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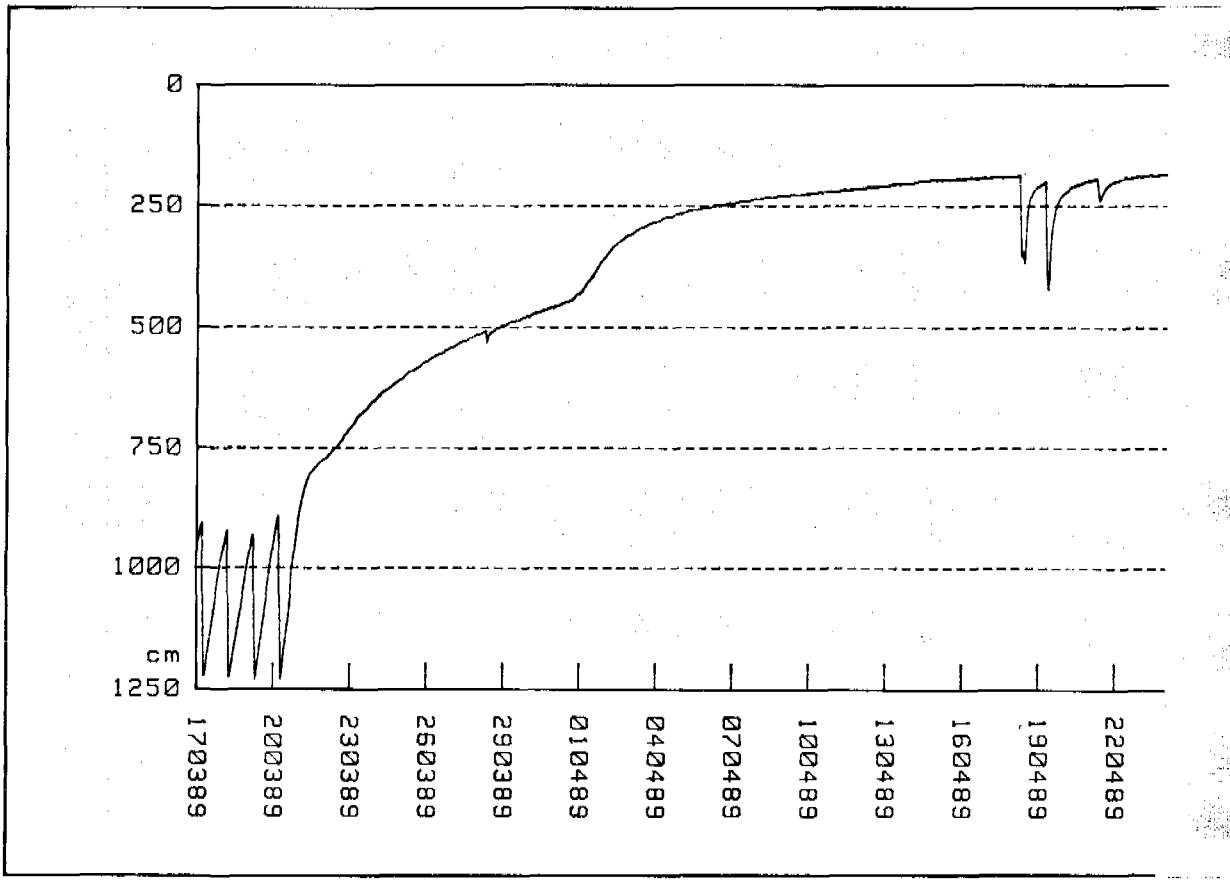
Technical note no. 35

Yemen Arab Republic / Kingdom of the Netherlands

Rada' Integrated Rural Development Project

Monitoring of hydrological and meteorological characteristics in Al Bayda Province, 1988



April 1990

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Yemen Arab Republic
Ministry of Agriculture
and Fisheries Department

Kingdom of the Netherlands
Ministry of Foreign Affairs
Development Cooperation
(Asia)

RADA INTEGRATED RURAL DEVELOPMENT PROJECT

MONITORING OF HYDROLOGICAL AND METEOROLOGICAL CHARACTERISTICS IN AL BAYDA PROVINCE 1988

Technical Note 35

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CONTENTS

LIST OF FIGURES

CONTENTS (Contd)

LIST OF ANNEXES

1 INTRODUCTION

The monitoring of ground water levels, wadi flow, rainfall and other meteorological data is one of the tasks of the RIRDP. The purpose of monitoring is to collect basic data for agricultural, engineering and other public activities. Especially activities in the field of water management and irrigation depend highly on the availability of above data measured on a regular basis over many years.

Data collection started in 1977 but increased substantially and has been carried out on a more regular basis since 1983 with the assignment of a resident hydrogeologist to the project. The project decided to use electronic recorders of the type developed by ITC-Enschede and after re-design produced by Siemens, The Hague, The Netherlands for the following reasons:

- To avoid expensive drilling of monitoring wells and the set up of expensive structures for installation and protection of mechanical recorders as well as for most electronic recorders.
- To limit visits for monitoring rainfall and water levels to the minimum in al Bayda province. Travelling is extremely time-consuming and costly due to bad road conditions and long distances. Usually only one site a day can be visited. The present network of rainfall stations and monitoring wells equipped with Rainlogs and Preslogs require only one visit per year for removal and installation of a new instrument and one extra visit before the rainy season to remove dust from the rain meter and check the rain container. More frequent visits required for mechanic rainfall and two-weekly visits to wells for water level measurements would require extra personnel and cars.
- Two-weekly visits to pumped wells do not yield the required rest water levels and are therefore useless. Only long records of hourly readings as measured with the electronic recorders provide us with reliable two-weekly rest water-levels as well as accurate information about pumping and recharge of groundwater after rainfall and wadi flow.

During the last year instruments as well as software for reading and processing of the data have been improved so that we expect that after some more training, maintenance and installation of the instruments can be carried out during the next observation period by the Yemeni staff with the HP-Vectra of the project. Training in processing of the monitoring data and proper presentation in reports forms one of the major tasks of the dutch staff members. Replacement of instruments by newer types which are still easier to process, requiring even less maintenance and with more application possibilities will continue during the next few years.

This report presents:

- rainfall and other meteorological data of 1988
- water level data collected by hand and electronic recorders;
- pumping hours of wells deduced from hourly water level data measured by the electronic recorders.

2 METEOROLOGICAL DATA COLLECTION

2.1 Al Khabar

All meteorological data collected at Al Khabar over the year 1988 are presented in Annex A. The data can be divided in measurements taken at 06:00 hrs and data taken at 15:00 hrs. Data that represent totals or maxima or minima of the whole day are listed together with the 06:00 hrs measurements.

Measuring practices and characteristics of instruments and stations can be found in the report on meteorological data collected at the Al Khabar meteo station 1978-1988 (Ilaco, 1989).

Apart from some missing data on a few single days, all weather characteristics are available over the whole year. Wind run data of a large part of July are lacking because the counter broke down. It was repaired on the site. Maximum temperatures in October are unreliable because the new installed thermometer was not treated correctly during the first weeks.

2.2 Ar Rawdah

Data from the automatic weather station in Ar Rawdah, 10 km west of Al Bayda town, are summarized in Annex B.

This station was set up in December 1987 by MOA and US-AID, with the help of RIRDP. The station is under responsibility of the Ministry of Agriculture and Fisheries, Irrigation department, meteorology section. The data are collected twice a year, and processed by computer in Sana'a.

The meteo station consists of an Omnidata logger provided with several sensors. The sensors attached register air temperatures, humidity, solar radiation, wind direction, wind speed, rainfall depth and soil temperature at a depth of 20 cm. Data are stored on an ordinary cassette tape. The site is on the land of Muhammed Muhsayn al Humayqani, who willingly offered a piece of his land for the meteorological data collection. The area of the instrument is fenced by a 1.5 m wire netting, surrounded by low bushes 0.5 - 1 m high. The growth of these bushes in future certainly needs attention in order to guarantee undisturbed measurements.

Coordinates of this station are: X = 552 km, Y = 1544 km. The site has an elevation of 2000 m above mean sea level (data derived from the 1 : 50 000 topographical map of the Yemen Arab Republic, first blueprint).

To make a comparison between the station in Al Khabar and Ar Rawdah possible, the data as received from the Irrigation department have been modified slightly; e.g. in Annex B maximum temperatures are processed to means instead of median month values. Calculated chilling hours have been added. Penman evaporation data could not yet be calculated.

3 RAINFALL MONITORING

3.1 Data

Data obtained from the various rainfall stations are listed in Annex C. For the sites see Figure 1. The registrations made by the Rainlog recorders could not yet be processed by computer because the software has to be adapted to filter variations caused by temperature differences throughout the day. Processing of the data sets will start soon because development of this part of the computer programme has been completed recently and is in its test phase.

Unfortunately some of the Rainlog graphs show extra large fluctuations due to clogging by silicon jelly of the air-hole for air pressure compensation of the pressure sensor of the Rainlog, see Figure 2. This clogging occurred during servicing of the instruments by the staff at the office. This error has been corrected recently by cleaning and opening of all the clogged air-holes during the visit of the senior geohydrologist to the RIRDP in December 1989. We doubt however if the data sets showing these extra large fluctuations can be processed accurately. For some stations preliminary calculations of rainfall have been made by reading rainfall from lists of pressure data at those places where pressure graphs of the water level in the collecting tube of the instrument indicate rainfall.

Data collection by the mechanical instruments continued as usual. Unfortunately the data series of the station Jawf an Nuqabah lacks quite some data. This was caused by the fact that the village could not be visited for quite some time because internal troubles in the village made it unsafe to visit the rainfall station.

From the collected data it can be concluded that for the area around Rada' the quantity of rainfall in the first rainy season of 1988 was above the average rainfall of the previous 7 years, whereas the second rainy season received more rainfall than average. The regional rainfall for the whole year is 5 % above average.

3.2 Proposed adaptations of the network

The rainfall station in Nata' became operational in March 1988. In discussions with the senior hydrologist Mr Jansen who visited the project for the land and water conservation programme in March 1989 we decided to set up some more stations in order to improve the network. Two Rainlogs will be installed in the catchment of the damsite at Mahajabah. One Rainlog will be installed in the valley, the other one on the rooftop of a house in the village nearby, so that differences in catch between the gauges at both sites can be studied. Another rainlog will be installed in the catchment of the dam being built near Al Bayda. The village of Ash Sharafah seems most suitable; it is situated in the middle of the catchment, and the RIRDP has contributed to a water supply scheme there. A fourth rainlog has to be installed in the Markhah district.

It is proposed to shift the recorder in Jubayr to Zakhim. Jubayr is not a very representative place to collect rainfall data, because it is situated at one of the highest mountains in the area. Zakhim is situated

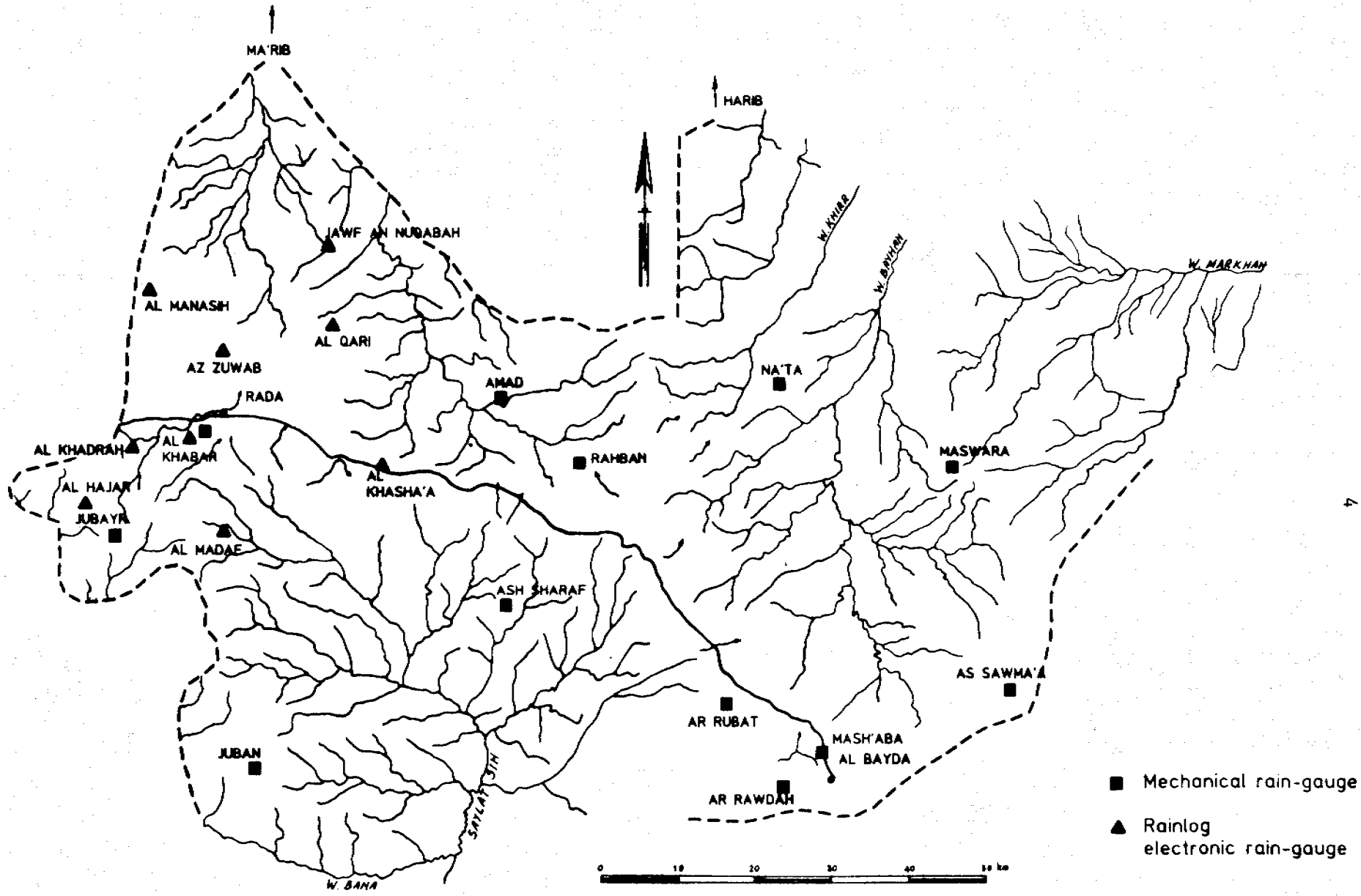


FIG. 1 LOCATION OF RAINFALL STATIONS IN AL BAYDA PROVINCE, 1988

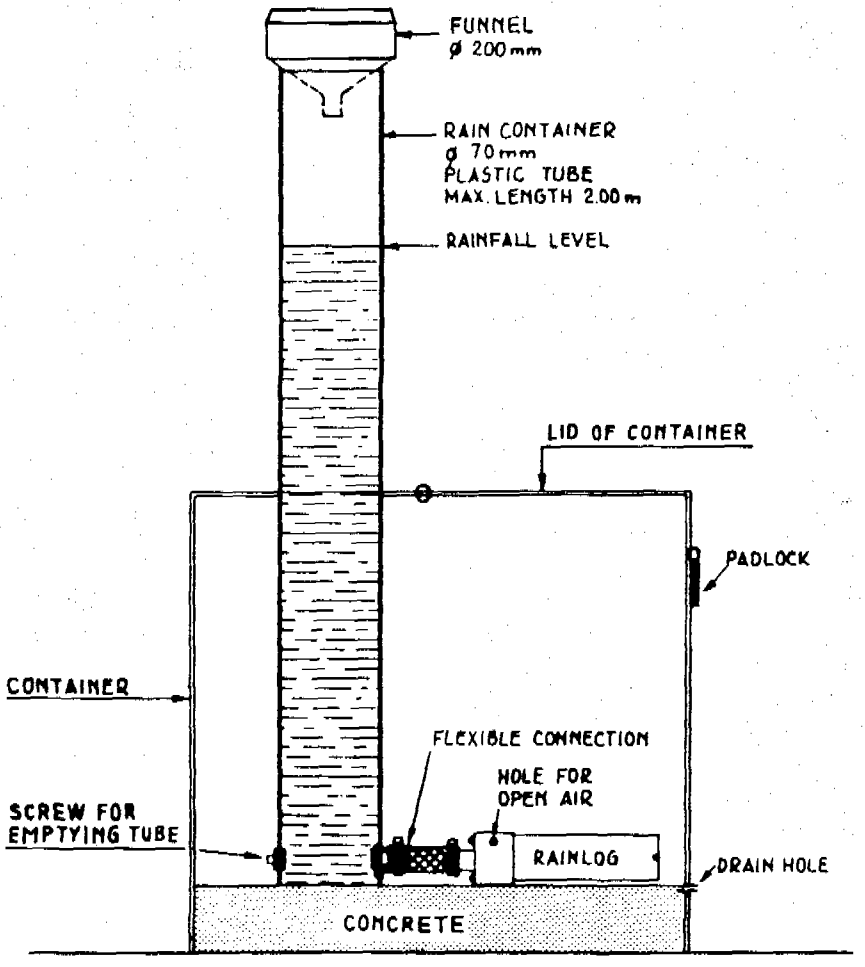


FIG. 2 SURFACE INSTALLATION OF A RAINLOG

more centrally in the Sabah area, and there is also an extension centre. After data have been collected successfully in Zakhim for about 2 years, the station in Al Hajar can be closed. The data collection there leaves a lot to be desired.

Except for the instrument to be installed on a rooftop in Mahajabah, all new gauges will be installed according to a new set-up described in Section 3.3. The old set-up with the rainfall recorder on a roof top was not functioning satisfactorily, and does not meet the standards for installation of rainfall instruments.

3.3 Improvements in the installation of rain meters with Rainlogs

3.3.1 Elimination of pressure fluctuation due to air pressure variation

During processing of the Rainlog pressure data several of the records showed abnormal large daily fluctuations. The reason was clogging by silicon jelly of the open hole for air in the Rainlog that causes that the pressure inside the instrument is equal to the air pressure. This pressure compensation is required in order to prevent fluctuations of several centimetres in the observed pressures caused by changing air pressure, that are much larger than the pressure changes in the order of millimetres in the rainfall container during rainfall and hamper the proper registration of rainfall. This silicon jelly was applied by the project staff in order to seal the Rainlog against for leakage. Therefore all Rainlogs were visited in November-December 1989. All Eproms were renewed and all the air holes were re-opened. Another very important detail is that all drums used as container for protection of the Rainlogs have a hole at the bottom in order to allow rainwater entering the container during storms can be drained immediately through this hole. In all the first installations the presence of this drain hole proved to be adequate for keeping the Rainlog dry and working, see Figure 2. The project staff was trained in maintenance and installation of the instruments so that a repetition of these errors in the future is reduced to a minimum. Unfortunately a number of the records show these unusually large fluctuations and will be difficult or impossible to process.

An important advantage of the change of all the Eproms in December 1990 during this mission is that all the Rainlogs have been started in a period of 2 weeks at the end of the year. This means that next year the rainfall falling in the year 1990 can be processed for all the Rainlogs in one time and published in one and the same monitoring report.

3.3.2 Elimination of pressure fluctuation due to temperature variation

Apart from fluctuations due to variations in air-pressure for which the Rainlog is normally compensated some pressure fluctuation is caused by the large fluctuations between day and night temperature in the Al Bayda province. This temperature of more than 30 ^{o}C/d causes some small daily fluctuation in the order of 3 to 8mm in the registered pressures of the Rainlog. This daily fluctuation has some influence on the accuracy of the rainfall data derived from the pressure values of the Rainlog which can be accounted for by the computer program but is better to avoid. From soil temperature measurements at Al Khabar it is known that the temperature at a

depth of 50 cm below surface level varies only about 1°C per day. Therefore a Rainlog was installed below ground surface, to see if the variations in registration of the pressure caused by temperature changes could be reduced. The set-up is described in Section 3.4 of this Chapter.

Figure 3 shows the results of a test with the new underground installation of a Rainlog, described later in Section 3.4 of this chapter, at the Al Khabar farm compared with results from the old set-up of installation at the surface shown in Figure 2.

Figure 3a shows the daily pressure variation of the water level in the rainfall container as registered by a Rainlog at ground surface, see Figure 2. Figure 3b shows the graph registered by the Rainlog installed with the sensor at a depth of 50 cm below surface, see Figure 4.
The resulting graph of the Rainlog is very satisfactorily. Pressure differences throughout the day stay within 2 millimetre which is the maximum possible accuracy of the instrument.

After this successful first test we plan to install all Rainlogs suitable for underground installation and where suitable sites can be found underground in order to come to an accurate registration of rainfall. A description of this installation design is presented in Section 3.4 of this chapter, Figure 4 shows the details.

3.4 Underground installations of Rainlogs

3.4.1 Reasons

There are two reasons for changing the way of installation of the gauges operated with Rainlogs from the present locations on roof tops to sites in the field :

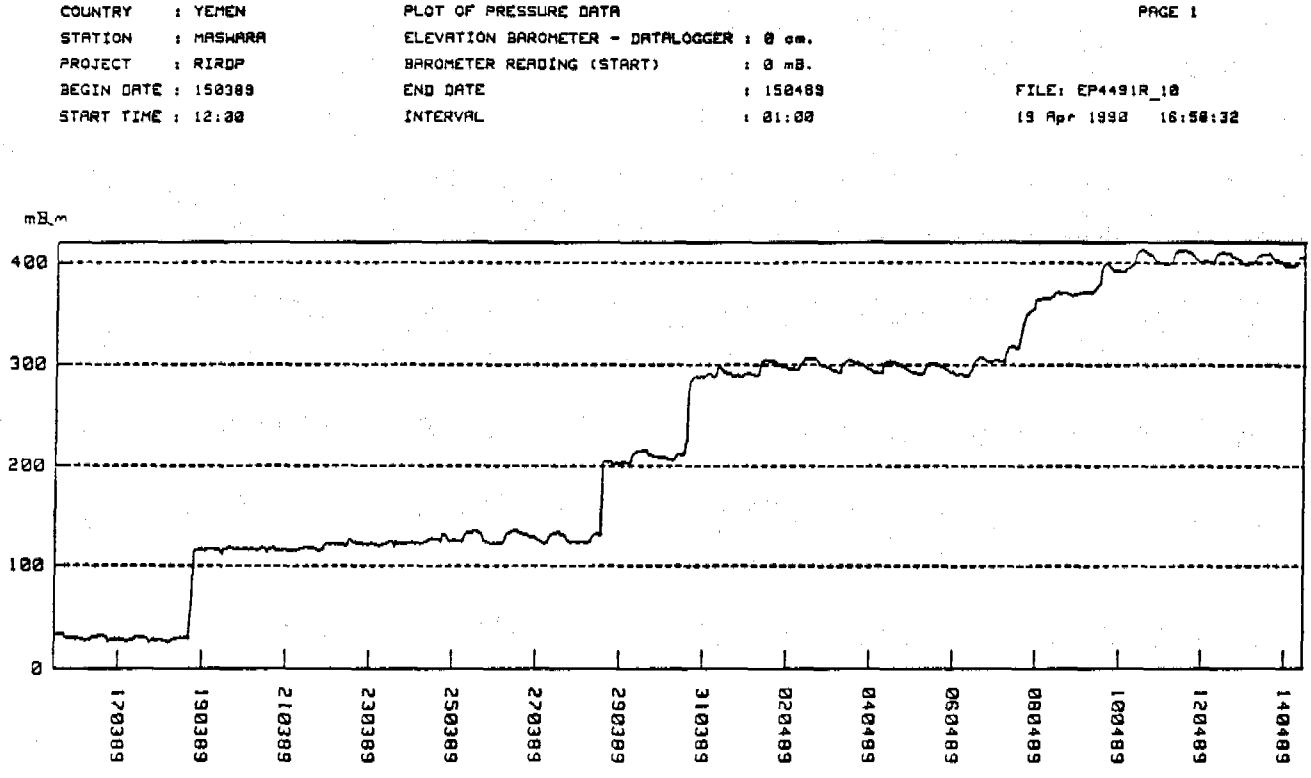
- Elimination of the influence of temperature variation on registered pressure data.
- Better protection of the instruments against unauthorized disturbance and damage when Rainfall recorders are installed at ground surface. Rainfall deficiencies caused by wind effects and losses in catch occurring with installation on rooftops will hopefully be reduced to a minimum;

However, underground installation of Rainlogs requires an absolute waterproof design and careful installation in order to eliminate flooding and damage of the instrument.

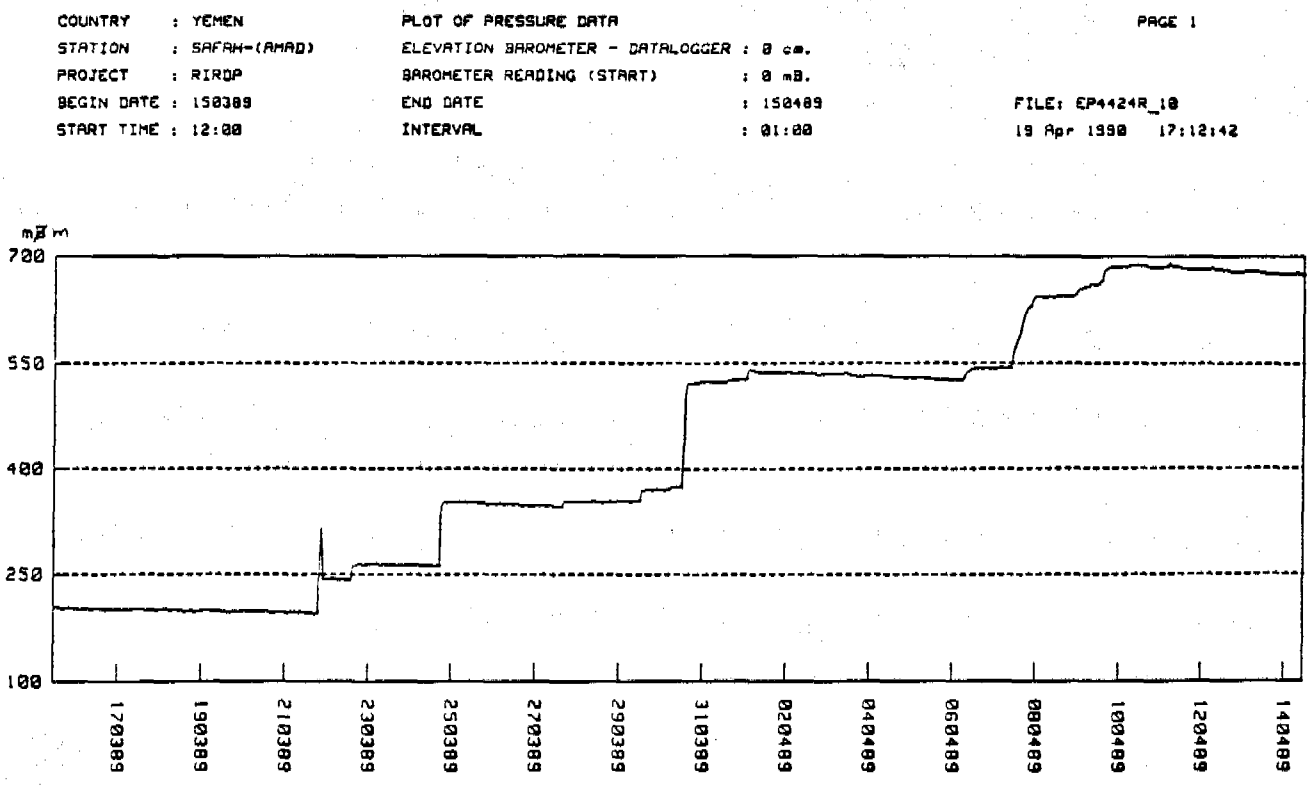
3.4.2 Recording of open pan evaporation

Registration of open-pan evaporation is carried out on a daily basis by the project at the Al Khabar weather station. Unfortunately the results seem often inaccurate due to errors made by the operator. In order to come to better evaporation data we connected a Rainlog to the evaporation-pan and installed it underground during this mission. Figure 5 shows the details of this installation.

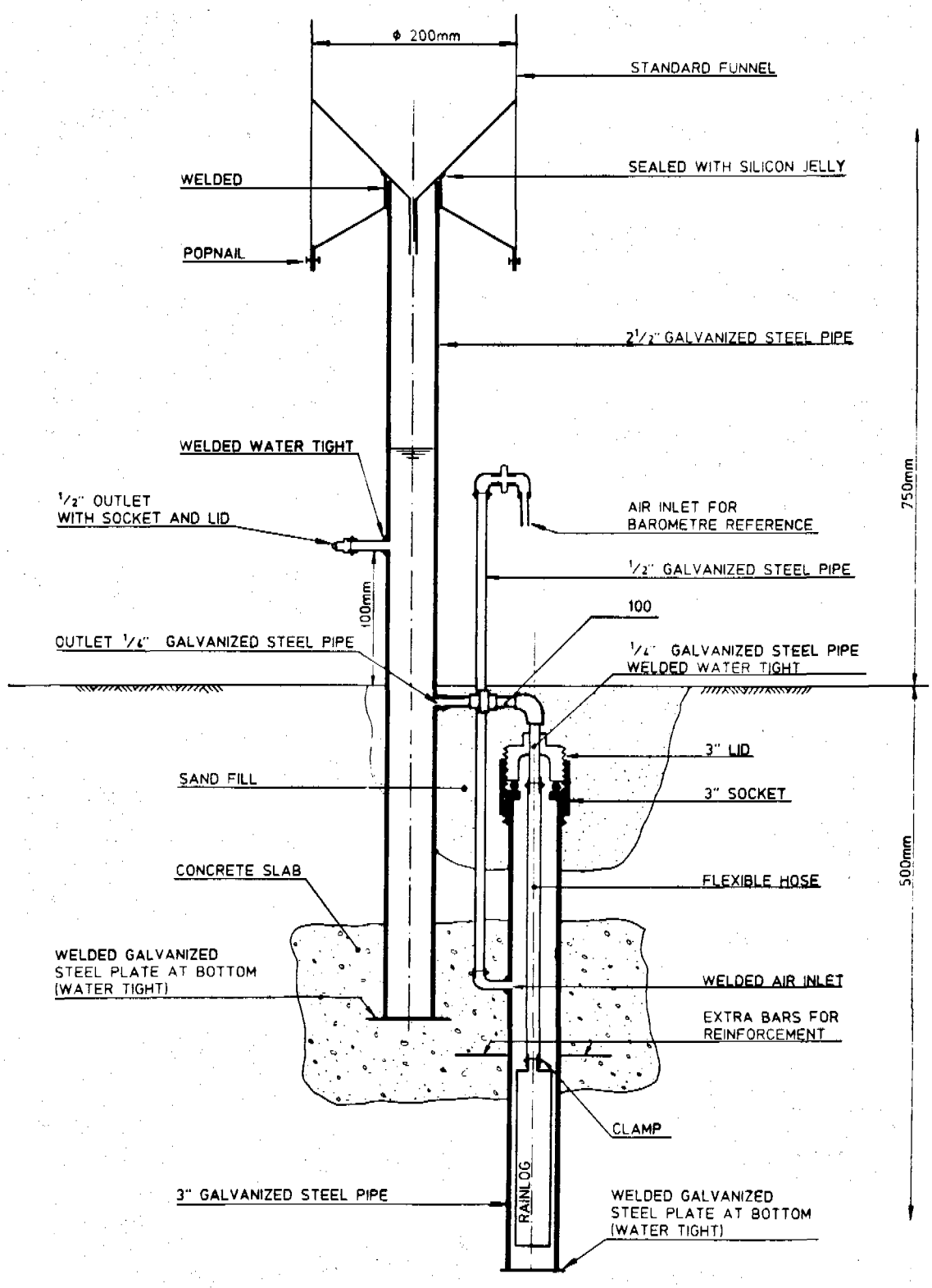
Figure 3 - Water level pressure in a rainfall container registered by a Rainlog



3a - Pressure fluctuations caused by daily temperature fluctuations of a Rainlog installed at the surface



3b - Smooth pressure graph as registered after underground installation of a Rainlog, see Figure 4



Check pipes and welding-connection on water tightness before installing !
Lid rainlog-pipe to be closed water tight with gas tape.
Connection of air inlet for barometer reference to be fixed water tight with gas tape

FIG. 4 RAIN CONTAINER WITH RAINLOG

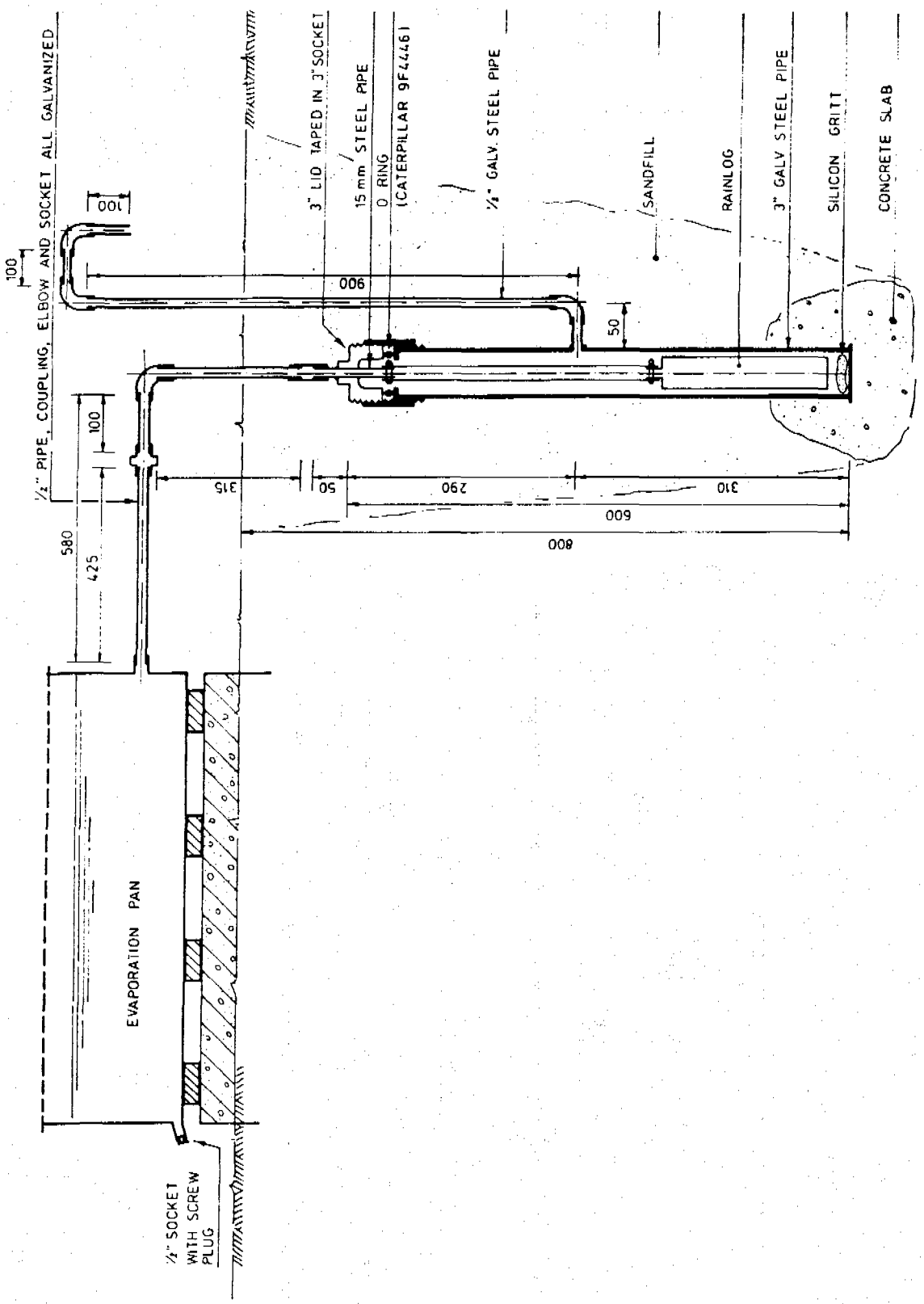


FIG. 5 EVAPORATION PAN WITH RAINLOG

3.4.3 Design of underground installation

Figures 4 and 5 show the detailed design of underground installation of a Rainlog connected to a rainfall container and an evaporation pan respectively. In both cases the design of the container for underground installation of a Rainlog should meet the following criteria:

- The container for underground installation of the Rainlog should be made of a galvanized iron tube with a length of 50 cm and an inner diameter of 75mm.
- The container should be closed absolutely water-tight. This is achieved by welding of the bottom of the container and closing of the top of the container with a screw-cap and a 75mm O-ring type CAT 9R4446 of Caterpillar.
- The waterproof closure of the container should be checked without Rainlog inside, by using an air pressure of at least 12 Bar (available at the workshop) and soap suds.
- The Rainlog is connected by means of a flexible hose and clamps to a small iron connection pipe welded in the cap. This pipe is connected to the pipe that connects the Rainlog with the evaporation pan or the rainfall container.
- In order to prevent damage of the Rainlog by moist or water inside the container we added a sack of silicon grit to absorb the water.
- It is very important to make an air-outlet connecting the Rainlog container with the open air in order to ensure a proper air pressure compensation of the Rainlog. To this purpose an extra tube has been welded to the container with its outlet approximately 50 cm above ground level. An extra U-bend is connected to this pipe to prevent the inflow of water during flooding. Some wire gauze is put into the outlet pipe against insects entering the pipe.
- The container with the Rainlog inside is positioned below the ground surface with the sensor at a depth of about 50 cm and fastened in the ground by concrete.
- The standard funnel of the rain meter is mounted on top of a 2.5 inch galvanized steel pipe functioning as rainfall container, fastened in the ground by concrete. There are two outlets, one to remove the water when the rainfall container is full, and one that is connected with the Rainlog.
- To prevent evaporation from the cylinder as much as possible, the connection between the rainfall funnel and the rainfall container is sealed with silicone jelly. When the rainfall container is emptied, or when the Rainlog is started, care should be taken to fill the rainfall container with water at least 20 cm above the outlet for the sensor. During dry periods, especially in summer, the evaporation may cause the water level in the rainfall container to drop 10 cm per month! Therefore the best time to visit the rainlogs is just before the start of the rainy seasons, in February and July. However, when no rain occurs, another visit should be made within 3 months in order to refill the cylinder. When the water level in the collecting cylinder drops below the sensor outlet, no rain will be registered until the water level rises enough to fill the outlet to the sensor.

3.5 Improved surface installation of Rainlogs

A very important limitation of the suitability of a Rainlog for underground installation is that the height of the water column above the Rainlog and the water level in the evaporation pan or in the rain container should not exceed the measuring range of the Rainlog. The minimum range for underground installation of a Rainlog is 2 meter. Most of the Rainlogs in use at RIRDP have unfortunately two different measuring ranges of 1 meter for the oldest instruments and 2 meter for the instruments of later date. The newest Rainlogs ordered by the project, but not yet arrived, have a measuring range of 4 meter.

- Therefore the Rainlogs with the numbers 4407, 4410, 4421, 4422, 4423, 4424, 4425, 4426, 4428, 4429, 4430, 4431 and 4434 (or 4344) with a measuring range of only 1m (=1000mm) are unsuitable for underground installation. Also the diameter of the metal ring with screws make the 2 oldest instruments 4407 and 4410 with the ring welded in the top of the container unsuitable for this type of installation.
- At this moment only Rainlogs with the numbers 4483, 4484, and 4491 with a red LED indicator have a measuring range of 2 meter and are suitable for underground installation. Also the 6 new Rainlogs (type COM-loggers with the numbers R185016, R185017, R185018, R185020, R185021, R185024) ordered by the project with a measuring range of 4m can be installed underground.

In order to find a reasonable short term solution for reduction of undulations of the pressure data due to the large fluctuations in day and night temperature for the Rainlogs on roof tops and Rainlogs that are unsuitable for underground installation due to their limited measuring range of 1000mm only, we recommend:

- wrapping of the Rainlog container in some insolation material without the danger of moisture built-up in the instrument. Aluminium-coated insolation sheet to be purchased from Arnhem would be a very good and cheap material. This easy to apply measure may already reduce the pressure fluctuations considerably to a more acceptable level for accurate processing of rainfall with BARRY or LOGPRO. We shall try out this solution during the next visit by Mr H. Nieuwenhuis or myself to Yemen.

Extra attention should be paid to the presence of open drainholes at the bottom of the container as indicated in Figure 2 in order drain rain water entering the container with the Rainlog so that the instrument is not flooded. Missing of these drainholes in the bottom of the container results in the danger of acute flooding of the instruments during heavy rainstorms which damaged Rainlog 4431 at Juban.

4 MONITORING OF WATER LEVELS

4.1 Rada basin

4.1.1 Water level data

Water level data collected by hand measuring in the Rada' basin are presented in Annex D. Results from Preslog registrations from the whole province are shown in Annex E. Figure 6 shows the location of the monitoring wells for the measuring of water levels in the Rada basin.

The drop of water levels already visible for several years continued in all areas. In the area between Bayt al Ya'ayshi and Farazi'ah locally very deep water levels of more than 100m below surface were reported. In the well drilled for the drinking water supply of Bayt al Ya'ayshi the water level was found to be at 173 m below surface. It must be concluded that aquifer in the south west of the Rada basin is almost depleted.

The well in Jayf (0375) was closed with a new lock by the owner in the beginning of 1988, so that measuring was not possible unfortunately for some months. Finally this problem could be solved in July.

4.1.2 Changes in the monitoring network

The shallow well in al Hajafah (0366) fell dry so that monitoring had to be stopped. Water in that area is now mainly abstracted from boreholes. No well could be found yet in the direct vicinity to continue measuring.

A borehole for monitoring was found in Ghawlays as Sianim close to the monitoring hole that fell dry in 1987, so that monitoring could be resumed in this area. The borehole (0392) was previously in production, but pumping was stopped because the yield dropped.

In Ghawl adh Dhrah monitoring was started in the well of the water supply scheme (0377). Monitoring was deemed useful here, because the site is just upstream of the future well field of the Rada' water supply.

4.2 Water level monitoring in Al Bayda province with Preslogs

In the Rada basin monitoring of water levels can be carried out by hand or by means of mechanic recorders. Electronic recorders or Preslogs have been installed in the rest of Al Bayda province and in some monitoring wells in the Rada basin. Figure 7 shows the location of Preslog monitoring stations in the Al Bayda province. Water level monitoring with Preslogs are carried out for all of the following reasons:

- Visits of boreholes twice a month and monthly visits of rainfall stations all over the province is too time-consuming and costly because it would require extra cars and personnel to maintain the necessary monitoring network.

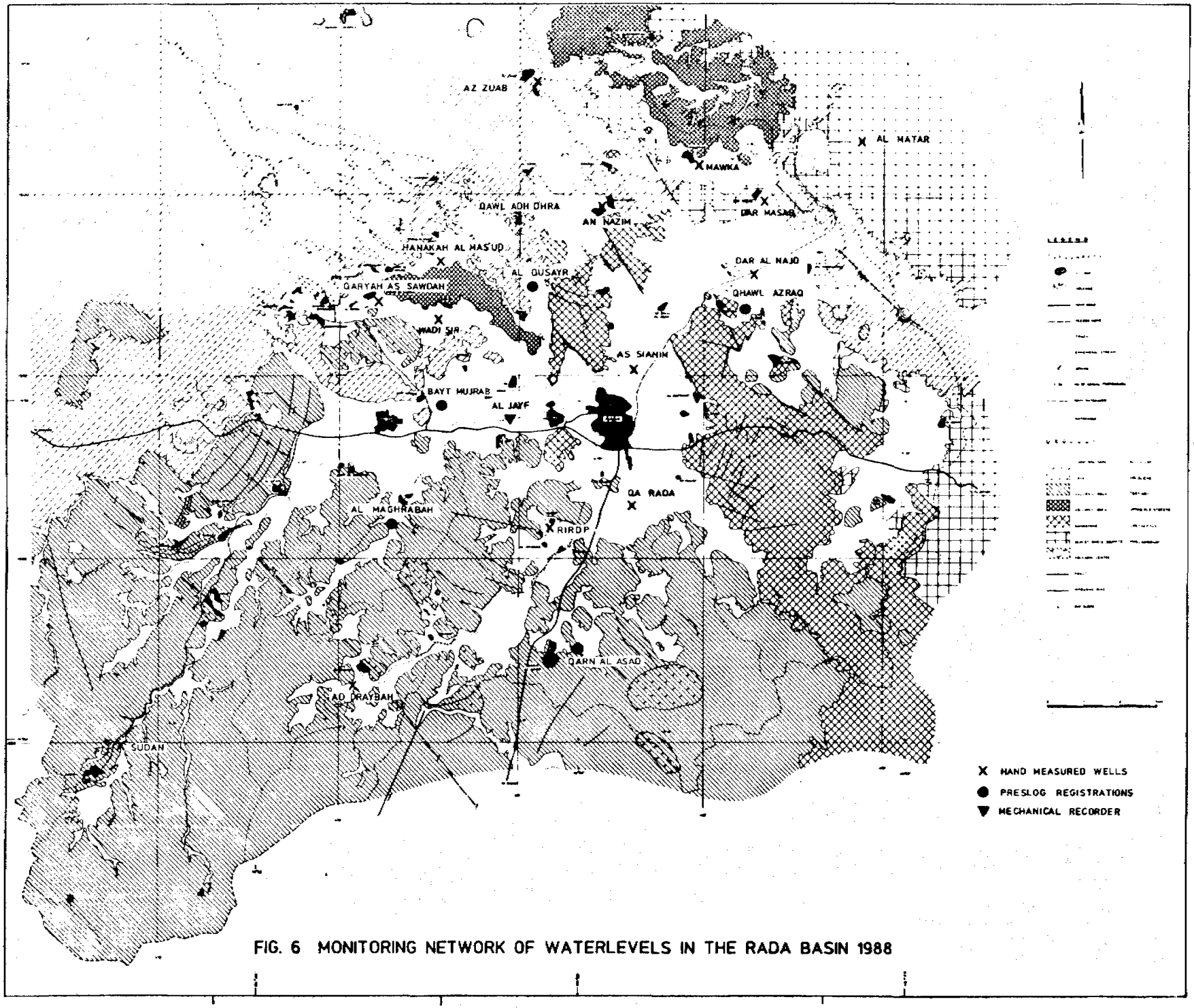


FIG. 6 MONITORING NETWORK OF WATERLEVELS IN THE RADA BASIN 1988

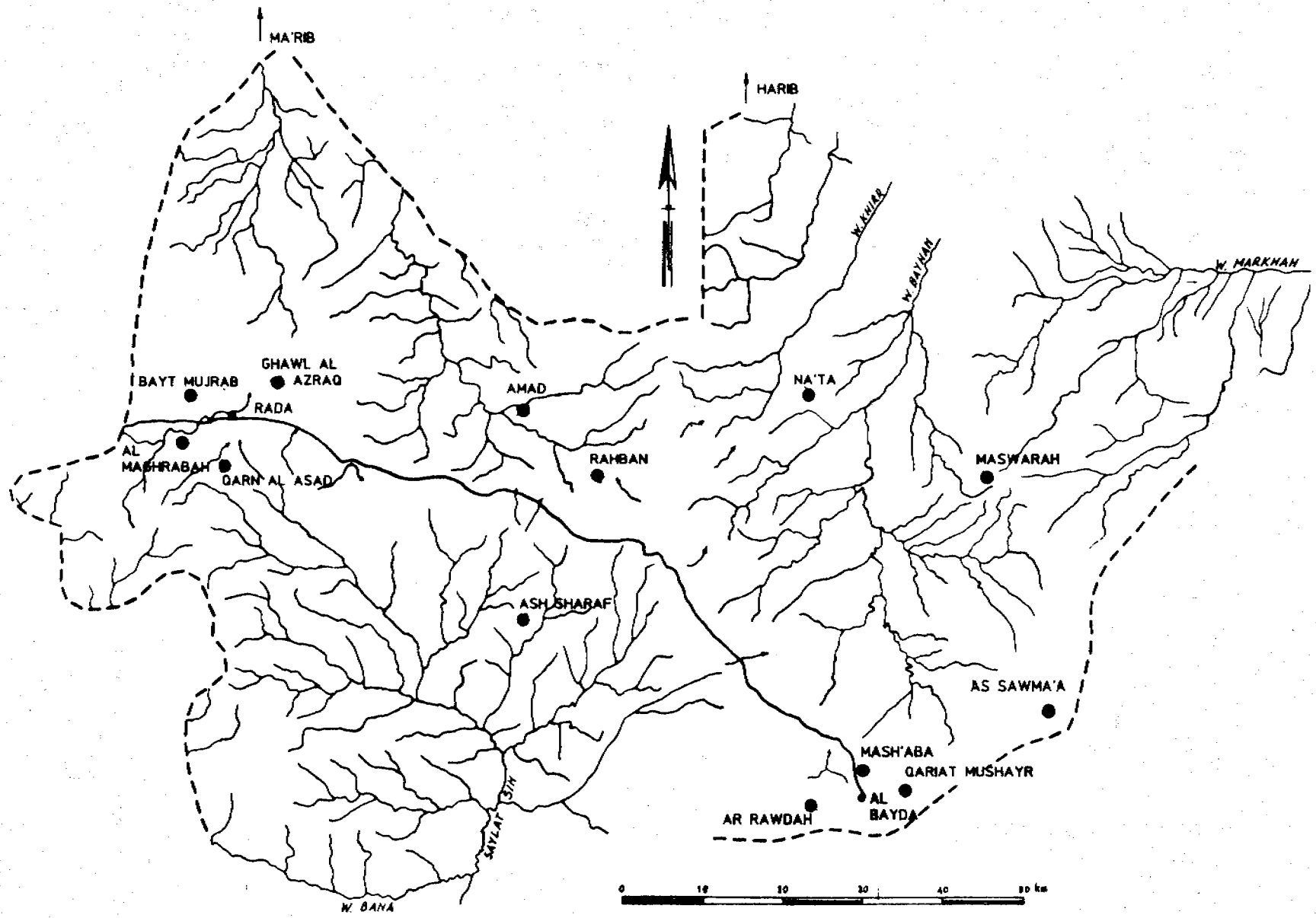


FIG. 7 LOCATION OF PRESLOG WATER LEVEL MONITORING STATIONS IN AL BAYDA PROVINCE, 1988

- All the monitoring wells in the province are shallow wells equipped with pumps. The water level in these wells fluctuates with pumping. Therefore a water level measured at any time during a visit usually will not represent the required rest water level but some deeper water level depending on the time of observation and the pump activities of the farmer. Such water levels are of little to no use for monitoring purposes devaluating visits to monitoring wells equipped with pumps. The only remedy would be the drilling and installation of our own monitoring boreholes by RIRDP. This expensive operation would be a heavy burden on the budget of the project.
- Preslog records of hourly readings provide us with information about pumping hours by the farmer which is of great use in determining groundwater abstraction for irrigation in the area.
- Installation of the whole instrument under water in the well is cheap and protects the Preslog adequately against unauthorized disturbance and damage. Installation of Preslogs in the province has been described in detail in the monitoring report by RIRDP 2nd phase of 1988. This type of installation proved to be safe because no further damage or loss of instruments was caused by disturbance by unauthorized people or theft.

Preslogs and Rainlogs should be replaced by new instruments every 3 years which may be extended to every 5 years for the newer types arriving at the project during 1990. Changing of batteries has to be carried out every 2 years or 20 000 registrations for the older types of Preslogs and Rainlogs and only every 5 y ears or 50 000 registrations for the new type of Preslogs or Com-loggers.

One of the oldest type of instruments Preslog 4320 in use for three years ceased working beyond repair after 12 months of operation during its third registration period.

We may conclude from this, that without the use of Preslogs and Rainlogs the required rest water-levels and rainfall data could not be collected and would be much more expensive in staffing and extra cars.

4.3 Training of project staff in processing of Preslog data

In November-December 1989 during a mission of the senior hydrogeologist the processing of Preslog data was carried out as an exercise by the project staff. This comprised:

- the processing of preslog data with LOGPRO;
- the drawing of water level hydrographs and;
- the determination of daily pumping hours and 2-weekly rest-water levels.

The daily pumping data and 2-weekly rest water-levels have been typed into tables within the LOTUS spreadsheet program. All data and the graphs are presented in Annex E.

4.4 Better protection of Preslogs against damage by leaking

In order to diminish the loss of data and Preslogs by malfunctioning and leakage as happened recently with Preslog 4428 we propose the following measures:

- check the batteries and replace them at least after every 20 000 readings (2 times of use);
- replace the O-rings in the lids of the Preslogs after every opening for instruments with one O-ring, and after every second time for Preslogs with 2 O-rings;
- apply the silicon jelly between the lid and steel container before closing of the Preslogs. Wait 24 hours with installation to let the silicon jelly dry.

Experience with the newest type of Preslogs and Rainlogs show that the screw cap at the bottom plate of these COM-loggers, to be started and read-out with LOGUTY or BARRY, sometimes do not remain water tight under tropical circumstances in an aggressive saline and oxygen-poor environment due to some corrosion of the stainless steel. In order to prevent leakage and damage as much as possible we propose the following effective, easy and cheap measures:

- Replace the steel screw caps by the nylon screw caps supplied by Siemens and sent with the Preslogs.
- Wind teflon tape around the thread of the screw cap that closes the communication hole at the bottom plate of the Preslog.
- Apply silicon grease of Siemens between the screw cap and the bottom plate before closing of the logger.
- Replace the O-ring frequently, every time after a long period of data registration. Keep for this purpose a stock of O-rings to be ordered at Euroconsult.

4.5 Combined registration of wadi-flow, groundwater levels and rainfall

Waterlevels observed with Preslogs in wells inside the wadi-bed and in wells at some distance from the wadi show that infiltrating floodwater during floods have a marked influence of the groundwater level. Rises of the groundwater level of 1 to 6m during and shortly after one or more floods has been observed in several of the groundwater level hydrographs measured by Preslogs in open wells in and near wadi-beds. Figures 8a-d show the principle of recharge of the groundwater adjacent to a wadi bed by lateral inflow from the sand aquifer in the wadi during and after the passage of a flood. Figure 8b shows a characteristic flood peak in a wadi with a total duration of only 4 hours. This is followed by the almost immediate rise of the groundwater table of several metres with a duration of approximately one day followed by a gradual declining water table in the sand aquifer below the wadi bed, see Figure 8c. Figure 8d shows the rising water table in a shallow irrigation well in the weathered rock aquifer adjacent to the wadi. The water level rises gradually over a period of several weeks under the influence of recharge by infiltrating rainfall and of lateral inflow from the sand aquifer below the wadi from a depth of 10 m to less than 2m below ground surface. Unfortunately there exists no synchrone data set showing wadi floods, the reaction of the groundwater level in the wadi bed and in a well at some distance from the wadi.

In order to obtain a better insight in the relation between rainfall, wadi flow and recharge of groundwater by floodwater we propose that:

- the two sub-sections geohydrology and hydrology combine monitoring of rainfall, wadi-flow and groundwater levels below and in the aquifer near the wadi-bed by means of Preslogs and Rainlogs at 4 selected sites in the Al Bayda province;
- to employ for a period of 6 months a junior engineer in hydrology with the following tasks described in more detail in the proposed terms of reference in Annex F:
  - to assist with the field work for monitoring and civil works;
  - to collect, study, process and evaluate the data;
  - to carry out the necessary hydrological and model studies resulting in conclusions about the recharge of groundwater by flood water under natural and controlled conditions;
  - to work out and propose measures to improve the infiltration of flood water in wadi beds aimed at extra recharge of the groundwater in irrigated areas.

The above proposal was discussed with Mr T.G.H. Jansen who will investigate the feasibility and use of this proposed study and discuss it with the project management during his next visit to the project.

5 MONITORING WELL ABSTRACTION

Hourly water level data registered by Preslogs in pumped irrigation wells used as water level observation points yield 2-weekly rest water levels presented in Annex F as well as daily pumping hours. Pumping hours are determined with the help of the subroutine PUMP of CALCULATION in the LOGPRO package. Improvements in the programme eliminate inaccuracies in the pumping hours published in previous reports. Therefore we decided to process al previous data sets again and publish the results of all the records in Annex G. The programme counts the hours of falling water levels caused by pumping taking a threshold and some other parameters into account. During long periods without rainfall where the water level in some of the wells falls below the depth of the sensor the resulting graph does not show the complete water level fluctuation and yields too long pumping periods. In all those cases corrections have been carried out on the pumping hour data using the water level graphs of Annex F. The tables with pumping hours from wells in the Rada basin have been very useful in determining reliable estimates of monthly water abstractions by wells in the groundwater model study of this area. We note that many of the wells in the Al Bayda province can be pumped only during one or two hours at a time one to three times per day indicating limited aquifer conditions.

6 WATER QUALITY

Annex H shows the Ec-values measured one to three times per year in some observation wells in the province. Although the results show some changes no conclusions can be drawn yet about deterioration or improvements in water quality.

7 RECOMMENDATIONS

Referring to the severe groundwater situation in the Rada basin and in order to be able to take sound water management decisions it is very important to obtain regular water levels from selected observation wells in the Rada basin. The project should therefor try to find permanent observation boreholes:

- at Al Khabar where we propose to use borehole A just south of the farm in case it is taken out of production. To this purpose the borehole should be cleaned and protected against the inflow of water during floods;
- at Faraza'h where a galvanized iron tube should be installed up to a depth of 160m in order to resume water level observations without damaging the water level meter. Another possibility may be to find another abandoned deep borehole that can be used as permanent observation borehole;
- to find a suitable borehole 1 to 2 kilometre north of wadi Tha on the lava plateau of Jabl Isbil in order to record the water level in the recharge area of the Rada basin at the boundary of the groundwater model. This to check the calibration results of the model.

Find one observation well for installation of a Preslog near each of the 14 rainfall stations in the province where this is not yet the case. This in order to monitor the relation between rainfall and the groundwater situation in the province.

Combine the monitoring of wadi flow with water level observation below the wadi bed and in adjacent irrigation areas if possible at 4 sites in the province. This in order to monitor the relation between recharge of groundwater and wadi flow under natural as well as controlled conditions. The sites should be combined with the rainfall stations in the province where possible in order to prevent an extra expansion of the monitor network.

In order to improve the results of rainfall registration it is necessary to reduce the daily temperature fluctuation of the Rainlogs and to install the rain meters on the ground surface instead of on the relatively safe rooftops. We recommend therefore insolation of the instruments with suitable insolation sheets or underground installation of Rainlogs as described in chapter 4 and already carried out at Al Khabar. Software solutions to eliminate the fluctuations are developed with help of the Agricultural University and may be available soon incorporated in the LOGPRO package.

In order to prevent damage of Preslogs by water it is of the utmost importance to renew the O-rings periodically and to apply silicon jelly to seal the instruments after changing Eproms or reading of the new Com-loggers. Teflon tape should be wrapped around the thread of the screw cap of the Com logger as extra barrier against leakage. These cheap measures are easy to apply and prevent damage of the instruments.

To start a well inventory of the Rada basin in order to obtain an updated insight in the present situation of groundwater abstraction which can be used in water management.

To order a SPOT satellite photo in May 1990 in order to obtain an up to date map of the area under irrigation

To find a limited number of four sites in the Al Bayda province for the combined observation by means of Preslogs of:

- wadi flow during floods;
- infiltration of flood water in the wadi bed;
- recharge of the groundwater reservoir in areas with irrigation near wadis.

Preference should be given to sites near existing rainfall stations in the province.

