: Yehia
Date: 21/6/1985	Equipment: CME45	Sheet 1 of 2

DEPTH m	SAMPLE NO.	SAMPLE Type	S.P.T. N or Rec. %R	STRATA Thickness m	STRATA Sec.	DESCRIPTION	REMARKS	Elev.
1	1		54	2.0		SAND: very dense, calcareous fine to medium grained with some sandstone pieces, light brown Becomes medium dense at 1.0m		
2	2		11					
3	3		100/6"	1.3		SANDSTONE: calcareous, fragmental & grey		
4	4		100/7"					
4	Core 1		80%	1.[illegible]		LIMESTONE: Moderately weathered fossiliferous & light grey RQD= 45% at 3.30m		
5	Core 2		40%			RQD=Zero at 4.50m		
5	5		32	2.0		CLAY: calcareous silty with traces of sand, brownish yellow	G.W.L.	
6	6		18			(L.L=39%, P.L=17%, w/c=21% at) 5.0m	CL	
7	7		14	1.0		CLAY: silty with traces of sand brownish yellow		
8	8		24	1.0		SILT: calyey with some sand & brownish yellow (-200=[illegible]%) (L/c=19%)		

Checked By

Shelby | S.P.T | Core

ARDAMAN _ ACE

Project: Water Treatment Plant At Hurgada	Borehole NO. (1)	File: 279/S
Ground Level: N/A	W. L. Initial: 5.50m Final: N/A	Date: 21/5/1986 Date:
Laboratory Eng. A.ALY	Field Eng. M.Mabarek	Driller: Yehia
Date: 21/6/1986	Equipment: CME45	Sheet 2 of 2

DEPTH m	SAMPLE NO.	SAMPLE Type	S.P.T. N or Rec. %R	STRATA Thickness m	STRATA Sec.	DESCRIPTION	REMARKS	Elev.
	9		16			CLAY: silty with traces of sand greyish green		
10	10		18			(L.L=102%, P.L=30%, w/c=29%) at 10.0m	CH	
11	11		19	3.25				
12	12		21					
13				1.75		SAND: medium dense fine to medium grained with pockets of silty clay redish yellow		
	13		55			Becomes very dense, without pockets and silty at 13.50m (-200=24%, w/c=32%)		
14						End of Boring at 14.0m		
15								
16								
17								

Checked By

Shelby S.P.T Core

ARDAMAN - ACE

Project: Water Treatment Plant At Hurgada	Borehole NO. (2)	File: 273 /S
Ground Level: N/A	W. L. Initial: 5.50m	Date: 21/6/1986
	W. L. Final: N/A	Date:
Laboratory Eng. A.Aly	Field Eng. M.Mobarek	Driller: Yehia
Date: 21/6/1986	Equipment: CME45	Sheet 1 of 2

DEPTH m	SAMPLE NO.	SAMPLE Type	S.P.T. N or Rec. %R	STRATA Thickness m	STRATA Sec.	DESCRIPTION	REMARKS	Elev.
1	1		50/3"	3.0		SAND: very dense, calcareous fine grained with sandstone pieces, some silt, yellow		
	2		25			Becomes medium dense & fine to medium grained light brown at 1.0m		
2	3		100/8"			Becomes very dense & yellowish white at 2.0m		
3	Core 1			1.0		LIMETSONE: moderately weathered fossiliferecus & yellowish white		
	4		7	1.0		SAND: loose fine to medium grained with cemented sand pieces & traces of silt, light brown		
5	5		5	2.0		CLAYEY SILT AND SAND: brownish grey (-200=47%, w/c=18%)	G.W.L.	
6	6		6			(-200=50%, w/c=17%) at 5.0m		
7	7		24			SAND: medium dense fine grained silty with traces of clay, light brown (-200=38%) (w/c=17%)		
8	8		29			Becomes with traces of silt at 8.0m		
9								

Checked By

Shelby | S.P.T | Core

ARDAMAN _ ACE

Project: Water Treatment Plant At Hurgada	Borehole NO. (2)	File: 273/5
Ground Level: N/A	W. L. Initial: 5.50m Final: N/A	Date: 21/5/1985 Date:
Laboratory Eng. A.Aly	Field Eng. M.Mobarek	Driller: Yehia
Date: 21/5/1985	Equipment: CME45	Sheet 2 of 2