Annex A

Meteorological data
Al Khabar
1988

Al Khabar Meteo station Month: January Year: 1988 regular observation time: 6:00 hrs

date	T wb	T db	R hum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun	Chill
1	7.2	7.5	100	NW	36	8	12.0	15.0	19.6	21.7	19.0	6.0	5.0	0.0	2.9	9.6	1.8
2	10.5	10.7	100	SW	63	4	13.0	15.0	-	21.8	24.0	10.0	8.0	0.0	7.2	2.9	0.0
3	11.0	12.0	98	NE	-	8	17.0	19.0	20.8	21.5	22.0	8.0	7.5	0.0	3.0	8.1	0.0
4	*9.8	*10.5	98	NE	37	8	*17.0	*19.0	21.3	22.0	21.5	5.0	3.5	0.0	5.3	8.6	2.9
5	4.0	5.0	95	SW	37	0	12.0	17.0	20.8	22.3	24.0	5.0	3.0	0.0	6.5	10.5	2.5
6	-0.5	1.5	69	SW	33	0	10.0	15.8	20.2	22.3	24.0	2.0	-1.0	0.0	4.2	10.5	5.5
7	-2.5	0.3	50	NE	36	2	9.2	15.0	19.5	22.0	25.5	0.0	-2.0	0.0	5.1	10.5	6.6
8	*9.5	*10.5	87	NE	32	0	*14.0	*17.8	*20.5	22.0	26.0	3.0	1.5	0.0	7.0	9.6	4.2
9	3.0	5.0	74	NE	50	2	12.8	17.3	21.0	22.3	23.0	5.0	4.0	0.0	6.4	9.8	2.7
10	8.0	8.5	100	NW	38	8	15.0	18.2	21.2	22.4	23.0	8.0	6.5	0.0	5.1	8.0	0.0
11	4.0	5.0	95	NW	53	0	12.5	17.3	20.8	22.4	25.0	3.0	1.0	0.0	6.6	10.4	4.4
12	2.2	4.0	85	NE	32	0	12.2	17.0	21.0	22.5	25.0	4.0	2.5	0.0	5.1	10.5	3.4
13	7.3	10.3	81	NW	78	0	13.5	17.8	21.2	22.5	24.0	7.0	4.5	0.0	6.3	9.8	0.0
14	2.0	3.5	73	NW	43	0	10.8	16.8	20.8	22.5	22.5	4.0	2.5	0.0	5.9	10.5	3.9
15	1.7	3.0	78	NW	39	0	10.3	16.5	20.2	22.4	24.0	3.0	1.5	0.0	5.9	10.4	4.6
16	7.2	8.8	84	SE	62	6	13.5	18.0	21.0	22.4	25.0	4.0	2.5	0.0	5.1	6.4	3.4
17	6.5	7.5	88	NW	109	2	13.5	18.0	21.2	22.4	24.5	7.0	4.0	1.4	4.7	7.8	0.0
18	*11.0	*11.8	90	SE	91	2	*15.0	*18.8	21.3	22.5	24.5	3.0	2.0	0.0	4.5	5.7	4.5
19	5.5	6.0	100	NE	53	0	10.5	16.0	19.3	22.3	21.3	6.0	4.0	0.0	4.2	7.8	1.6
20	1.3	2.3	82	NW	64	2	10.0	15.6	19.3	22.0	20.3	2.0	-2.5	0.0	5.9	8.1	6.6
21	-0.5	1.3	65	NW	10	0	8.3	14.5	18.6	21.6	23.5	2.0	0.0	0.0	-	10.1	5.6
22	2.5	4.5	68	NW	50	0	11.0	16.3	19.8	21.5	23.5	4.0	2.5	0.0	-	10.1	3.7
23	1.0	3.5	60	SW	34	0	10.8	17.4	20.2	21.8	22.0	3.0	2.0	0.0	-	10.3	5.1
24	0.3	2.0	69	NW	56	0	10.3	15.2	20.0	22.0	24.5	2.0	1.0	0.0	-	10.7	5.3
25	0.3	3.0	47	NW	72	0	10.0	15.8	19.8	22.0	26.0	3.0	0.5	0.0	-	10.7	4.2
26	0.5	2.5	45	SE	45	0	10.2	15.8	20.0	22.0	26.5	2.0	0.5	0.0	-	10.5	4.9
27	4.0	5.0	72	SW	74	0	13.0	18.0	21.2	22.0	23.5	6.0	4.0	0.0	-	10.6	1.4
28	0.0	2.5	48	SW	85	0	11.0	17.0	20.8	22.4	25.5	2.0	1.0	0.0	-	10.7	5.1
29	1.5	3.5	53	NE	53	0	10.2	16.0	20.0	22.3	26.0	3.0	1.0	0.0	-	10.7	4.2
30	2.0	4.0	66	SW	54	0	11.2	17.0	20.8	22.3	24.5	4.0	2.0	0.0	-	10.8	3.5
31	5.3	6.0	95	NE	45	0	12.0	17.8	21.0	22.4	25.0	5.0	3.0	0.0	-	11.0	2.4
no/rg	28	28	31	31	30	31	28	28	29	31	31	31	31	31	20	31	31
total				NE 29%	1564									1.4		291.7	103.7
mean	3.4	5.0	78	SE 10%	52.1	1.7	11.6	16.6	20.4	22.1	23.8	4.2	2.4		5.3	9.4	
max	11.0	12.0	100	SW 22%	109		17.0	19.0	21.3	22.5	26.5	10.0	8.0	1.4	7.2	11.0	
min	-2.5	0.3	45	NW 39%	10		8.3	14.5	18.6	21.5	19.0	0.0	-2.5		2.9	2.9	
					1.61 m/s						number of rainy days:			1			

* unreliable data

Al Khabar Meteo station Month: January Year: 1988 regular observation time: 15:00 hrs

date	T wb	T db	R hum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	13.5	17.5	71	SE	91	8	35.5	22.0	19.8	21.4
2	14.2	23.0	50	NW	131	6	31.2	24.8	20.6	21.2
3	15.0	22.0	60	NE	-	8	31.5	26.0	21.5	21.5
4	15.0	23.0	65	NE	47	4	32.0	25.0	22.4	21.8
5	11.2	23.0	35	NE	49	2	35.0	25.8	21.2	22.2
6	11.0	23.5	30	NE	39	0	34.2	25.2	20.6	22.0
7	12.0	24.7	27	SE	126	0	35.0	25.8	20.2	21.8
8	15.0	23.0	38	NE	67	-	36.0	25.8	20.8	21.8
9	13.7	22.0	45	NE	95	2	35.5	26.8	21.8	22.3
10	12.7	22.7	47	SE	63	0	34.5	26.2	21.8	22.2
11	11.3	21.0	45	NE	43	0	32.0	25.5	21.6	22.2
12	13.0	25.0	37	NE	66	0	36.0	26.8	21.8	22.4
13	13.5	22.5	37	NE	72	0	35.2	26.8	22.2	22.4
14	10.5	20.5	32	NE	79	0	33.0	26.3	21.0	22.4
15	10.5	20.0	33	NE	51	0	33.5	26.5	21.2	22.2
16	13.5	21.8	38	NE	85	2	35.5	27.0	22.0	22.2
17	12.5	20.8	39	NE	82	2	35.7	27.0	21.5	22.2
18	15.0	18.0	76	SE	41	6	25.5	25.3	22.2	22.4
19	14.5	21.0	51	NE	87	2	34.0	25.2	20.5	22.0
20	11.5	18.5	38	NE	54	0	33.5	23.5	20.2	21.8
21	14.4	22.3	38	SE	92	0	34.2	25.3	20.2	21.4
22	14.5	20.0	39	NE	50	0	35.0	25.3	20.6	21.3
23	13.0	21.8	40	NE	68	0	35.2	25.3	20.7	21.7
24	14.5	23.5	35	NE	59	0	35.3	25.8	20.8	21.7
25	14.5	25.5	32	NE	56	0	35.5	25.8	20.8	21.8
26	14.6	25.8	35	SE	50	0	37.8	27.5	21.6	21.7
27	13.0	22.7	35	NE	52	0	36.8	27.8	22.2	22.0
28	14.8	23.3	32	SE	70	0	35.3	26.8	21.8	22.2
29	14.0	25.5	34	SE	76	2	37.0	27.0	21.2	22.0
30	14.0	23.5	36	NE	72	0	36.6	26.8	21.6	22.4
31	16.4	24.7	40	SE	99	2	37.2	27.6	22.2	22.3
no/rg	31	31	31	31	30	30	31	31	31	31
total				NE 68%	2112					
mean	13.4	22.3	42	SE 29%	70.4	1.5	34.5	25.9	21.2	22.0
max	16.4	25.8	76	SW 0%	131		37.8	27.8	22.4	22.4
min	10.5	17.5	27	NW 3%	39		25.5	22.0	19.8	21.2
					1.30 m/s					

Al Khabar Meteo station Month: February Year: 1988 regular observation time: 6:00 hrs

date	T wb	T db	R hum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun	Chill
1	4.7	6.3	50	NE	47	0	12.8	17.8	21.2	22.5	25.0	4.5	3.5	0.0	-	10.6	2.9
2	4.2	6.2	40	SW	40	0	12.5	17.8	21.3	22.6	26.0	4.0	3.0	0.0	-	11.0	3.3
3	7.0	8.0	63	SE	29	0	13.0	18.0	21.5	22.7	26.5	5.0	3.5	0.0	-	8.1	2.2
4	*9.0	*10.5	75	NE	36	0	*14.0	*18.8	21.8	22.8	26.0	5.0	4.0	0.0	-	9.6	2.3
5	4.0	4.7	66	NE	63	0	12.0	17.5	21.2	22.8	23.0	4.0	3.0	0.0	-	9.9	3.8
6	5.0	6.0	58	NE	79	2	12.6	18.0	21.2	22.8	23.7	5.0	3.5	0.0	-	8.8	2.6
7	4.5	6.0	53	NE	44	6	12.6	17.8	21.2	22.7	25.5	4.0	3.0	0.0	10.1	8.4	3.3
8	5.6	7.0	70	SW	59	0	13.6	17.7	21.7	22.8	25.6	6.0	5.0	0.0	4.8	8.3	1.2
9	*9.0	*13.5	60	NW	77	0	*14.5	*18.8	21.8	23.0	26.0	5.0	3.5	0.0	4.9	11.0	2.3
10	5.5	6.7	78	NW	102	0	13.0	18.0	22.2	23.0	26.7	6.0	5.0	0.0	10.3	10.8	1.2
11	6.0	7.7	88	NW	58	0	13.6	18.8	22.2	23.3	27.0	7.0	5.0	0.0	6.9	10.9	0.0
12	5.8	8.3	78	SW	58	0	14.0	19.0	22.6	23.4	27.5	7.0	5.5	0.0	6.0	11.0	0.0
13	7.0	8.0	92	SW	90	0	15.0	20.0	23.3	23.7	27.0	7.5	6.0	0.0	7.7	10.6	0.0
14	*12.5	*13.5	92	SW	80	0	*16.7	*20.8	23.8	24.0	27.0	7.0	5.5	0.0	6.1	7.0	0.0
15	*10.5	*11.0	100	NW	63	2	*16.0	*20.5	23.3	24.0	26.5	6.5	6.0	0.0	5.2	6.4	0.6
16	9.0	9.5	100	SE	37	2	14.5	19.3	22.8	24.0	27.0	8.0	6.0	0.0	6.8	8.1	0.0
17	*11.6	*13.5	87	NE	65	4	*16.3	*20.2	23.0	24.0	28.0	8.5	7.0	0.0	6.3	3.8	0.0
18	11.0	12.0	96	SE	82	0	16.0	20.0	23.0	24.0	25.0	9.0	7.5	0.0	5.8	8.6	0.0
19	6.0	13.5	70	SE	73	0	15.5	20.2	23.6	24.2	27.0	11.0	9.0	7.7	7.4	8.4	0.0
20	11.0	11.0	100	NW	70	2	13.0	18.0	22.0	24.2	25.5	11.0	8.5	0.0	6.2	10.2	0.0
21	7.0	7.5	96	SW	60	0	12.5	17.0	21.8	23.8	25.5	5.0	4.5	0.0	7.4	11.0	2.3
22	7.0	10.0	68	NE	63	4	14.0	18.0	22.2	23.8	25.0	8.0	7.5	0.0	5.9	8.0	0.0
23	5.5	9.5	48	NE	61	6	13.0	17.8	22.2	23.8	23.5	9.0	8.0	0.0	9.0	4.5	0.0
24	*10.0	*13.5	58	SW	32	6	*16.5	*19.0	21.8	23.5	24.5	8.0	6.5	0.0	4.9	1.9	0.0
25	5.5	7.5	71	SW	63	2	13.0	15.8	19.8	23.0	25.0	8.0	13.0	0.0	6.3	8.0	0.0
26	8.5	9.5	95	SE	60	0	14.0	18.0	21.0	23.0	26.5	9.0	8.5	0.0	8.1	9.5	0.0
27	11.0	13.0	93	NE	25	8	18.5	21.0	22.5	23.4	28.0	10.0	9.0	1.4	8.1	8.5	0.0
28	7.3	8.5	95	NW	44	0	15.5	20.0	23.5	24.0	24.5	8.0	*15.0	0.0	4.1	8.9	0.0
29	7.5	8.0	100	SW	59	2	13.0	18.0	22.6	24.2	25.0	*13.0	*12.0	0.0	6.2	10.8	0.0
no/rg	23	23	29	29	29	29	23	23	29	29	29	28	27	29	23	29	29
total				NE 31%	1719									9.1		252.6	28.0
mean	6.8	8.5	77	SE 17%	59.3	1.6	13.8	18.4	22.1	23.4	25.8	7.0	5.9		6.7	8.7	
max	11.0	13.5	100	SW 31%	102		18.5	21.0	23.8	24.2	28.0	11.0	13.0	7.7	-	11.0	
min	4.0	4.7	40	NW 21%	25		12.0	15.8	19.8	22.5	23.0	4.0	3.0		4.1	1.9	

1.83 m/s number of rainy days: 2

* unreliable data

Al Khabar Meteo station Month: February Year: 1988 regular observation time: 15:00 hrs

date	T wb	T db	R hum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	15.0	24.0	33	SE	113	0	37.3	27.7	22.4	22.4
2	14.7	24.0	31	SE	120	0	37.0	27.7	22.5	*26.5
3	*18.5	26.0	38	NE	96	0	38.0	27.8	22.6	22.5
4	*20.5	26.0	33	SE	104	0	38.0	28.0	23.0	22.6
5	15.0	22.0	30	SE	69	0	36.0	27.5	22.3	22.6
6	16.5	22.5	36	SE	84	2	35.8	26.7	22.2	22.6
7	15.5	23.0	33	SE	87	4	33.6	26.5	22.3	22.5
8	16.4	24.0	38	NE	87	0	34.5	27.0	22.6	22.6
9	13.0	23.7	36	SW	155	2	36.0	28.0	22.2	22.8
10	16.2	24.0	39	NE	120	0	34.0	27.3	23.4	22.8
11	15.0	25.7	37	NW	89	2	37.8	28.8	23.2	23.1
12	14.0	25.7	34	NW	94	2	38.3	29.5	23.8	23.4
13	16.0	25.0	39	NW	70	0	39.0	*24.0	24.3	23.5
14	*23.0	28.0	39	NW	84	4	40.0	*23.5	24.5	23.8
15	15.5	23.2	43	SE	63	6	35.0	*34.0	24.3	24.0
16	*18.0	26.0	43	NE	119	6	38.5	*23.0	24.5	24.0
17	*21.0	28.0	32	NE	113	4	39.0	*24.0	25.3	23.8
18	14.5	24.5	38	SW	115	6	37.0	30.2	24.8	23.8
19	*19.0	23.5	36	SE	63	6	37.5	29.8	24.5	24.0
20	*20.0	22.0	35	NE	73	6	35.5	26.0	23.5	24.0
21	16.0	24.0	38	NE	104	4	32.0	28.0	22.5	23.6
22	14.5	24.0	35	SE	94	4	34.2	30.2	24.2	23.7
23	15.2	22.0	38	SW	122	8	30.0	25.2	22.0	23.6
24	*17.0	24.5	31	NE	115	8	32.0	26.0	22.5	23.3
25	14.5	22.6	39	SE	66	6	32.6	27.7	21.8	22.6
26	15.5	26.0	40	SE	171	2	37.8	30.0	23.2	22.8
27	*21.0	28.0	38	SW	139	6	38.0	31.0	24.0	23.2
28	15.5	23.5	41	NE	89	2	37.2	30.8	24.8	24.0
29	16.8	23.5	42	SE	88	2	36.8	29.8	24.2	24.0
no/rg	20	29	29	29	29	29	29	24	29	28
total				NE 31%	2906					
mean	15.3	24.4	37	SE 41%	100.2	3.2	36.2	28.2	23.4	23.3
max	16.8	28.0	43	SW 14%	171		40.0	31.0	25.3	24.0
min	13.0	22.0	30	NW 14%	63		30.0	25.2	21.8	22.4
					1.86 m/s					

* unreliable data

Al Khabar Meteo station Month: March Year: 1988 regular observation time: 6:00 hrs

date	T wb	T db	R hum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun	Chill
1	11.0	11.5	100	SW	59	2	15.0	19.8	21.8	24.0	26.0	12.0	11.0	0.0	6.7	10.3	0.0
2	11.0	13.0	83	NE	40	0	16.0	20.6	24.0	24.4	28.5	12.0	9.0	0.4	10.6	10.0	0.0
3	11.5	14.0	75	SW	72	0	16.0	20.2	24.0	24.1	25.5	11.0	11.0	0.0	5.3	7.5	0.0
4	11.4	12.5	96	NE	42	0	16.0	20.0	23.0	24.6	26.0	11.0	10.0	0.0	7.8	9.3	0.0
5	9.5	10.5	88	SE	59	0	17.0	21.0	24.3	24.8	26.5	11.0	8.0	0.0	8.1	10.6	0.0
6	8.0	10.5	84	SW	70	0	16.8	21.5	25.0	25.3	27.0	10.0	7.5	0.0	6.1	10.8	0.0
7	8.0	9.5	87	SE	101	0	17.0	21.8	25.3	25.5	26.5	*12.0	9.0	0.0	8.8	10.7	0.0
8	4.0	8.5	48	SE	116	0	15.6	21.0	25.0	25.6	27.0	8.0	8.0	0.0	9.4	10.7	0.0
9	3.0	6.0	53	NW	52	0	14.0	20.2	24.5	25.6	28.0	5.0	3.0	0.0	8.9	10.7	2.1
10	7.0	10.0	68	SW	65	0	17.0	22.0	25.6	25.7	29.0	8.0	7.5	0.0	-	10.7	0.0
11	9.5	10.5	84	SW	25	0	18.3	23.0	26.5	26.0	28.5	9.0	8.0	0.0	-	10.7	0.0
12	5.5	8.5	68	NE	64	0	17.0	22.6	26.3	26.4	27.7	8.5	7.2	0.0	-	10.7	0.0
13	6.0	7.8	83	SE	80	0	17.1	22.7	26.5	26.6	27.0	8.0	*8.5	0.0	8.2	10.7	0.0
14	9.0	12.5	70	SW	58	2	18.0	23.0	26.6	26.7	27.0	9.5	8.0	0.0	7.9	10.7	0.0
15	7.5	9.5	83	SE	73	0	17.5	22.8	26.6	26.7	26.5	9.5	7.8	0.0	10.2	9.9	0.0
16	7.0	12.5	50	NE	92	0	18.6	23.3	26.8	26.8	23.5	12.0	10.5	0.0	-	7.5	0.0
17	5.0	8.0	62	NE	39	0	15.2	21.2	25.3	26.7	25.5	8.0	7.5	0.0	9.1	9.7	0.0
18	2.0	5.5	53	SW	52	0	15.0	20.8	25.0	26.5	25.7	6.0	5.0	0.0	7.9	10.4	1.2
19	2.5	5.5	43	SW	52	2	15.3	21.2	25.2	26.4	27.5	6.0	4.5	0.0	9.1	10.3	1.1
20	11.5	14.0	84	SW	66	0	18.5	23.0	26.2	26.4	28.0	10.0	7.0	0.0	8.2	9.8	0.0
21	6.2	10.0	54	SW	55	0	17.8	23.0	26.6	26.7	28.0	8.5	5.5	0.0	8.9	10.2	0.0
22	5.0	10.0	45	SW	89	0	18.0	23.5	27.0	27.0	29.0	10.0	7.5	0.0	10.0	10.2	0.0
23	12.2	14.8	75	SE	119	0	18.3	23.6	26.8	27.0	28.8	11.0	8.5	0.0	10.9	9.8	0.0
24	6.0	12.7	40	NE	76	0	19.5	24.3	27.8	27.3	24.0	13.0	12.0	0.0	9.2	6.5	0.0
25	4.2	9.0	40	NW	49	0	17.0	22.3	26.3	27.3	26.0	9.0	8.0	0.0	8.1	8.0	0.0
26	6.0	8.0	40	SW	43	0	16.3	22.0	26.0	27.0	29.0	8.0	6.5	0.0	7.1	9.7	0.0
27	10.0	13.5	71	NE	55	0	19.5	24.0	26.3	27.2	28.7	11.0	8.0	0.0	10.1	8.7	0.0
28	7.4	11.0	63	SW	89	0	18.8	24.0	27.6	27.5	28.3	8.0	7.5	0.0	9.9	9.6	0.0
29	7.5	10.0	78	NW	66	0	18.0	23.8	27.8	27.6	27.5	8.0	7.5	0.0	9.8	10.3	0.0
30	6.0	8.5	73	NE	57	0	17.0	23.0	27.2	27.7	28.0	8.0	7.5	0.0	9.1	10.8	0.0
31	5.0	8.0	63	NE	76	0	17.0	23.0	27.2	27.8	28.8	7.0	6.0	0.0	7.9	11.0	0.0
no/rg	31	31	31	31	31	31	31	31	31	31	31	30	30	31	27	31	31
total				NE 29%	2051									0.4		306.5	4.4
mean	7.3	10.2	68	SE 19%	66.2	0.2	17.0	22.2	25.8	26.3	27.2	9.2	7.8		8.6	9.9	
max	12.2	14.8	100	SW 42%	119		19.5	24.3	27.8	27.8	29.0	13.0	12.0	0.4	10.9	11.0	
min	2.0	5.5	40	NW 10%	25		14.0	19.8	21.8	24.0	23.5	5.0	3.0		5.3	6.5	
					2.04 m/s							number of rainy days:		1			

Al Khabar Meteo station Month: March Year: 1988 regular observation time: 15:00 hrs

date	T wb	T db	R hum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	17.0	24.5	41	SE	98	4	39.5	30.5	24.3	24.0
2	*19.0	26.0	38	NE	172	2	38.0	30.8	25.0	24.2
3	16.5	24.0	43	SE	64	4	32.0	28.2	25.0	24.5
4	*18.0	23.6	42	NE	87	4	32.0	28.3	24.0	24.4
5	16.8	25.0	40	NW	90	2	40.0	32.2	26.2	24.8
6	13.0	26.5	38	SE	90	2	40.5	32.3	26.6	25.0
7	15.0	24.8	39	NW	104	0	41.0	32.5	26.6	25.4
8	16.0	23.5	32	NW	96	0	38.0	32.0	26.2	25.4
9	16.0	27.5	28	NE	67	0	41.8	32.2	26.0	25.4
10	*20.2	26.0	33	NE	85	0	40.0	33.0	26.5	25.5
11	*21.0	26.0	35	NE	131	0	40.0	33.0	27.0	25.8
12	14.8	27.1	33	SE	76	0	42.6	33.7	27.5	26.2
13	13.5	25.5	33	NE	83	0	42.5	33.0	27.5	26.4
14	12.0	26.7	37	NE	67	0	42.6	33.7	27.8	26.5
15	12.4	25.0	38	NE	108	0	42.2	33.6	28.0	26.6
16	11.5	22.0	39	NE	87	0	39.0	31.8	27.2	26.7
17	10.8	22.5	35	SE	99	0	37.0	29.0	26.4	26.5
18	11.5	20.5	38	NE	42	0	37.5	28.3	26.4	26.3
19	13.0	26.0	33	NE	103	2	41.6	32.2	26.6	26.2
20	14.2	26.4	36	NE	78	2	42.3	34.0	28.0	26.3
21	13.0	25.0	34	NE	65	2	41.5	34.0	28.5	26.5
22	13.3	27.5	32	SE	118	2	*34.0	34.0	28.2	26.8
23	15.0	26.5	38	SW	149	2	42.4	34.0	28.2	26.8
24	12.5	23.3	36	NE	75	0	40.6	32.6	28.0	27.2
25	12.0	21.5	36	NE	86	0	41.0	30.5	27.0	27.1
26	11.8	27.3	30	NW	76	0	43.3	33.6	27.5	26.8
27	13.0	27.2	34	NE	54	0	43.6	34.5	28.5	27.0
28	14.0	29.0	33	NW	45	0	42.0	34.5	29.3	27.3
29	16.0	27.5	36	NE	95	0	42.0	33.0	29.0	26.4
30	13.5	27.0	35	NE	68	0	43.7	34.0	28.2	27.5
31	13.5	28.5	31	NE	74	0	43.2	34.2	28.3	27.5
no/rg	27	31	31	31	31	31	30	31	31	31
total				NE 61%	2732					
mean	13.8	25.4	36	SE 20%	88.1	0.9	40.4	32.4	27.1	26.1
max	17.0	29.0	43	SW 3%	172		43.7	34.5	29.3	27.5
min	10.8	20.5	28	NW 16%	42		32.0	28.2	24.0	24.0
					1.63 m/s					

Al Khabar meteo station Month: April Year: 1988 Regular observation time: 0600 hrs

date	T wb	T db	Rhum hyg	Rhum dw/wb	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin		Tssmin	Rain	Evap	Sun
1	7.0	8.3	71	84	SW	86	0	17.3	23.0	27.2	27.7	28.0	8.0	e	6.5	0	10.2	-
2	7.0	9.0	70	76	SW	75	0	17.5	23.3	27.2	27.7	27.5	8.5	e	7.5	0	10.9	11.1
3	4.5	8.0	53	57	SE	76	0	17.0	23.0	27.0	27.7	27.7	7.5	e	6.5	0	10.0	11.0
4	4.5	7.5	63	62	SW	69	0	17.0	23.0	27.0	27.7	28.0	7.0	e	6.0	0	8.9	11.2
5	7.0	9.0	80	74	SW	67	0	17.8	23.5	27.3	27.7	27.8	8.5	e	7.5	0	-	10.2
6	9.0	10.5	90	83	SW	109	0	18.0	23.6	27.3	27.8	26.5	9.5	e	8.5	0	9.9	10.0
7	8.0	12.4	60	54	SW	101	0	18.7	23.8	27.2	27.7	25.5	10.5	e	8.5	0	10.3	10.9
8	6.5	12.5	44	40	SE	117	0	17.5	22.8	26.8	27.7	25.7	11.0		9.0	0	9.9	8.3
9	7.0	9.0	60	76	SW	-	4	16.8	22.3	26.3	27.4	26.7	8.5		7.2	0	9.0	10.0
10	7.5	9.5	70	76	SW	86	2	17.8	23.3	27.0	27.5	27.5	9.0		7.5	0	9.0	9.3
11	11.0	13.7	75	72	SW	106	2	19.0	24.0	27.3	27.5	28.0	12.0		10.3	0	9.1	9.6
12	*11.0	13.5	62	-	SW	143	0	18.0	23.0	26.8	27.7	26.7	12.0		10.0	0	8.8	7.5
13	11.5	14.4	70	71	SW	100	8	20.0	23.8	26.8	27.4	25.5	14.0		13.5	.4	3.9	4.4
14	9.5	10.5	100	88	SW	69	2	16.3	21.3	24.6	27.0	27.4	11.0		9.5	0	5.6	9.0
15	10.0	12.5	78	73	SW	75	2	18.6	23.2	26.4	27.0	27.7	12.0		9.0	0	9.2	-
16	9.0	12.0	71	68	SW	79	0	18.8	23.5	26.6	27.2	26.5	12.0		10.8	.8	4.9	6.1
17	9.0	10.0	100	88	NE	56	0	15.0	21.2	24.2	26.8	27.5	9.5		8.3	10.8	6.6	9.4
18	11.5	12.5	100	89	NE	62	4	15.2	19.3	23.8	26.5	25.0	12.0		11.0	1.0	6.2	7.6
19	12.0	13.0	97	89	SW	39	4	15.5	18.8	23.0	26.0	26.3	13.0		12.0	0	4.9	7.6
20	13.4	15.5	95	89	SE	52	6	18.2	21.0	24.2	25.8	27.5	15.0		13.0	7.2	6.1	7.4
21	13.0	14.0	100	90	SE	41	2	17.5	21.0	25.3	26.4	25.5	14.0		13.5	14.2	7.3	6.2
22	11.4	11.5	100	99	NE	87	0	14.5	17.0	21.5	25.7	26.4	12.0		10.5	36.0	-	9.5
23	12.2	14.0	88	82	SE	46	6	16.0	18.2	21.7	25.2	25.3	13.0		12.0	2.2	-	8.1
24	13.3	15.0	100	83	NE	63	6	16.0	18.0	20.8	24.7	24.0	13.0		12.5	7.0	4.9	6.4
25	10.0	11.0	100	88	SW	64	0	14.0	17.0	20.0	24.4	26.5	11.5		10.0	0	7.9	11.0
26	12.0	13.0	97	89	NW	58	2	15.6	*13.8	21.8	24.3	26.5	13.0		11.5	0	6.9	10.9
27	12.2	13.5	100	88	NW	64	0	17.3	20.2	23.3	24.6	26.5	13.0		12.0	0	6.4	8.8
28	11.5	13.8	76	76	NE	70	4	18.3	21.2	24.0	25.0	24.5	*15.0		*15.0	0	7.0	8.2
29	9.0	13.5	67	55	NE	42	0	18.0	21.6	24.6	25.5	25.5	12.0		11.0	0	*3.1	10.7
30	12.2	14.0	93	82	NW	34	2	19.0	22.3	25.3	26.0	26.0	11.5		10.0	0	9.2	11.3
no/rg	29	30	30	29	30	29	30	30	29	30	30	30	29		29	30	26	28
total					NE 20%											79.6		251.7
mean	9.7	11.9	81	77	SE 17%	73.7	1.9	17.2	21.6	25.1	26.6	26.5	11.2		9.8		7.8	9.0
max	13.4	15.5	100	99	SW 53%	143		20.0	24.0	27.3	27.8	28.0	15.0		13.5	36.0	10.9	11.3
min	4.5	7.5	44	40	NW 10%	34		14.0	17.0	20.0	24.3	24.0	7.0	e	6.0		3.9	4.4
						2.27	m/s											

e estimated from Tdb and Tssmin

Al Khabar meteo station Month: April Year: 1988 Regular observation time: 1500 hrs

date	T wb	T db	Rhum	Rhum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	12.5	27.0	30	14	SE	67	0	42.8	34.0	28.3	27.5
2	12.3	26.5	32	14	NE	79	0	43.0	34.3	28.4	27.5
3	12.5	27.0	31	14	SE	88	0	42.6	34.0	28.2	27.5
4	12.0	27.4	31	11	SE	51	0	43.6	34.2	28.2	27.5
5	13.4	27.3	34	17	SE	131	2	44.0	34.5	28.5	27.6
6	13.5	25.0	37	25	SE	120	4	41.8	33.2	28.2	27.5
7	13.5	24.5	37	27	SE	127	2	41.8	33.2	28.0	27.5
8	13.8	25.0	37	27	NE	88	4	41.8	31.8	27.5	27.4
9	13.6	25.9	35	22	SE	-	8	42.1	34.9	28.3	27.3
10	13.5	*	33	-	SE	118	6	43.0	34.0	28.2	27.4
11	13.5	26.5	35	20	SE	90	2	42.2	34.2	28.6	27.5
12	*18.0	23.5	41	-	SE	85	8	37.7	32.4	27.8	27.4
13	14.2	23.0	48	37	SE	56	8	32.6	29.2	27.9	27.2
14	13.5	25.4	37	24	SW	72	6	41.8	32.0	26.3	26.7
15	14.0	21.5	47	43	SE	83	4	30.0	29.6	27.3	26.8
16	12.0	*14.5	75	-	SE	31	8	28.8	31.8	27.8	27.0
17	15.3	25.4	45	33	SE	117	6	38.5	31.8	25.8	26.5
18	15.0	23.6	49	40	NE	125	8	33.0	30.0	25.2	26.0
19	14.0	23.5	45	33	SE	59	8	36.8	32.5	25.6	25.6
20	16.0	26.0	42	34	NE	104	6	38.0	37.0	26.0	25.5
21	14.0	18.0	82	65	SW	51	8	24.0	26.6	26.3	26.1
22	*18.5	24.5	47	-	NW	57	8	32.0	29.6	24.6	25.2
23	15.5	23.3	53	45	SE	85	8	34.0	26.6	24.0	24.8
24	*17.0	24.0	49	-	NW	58	8	34.0	26.6	23.6	24.4
25	13.0	25.5	39	21	NW	90	4	32.0	27.3	23.3	24.0
26	15.5	26.0	42	31	NE	72	4	31.2	28.8	25.3	24.2
27	15.5	24.3	53	39	NE	97	8	31.2	29.7	26.2	24.6
28	14.0	23.5	48	36	NE	85	4	35.0	31.0	26.6	25.0
29	*18.0	25.5	33	-	SW	73	2	31.0	28.0	26.5	25.3
30	*20.2	26.3	41	-	NE	99	0	32.0	29.0	27.0	25.8
no/rg	25	28	30	23	30	29	30	30	30	30	30
total					NE 27%	2458					
mean	13.8	24.8	43	29	SE 53%	84.8	4.8	36.7	31.4	26.8	26.3
max	16.0	27.4	82	65	SW 10%	131		44.0	37.0	28.6	27.6
min	12.0	18.0	30	11	NW 10%	31		24.0	26.6	23.3	24.0
						1.57	m/s				

Al Khabar meteo station Month: May Year: 1988 Regular observation time: 0600 hrs

date	T wb	T db	Rhum hygr	Rhum dbwb	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun
1	9.0	11.0	68	78	SE	81	0	18.3	22.0	25.6	26.4	26.5	11.0	9.5	0	8.8	11.5
2	5.5	8.5	69	64	SW	81	0	17.0	21.6	25.2	26.5	26.5	9.0	7.0	0	8.4	11.6
3	6.5	10.5	58	55	NW	68	0	17.7	21.5	25.2	26.5	27.0	10.0	8.0	0	10.6	11.7
4	6.0	9.5	67	59	NE	90	0	17.7	21.8	25.5	26.7	27.5	9.0	7.5	0	6.3	11.6
5	12.0	13.5	88	84	SE	63	2	20.0	23.3	26.3	26.8	27.0	13.0	12.0	0	-	11.3
6	12.5	14.3	95	82	NW	38	0	20.3	24.0	26.8	27.3	28.0	12.5	11.0	0	-	11.2
7	9.0	11.0	82	78	SW	103	0	20.0	23.6	26.8	27.5	27.5	11.0	10.0	0	-	11.4
8	12.0	15.0	90	71	SE	81	0	20.3	23.8	26.6	27.5	28.0	14.0	11.5	0	10.2	11.5
9	12.2	15.0	84	73	SW	84	0	20.8	24.2	27.0	27.7	26.7	15.0	12.0	0	11.1	11.2
10	7.5	12.8	53	47	SE	78	0	19.8	23.3	26.6	27.7	27.0	12.0	10.0	0	9.1	12.0
11	9.3	13.0	70	62	NE	68	2	20.2	23.8	26.8	27.8	27.5	13.0	11.5	2.2	6.4	-
12	13.5	15.0	92	85	NE	68	8	20.3	24.3	27.2	27.8	27.0	15.0	14.5	0	7.5	-
13	11.5	14.5	80	70	SW	110	0	19.8	23.6	26.8	27.8	27.7	12.5	11.0	0	12.0	-
14	7.5	11.5	55	57	SE	70	2	19.0	23.0	26.5	27.8	28.0	12.0	11.5	0	10.2	3.1
15	10.0	12.0	70	78	SE	79	0	20.3	24.0	27.0	27.8	27.6	12.0	10.0	0	9.1	7.9
16	15.0	16.0	86	90	NE	69	0	21.6	24.8	27.5	28.0	27.5	12.0	10.0	0	7.9	10.5
17	8.0	11.3	68	64	SW	67	0	20.2	23.8	27.2	28.0	27.0	11.5	10.0	0	5.2	10.3
18	6.0	10.0	48	55	NW	42	0	19.3	23.6	26.8	27.0	27.5	10.5	9.0	0	12.7	10.8
19	5.0	10.0	45	45	SW	61	0	18.8	23.2	26.6	28.0	27.0	10.5	10.0	0	11.1	11.0
20	5.5	10.0	45	50	NW	77	0	19.0	23.2	26.2	28.0	28.0	11.0	9.5	0	9.2	10.9
21	7.5	13.0	42	45	NW	69	0	19.8	23.8	26.7	28.0	28.0	14.0	12.0	0	10.1	10.4
22	10.0	13.5	71	65	NE	111	0	20.2	24.0	27.0	28.0	28.0	10.0	8.0	0	5.4	10.9
23	6.5	10.4	42	56	NW	57	0	19.8	23.8	27.0	28.0	28.5	10.0	7.5	0	11.1	10.6
24	5.5	10.0	40	50	NW	44	0	18.5	22.8	26.3	28.0	28.5	10.5	10.0	0	12.0	11.0
25	5.5	13.0	39	28	NW	138	0	19.3	23.5	26.6	28.0	29.0	12.0	10.0	0	10.9	10.7
26	7.5	12.5	55	49	NE	84	0	19.8	23.8	27.0	28.0	28.5	12.5	11.0	0	10.4	10.9
27	7.7	13.5	39	42	SW	59	0	19.6	23.8	27.2	28.0	27.7	13.0	12.0	0	10.0	10.8
28	4.5	9.0	41	37	SW	69	0	18.0	23.0	26.6	28.0	29.0	9.0	7.0	0	8.9	11.9
29	4.5	9.5	50	44	SW	53	0	18.8	23.0	26.6	28.0	29.5	9.0	7.5	0	8.9	-
30	7.0	10.0	53	66	NE	40	0	18.8	23.6	27.0	28.0	23.0	10.0	8.8	0	-	8.0
31	12.5	20.5	40	38	NE	135	8	23.5	25.5	27.3	28.0	28.5	20.0	20.0	0	-	5.5
no/rg	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	26	27
total					NE 26%	2337									2.2		280.2
mean	8.5	12.2	62	60	SE 19%	75.4	.7	19.6	23.5	26.6	27.6	27.6	11.8	10.3		9.4	10.4
max	15.0	20.5	95	90	SW 29%	138		23.5	25.5	27.5	28.0	29.5	20.0	20.0	2.2	12.7	12.0
min	4.5	8.5	39	28	NW 26%	38		17.0	21.5	25.2	26.4	23.0	9.0	7.0		5.2	3.1
						2.33	m/s										

Al Khabar meteo station Month: May Year: 1988 Regular observation time: 1500 hrs

date	T wb	T db	Rhum hygr	Rhum dbwb	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	11.5	25.2	35	14	NE	50	0	35.3	32.6	28.2	26.2
2	11.0	25.5	32	13	NE	39	0	36.6	32.0	27.7	26.3
3	12.5	25.2	36	19	NE	49	0	37.0	32.8	28.0	26.3
4	13.0	27.0	33	16	NE	52	0	37.0	32.6	28.0	26.5
5	15.0	26.5	34	27	NE	58	0	42.2	33.5	28.8	26.6
6	14.5	27.0	36	23	NE	104	0	42.0	34.0	28.5	27.0
7	12.0	26.0	34	15	NE	64	0	*26.8	32.8	28.8	27.2
8	12.0	26.0	34	15	NE	89	0	42.0	33.0	28.8	27.4
9	14.2	25.8	36	26	NE	113	0	42.3	34.0	29.0	27.5
10	12.5	26.0	36	17	NE	69	2	37.2	32.8	28.5	27.4
11	14.4	25.4	40	28	NE	108	8	35.5	32.2	28.8	27.5
12	14.5	25.0	42	30	NE	82	8	36.0	32.3	29.2	27.5
13	*15.0	24.5	38	*	NE	97	2	37.3	32.3	28.2	27.6
14	13.5	25.0	37	25	NE	132	2	37.0	32.0	28.0	27.6
15	13.0	25.7	36	20	NE	82	8	36.0	32.8	29.2	27.6
16	*18.0	26.0	38	-	SE	67	0	38.0	33.0	28.5	27.8
17	13.5	24.0	35	28	NE	64	0	37.2	32.0	28.0	27.8
18	13.0	23.5	33	28	NE	87	0	36.0	32.2	27.8	26.8
19	13.0	23.2	33	29	NE	73	0	35.5	32.0	27.8	27.8
20	13.5	23.3	33	31	NE	113	0	36.3	32.0	27.5	27.9
21	*15.0	25.0	31	*	NE	121	0	36.8	32.0	27.3	26.8
22	13.5	27.5	35	17	NE	91	0	37.0	32.2	28.8	27.8
23	12.0	25.0	31	18	NE	96	2	36.0	*21.5	28.0	27.8
24	12.0	25.2	33	17	NE	112	0	35.5	*23.8	27.5	27.8
25	12.0	27.5	33	10	NE	57	0	36.3	31.5	27.5	26.9
26	15.0	*22.5	40	*	SW	90	0	36.5	31.8	28.0	27.9
27	15.0	*23.5	31	*	NE	91	0	36.6	31.8	28.3	27.8
28	15.0	28.0	31	23	NW	51	0	41.5	32.8	28.3	27.7
29	15.0	28.0	31	23	NE	67	0	40.2	32.6	28.2	27.7
30	-	-	-	-	-	218	5	-	-	-	-
31	15.5	26.5	37	29	NE	94	5	38.5	32.6	29.0	27.8
no/rg	27	28	30	25	30	31	31	29	28	30	30
total					NE 91%	2680					
mean	13.4	25.7	35	22	SE 3%	86.5	1.4	37.6	32.5	28.3	27.3
max	15.5	28.0	42	31	SW 3%	218		42.3	34.0	29.2	27.9
min	11.0	23.2	31	10	NW 3%	39		35.3	31.5	27.3	26.2
						1.60	m/s				

Al Khabar meteo station Month: June Year: 1988 Regular observation time: 0600 hrs

date	T wb	T db	Rhum hygr	Rhum dbwb	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun
1	11.0	13.5	80	74	SW	57	0	20.8	25.0	27.6	28.0	28.5	13.0	11.6	0	9.3	9.4
2	12.0	15.0	66	71	NW	88	0	21.2	25.2	28.2	28.4	30.0	14.0	12.5	0	9.9	11.2
3	13.0	17.0	73	64	SW	101	0	22.0	25.8	28.8	28.7	30.0	16.0	14.5	0	12.1	10.6
4	11.0	13.0	*39	79	NW	98	0	13.8	24.7	28.2	28.8	29.5	11.0	10.0	0	10.1	11.3
5	14.0	20.5	50	48	NW	94	7	24.0	26.3	28.5	28.8	27.5	18.0	15.5	0	8.8	2.7
6	13.5	16.0	78	76	SW	79	0	20.8	25.0	27.8	28.7	29.5	16.0	14.0	0	10.1	11.5
7	*15.5	16.5	63	*	SW	122	0	21.0	25.3	28.8	29.0	29.0	13.0	11.0	0	11.2	11.1
8	7.5	13.0	42	44	SW	111	0	21.0	25.4	28.8	29.0	30.0	12.5	10.5	0	10.0	9.2
9	7.5	13.0	50	45	SW	59	0	20.2	25.0	28.2	29.0	29.8	14.0	12.0	0	11.2	-
10	12.2	15.7	72	67	SE	151	0	21.8	25.8	28.8	29.0	29.5	12.5	11.0	0	12.0	-
11	13.5	17.5	73	65	NW	127	0	22.2	26.0	28.6	29.0	30.0	12.0	10.5	0	8.9	-
12	10.0	14.0	67	61	SW	65	0	20.0	24.3	27.8	29.0	28.0	12.0	10.5	0	8.1	-
13	11.5	16.0	68	58	NE	95	0	19.5	24.0	26.2	28.5	28.5	14.0	11.5	0	9.9	8.9
14	14.0	17.0	78	73	SW	88	0	21.2	25.0	28.0	28.6	29.0	15.0	12.0	0	8.1	-
15	13.5	15.5	84	80	NW	135	0	21.0	25.0	28.0	28.6	30.0	16.0	11.5	0	9.2	9.7
16	11.5	15.5	66	62	SW	66	0	20.8	25.0	28.2	28.7	30.5	14.0	12.0	0	-	10.2
17	11.0	15.5	70	58	NE	40	1	22.6	25.3	28.8	28.8	30.0	15.0	12.5	0	-	10.9
18	11.5	16.5	71	55	SW	78	0	21.6	26.0	29.0	29.2	30.5	15.0	13.0	0	9.2	9.9
19	11.5	14.5	62	70	SW	110	1	22.6	26.3	29.2	29.4	30.5	17.0	15.5	0	12.9	7.3
20	10.0	15.5	44	49	NW	174	1	22.2	26.2	29.0	29.4	28.5	18.0	16.0	0	9.9	7.4
21	7.0	12.5	40	44	NW	-	0	19.0	24.0	27.8	29.2	28.5	11.0	9.0	0	12.3	11.2
22	5.0	11.5	37	35	NW	52	0	18.3	24.0	27.8	29.0	29.0	10.0	7.5	0	8.9	11.6
23	11.0	*18.0	60	*	SW	90	0	21.3	25.0	28.2	29.0	29.0	14.0	13.0	0	8.1	10.6
24	11.0	14.0	70	70	SW	59	0	21.6	25.8	29.0	29.2	30.5	12.0	11.0	0	11.2	9.8
25	11.5	14.5	68	70	SW	52	0	22.5	26.8	29.5	29.5	29.5	17.0	15.0	0	8.8	8.1
26	11.5	16.3	64	56	SW	62	0	20.8	25.3	28.6	29.6	29.3	15.0	13.0	0	9.9	10.9
27	*13.5	*19.0	57	*	SW	75	2	*23.3	*26.5	29.0	29.4	29.0	14.0	12.0	0	*13.5	10.8
28	10.0	14.0	70	61	SW	64	0	21.4	26.3	29.6	29.5	29.0	13.0	11.5	0	10.3	11.4
29	11.0	15.0	65	62	SE	52	0	22.6	26.8	29.8	29.7	29.3	13.5	12.0	0	9.7	10.0
30	9.0	15.0	43	45	SW	9	4	21.6	26.0	29.2	29.5	29.0	13.0	12.0	0	10.2	9.1
no/rg	28	28	29	27	30	29	30	29	29	30	30	30	30	30	30	27	25
total					NE 7%										0		
mean	11.0	15.1	63	61	SE 7%	84.6	.5	21.0	25.4	28.5	29.0	29.4	14.0	12.1		10.0	9.8
max	14.0	20.5	84	80	SW 60%	174		24.0	26.8	29.8	29.7	30.5	18.0	16.0	0	12.9	11.6
min	5.0	11.5	37	35	NW 26%	9		13.8	24.0	26.2	28.0	27.5	10.0	7.5		8.1	2.7
						2.61	m/s										

Al Khabar meteo station Month: June Year: 1988 Regular observation time: 1500 hrs

date	T wb	T db	Rhum hygr	Rhum dbwb	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	-	-	36	-	NE	57	4	-	-	-	-
2	15.6	28.0	33	25	NW	101	1	41.5	35.2	30.3	28.3
3	15.8	28.2	31	25	NE	79	0	40.0	34.0	30.2	28.5
4	13.5	28.5	33	14	NW	82	4	40.0	38.6	29.8	28.5
5	15.0	27.0	37	25	NE	67	2	36.5	32.0	29.3	28.7
6	15.5	28.6	34	23	SE	98	1	41.8	34.3	29.8	28.5
7	15.0	29.5	31	18	NE	73	0	40.2	34.2	30.0	28.8
8	14.0	26.5	32	21	NE	126	2	40.3	34.5	30.0	28.8
9	14.5	26.3	30	25	NE	124	0	39.5	34.0	29.8	28.8
10	16.5	29.0	33	26	NE	113	0	40.5	34.5	30.0	28.8
11	18.0	*31.5	35	-	NE	74	0	41.0	35.0	29.8	*29.7
12	14.0	27.0	37	21	NE	129	3	36.0	31.8	28.3	28.8
13	*17.5	28.5	31	-	NE	124	1	38.8	32.8	28.8	28.4
14	*19.0	29.0	36	-	NW	115	1	39.0	33.2	29.6	28.3
15	16.5	28.0	33	29	NE	23	2	30.0	33.0	29.5	28.4
16	*20.5	29.0	31	-	NE	122	3	40.5	34.2	29.8	28.5
17	*20.0	29.0	35	-	SE	138	0	41.5	34.4	29.8	28.6
18	14.0	29.0	34	15	NE	154	3	42.2	34.8	30.3	29.0
19	14.0	29.0	34	19	NE	153	3	38.0	33.0	30.3	29.3
20	15.0	30.0	33	17	NE	23	3	38.0	32.8	30.0	29.2
21	11.5	27.5	31	9	NE	-	0	41.0	34.0	29.2	28.8
22	12.5	27.5	31	12	NE	65	0	42.0	34.0	29.2	28.8
23	12.0	27.3	31	11	NE	89	1	41.8	35.2	30.3	28.8
24	15.0	26.0	35	29	NE	146	1	42.0	35.4	31.0	29.0
25	16.0	26.5	34	32	NE	126	1	43.0	28.0	30.0	29.3
26	16.0	28.0	32	27	NE	95	0	41.0	27.5	29.4	29.3
27	13.8	28.0	33	17	NE	119	1	42.0	34.6	30.2	29.3
28	13.0	28.0	31	13	NE	95	0	42.0	35.0	30.6	29.4
29	14.0	29.0	33	15	SW	93	1	42.5	35.3	30.7	29.5
30	13.5	28.0	30	15	NE	131	1	41.6	34.2	30.0	29.5
no/rg	25	28	30	24	30	29	30	29	29	29	28
total					NE 80%						
mean	14.6	28.1	33	20	SE 7%	101.2	1.3	40.1	33.8	29.9	28.9
max	18.0	30.0	37	32	SW 3%	154		43.0	38.6	31.0	29.5
min	11.5	26.0	30	9	NW 10%	23		30.0	27.5	28.3	28.3
						1.87	m/s				

Al Khabar meteo station Month: July Year: 1988 Regular observation time: 6:00 hrs

date	T wb	T db	Rhum	Rhum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap
1	11.5	14.0	83	74	SW	67	0	21.0	25.8	29.0	29.7	30.0	12.5	11.0	0	8.0
2	14.5	19.5	66	57	SW	-	0	22.5	26.8	29.5	29.8	30.0	13.0	11.5	0	9.3
3	*13.5	16.5	68	-	NE	-	0	22.8	26.8	29.8	30.0	31.0	13.0	12.0	0	12.1
4	* 7.5	14.0	33	-	NW	-	1	21.0	28.2	29.3	29.8	31.0	13.0	11.5	0	10.3
5	* 9.0	16.0	36	-	NE	-	2	22.6	27.0	30.0	29.8	30.5	14.0	13.0	0	9.6
6	13.0	17.0	68	64	SE	-	1	23.0	27.0	29.8	30.0	31.0	16.0	15.0	0	9.0
7	11.0	17.2	50	46	SE	-	0	24.0	27.8	30.2	30.0	30.4	13.0	11.5	0	10.3
8	16.0	21.0	64	60	NW	-	2	25.3	28.2	30.5	30.0	32.0	17.0	16.0	.6	8.3
9	13.5	19.0	67	55	SW	-	0	21.0	25.0	26.8	30.0	31.0	17.0	16.0	0	8.1
10	12.5	16.7	70	62	SW	-	0	21.8	25.8	28.8	27.6	30.5	16.0	13.5	0	9.2
11	*12.5	15.5	70	-	SE	-	1	22.5	26.4	29.0	29.5	31.0	15.0	13.0	0	9.8
12	*16.5	19.5	60	-	NW	-	1	24.2	27.3	29.8	29.6	30.5	16.0	14.0	0	8.9
13	12.5	17.5	65	55	SW	-	0	22.0	26.4	29.8	29.9	31.0	15.0	12.5	0	9.4
14	16.0	17.0	93	90	NW	-	8	23.5	27.7	30.0	30.0	24.5	16.0	13.5	0	1.9
15	15.5	18.0	84	78	SW	-	6	20.6	24.0	26.6	29.2	28.0	17.0	16.0	0	-
16	*18.0	19.5	65	-	SW	-	6	22.0	24.6	27.0	28.6	29.0	18.0	18.5	0	-
17	*17.0	19.0	67	-	NW	-	6	21.8	25.0	27.4	28.5	30.5	18.0	18.0	*0.6	-
18	*17.0	19.0	68	-	NW	-	6	20.6	24.0	27.2	28.5	29.0	15.0	14.0	2.6	-
19	*18.0	19.5	80	-	SW	-	4	15.5	19.6	23.7	27.3	26.5	15.0	13.0	1.8	5.9
20	*15.5	17.5	67	-	SW	-	8	16.0	18.8	22.2	26.5	28.0	15.0	14.5	0	9.7
21	*18.0	20.0	55	-	NW	-	6	18.8	21.4	24.0	26.0	26.5	17.0	14.0	0	3.5
22	*13.0	15.0	75	-	NW	-	6	18.0	20.8	23.6	26.0	25.5	15.0	14.0	0	6.8
23	*15.0	17.0	67	-	NW	-	1	20.0	22.2	24.4	26.0	28.6	-	-	.3	-
24	-	-	-	-	NW	-	8	-	-	-	-	23.5	16.0	13.9	.3	-
25	*15.0	17.0	67	-	NW	-	6	19.5	21.8	24.0	26.0	28.0	17.0	16.0	1.0	4.3
26	14.0	17.5	84	69	SW	58	2	18.5	21.2	23.8	26.0	29.0	16.0	15.0	10.6	0
27	15.5	16.5	100	90	NE	52	2	17.5	19.8	22.6	25.7	28.0	17.0	16.0	.3	8.4
28	15.0	17.5	80	77	SW	61	2	18.0	20.0	23.5	25.7	26.0	14.0	13.0	47.0	-
29	14.5	16.5	96	81	SE	99	6	16.6	17.6	19.8	24.7	25.0	14.0	12.0	0	5.3
30	15.0	17.0	93	81	SW	53	3	16.8	18.5	20.3	24.0	28.0	16.0	14.5	0	6.9
31	15.0	22.0	62	47	NW	69	0	22.8	21.8	23.0	24.8	30.0	18.0	17.5	0	9.9
no/rg	16	30	30	16	31	7	31	30	30	30	30	31	30	30	30	24
total					NE 9%	-									'64.5	-
mean	14.1	17.6	70	-	SE 13%	-	3.0	20.7	23.9	26.5	28.0	28.8	15.5	14.1		7.7
max	16.0	22.0	100	90	SW 39%	-		25.3	28.2	30.5	30.0	32.0	18.0	18.5	47.0	12.1
min	11.0	14.0	33	-	NW 39%	-		15.5	17.6	19.8	24.0	23.5	12.5	11.0		0

Al Khabar meteo station Month: July Year: 1988 Regular observation time: 15:00 hrs

date	T wb	T db	hum	Rhum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun
1	15.5	27.0	35	27	NE	63	3	41.5	33.5	30.3	29.5						
2	14.0	29.2	33	14	NW	-	4	38.8	34.6	31.0	29.7						
3	15.0	29.0	33	15	SW	-	1	41.2	28.2	30.3	29.8						
4	*18.5	29.3	31	-	NE	-	1	41.2	35.2	30.8	29.7						
5	*19.4	29.0	31	-	NE	-	4	40.0	34.8	30.8	29.7						
6	*21.5	29.5	33	-	NE	-	3	42.0	35.2	31.0	29.8						
7	*18.0	26.0	34	-	NW	-	8	41.5	36.0	31.0	29.8						
8	*22.0	27.0	41	-	SW	-	4	39.5	35.5	31.6	30.0						
9	*22.5	28.0	37	-	SW	-	8	37.7	33.2	30.0	29.7						
10	*27.5	30.0	34	-	NE	-	3	37.0	33.2	30.2	27.4						
11	*26.0	29.0	36	-	NW	-	6	38.0	34.3	30.5	29.3						
12	*23.0	29.7	32	-	NE	-	3	40.2	35.3	31.2	29.6						
13	*27.0	31.5	34	-	NE	-	3	38.0	34.0	31.0	29.1						
14	*20.5	22.5	64	-	NE	-	8	29.8	28.2	28.8	29.7						
15	*21.0	27.5	40	-	NE	-	8	33.0	31.0	28.2	29.0						
16	*23.0	29.0	34	-	NE	-	8	34.5	31.3	28.2	28.5						
17	*25.0	28.0	41	-	NW	-	8	37.2	32.8	28.8	28.4						
18	*21.0	26.0	30	-	NE	-	-	28.5	29.0	28.0	28.2						
19	*21.0	22.6	60	-	NW	-	8	25.2	25.8	24.4	27.3						
20	*26.0	26.5	41	-	SW	-	8	33.6	38.8	24.2	26.1						
21	*20.0	24.5	40	-	NW	-	6	31.0	27.5	24.4	26.0						
22	*20.6	24.5	43	-	NE	-	4	28.0	26.0	24.4	25.8						
23	-	-	-	-	-	-	7	-	-	-	-						
24	15.7	22.0	64	51	NW	-	7	25.9	24.7	24.8	26.3						
25	16.0	25.2	45	44	SW	92	8	32.2	29.0	25.4	25.8						
26	18.0	22.0	80	68	SE	129	4	31.0	29.8	26.0	25.8						
27	*19.0	24.6	40	-	NE	129	7	30.6	28.0	23.8	25.5						
28	14.5	21.0	40	49	NW	187	8	29.0	25.5	23.8	25.3						
29	17.5	24.5	60	51	NW	65	4	23.8	21.8	21.0	24.4						
30	18.0	27.0	43	41	NE	113	4	34.2	29.8	24.4	23.8						
31	*23.0	29.0	39	-	NE	161	2	38.2	32.0	27.0	25.0						
no/rg	9	30	30	9	30	8	30	30	30	30	30	0	0	0	0	0	0
total					NE 50%	-									0	0	0
mean	-	26.7	42	-	SE 3%	-	5.3	34.7	31.1	27.8	27.8	0	0	0		0	0
max	-	31.5	80	-	SW 17%	-		42.0	38.8	31.6	30.0	0	0	0	0	0	0
min	-	21.0	30	-	NW 9%	-		23.8	21.8	21.0	23.8	0	0	0		0	0

30

Al Khabar meteo station Month: August Year: 1988 Regular observation time: 0600 hrs

date	T wb	T db	Rhum hygr	Rhum dbwb	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun
1	15.0	19.0	81	66	SW	88	6	19.8	22.6	25.5	25.8	27.0	16.0	15.0	12.2	4.5	4.0
2	13.0	15.0	95	80	NW	220	8	16.8	19.2	22.8	26.0	*23.5	15.0	14.0	.2	5.9	1.3
3	15.0	16.5	93	86	SW	122	4	16.5	18.5	20.6	24.7	28.0	14.0	13.0	.8	6.0	7.0
4	15.0	18.5	81	70	SW	81	0	17.6	19.4	22.2	24.6	28.0	16.0	15.0	0	6.9	7.6
5	16.0	18.0	88	82	NE	78	6	19.4	21.3	23.8	25.0	29.0	17.0	15.0	0	8.1	8.5
6	*17.5	18.5	77	*77	SW	61	0	20.0	22.5	25.0	25.8	27.5	17.0	15.5	0	7.1	5.3
7	*20.0	20.0	72	72	SW	-	0	20.2	22.3	24.6	26.0	29.2	14.0	13.3	0	-	8.9
8	-	-	-	-	-	63	0	-	-	-	-	29.0	-	-	0	-	6.2
9	14.4	19.5	63	58	NW	74	4	22.2	24.4	26.6	27.0	29.9	18.5	18.2	0	9.7	6.3
10	14.4	20.0	58	55	SW	75	0	22.8	25.0	26.2	27.4	30.0	19.5	19.0	0	8.4	6.3
11	13.7	18.2	66	61	SW	68	0	22.5	25.2	27.7	27.8	29.5	16.5	15.2	7.3	5.3	5.3
12	13.3	13.9	100	94	SW	51	2	18.0	21.2	23.9	27.5	27.8	13.5	13.0	0	6.6	6.8
13	13.2	14.0	96	92	SE	60	0	18.6	21.7	24.9	27.0	28.9	14.0	13.0	0	9.4	9.2
14	11.2	13.9	72	71	SE	80	0	20.1	23.3	26.3	27.2	29.3	14.0	12.2	0	11.0	10.0
15	*13.7	16.4	67	*75	NW	54	0	22.8	25.5	28.0	27.7	28.6	16.0	12.3	0	7.9	6.0
16	14.7	18.7	70	66	SW	-	2	22.3	25.0	27.5	28.1	28.5	18.0	17.3	.4	7.3	4.3
17	14.6	18.4	61	67	NW	74	5	21.4	23.7	26.1	27.7	30.0	17.8	15.8	0	8.1	9.3
18	13.0	16.0	70	70	SW	87	0	21.4	24.4	27.3	28.0	29.5	15.0	13.8	0	9.1	-
19	12.1	16.4	72	61	SW	95	0	22.0	25.1	27.8	28.2	29.1	14.0	12.6	0	9.2	-
20	13.0	16.2	*39	70	SW	109	1	22.9	24.5	28.0	28.4	28.7	16.2	14.9	0	10.2	6.1
21	12.5	15.6	73	71	NW	91	1	22.2	25.4	27.9	28.3	27.6	15.6	13.7	1.9	5.8	5.8
22	10.8	11.3	96	95	SE	56	0	18.7	21.2	24.3	27.8	28.7	11.0	9.7	0	7.7	10.2
23	12.6	15.9	78	69	NW	51	0	20.5	23.8	26.7	27.6	28.9	14.1	12.0	11.8	8.0	-
24	14.5	15.6	98	89	SW	45	7	19.8	22.8	26.6	28.0	26.1	14.7	14.4	0	4.9	5.5
25	14.2	16.9	85	76	SW	63	7	17.8	20.4	23.8	27.2	28.6	16.2	14.2	0	7.9	6.9
26	13.3	16.3	85	71	SW	51	0	19.3	22.5	25.4	27.1	29.0	16.3	14.3	.2	7.4	8.2
27	13.2	17.3	72	62	SW	74	0	20.4	23.3	26.2	27.4	28.6	16.9	14.6	0	8.7	7.8
28	11.2	14.0	79	72	SE	51	1	19.9	23.3	26.4	27.5	29.2	13.5	12.0	1.2	7.8	7.8
29	14.2	17.4	78	71	NW	-	2	20.8	23.3	26.0	27.6	27.4	-	-	9.4	4.9	3.2
30	12.7	15.2	81	76	NW	85	2	16.9	19.7	23.0	26.8	27.1	15.2	12.9	.8	5.6	6.7
31	13.1	14.5	95	86	SW	-	0	16.2	18.7	21.9	25.8	28.0	*17.5	13.1	.1	6.8	7.9
no/rg	27	30	29	28	30	27	31	30	30	30	30	30	28	29	31	29	28
total					NE 3%										46.3		
mean	13.5	16.6	79	74	SE 13%	78.0	1.9	20.0	22.6	25.4	27.0	28.6	15.6	14.1		7.5	6.7
max	16.0	20.0	100	95	SW 57%	220		22.9	25.5	28.0	28.4	30.0	19.5	19.0	12.2	11.0	10.2
min	10.8	11.3	58	55	NW 27%	45		16.2	18.5	20.6	24.6	26.1	11.0	9.7		4.5	1.3
						2.41	m/s										

Al Khabar meteo station Month: August Year: 1988 Regular observation time: 1500 h

date	T wb	T db	Rhum hygr	Rhum dbwb	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	*17.5	26.0	39	*	NW	301	8	28.0	31.0	26.3	25.5
2	*22.5	26.0	40	*	NE	115	8	24.5	29.0	24.0	25.9
3	*22.0	25.5	46	*	NE	163	3	31.3	34.0	24.2	24.9
4	*25.0	27.6	40	*	NE	114	2	31.2	34.0	25.3	24.5
5	*25.0	28.0	37	*	NE	162	4	36.0	31.8	27.0	25.0
6	*25.0	25.5	41	*	NE	82	6	31.6	34.4	26.6	25.6
7	-	-	-	-	-	-	-	-	-	-	-
8	15.8	27.6	40	27	NE	83	6	34.0	30.0	28.5	26.5
9	15.0	28.5	36	21	NE	136	5	35.0	32.3	29.0	26.8
10	17.1	28.2	37	31	NE	105	6	37.3	33.8	29.8	27.2
11	16.8	26.9	42	36	SE	90	7	34.7	32.5	29.5	27.6
12	16.0	26.1	40	33	NE	70	6	34.4	31.2	27.1	27.0
13	14.8	27.8	35	23	NE	72	1	38.0	33.0	27.7	26.7
14	*18.3	28.4	37	*	NE	127	2	38.9	33.4	28.9	27.0
15	*16.7	26.9	39	*	NE	184	8	35.2	33.4	30.1	27.7
16	-	-	-	-	-	-	-	-	-	-	-
17	*22.0	28.1	37	*	NE	114	3	37.8	34.2	29.3	27.5
18	14.2	28.2	36	18	NE	111	5	37.2	33.6	29.5	27.8
19	14.3	27.9	37	20	NE	98	5	37.3	34.1	29.9	28.0
20	14.0	28.3	35	17	NE	133	7	35.8	32.2	29.1	28.2
21	15.0	25.0	43	33	NW	52	8	32.5	31.3	29.3	28.1
22	13.5	28.1	34	15	NE	84	0	37.9	32.3	27.6	27.4
23	14.4	27.7	36	21	NE	123	4	39.6	34.3	29.1	27.5
24	15.9	25.6	45	35	NE	75	1	33.2	29.4	26.6	27.6
25	14.8	27.9	38	22	NE	109	5	34.2	31.1	26.9	26.7
26	15.4	28.2	38	24	NE	52	5	36.5	32.9	28.5	26.8
27	14.5	27.8	37	21	NW	102	5	35.4	32.7	28.9	27.2
28	15.8	29.3	36	21	SE	135	3	37.7	33.4	28.9	27.3
29	-	-	-	-	-	-	-	-	-	-	-
30	16.1	26.1	45	34	SW	150	5	29.6	27.2	24.6	26.2
31	-	-	-	-	-	-	-	-	-	-	-
no/rg	18	27	27	18	27	27	27	27	27	27	27
total					NE 78%						
mean	15.2	27.3	39	25	SE 7%	116.4	4.7	34.6	32.3	27.9	26.8
max	17.1	29.3	46	36	SW 4%	301		39.6	34.4	30.1	28.2
min	13.5	25.0	34	15	NW 11%	52		24.5	27.2	24.0	24.5
						2.16	m/s				

Al Khabar meteo station Month: September Year: 1988 Regular observation time: 6:00 hrs

date	T wb	T db	Rhum	Rhum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun
1	15.1	18.9	78	68	NWc	68	7	20.6	22.7	24.9	26.0	27.3	-	-	5.6	5.9	5.5
2	14.5	15.0	100	95	NW	55	8	20.1	23.1	24.2	26.4	24.9	-	-	8.6	5.3	-
3	14.5	15.9	97	86	SEc	69	8	18.1	20.6	23.4	26.0	24.5	-	-	.4	4.8	6.0
4	12.9	14.4	94	85	NW	52	2	16.5	19.2	22.3	25.5	26.7	13.7	12.0	0	6.6	9.3
5	13.0	14.9	87	81	NWc	109	1	19.1	21.4	23.9	25.5	27.9	14.6	13.3	0	10.8	7.2
6	11.5	15.0	71	67	SWc	119	0	20.0	22.7	25.3	26.0	27.6	14.7	13.0	0	10.6	9.7
7	10.0	14.5	57	57	NWc	82	0	19.7	22.8	25.7	26.5	26.9	13.0	11.5	0	8.4	10.2
8	7.1	10.4	66	62	SWc	60	0	18.8	22.4	25.8	26.9	27.6	10.0	9.0	0	9.7	10.3
9	13.8	18.1	73	63	SW	39	8	23.4	25.7	27.7	27.3	20.8	16.2	15.6	3.9	.6	2.3
10	12.3	12.7	100	96	SWc	108	0	16.8	19.9	23.1	26.4	27.2	12.6	11.6	0	8.5	9.0
11	13.5	14.5	97	90	NWc	64	8	19.2	21.7	24.3	26.0	26.6	14.0	13.1	0	7.1	4.9
12	10.6	12.0	95	85	SWc	56	0	18.5	21.8	24.7	26.2	26.6	11.6	9.8	0	6.5	6.0
13	9.4	12.2	72	70	NEc	85	0	19.6	22.7	25.3	-	27.1	11.9	10.9	0	-	10.9
14	10.5	14.3	67	63	SWc	79	5	19.9	22.9	25.9	-	25.6	13.2	10.8	0	8.5	6.1
15	10.6	15.0	72	58	SWc	67	0	20.3	23.5	26.3	26.9	25.5	12.6	11.3	0	7.2	8.1
16	14.5	16.1	95	84	SW	72	1	21.6	24.4	27.0	27.2	25.5	15.0	13.9	0	4.9	4.8
17	11.4	13.4	83	79	NWc	49	0	20.6	23.5	26.0	27.1	27.4	13.3	12.2	0	7.0	8.7
18	13.5	15.2	91	83	SWc	-	7	21.8	24.7	27.3	27.5	26.6	14.0	13.4	0	7.7	8.2
19	14.0	17.4	71	69	SWc	97	5	23.4	25.6	27.8	27.8	27.0	17.5	17.1	0	-	5.9
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	2.7
21	12.2	16.0	74	65	SW	72	2	20.7	23.9	26.8	27.8	25.7	-	-	0	7.0	5.8
22	11.6	12.4	94	91	SEc	75	1	20.0	23.4	26.3	27.5	25.9	12.4	11.1	0	7.5	6.6
23	11.6	18.0	52	46	NWc	65	8	22.0	24.3	26.5	27.4	27.4	17.7	16.5	0	8.3	9.1
24	6.2	8.0	81	77	SWc	81	1	18.8	23.5	26.9	27.7	26.0	7.6	6.8	0	7.8	8.6
25	13.5	16.2	83	75	SWc	56	1	20.7	24.1	26.8	27.6	26.1	15.0	12.5	0	7.1	4.9
26	11.8	16.0	68	61	NWc	98	2	21.4	24.4	26.7	27.6	27.1	15.5	13.0	0	8.6	8.7
27	7.1	11.5	64	53	SWc	77	-	19.2	23.2	26.5	27.6	26.0	9.5	*10.0	0	8.8	6.7
28	-	-	-	-	NE	88	0	19.0	23.0	26.2	27.5	26.3	9.5	9.3	0	9.4	10.7
29	4.0	8.0	52	51	SW	59	0	17.0	21.8	25.7	27.5	24.0	5.5	5.0	0	7.2	10.4
30	5.0	9.0	53	53	SW	96	0	17.8	22.4	26.2	27.5	26.2	7.5	6.5	0	8.5	10.7
no/rg	28	28	28	28	29	28	28	29	29	29	27	29	25	24	30	27	29
total					NE 7%	2097	-								18.5	-	-
mean	11.3	14.1	78	72	SE 7%	75	2.7	19.8	22.9	25.7	26.9	26.2	12.7	11.6	.6	7.4	7.5
max	15.1	18.9	100	96	SW 55%	119	-	23.4	25.7	27.8	27.8	27.9	17.7	17.1	8.6	10.8	10.9
min	4.0	8.0	52	46	NW 31%	39	-	16.5	19.2	22.3	25.5	20.8	5.5	5.0	0	.6	2.3
						2.31	m/s							Rainy days: 4			

Al Khabar meteo station Month: September Year: 1988 Regular observation time: 15:00 hrs

date	T wb	T db	Rhum	Rhum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	15.9	26.9	42	30	NE	103	8	35.4	31.6	27.1	25.9
2	17.1	24.9	53	46	NE	85	5	32.6	29.6	26.3	26.1
3	16.0	24.0	54	44	NE	54	4	27.6	26.7	24.5	25.7
4	14.5	27.0	39	24	NE	78	2	33.5	29.2	24.9	25.1
5	26.8	12.5	35	15	NE	137	3	35.2	31.2	26.5	25.5
6	13.5	27.5	36	18	NE	86	3	37.1	32.5	27.5	25.9
7	13.3	27.2	36	17	NW	45	1	38.7	33.7	28.2	26.4
8	15.5	27.6	38	26	NE	109	1	39.6	32.8	28.3	26.6
9	16.3	20.2	76	68	NW	26	3	24.0	24.4	25.7	27.1
10	13.6	26.2	38	21	NE	97	3	33.6	29.7	25.7	25.8
11	14.1	25.6	40	26	NE	80	8	32.9	30.3	26.4	25.8
12	14.3	25.9	39	26	SE	63	7	32.7	29.9	26.5	25.9
13	13.0	27.3	34	15	NW	96	1	37.1	32.7	27.6	-
14	14.4	25.5	42	28	NE	101	3	36.0	32.6	27.9	26.6
15	14.5	25.0	43	31	NE	58	7	37.6	33.2	28.5	26.8
16	15.3	25.8	47	32	NW	54	7	34.0	30.3	27.8	27.0
17	15.5	27.1	42	27	NW	53	6	38.6	33.7	28.7	26.9
18	-	-	-	-	-	-	-	-	-	-	-
19	13.2	26.0	37	21	NE	-	3	35.3	30.9	29.0	27.7
20	-	-	-	-	-	-	-	-	-	-	-
21	13.2	25.2	39	23	NW	87	7	33.2	30.7	28.1	27.5
22	13.0	24.4	39	25	NE	80	6	34.0	29.8	27.9	27.3
23	12.5	27.0	33	14	NE	46	1	40.4	32.9	28.9	27.3
24	12.1	25.5	34	18	NE	51	2	38.4	31.3	28.3	27.5
25	14.0	25.2	38	27	NEc	95	-	34.4	30.4	28.5	27.5
26	12.4	26.0	34	17	NE	72	4	37.6	32.2	28.4	27.5
27	14.0	26.0	35	24	NE	88	7	37.8	23.3	28.2	27.4
28	11.0	26.0	32	10	NE	54	0	39.2	33.8	28.2	27.3
29	11.5	26.0	32	11	NE	68	1	39.8	32.6	27.8	27.3
30	12.4	25.2	33	19	NE	43	0	39.2	32.4	27.8	27.2
no/rg	28	28	28	28	28	27	27	28	28	28	27
total					NE 75%						
mean	14.4	25.3	40	25	SE 4%	74	3.8	35.6	30.9	27.5	26.7
max	26.8	27.6	76	68	SW 0%	137		40.4	33.8	29.0	27.7
min	11.0	12.5	32	10	NW 21%	26		24.0	23.3	24.5	25.1
						1.38	m/s				

Al Khabar meteo station Month: October Year: 1988 Regular observation time: 6:00 hrs

date	T wb	T db	Rhum hygr	Rhum dbwb	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun
1	3.5	7.4	54	51	NEc	59	0	17.0	22.0	25.8	24.4	*25.5	6.5	5.7	0	9.2	10.5
2	6.0	10.0	60	55	SWc	93	0	19.2	23.5	26.6	25.4	*26.0	9.6	8.5	0	8.3	10.3
3	4.5	7.5	63	62	NE	96	0	20.7	22.5	26.4	25.3	*24.7	8.5	7.0	0	8.0	10.6
4	-	-	-	-	-	71	0	-	-	-	-	*24.5	7.5	5.0	0	6.0	10.7
5	3.2	6.5	55	57	SWc	60	0	16.6	21.6	25.3	27.2	*24.7	5.9	5.0	0	10.1	10.7
6	6.0	9.0	66	65	SWc	30	0	17.2	22.0	25.6	27.2	*25.0	8.0	6.0	0	10.1	8.8
7	4.8	8.0	65	61	NW	70	0	17.2	22.2	25.6	27.0	*25.2	7.6	6.8	0	5.2	10.7
8	6.0	9.0	70	65	NEc	69	0	17.6	22.3	26.0	27.2	*25.5	8.5	7.5	0	7.9	10.6
9	4.0	7.5	60	56	NW	68	0	17.3	22.6	26.2	27.2	*25.3	7.0	5.5	0	9.7	10.9
10	2.5	6.5	53	49	NWc	74	0	16.0	22.7	25.7	27.2	*25.2	5.3	4.2	0	7.1	10.8
11	2.5	5.5	53	60	NEc	61	0	16.0	21.2	25.2	27.0	*25.0	4.8	4.0	0	8.1	10.9
12	2.4	6.6	50	48	SWc	56	0	15.5	21.0	25.0	26.8	*25.0	4.5	3.5	0	6.9	11.1
13	1.0	4.5	49	51	NWc	20	0	15.2	20.8	24.8	26.7	*25.2	4.0	3.5	0	4.8	11.0
14	2.0	5.0	58	59	NWc	49	0	15.2	21.0	24.6	26.6	*25.0	3.5	2.5	0	10.0	11.2
15	3.5	5.0	52	*80	NEc	40	0	14.7	20.6	24.6	26.5	*25.0	3.0	2.5	0	4.3	11.2
16	2.5	5.5	58	60	SEc	47	0	15.3	20.8	24.5	26.5	*25.3	5.0	3.5	0	7.6	11.2
17	3.3	6.5	63	58	NEc	39	0	15.6	21.0	24.8	26.5	*25.0	4.6	2.5	0	7.3	11.2
18	1.5	5.0	58	52	NWc	61	0	15.2	20.8	24.6	26.5	*25.0	4.5	3.0	0	6.8	11.3
19	2.0	5.0	65	59	SEc	73	0	14.6	20.2	24.3	26.4	*25.0	4.5	3.4	0	7.9	11.2
20	2.0	5.3	60	55	SWc	75	0	14.8	20.2	24.2	26.3	*25.0	4.5	3.5	0	9.1	11.0
21	0	4.0	52	44	NEc	47	0	13.8	19.6	23.8	26.0	*25.0	4.0	3.0	0	7.9	11.0
22	3.0	7.0	62	50	NWc	75	0	15.2	20.6	24.2	26.0	*25.0	3.5	2.5	0	7.3	11.0
23	3.0	5.0	53	*72	NEc	93	0	14.3	19.8	23.8	25.9	*25.5	4.7	3.6	0	7.9	10.9
24	7.5	10.5	66	66	NWc	100	0	16.0	22.3	23.8	25.7	*25.4	11.0	9.5	0	7.1	10.7
25	3.0	5.5	72	66	NEc	61	1	14.6	19.7	23.7	25.5	*25.0	5.0	4.2	0	9.0	10.9
26	3.0	5.0	70	72	NEc	61	0	14.7	20.0	23.8	25.5	23.1	5.0	3.9	0	7.2	11.0
27	1.5	4.5	65	58	NWc	83	0	14.0	19.8	23.8	25.5	23.3	3.5	3.0	0	6.9	11.1
28	.5	3.0	55	63	NE	93	0	12.8	18.8	23.0	25.4	23.1	2.9	1.5	0	6.9	11.0
29	.5	3.6	53	55	SWc	74	0	12.3	18.2	22.3	25.0	23.0	2.9	1.6	0	6.1	11.0
30	-2.5	.5	!45	!	SW	42	0	11.3	17.5	22.2	24.8	23.8	.2	-1.1	0	7.5	11.0
31	-2.5	1.0	!44	!	NEc	57	0	11.5	17.6	22.0	24.5	22.8	.7	-.9	0	6.3	11.1
nr/rg	30	30	28	26	30	31	31	30	30	30	30	6	31	31	31	31	31
total					NE 40%	1997									0	234.5	336.6
mean	2.7	5.8	59	58	SE 7%	64	.0	15.4	20.8	24.5	26.1	-	5.2	4.0		7.6	10.9
max	7.5	10.5	72	72	SW 23%	100		20.7	23.5	26.6	27.2	-	11.0	9.5	0	10.1	11.3
min	-2.5	.5	49	44	NW 30%	20		11.3	17.5	22.0	24.4	22.8	.2	-1.1		4.3	8.8
						1.99	m/s										

Al Khabar meteo station Month: October Year: 1988 Regular observation time: 15:00 hrs

date	T wb	T db	Rhum hygr	Rhum dbwb	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	-	-	33	-	NE	71	0	-	-	-	27.2
2	13.5	24.0	35	28	NE	31	1	39.8	33.2	28.5	27.4
3	10.0	24.5	32	10	NE	62	0	39.4	32.0	27.6	27.2
4	13.5	24.2	32	28	NE	47	0	39.0	32.2	27.8	27.0
5	13.0	25.0	35	23	NE	60	0	39.8	32.5	27.6	27.0
6	14.0	24.5	36	29	NE	113	2	39.7	32.7	27.7	27.0
7	12.8	24.7	39	23	NE	51	0	39.8	32.8	27.6	26.9
8	13.3	25.5	38	22	NE	65	2	40.5	32.6	27.8	27.0
9	11.2	24.5	34	15	NW	53	0	40.2	32.3	27.5	27.0
10	11.6	24.8	34	16	NE	47	0	39.4	31.2	26.6	27.0
11	11.6	24.5	35	17	NW	50	0	39.2	30.8	26.4	26.8
12	10.5	24.2	32	13	NE	48	0	40.2	32.2	27.0	26.7
13	14.0	24.7	31	28	NE	85	0	*28.5	29.0	25.6	26.5
14	11.0	24.0	34	16	NE	45	0	40.0	32.0	26.6	26.6
15	10.5	24.5	34	12	NE	54	0	40.2	31.6	26.2	26.3
16	11.0	25.0	34	13	SE	45	0	39.8	32.2	26.6	26.2
17	10.0	25.5	35	8	NWc	75	0	39.5	*33.0	26.8	26.3
18	10.8	22.7	38	18	NE	51	0	39.0	30.5	25.6	26.3
19	10.5	23.0	35	16	NE	41	0	38.8	31.6	26.2	26.2
20	10.7	23.0	35	17	SE	38	0	38.8	30.8	25.8	26.0
21	*	*26.0	*62	*	NW	76	0	38.5	30.0	25.0	25.8
22	10.9	22.7	36	21	NE	47	0	38.3	30.8	25.8	25.8
23	10.5	21.6	39	21	NW	116	0	37.0	29.8	25.2	25.5
24	10.5	22.2	38	19	NE	60	0	37.5	29.8	25.0	25.5
25	12.4	21.7	43	32	NE	61	2	37.6	30.8	25.2	25.4
26	10.5	21.8	41	21	NE	53	1	38.0	30.7	25.3	25.4
27	10.5	22.0	38	20	NW	49	0	36.3	30.2	25.2	25.3
28	9.3	21.8	35	15	NE	48	0	35.7	29.0	24.4	25.2
29	9.5	22.0	32	14	NE	35	0	37.0	29.3	24.2	24.7
30	9.5	23.0	31	11	NE	27	0	37.5	28.8	23.3	24.5
31	9.0	21.8	33	13	NE	30	0	36.8	28.8	23.5	24.3
no/rg	29	29	30	29	31	31	31	29	29	30	31
total					NE 74%	1734					
mean	11.2	23.6	35	19	SE 7%	56	.3	38.7	31.0	26.1	26.2
max	14.0	25.5	43	32	SW 0%	116		40.5	33.2	28.5	27.4
min	9.0	21.6	31	8	NW 19%	27		35.7	28.8	23.3	24.3
						1.04	m/s				

average wind speed	1.39	m/s
potential evapotranspiration (Penman Et0)	6.5	mm/day
chilling hours (Crossa-Raynaud)	78.4	hrs
no. of rainy days	0	
no. of days with surface temp. below 0	2	
no. of days with min. temp. below 0	0	

Al Khabar meteo station Month: November Year: 1988 Regular observation time: 6:00 hrs

date	T wb	T db	Rhum	Rhum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun	Chill
1	-1.3	2.0	45	!	NEc	60	0	11.6	17.5	21.8	24.4	21.7	1.7	.3	0	6.7		6.4
2	2.0	5.7	52	51	NE	61	1	13.3	18.2	21.8	24.3	21.0	4.5	3.0	0	6.2		3.6
3	3.7	6.0	78	69	NEc	66	0	13.3	18.6	22.2	24.3	21.5	4.0	3.0	0	5.9		4.1
4	1.0	3.3	70	66	NEc	62	0	13.0	18.8	22.3	24.4	21.0	3.0	1.6	0	6.4		5.3
5	0	3.7	62	48	NWc	66	0	12.0	17.8	22.0	24.3	21.0	2.0	1.0	0	5.8		6.3
6	-1.5	1.0	60	!	NEc	67	0	11.6	17.2	21.6	24.0	20.0	.7	-.5	0	7.1		7.8
7	-1.0	1.5	57	!	NWc	52	0	11.0	16.8	21.2	23.8	20.0	1.3	-.3	0	8.2		7.3
8	0	3.5	64	50	NEc	66	0	11.0	16.8	20.8	23.6	20.5	1.3	-.2	0	7.0		7.1
9	-2.0	0	55	!	SEc	55	0	10.0	16.0	20.6	23.5	21.0	-.2	-1.6	0	5.8		8.2
10	-4.5	.5	52	!	SWc	44	0	9.5	15.6	20.2	23.3	22.0	-.1	-2.3	0	5.3		7.7
11	-2.3	0	65	!	SWc	40	0	10.0	16.0	20.3	23.0	21.7	-.8	-2.2	0	6.1		8.3
12	-3.5	1.0	50	!	NWc	31	0	10.0	15.8	20.2	23.0	23.0	-1.0	-2.0	0	5.7		8.0
13	-1.5	3.2	48	!	NEc	44	0	11.0	16.8	20.3	23.0	23.5	1.8	.4	0	5.4		5.8
14	-.5	3.3	63	!	SWc	51	0	12.5	17.7	21.2	23.0	24.0	2.8	1.8	0	9.2		4.8
15	4.5	7.5	67	62	NWc	27	0	13.0	18.2	21.8	23.3	19.0	5.2	2.9	0	6.9		3.1
16	6.2	8.3	88	74	NWc	61	0	15.0	18.5	21.3	23.2	19.0	5.0	2.5	0	5.3		3.4
17	3.0	5.0	82	72	NWc	56	0	16.6	16.8	20.8	23.0	19.5	4.8	3.1	0	6.0	10.3	3.6
18	-2.0	0	78	!	NEc	52	0	10.2	16.2	20.3	23.0	20.0	-.5	-1.5	0	4.8	10.6	8.8
19	-4.0	-1.0	60	!	NEc	46	0	9.2	15.3	19.6	22.6	21.0	-2.0	-3.0	0	5.1	10.7	9.4
20	-2.0	0	58	!	NEc	39	0	10.0	15.5	19.8	22.4	21.7	.3	-1.9	0	5.8	10.8	7.5
21	-3.0	0	52	!	NWc	68	0	10.0	15.5	19.8	22.3	20.0	-.1	-1.9	0	5.5	10.9	8.5
22	-2.0	.3	64	!	NEc	28	0	9.2	15.0	19.3	22.0	20.5	-.3	-2.0	0	5.8	10.8	8.4
23	-3.7	-1.5	62	!	NEc	49	0	9.2	14.8	19.0	22.0	24.2	-1.9	-2.9	0	6.2	10.5	8.2
24	-1.5	0	68	!	NEc	43	0	9.5	15.0	19.2	21.8	23.5	-.3	-1.6	0	5.8	10.2	7.4
25	-1.0	1.8	60	!	SWc	41	0	10.2	15.6	19.8	21.8	23.0	.6	-.6	0	6.3	10.2	6.9
26	-2.0	1.0	55	!	NEc	41	0	10.2	15.8	19.8	21.8	20.5	-.1	-1.0	0	4.7	10.2	8.3
27	-3.5	-1.0	55	!	NEc	53	0	8.8	14.7	19.2	21.8	20.0	-1.5	-2.5	0	5.3	10.3	9.5
28	0	4.0	53	44	NWc	56	0	9.0	14.4	18.8	21.5	22.0	0	-1.2	0	5.1	10.3	7.6
29	-3.5	-1.0	54	!	NE	48	0	8.8	14.6	18.8	21.4	21.7	-1.3	-2.1	0	4.9	10.3	8.7
30	-1.7	1.2	53	!	NWc	43	0	8.8	14.6	18.8	21.4	21.0	-.5	-1.9	0	5.9	10.3	8.4
no/rg	30	30	30	9	30	30	30	30	30	30	30	30	30	30	30	30	14	30
total					NE 57%	1516									0	180.2	146.4	208.3
mean	-.9	2.0	61	60	SE 3%	51	.0	10.9	16.3	20.4	22.9	21.3	.9	-.5		6.0	10.5	
max	6.2	8.3	88	74	SW 10%	68		16.6	18.8	22.3	24.4	24.2	5.2	3.1	0	9.2	10.9	
min	-4.5	-1.5	48	44	NW 30%	27		8.8	14.4	18.8	21.4	19.0	-2.0	-3.0		4.7	10.2	
						1.56	m/s											

Al Khabar meteo station Month: November Year: 1988 Regular observation time: 15:00 hrs

date	T wb	T db	R hum	Rhum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50			
1	9.0	21.5	33	13	NW	40	0	16.0	28.3	23.3	24.1			0
2	11.0	21.5	40	25	NW	61	0	36.6	28.8	23.3	24.2			0
3	11.5	22.5	47	26	NE	62	1	37.3	29.3	24.0	24.0			0
4	11.2	21.3	40	27	SE	41	0	36.8	28.8	23.6	24.2			0
5	10.5	21.0	39	24	NE	66	0	36.2	23.2	23.3	24.0			0
6	9.5	21.0	37	18	NE	43	0	35.3	28.3	23.2	23.8			0
7	9.2	20.5	35	18	NE	58	0	35.0	27.8	23.0	23.6			0
8	10.3	20.3	37	25	NE	35	0	35.5	27.6	22.3	23.4			0
9	9.3	21.2	35	16	NE	29	0	35.5	27.2	22.2	23.2			0
10	10.0	22.5	32	15	NW	25	0	36.0	27.7	22.2	23.0			0
11	10.0	21.5	34	19	SW	39	0	35.8	28.0	22.5	22.8			0
12	10.5	24.0	32	13	NE	25	0	36.3	27.0	21.8	22.8			0
13	11.0	24.2	33	15	NW	29	0	36.2	28.2	22.2	22.7			0
14	11.0	23.7	37	17	NE	62	0	36.2	28.8	23.0	23.0			0
15	12.0	23.0	38	24	NE	56	0	38.0	28.5	22.5	23.0			0
16	9.0	19.0	42	23	NE	91	0	34.0	27.3	22.6	23.0			0
17	9.2	19.1	38	23	NE	47	0	34.4	26.7	21.9	22.9			0
18	9.0	20.0	39	19	NEc	30	0	34.0	26.8	21.8	22.7			0
19	9.5	21.3	35	17	NE	37	0	34.2	25.6	20.8	22.4			0
20	8.9	21.3	34	13	NE	50	0	34.5	26.5	21.2	22.2			0
21	8.6	19.0	39	21	NE	43	0	33.2	25.6	20.8	22.0	average wind speed	1.11 m/s	0
22	10.0	20.0	36	25	NW	41	0	32.5	25.2	20.4	21.8			0
23	9.0	21.5	35	13	NE	40	0	33.8	25.8	20.6	21.7	potential	5.2 mm/day	0
24	10.0	22.5	35	15	SE	38	0	34.3	26.0	20.6	21.6	evapotranspiration		0
25	9.5	22.0	35	14	NE	49	0	34.6	26.5	21.0	21.7	(Penman EtP)		0
26	8.5	20.2	35	15	NE	49	0	33.8	26.0	20.8	21.7			0
27	8.5	19.7	36	17	NE	47	0	32.5	24.5	20.0	21.5	Chilling hours	208.3 hrs	0
28	9.3	21.3	35	15	NE	34	0	33.2	25.3	20.2	21.3	(Crossa-Raynaud)		0
29	9.5	21.3	36	16	SE	42	0	33.6	25.3	20.2	21.2			0
30	9.0	20.2	36	18	NE	51	0	33.5	24.2	19.5	21.2	no. of rainy days	0	0
no/rg	30	30	30	30	30	30	30	30	30	30	30	no. of days with	20	
total					NE 70%	1360						surface temp. below 0		
mean	9.8	21.3	37	19	SE 10%	45	.0	33.4	26.5	21.8	22.7			
max	12.0	24.2	47	27	SW 3%	91		38.0	29.3	24.0	24.2	no. of days with	15	
min	8.5	19.0	32	13	NW 17%	25		10.0	15.8	19.5	21.2	min. temp. below 0		
						.84	m/s							

Al Khabar meteo station Month: December Year: 1988 Regular observation time: 6:00 hrs

date	T wb	T db	Rhum	Rhum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50	Tmax	Tmin	Tssmin	Rain	Evap	Sun	Chill
1	-3.0	-.5	!	53	NWc	45	0	9.2	14.7	18.8	21.3	21.6	-.7	-1.5	0	4.6		8.3
2	-	-	-	-	-	-	0	-	-	-	-	20.3	-.6	-	0	4.6		8.7
3	*-5.0	*2.5	!	64	NEc	66	0	8.8	14.0	18.2	21.0	16.7	-.4	-2.0	0	6.9		10.4
4	-2.8	-.8	!	72	NEc	41	0	7.3	13.2	17.6	20.7	18.5	-1.3	-3.3	0	4.5		10.1
5	-4.7	-1.5	!	66	SWc	42	0	7.5	13.5	16.2	20.5	18.8	-2.5	-3.5	0	4.7		10.7
6	-4.0	-2.0	!	70	NEc	35	0	7.5	13.2	17.3	20.4	21.7	-2.5	-3.5	0	10.1	10.4	9.4
7	-1.0	0	!	70	NEc	31	0	8.8	14.2	18.0	20.4	23.7	-.5	-2.0	0	2.1	10.3	7.4
8	2.2	4.5	67	80	SWc	41	0	11.2	15.8	19.0	20.5	22.7	3.5	2.0	0	3.1	8.6	4.4
9	-1.5	1.0	!	58	SWc	49	0	10.0	15.0	18.8	20.7	24.5	.7	-.2	0	5.1	9.8	6.4
10	1.0	3.0	70	60	SWc	36	0	11.5	16.5	19.4	20.8	21.5	3.0	-2.0	0	5.8	10.2	5.2
11	1.0	1.5	89	65	NEc	46	0	10.2	15.4	19.2	21.0	19.0	1.0	-.5	0	4.1	10.3	8.0
12	-3.7	-1.5	!	71	NEc	32	0	8.5	14.5	18.6	21.0	21.0	-2.0	-3.0	0	4.9	10.3	9.4
13	-4.0	-2.0	!	63	NWc	39	0	7.5	13.8	18.2	20.8	21.5	-3.0	-3.7	0	-	10.4	9.8
14	-4.2	-1.5	!	53	NEc	37	0	7.2	13.3	17.8	20.5	23.3	-3.0	-4.5	0	6.4	10.4	9.1
15	-4.5	-1.5	!	50	NEc	63	0	7.3	13.7	17.8	20.5	24.4	-2.5	-4.0	0	6.2	10.4	8.5
16	-3.0	-.5	!	47	SWc	20	0	7.8	13.6	17.8	20.4	24.0	*2.0	*-1.5	0	5.8	10.4	8.5
17	-3.0	.5	!	42	SWc	41	0	8.2	13.8	18.0	20.3	24.3	-2.5	-4.0	0	5.7	10.4	8.5
18	-3.5	-.5	!	45	SWc	36	0	8.3	14.2	18.2	20.4	25.0	-1.0	-2.6	0	5.5	10.4	7.4
19	.5	3.0	63	65	SWc	33	0	10.3	15.6	19.0	20.5	25.5	3.0	-.5	0	5.5	10.4	4.3
20	-.5	2.0	!	68	NEc	41	0	10.3	15.8	19.3	20.7	24.6	1.5	-.5	0	6.2	10.4	5.7
21	-2.5	-.5	!	71	SEc	76	0	10.2	15.8	19.5	21.0	22.5	-.6	-1.8	0	1.9	10.4	7.9
22	-2.6	0	!	58	NWc	63	0	9.2	14.6	18.8	21.8	20.8	-.5	-2.0	0	10.2	10.4	8.5
23	-1.2	1.2	!	70	SWc	62	0	9.2	14.4	18.3	20.6	23.0	-1.0	-2.5	0	5.1	10.4	8.0
24	-1.0	1.0	!	74	SWc	67	0	10.0	15.2	18.8	20.6	22.5	0	-1.2	0	4.9	10.4	7.5
25	-2.0	0	!	75	SWc	36	0	9.4	14.7	18.6	20.6	22.3	-.5	-1.0	0	6.2	10.4	7.9
26	-5.5	-3.0	!	48	SWc	54	0	6.2	13.0	17.8	20.5	23.7	-3.6	-5.5	0	5.7	10.4	9.3
27	-4.0	0	!	40	SWc	53	0	7.2	13.0	17.5	20.3	24.8	-2.0	-4.0	0	6.3	10.4	8.1
28	-.5	2.0	!	69	SEc	20	0	9.5	14.8	18.3	20.3	21.7	2.5	-.5	0	4.9	9.8	5.6
29	2.0	4.0	71	93	NWc	57	0	10.6	15.5	18.8	20.4	18.5	.5	-.5	0	5.1	6.8	8.7
30	-2.0	-.5	!	86	SWc	52	0	8.5	14.0	18.0	20.3	22.2	-1.0	-2.0	0	8.1	10.1	8.3
31	-2.0	1.0	!	65	SW	40	0	8.2	14.2	17.8	20.2	22.0	0	-.8	0	5.9	10.4	7.6
no/rg	29	29	5	30	30	30	31	30	30	30	30	31	30	29	31	30	26	31
total					NE 30%	1354									0	166.0	263.0	247.4
mean	-2.1	.3	-	64	SE 7%	45	0.0	8.9	14.4	18.3	20.6	22.1	-.5	-2.1		5.5	10.1	
max	2.2	4.5	-	93	SW 50%	76		11.5	16.5	19.5	21.8	25.5	3.5	2.0	0	10.2	10.4	
min	-5.5	-3.0	-	40	NW 13%	20		6.2	13.0	16.2	20.2	16.7	-3.6	-5.5		1.9	0	
						1.39	m/s											

Al Khabar meteo station Month: December Year: 1988 Regular observation time: 15:00 hrs

date	T wb	T db	Rhum	Rhum	Wdir	Wrun	octas	Ts 5	Ts 10	Ts 20	Ts 50
1	9.0	21.0	9	35	NE	-	0	33.5	24.8	19.6	21.0
2	-	-	-	-	-	-	0	-	-	-	-
3	7.5	15.8	25	45	NW	50	0	30.3	22.8	18.8	20.7
4	8.5	17.2	27	43	NE	41	0	30.6	21.8	18.2	20.5
5	8.2	18.2	21	40	SE	40	0	31.5	23.5	18.3	20.3
6	10.0	22.0	17	35	SE	20	0	32.8	24.0	18.8	20.2
7	10.5	23.0	16	34	NE	40	0	33.0	24.2	19.0	20.3
8	11.4	22.0	25	41	NE	27	2	33.2	25.2	20.0	20.5
9	10.5	23.0	16	34	SE	57	1	33.0	25.2	19.8	20.6
10	11.0	20.5	29	43	NE	62	1	34.2	25.6	20.3	21.8
11	10.0	19.0	29	43	NE	56	0	32.3	25.2	20.2	21.0
12	8.5	20.0	16	35	NE	34	0	32.8	24.6	19.4	20.7
13	8.0	20.7	11	32	NE	40	0	32.8	24.2	19.2	20.6
14	9.0	23.0	9	30	SE	39	0	33.0	24.2	19.0	20.3
15	10.3	24.5	11	32	SE	36	0	32.2	24.0	19.0	20.3
16	8.2	23.0	5	32	NE	40	0	33.0	24.0	18.6	20.2
17	10.5	24.7	11	29	SE	25	0	33.8	25.2	19.3	20.2
18	10.0	24.0	11	28	NE	39	0	34.5	25.0	19.3	20.3
19	10.5	23.4	15	33	NE	33	0	34.5	26.0	20.5	20.3
20	11.0	23.8	16	32	NE	37	0	35.2	26.3	20.4	20.5
21	9.2	21.5	14	32	NE	57	0	32.3	25.3	20.3	20.8
22	8.0	20.0	13	36	NE	67	0	32.2	24.8	19.8	20.7
23	10.0	19.5	*27	32	NE	52	0	32.5	24.5	19.6	20.4
24	10.3	22.5	17	38	SE	54	0	32.5	24.6	19.8	20.5
25	10.0	19.5	27	35	NE	75	0	32.3	24.5	19.5	20.4
26	8.0	23.5	*3	33	SW	42	0	32.0	23.3	18.3	20.3
27	9.5	24.0	7	29	NE	57	0	32.2	24.3	18.8	20.0
28	11.8	22.5	25	36	NE	101	0	32.5	24.7	19.2	20.1
29	9.0	18.0	14	48	SE	69	0	30.5	23.8	18.8	20.3
30	8.0	20.4	12	34	SE	27	0	30.6	23.3	18.6	20.1
31	9.2	21.5	14	34	NE	33	0	32.6	24.3	19.0	20.0
no/rg	30	30	28	30	30	29	31	30	30	30	30
total					NE 64%	1350					
mean	9.5	21.4	17	35	SW 30%	47	.1	32.6	24.4	19.3	20.5
max	11.8	24.7	29	48	SW 3%	101		35.2	26.3	20.5	21.8
min	7.5	15.8	5	28	NW 3%	0		30.3	21.8	18.2	20.0
						.86	m/s				

0

RAINFALL DATA STATION: AR RUBAT YEAR: 1987 UGE TYPE: RAINLOG Y

date	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUSTUS	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	0	0	0	0	0	7.0	0	0
2	-	-	-	-	0	0	0	0	0	0	0	0
3	-	-	-	-	0	0	0	4.7	0	0	0	0
4	-	-	-	-	0	0	0	0	0	0	0	0
5	-	-	-	-	0	2.2	0	0	0	0	0	0
6	-	-	-	-	0	0	0	0	0	0	0	0
7	-	-	-	-	0	0	15.5	3.0	10.7	0	0	0
8	-	-	-	-	26.2	0	0	0	0	0	0	0
9	-	-	-	-	0	0	0	0	0	0	0	0
10	-	-	-	-	0	0	0	1.8	0	0	0	0
11	-	-	-	-	0	0	12.0	9.8	0	0	0	0
12	-	-	-	-	0	0	0	9.1	0	0	0	0
13	-	-	-	-	0	1.2	0	0	3.4	0	0	0
14	-	-	-	-	0	0	0	9.0	4.6	0	0	0
15	-	-	-	-	0	0	0	0	0	0	0	0
16	-	-	-	-	0	0	0	2.6	0	0	0	0
17	-	-	-	-	0	0	0	0	0	0	0	0
18	-	-	-	-	0	0	0	0	0	0	0	0
19	-	-	-	-	0	0	0	0	0	0	0	0
20	-	-	-	-	0	0	0	0	0	0	0	0
21	-	-	-	-	0	0	0	0	0	0	0	0
22	-	-	-	-	0	0	0	10.9	0	0	0	0
23	-	-	-	-	0	0	0	0	0	0	0	0
24	-	-	-	-	0	0	0	0	0	0	0	0
25	-	-	-	-	2.3	0	0	0	0	0	0	0
26	-	-	-	-	0	0	0	0	0	0	0	0
27	-	-	-	-	0	0	1.1	0	0	0	0	0
28	-	-	-	-	0	0	0	0	0	0	0	0
29	-		-	0	0	0	0	0	0	0	0	0
30	-		-	0	0	0	0	0	0	0	0	0
31	-		-		0		0	0		0		0
TOTA	-	-	-	-	28.5	3.4	28.6	50.9	18.7	7.0	0	0
MAX:	-	-	-	-	26.2	2.2	15.5	10.9	10.7	7.0	0	0
NO. RAINY DAYS												137.1

Annex B

Meteorological data
Ar Rawdah
January - November
1988

Ar Rawdah meteo station month January year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wind dir. vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley	Chill hrs
1	94.4	76.1	122	9.9	18.6	15.6	8.3	0	157	0
2	95.6	92.4	167	8.4	17.8	13.1	11.5	0	117	0
3	92.4	57.5	74	11.7	18.0	20.6	10.1	0	374	0
4	89.2	49.2	79	10.2	18.8	20.6	9.5	0	438	0
5	94.1	19.9	169	8.1	18.4	23.1	5.4	0	488	2.2
6	95.8	14.1	192	7.7	17.6	22.3	1.6	0	495	6.3
7	93.6	24.1	190	10.5	17.1	19.1	.6	0	506	8.3
8	95.9	18.9	181	7.9	17.5	23.3	2.6	0	497	5.1
9	95.0	40.2	108	10.4	17.9	21.0	4.1	0	483	4.1
10	93.0	49.6	102	11.1	18.5	20.1	9.1	0	465	0
11	95.0	65.8	174	8.5	18.2	18.6	3.7	0	498	5.3
12	95.4	26.0	190	7.8	18.0	22.9	2.9	0	528	4.9
13	94.7	14.6	49	10.2	18.0	24.9	3.4	0	526	4.0
14	87.8	24.2	68	11.9	18.7	22.4	9.0	0	525	0
15	93.7	21.5	178	9.4	18.4	20.4	2.8	0	532	5.7
16	94.0	14.7	185	8.5	18.2	20.9	7.3	0	456	0
17	93.2	34.1	189	9.4	18.3	21.0	5.9	0	496	1.7
18	92.9	43.8	164	9.1	18.9	23.5	9.4	0	500	0
19	78.3	36.6	49	16.1	19.4	22.2	10.3	0	488	0
20	81.7	30.9	80	11.0	18.9	19.9	6.2	0	469	1.4
21	92.7	32.2	149	9.5	18.6	19.2	3.2	0	505	5.7
22	94.0	42.3	181	8.6	18.3	20.8	4.5	0	493	3.7
23	92.6	31.0	156	8.0	18.2	21.3	4.3	0	503	3.8
24	63.2	12.4	51	13.7	18.4	25.3	6.7	0	523	.4
25	55.0	13.6	219	8.0	18.5	24.9	3.8	0	520	3.6
26	85.3	15.4	190	9.7	18.5	23.3	5.1	0	518	2.5
27	79.8	13.2	88	10.2	18.4	24.7	3.4	0	518	4.1
28	92.3	21.3	162	10.2	18.4	20.5	5.2	0	522	2.8
29	93.3	35.5	181	9.6	18.5	20.5	5.8	0	531	2.0
30	92.4	30.7	165	9.8	18.4	21.0	3.1	0	528	5.2
31	92.6	16.7	186	9.2	18.6	22.6	3.0	0	530	4.9
no/rg	31	31	31	31	31	31	31	31	31	31
total								0	14728	87.8
mean	89.6	32.8	143	9.8	18.3	21.3	5.5		475.1	
max	95.9	92.4	142+	16.1	19.4	25.3	11.5	0	532.0	
min	55.0	12.4		7.7	17.1	13.1	.6		117.0	
			NE 26%	2.73	m/s					
			SE 39%							
			SW 35%							
			NW 0%							

+ vector

Ar Rawdah meteo station month: February year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley	Chill
1	85.2	13.9	178	11.7	18.5	22.4	5.1	0	527	2.6
2	65.7	15.2	177	12.2	18.5	22.0	8.0	0	519	0
3	90.6	14.1	181	10.5	18.7	22.5	7.5	0	513	0
4	88.3	19.9	83	10.5	18.8	23.2	5.3	0	481	2.3
5	92.4	26.4	127	7.9	18.9	21.9	6.7	0	485	.5
6	92.4	22.2	153	8.7	18.8	21.6	4.8	0	492	3.1
7	92.3	19.5	167	9.9	18.8	21.4	4.1	0	504	4.0
8	90.1	19.7	178	10.9	19.3	21.2	7.4	0	501	0
9	90.6	25.4	177	10.2	19.3	24.2	7.0	0	509	0
10	90.5	20.3	192	10.4	19.5	24.6	8.5	0	496	0
11	92.8	40.2	175	9.6	19.7	23.6	7.8	0	496	0
12	92.7	67.6	182	10.8	20.0	20.5	9.5	0	448	0
13	93.5	71.1	177	10.8	20.1	20.1	8.0	0	516	0
14	93.5	75.1	175	9.8	20.3	19.2	10.5	0	421	0
15	94.3	68.6	172	10.1	20.5	21.5	9.0	0	445	0
16	92.0	62.8	175	13.8	21.0	20.6	12.2	0	511	0
17	90.8	54.9	184	13.0	21.0	22.6	12.4	0	445	0
18	93.4	50.2	186	11.2	21.0	22.5	9.3	0	521	0
19	94.3	45.6	184	11.1	21.2	23.7	8.4	0	525	0
20	92.8	44.8	165	10.0	21.6	23.0	12.4	0	496	0
21	92.7	19.2	165	9.8	21.0	23.3	5.1	0	561	2.5
22	91.4	17.0	166	9.8	20.7	23.0	6.8	0	536	.3
23	92.2	38.9	163	15.1	20.8	20.5	9.5	0	486	0
24	91.4	43.1	172	12.9	20.5	21.2	11.5	0	332	0
25	92.5	35.8	169	12.1	20.3	22.4	11.2	0	498	0
26	90.9	24.0	167	10.5	20.5	23.1	6.5	0	566	.7
27	91.3	40.4	125	13.4	21.2	22.0	12.2	0	532	0
28	93.2	25.9	169	11.2	21.2	22.9	7.8	0	553	0
29	90.5	33.3	172	12.4	21.3	21.8	7.3	0	554	0
no/rg	29	29	29	29	29	29	29	29	29	29
total								0	14465	16.1
mean	90.8	36.4	171+	11.0	20.1	22.2	8.3		498.9	
max	94.3	75.1		15.1	21.6	24.6	12.4	0	566.0	
min	65.7	13.9	NE 3%	7.9	18.5	19.2	4.1		332.0	
			SE 21%	3.07	m/s					
			SW 76%							
			NW 0%							

+ vector

Ar Rawdah meteo station month: March year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley	Chill
1	93.1	30.1	165	12.0	21.5	23.3	9.3	0	561	0
2	90.6	21.9	173	11.1	21.3	23.1	8.0	0	562	0
3	87.9	29.3	178	10.4	21.4	23.1	10.4	0	556	0
4	92.9	33.1	161	10.2	21.4	25.5	8.6	0	500	0
5	88.1	35.9	168	11.5	21.5	24.6	9.4	0	553	0
6	51.9	14.4	170	11.1	21.6	25.5	8.4	0	577	0
7	47.2	12.8	157	12.2	21.5	25.2	7.1	0	585	0
8	33.2	14.6	151	13.0	21.5	25.0	11.8	0	588	0
9	89.7	15.3	172	11.4	21.4	25.7	11.1	0	599	0
10	91.6	11.9	182	10.8	21.5	26.6	5.2	0	589	2.0
11	92.9	11.7	177	9.5	21.7	26.8	7.3	0	610	0
12	41.9	13.0	168	11.5	21.6	24.9	7.2	0	603	0
13	36.7	12.3	164	12.5	21.5	26.0	6.8	0	609	.3
14	41.6	12.4	163	11.0	21.7	26.0	6.2	0	605	1.0
15	44.0	15.4	163	11.1	21.8	24.4	7.1	0	594	0
16	83.9	17.3	126	9.8	21.8	24.1	8.6	0	542	0
17	87.7	20.1	108	11.6	21.9	23.8	9.6	0	580	0
18	86.6	20.6	167	9.6	21.7	23.9	5.9	0	583	1.5
19	82.8	21.3	172	10.9	21.6	24.0	6.3	0	590	.9
20	86.6	17.5	172	9.2	21.9	26.6	8.3	0	569	0
21	89.3	14.5	175	10.7	22.0	25.4	8.8	0	586	0
22	89.4	12.1	176	12.4	22.1	25.9	7.9	0	609	0
23	62.5	12.5	177	10.4	22.3	28.2	10.1	0	579	0
24	36.2	12.4	51	16.3	22.7	25.3	14.4	0	527	0
25	88.6	12.3	100	9.2	22.6	26.9	9.8	0	524	0
26	91.4	12.0	165	9.0	22.5	26.4	7.5	0	569	0
27	90.5	16.8	182	10.5	22.5	25.8	8.7	0	566	0
28	75.3	13.1	171	11.5	22.4	24.8	7.8	0	588	0
29	88.7	19.3	174	11.5	22.3	25.3	7.4	0	648	0
30	88.4	13.6	174	11.5	22.4	26.2	6.5	0	700	.6
31	83.7	12.7	170	10.4	22.6	27.0	7.8	0	694	0
no/rg	31	31	31	31	31	31	31	31	31	31
total								0	18144	6.3
mean	75.3	17.2	160 +	11.1	21.9	25.3	8.4		585.3	
max	93.1	35.9		16.3	22.7	28.2	14.4	0	700.0	
min	33.2	11.7	NE 3%	9.0	21.3	23.1	5.2		500.0	
			SE 91%	3.08	m/s					
			SW 6%							
			NW 0%							

+ vector

Ar Rawdah meteo station month April year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley
1	66.0	11.9	169	11.4	22.6	26.9	8.0	0	701
2	51.8	12.4	158	12.1	22.5	25.9	6.8	0	690
3	43.5	12.7	156	10.8	22.6	26.0	9.0	0	684
4	91.3	14.0	159	10.9	22.5	25.5	7.0	0	699
5	89.8	18.4	163	13.9	22.3	22.5	6.4	0	702
6	85.0	29.0	158	13.9	22.1	23.7	7.6	0	679
7	40.6	15.6	152	13.3	22.1	24.0	11.7	0	681
8	32.5	15.6	157	13.4	22.0	23.9	10.9	0	557
9	49.2	13.6	161	11.4	22.2	25.2	8.7	0	660
10	66.4	17.1	159	13.3	22.3	24.2	8.9	0	681
11	73.5	24.6	161	14.5	22.5	23.7	10.6	0	682
12	87.2	31.0	155	12.3	22.0	23.8	9.0	0	536
13	90.3	44.3	149	11.2	22.5	24.0	13.7	0	572
14	61.6	24.2	155	11.5	23.3	26.0	12.9	0	679
15	84.3	15.7	170	11.1	23.9	26.5	11.1	0	669
16	89.1	34.4	174	9.2	24.3	26.3	11.8	0	563
17	89.8	40.2	152	11.6	23.5	25.5	11.6	8	585
18	91.6	46.4	142	9.4	22.7	24.3	14.9	0	525
19	91.6	27.9	164	10.9	22.4	24.6	12.7	0	627
20	86.6	38.7	168	11.3	23.5	25.1	14.0	0	665
21	89.8	50.2	185	10.4	23.6	24.2	12.5	0	505
22	92.1	34.5	169	10.2	23.7	26.3	13.7	1	616
23	89.4	50.9	186	10.6	22.1	24.3	14.8	0	611
24	90.1	54.8	154	9.5	22.4	23.3	15.9	0	557
25	91.0	12.6	199	8.6	23.7	27.9	12.8	0	728
26	91.2	56.2	164	11.8	24.6	24.4	14.4	0	650
27	91.2	50.7	171	9.0	24.4	25.7	15.3	4	572
28	89.9	29.0	81	9.8	22.4	26.5	15.9	0	552
29	91.4	25.4	163	8.9	22.3	25.1	11.7	0	645
30	91.2	15.4	169	9.0	23.4	27.1	11.8	0	678
no/rg	30	30	30	30	30	30	30	30	30
total								13	18951
mean	79.0	28.9	161	11.2	22.9	25.1	11.5		632
max	92.1	56.2	161+	14.5	24.6	27.9	15.9	8	728
min	32.5	11.9		8.6	22.0	22.5	6.4		505
			NE 3%	3.10	m/s				
			SE 87%						
			SW 10%						
			NW 0%						

+ vector

Ar Rawdah meteo station month May year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley
1	90.0	11.3	104	9.5	24.2	28.5	13.5	0	705
2	87.1	11.2	132	10.4	24.6	27.9	12.6	0	710
3	90.2	12.8	160	9.3	25.0	26.9	12.4	0	708
4	90.0	12.4	167	10.1	25.0	27.3	10.1	0	700
5	59.0	13.7	168	10.9	25.2	27.8	11.0	0	684
6	83.2	11.9	157	10.2	25.5	27.9	11.0	0	696
7	78.2	11.7	148	11.4	25.4	27.3	10.4	0	687
8	42.7	11.5	167	11.1	25.3	27.4	10.4	0	687
9	88.5	11.9	162	9.7	25.5	27.5	11.7	0	676
10	90.9	11.3	145	9.3	26.0	28.8	12.4	0	677
11	91.4	42.6	165	10.2	25.7	24.8	12.6	0	546
12	90.2	30.0	163	10.4	25.7	25.5	13.4	0	616
13	87.4	17.1	150	14.1	25.8	26.3	14.9	0	651
14	43.7	13.0	152	15.5	26.1	27.2	19.0	0	667
15	45.5	12.0	165	10.0	26.3	28.0	15.0	0	632
16	41.3	11.4	163	9.3	26.4	29.3	12.0	0	653
17	39.3	10.7	83	10.2	26.5	29.7	13.1	0	651
18	60.2	10.5	86	10.3	26.5	29.7	11.7	0	659
19	82.6	10.4	66	9.9	26.7	30.2	12.2	0	666
20	88.9	10.3	72	11.8	26.8	30.3	12.9	0	655
21	56.7	10.6	113	12.7	26.6	30.0	12.3	0	638
22	71.4	10.4	71	11.4	26.7	30.6	12.1	0	654
23	80.8	10.3	42	11.9	26.5	30.0	11.3	0	636
24	66.9	10.2	50	11.7	26.3	30.4	9.7	0	654
25	70.6	10.3	129	10.9	26.6	30.4	12.0	0	634
26	73.8	10.5	101	11.5	26.6	29.9	10.8	0	643
27	39.0	10.6	95	9.7	26.8	29.6	12.1	0	650
28	74.7	10.3	151	8.9	26.8	30.2	10.4	0	663
29	73.2	10.5	160	9.8	27.1	29.8	10.5	0	654
30	82.1	13.3	165	9.7	27.0	28.0	12.5	0	549
31	86.6	32.6	100	9.0	25.9	26.5	16.1	0	310
no/rg	31	31	31	31	31	31	31	31	31
total								0	20009
mean	72.5	13.8	127	10.7	26.0	28.5	12.3		646
max	91.4	42.6	139+	15.5	27.1	30.6	19.0	0	710
min	39.0	10.2		8.9	24.2	24.8	9.7		310
			NE 23%	2.96	m/s				
			SE 77%						
			SW 0%						
			NW 0%						

+ vector

Ar Rawdah meteo station month June year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley
1	90.0	30.3	171	9.6	25.6	28.1	13.1	0	668
2	81.2	23.9	178	10.5	26.2	28.4	12.8	0	597
3	79.8	9.9	26	9.6	26.5	31.5	14.8	0	653
4	81.9	10.1	45	10.3	27.0	31.8	13.9	0	690
5	88.1	15.3	162	8.0	26.4	29.4	16.9	0	279
6	57.9	11.7	161	9.9	26.5	30.4	13.8	0	581
7	71.7	9.8	65	9.4	27.0	31.8	13.1	0	678
8	88.0	28.9	169	11.5	27.9	28.8	17.2	0	623
9	85.3	10.5	164	10.0	27.7	29.9	14.5	0	636
10	80.6	14.2	177	11.0	27.3	27.1	14.3	0	620
11	88.0	32.2	171	11.7	27.0	27.0	15.6	0	532
12	90.0	36.0	164	12.1	26.8	27.2	14.6	0	559
13	89.7	39.0	167	11.6	26.9	26.0	13.1	0	631
14	89.1	36.7	173	9.6	26.9	27.8	13.1	0	599
15	88.4	19.9	175	9.7	27.1	27.9	14.3	0	563
16	90.1	37.5	170	10.7	26.9	25.9	13.8	0	517
17	88.4	18.9	161	10.7	27.3	28.1	16.0	0	653
18	51.9	11.7	173	10.8	27.6	31.2	18.0	0	546
19	78.6	10.6	190	8.8	27.1	31.2	15.3	0	464
20	84.1	10.3	69	10.0	27.6	30.6	16.4	0	539
21	88.4	10.0	82	8.8	27.5	31.2	12.0	0	664
22	36.1	10.6	168	9.6	27.5	29.7	10.9	0	661
23	34.3	12.1	183	11.0	27.3	28.4	12.2	0	585
24	84.9	24.1	176	11.6	27.3	28.0	12.6	0	629
25	89.5	25.8	184	9.9	27.2	27.8	15.9	0	504
26	85.8	9.8	150	9.6	27.0	31.8	12.0	0	635
27	85.8	14.3	170	9.6	27.4	28.0	18.4	0	414
28	63.7	10.2	105	9.6	27.6	30.5	16.7	0	616
29	81.1	10.3	43	8.3	27.6	30.3	14.4	0	611
30	61.9	10.1	159	9.0	27.8	30.5	14.9	0	559
no/rg	30	30	30	30	30	30	30	30	30
total								0	17508
mean	78.5	18.5	145	10.1	27.1	29.2	14.5		584
max	90.1	39.0	165+	12.1	27.9	31.8	18.4	0	690
min	34.3	9.8		8.0	25.6	25.9	10.9		279
			NE 20%	2.80	m/s				
			SE 70%						
			SW 10%						
			NW 0%						

+ vector

Ar Rawdah meteo station month July year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley
1	86.1	10.4	176	9.0	27.8	30.5	14.2	*0	538.0
2	89.2	32.2	173	9.9	27.3	26.4	15.9	*0	420
3	89.6	16.4	168	9.1	28.0	29.6	17.3	*0	597
4	82.3	9.9	166	9.7	28.2	31.6	13.3	*0	602
5	67.4	10.8	170	10.3	28.3	30.0	16.1	*0	522
6	72.3	17.9	174	8.9	28.2	29.0	15.3	*0	574
7	69.9	19.0	173	10.1	28.4	29.6	16.5	*0	536
8	86.5	33.8	192	12.9	28.7	28.6	18.9	*0	538
9	89.2	21.8	194	8.8	27.6	28.9	17.9	*0	420
10	88.3	13.9	185	9.6	26.8	29.9	17.5	*0	507
11	87.3	13.8	187	9.8	27.0	30.0	16.7	*0	458
12	88.5	14.3	191	9.8	26.2	29.8	14.8	*0	545
13	87.6	12.4	174	10.5	26.6	29.1	13.2	*0	589
14	89.2	45.6	5	8.7	25.1	22.8	15.2	*0	142
15	88.8	45.8	188	9.5	23.8	25.5	16.1	*0	480
16	78.9	37.6	194	10.0	24.7	27.0	18.2	*0	513
17	79.9	13.9	238	10.9	25.1	30.3	18.0	*0	483
18	54.6	12.2	282	11.3	25.2	30.5	19.2	*0	396
19	73.2	12.4	292	11.9	25.0	29.7	17.5	*0	401
20	54.5	12.3	35	13.2	23.0	29.6	19.1	*0	449
21	34.5	11.7	353	10.0	24.1	28.9	20.5	*0	402
22	44.1	12.8	65	11.5	25.4	29.1	20.0	*0	376
23	72.9	15.1	228	8.1	25.4	29.3	16.8	*0	336
24	88.9	41.9	359	10.3	23.7	23.6	15.9	*0	356
25	88.1	45.4	173	9.3	23.2	25.7	17.2	*0	456
26	88.6	42.5	178	11.1	24.9	26.6	16.7	*0	607
27	89.6	63.7	190	10.1	24.0	24.0	15.5	*0	466
28	87.7	72.1	199	10.7	23.5	24.2	15.8	*0	521
29	88.3	38.3	201	6.5	22.1	27.1	15.7	*0	301
30	87.7	53.4	180	8.9	24.0	26.8	16.1	*0	614
31	88.3	52.0	187	8.9	24.1	27.6	17.6	*0	553
no/rg	31	31	31	31	31	31	31	0	31
total								-	14696
mean	79.4	27.6	189	10.0	25.7	28.1	16.7		474
max	89.6	72.1	165+	13.2	28.7	31.6	20.5	-	614
min	34.5	9.9		6.5	22.1	22.8	13.2		142
			NE 10%	2.77	m/s				
			SE 32%						
			SW 45%						
			NW 13%						

+ vector

Rainfall data over this month are not reliable because the sensor was not functioning properly

Ar Rawdah meteo station month August year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley
1	88.2	21.2	265	10.0	23.9	29.5	16.2	*0	471
2	89.0	60.7	266	10.5	21.6	21.4	14.5	*14	226
3	85.7	56.4	184	8.9	22.2	24.6	17.2	*0	603
4	87.6	12.9	32	8.5	23.2	29.3	15.3	*0	556
5	85.1	11.3	35	10.2	24.5	30.3	16.8	*0	527
6	84.6	16.4	181	6.8	24.6	29.0	16.6	*0	422
7	83.7	10.7	84	9.6	26.3	30.9	19.5	*0	626
8	84.8	22.2	184	*0.0	26.0	27.6	15.6	*2	412
9	86.8	15.1	152	8.6	26.1	29.4	19.2	*0	440
10	68.3	16.8	214	8.7	25.8	29.9	18.3	*0	432
11	85.8	25.4	204	9.6	25.4	29.1	16.1	*0	503
12	86.5	32.3	188	7.7	24.3	28.4	17.4	*0	561
13	88.2	24.0	185	7.4	24.2	29.1	14.9	*0	589
14	86.2	11.2	64	9.4	25.0	30.6	15.2	*0	587
15	86.6	23.9	175	10.1	26.6	28.7	15.7	*0	602
16	80.9	16.9	216	8.6	26.8	28.9	16.7	*0	559
17	81.4	11.2	187	8.2	26.6	31.0	15.6	*0	540
18	85.0	10.4	22	9.4	27.2	31.3	14.6	*0	552
19	80.9	16.5	169	9.7	27.0	28.2	15.6	-	474
20	85.1	18.6	188	7.6	25.9	28.8	16.6	-	395
21	89.7	20.9	139	8.0	24.9	28.6	12.7	-	399
22	88.3	38.4	185	8.4	24.2	27.2	14.5	-	611
23	88.7	40.7	176	8.5	24.4	27.5	15.2	-	533
24	87.5	23.8	217	8.6	24.6	29.0	15.1	-	513
25	85.9	15.7	192	8.1	24.6	28.6	13.1	-	551
26	88.7	39.4	179	9.5	25.7	27.4	14.8	-	580
27	86.6	32.6	172	9.0	26.2	28.2	13.6	-	586
28	78.5	20.6	183	9.9	26.7	28.7	13.6	-	608
29	81.6	36.1	212	9.1	26.6	28.6	14.6	-	481
30	89.1	30.1	239	8.4	34.1	28.9	-	-	440
31	86.5	38.5	204	6.7	23.0	27.0	13.7	0	464
no/rg	31	31	31	30	31	31	30	1	31
total								-	15843
mean	85.2	24.9	171	8.8	25.4	28.6	15.6		511
max	89.7	60.7	192*	10.5	34.1	31.3	19.5	-	626
min	68.3	10.4		6.7	21.6	21.4	12.7		226
			NE 16%	2.44	m/s				
			SE 23%						
			SW 61%						
			NW 0%						

* vector

False readings on 30th of August are due to maintenance of the station.
From 19 August onward no rainfall measurements because the magnet fell off.
Raindata of the first half of the month are questionable, since the sensor was not functioning properly when it was tested on August 19.
Raindata from 31 August onward are reliable.

WATER LEVEL DATA Station: As Sudan well number: 774.00 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	6.83	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	7.28	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:

Ar Rawdah meteo station month September year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley
1	87.3	33.4	207	7.6	22.9	27.4	15.2	12.0	476
2	86.8	39.2	223	8.9	22.6	26.3	14.9	14.0	407
3	87.9	43.2	123	9.0	22.4	25.4	14.3	9.0	537
4	88.1	14.4	126	7.6	22.7	28.0	13.1	0	604
5	87.2	11.2	70	10.2	22.7	29.3	14.8	0	637
6	87.7	13.1	170	7.9	23.4	26.6	14.4	0	620
7	87.6	11.7	35	9.3	24.4	28.9	14.6	0	629
8	87.2	17.7	158	9.0	24.7	27.9	13.1	0	583
9	87.9	57.8	297	7.4	23.9	24.7	14.6	26.0	272
10	86.9	32.7	146	8.0	23.5	26.3	13.6	0	662
11	87.4	35.6	171	7.5	23.7	25.6	14.8	0	561
12	87.0	14.8	194	6.7	23.0	27.3	13.7	0	486
13	87.3	11.4	33	10.4	23.5	28.3	14.5	0	623
14	87.4	18.7	81	9.4	23.3	26.6	13.3	0	427
15	87.4	28.4	171	8.9	23.6	25.5	12.2	0	505
16	88.0	47.0	216	6.0	23.5	24.9	13.7	0	293
17	85.0	27.7	173	8.0	23.6	27.5	14.0	0	493
18	85.6	21.8	89	8.4	23.9	28.0	14.4	0	414
19	86.4	30.5	174	7.1	23.9	26.8	16.1	7.0	371
20	87.0	35.7	171	8.4	23.4	24.6	15.4	0	540
21	87.4	18.2	176	8.3	23.0	26.5	12.5	0	519
22	85.7	16.8	176	7.8	22.7	26.6	12.2	0	468
23	84.3	11.5	58	8.3	23.7	27.5	15.4	0	579
24	86.9	12.1	100	9.6	24.2	27.4	13.0	0	486
25	84.0	13.7	181	7.6	24.1	25.9	14.8	0	297
26	84.3	13.3	170	7.8	23.9	27.5	14.7	0	429
27	87.3	12.4	88	8.2	24.3	27.4	15.0	0	477
28	86.9	11.4	20	9.2	24.7	27.3	11.3	0	642
29	88.5	11.4	55	8.6	24.9	27.4	9.3	0	642
30	87.3	11.7	51	9.2	25.1	27.1	10.7	0	630
no/rg	30	30	30	30	30	30	30	30	30
total								68.0	15310
mean	86.9	22.6	137	8.3	23.6	26.9	13.8		510
max	88.5	57.8	141*	10.4	25.1	29.3	16.1	26.0	662
min	84.0	11.2		6.0	22.4	24.6	9.3		272
			NE 33%	2.32	m/s				
			SE 47%						
			SW 17%						
			NW 3%						

* vector

Ar Rawdah meteo station month October year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley	Chill
1	83.0	11.1	66	9.0	25.4	27.9	13.9	0	620	0
2	83.5	12.6	40	9.6	25.4	26.2	12.7	0	527	0
3	81.9	11.7	39	11.0	25.6	26.6	11.7	0	609	0
4	88.0	11.8	22	8.4	25.3	26.2	10.5	0	623	0
5	87.9	12.6	80	8.7	25.6	25.9	11.1	0	605	0
6	87.2	20.7	154	8.5	25.6	26.5	10.9	0	554	0
7	87.7	14.7	103	8.9	25.8	27.1	10.7	0	588	0
8	87.5	16.0	141	8.4	25.6	26.2	10.1	0	508	0
9	87.9	12.5	161	8.5	25.4	27.0	10.7	0	522	0
10	87.9	11.7	90	8.7	25.3	26.8	9.1	0	586	0
11	87.9	12.0	163	8.6	25.3	26.5	7.0	0	584	0
12	88.1	12.4	149	8.5	25.2	25.4	7.1	0	596	0
13	87.8	13.1	164	7.8	25.1	24.8	7.0	0	588	0
14	87.6	13.1	154	8.5	24.9	24.2	7.4	0	592	0
15	87.7	13.3	159	9.1	24.8	24.2	7.1	0	591	0
16	87.2	16.6	172	8.9	24.7	24.1	7.3	0	583	0
17	87.4	17.1	178	8.6	24.7	23.8	8.7	0	583	0
18	86.8	13.7	43	10.0	24.7	24.7	8.2	1.0	584	0
19	87.0	13.0	69	9.8	25.1	25.1	9.2	0	579	0
20	87.1	12.5	98	10.2	24.8	24.6	8.0	0	576	0
21	67.9	13.1	170	9.6	24.4	24.5	5.0	0	560	2.5
22	83.3	12.7	67	9.0	24.5	25.2	6.8	0	555	.3
23	43.3	13.3	40	12.4	24.6	24.6	8.5	0	551	0
24	86.7	14.6	73	10.6	24.8	23.9	11.0	0	542	0
25	88.4	31.7	156	9.0	24.5	22.6	5.6	0	521	2.0
26	88.6	19.5	152	8.5	24.3	23.7	5.2	0	544	2.3
27	88.1	12.7	104	9.0	24.1	24.3	5.7	0	552	1.7
28	73.7	12.7	36	11.6	23.8	24.0	8.2	0	548	0
29	80.3	12.3	56	9.1	23.9	24.8	7.6	0	552	0
30	45.1	12.4	168	8.1	23.7	24.9	3.2	0	550	4.2
31	81.3	12.4	171	8.2	23.3	24.6	4.0	0	543	3.5
no/rg	31	31	31	31	31	31	31	31	31	31
total								1.0	17616	16.4
mean	82.7	14.2	111	9.2	24.8	25.2	8.4		568	
max	88.6	31.7	99*	12.4	25.8	27.9	13.9	1.0	623	
min	43.3	11.1		7.8	23.3	22.6	3.2		508	
			NE 39%	2.6	m/s					
			SE 61%							
			SW 0%							
			NE 0%							

* vector

Ar Rawdah meteo station month November year: 1988

Responsible authority: Ministry of Agriculture, Irrigation department

date	Rhum max %	Rhum min %	Wdir vector	Wind speed km/hr	Ts 20 °C	Tmax °C	Tmin °C	Rain mm	Solar rad. Langley	Chill hrs
1	88.1	12.5	132	8.6	23.2	24.7	3.9	0	520	3.6
2	88.1	25.5	145	8.1	23.2	21.9	6.5	0	491	.8
3	88.3	38.0	160	9.0	23.1	21.4	4.5	0	506	3.6
4	88.1	14.1	58	8.9	22.9	23.3	4.3	0	522	3.4
5	88.0	13.4	75	9.0	23.0	22.9	5.2	0	520	2.4
6	88.2	13.4	55	9.5	22.7	23.0	3.1	0	519	4.7
7	20.3	13.5	39	12.0	22.9	22.5	10.6	0	516	0
8	71.5	13.1	32	8.4	22.9	23.0	7.2	0	511	0
9	48.2	13.0	61	8.2	22.6	23.3	6.3	0	510	1.0
10	83.6	12.9	188	7.7	22.2	23.4	1.9	0	508	5.7
11	86.4	12.8	173	8.6	22.0	23.5	1.6	0	507	5.9
12	88.0	13.2	199	7.7	22.2	23.5	3.7	0	496	4.0
13	87.8	13.3	188	9.3	22.2	23.6	3.7	0	488	4.0
14	87.6	12.8	185	8.3	22.5	25.4	5.1	0	484	2.2
15	59.9	18.2	20	13.7	22.6	20.5	11.4	0	482	0
16	76.8	16.9	33	14.0	22.5	19.8	9.7	0	435	0
17	63.9	16.3	59	10.1	22.1	21.3	8.2	0	462	0
18	87.2	15.9	100	8.2	21.8	21.5	3.6	0	468	4.6
19	87.6	13.8	171	9.5	21.4	21.0	0.0	0	473	8.0
20	88.2	13.7	150	8.6	21.4	21.8	2.9	0	472	5.2
21	27.3	13.6	40	12.1	21.4	21.7	7.4	0	468	0
22	48.9	13.7	45	10.6	21.5	21.7	8.6	0	460	0
23	56.2	13.0	66	8.9	21.6	23.8	8.1	0	460	0
24	85.3	14.2	18	8.7	21.4	22.0	2.4	0	450	5.6
25	85.5	13.0	76	9.1	21.5	23.5	3.5	0	447	4.2
26	21.3	13.4	37	12.0	21.5	22.0	9.3	0	447	0
27	20.6	13.8	32	10.8	21.3	21.1	8.4	0	444	0
28	31.2	13.4	44	9.8	21.2	22.4	8.9	0	440	0
29	45.2	13.1	59	8.4	21.1	23.1	3.0	0	434	4.8
30	72.5	13.3	41	9.9	21.1	22.3	8.4	0	433	0
no/rg	30	30	30	30	30	30	30	30	30	30
total								0	14373	73.7
mean	68.7	15.0	89	9.6	22.1	22.5	5.7		479	
max	88.3	38.0	119+	14.0	23.2	25.4	11.4	0	522	
min	20.3	12.5		7.7	21.1	19.8	0.0		433	
			NE 64%	2.66	m/s					
			SE 23%							
			SW 13%							
			NE 0%							