DEPTH	SAMPLE NO.	SAMPLE Type	S.P.T. N or Rec. %R	STRATA Thickness m	STRATA Sec.	DESCRIPTION	REMARKS	Elev.
	9		45			Becomes dense & yellow at 9.0m		
10	10		58			Becomes very dense with some silt at 10.0m		
						End of Boring at 10.45m		
11								
12								
13								
14								
15								

Checked By

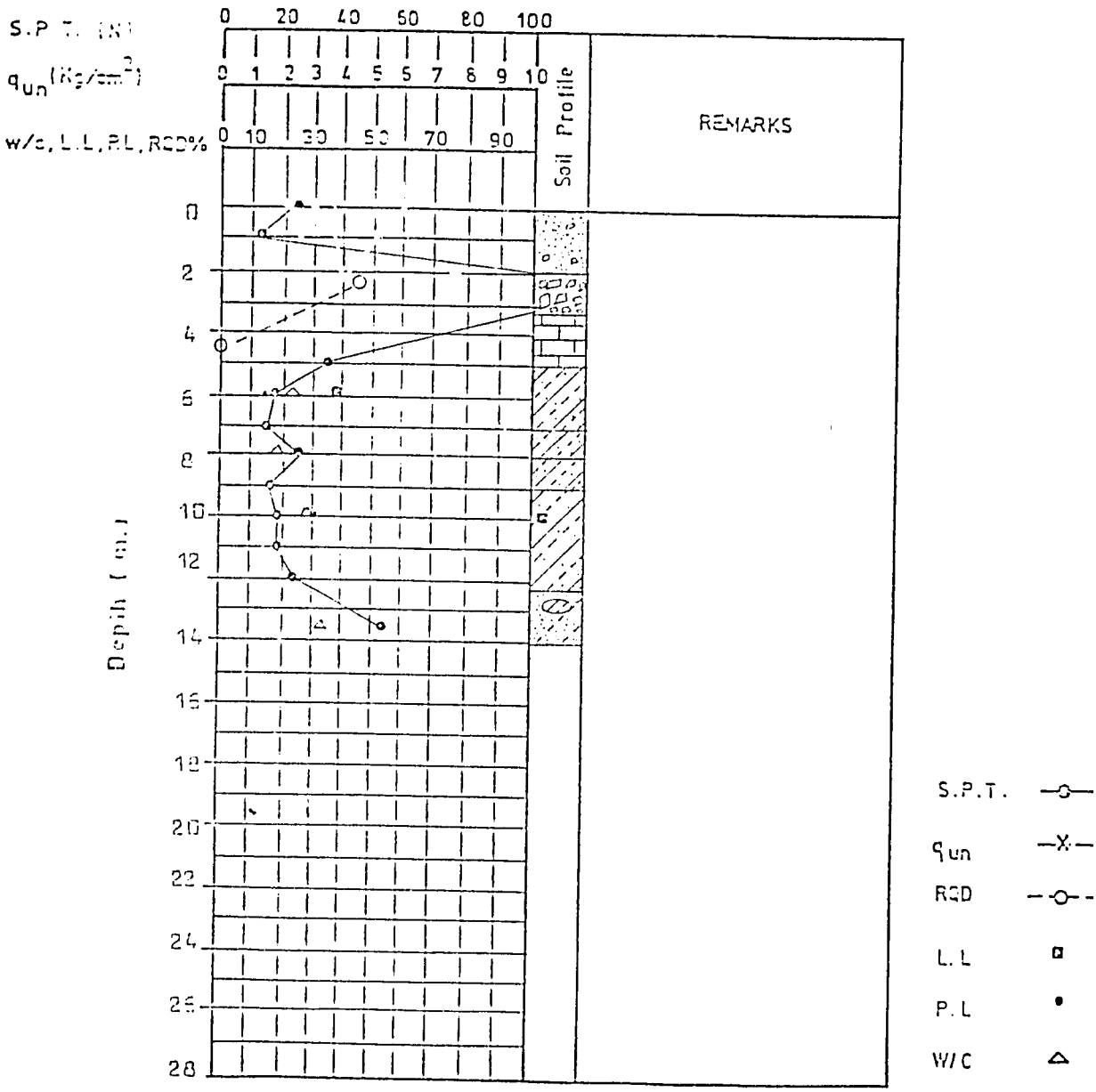
Shelby S.P.T Core

RELATIONSHIP BETWEEN DEPTH & SPT

w/c,L.L,P.L

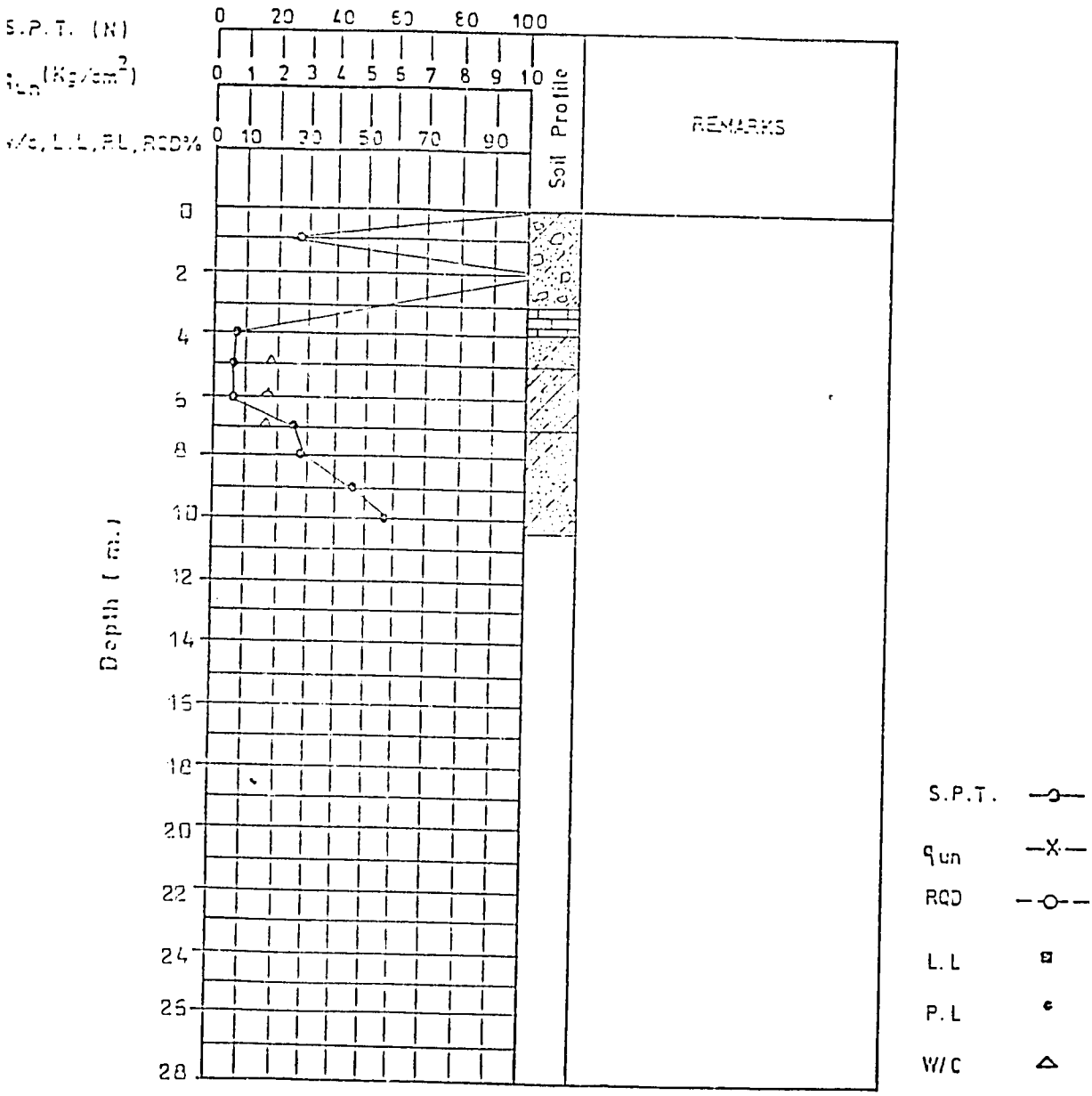
Project: Water Treatment Plant At Hurgada — Borehole No.: (1) — File No: 279/5