+ vector

Annex C

Daily rainfall totals of stations in Al Bayda Province

RAINFALL DATA STATION: Rada' YEAR: 1988 GAUGE TYPE: CASELLA X: 482.44 km Y: 1594.02 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0	0	0	0	0	10.4	1.6	0	0	0
2	0	0	0.8	0	0	0	0	0	8.1	0	0	0
3	0	0	0	0	0	0	0	0.4	0.7	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	1.0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	2.8	0	0	0
10	0	0	0	0	0	0	0	0.1	0	0	0	0
11	0	0	0	0	6.0	0	0	5.2	0	0	0	0
12	0	0	0	0.6	0	1.2	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0.2	0	0	0	0	0.8	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	1.7	0	0.2	0	0	0	0	0	0	0	0
17	0	0.1	0	12.5	0	0	1.7	0	0	0	0	0
18	0	0	0	0.1	0	0	0.8	0	0	0	0	0
19	0	4.2	0	0.2	0	0	0.4	0.1	0	0	0	0
20	0	0	0	0.7	0	0	0	0	0	0	0	0
21	0	0	0	6.2	0	0	0.3	0.4	0	0	0	0
22	0	0	0	58.0	0	0	0	0	0	0	0	0
23	0	0	0	2.1	0	0	0	12.2	0	0	0	0
24	0	0	0	0.1	0	0	0.2	0	0	0	0	0
25	0	0	0	0	0	0	1.2	0	0	0	0	0
26	0	0	0	0	0	0	11.9	0	0	0	0	0
27	0	2.8	0	0	0	0	0	0	0	0	0	0
28	0	0.8	0	0	0	0	21.7	0.6	0	0	0	0
29	0	0	0	0	0	0	0	7.0	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		0		0		0	2.5		0		0
sum:	0	9.8	0.8	80.7	6.0	1.2	40.0	38.9	13.2	0	0	0
max:	0	4.2	0.8	58.0	6.0	1.2	21.7	12.2	8.1	0	0	0
no. of rainy days	0	6	1	10	1	1	10	10	4	0	0	0

total number of rainy days 43 year total: 190.6

RAINFALL DATA STATION: Al Khabar Year: 1988 GAUGE TYPE: HELLMANN X: 481.29 km Y: 1590.79 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0	0	0	0	0	12.2	5.6	0	0	0
2	0	0	0.4	0	0	0	0	0.2	8.6	0	0	0
3	0	0	0	0	0	0	0	0.8	0.4	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0.6	0	0	0	0	0
9	0	0	0	0	0	0	0	0	3.9	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	2.2	0	0	7.3	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0.4	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0.8	0	0	0	0.4	0	0	0	0
17	1.4	0	0	10.8	0	0	0.6	0	0	0	0	0
18	0	0	0	1.0	0	0	2.6	0	0	0	0	0
19	0	7.7	0	0	0	0	1.8	0	0	0	0	0
20	0	0	0	7.2	0	0	0	0	0	0	0	0
21	0	0	0	14.2	0	0	0	1.9	0	0	0	0
22	0	0	0	36.0	0	0	0	0	0	0	0	0
23	0	0	0	2.2	0	0	0.3	11.8	0	0	0	0
24	0	0	0	7.0	0	0	0.3	0	0	0	0	0
25	0	0	0	0	0	0	1.0	0	0	0	0	0
26	0	0	0	0	0	0	10.6	0.2	0	0	0	0
27	0	1.4	0	0	0	0	0.3	0	0	0	0	0
28	0	0	0	0	0	0	47.0	1.2	0	0	0	0
29	0	0	0	0	0	0	0	9.4	0	0	0	0
30	0		0	0	0	0	0	0.8	0	0	0	0
31	0		0		0		0	0.1		0		0
sum:	1.4	9.1	0.4	79.6	2.2	0	65.1	46.3	18.5	0	0	0
max:	0	7.7	0.4	36.0	2.2	0	47.0	12.2	8.6	0	0	0
no. of rainy days	1	2	1	9	1	0	10	12	4	0	0	0

total number of rainy days 40 year total: 222.6

RAINFALL DATA STATION: Al Hajar Year: 1988 GAUGE TYPE: ENAI X: 464.6 km Y: 1582.8 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	.	.	1.4	0	0	0	0	12.2	1.0	.	0	.
2	.	.	0	0	0	0	0	.6	15.2	.	0	.
3	.	.	0	0	0	0	1.2	3.0	3.4	.	0	.
4	.	.	0	0	0	0	0	0	0	.	0	.
5	0	0	0	0	0	0	0	0	0	.	0	.
6	0	0	0	0	0	0	0	0	0	.	0	.
7	0	0	0	0	0	0	0	0	0	.	0	.
8	0	0	0	0	0	0	6.6	0	3.6	.	0	.
9	0	0	0	0	0	0	1.0	0	0	.	0	.
10	0	0	0	0	0	0	0	0	0.4	0	0	.
11	0	0	0	0	7.8	0	0	10.0	0	0	0	.
12	0	0	0	0.8	0	1.6	0	.	0	0	0	.
13	0	0.6	0	0	0	0	3.8	.	0	0	0	.
14	0	0	0	0	0	0	0.2	.	0	0	0	.
15	0	0	0	4.0	0	0	0	.	3.6	0	0	.
16	0	0	0	0	0	0	0	.	1.8	0	0	0
17	0	0	0	5.8	0	0	1.8	.	0.2	0	0	0
18	0	0	0	31.0	0	0	8.4	0.2*	0	.	0	0
19	.	0	0	7.8	0	0	1.0	4.6*	0	.	0	0
20	.	0.2	0	4.6	0	0	0	.	0	.	0	0
21	.	1.2	0	6.0	0	0	0	.	0	.	0	0
22	.	0	0	5.4	0	0	2.2	.	0	.	0	0
23	.	0	0	5.6	0	0	0	.	0	.	0	0
24	.	10.4	0	0	0	0	0	.	0	.	0	0
25	.	0	0	0	0	0	0	.	0	.	0	0
26	.	1.0	0	0	0	0	0	.	0	.	0	0
27	.	0.2	0	0	0	0	1.2	.	0	.	0	0
28	.	0	0	0.4	0	0	0.6	.	0	.	0	0
29	.	0	0	0	0	0	0.2	12.2	0	.	0	0
30	.		0	0	0	0	16.6	0	0	.	0	0
31	.		0		0		4.0	0		.		0
sum:	0	13.6	1.4	71.4	7.8	1.6	48.8	42.8	29.2	0	0	0
max:	0	10.4	1.4	31.0	7.8	1.6	16.6	12.2	3.6	0	0	0
no. of rainy days	0	6	1	10	1	1	14	7	8	0	0	0

total number of rainy days 48 year total: 216.6

* exact date not known

RAINFALL DATA STATION: Al Khadrah Year: 1988 GAUGE TYPE: ENAI X: 470.8 km Y: 1590.4 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0	0	0	0	0	12.2	1.0	0	0	0
2	0	0	0.4	0	0	1.2	0	.4	6.4	0	0	0
3	0	0	0	0	0	0	0	4.2	4.2	0	0	0
4	0	0	0.2	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	4.2	0	0	0	0	0
6	0	0	0	0	0	0	0.6	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	1.0	0	3.4	0	0	0
10	0	0	0	0	0	0	0.2	0	0	0	0	0
11	0	0	0	0	1.6	0	0.2	12.2	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	2.6	0	0	0	0	0
14	0	3.6	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0.6	0	0	0	0	0	0	0	0
16	0	3.2	0	0	0	0	0.4	0.4	2.8	0	0	0
17	0	0	0	2.0	0	0	0.6	0	0.8	0	0	0
18	0	0	0	7.0	0	0	4.2	0	0	0	0	0
19	0	6.8	0	8.8	0	0	0	0.2	0	0	0	0
20	0	0.2	0	0	0	0	0	0	0	0	0	0
21	0	0	0	4.8	0	0	0.2	0.4	0	0	0	0
22	0	0	0	16.8	0	0	1.0	0	0	0	0	0
23	0	0	0	3.4	0	0	0	12.2	0	0	0	0
24	0	0.2	0	3.8	0	0	0	0	0	0	0	0
25	0	0	0	0.2	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	.	0	0	0	0	0
27	0	0	0	0.2	0	0	.	0	0	0	0	0
28	0	0.2	0	0	0	0	.	1.8	0	0	0	0
29	0	0	0	0	0	0	29.0	12.2	0	0	0	0
30	0		0	0	0	0	.	1.0	0	0	0	0
31	0		0		0		.	0		0		0
sum:	0	14.2	0.6	47.6	1.6	1.2	44.2	57.2	18.6	0	0	0
max:	0	6.8	0.4	16.8	1.6	1.2	29.0	12.2	6.4	0	0	0
no. of rainy days	0	6	2	10	1	1	12	11	6	0	0	0

total number of rainy days 49 year total: 185.2

RAINFALL DATA STATION: Az Zuwab Year: 1988 GAUGE TYPE: ENAI X: 480.7 km Y: 1580.9 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	6.0	0	0	0	0	7.2	0	0	0	0
2	0	0	0.2	0	0	0	0	0	8.4	0	0	0
3	0	0	0	0	0	0	0	0	1.4	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	1.4	0	0	.	0	0	0	0	0
7	0	0	0	0	0	0	.	0	3.6	0	0	0
8	0	0	0	0	0	0	.	0	0	0	0	0
9	0	0	0	0	0	0	.	0	0	0	0	0
10	0	0	0	0	0	0	.	0.4	0	0	0	0
11	0	0	0	0	0	0	.	7.4	0	0	0	0
12	0	0	0	0	2.6	0	.	0	0	0	0	0
13	0	0	0	4.6	0	0	.	0	0	0	0	0
14	0	0	0	0	0	0	.	0	0	0	0	0
15	0	0	0	0	0	0	.	0	0	0	0	0
16	0	0	0	0	0	0	.	3.4	0	0	0	0
17	0	0	0	8.2	0	0	.	0.2	0	0	0	0
18	0	0	0	0	0	0	40.0	0	0	0	0	0
19	0	15*	0	4.0	0	0	.	0	0	0	0	0
20	0	0	0	0.8	0	0	.	0	0	0	0	0
21	0	0	0	0	0	0	.	0	0	0	0	0
22	0	0	0	7.0	0	0	.	0	0	0	0	0
23	0	0	0	3.0	0	0	.	0	0	0	0	0
24	0	0	0	2.2	0	0	.	0	0	0	0	0
25	0	0.2	0	4.4	0	0	.	9.6	0	0	0	0
26	0	0	0	0	0	0	.	0	0	0	0	0
27	0	4.0	0	0	0	0	.	0	0	0	0	0
28	0	0	0	0	0	0	.	0	0	0	0	0
29	0	1.2	0	0	0	0	.	0	0	0	0	0
30	0		0	0	0	0	.	0	0	0	0	0
31	0		0		0		0	0		0		0
sum:	0	20.4	6.2	35.6	2.6	0	40.0	28.2	13.4	0	0	0
max:	0	4.0	6.0	8.2	2.6	0	40.0	9.6	8.4	0	0	0
no. of rainy days	0	4	2	9	1	0	-	6	3	0	0	0

total number of rainy days - year total: 146.4

* estimated

RAINFALL DATA STATION: Madaf Year: 1988 GAUGE TYPE: ENAI X: 480.7 km Y: 1580.9 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0.2	0	0	0	0	10.4	2.4	0	0	.
2	0	0	0.4	0	0	0	0	0.2	3.4	0	0	.
3	0	0	0	0	0	0	0	1.6	0.2	0	0	.
4	0	0	0	0	0	0	0	0	0	0	0	.
5	0	0	0	0	0	0	0	0	0	0	0	.
6	0	0	0	0	0	0	0	0.4	0	0	0	.
7	0	0	0	0	0	0	0	0	0	0	0	.
8	0	0	0	0	0	0	2.6	0	0	0	0	.
9	0	0	0	0	0	0	0	0	9.4	0	0	.
10	0	0	0	0	0	0	0	0	0	0	0	.
11	0	0	0	0	0.8	0.6	0	0.4	0	0	0	.
12	0	0	0	0	0	0	0	0	0	0	0	.
13	0	0	0	2.4	0	0	0	0	0	0	0	.
14	0	0	0	0	0	1.2	0	0	0	0	0	.
15	0	0	0	0	0	0	x.x*	0	0	0	0	.
16	0	0	0	4.8	0	0	-	8.8	2.4	0	0	.
17	0	0	0	13.0	0	0	-	0	3.2	0	0	.
18	0.2	0	0	0	0	0	-	0.2	0.4	0	0	.
19	4.2	0	0	x.x	0	4.6	x.x*	0	0	0	0	.
20	0	0	0	x.x	0	0	-	x.x *	0	0	0	.
21	0	0	0	8.2	0	0	-	x.x	0	0	0	.
22	0	0	0	12.2	0	0	-	0	0	0	0	.
23	0	0	0	1.4	0	0	-	0 2.4	0	0	0	.
24	0	0	0	11.4	0	0	-	x.x	0	0	0	.
25	0	0	0	0	0	0	-	x.x	0	0	0	.
26	0	0.4	0	0	0	0	12.2	0	0	0	0	.
27	0	17.4	0	1.6	0	0	0.6	0	0	0	0	.
28	0	0	0	0	0	0	18.8	10.4	0	0	0	.
29	0	0	0	0	0	0	0	2.8	0	0	0	.
30	0		0	0	1.8	0	1.7	0	0	0	.	.
31	0		0		0		0.2	0		0		.
sum:	4.4	17.8	0.6	-	2.6	6.4	-	-	21.4	0	0	0
max:	0	17.4	0.4	13.0	1.8	4.6	18.8	10.4	9.4	0	0	0
no. of rainy days	2	2	2	10	2	3	8	13	7	1	0	0

total number of rainy days 50 year total: -

* funnel blocked; x.x rain occurred, depth not known

RAINFALL DATA STATION: Khasha'a Year: 1988 GAUGE TYPE: ENAI X: 504 km Y: 1586 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0	0	0	0	0	14.2	9.6	0	0	0
2	0.4	0	0.6	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	11.4	0	0	0	0
12	0	0	0	0	0	0.6	0	0	0	0	0	0
13	0	0	0	17.4	0	0	1.2	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0.8	0	0	0	0.8	0	0	0	0
17	0	0	0	2.6	0	0	0.8	0	0	0	0	0
18	0	0	0	0	0	0	0.6	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	9.2	0	0	0.2	0	0	0	0	0
21	0	0	0	1.2	0	0	1.2	9.8	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	6.0	0	0	1.6	0	0	0	0	0
24	0	0	0	0	0	0	0	16.6	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	11.4	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	20.8	0	0	0	0	5.6	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		0		0.4		0	0		0		0
sum:	0.4	20.8	0.6	37.2	0.4	0.6	22.6	52.8	9.6	0	0	0
max:	0	20.8	0.6	17.4	0.4	0.6	11.4	16.6	9.6	0	0	0
no. of rainy days	1	1	1	6	total number of rainy days		1	8	5	1	-	-
									25	year total:		145.0

RAINFALL DATA STATION: Al Qari Year: 1988 GAUGE TYPE: HELLMANN X: 497.9 km Y: 1606.5 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0	0	0	0	0	9.8	5.2	0	0	0
2	0	0	3.0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	2.0	0.8	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0.2	0	0	0	0.2	0	0	0	0
7	0	0	0	0	0	0	0	1.8	0	0	0	0
8	0	0	0	0	0	0	0.6	5.4	0.6	0	0	0
9	0	0	0	0	0	0	0	0	0.8	0	0	0
10	0	0	0	0	0	0	0	0	0.2	0	0	0
11	0	0	0	0	3.2	0	0	0	0	0	0	0
12	0	0	0	1.2	0	1.4	0	0	0	0	0	0
13	0	0	0	4.6	0	0	0	0	0	0	0	0
14	0	1.6	0	0	0	0	1.6	0.4	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	2.6	0	0.4	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	1.2	0	0	0	0	0
18	0.4	21.2	0	1.0	0	0	1.2	0	0	0	0	0
19	0	0	0	0	0	0	0	0.6	0	0	0	0
20	0	0	0	5.8	0	0	0	0	0	0	0	0
21	0	0	0	5.6	0	0	1.8	0	0	0	0	0
22	0	0	0	4.6	0	0	0.4	6.8	0	0	0	0
23	0	0	0	2.0	0	0	0	0	0	0	0	0
24	0	0.2	0	14.2	0	0	0.8	0	0	0	0	0
25	0	0	0	0	0	0	1.2	0	0	0	0	0
26	0	0	0	0	0	0	14.1	0	0	0	0	0
27	0	1.6	0	0	0	0	0.2	0	0	0	0	0
28	0	0	0	0	0	0	15.6	2.2	0	0	0	0
29	0	0	0	0	0	0	0	0.2	0	0	0	0
30	0		0	0	0	0	0	0	0	0	0	0
31	0		0		0		0	0		0		0
sum:	0.4	27.2	3.0	39.6	3.2	1.4	38.7	29.4	7.6	0	0	0
max:	0	21.2	3.0	14.2	3.2	1.4	15.6	9.8	5.2	0	0	0
no. of rainy days	1	5	1	10	total number of rainy days	1	11	10	5	0	0	0
								45		year total:		150.5

RAINFALL DATA STATION: Manasih Year: 1988 GAUGE TYPE: ENAI X: 472.3 km Y: 1612.3 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0.4	0	0	0	0	5.6	0	0	0	0
2	0	0	2.4	0	0	0	0	0	0.2	0	0	0
3	4.4	0	0	0	0	0	0	1.2	0.5	0	0	0
4	0	0	0	0	0	0	0	0	15.0	0	0	0
5	0	0	0	0	0	0	0.6	0	1.2	0	0	0
6	0	0	0	0.4	0	0	0.2	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	1.6	0	0	0
9	0	0	0	0	0	0	0	0	8.1	0	0	0
10	0	0	0	0	0	0	0	0.2	0	0	0	0
11	0	0	0	0.4	3.8	0	0.4	3.6	0.2	0	0	0
12	0	0	0	3.0	0	0	0	0	0	0	0	0
13	0	0.4	0	8.6	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0.8	0	0.2	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	4.8	0	0	1.2	0	0	0	0	0
18	0	0	0	7.8	0	0	1.2	0	0	0	0	0
19	0	0	0	1.2	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	9.4	0	0	4.2	0	0	0	0	0
22	0	0	0	18.8	0	0	0	0	0	0	0	0
23	0	0	0	4.4	0	0	0.6	0	0	0	0	0
24	0	0.2	0	0	0	0	0.8	0	0	0	0	0
25	0	0	0	0.2	0	0	0	4.0	0	0	0	0
26	0	0	0	0	0	0	27.2	15.2	0	0	0	0
27	0	0.2	0	0	0	0	.8	0	0	0	0	0
28	0	0	0	0	0	0	32.6	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0		0	0	0	0	0	7.8	0	0	0	0
31	0		0		0		0	0		0		0
sum:	4.4	1.6	2.8	59.2	3.8	0	69.8	37.6	26.8	0	0	0
max:	0	.8	2.4	18.8	3.8	0	32.6	15.2	15.0	0	0	0
no. of rainy days	1	4	2	12	1	0	11	7	7	0	0	0
					total number of rainy days			45		year total:		206.0

RAINFALL DATA STATION: Jawf an Nuqabah Year: 1988 GAUGE TYPE: ENAI X: 496.0 km Y: 1615.4 km

date	January	February	March	April	May	June	July	August	September	October	November	December
1	0	0	0.6	.	0	0	0	-	-	0	0	0
2	0	0	0.4	.	0	0	0	-	-	0	0	0
3	0	0	0	.	0	0	0	-	0	0	0	0
4	0	0	0	.	0	0	0	-	0	0	0	0
5	0	1.4	0	2.6	0	0	0	-	0	0	0	0
6	0	0	0	.	0	0	0	-	0	0	0	0
7	0	0	0	.	0	0	0	-	0	0	0	0
8	0	0	0	.	0	0	1.8	-	0.6	0	0	0
9	0	0	0	.	0	0	0	-	1.0	0	0	0
10	0	0	0	.	0	0	0	-	0	0	0	0
11	0	0	0	.	0	0	0	-	0.2	0	0	0
12	0	0	0	.	0	0.6	0	-	0	0	0	0
13	0	0	0	.	0	0	0	-	0	0	0	0
14	0	0	0	7.6	0	0	2.0	-	0	0	0	0
15	0	0	0	1.2	0	0	0	-	0	0	0	0
16	0	0	0	2.0	0	0	-	-	0	0	0	0
17	0	0	0	.	0	0	-	-	0	0	0	0
18	0	0	0	.	0	0	-	-	0	0	0	0
19	0	0.8	0	.	0	0	-	-	0	0	0	0
20	0	0.4	0	-	0	0	-	-	0	0	0	0
21	0	0	0	-	0	0	0.6	-	0	0	0	0
22	0	0	0	-	0	0	0.4	-	0	0	0	0
23	0	0	0	-	0	0	0	-	0	0	0	0
24	0	0	0	-	0	0	2.4	-	0	0	0	0
25	0	0	0	-	0	0	0	-	0	0	0	0
26	0	0	0	-	0	0	24.4	-	0	0	0	0
27	0	4.0	0	-	0	0	-	-	0	0	0	0
28	0	0	0	-	0	0	-	-	0	0	0	0
29	0	0	0	-	0	0	-	-	0	0	0	0
30	0		0	-	0	0	-	-	0	0	0	0
31	0		0		0		-	-		0		0
sum:	0	6.6	1.0	13.4	0	0	31.6	-	1.8	0	0	0
max:	0	4.0	0.6	7.6	0	0	24.4	-	-	0	0	0
no. of rainy days	0	4	2	-	0	1	-	-	-	0	0	0

total number of rainy days - year total: -

Remark: Due to tribal problems the station could not be visited from the beginning of June until the beginning of September. Therefore the operator ran out of papers.

Annex D

Water levels (hand measured)

WATER LEVEL DATA Station: Al Khabar well number: 0723 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	62.32	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	58.99	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	64.27	-
6	-	-	-	-	59.36	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	63.30	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	58.87	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	60.51	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	62.45	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	61.40
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	60.66	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	60.28	-	-	-	-
21	-	59.46	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	64.54	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	64.67	-	-	-	-	-
26	-	-	61.31	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	59.55	-	-	62.93	-
28	-	59.62	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	64.78	-	-
30	-		-	-	58.77	-	-	-	-	-	-	-
31	-		-		-		-	-		-		

Remarks:

WATER LEVEL DATA Station: Qa' Rada' well number: 0737 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	52.90	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	52.53	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	52.78	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	53.31	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	57.47	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	53.40	-	-	-	-
21	-	51.67	-	-	-	-	54.52	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	58.22	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	52.21	-
25	-	-	-	-	-	-	-	-	-	53.33	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	55.70	-	-	-	-	-	-	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:

WATER LEVEL DATA Station: Al Hajafah well number: 0366 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	15.42	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	17.21	-	-	-
5	-	-	-	16.21	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	16.14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	15.98	-	-	-	-	16.91	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	16.48	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	dry	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	16.32	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:
Monitoring was stopped after the well fell dry in October

WATER LEVEL DATA Station: Ghawlays as Sianim well number: 0392 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	29.12
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	28.38	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	28.27	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	29.05	-
25	-	-	-	-	-	-	-	-	-	28.95	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	28.45	28.74	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:
Monitoring in this borehole, close to monitoring hole "mon 3", was started on 21 July

WATER LEVEL DATA Station: Dar an Najd well number: mon 7 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	12.61
4	-	-	-	-	-	-	-	-	12.47	-	-	-
5	-	-	-	12.24	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	12.57	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	12.21	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	12.28	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	12.13	-	-	-	-	12.43	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	12.60	-
25	-	-	-	-	-	-	-	-	-	12.55	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	12.50	-	-	-
28	-	-	-	12.29	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:

WATER LEVEL DATA Station: Dar Mas'ab well number: 328 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	16.46	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	16.66
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	16.88	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	16.94	-	-	16.70	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	16.80	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	16.52	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	16.97	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	16.50	-	-	-	-	16.97	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	16.96	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	16.56	-
25	-	-	-	-	-	-	-	-	-	16.92	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	16.67	-	-	-
28	-	-	-	16.64	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:

WATER LEVEL DATA Station: Mawka well number: 0366 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	16.77	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	17.88
4	-	-	-	-	-	-	-	-	18.27	-	-	-
5	-	-	-	17.30	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	17.90	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	P	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	P	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	P	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	16.66	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	P	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	P	-
25	-	-	-	-	-	-	-	-	-	P	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	17.85	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	17.88	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:
P = pumping

WATER LEVEL DATA Station: An Nazim well number: 0775 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	5.25	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	P	-	-	-
5	-	-	-	7.90 (P)	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	6.39	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	5.88	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	5.55	5.52	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	5.58	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	5.94	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	5.54	-	-	-	-	5.93	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	5.66	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	6.28	-
25	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	6.32	-	-
27	-	-	-	-	-	-	-	-	6.40	-	-	-
28	-	-	-	5.20	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:
P = pumping

WATER LEVEL DATA Station: Az Zuwab well number: 0681 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	28.60	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	28.54	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	28.50	-	28.50	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	28.19	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	28.50	-	-	-
28	-	-	-	28.36	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:

WATER LEVEL DATA Station: Ghawl adh Dhrah well number: 0377 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	27.65
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	27.67	-
25	-	-	-	-	-	-	-	-	-	P	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:
Regular monitoring started 25 October

WATER LEVEL DATA Station: Hanakat al Mas'ud well number: 0259 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	9.19	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	P
4	-	-	-	-	-	-	-	-	9.67	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	P	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	P	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	9.37	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	P	-	-	-	-	-	-
20	-	-	-	-	-	-	-	P	-	-	-	-
21	-	P	-	-	-	-	P	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	P	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	9.75	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	P	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	9.25	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:
P = pumping

WATER LEVEL DATA Station: Qariat as Sawdah well number: 0771 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	P	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	6.25
4	-	-	-	-	-	-	-	-	5.90	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	6.12	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	4.61	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	5.10	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	P	-	-	-	-	-	-
20	-	-	-	-	-	-	-	P	-	-	-	-
21	-	4.36	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	5.26	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	P	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	P	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	4.78	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:
P = pumping

WATER LEVEL DATA Station: Wadi as Sir well number: 0734 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	10.59
4	-	-	-	-	-	-	-	-	10.17	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	P	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	9.63	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	P	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	10.55	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-		-	9.23	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:
P = pumping

WATER LEVEL DATA Station: Jayf well number: 0735 year: 1988

date	January	February	March	April	May	June	July	August	September	October	November	December
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	53.57	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	58.11	-
6	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	57.68	-	-
10	-	-	-	-	-	-	-	-	53.71	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	50.80
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	58.27	-	-
24	-	-	-	-	47.30	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	57.41	53.30	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	54.11	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	58.49	-	-
30	-		-	-	-	-	-	-	-	-	-	-
31	-		-		-		-	-		-		-

Remarks:
Pumphouse locked until May 24th

Annex E

Water levels (preslogs)

ANNEX E

WATER LEVELS BY PRESLOGS

E.1 Bi-monthly water levels in well No. 824 at Maghrabah, Rada area in meters below surface. File EP4373P-0

E.2 Bi-monthly water levels in well No. 824 at Maghrabah, Rada area in meters below surface. File EP4345-10

E.3 Bi-monthly water levels in well No. 736 at Ghawl Azraq, Rada area in metres below surface. File EP4370P-0

E.4 Bi-monthly water levels in well No. 738 at Qarn al Asad, Rada area in meters below surface. File EP4354-0

E.5 Bi-monthly rest water levels in a well at Sharaf, Al Bayda, File EP4324P-12

E.6 Bi-monthly water levels in a well at Al Junubah, Al Bayda in metres below surface. File EP4320-10

E.7 Bi-monthly water levels in a well at As Sawma'a, Al Bayda in metres below surface; File EP4353-0

E.8 Bi-monthly water-levels in well No. 2011 at Qariat Mushayr, Al Bayda, in metres below surface.

E.9 Bi-monthly rest water levels in well No. 2164 at Mashaba, Al Bayda, EP4384P-10

ANNEX E
WATER LEVELS BY PRESLOGS

Table E.1 - Location of Preslogs

Location	Region	Well No.	Elevation above MSL (m)	Preslog No. SNP	Installation date	Installation Time	Water depth (m)
Maghrabah	Rada	60	2100	4373	1-11-86	16:00	23.40
Maghrabah	Rada	60	2100	4345	12-12-87	15:00	21.89
Qawl Azraq	Rada	736	2098	4370	17-09-86	09:00	14.63
Qarn al Asad	Rada	738	2125	4354	1-01-88	12:00	12.20
Sharaf	Ash Sharaf			4324	30-08-87	9:00	11.89
Al Junabah	W. Matar		5661	4320	11-02-87	8:00	9.71
As Sawma'a	Al Bayda		2020	4353	7-10-87	16:00	17.00
Qar. Mushayr	Al Bayda	2011	1978	4352	30-05-88	11:00	11.93
Mash'aba	Al Bayda		1950	4384	30-05-88	12:00	19.18

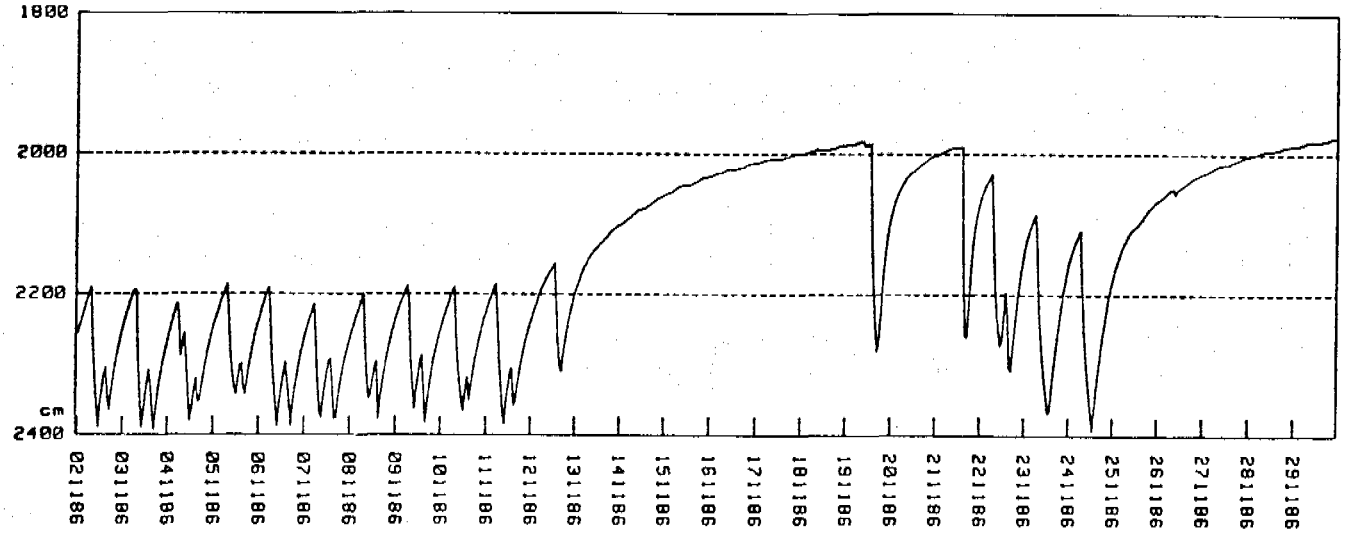
Bi-monthly water levels in well No.824 at Maghrabah, Rada area in meters below surface. File EP4373P_0

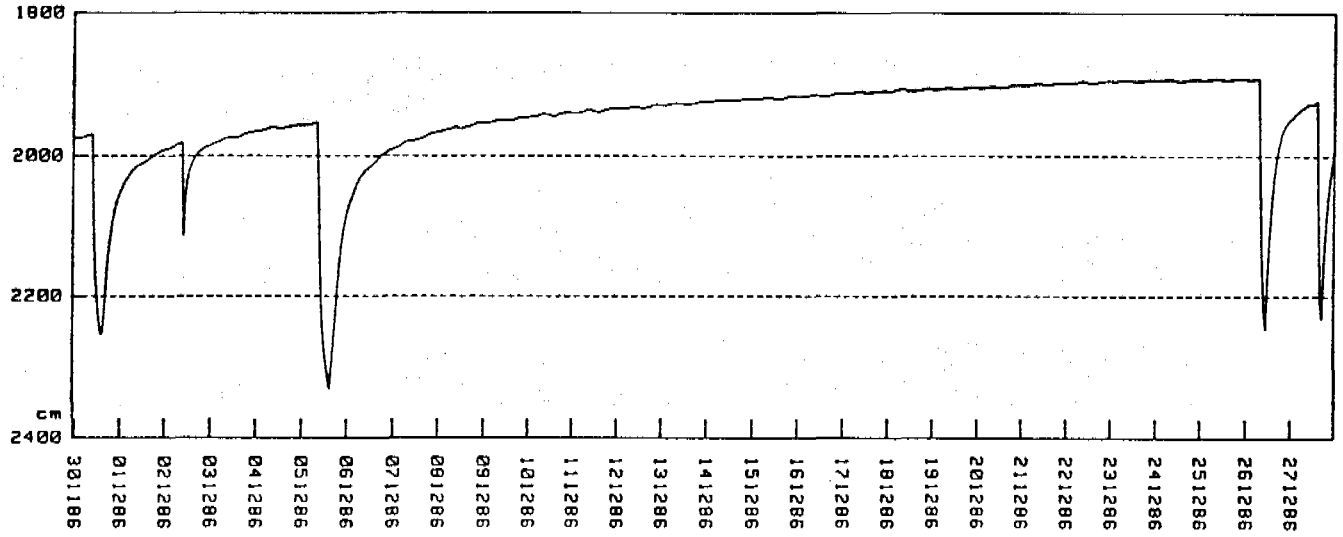
	1986						1987							
	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	August	Sept	Oct	Nov	Dec
1		19.63				20.81		20.04						
2	23.03										22.94		22.47	22.03
3														
4					21.00									
5									22.60					
6			18.78											
7														
8										22.25				
9							21.53							
10														
11				21.09										
12												22.95		21.39
13														
14														
15														
16										22.11				
17								22.04						
18														
19	19.75					19.43								
20														
21													22.17	
22														
23														
24							20.17					23.15		
25		18.83			19.73									
26			18.63	21.45					22.30					
27											22.90			
28														
29														
30														
31														

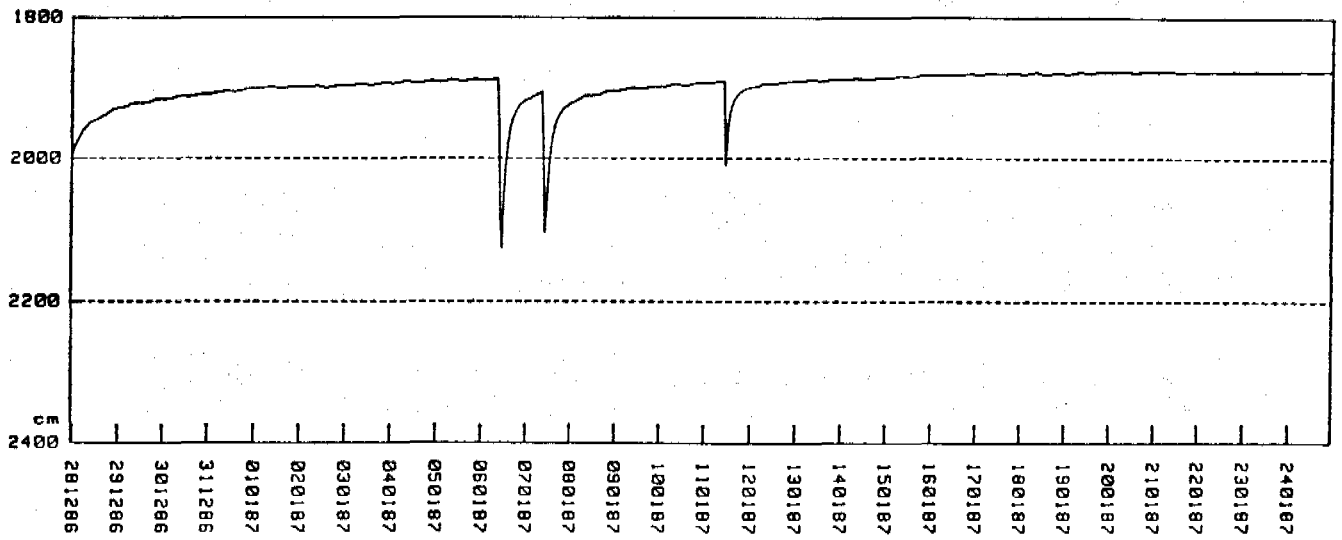
COUNTRY : YEMEN
STATION : MAGHRABAH
PROJECT : R.I.R.D.P.
BEGIN DATE : 011186
START TIME : 24:00

PLOT OF WATER LEVEL DEPTH
WATER LEVEL DEPTH (START) : 2340 cm.
BAROMETER READING (START) : 707 mB.
END DATE : T
INTERVAL : 01:00

FILE: EP4373P_0
4 Dec 1989 14:02:01



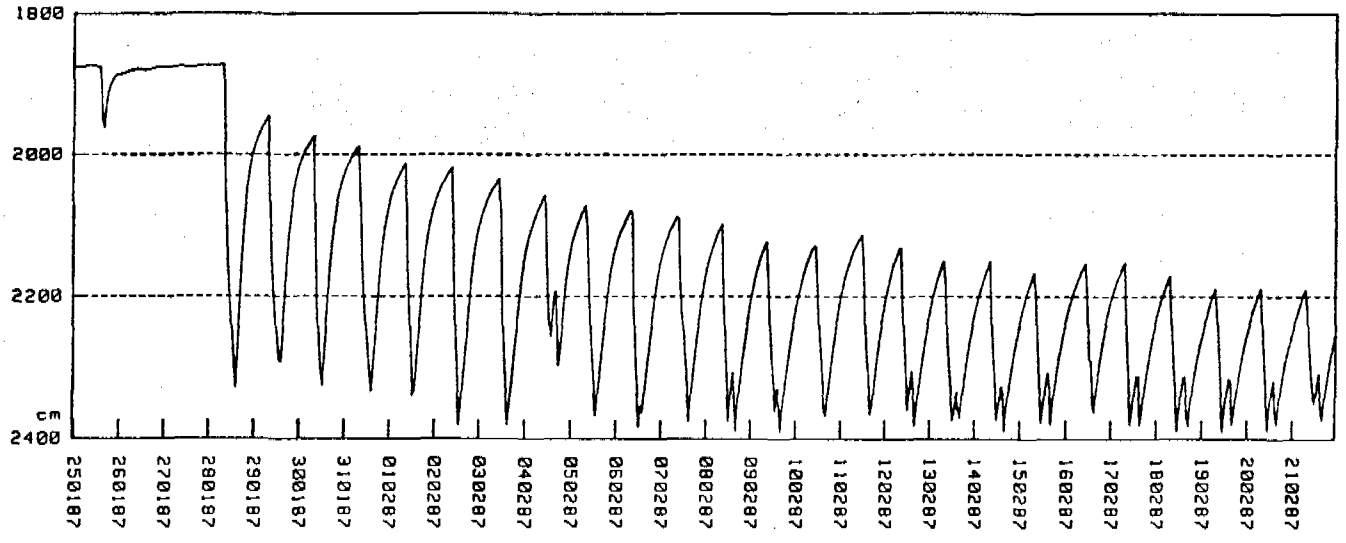


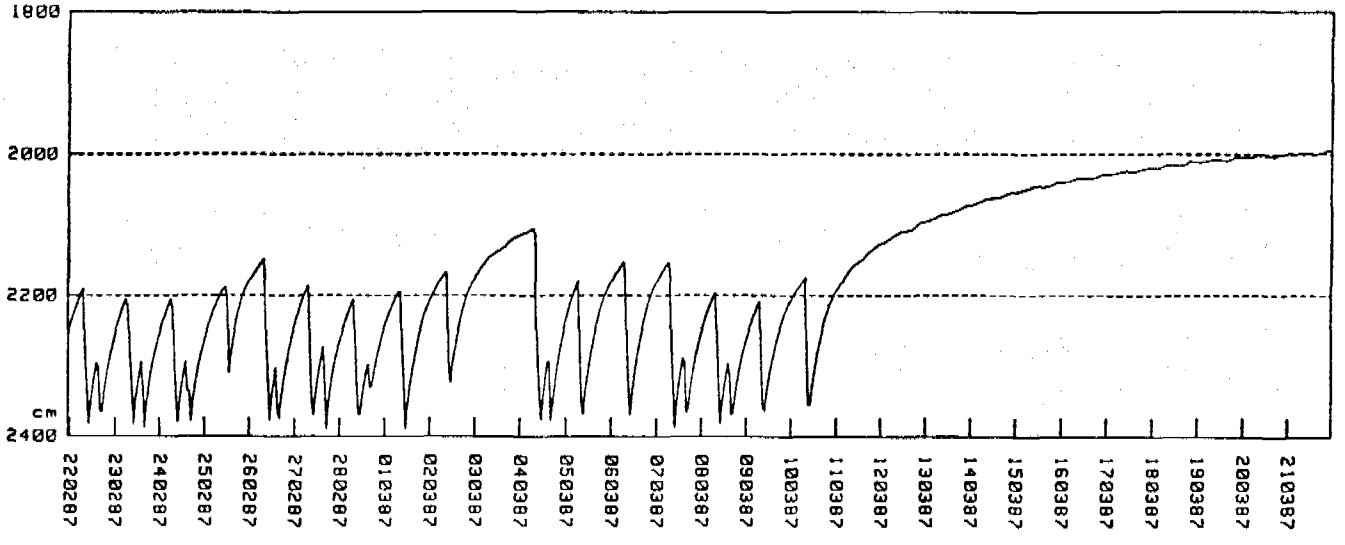


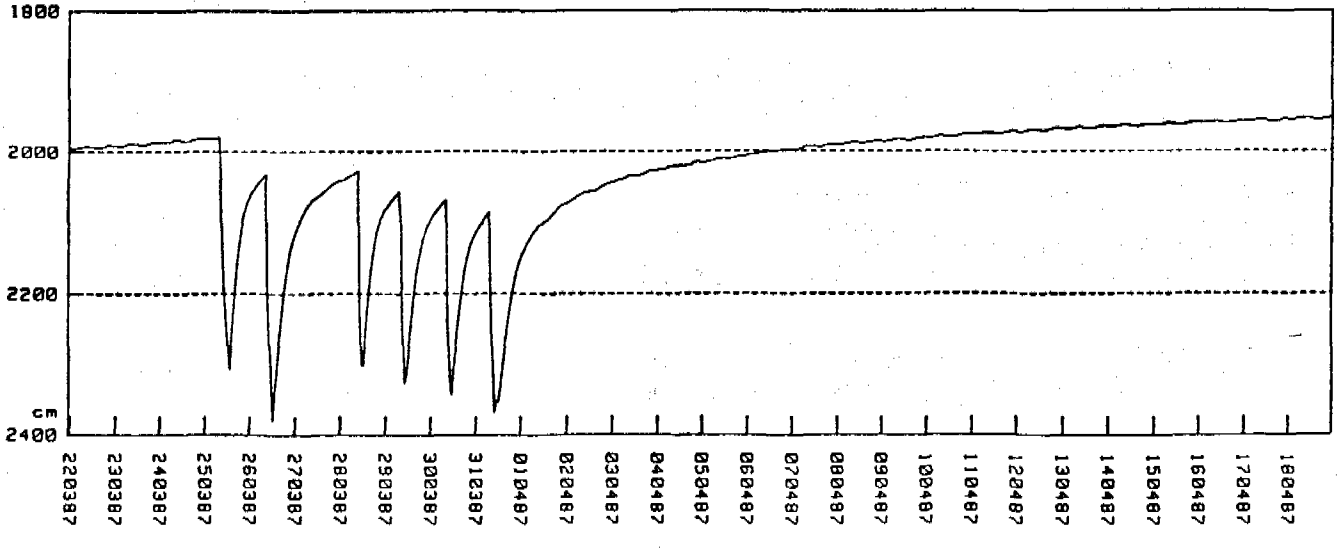
COUNTRY : YEMEN
STATION : MAGHRABAH
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4373P_0
4 Dec 1989 14:00:12



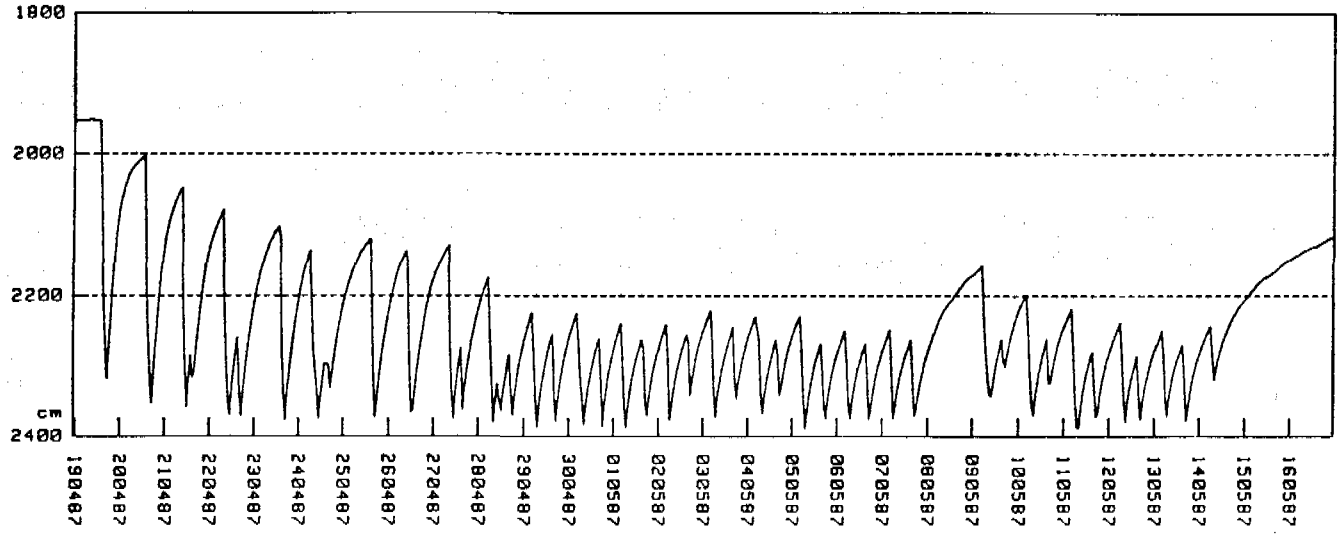


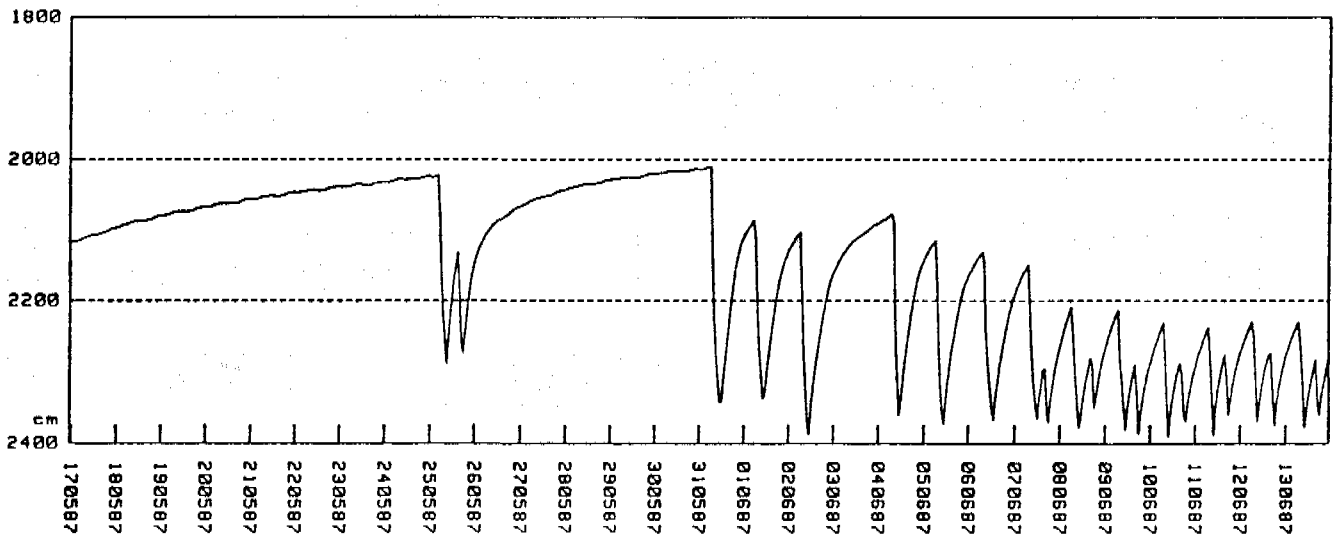


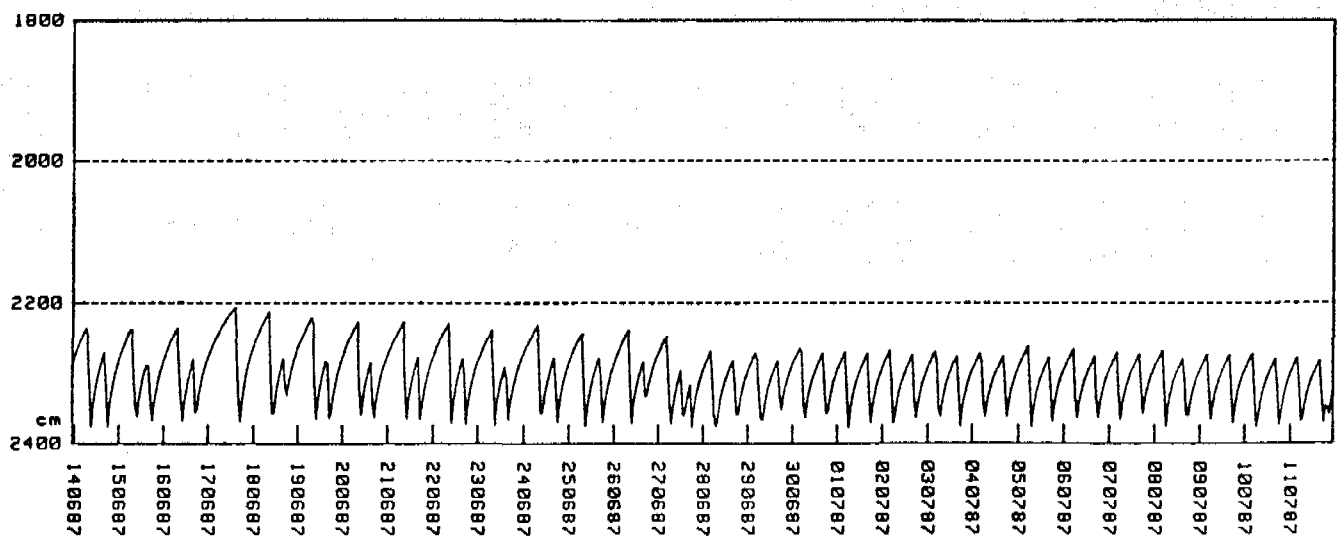
COUNTRY : YEMEN
STATION : MAGHRABAH
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4373P_0
4 Dec 1989 14:14:38



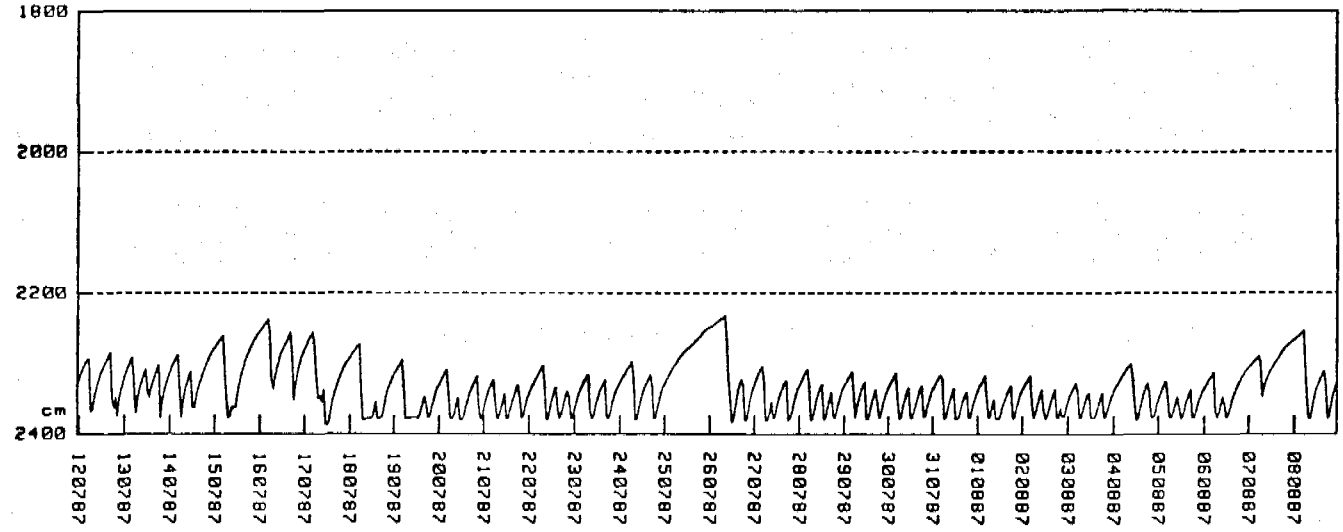


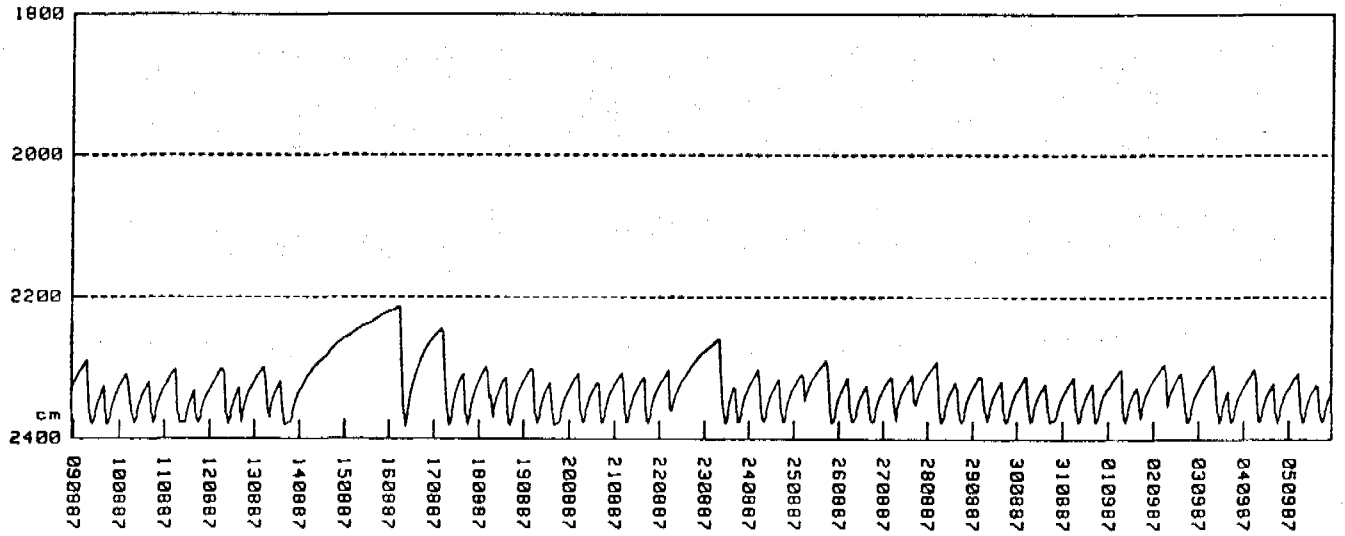


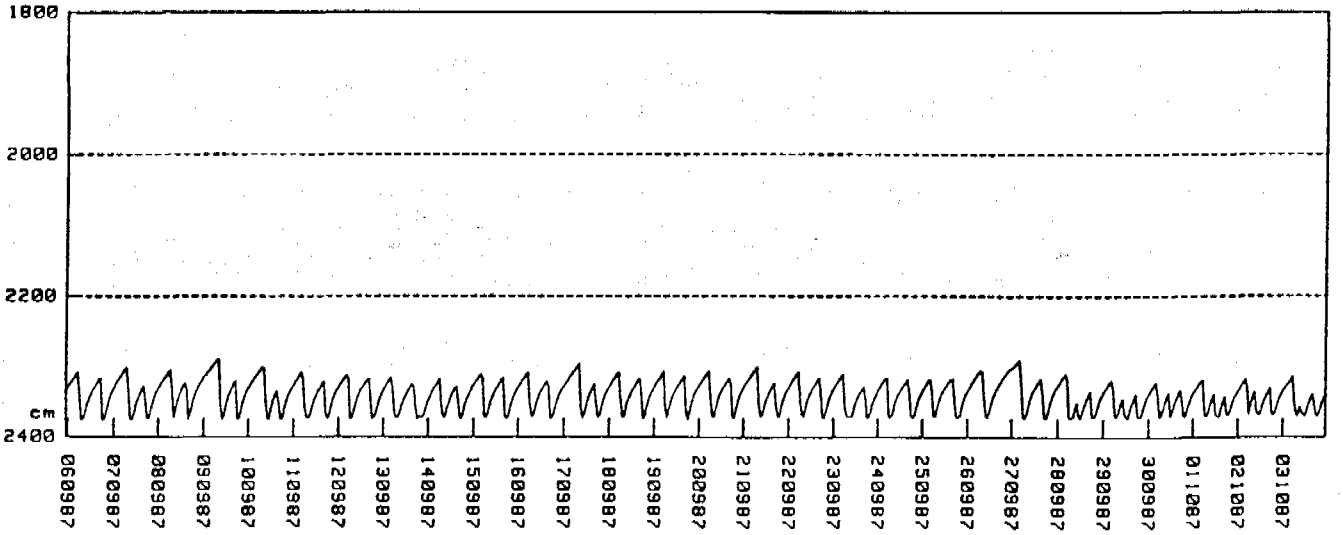
COUNTRY : YEMEN
STATION : MAGHRABAH
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4373P_0
4 Dec 1989 14:20:46



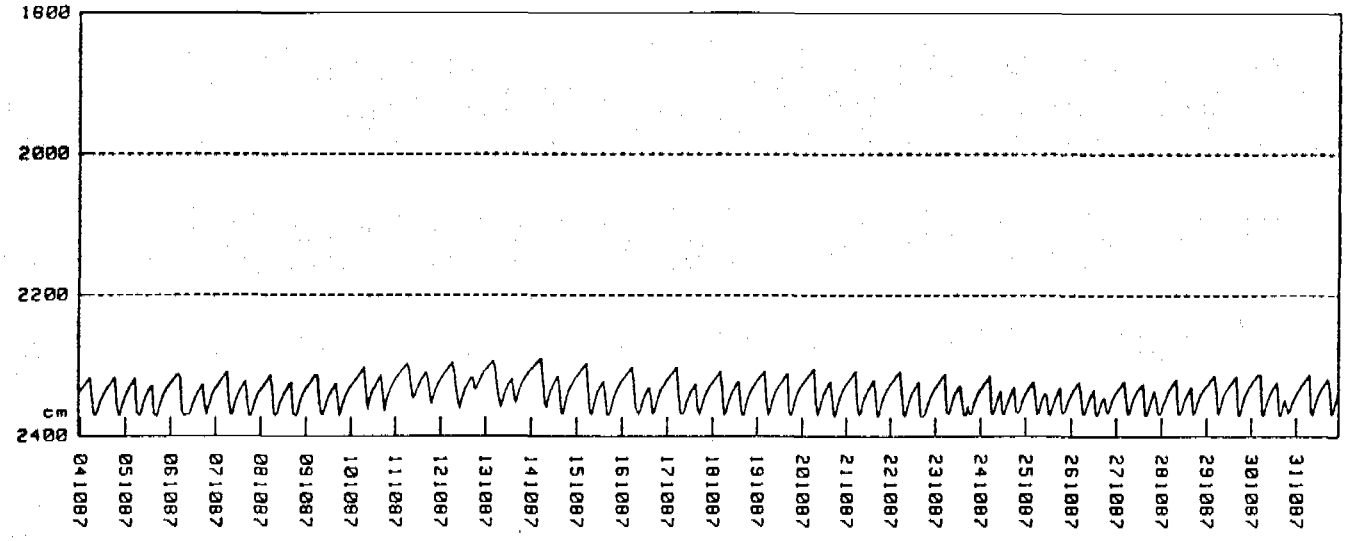


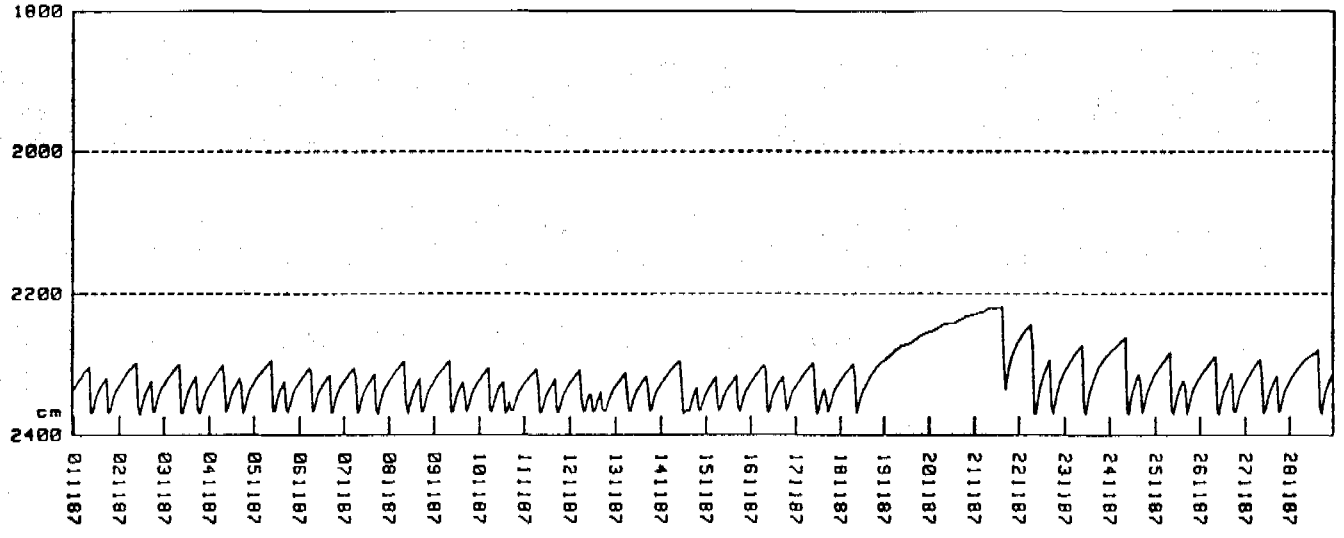


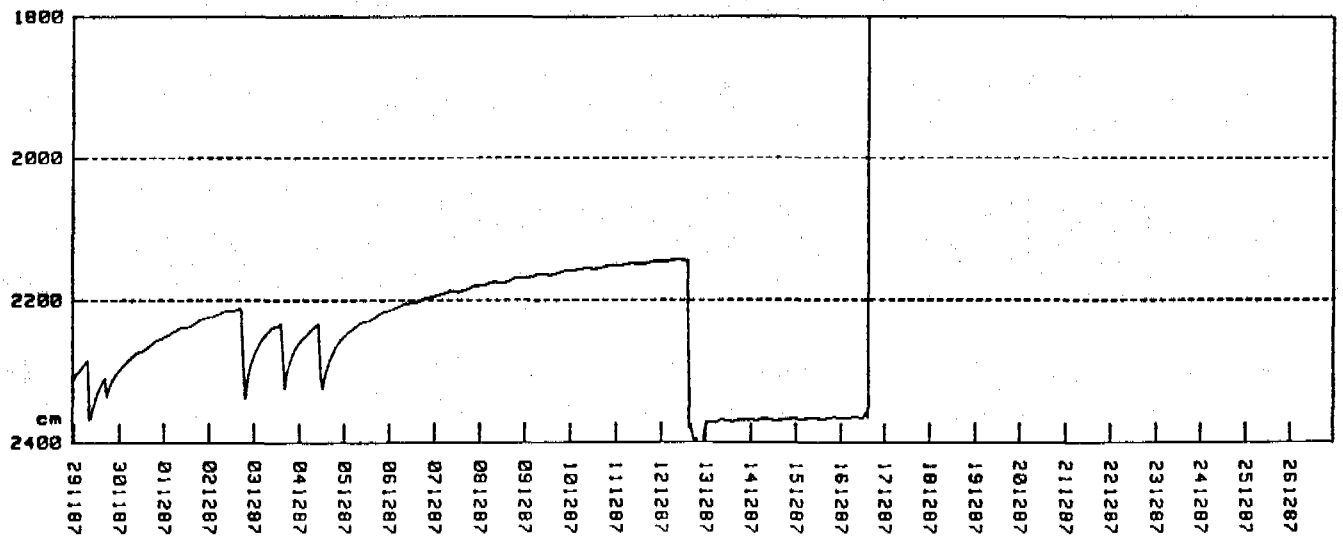
COUNTRY : YEMEN
STATION : MAGHRABAH
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4373P_0
4 Dec 1989 14:27:03







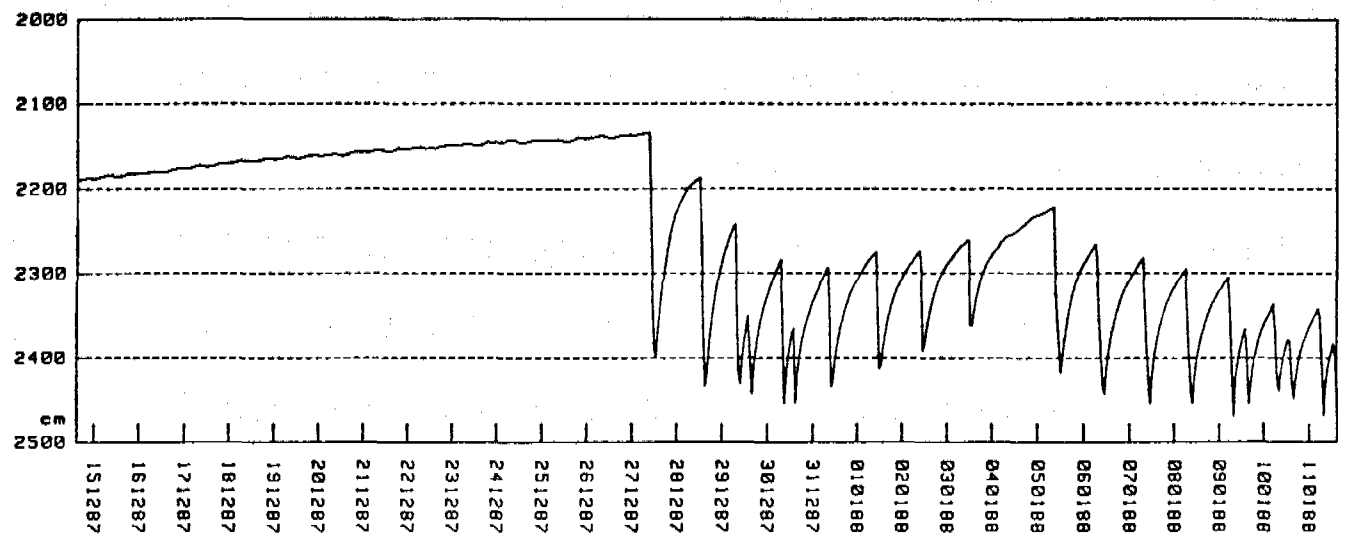
Bi-monthly water levels in well No.824 at Maghrabah, Rada area in meters below surface. File EP4345-10

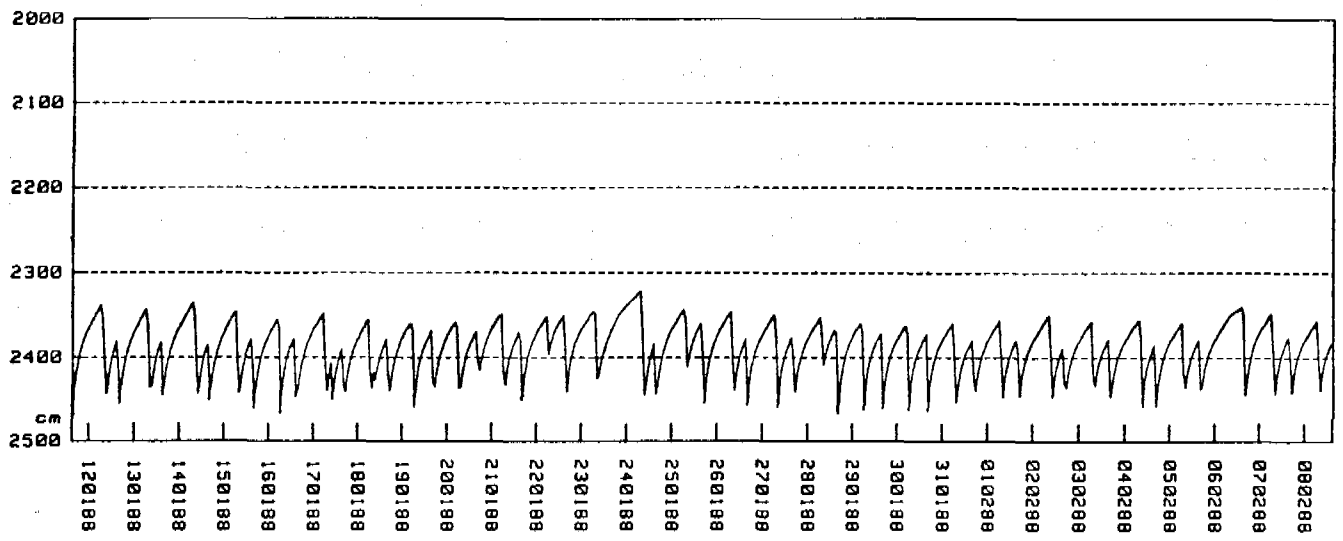
	1987			1988								1989		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1															
2															
3														20.3	
4					23.85								21		
5												23.23			
6															
7				23.8											
8			23.59												
9											23.34				
10													20.72		
11									22.5						20.8
12		23.41								21.13					
13								23.83							
14						23.34						20.66			
15															
16														20.67	
17															
18						21.8									
19					23.87										
20															
21															
22			23.73	23.8											
23											23.28				
24															
25		23.46													
26										23.39					
27	21.33					23.79									
28															
29								23.1	21.66						
30															
31						21.6									

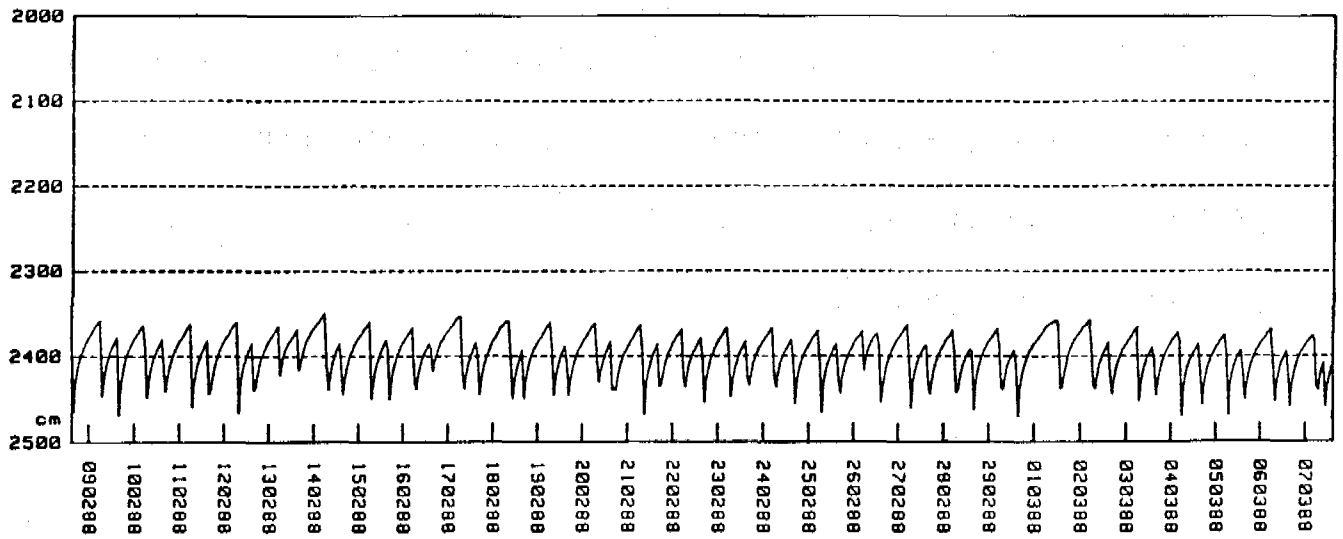
COUNTRY : YEMEN
STATION : Hagrabah
PROJECT : R.I.R.D.P.
BEGIN DATE : 141287
START TIME : 16:00

PLOT OF WATER LEVEL DEPTH
WATER LEVEL DEPTH (START) : 2189 cm.
BAROMETER READING (START) : 794 mB.
END DATE : 140289
INTERVAL : 01:00

FILE: EP4343P_10
8 Nov 1989 14:53:39



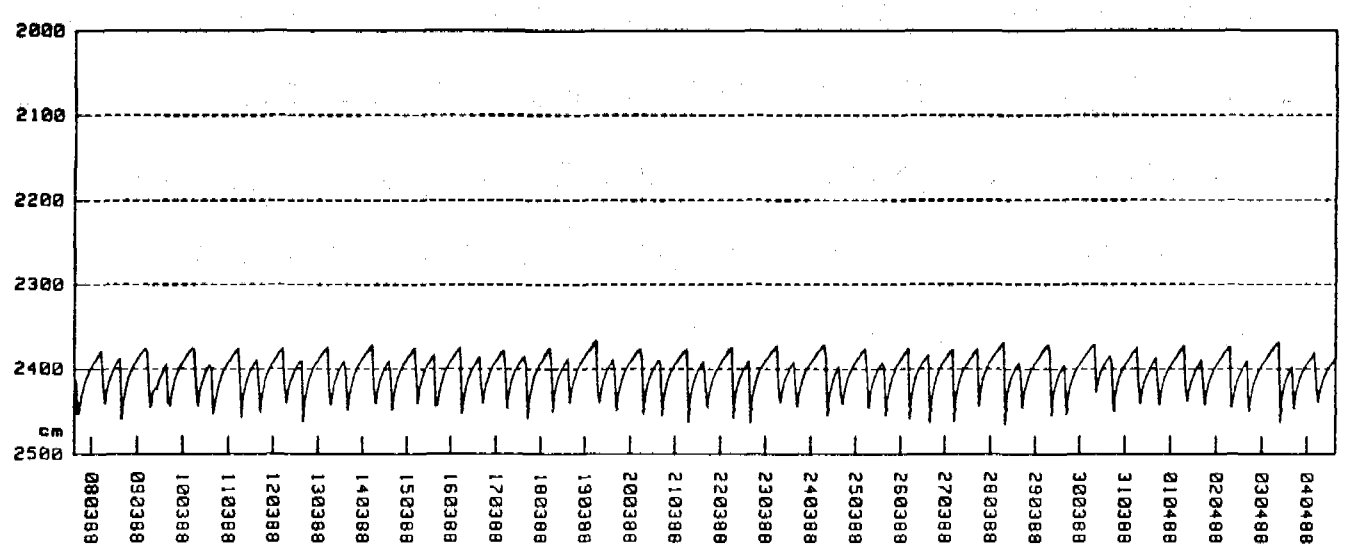


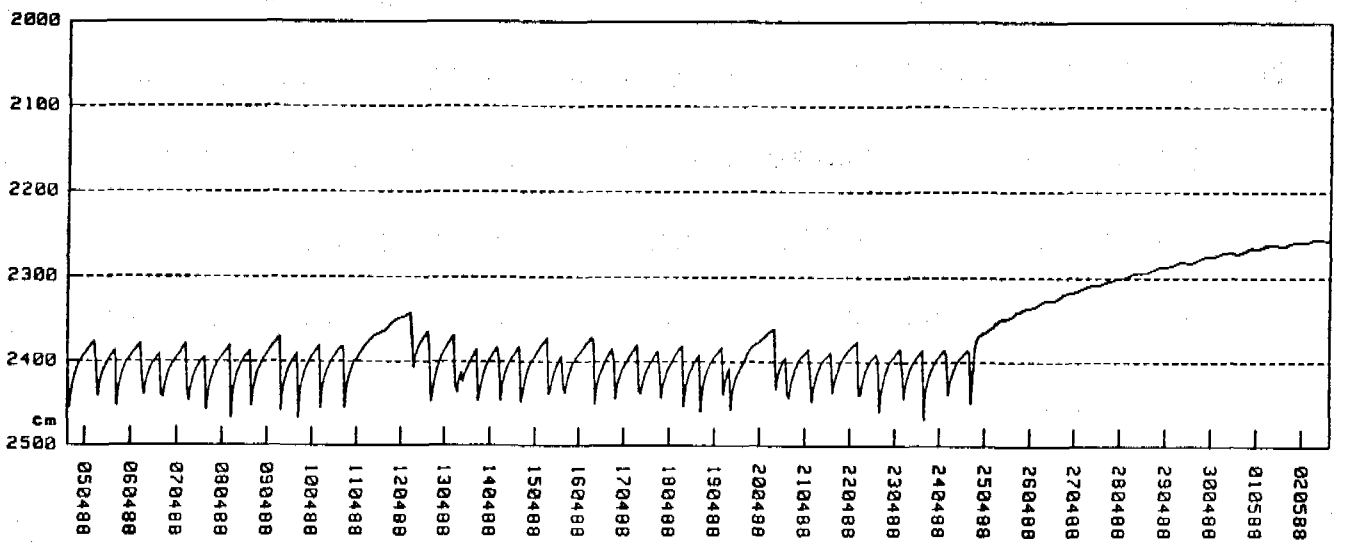


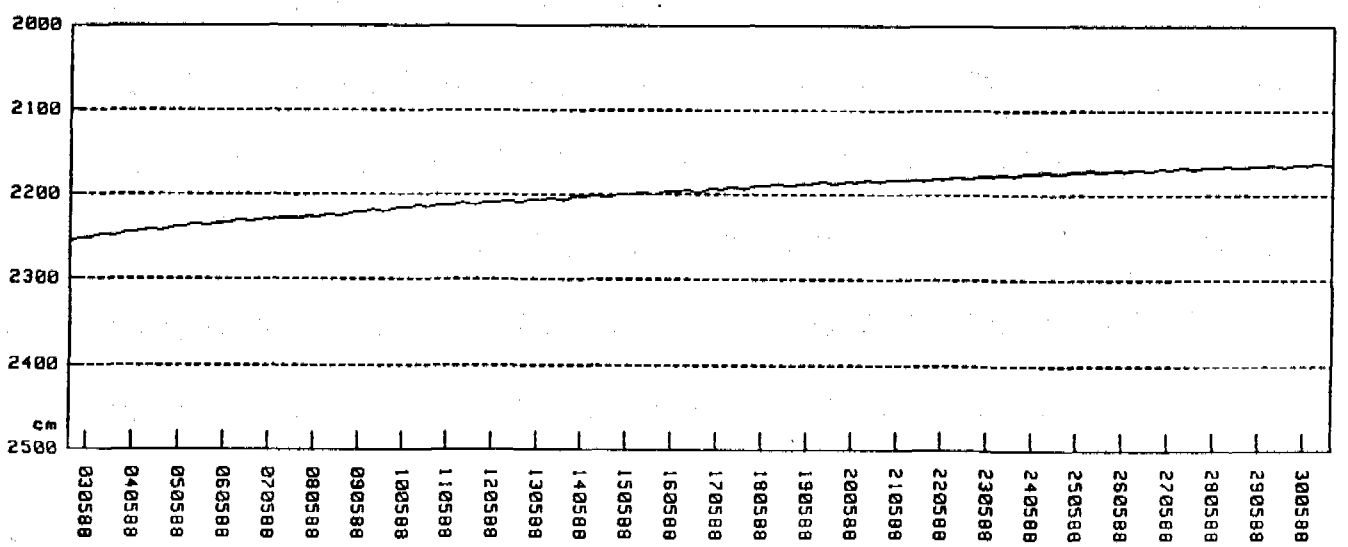
COUNTRY : YEMEN
STATION : Magrabah
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4345P_10
8 Nov 1989 15:01:03



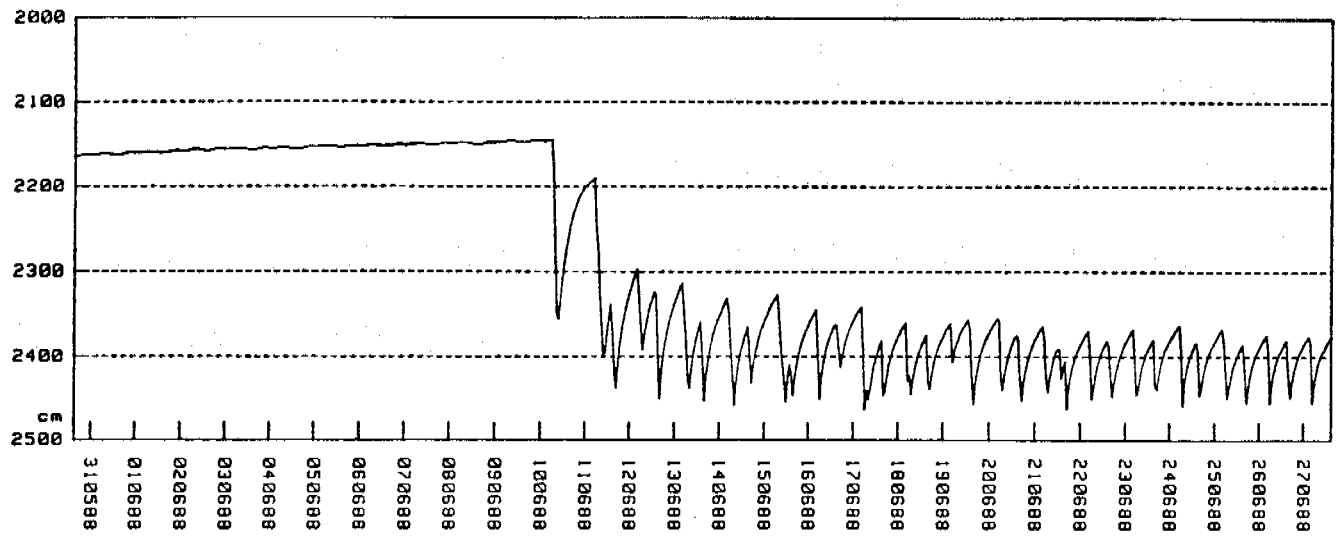


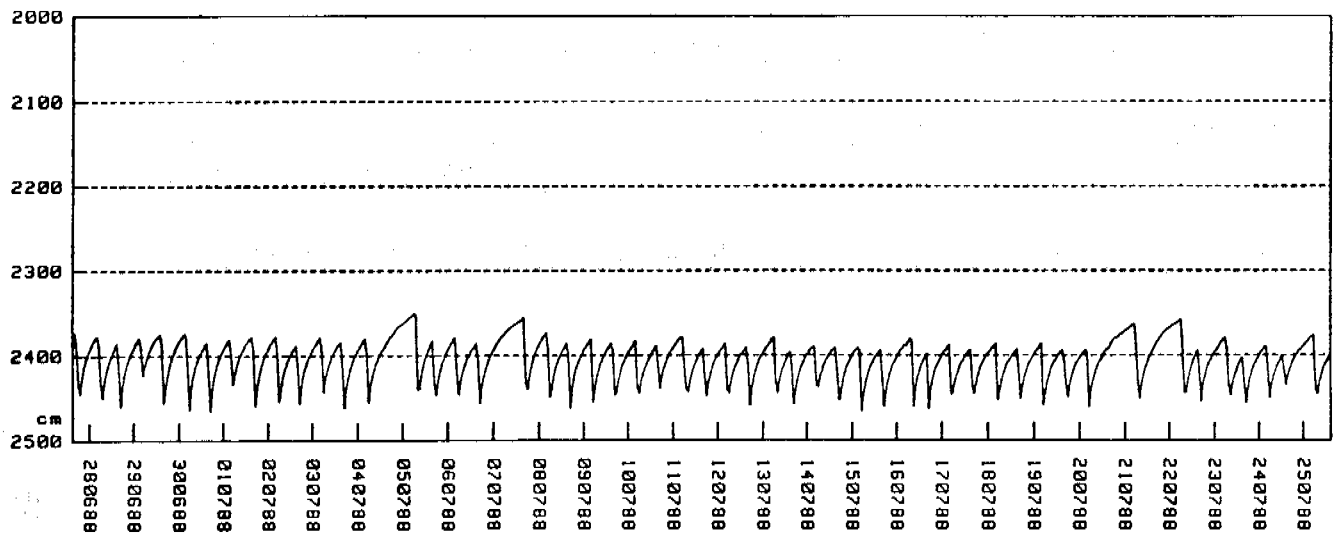


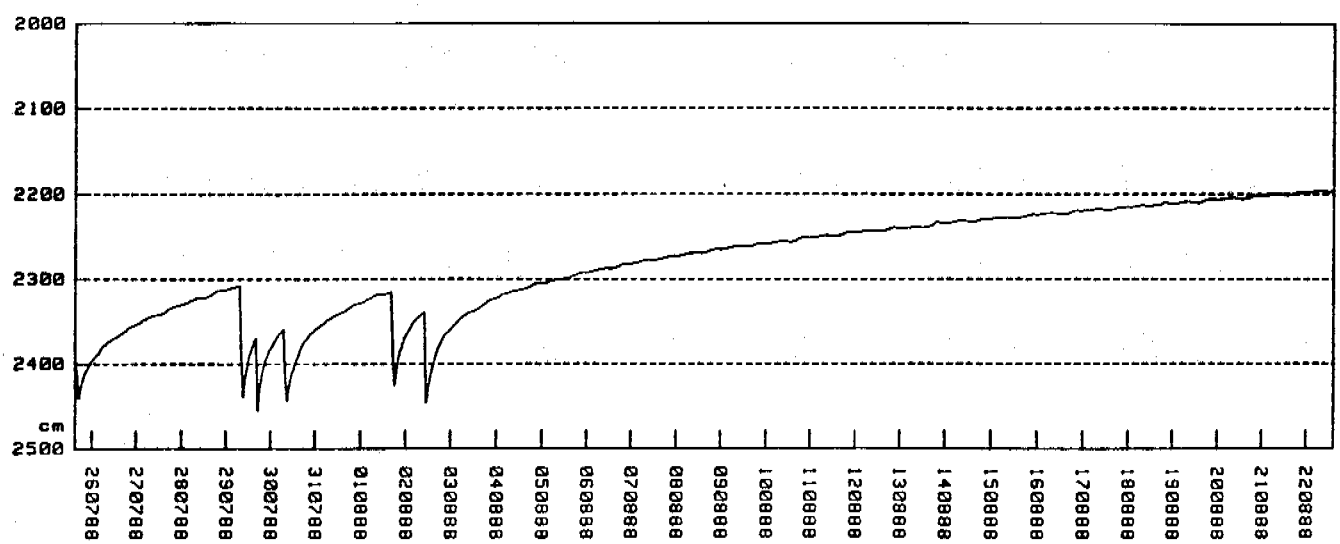
COUNTRY : YEMEN
STATION : Magrabah
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4345P_10
8 Nov 1989 15:08:27



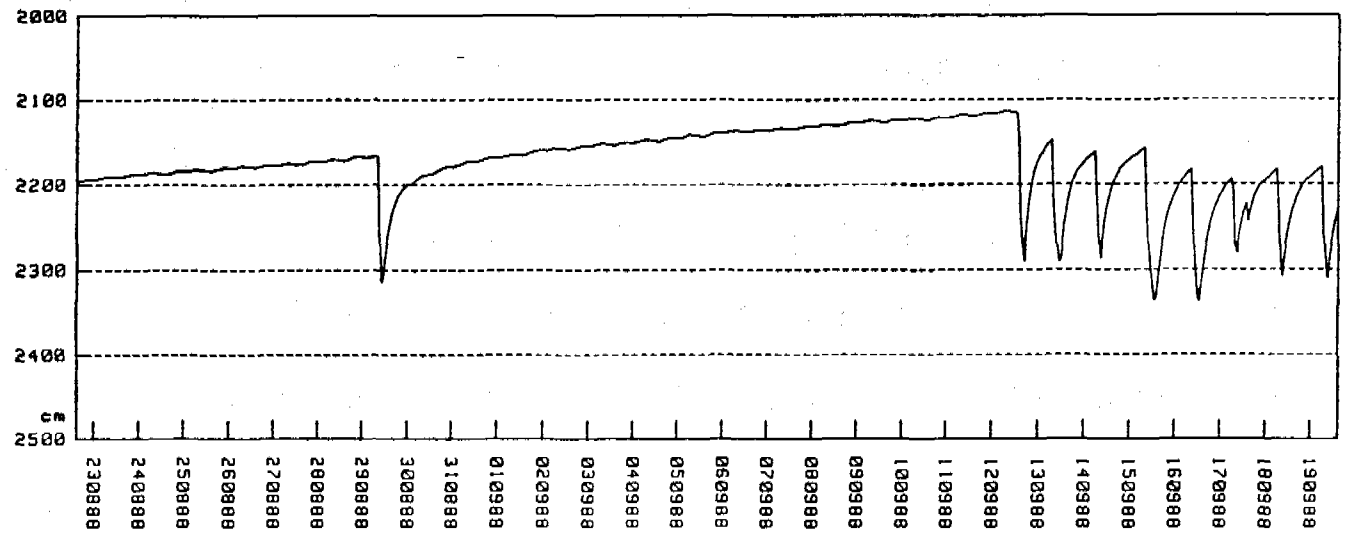


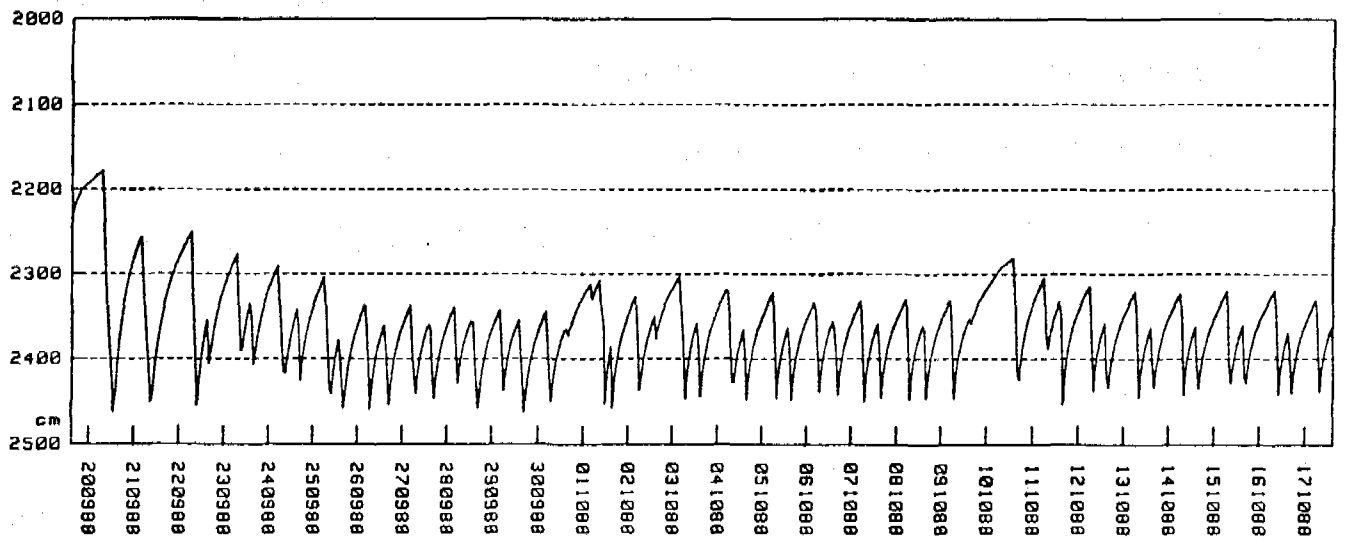


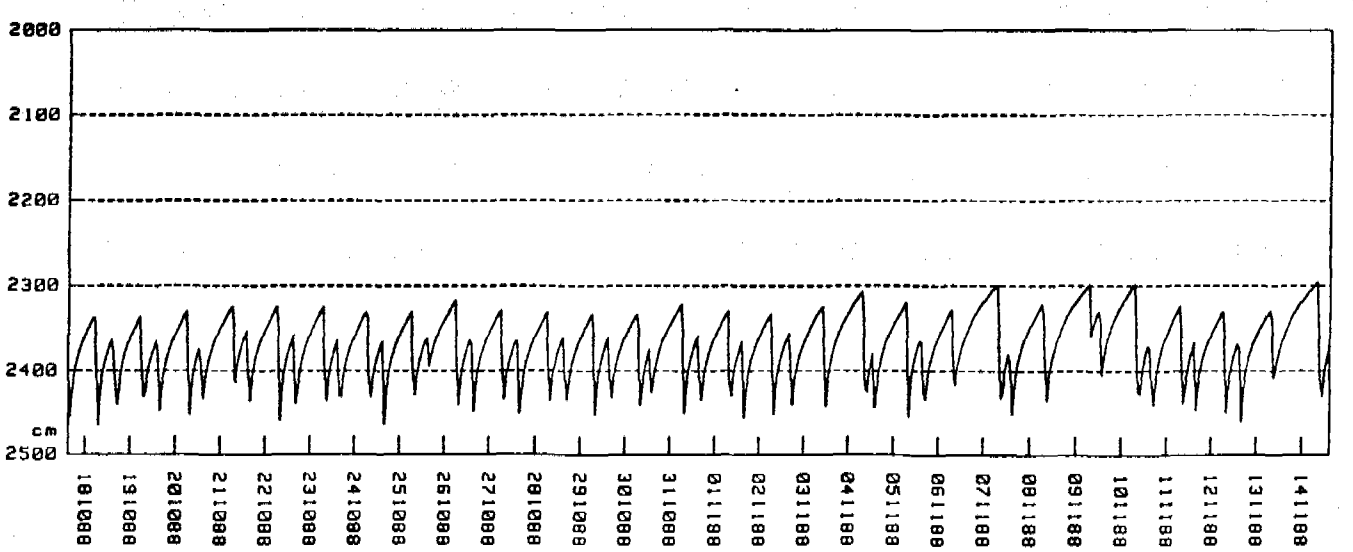
COUNTRY : YEMEN
STATION : Magrabah
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4345P_18
8 Nov 1989 15:15:54



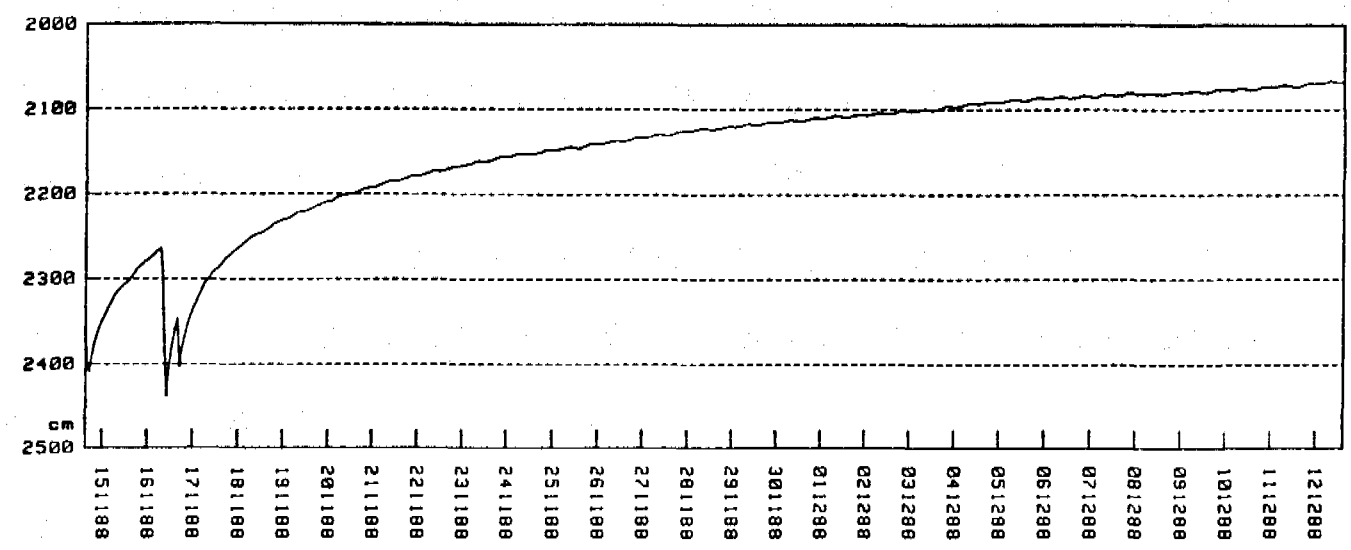


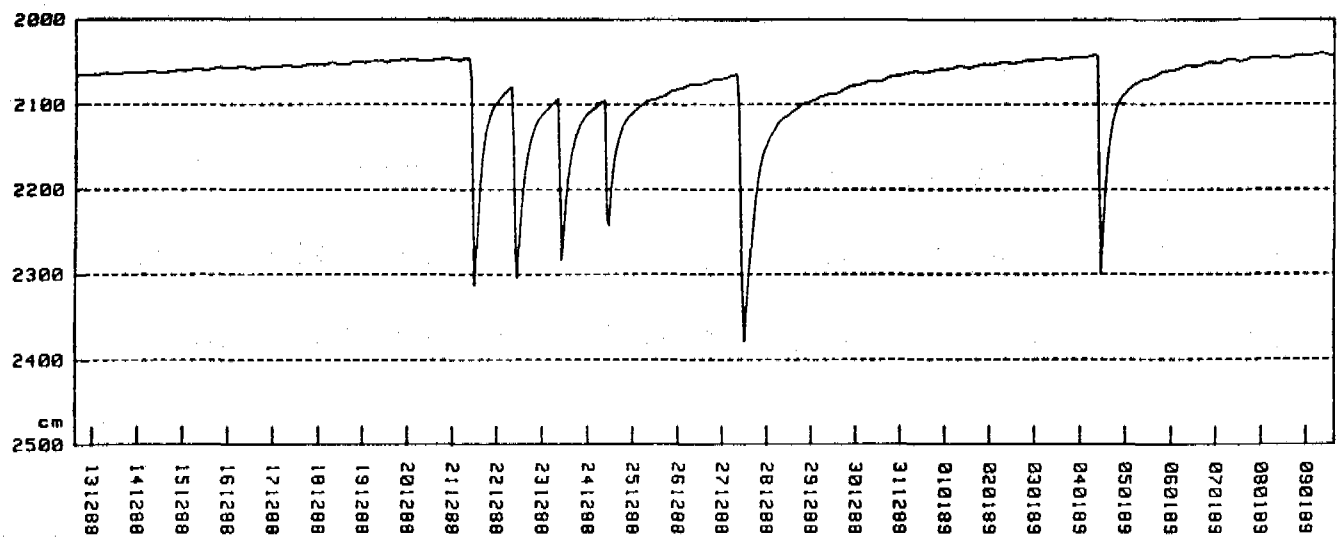


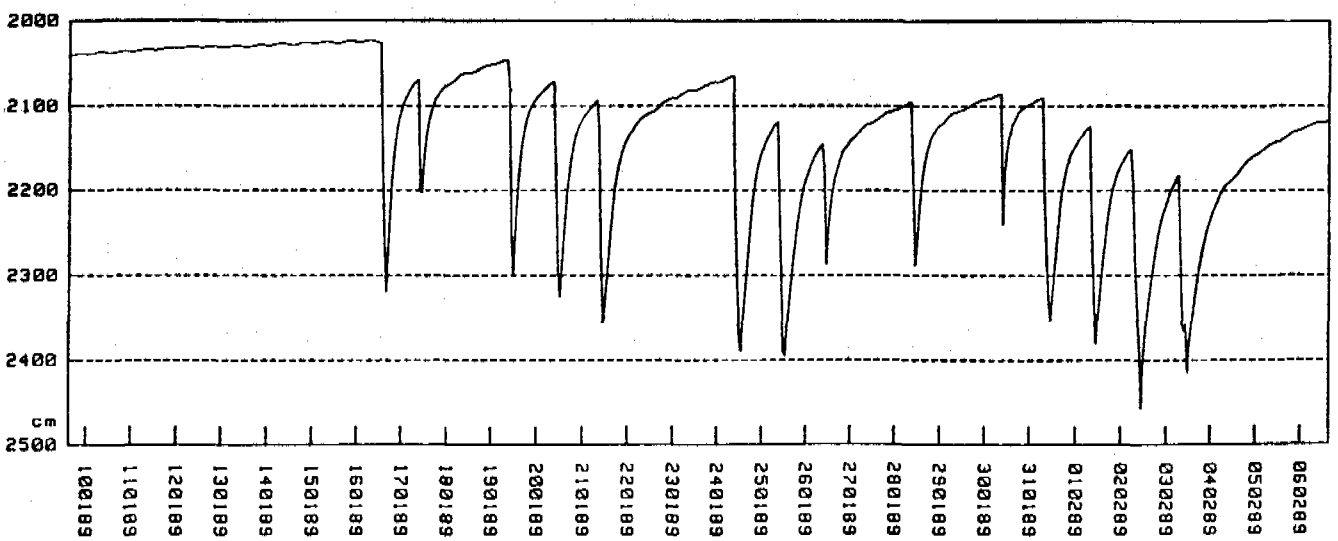
COUNTRY : YEMEN
STATION : Magrabah
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4345P_10
8 Nov 1989 15:23:21



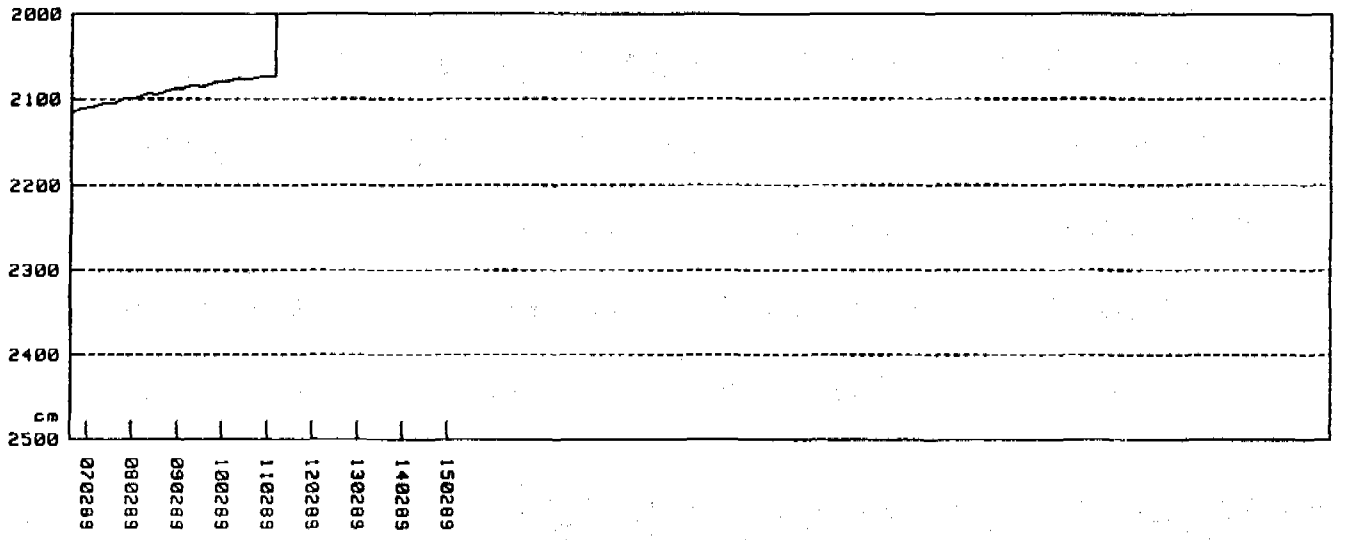




COUNTRY : YEMEN
STATION : Magrabah
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4345P_10
8 Nov 1989 15:30:37



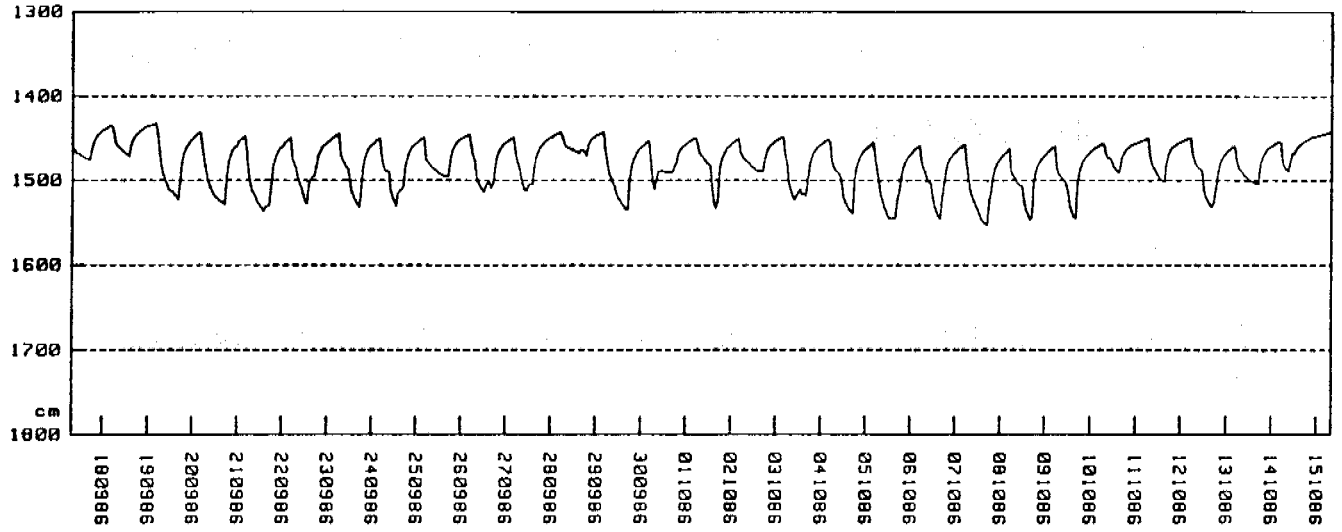
Bi-monthly water levels in well No 736 at Ghawl Azraq, Rada area in metres below surface. File EP4370P_0

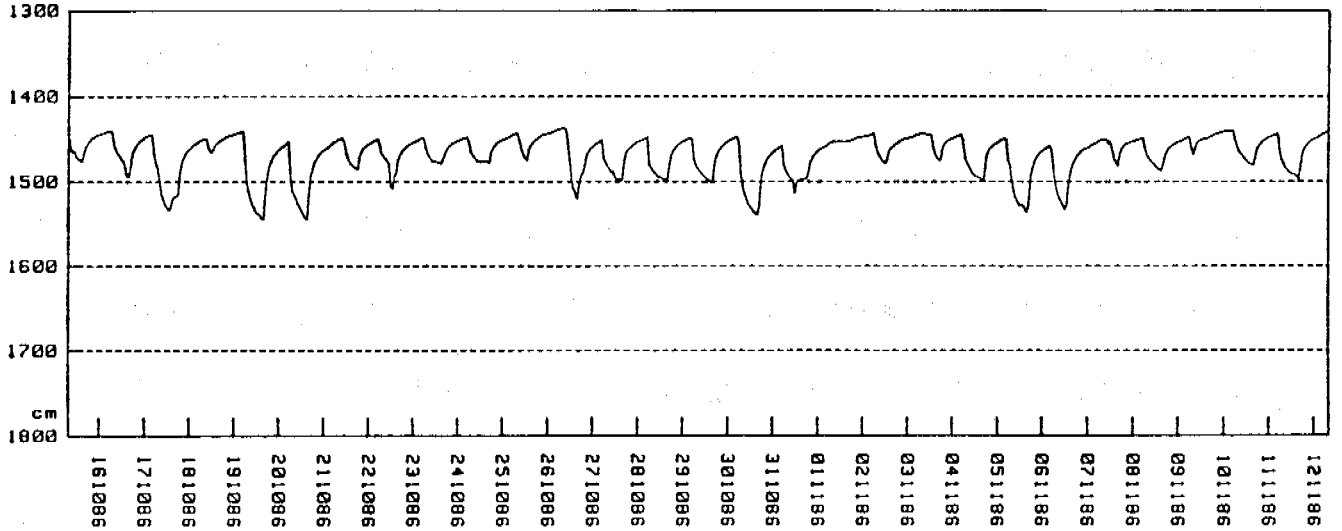
	1986				1987										
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov
1					14.04										
2															
3															
4															
5															15.01
6															
7						14									
8							14.06								
9															
10			14.39	14.15											
11													14.96	15.1	
12															
13									13.56						
14															
15		14.42													
16										14.13		14.59			
17											14.36				
18															14.97
19	14.31														
20															
21						14.15									
22								13.26							
23				14.09	14.02										
24															
25														15.11	
26		14.36													
27										14.18		14.98			
28			14.29												
29	14.42								14.04						
30															
31											14.65	14.91			

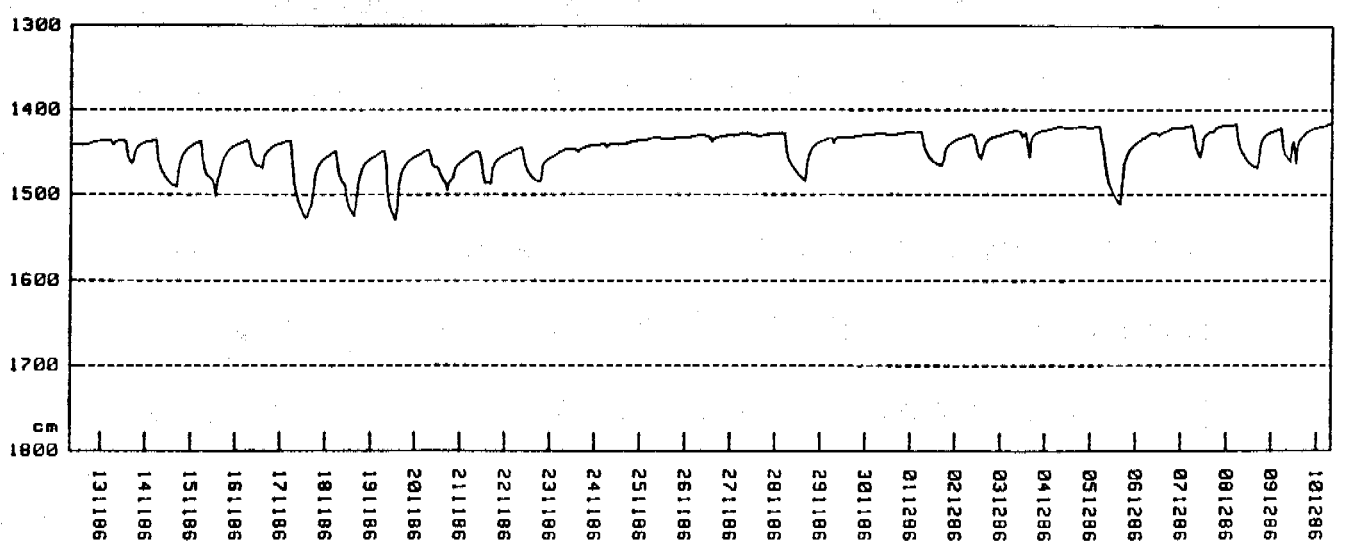
COUNTRY : YEMEN
STATION : GHAWL AZRAQ
PROJECT : R.I.R.D.P
BEGIN DATE : 170986
START TIME : 09:00

PLOT OF WATER LEVEL DEPTH
WATER LEVEL DEPTH (START) : 1463 cm.
BAROMETER READING (START) : 790 mB.
END DATE : T
INTERVAL : 01:00

FILE: EP4370P_0
4 Dec 1989 16:45:20



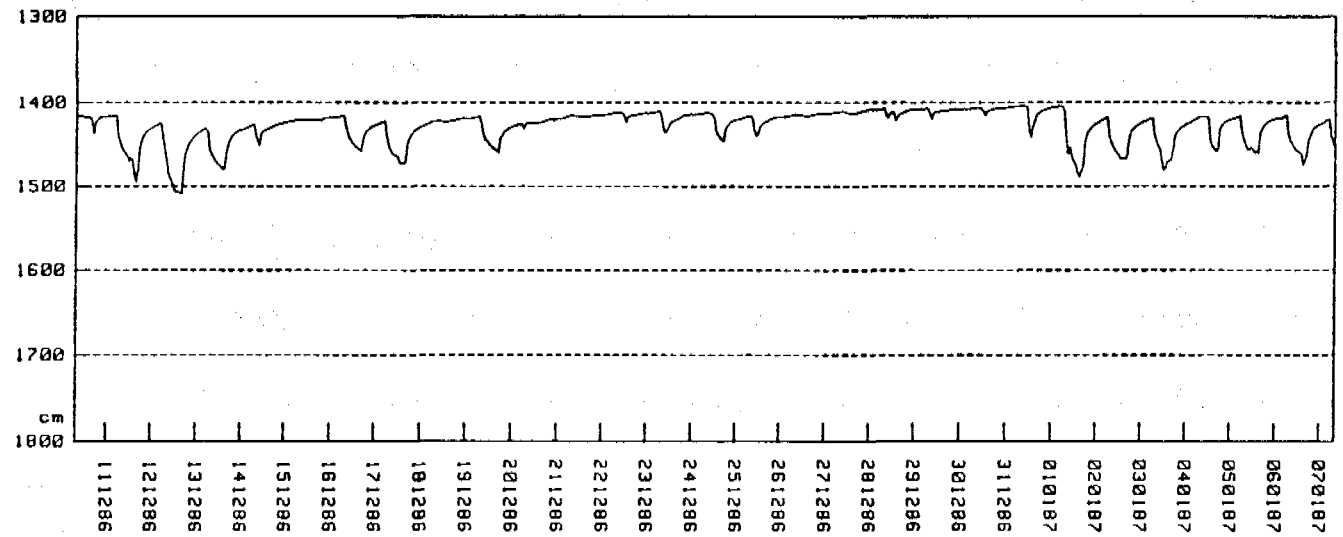


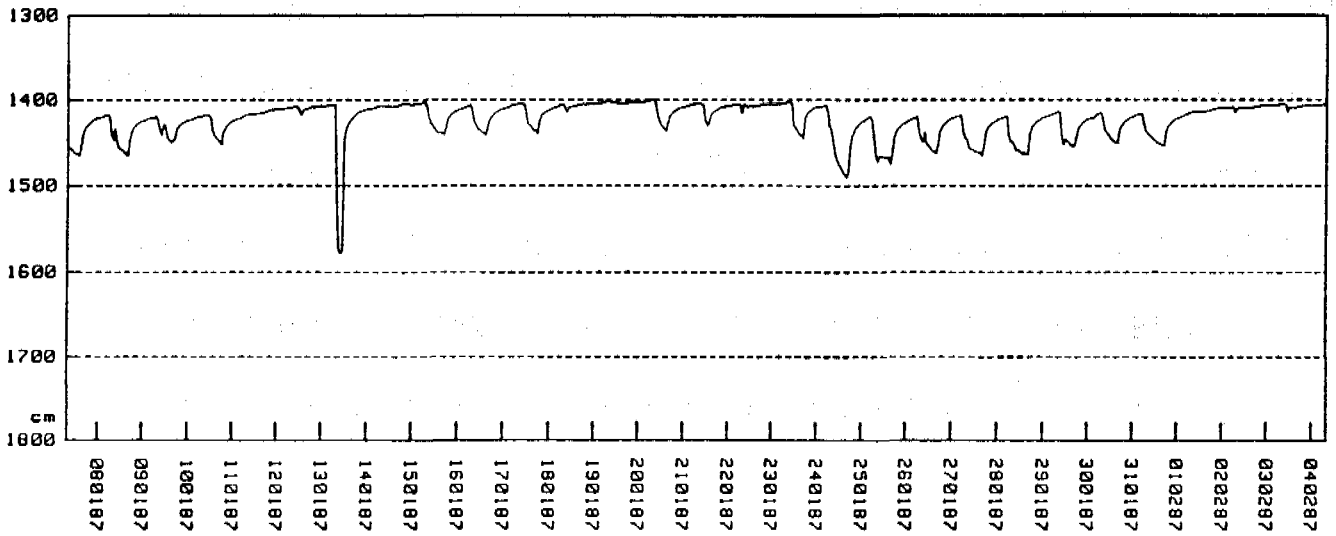


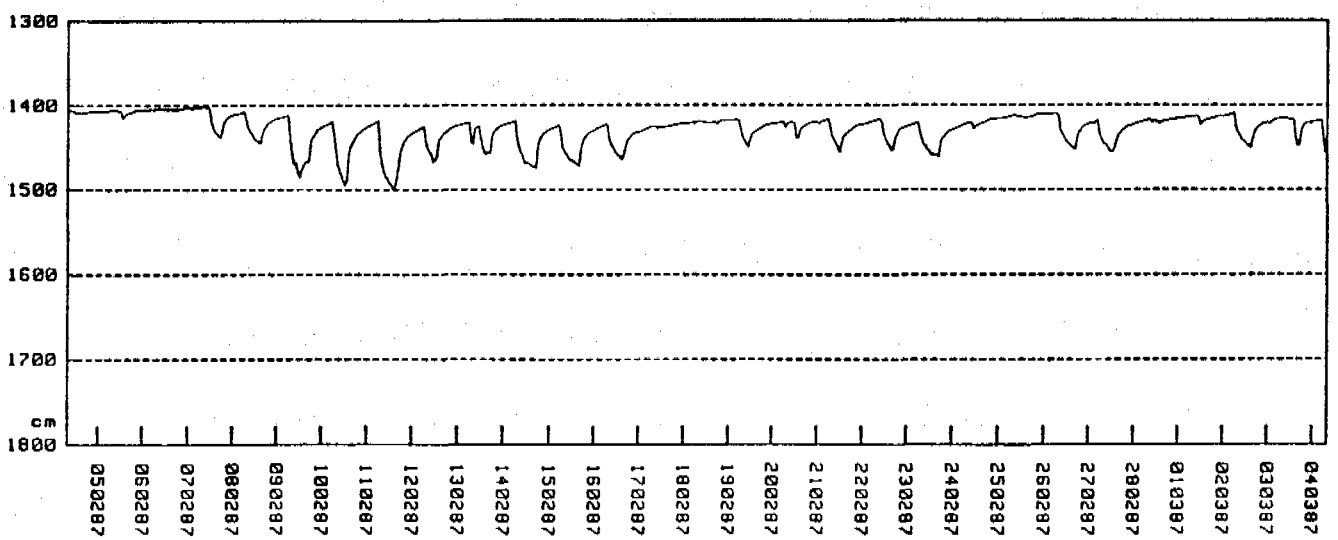
COUNTRY : YEMEN
STATION : GHAWL AZRAQ
PROJECT : R.I.R.D.P

PLOT OF WATER LEVEL DEPTH

FILE: EP4370P_0
4 Dec 1989 16:52:27



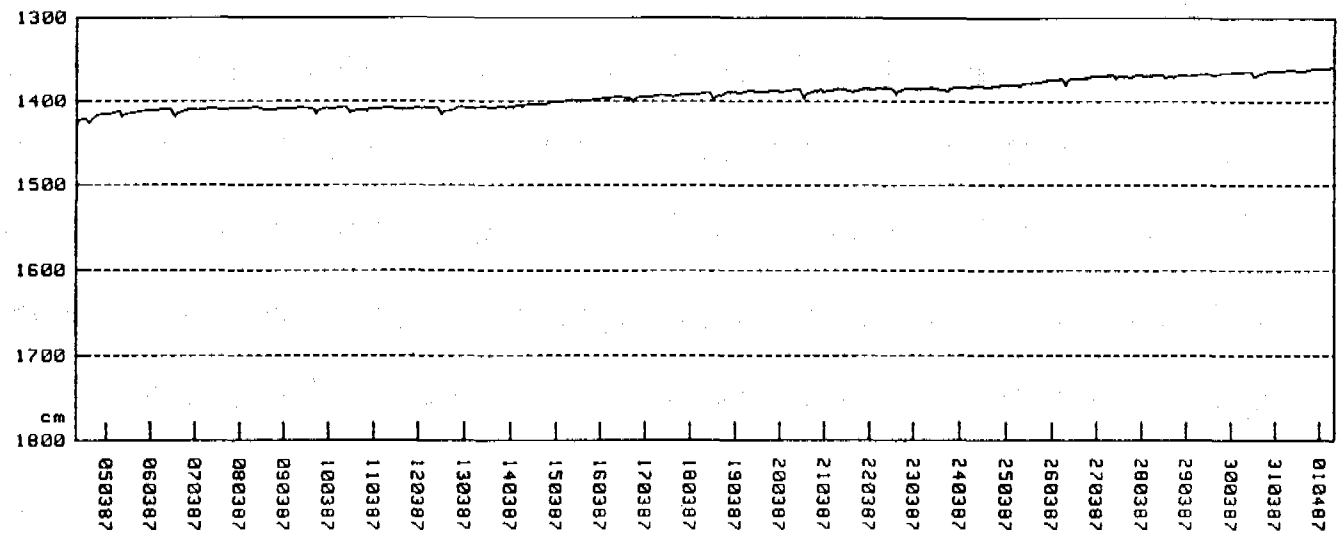


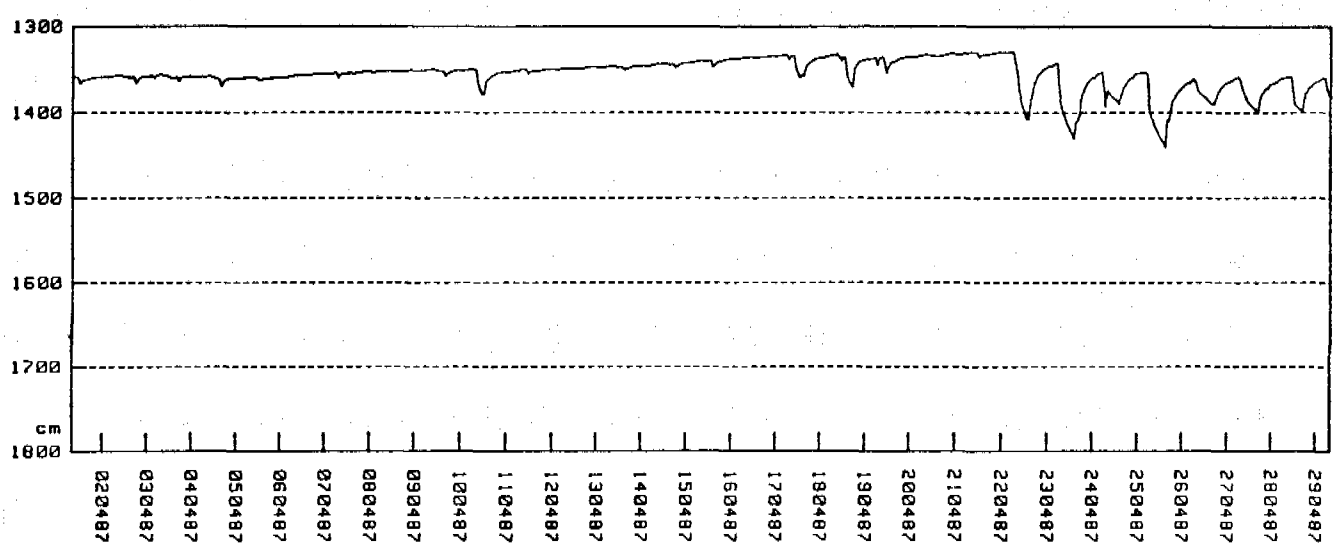


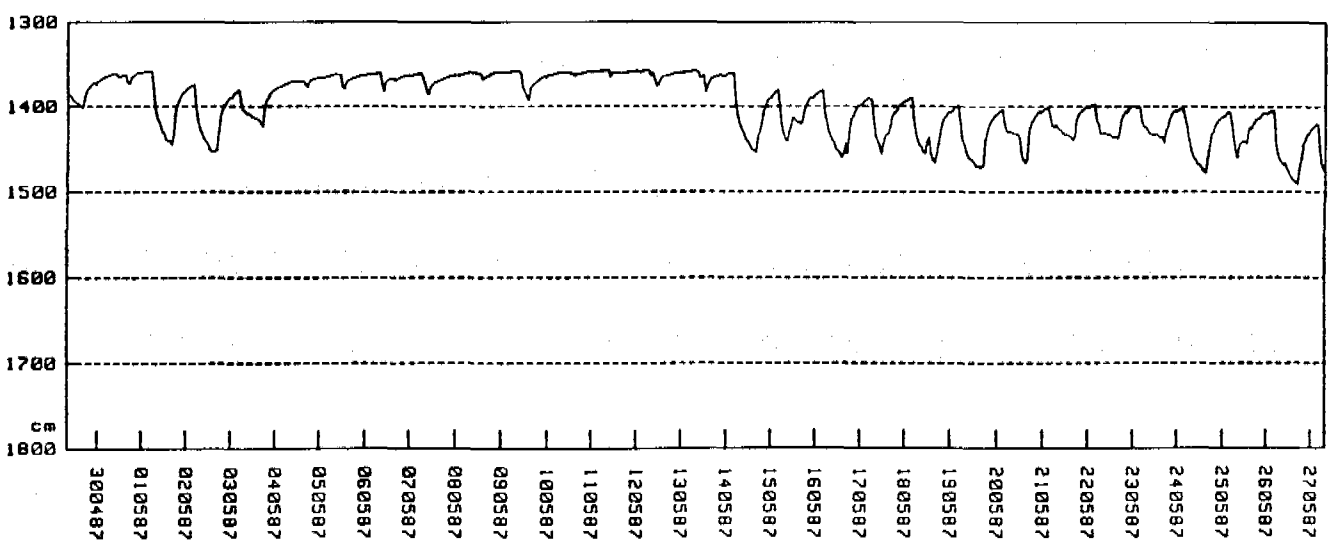
COUNTRY : YEMEN
STATION : GHAWL AZRAQ
PROJECT : R.I.R.D.P

PLOT OF WATER LEVEL DEPTH

FILE: EP4370P_0
4 Dec 1989 16:59:30



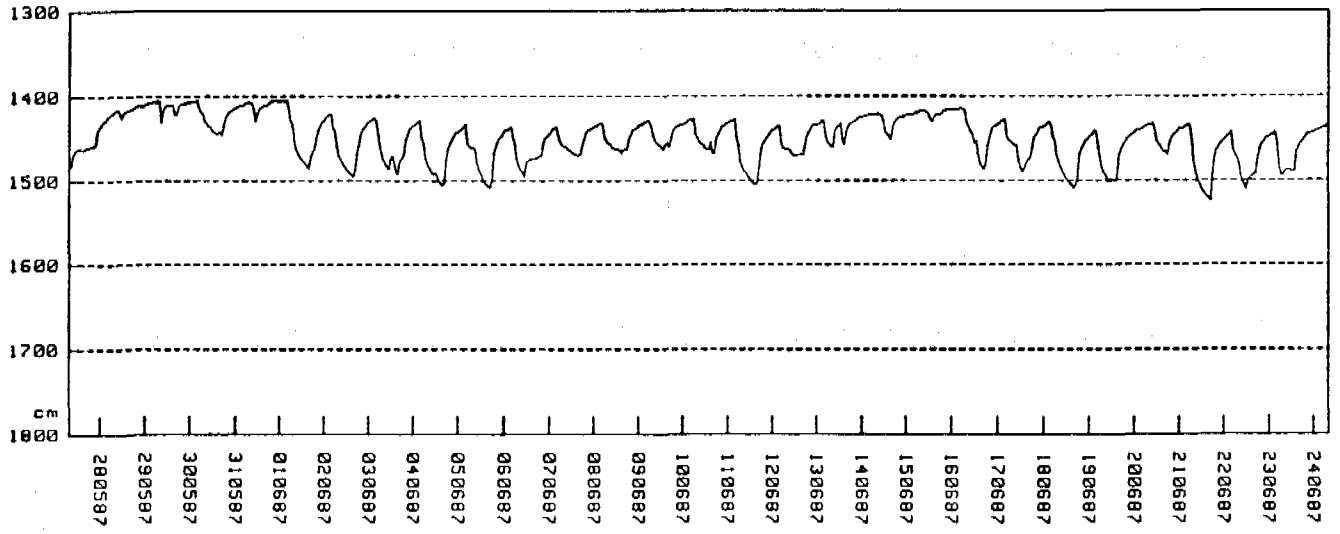


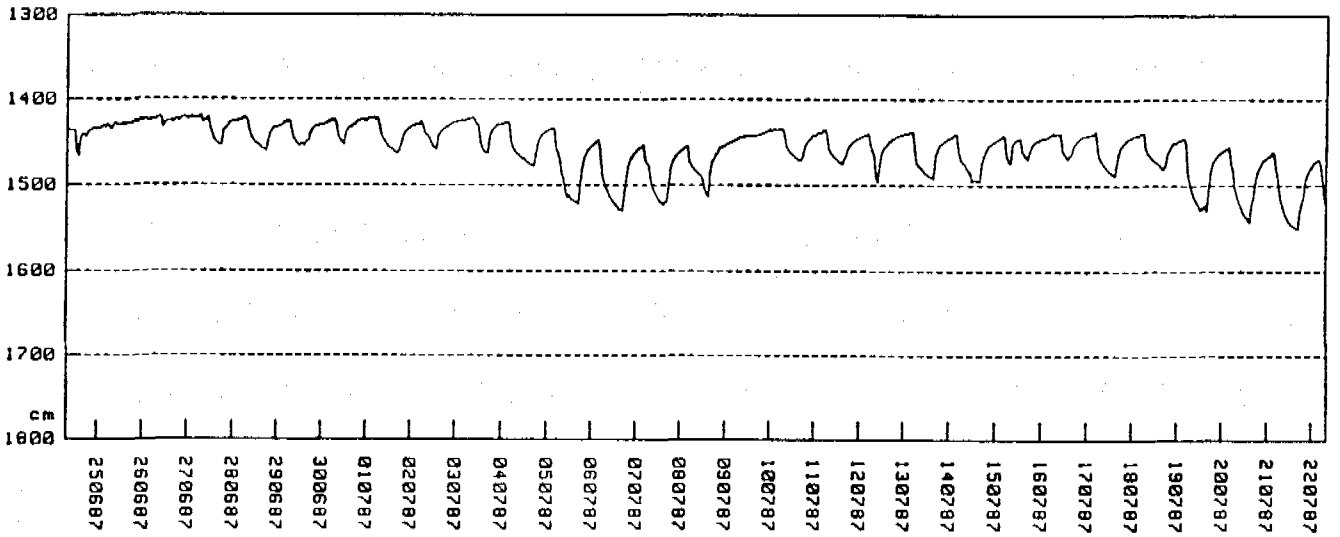


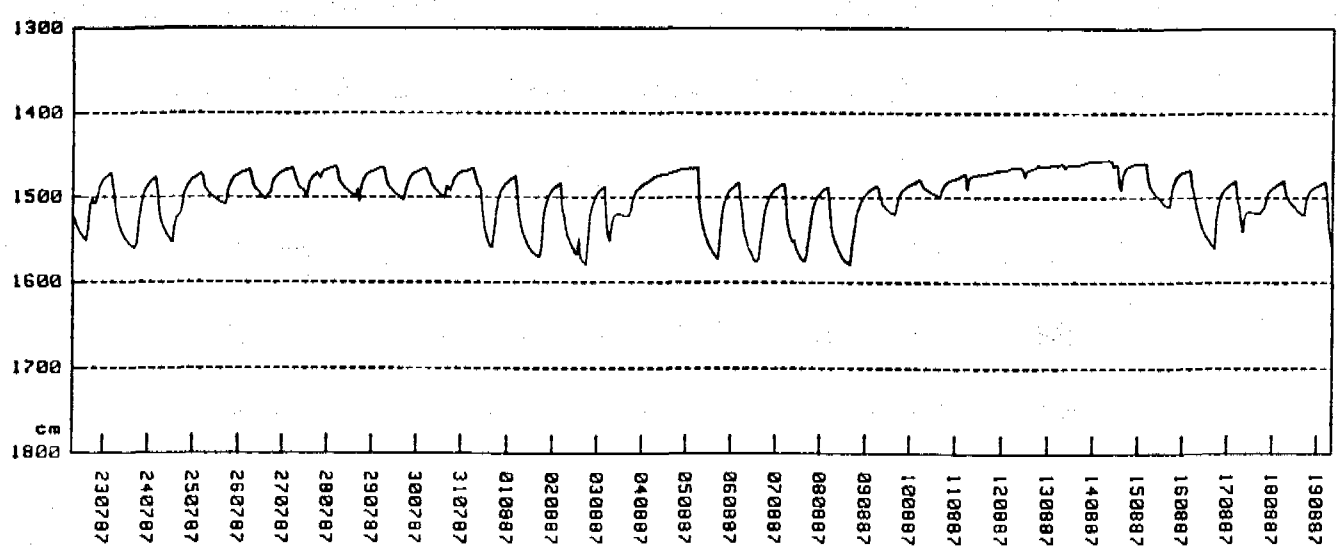
COUNTRY : YEMEN
STATION : GHAHL AZRAQ
PROJECT : R.I.R.D.P