Log By: S.M. — Date: July.1985



Project : Water Treatment Plant At Hurgada Borehole Nº : (2) File Nº : 279/S

Lab. Eng. : S.M. Date : July.1985



CHEMICAL ANALYSIS

CHEMICAL ANALYSIS FOR WATER SAMPLE

B.H. No.	1
Depth	5.50m
CL	9800 PPm
≡ Nacl	16149 PPm
SO_3	1990 PPm
T.D.S.	19629 PPm
PH	7.05

APPENDIX D

INSTRUMENTATION REQUIREMENTS AND SPECIFICATIONS

SPECIFICATIONS FOR A FILED TEST INSTRUMENTATION SYSTEM

The Renewable Energy Field Test instrumentation system will be used to monitor IPH, PV and wind energy system installation at urban and remote desert locations in Egypt. These energy systems include main power sources (solar collectors, PV arrays and wind turbines) as well as ancillary subsystems depending on specific field test applications. These subsystems include ice-making equipment, desalination systems, a variety of load characteristics ranging from small DC loads to grid-connected applications and back-up power systems (diesel engines and batteries).

The instrumentation system must be a stand-alone system. Failure of the instrumentation system must not affect the performance of the field test system that is being monitored.
The instrumentation system must have an on-site data storage system that is non-volatile and capable of easy physical removal and transport to another location for data removal and long-term storage. One form of the non-volatile storage system must be a microchip/EPROM or CMOSRAM - Type system that can be "milked" on site easily and without danger of a loss of data.

The instrumentation system must be a microcomputer based data logger with programmable input channels and output formats both analog and digital. The user must have control over sampling frequency and output period for channel. The capability to multiplex some of the channels is also required. Primary design objectives for the instrumentation system should be reliability, simplicity, small size, low power and the ability to operate in environmental extremes as specified (especially high temperature, sand/dust and tropical/sea coast). The unit must be capable of stand-alone battery operation for a period of two months. The monitoring system for the entire field test will be expected to be a centralized system.

The following minimum specifications are required for the instrumentation system. If an exception must be taken to one or more of these requirements, the exception shall be noted and a clear explanation given as to why the bidder believes that the exception should be acceptable to the purchaser.

System Power Requirements

- Capable of operation using self-contained batteries
- Capability for the use of an external power source to allow continued data collection while changing batteries is desirable
- Capable of transient protection from spurious electrical charges or lightning

Environmental Specifications

- o Ambient Temperature: - 5 deg. C to + 55 deg. C
- o Relative Humidity: 0 to 95 percent
- o Impervious to a tropical, oceanside environment with occasional high airborne sand/dust and/or sulphur levels.

Analog Input

Number of Channels: At least 12 channels

Voltage Measurement Types: Differential or single-ended

Accuracy of Measurements: At least ± 0.5 percent

Range and Resolution: Selectable for any input channel from microvolts to several volts full scale

Sample Rates: At least once per second for each channel

Multiplex Capability: At least for channels

Pulse Inputs

Number of Pulse counter Channels: At least 4 channels

Analog and Digital Control Outputs: A total of three resettable channels each is desired with a range of 0 to ± 5 volts with a 0.5 volt resolution.

Multiplex Capability: At least three channels

Output Signal Interface

Memory: Capable of storing at least 3000 data points per day for a period of two months

Display: A visual display of instantaneous and stored data is required on-site for data verification before data removal.

Peripheral Interface: Downloading of data at the site should be by physical removal of the data storage device or simple, reliable data downloading to a non-volatile storage device. Storage data files shall be IBM-PC compatible on floppy disc either directly from the data logger or through a simple, fast reformatting technique.