PLOT OF WATER LEVEL DEPTH

FILE: EP4370P_0
4 Dec 1989 17:06:33



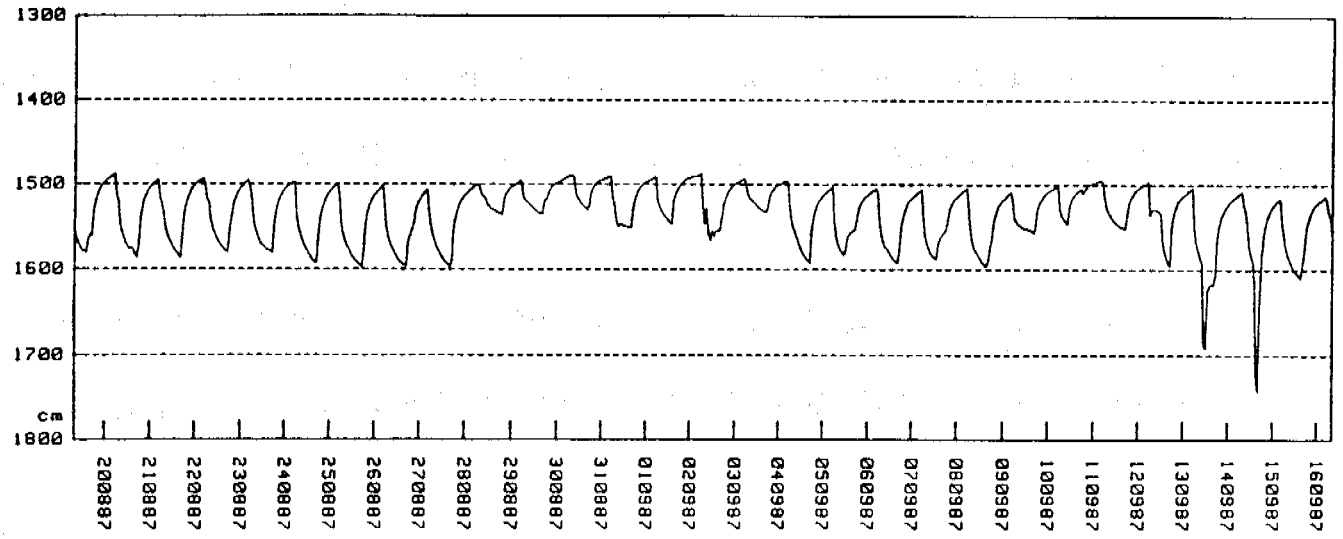


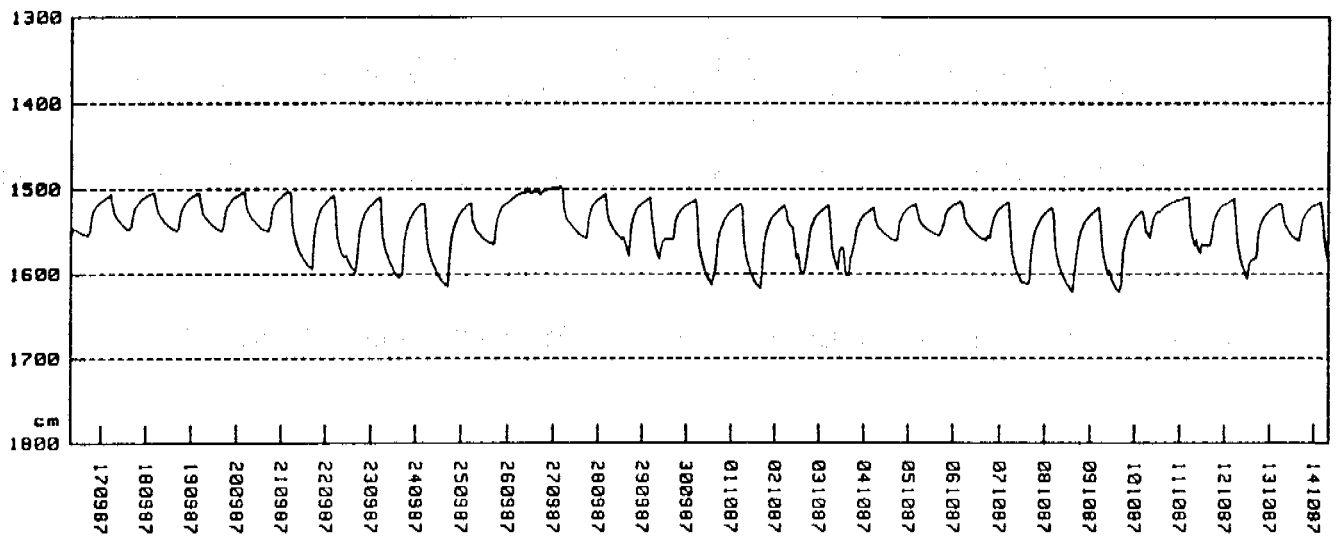


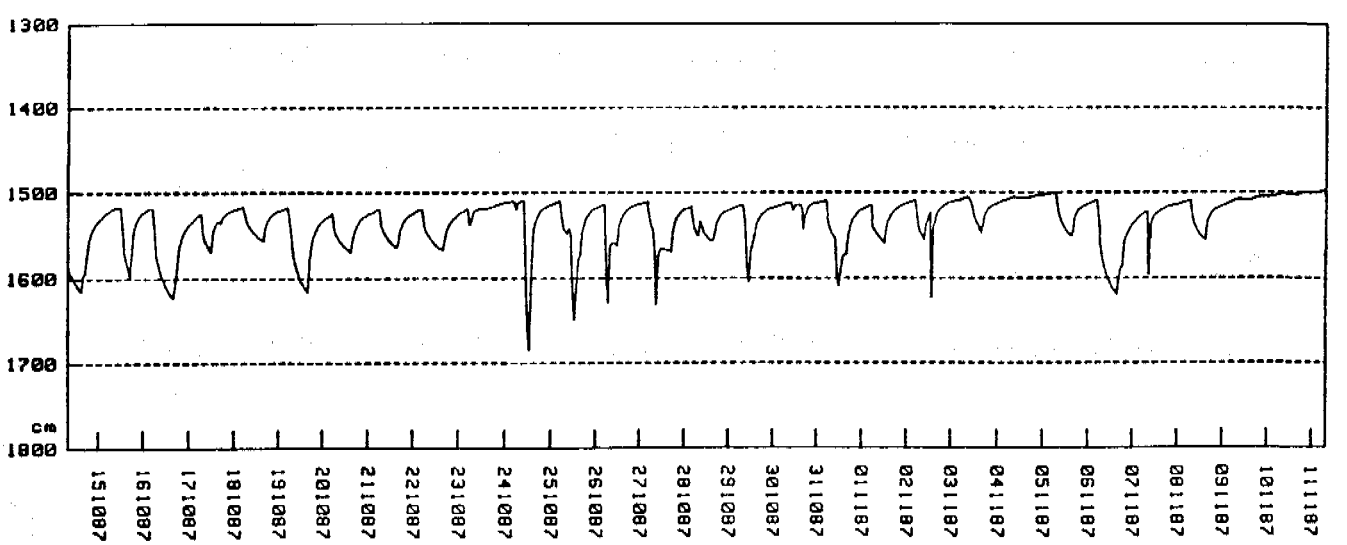
COUNTRY : YEMEN
STATION : GHAWL AZRAQ
PROJECT : R.I.R.D.P

PLOT OF WATER LEVEL DEPTH

FILE: EP4370P_0
4 Dec 1989 17:13:48



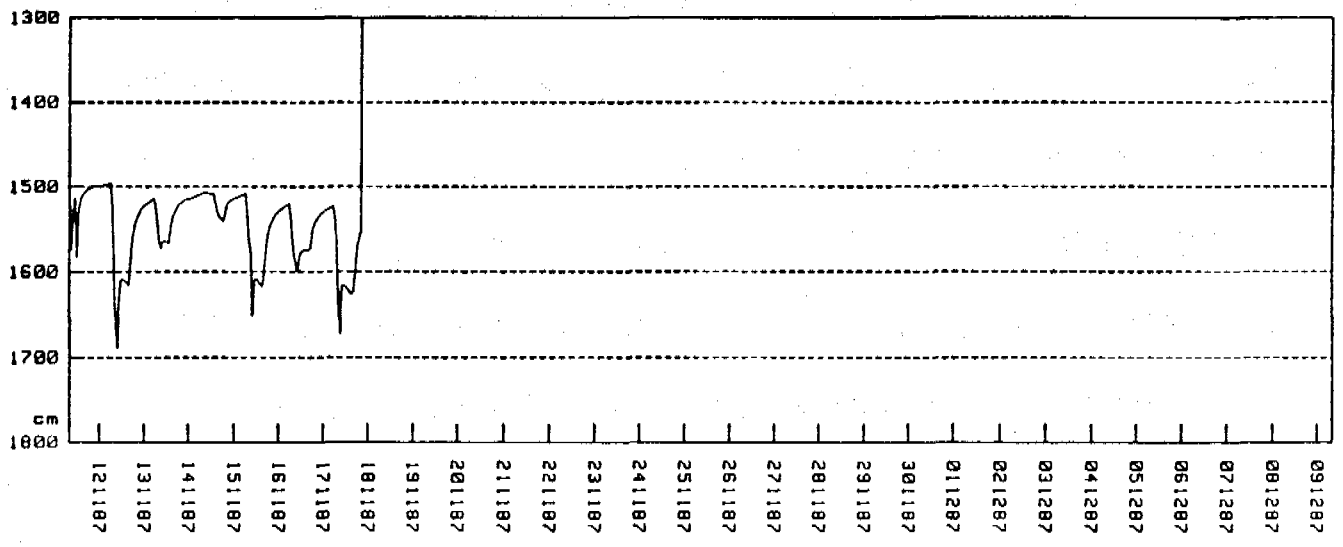




COUNTRY : YEMEN
STATION : GHAWL AZRAQ
PROJECT : R.I.R.D.P

PLOT OF WATER LEVEL DEPTH

FILE: EP4370P_0
4 Dec 1989 17:20:45



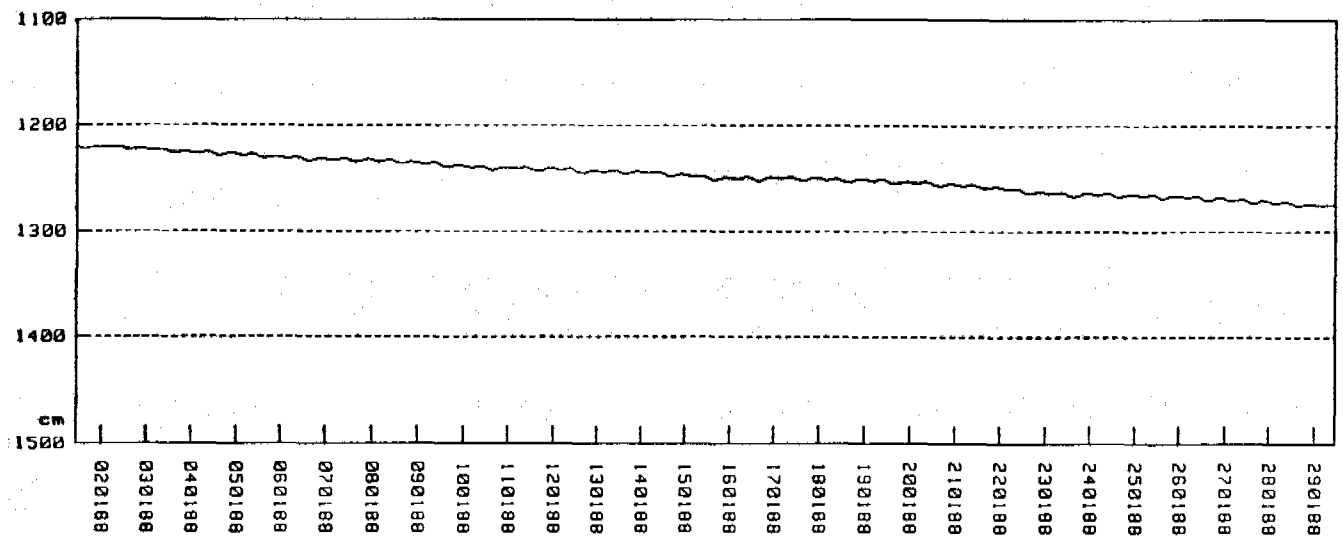
Two-monthly water levels in well No.738 at Qarn al Asad, Rada area in meters below surface. File EP4354-0

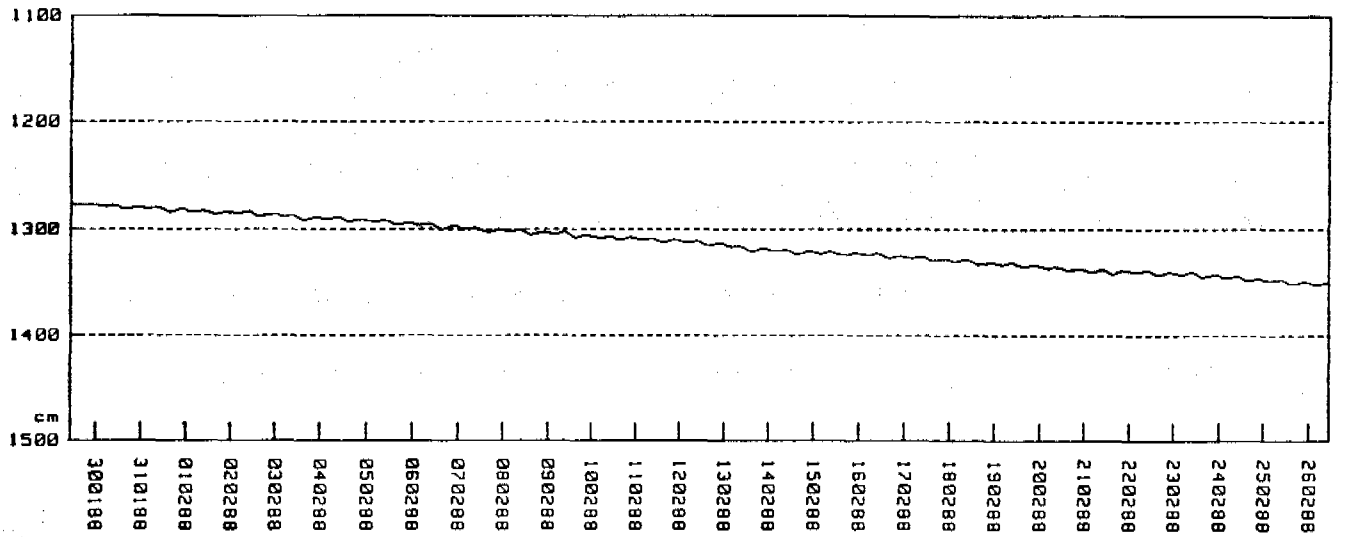
	1988												1989	
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb
1	12.2					14.25								
2		12.88		14.12	14.43									
3			13.57											
4														
5														
6														
7														
8														
9														
10														
11													12.72	
12														
13											11.34	11.92		
14									12.35	11.36				13.31
15								12.91						
16						13.6	12.74							
17		13.32		14.22	14.63									
18	12.52		14.09											
19														
20														
21														
22														
23														
24														
25														
26													13.21	
27												12.25		
28											11.98			
29									11.89	11.23				
30								12.8						
31							11.64							

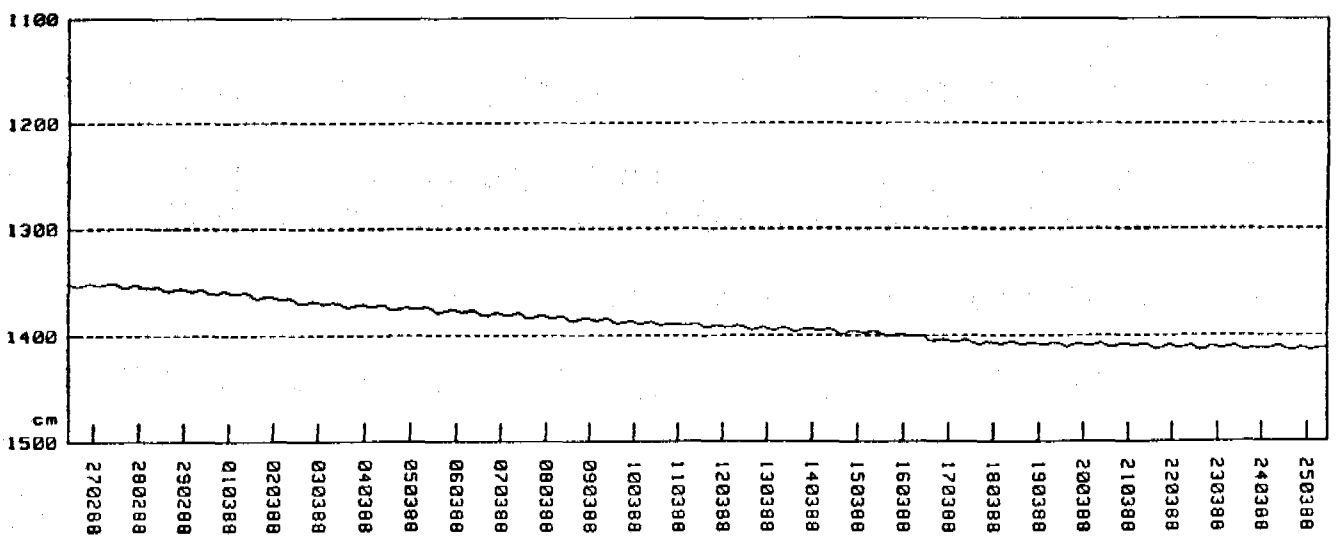
COUNTRY : YEMEN
STATION : Qarn al Asad
PROJECT : R.I.R.D.P.
BEGIN DATE : 010188
START TIME : 12:00

PLOT OF WATER LEVEL DEPTH
WATER LEVEL DEPTH (START) : 1220 cm.
BAROMETER READING (START) : 789 mB.
END DATE : 010389
INTERVAL : 01:00

FILE: EP4354P_0
10 Nov 1989 09:10:45



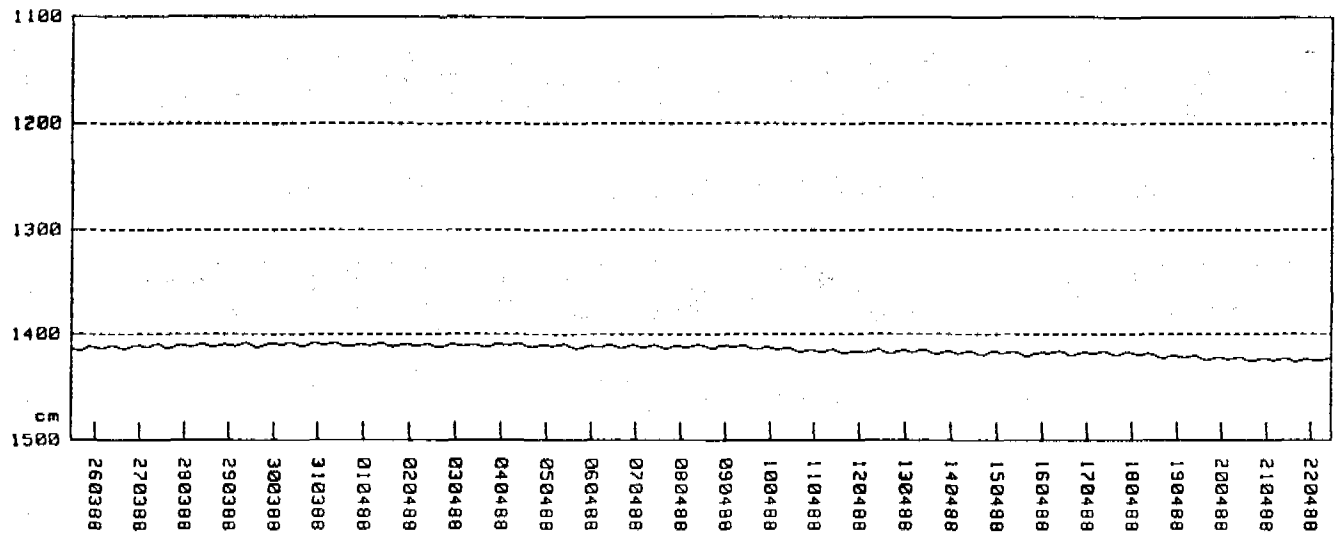


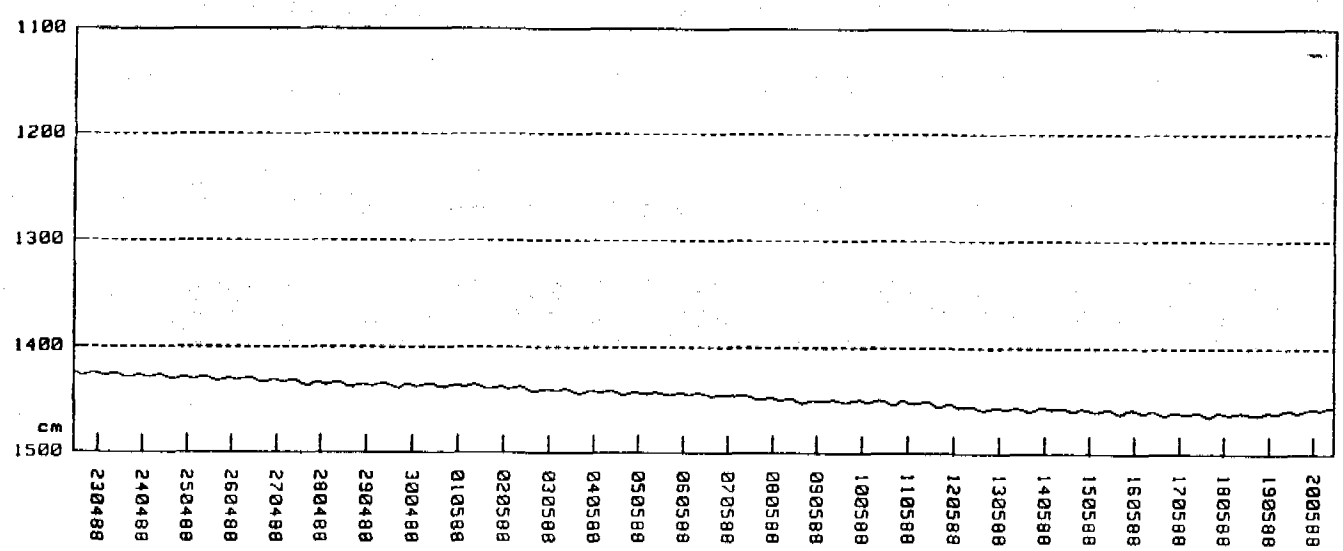


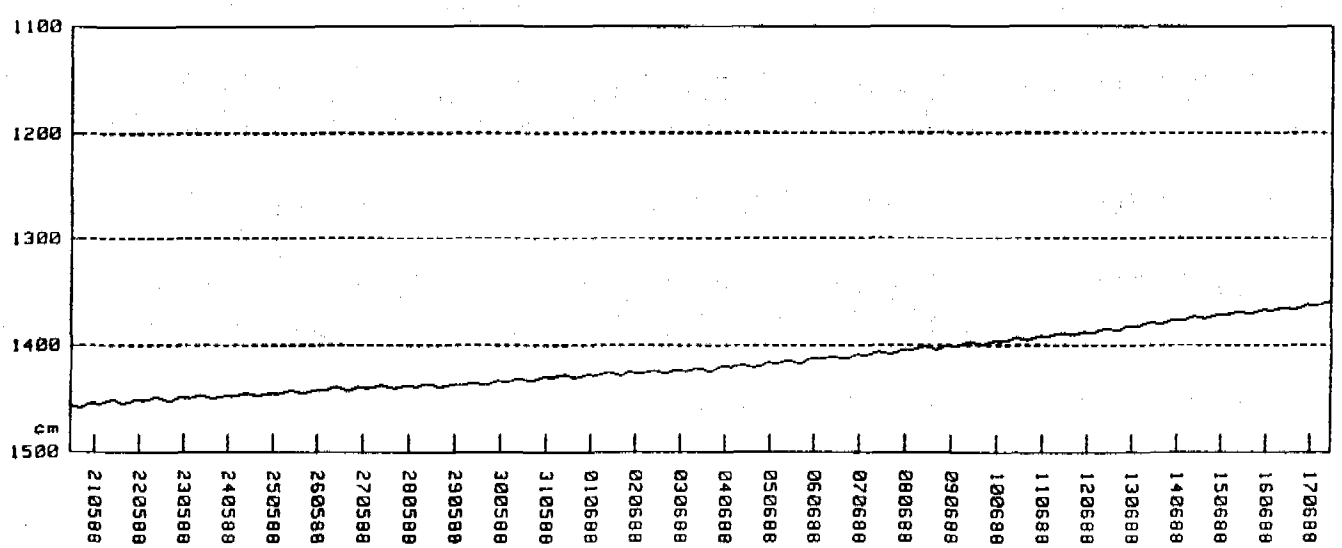
COUNTRY : YEMEN
STATION : Qarn al Asad
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4354P_0
10 Nov 1989 09:17:39



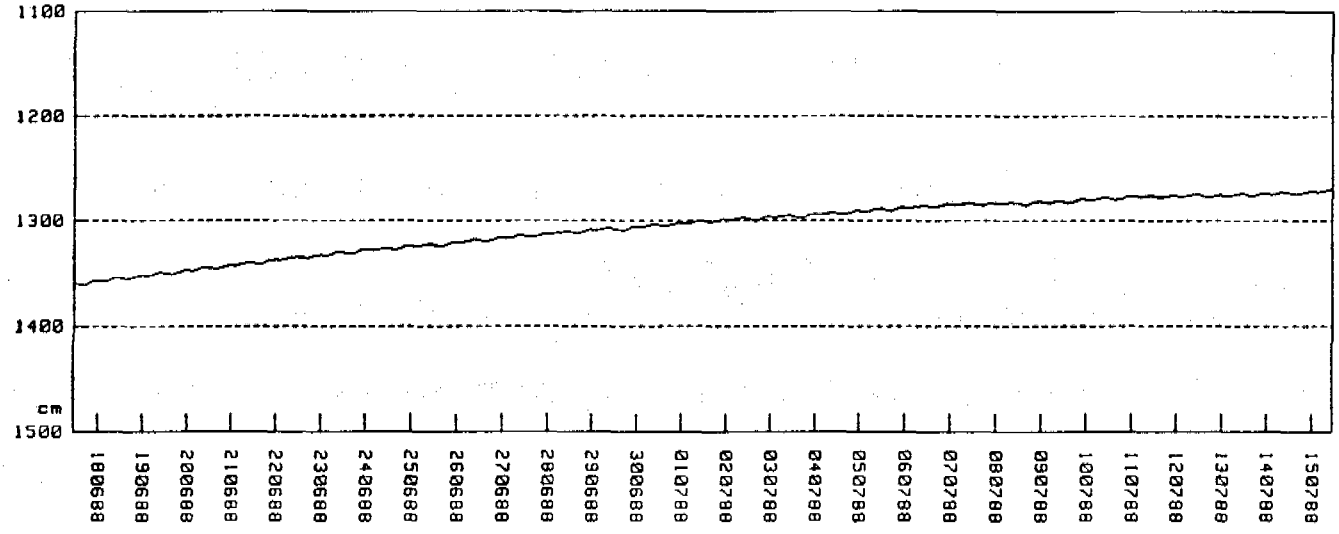


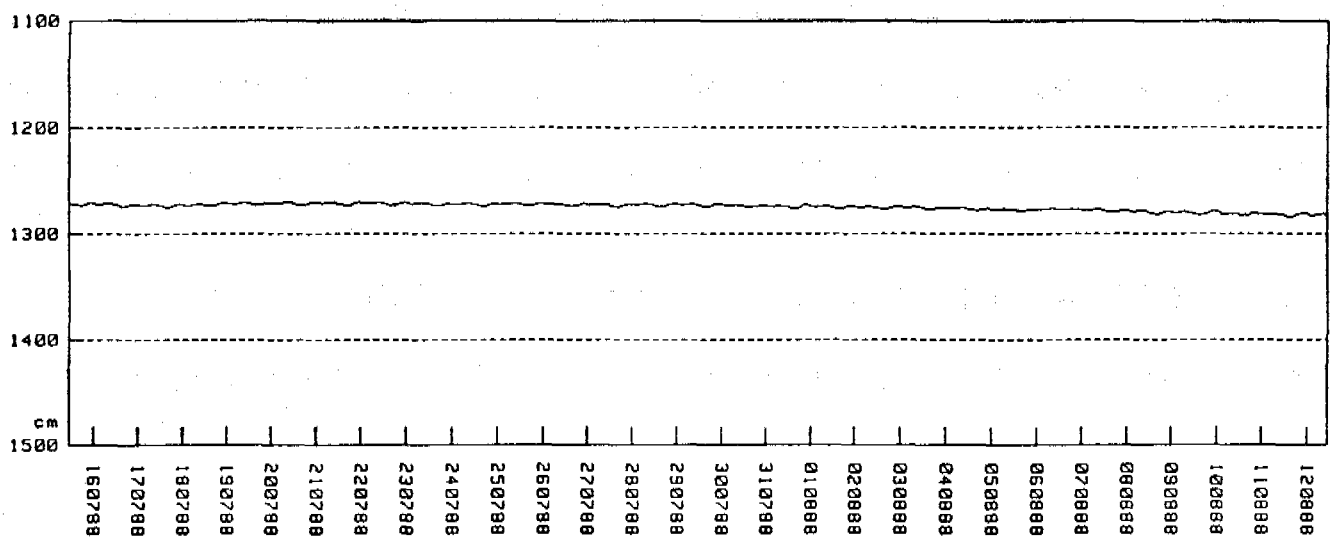


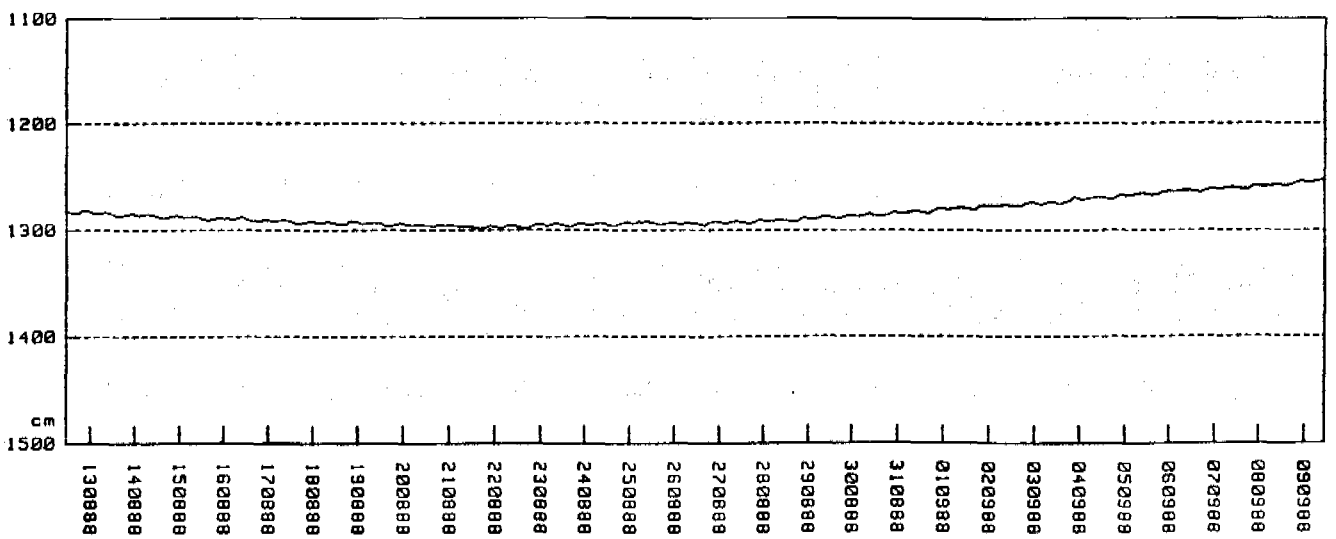
COUNTRY : YEMEN
STATION : Qarn al Asad
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4354P_0
10 Nov 1989 09:24:31



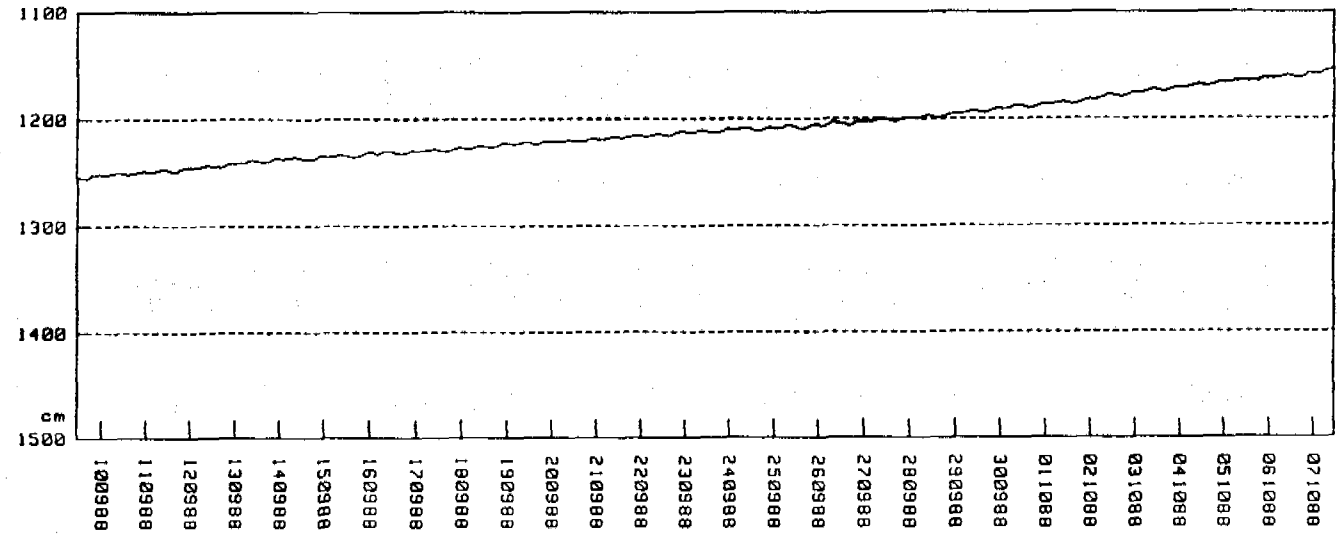


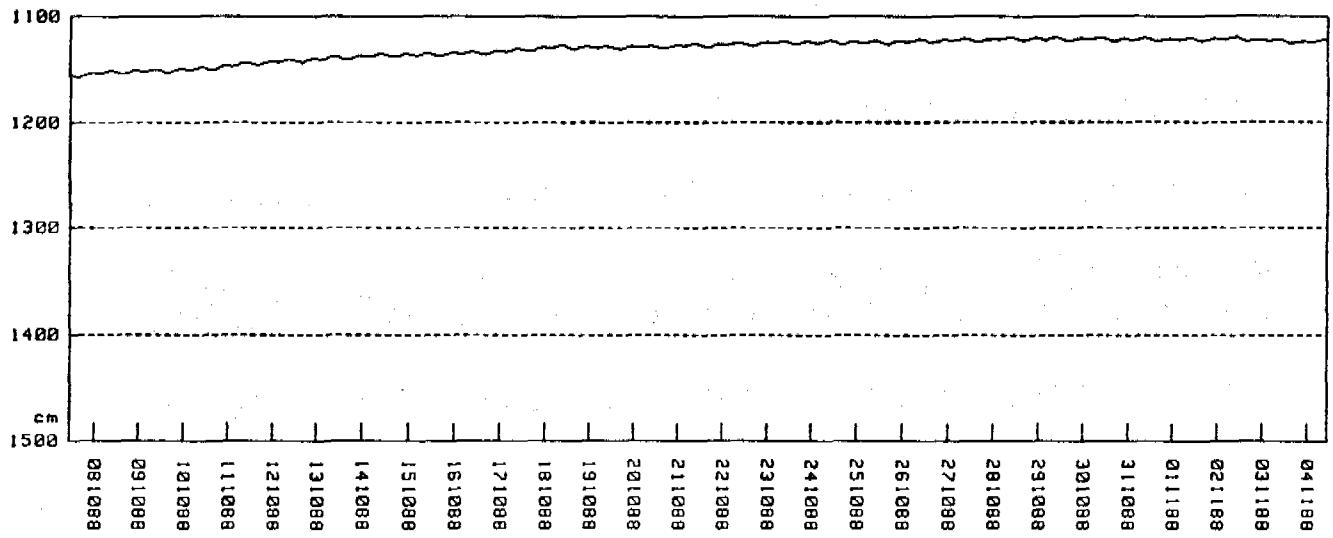


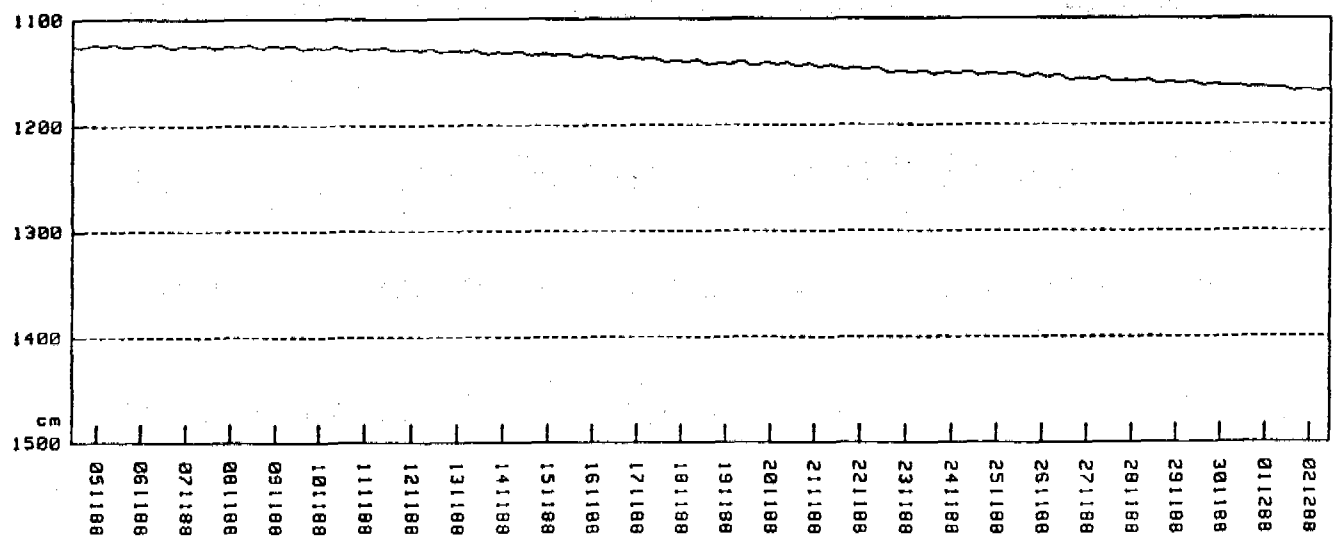
COUNTRY : YEMEN
STATION : Qarn al Asad
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4354P_0
10 Nov 1989 09:31:28



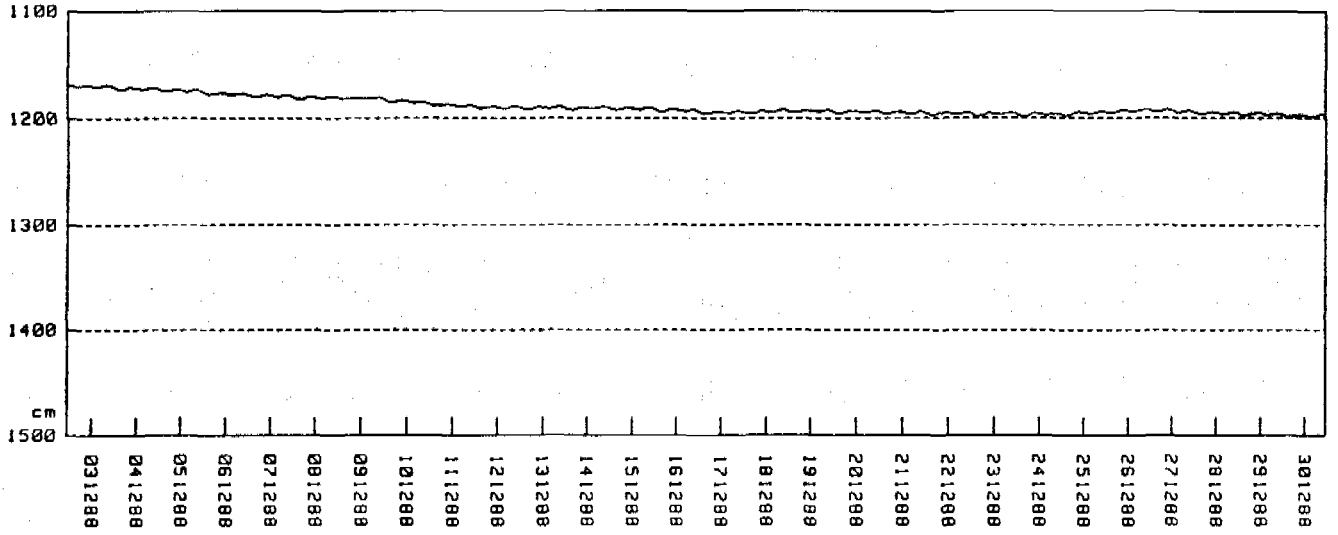


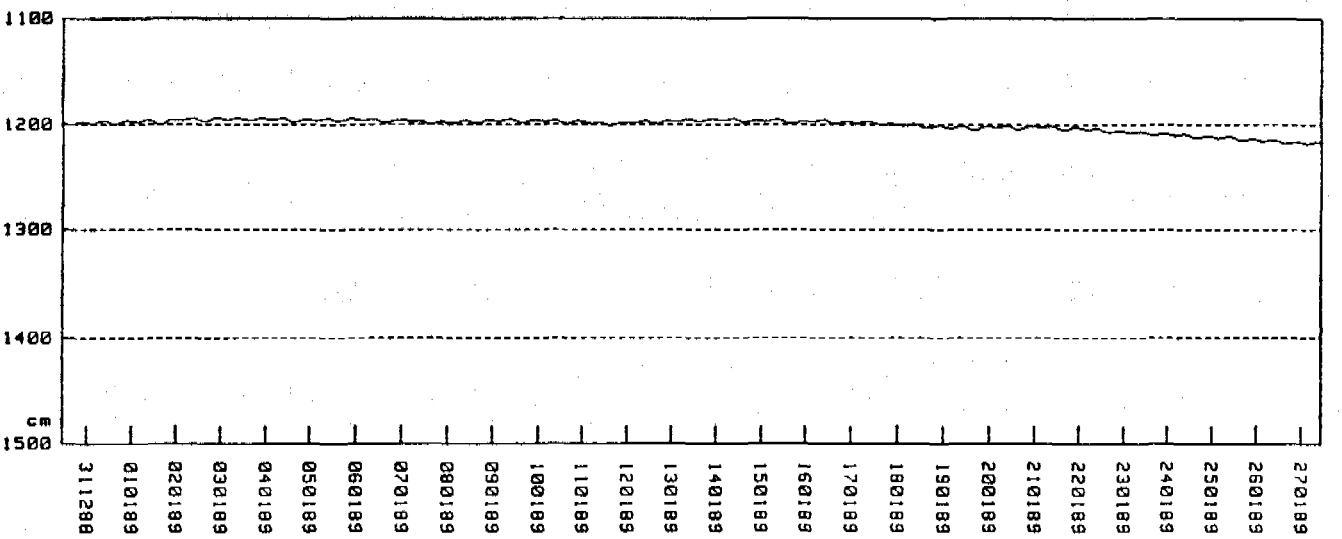


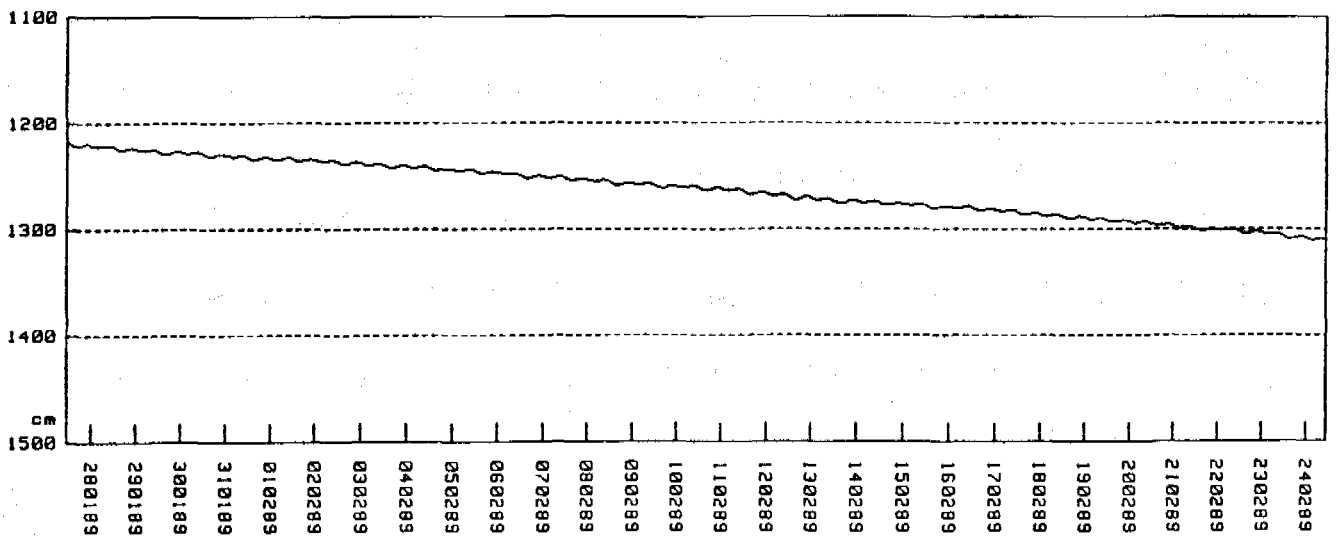
COUNTRY : YEMEN
STATION : Qarn al Asad
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4354P_0
10 Nov 1989 09:38:16



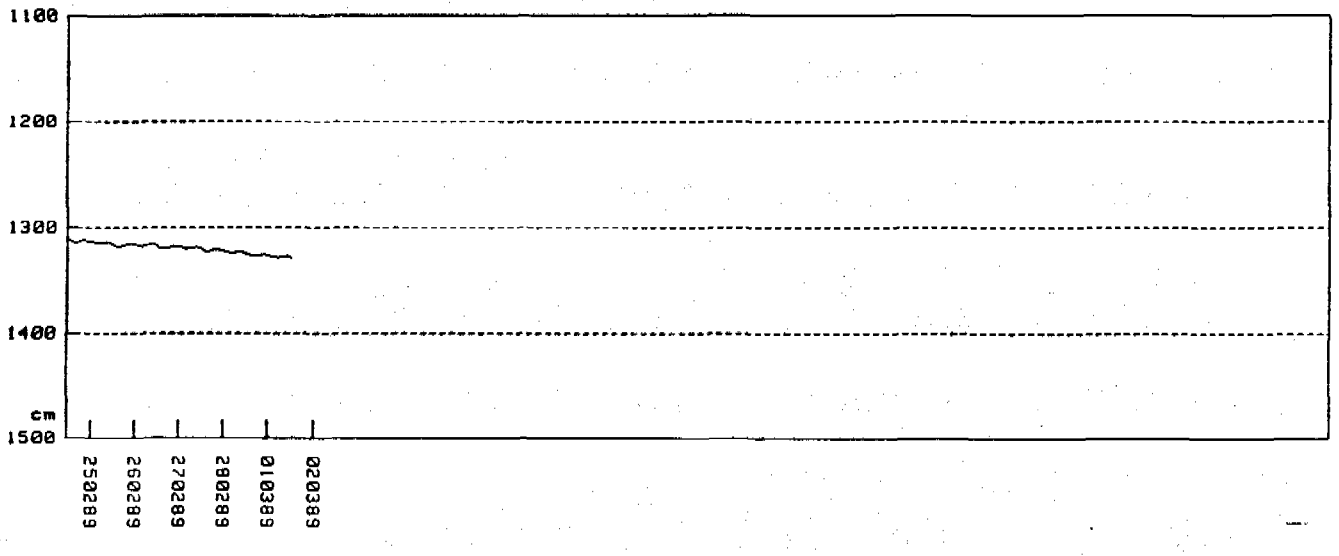




COUNTRY : YEMEN
STATION : Qarn al Asad
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

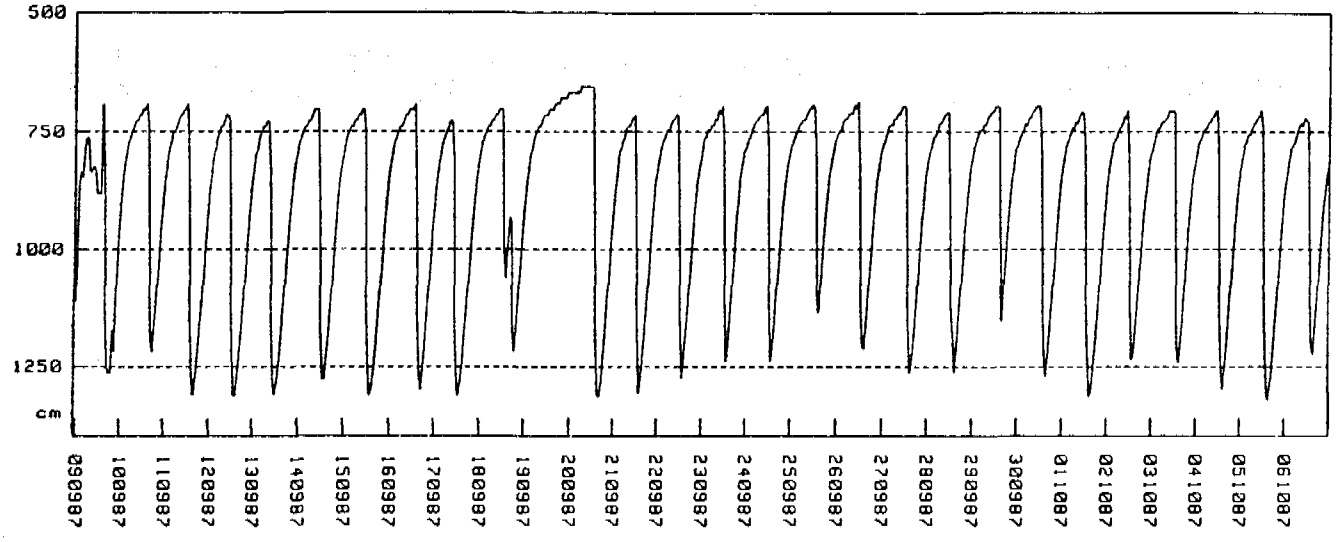
FILE: EP4354P_0
10 Nov 1989 10:04:29

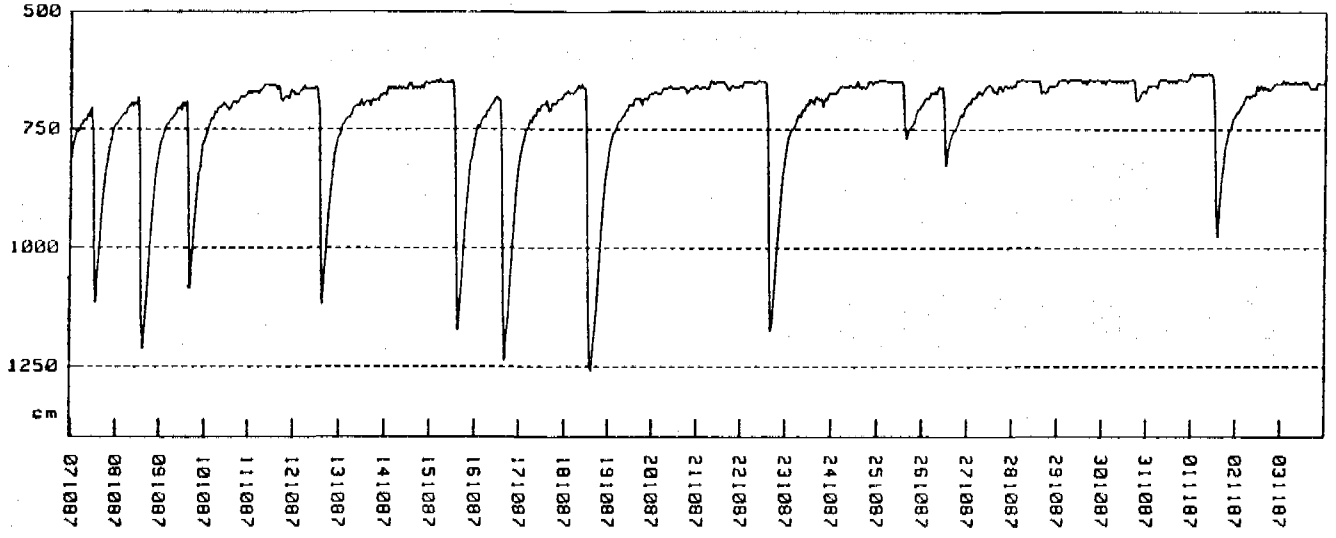


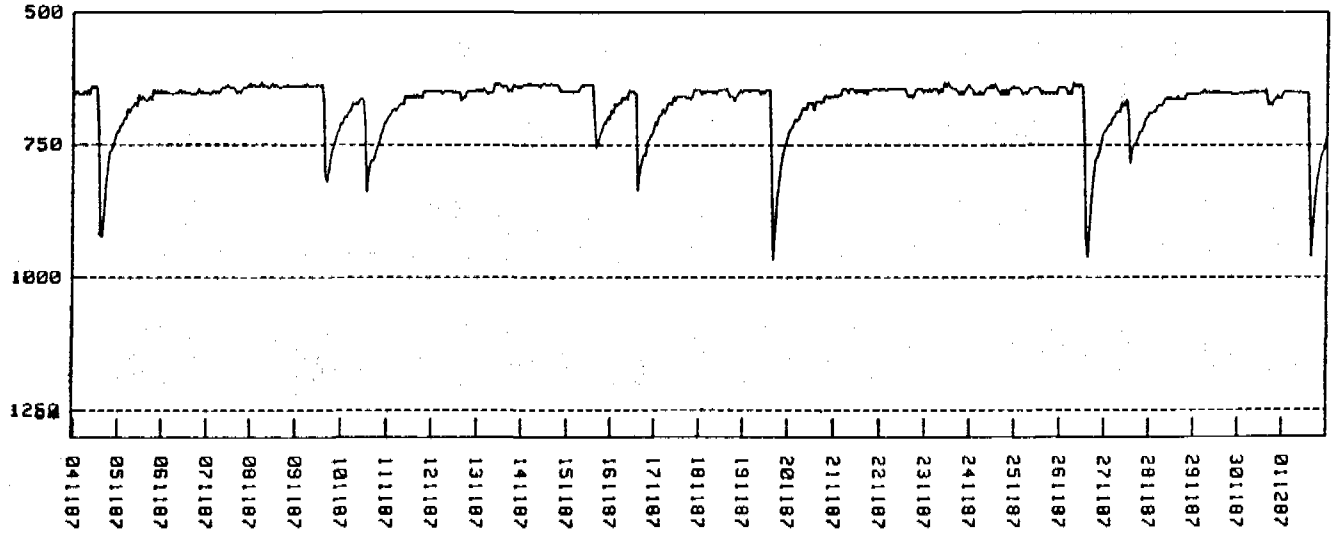
Bi-monthly rest water levels in a well at Sharaf , Al Bayda. File EP4324P_12

	1987								1988					
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct
1	7.03		6.17						5.84					
2														
3				6.32	6.17	6.86								
4														
5							5.46							
6														
7								5.81						6.29
8														
9														
10														
11									5.94	6.06	6.31	6.31	6.30	
12														
13			6.18											
14	6.78			6.29										
15		6.29												
16						6.66		5.96						
17							5.99					6.29		
18														
19														
20	6.42													
21		6.32												
22														
23					6.19									
24														
25										6.61				
26														
27														
28														
29												6.29		
30	7.03													
31											6.29			

COUNTRY : YEMEN ARAB REPUBLIC PLOT OF WATER LEVEL DEPTH
STATION : SHARAF WATER LEVEL DEPTH (START) : 703 cm.
PROJECT : R.I.R.D.P. BAROMETER READING (START) : 840 mB.
BEGIN DATE : 090987 END DATE : 240988 FILE: EP4324P_12
START TIME : 00:00 INTERVAL : 01:00 12 Dec 1988 13:14:41

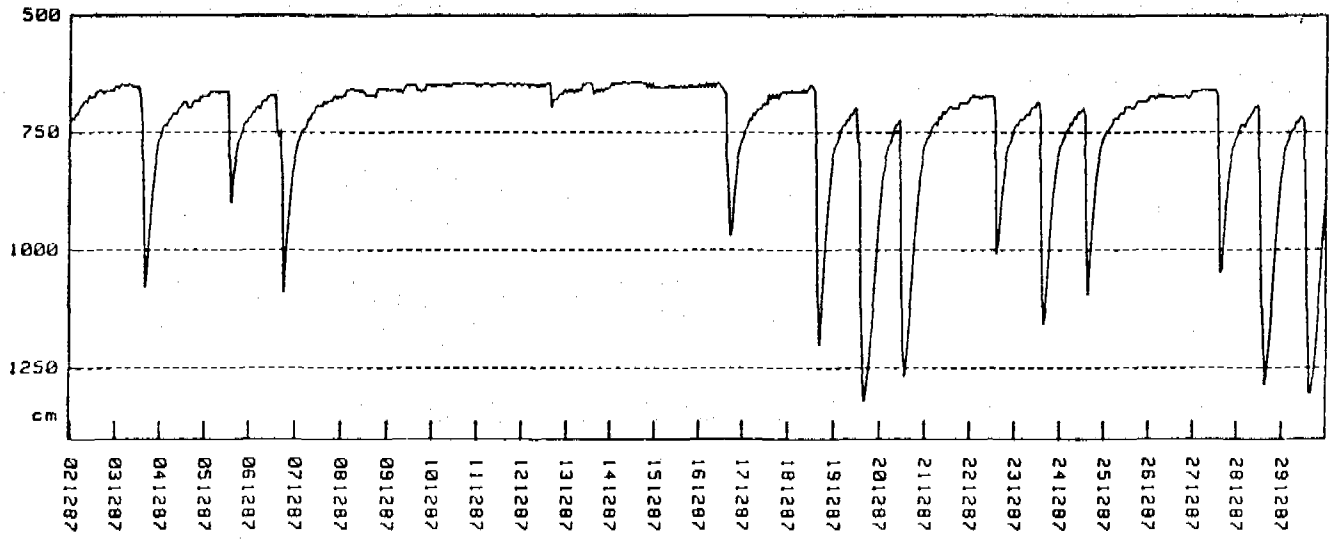


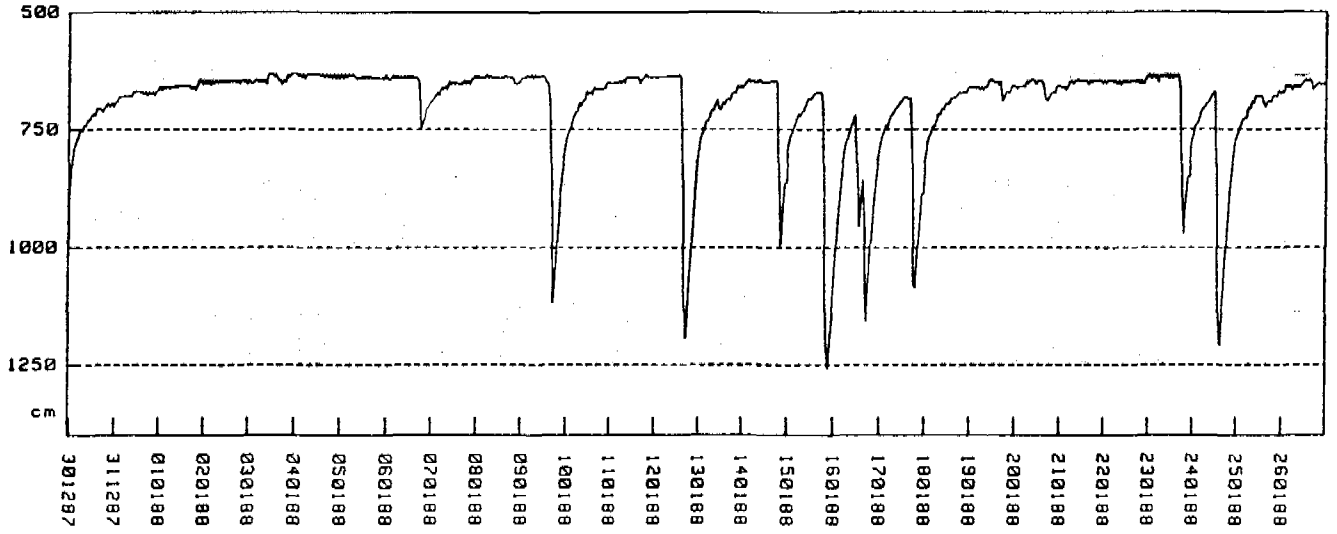


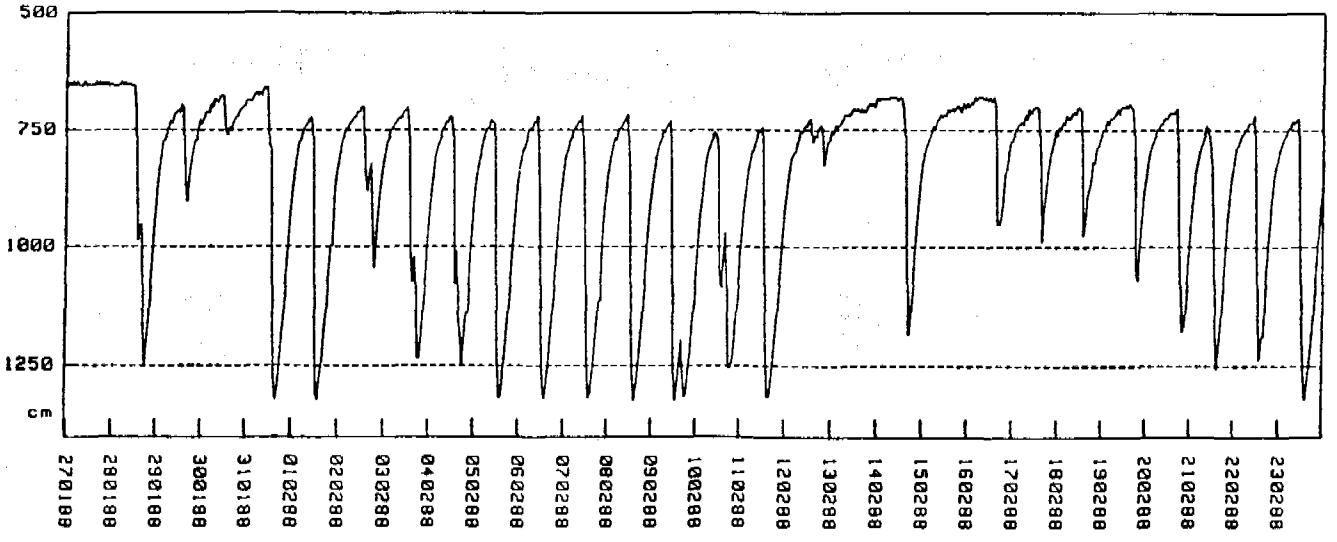


COUNTRY : YEMEN ARAB REPUBLIC PLOT OF WATER LEVEL DEPTH
STATION : SHARAF
PROJECT : R.I.R.D.P.