FIELD TEST PERFORMANCE MONITORING DATA REQUIREMENTS

Field Test #10 (Wind Powered Desalinatin Plant)

Parameter	Channel Type	Output Interval
Turbine power (kW)	P	10 min.
Generator Voltage (volts)	A	10 min.
Generator Current (3) (Amps)	A	10 min.
Frequency (Hz)	A	10 min.
Reactive Power (VAR)	A	10 min.
Power Factor	A	10 min.
Rotor RPM (Rev/min)	P	10 min.
Number of On-off Cycles (Turbine)	P	Daily
KWH Output	A	Hourly
KWH flow from System to Grid	A	10 min.
KWH flow from Grid to System	A	10 min.
KWH to Desalination unit	A	10 min.
KWH Output from ERS	A	10 min.
Battery Charge (Amps)	A	10 min.
Battery Discharge (Amps)	A	10 min.
Battery Voltage (Volts)	A	10 min.
Battery Temp. (degrees C)	A	10 min.
Feedwater Flow (liters)	P	10 min.
Product water flow (liters)	P	10 min.
Water inlet Pressure	A	10 min.
Water outlet Pressure	A	10 min.
Water Inlet Temp. (degress C)	A	30 min.
Water Outlet Temp. (degrees C)	A	30 min.
HP Pumps Power (KW)	A	10 min.
HP Pumps Voltage (volts)	A	10 min.
HP Pumps Current (Amps)	A	10 min.

Meteorological Station

Parameter	Channel Type	Output Interval
Horizontal Insolation (kW/m2)	A	10 min.
Plane of Array Insolation (if appropriate) (kW/m2)	A	10 min.
Ambient Temp. (Degrees C)	A	30 min.
Humidity (%)	A	30 min.
Air Pressure (Kgr/m2)	A	30 min.
Wind Speed (m/sec)	A	10 min.
Wind Direction (degree)	A	10 min.

Existing Power Grid

Parameter	Channel Type	Output Interval
Grid line Voltage (volts)	A	Hourly
Grid line Frequency (Hz)	A	Hourly

APPENDIX E

WATER ANALYSIS FOR HURGHADA AND ZAAFARANA

Sea Water Analysis

(Hurghada)

ITEM	Red Sea Water at Hurghada
pH	8.4
Conductivity U mhos/cm^2	58 000
Partial Alkalinity mg/L as $CaCo_3$	10
Total Alkalinity mg/L as $CaCo_3$	135
Total Hardness mg/L as $CaCo_3$	752 0
Calcium Hardness mg/L as $CaCo_3$	11 00
Magnesuim Hardness mg/L as $CaCo_3$	642 0
Chloride mg/L as $CaCo_3$	33267.7
Sulphate mg/L as $CaCo_3$	3360.1
Soduim mg/L as $CaCo_3$	28359.9
Potassuim mg/L as $CaCo_3$	884.6
Iron mg/L as Fe	0.23
Barium mg/L as Ba	0.15
Strontium mg/L as Sr	8.8
Manganese mg/L as Mn	0.06
Total Dissolved Solid mg/L	386 00
Turbidity NTU	0.2
Silica mg/L as Sio_2	3.3

Site: ZAFARANA Date: 26-06-79

Sampling location: Profile n° 11 - depth 20m

DEPTH		Surface	4m	8m	16m	Bottom
Temperature (°C)		26.4	26.4	26.4	26.4	26.3
pH		7.9	7.9	7.9	7.9	7.9
Total settleable solids	mg/l	5	50	10	10	5
Organic settlable solids	mg/l	negligeable	neg.	neg.	neg.	neg.
Dissolved solids	mg/l	46,800	47,200	46,800	47,100	46,700
Total hardness	meq/l	158	158	158	158	159
Salinity w/w	%	4.53	4.57	4.54	4.56	4.52
Halides as Cl^-	mg/l	23,900	24,300	23,900	24,200	23,900
Sulfates as SO_4^{2-}	mg/l	3,400	3,400	3,390	3,390	3,380
Bicarbonate as HCO^3	mg/l	178	189	183	183	183
Na^+	mg/l	13,200	13,200	13,200	13,200	13,200
Ca^{2+}	mg/l	500	500	500	500	500
Mg^{3+}	mg/l	1,600	1,600	1,600	1,600	1,610
K	mg/l	460	460	460	470	460
Fe^{3+}	mg/l	0.12	0.36	0.12	0.08	0.04