FILE: EP1324P_12
12 Dec 1989 13:21:22

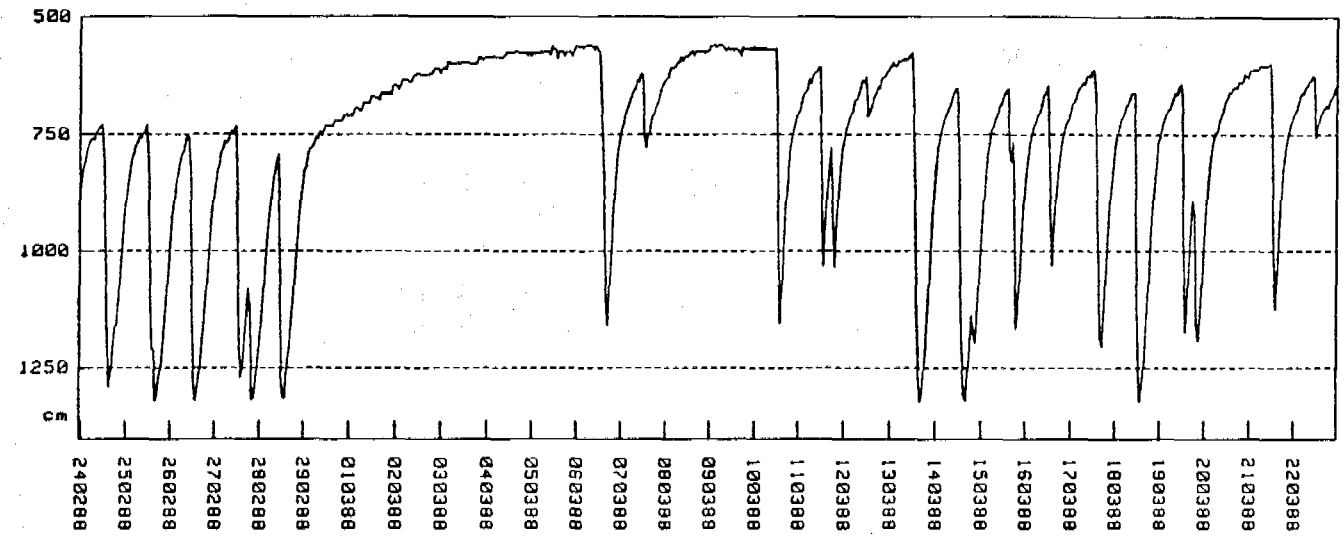


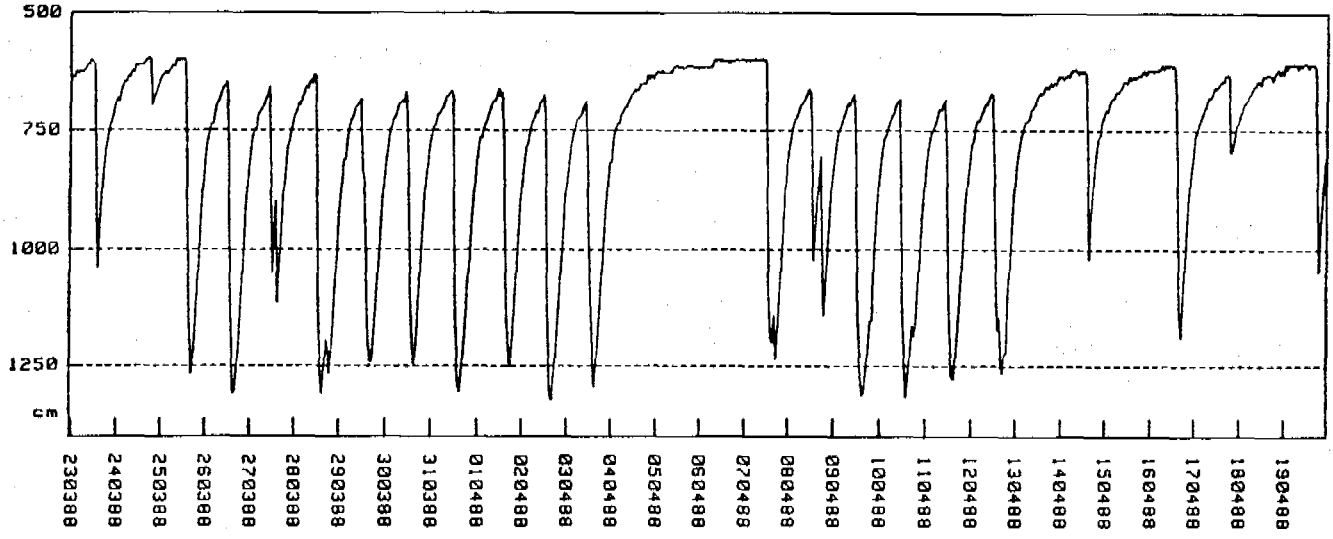


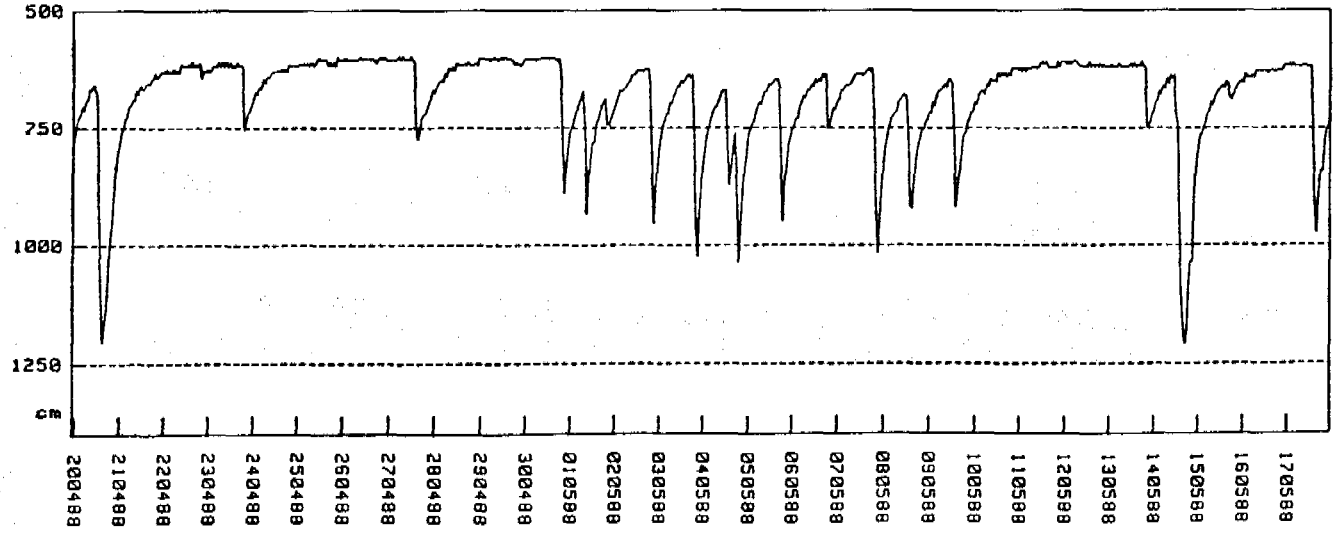


COUNTRY : YEMEN ARAB REPUBLIC PLOT OF WATER LEVEL DEPTH
STATION : SHARAF
PROJECT : R.I.R.D.P.

FILE: EP4324P_12
12 Dec 1989 13:28:10

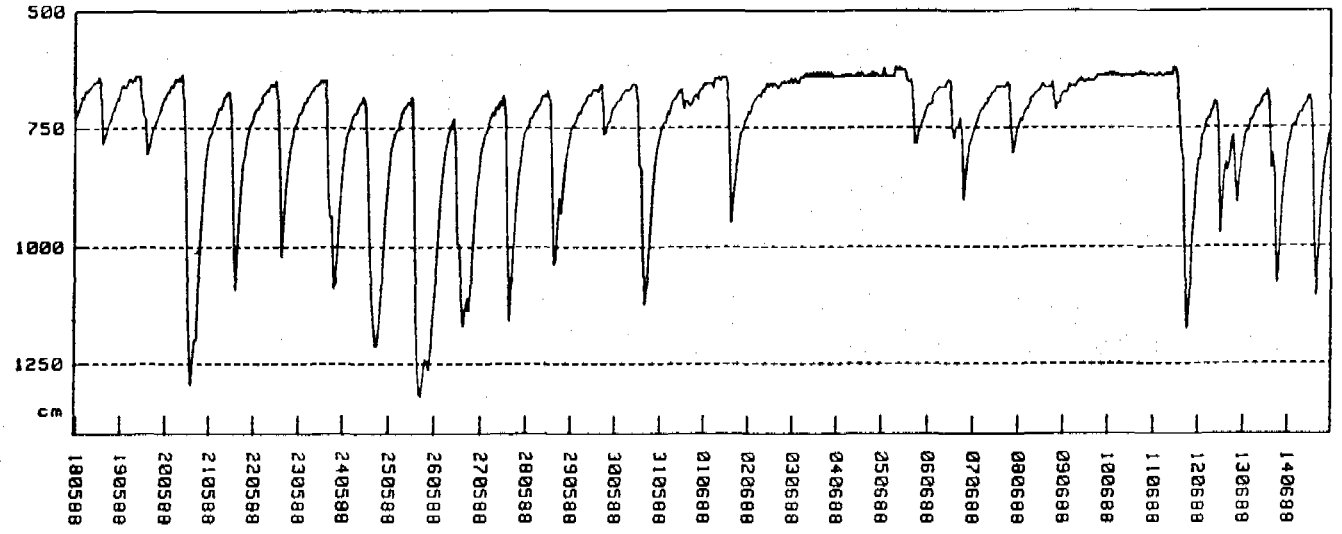


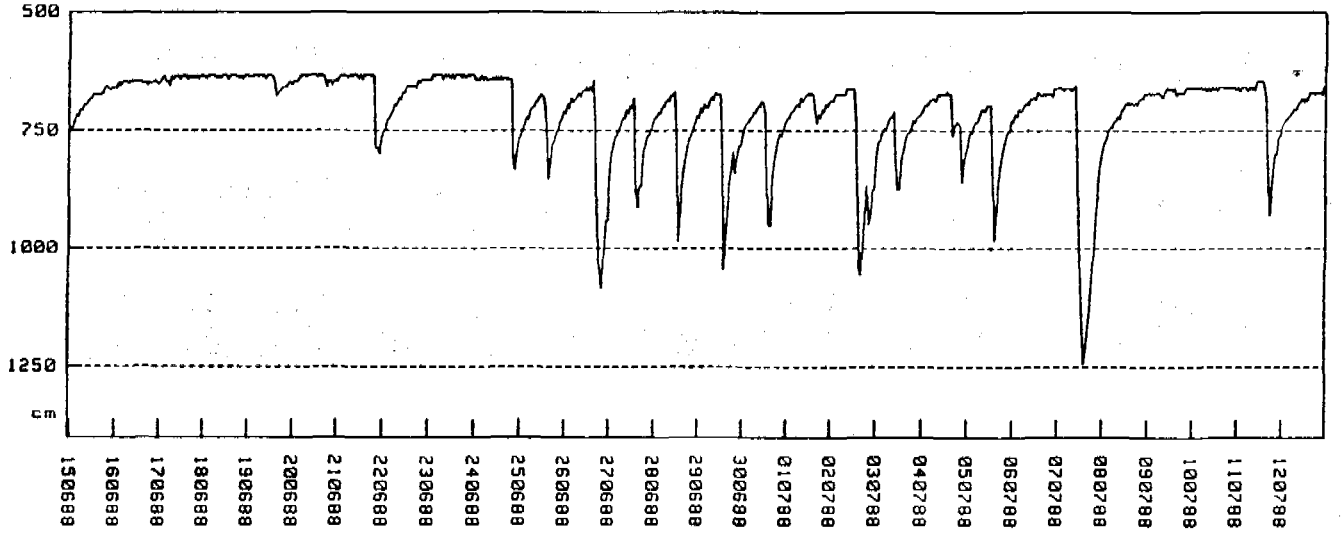


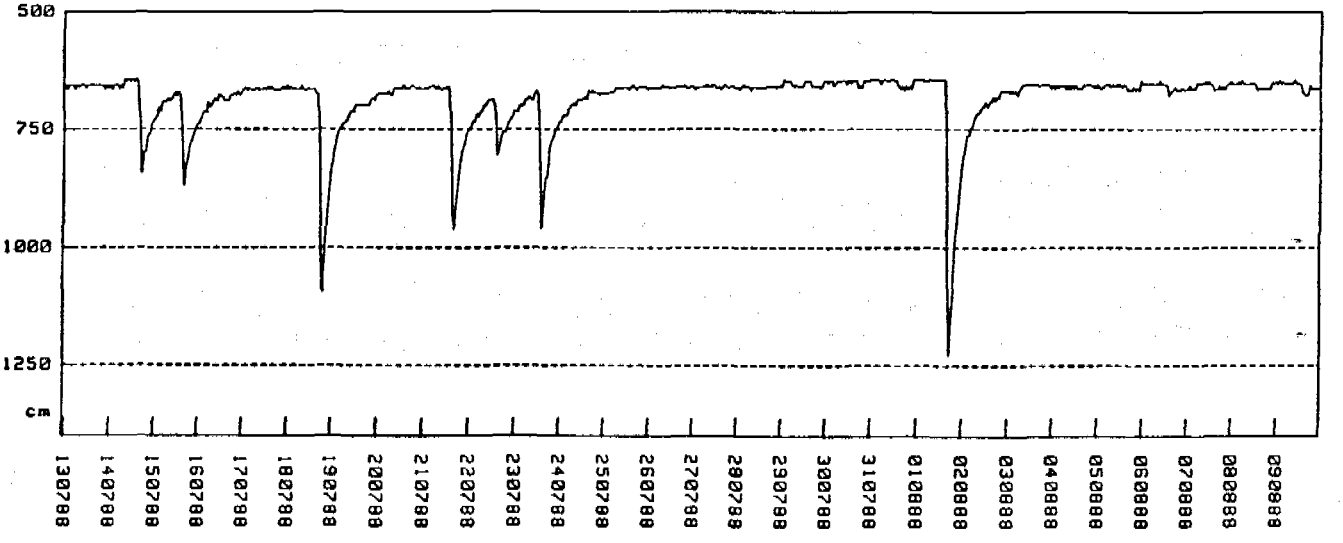


COUNTRY : YEMEN ARAB REPUBLIC PLOT OF WATER LEVEL DEPTH
STATION : SHARAF
PROJECT : R.I.R.D.P.

FILE: EP4324P_12
12 Dec 1989 13:35:28

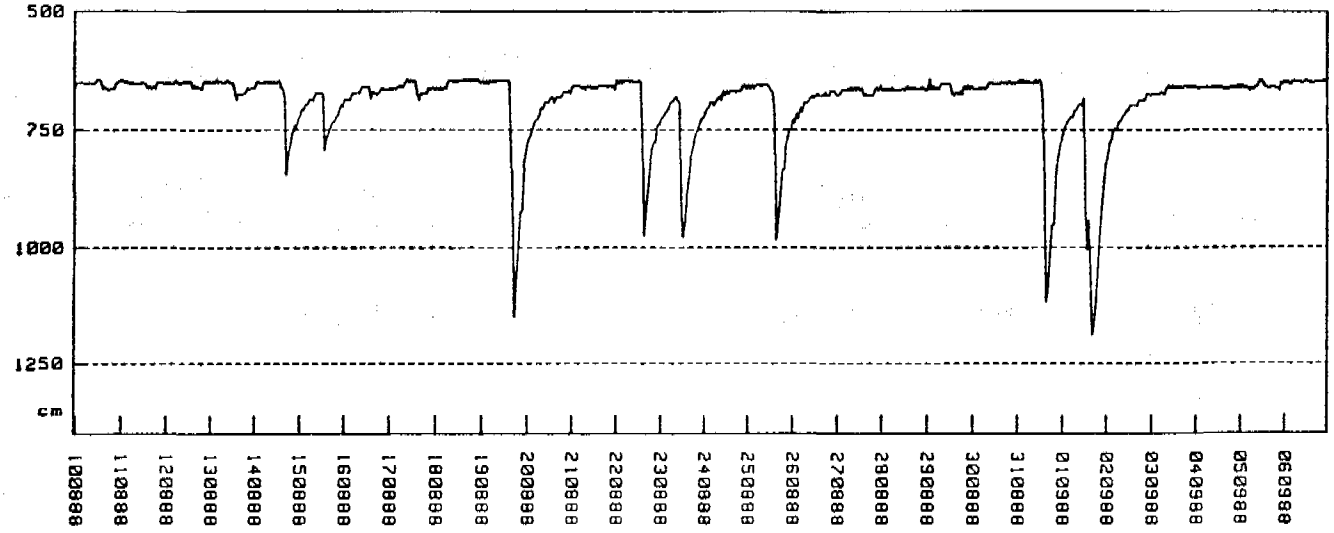


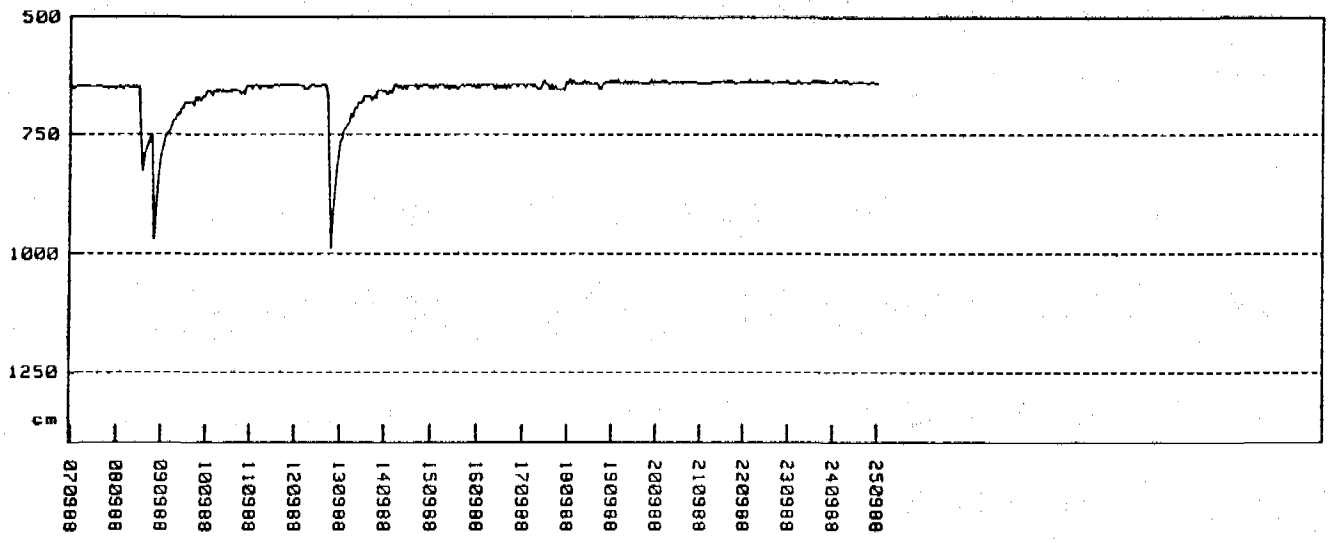




COUNTRY : YEMEN ARAB REPUBLIC PLOT OF WATER LEVEL DEPTH
STATION : SHARAF
PROJECT : R.I.R.D.P.

FILE: EP4324P_12
12 Dec 1989 13:42:29





027

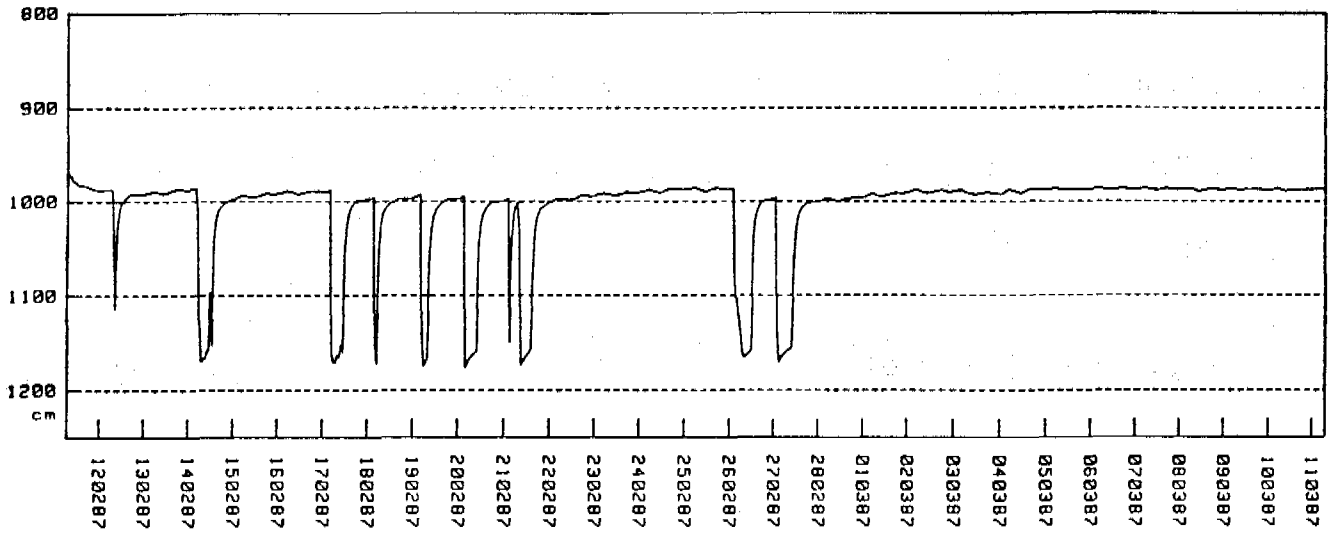
Bi-monthly water levels in a well at Al Junubah,Al Bayda in metres below surface. File EP4320-10

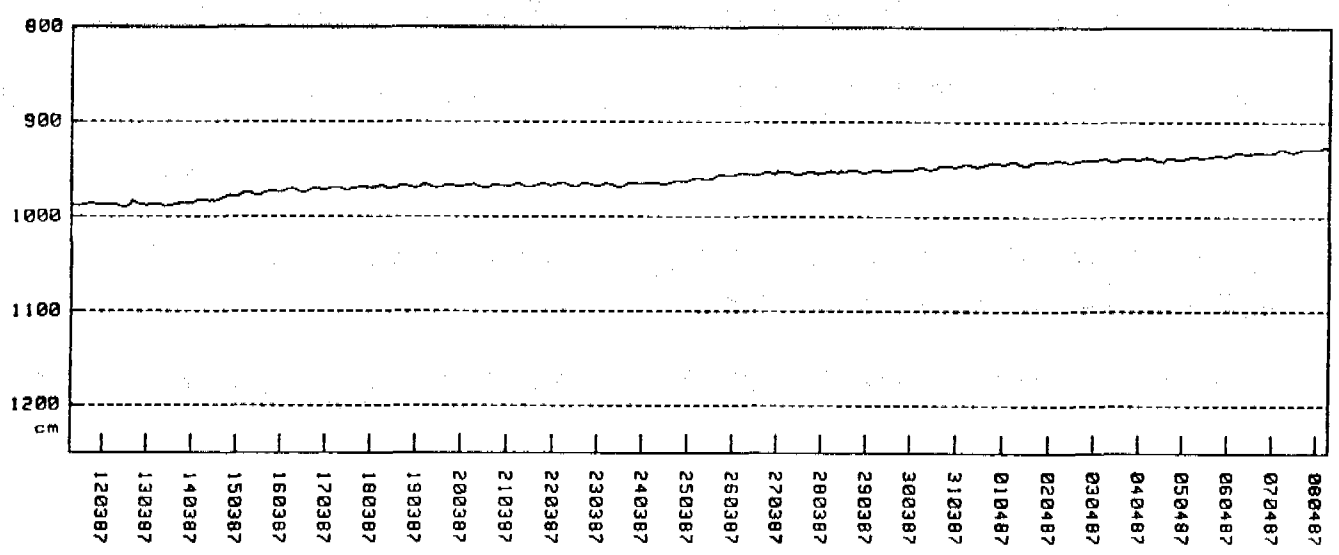
	1987										1988				
	Feb	March	April	May	June	July	Aug	Sept`	Oct	Nov	Dec	Jan	Feb	March	April
1													8.66		
2						10.66	10.77	10.83			8.55				
3												8.49			
4															
5										10.81					8.72
6															
7					9.04								8.81	8.45	
8															
9															
10															
11	9.71											8.64			
12															8.88
13															
14															
15			8.33												
16				8.90					10.75						
17															
18							10.74								
19								10.75							
20															
21															
22															
23					9.31										
24															
25	9.85								11.01						
26										8.69					
27						10.35									
28				8.89										8.75	
29											8.48				
30															
31															

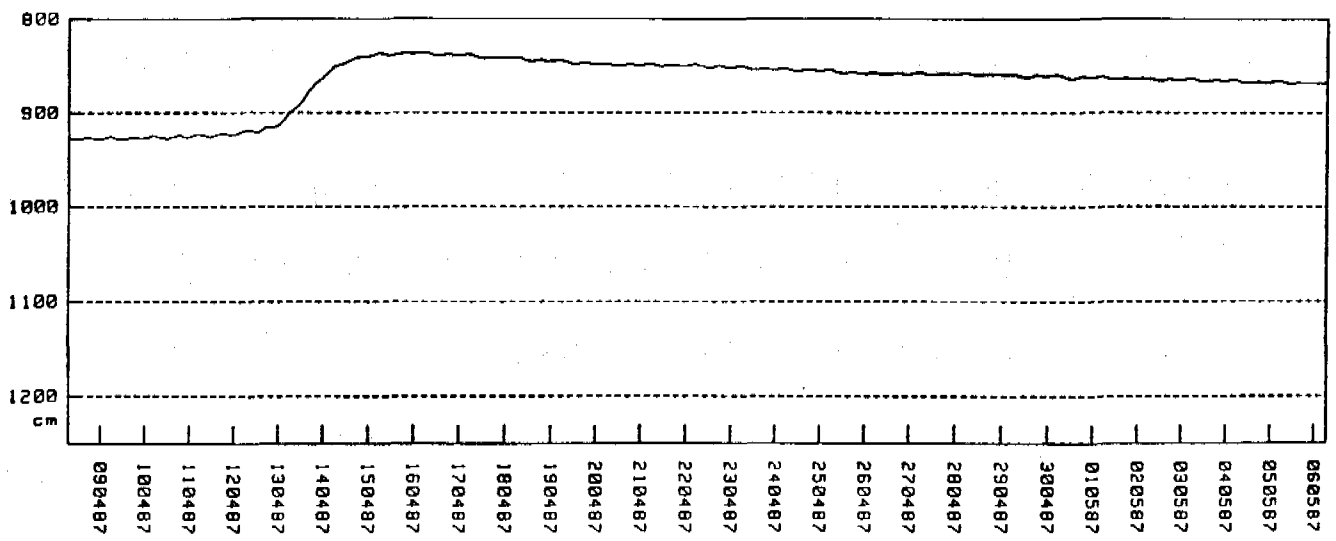
COUNTRY : YEMEN
STATION : Al Junabah W. Mataar
PROJECT : RIRDP
BEGIN DATE : 110287
START TIME : 00:00

PLOT OF WATER LEVEL DEPTH
WATER LEVEL DEPTH (START) : 971 cm.
BAROMETER READING (START) : 870 mB.
END DATE : 010787
INTERVAL : 01:00

FILE: EP4320P_10
16 Feb 1990 10:22:35



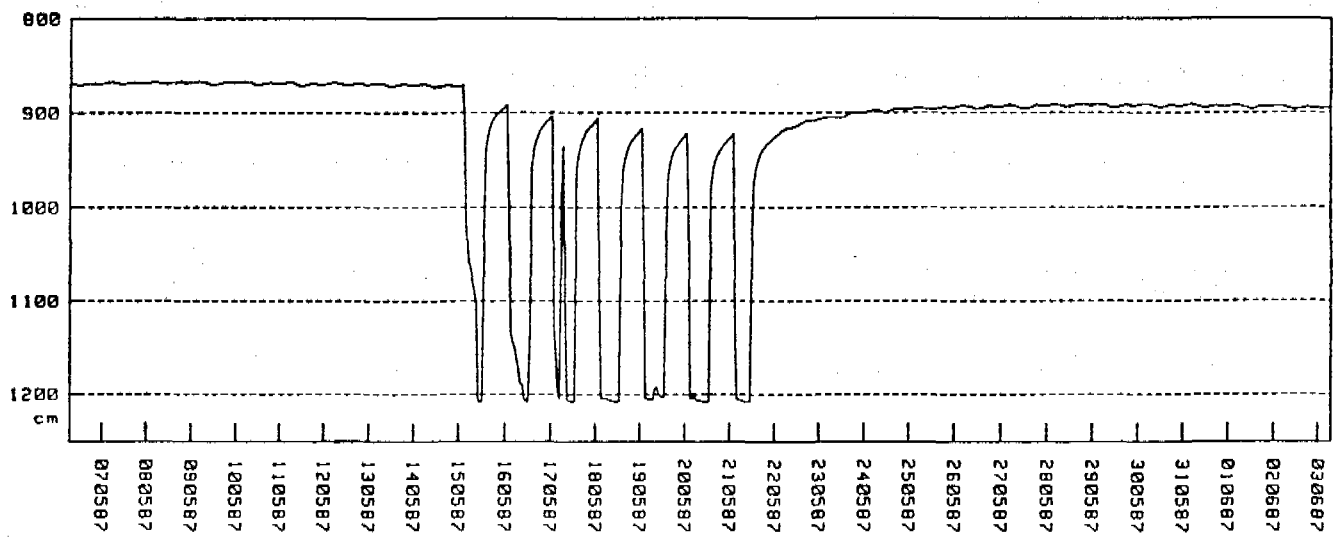


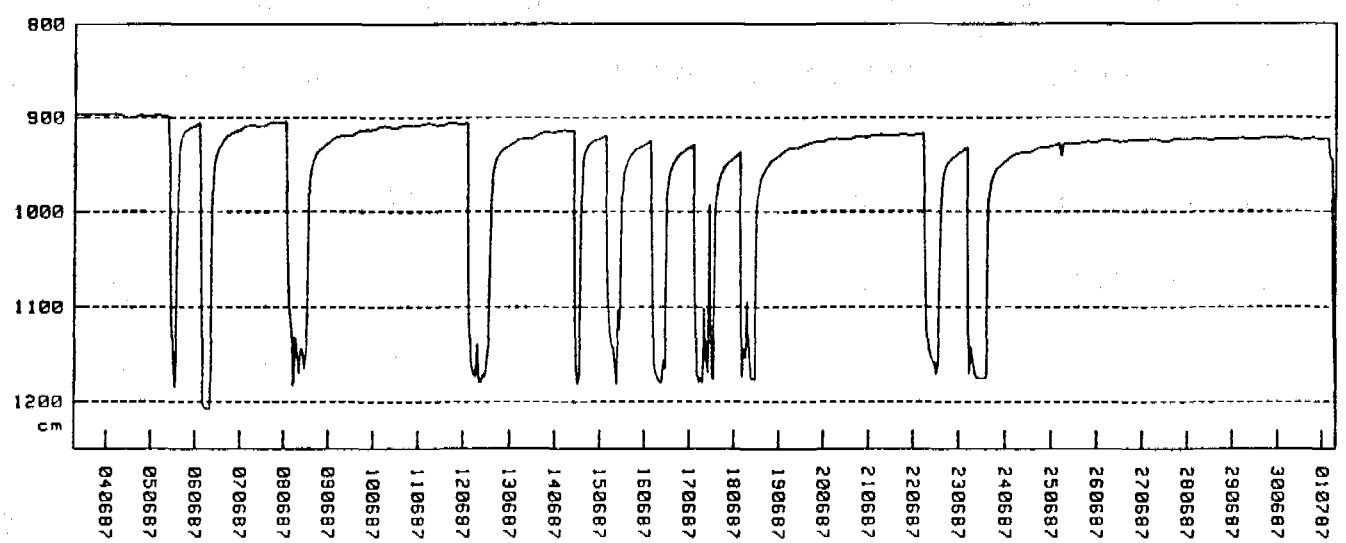


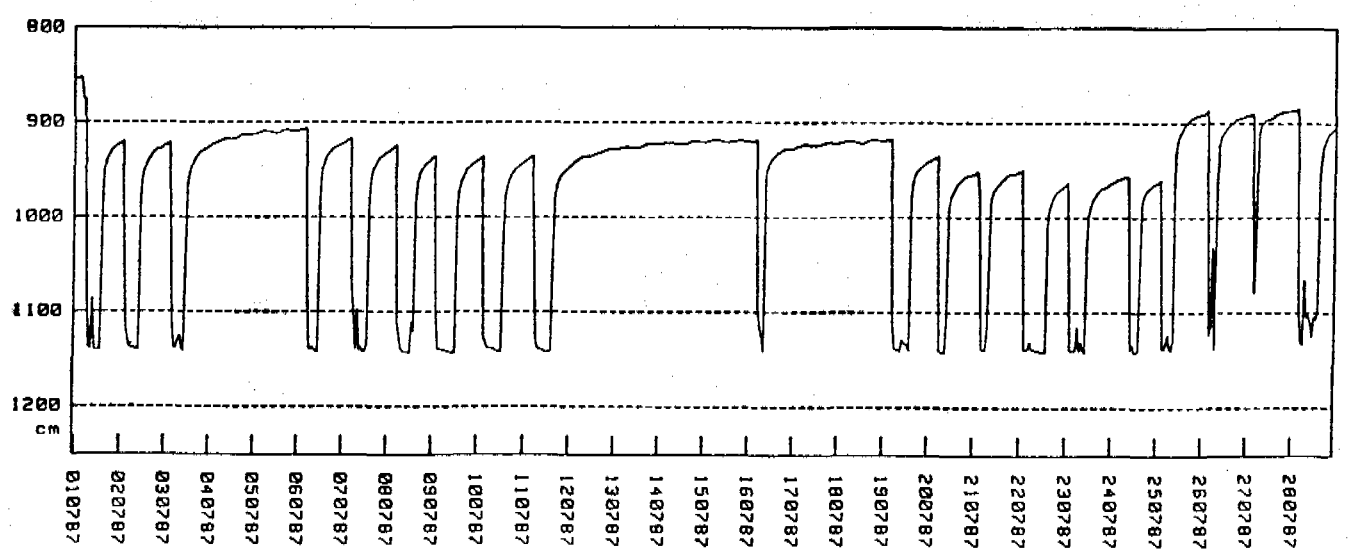
COUNTRY : YEMEN
STATION : Al Junabah W. Mater
PROJECT : RIRDP

PLOT OF WATER LEVEL DEPTH

FILE: EP4320P_10
16 Feb 1990 10:29:40

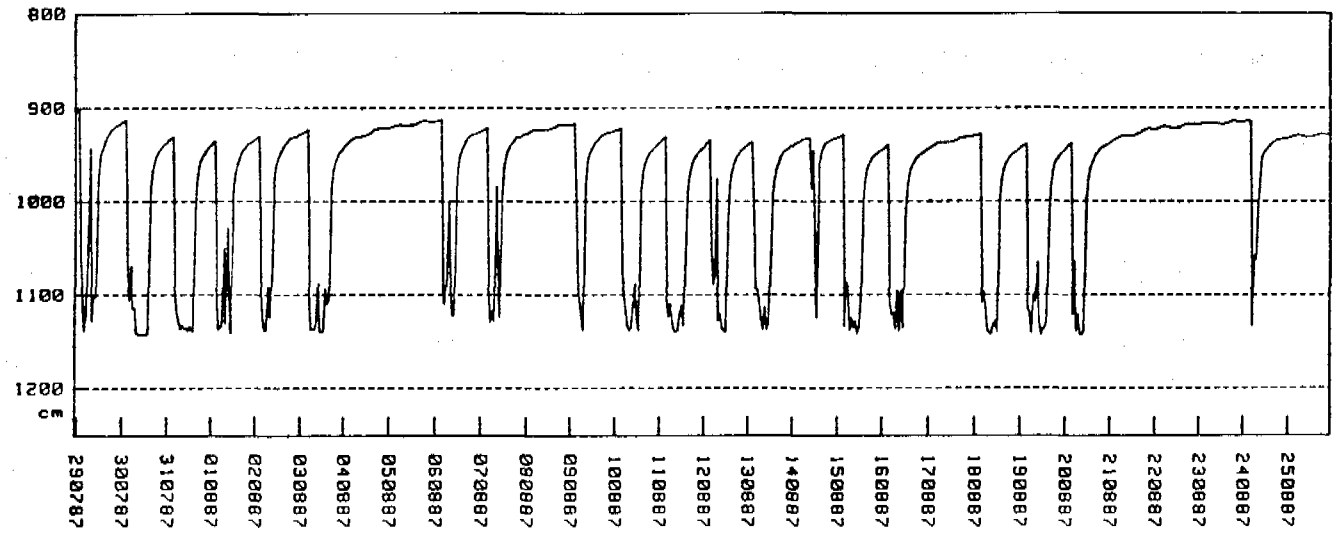


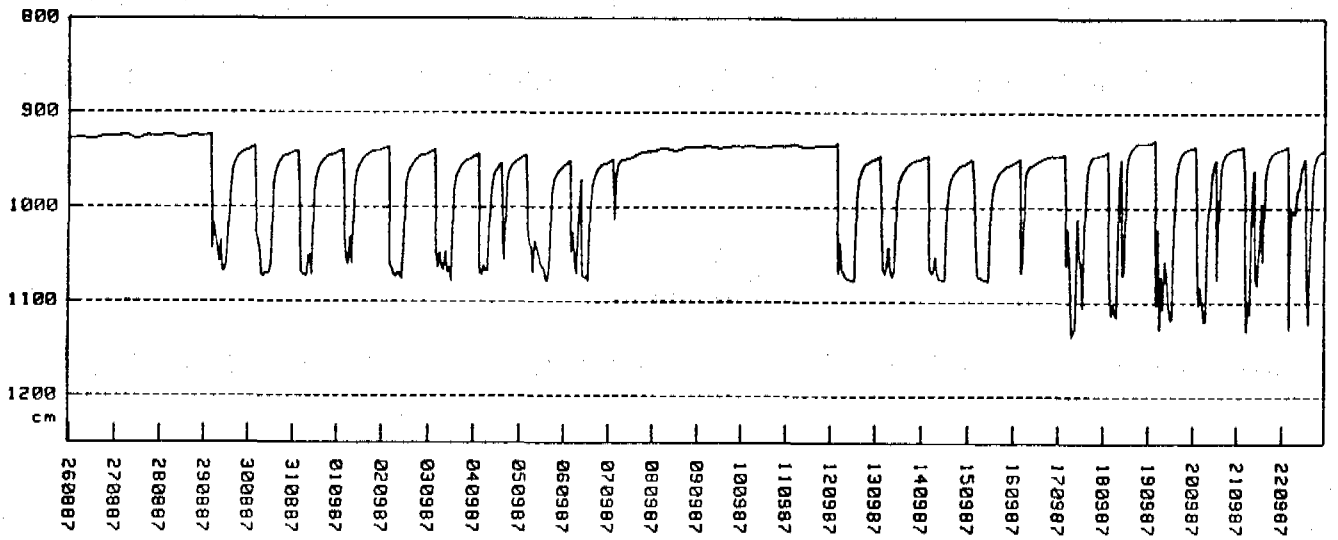


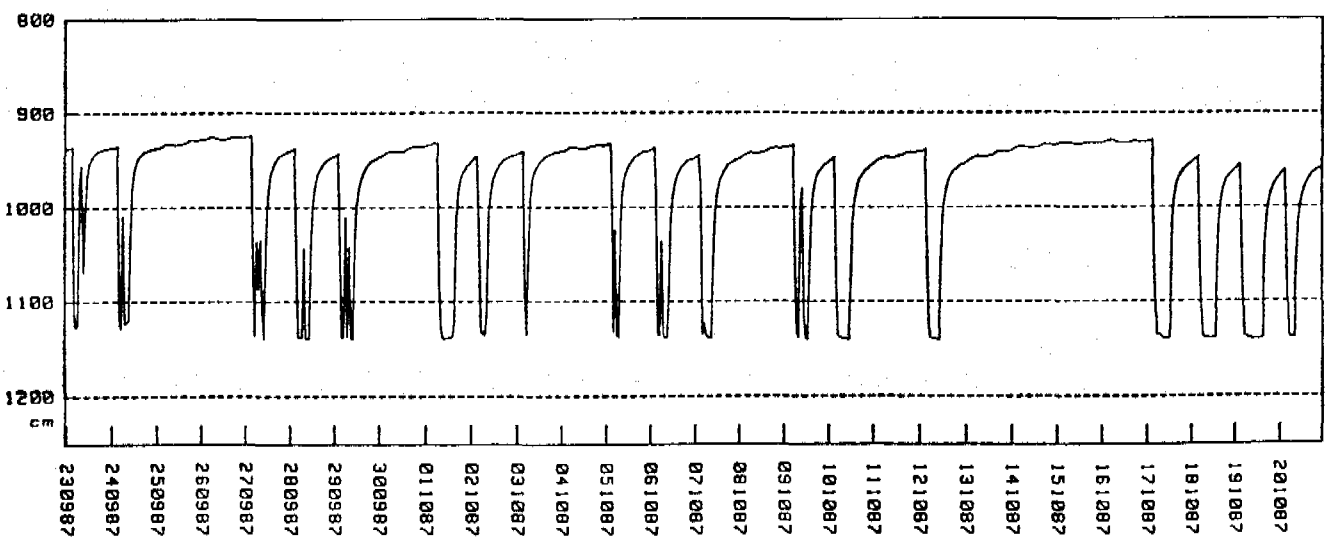


COUNTRY : YEMEN PLOT OF WATER LEVEL DEPTH
STATION : Al Junabah W. Matar
PROJECT : RIRDP

FILE: EP4320P_10
16 Feb 1990 11:00:00



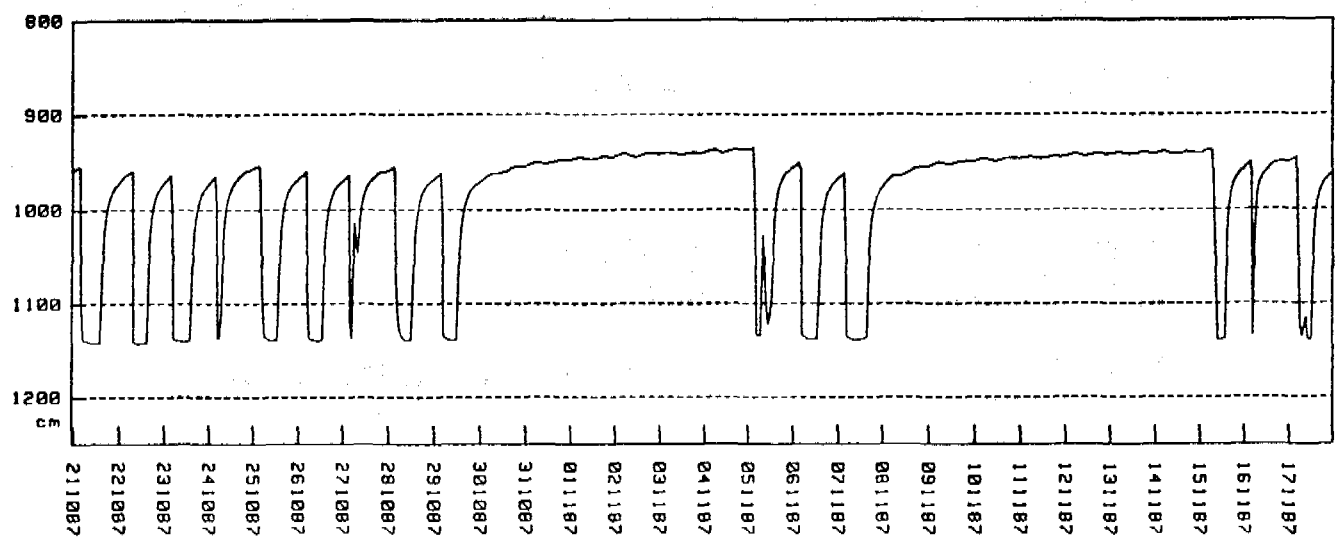


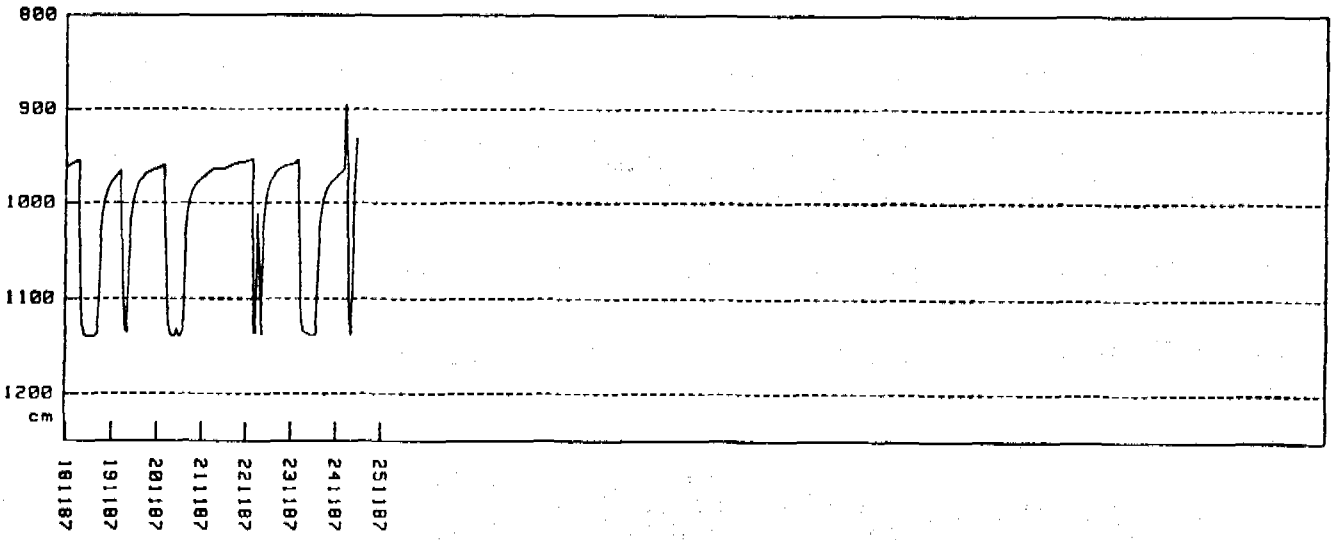


COUNTRY : YEMEN
STATION : Al Junabah W. Matar
PROJECT : RIRDP

PLOT OF WATER LEVEL DEPTH

FILE: EP4320P_10
16 Feb 1990 11:07:33





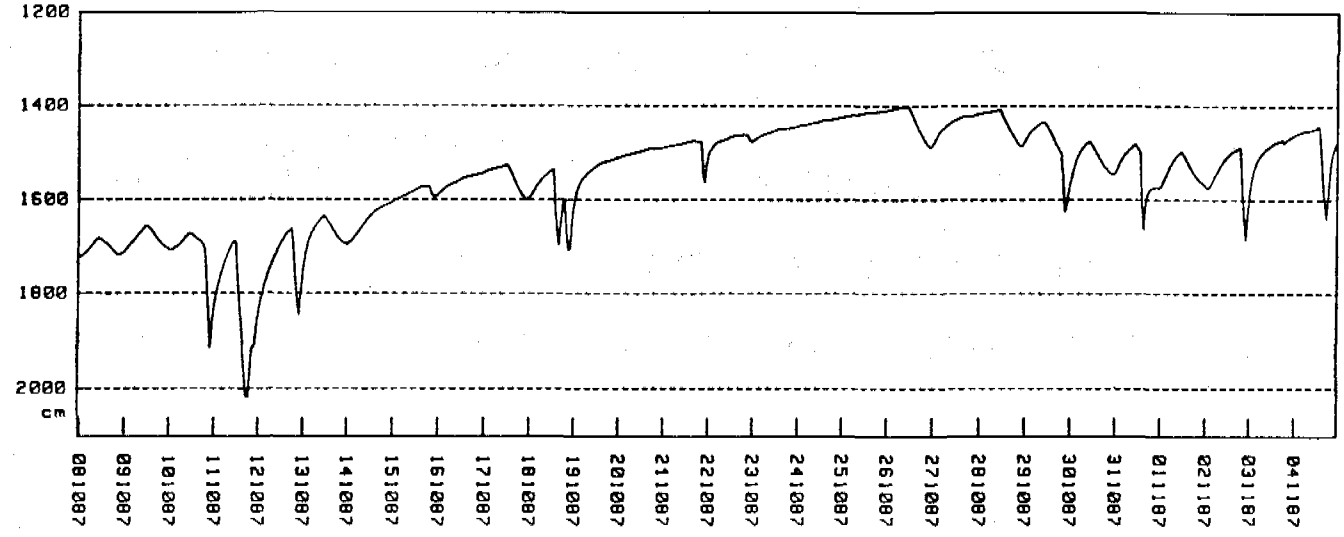
Bi-monthly water levels in a well at As Sawma'a, Al Bayda in metres below surface; File EP4353_0

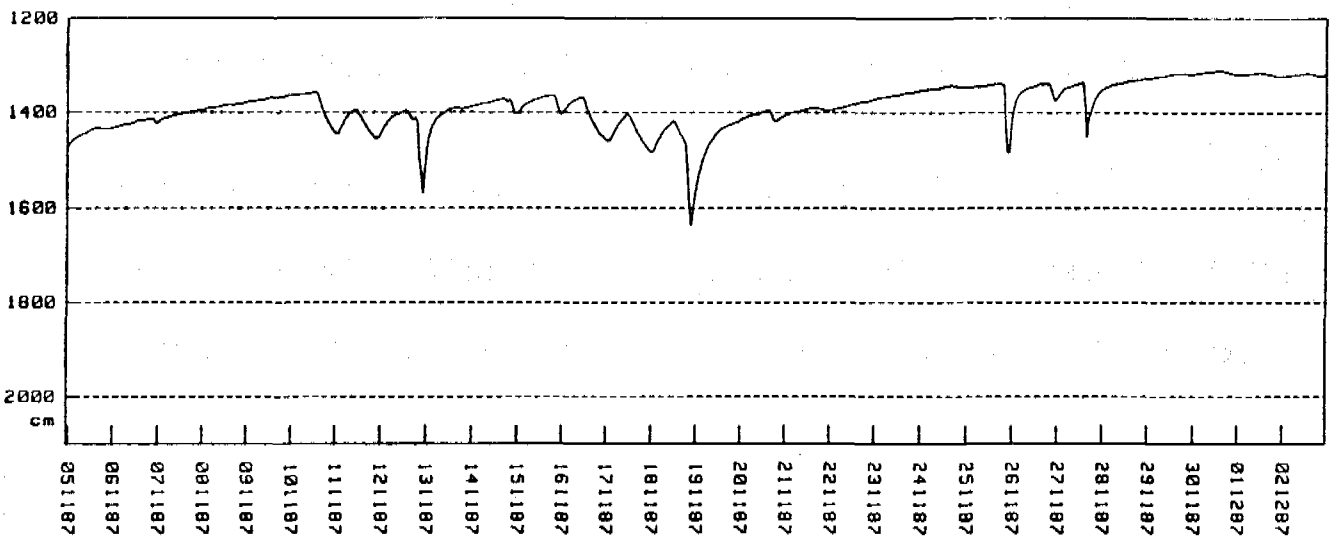
	1987				1988											
	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
1								>20	>20	>20	>20			19.09		
2						15.98									16.44	
3													20			
4																
5					14.15											
6												17.7				
7			13.34													
8					14.6											
9	16.55			12.35												
10		13.51														
11																
12														17.51		
13																
14							18.45									
15													>20.00			
16						17.65										
17																
18																
19																
20																
21																
22			12.63	12.85								19.01				
23																
24																
25		13.32														
26	13.96															
27																
28							19.01									
29										19.43						
30																
31																

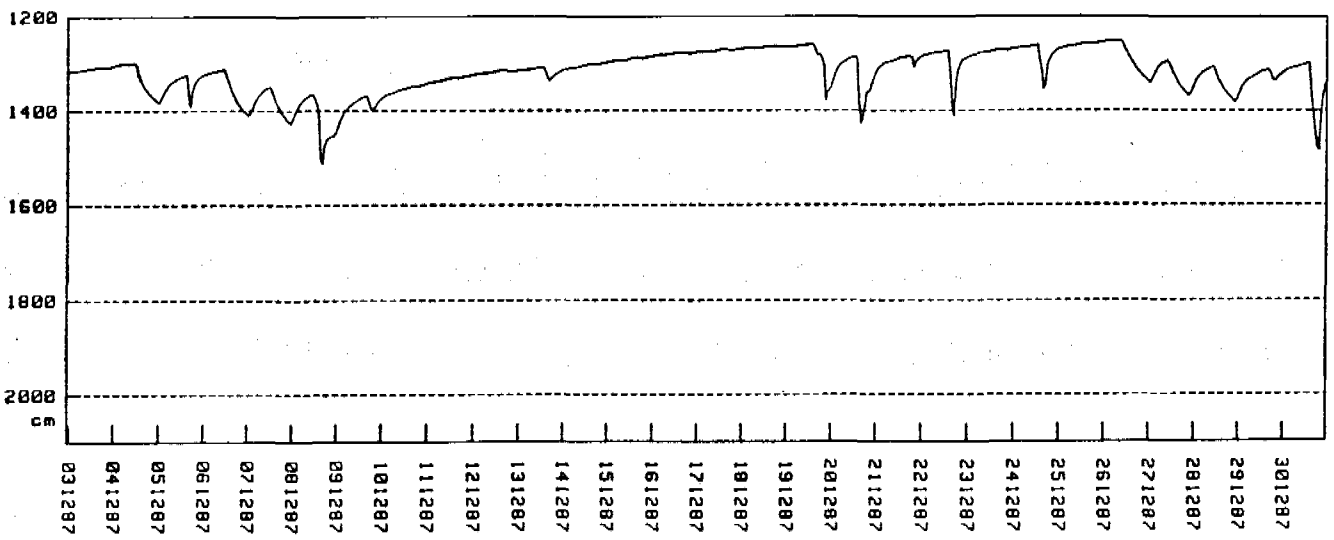
COUNTRY : YEMEN
STATION : Ar-Sawma'a
PROJECT : R.I.R.D.P.
BEGIN DATE : 081087
START TIME : 00:00

PLOT OF WATER LEVEL DEPTH
WATER LEVEL DEPTH (START) : 1700 cm.
BAROMETER READING (START) : 809 mB.
END DATE : 101288
INTERVAL : 01:00

FILE: EP4353P_0
9 Nov 1989 12:52:35



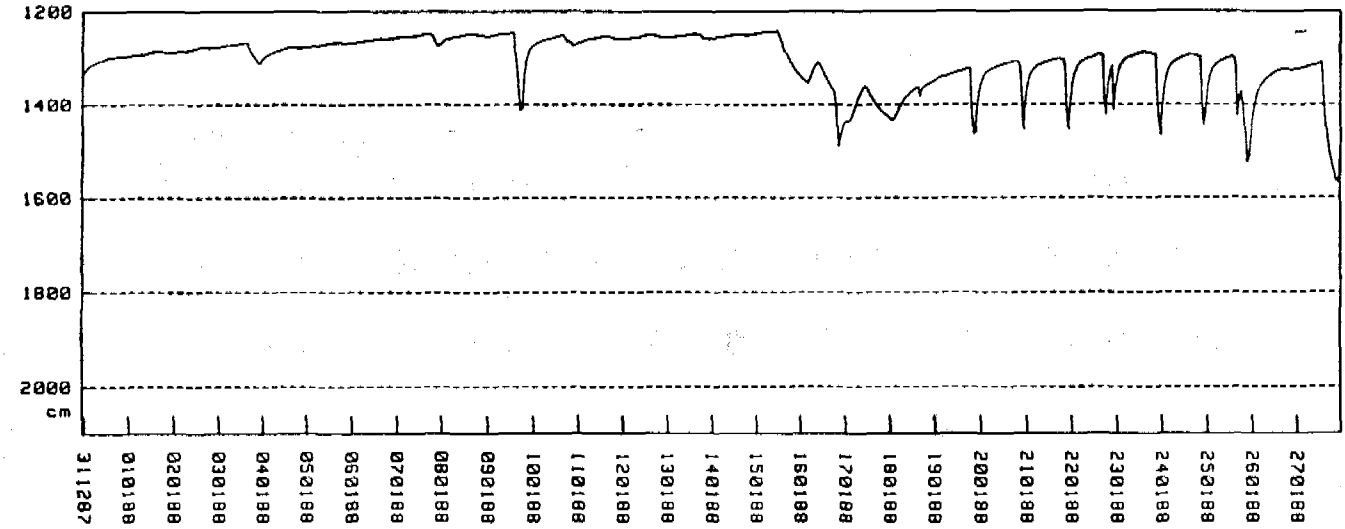


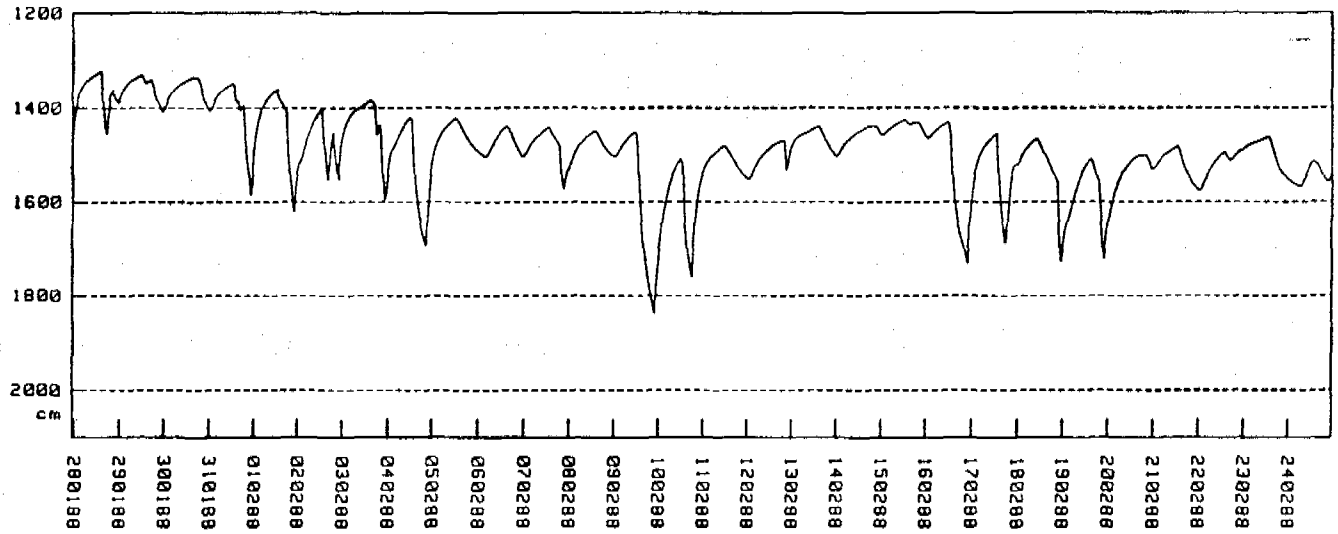


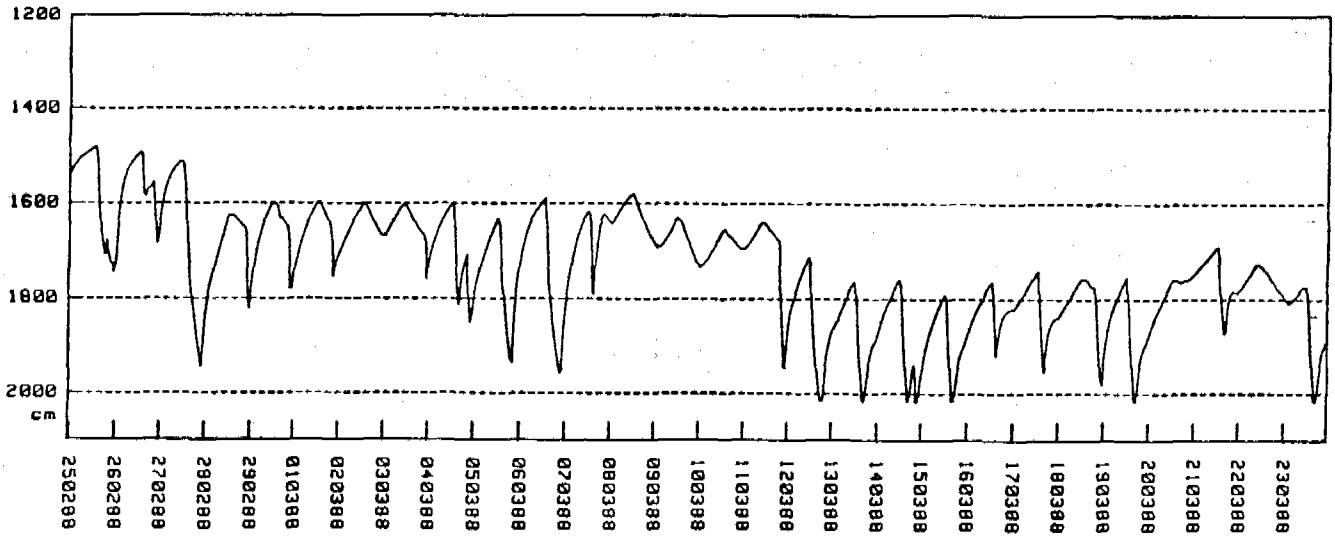
COUNTRY : YEMEN
STATION : Ba-Sawas'a
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4353P_B
9 Nov 1989 12:59:30



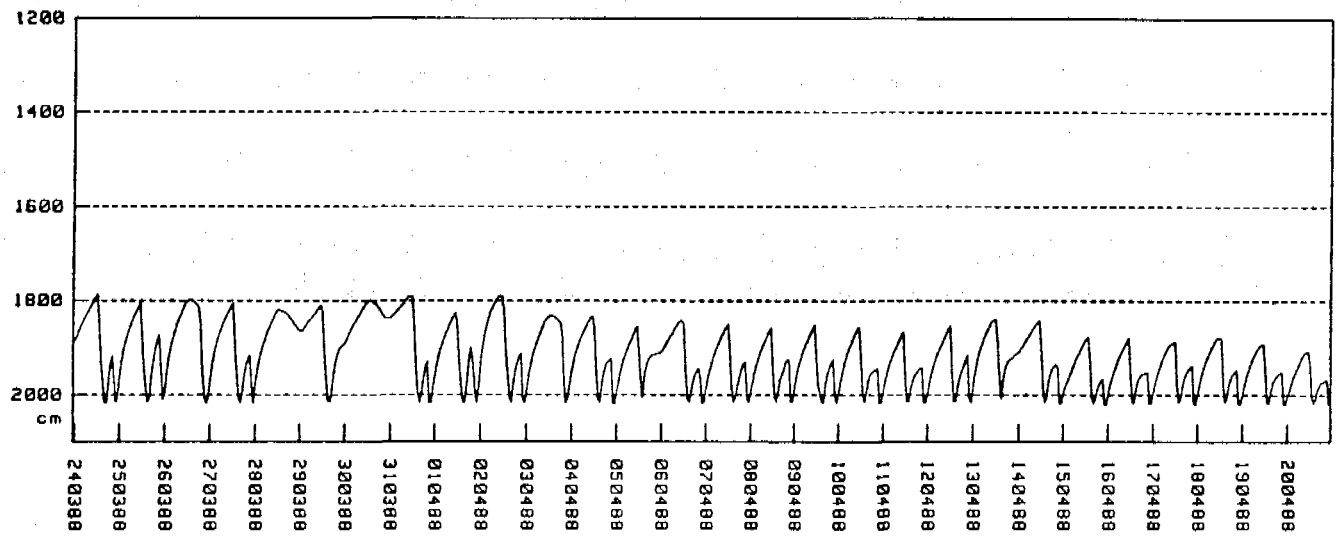


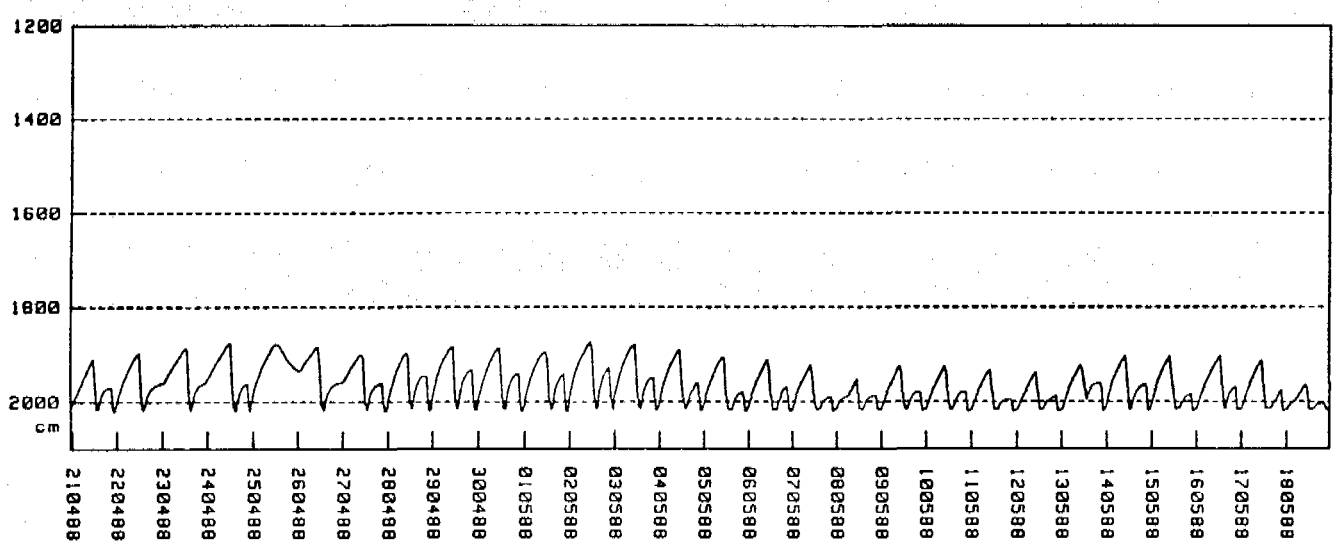


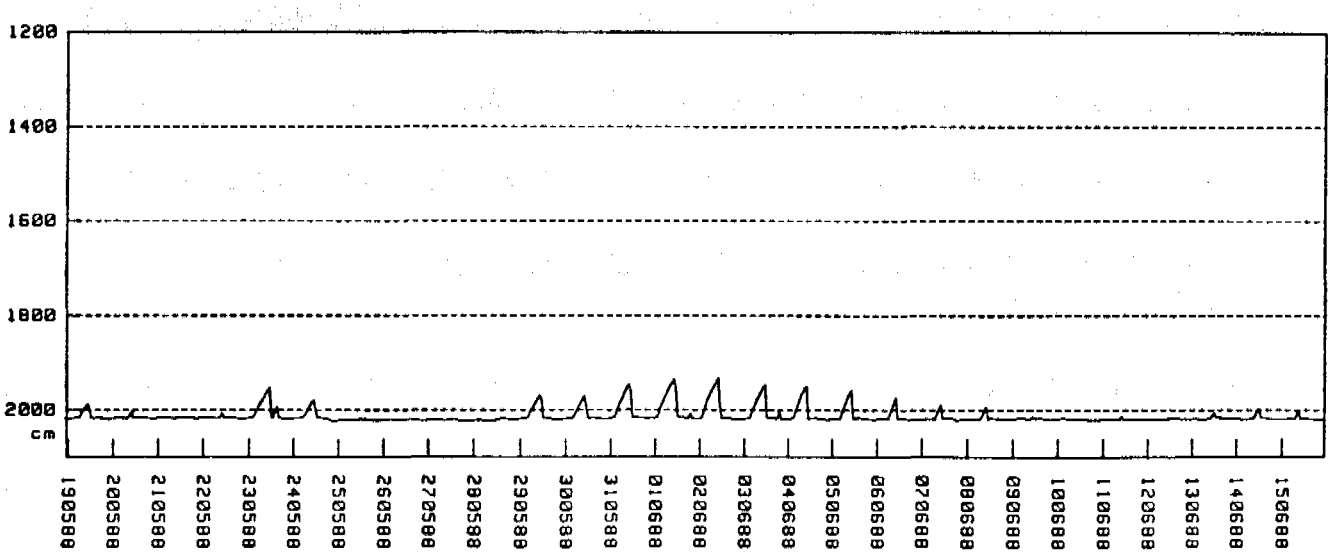
COUNTRY : YEMEN
STATION : As-Sawma'a
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4353P_0
9 Nov 1989 13:06:51