ANALYSIS OF ZAFARANA SEA WATER

NOTE: The analysis at 16m depth was used in the preliminary conceptual design

SOURCE: EEA

APPENDIX F

TABLES OF COMPONENTS' SPECIFICATIONS

Wind Power System

ROTOR

Number of blades
Blade support
Axis of rotation
Diameter
Rotor centerline height above foundation
Rotational speed (at rated power)
Rotational speed (maximum)
Free running, rotational speed
with feathered blades:
Direction of rotation (looking upwind)
Orientation
Tilt angle
Power regulation
Cone angle
Solidity
Swept area
Tip speed at 42 RPM
Design tip speed ratio
Operational tip speed ratio range
Rotor power coefficient (maximum)
Torque at rated power

ROTOR CONTROL SYSTEM

Pitch control, type
Pitch rate, maximum
Overspeed control

HUB

Type
Material
Blade connection technique

Diameter
Manufacturer

BLADE

Construction
Material
Length (root to tip)
Ground clearance
Airofoil section
Pitch
Twist
Chord:
  Root
  Tip
Chord taper
Thickness
Manufacturer

GEAR UNIT

Type
Ratio
Rated power
Input speed
Output speed
Lubrication
Efficiency (at rated power)
Manufacturer

ENERATOR

ype
ated power
ower factor
oltage
hases
peed (at rated power)
fficiency (at rated power)
equency
nufacturer

ECTRIC POWER TRANSMISSION

wer transfer from nacelle

id connection

RAKING SYSTEM

ir brake:
Type
Brake set

Braking time
Manufacturer

chanical brake:
Type
Brake set/release
Torque (referred to main shaft)
Energy absorption
Manufacturer

TROL SYSTEM

e
ufacturer

ELLE

rial

nsions (L x W x H)
facturer

NTATION DRIVE

rotation rate
drive/damper

ial
t
ter
ending frequency
of access to nacelle
ion technique
ifcturer

'OUNDATION

'ype
'or diameter 10 m (33 ft):
  Concrete
  Reinforcement

EIGHTS

lade (incl. counterweight)
otor (blades and hub)
acelle
ower, lower section
      Upper section
      Total
otal system (excl. foundation)

ear unit
enerator

ERFORMANCE

ated power output
aximum power
ind speeds (at hub height):
  Start-up
  Cut-in
  Maximum power output
  Shut-down
  Maximum design

RO System

1. Membranes

- o Manufacturer, Country _____
- o Type _____
- o ODS _____

2. High Pressure Pumps

- o Manufacturer, Country _____
- o Number of Stages _____
- o Type _____
- o Operating Pressure _____
- o Operating Flow Rate _____
- o Operating Efficiency _____
- o NPSH _____
- o Dimensions _____
- o Weight _____
- o HP _____
- o RPM _____
- o Impeller Size _____
- o Impeller Material _____
- o Casing Material _____

3. **Pretreatment system**

- o Manufacturer _____
- o Number of Stages (Cleaning cycles) _____
- o Type _____
- o Operating Temperature _____
- o Weight _____

4. Chemical Feed Pumps (If Any)

- o Manufacturer, Country _____
- o Type _____
- o Number of Stages _____
- o Operating Pressure _____
- o Operating Flow Rate _____
- o Operating Efficiency _____
- o Dimensions _____
- o Weight _____
- o NPSH _____
- o HP _____
- o RPM _____
- o Impeller Size _____
- o Impeller Material _____
- o Casing Material _____

5. **Chlorinator**

- o Manufacturer, Country _____
- o Feed Rate (kg/day) _____

6. Well Pump

- o Manufacturer, Country _____
- o Type _____
- o Number of Stages _____
- o Operating Pressure _____
- o Operating Flow Rate _____
- o Operating Efficiency _____
- o Dimensions _____
- o Weight _____
- o NPSH _____
- o RPM _____
- o Impeller Size _____
- o Impeller Material _____
- o Casing Material _____

7. Battery

- o Manufacturer, Country _____
- o Type _____
- o Efficiency _____
- o Charging Max. Volt. _____
- o Charging Max. Current _____

- o Output Kwh _____
- o Output Voltage _____
- o Dimensions _____
- o Weight _____
- o Temp. Limits _____

8. Inverter (If Any)

- o Manufacturer, Country _____
- o Type _____
- o Rated Output Power _____
- o Rated Output Current _____
- o Output Voltage _____
- o Output Frequency _____
- o Rated Input Voltage _____
- o Dimensions _____
- o Weight _____