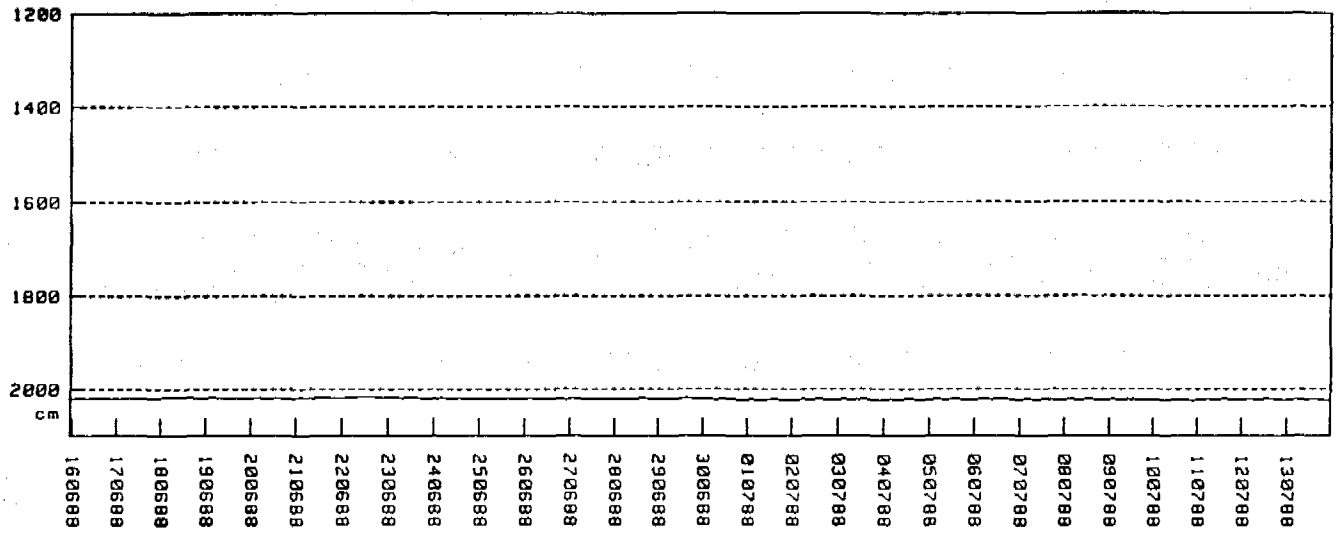


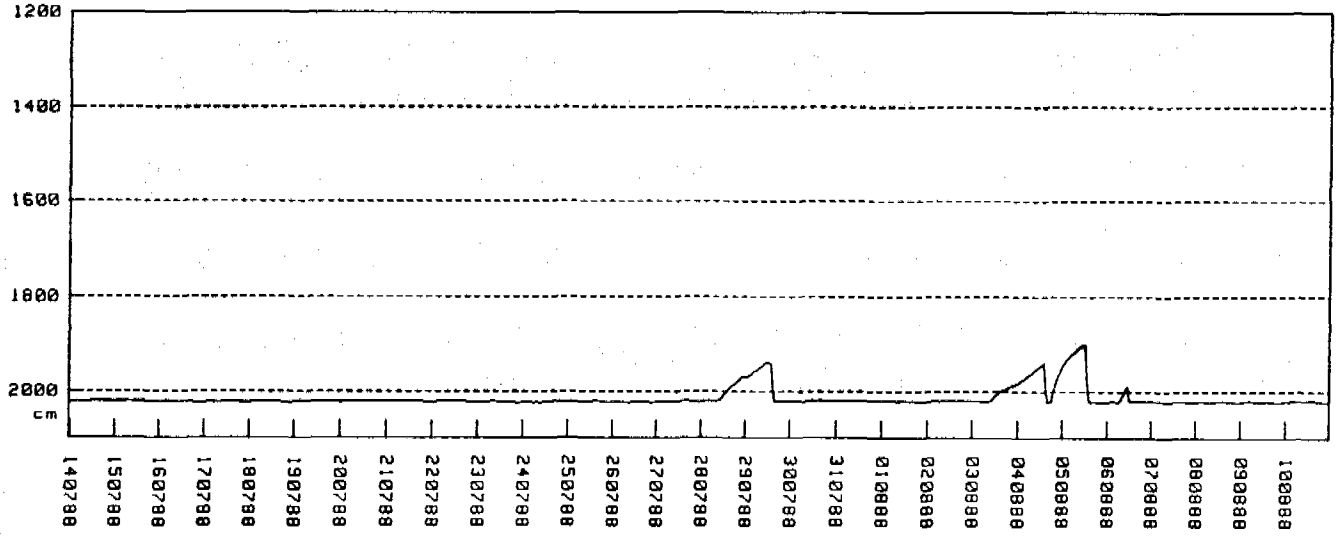


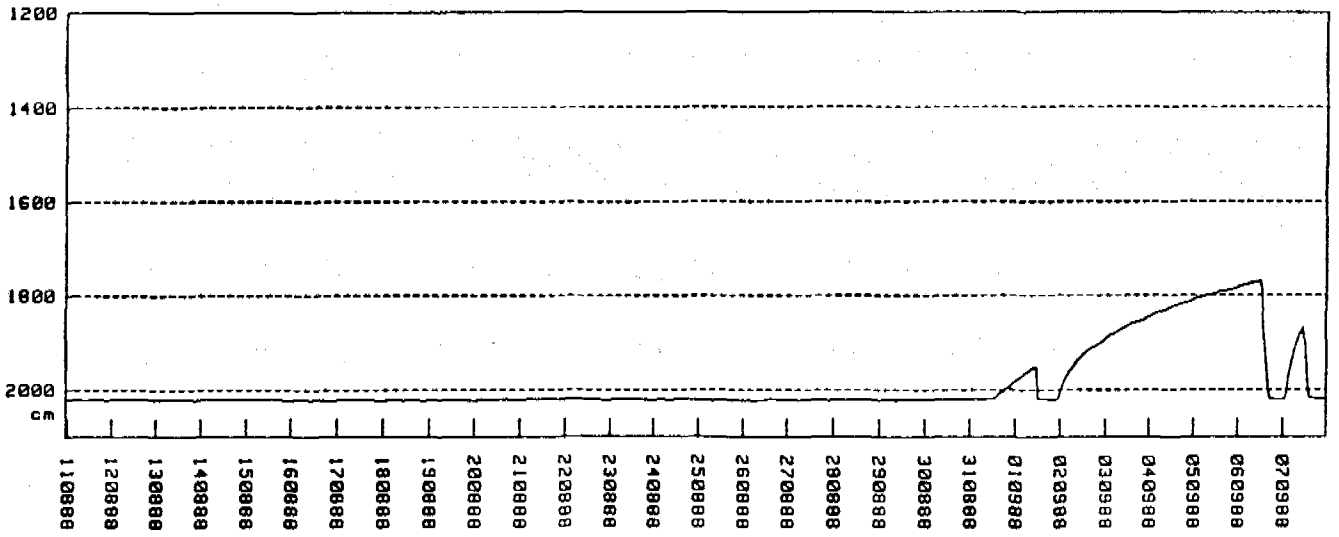
COUNTRY : YEMEN
STATION : Ma-Sawma'a
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4353P_0
9 Nov 1989 13:14:10



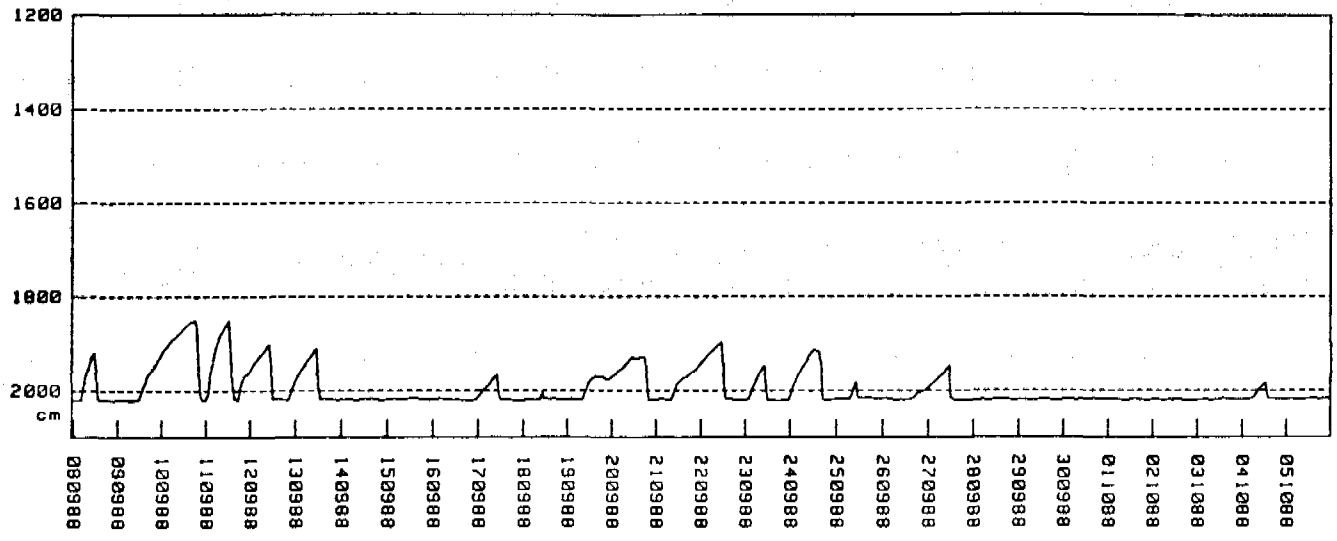


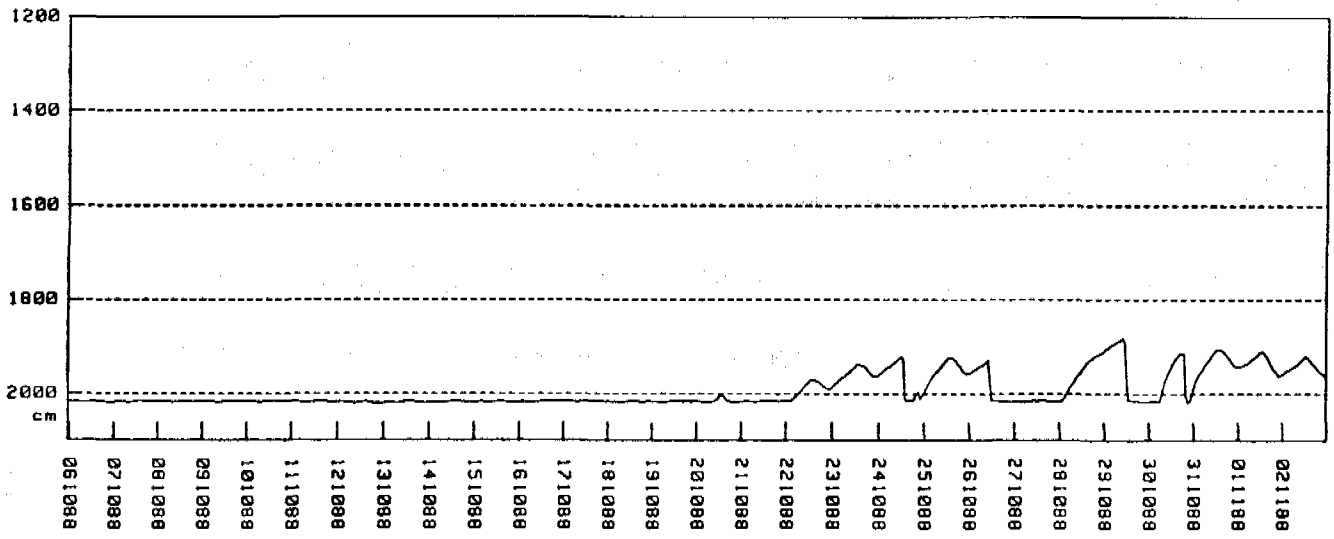


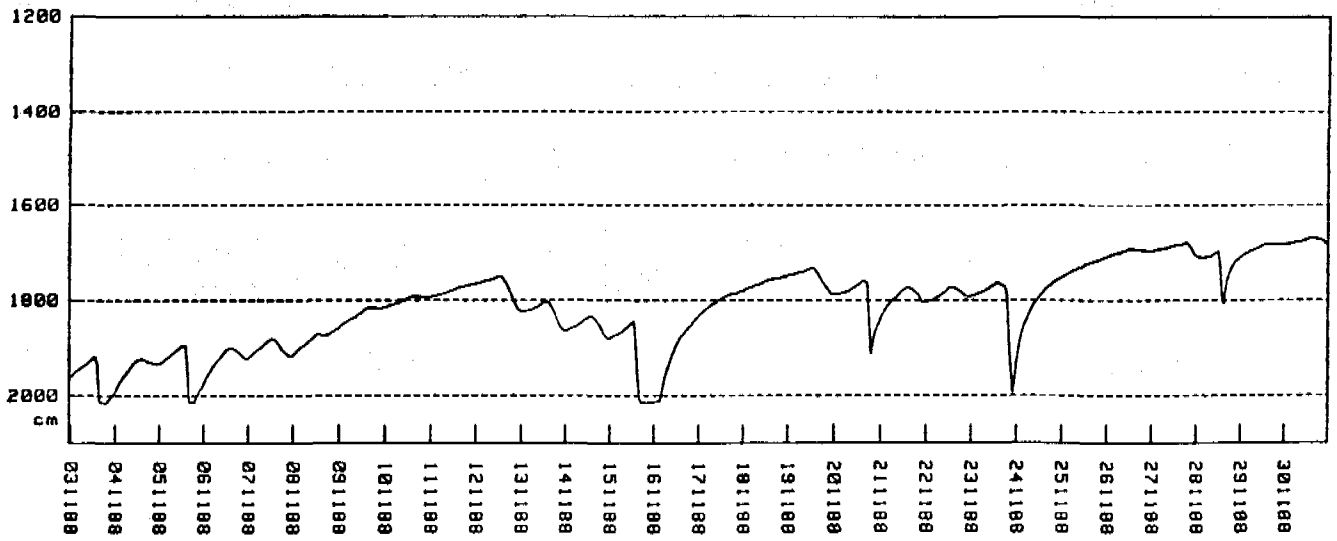
COUNTRY : YEMEN
STATION : As-Sawda'a
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4353P_0
9 Nov 1989 13:21:32



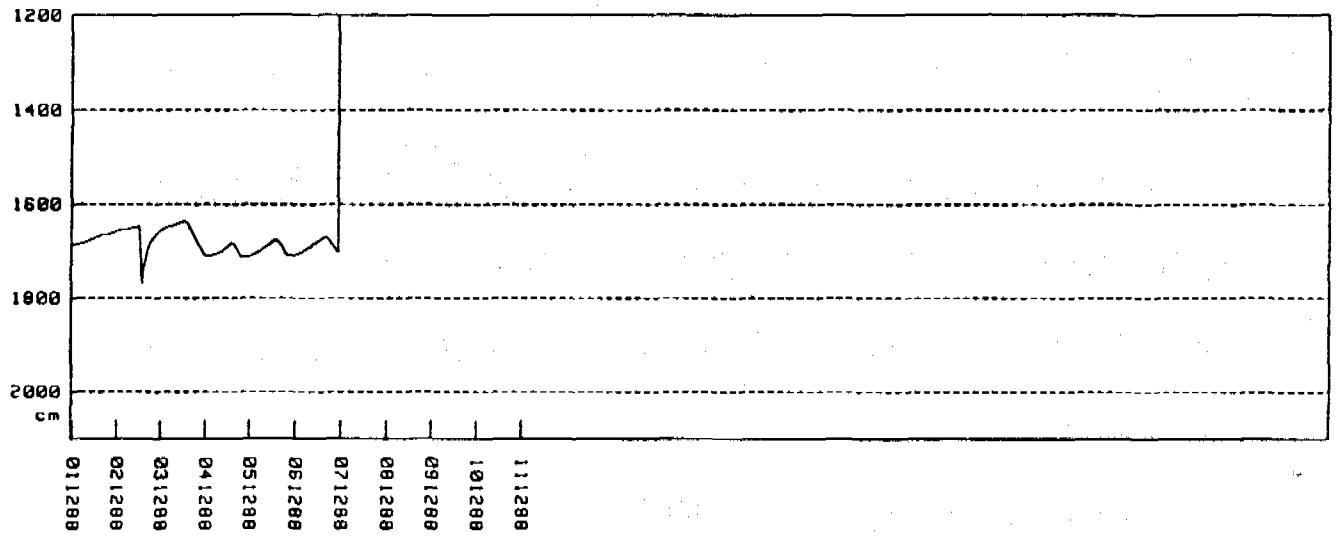




COUNTRY : YEMEN
STATION : Ar-Sawma'a
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4353P_0
9 Nov 1989 13:28:46



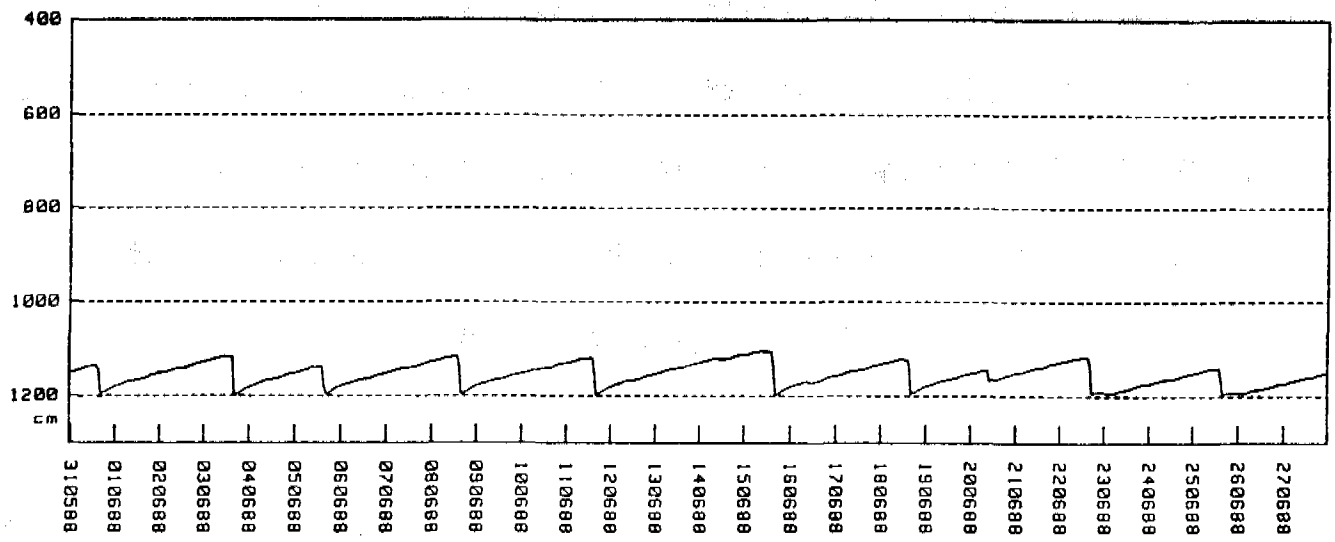
Bi-monthly water-levels in well No.2011 at Qariat Mushayr,Al Bayda, in metres below surface.

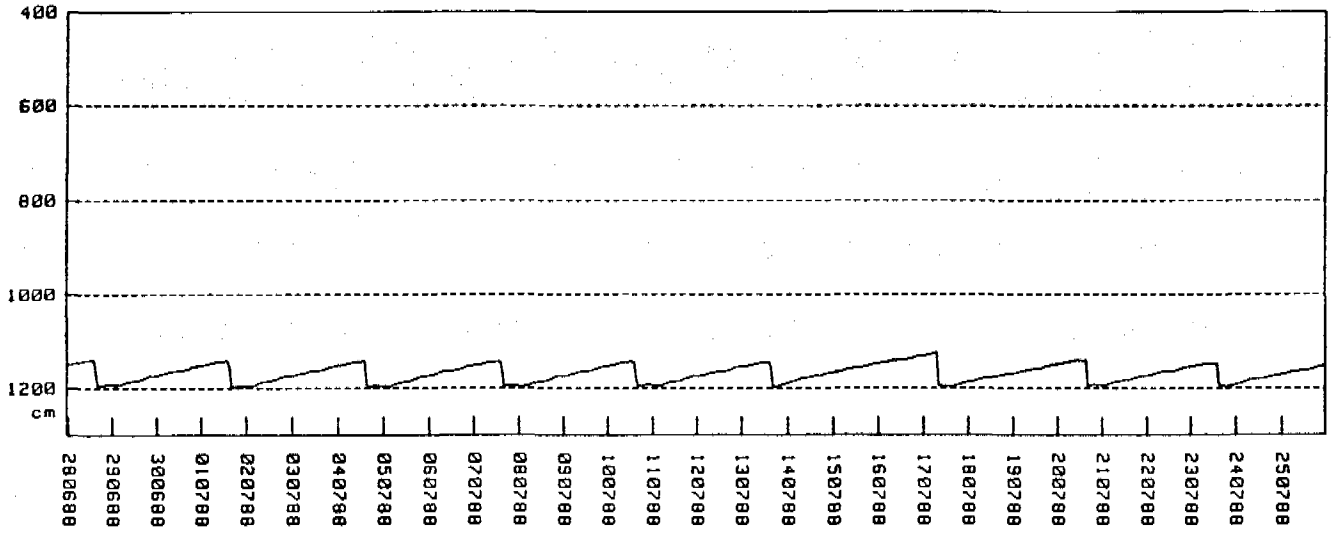
	1988								1989			
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April
1												7.30
2												
3				10.44							5.98	
4			11.71						4.38			
5						8.98	5.07					
6								4.75				
7												
8												
9												
10												
11												
12					9.26							
13												
14										5.16		
15		11.32										8.20
16												
17			11.53									
18									4.38		6.00	1.67
19						5.11						
20							5.20					
21								4.54		5.01		
22												
23												
24												1.61
25												
26												
27												
28												
29												
30												
31	11.64											

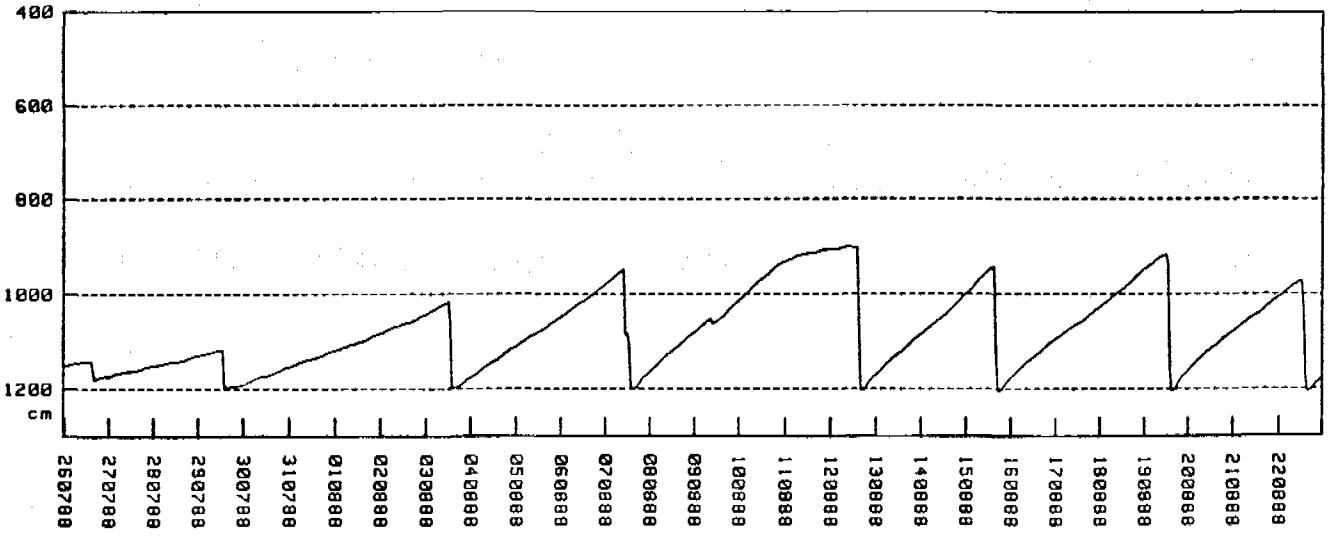
COUNTRY : YEMEN
STATION : Qarlah Mushayr
PROJECT : R.I.R.D.P.
BEGIN DATE : 300588
START TIME : 24:00

PLOT OF WATER LEVEL DEPTH
WATER LEVEL DEPTH (START) : 1193 cm.
BAROMETER READING (START) : 817 mB.
END DATE : 310789
INTERVAL : 01:00

FILE: EP4352P_18
8 Nov 1989 15:42:40



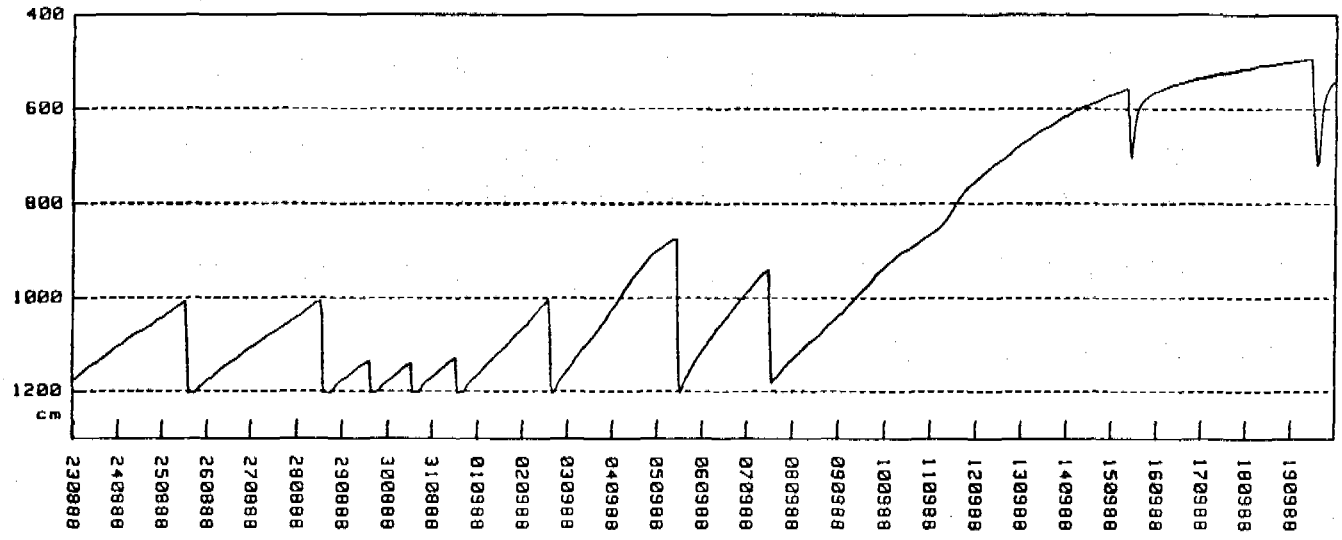


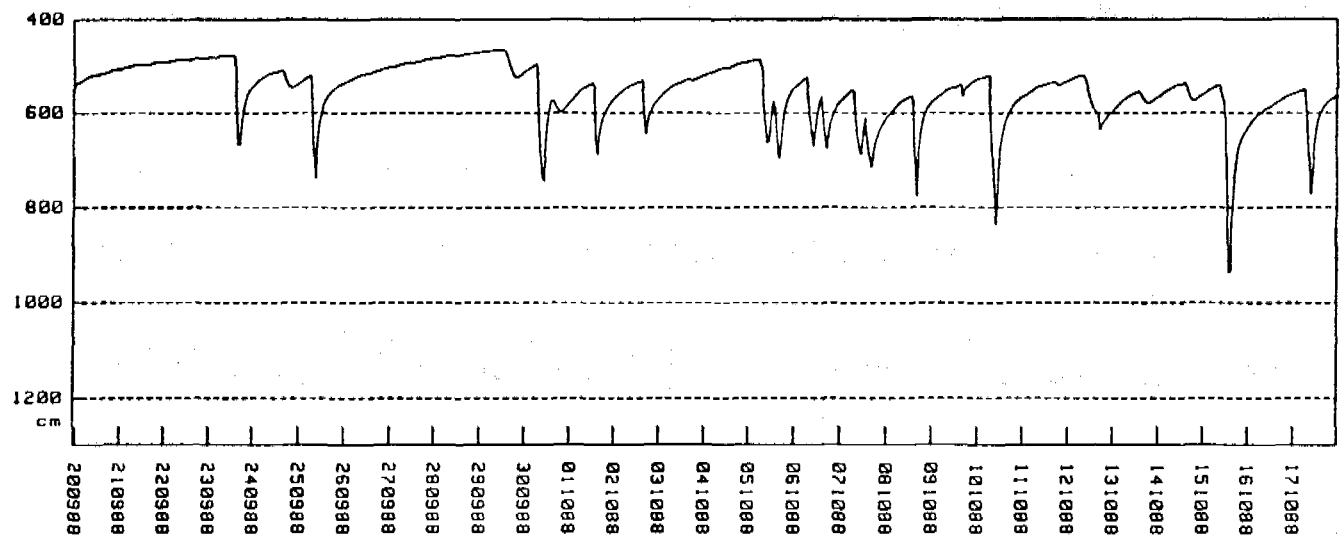


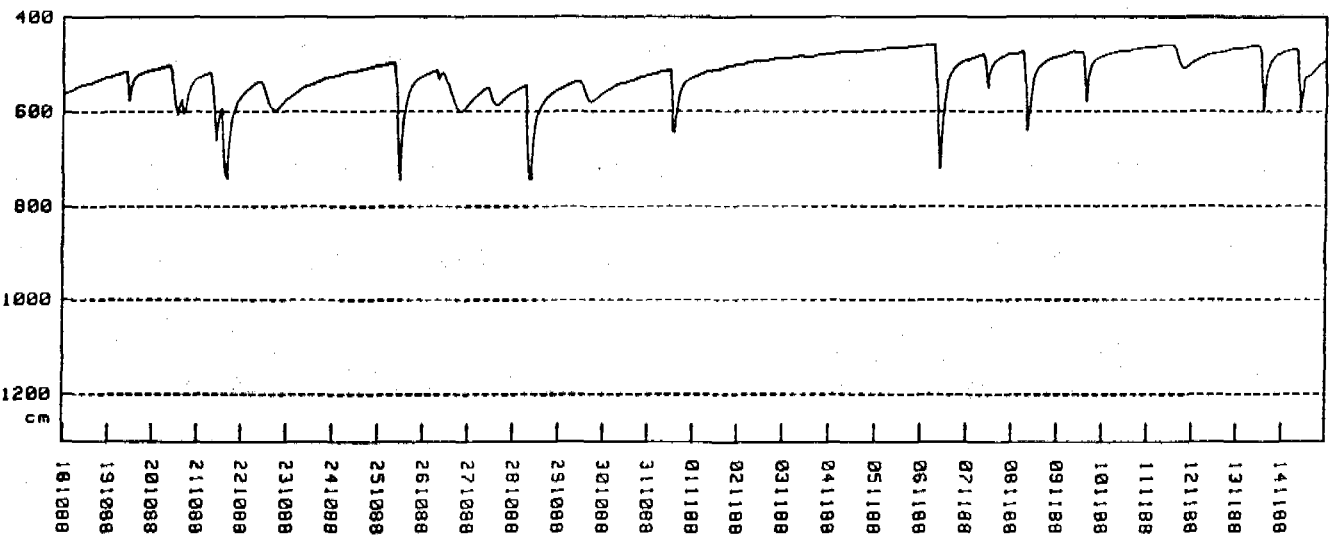
COUNTRY : YEMEN
STATION : Qariah Mushayr
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4352P_10
8 Nov 1989 15:50:01



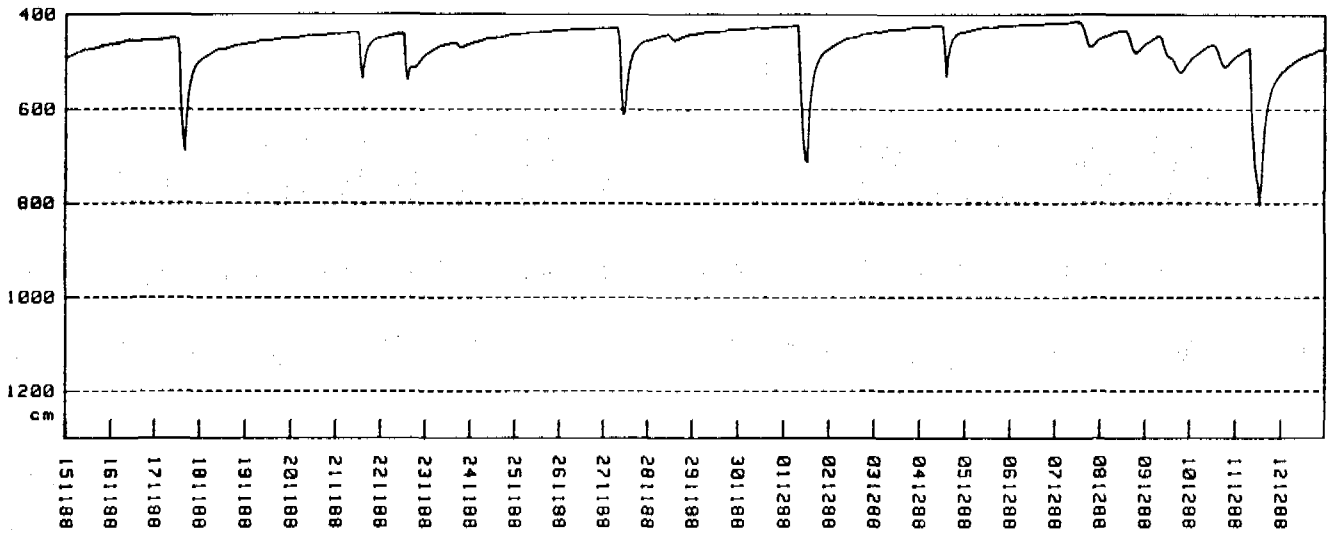


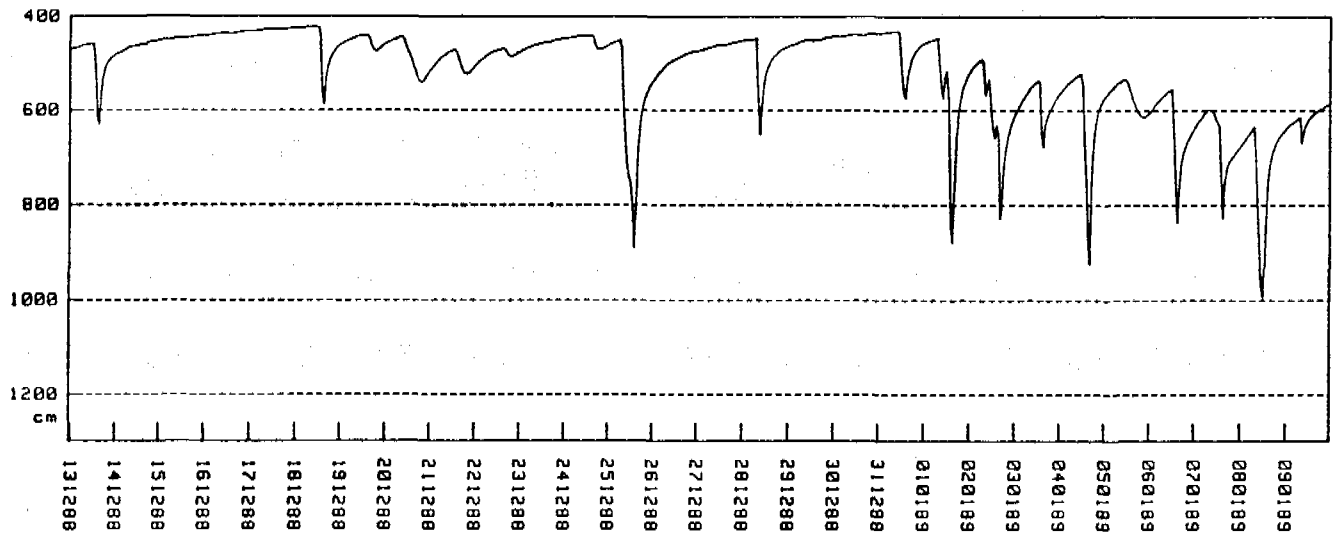


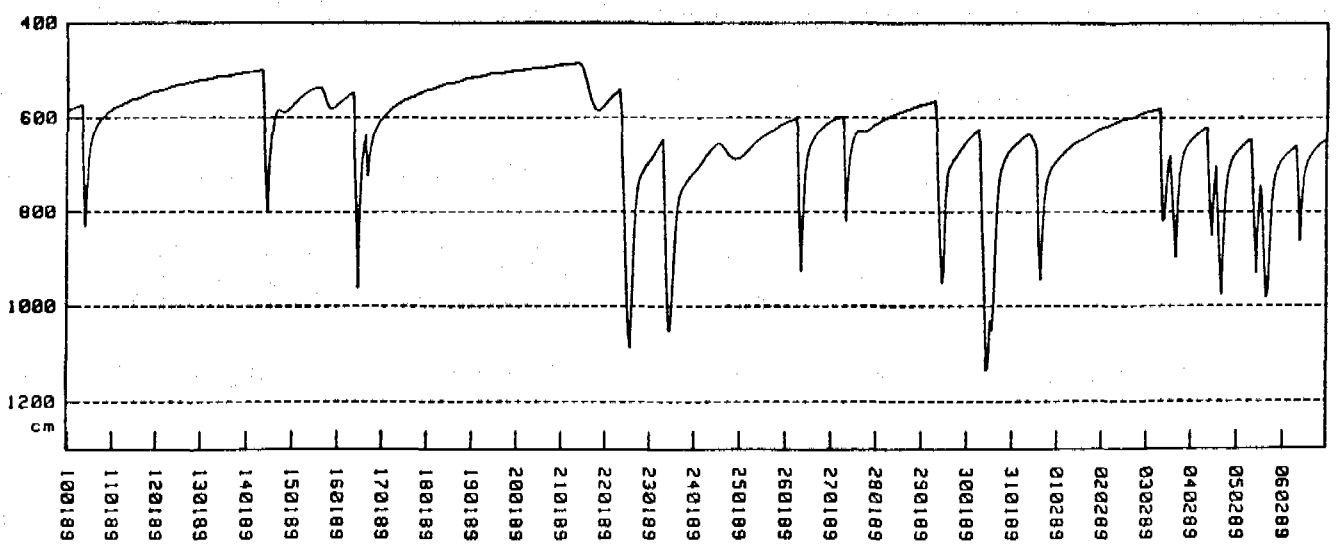
COUNTRY : YEMEN
STATION : Qarish Mushayr
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4352P_10
8 Nov 1989 16:05:13



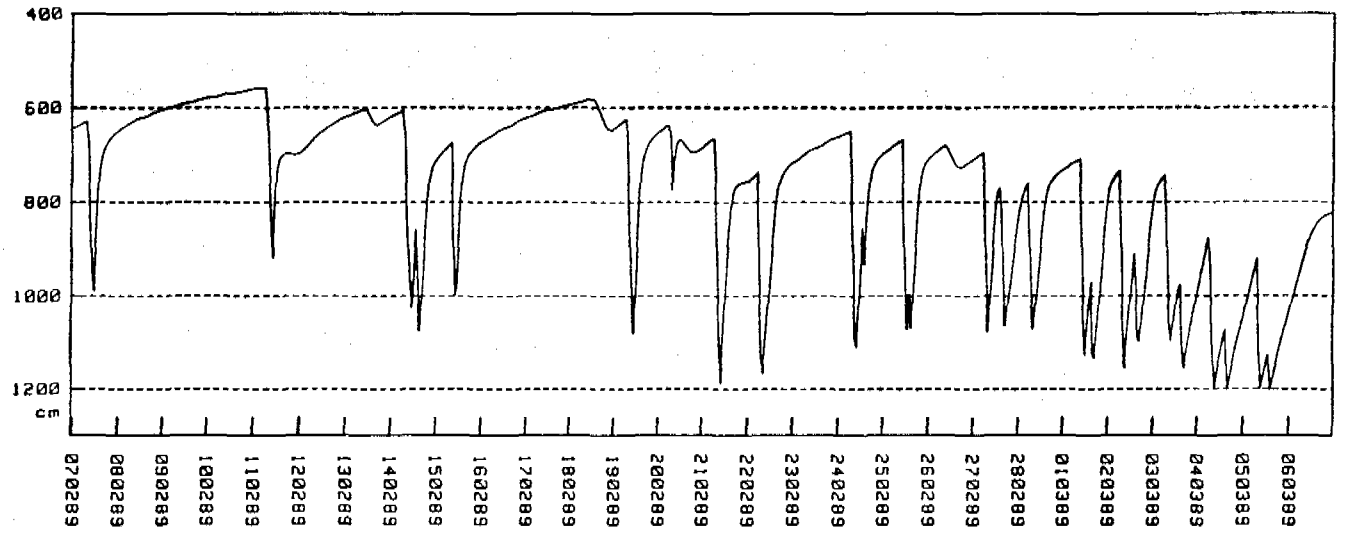


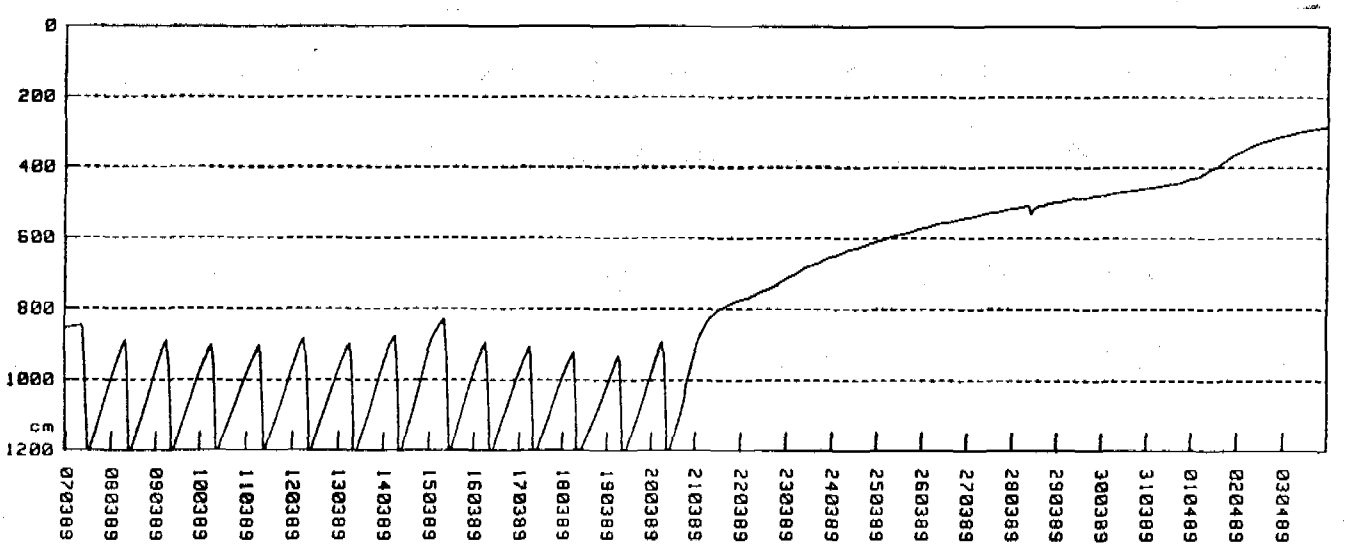


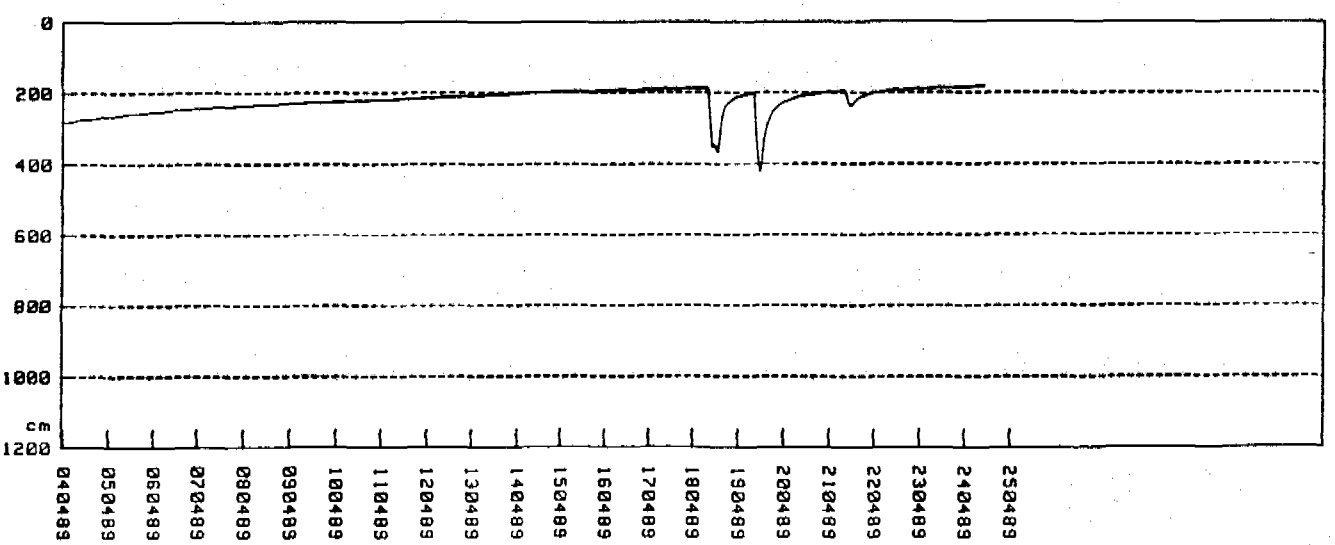
COUNTRY : YEMEN
STATION : Qarlah Mushayr
PROJECT : R.I.R.D.P.

PLOT OF WATER LEVEL DEPTH

FILE: EP4352P_18
8 Nov 1989 16:12:27







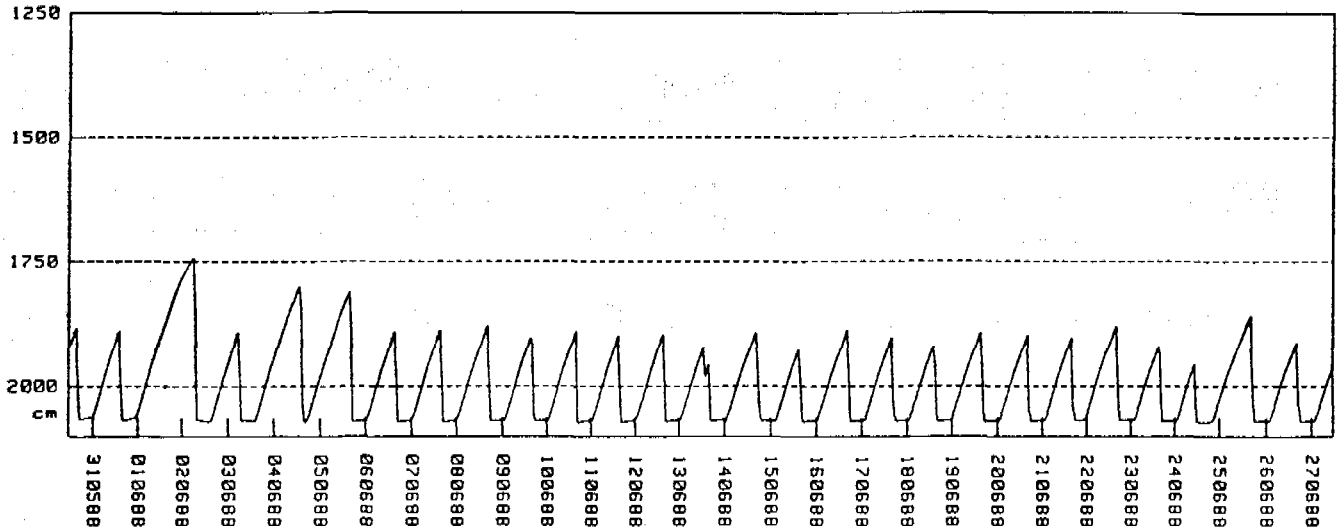
Two monthly rest water levels in well No. 2164 at Mashaba ,Al Bayda , EP4384P_10

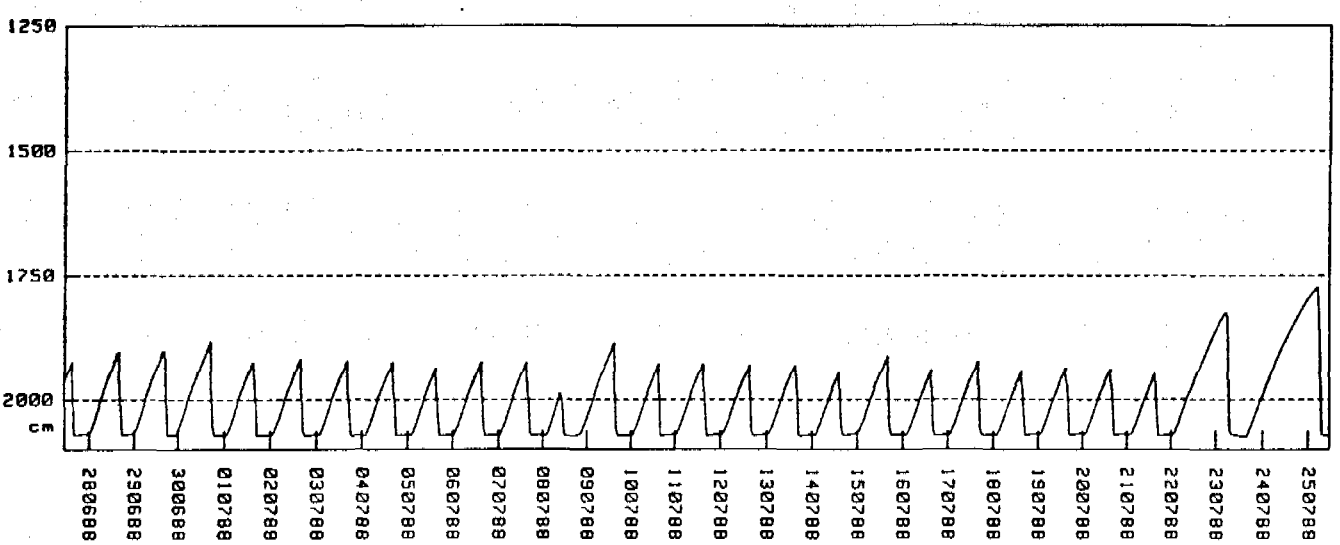
	1988							1989			
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April
1												
2		17.4										
3												
4												
5												
6												
7								13.43				
8				16.92	15.47	13.68						
9			18.86				13.57				15.13	
10										14.51		
11												
12												
13												14.72
14									13.85			
15												
16												
17												
18												
19												
20												
21										14.68		14.52
22							13.39					
23				16.53	13.93							
24						13.63						
25		18.6	17.7									
26											15.12	
27												
28								13.42				
29												
30									14.42			
31												

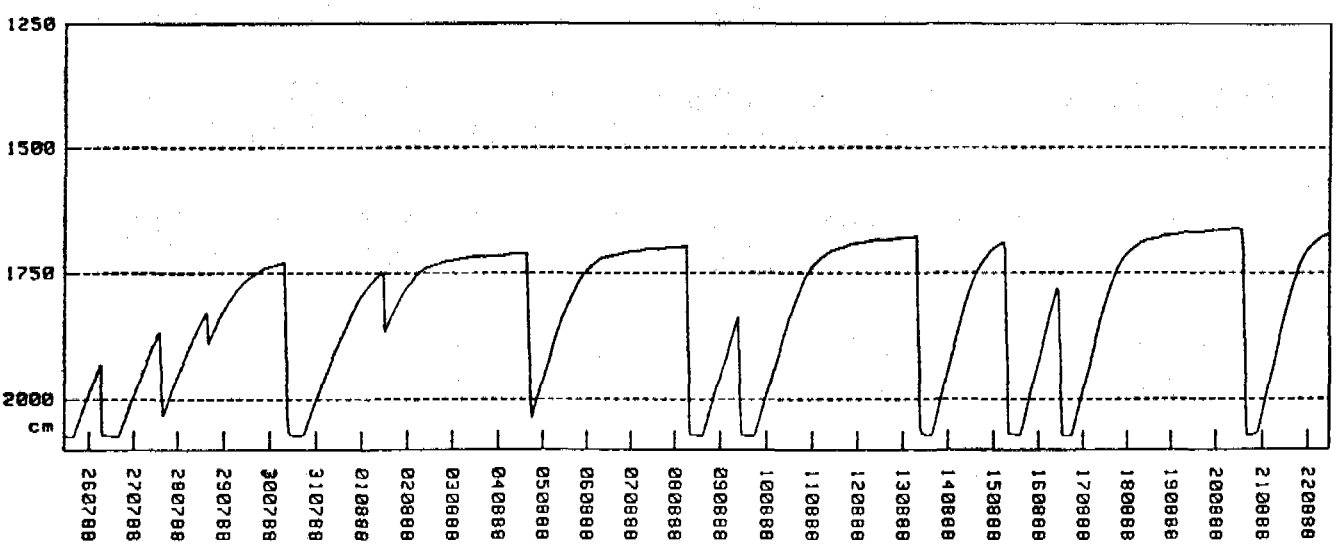
COUNTRY : YEMEN
STATION : Mash'aba - Al Bayda
PROJECT : RIRDP
BEGIN DATE : 300588
START TIME : 12:00

PLOT OF WATER LEVEL DEPTH
WATER LEVEL DEPTH (START) : 1918 cm.
BAROMETER READING (START) : 816 mB.
END DATE : 240489
INTERVAL : 01:00

FILE: EP4384P_10
16 Feb 1990 12:59:26



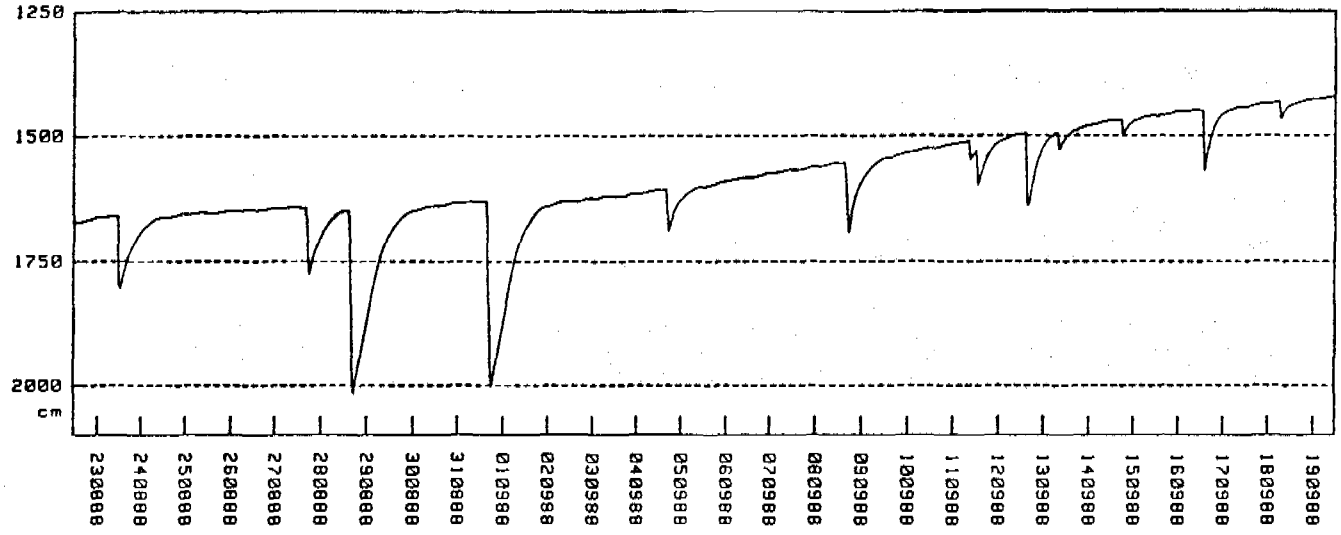


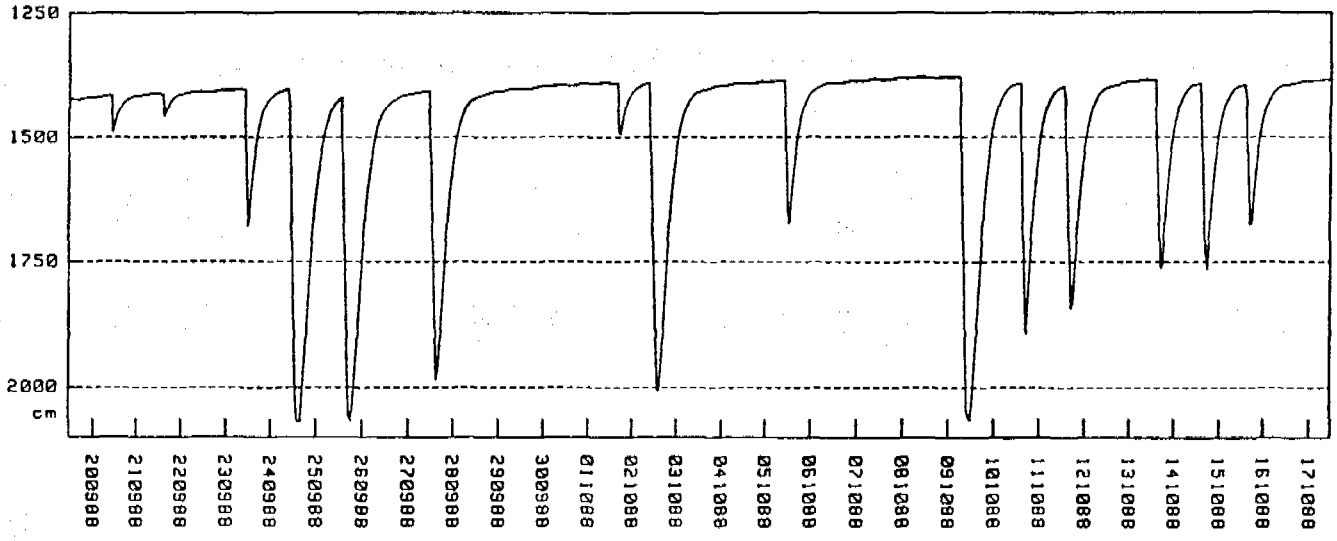


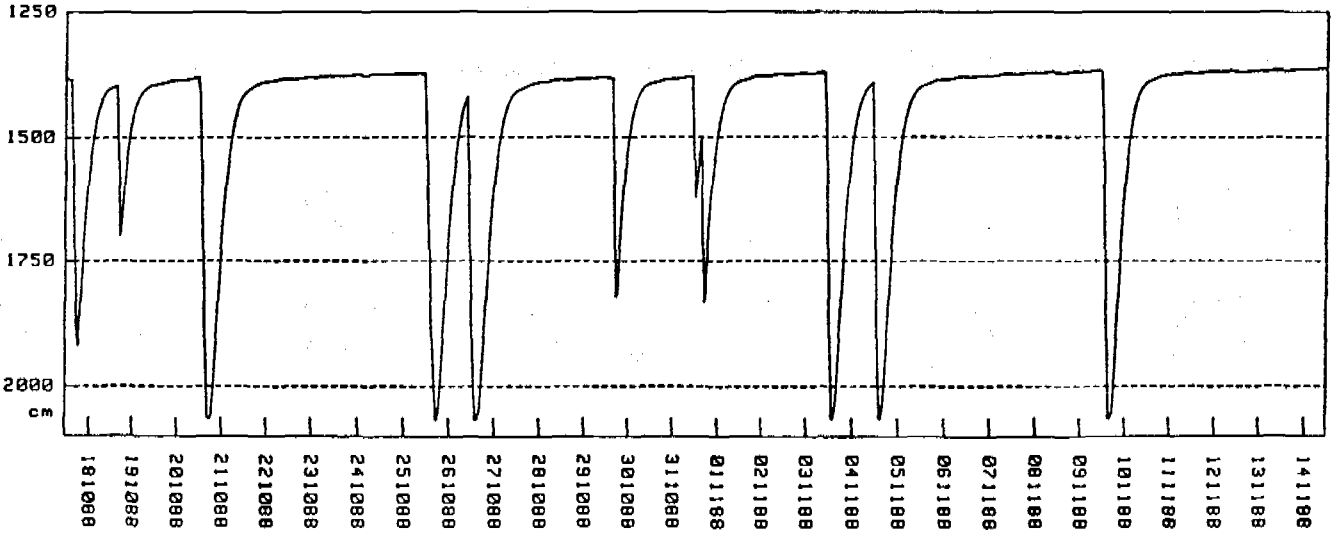
COUNTRY : YEMEN
STATION : Mash'aba - Al Bayda
PROJECT : RIRDP

PLOT OF WATER LEVEL DEPTH

FILE: EP4384P_10
16 Feb 1990 13:06:24



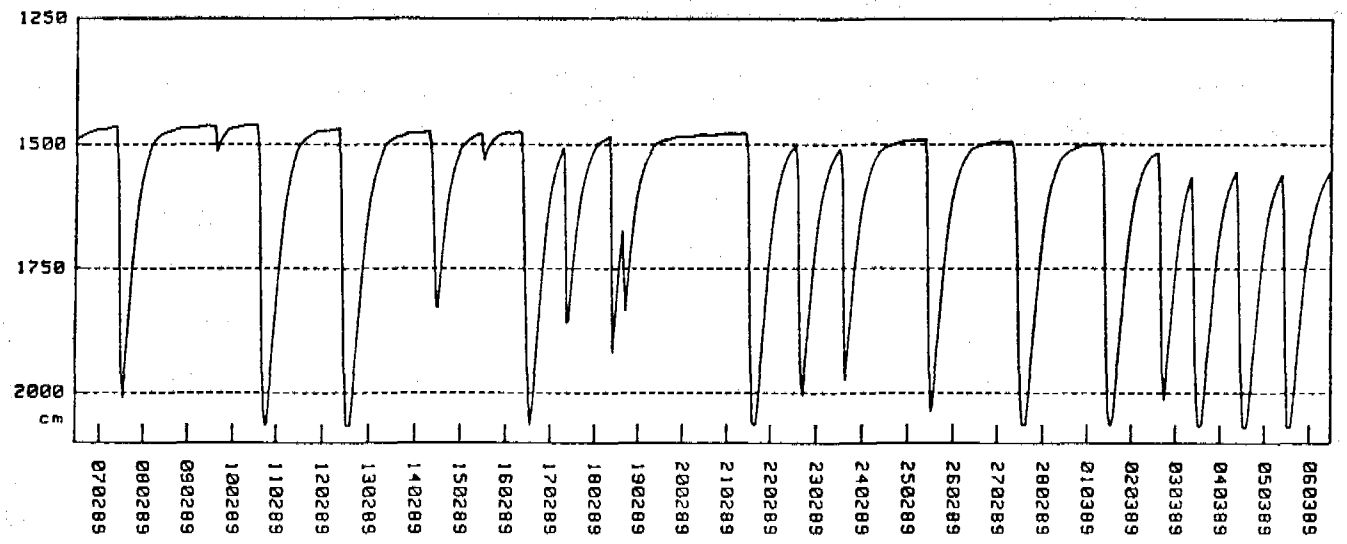


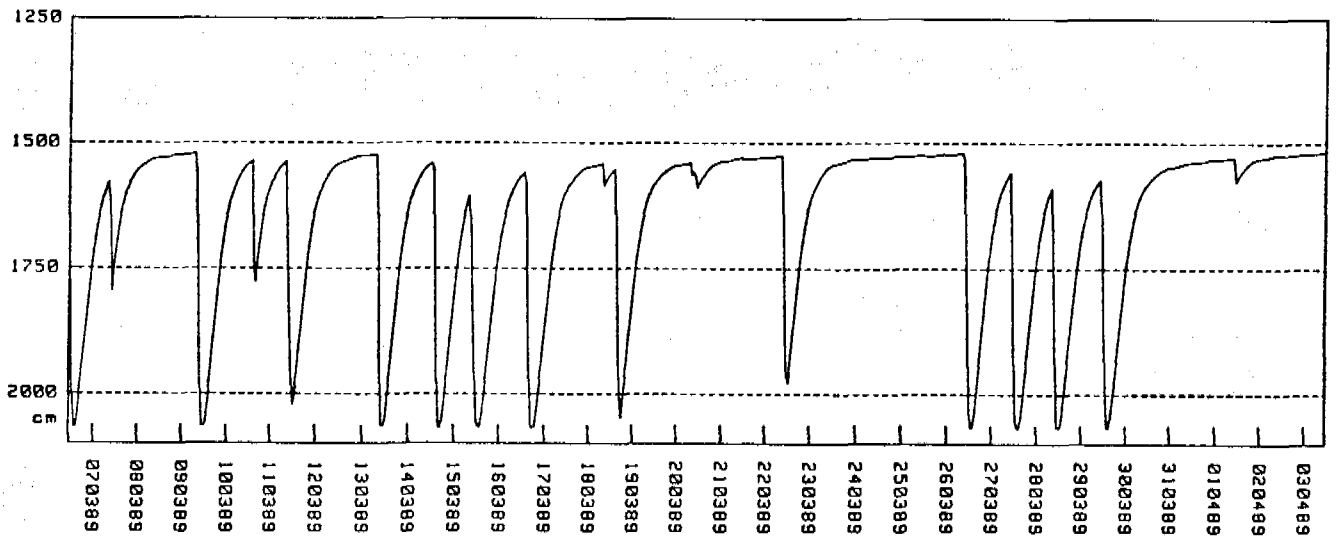


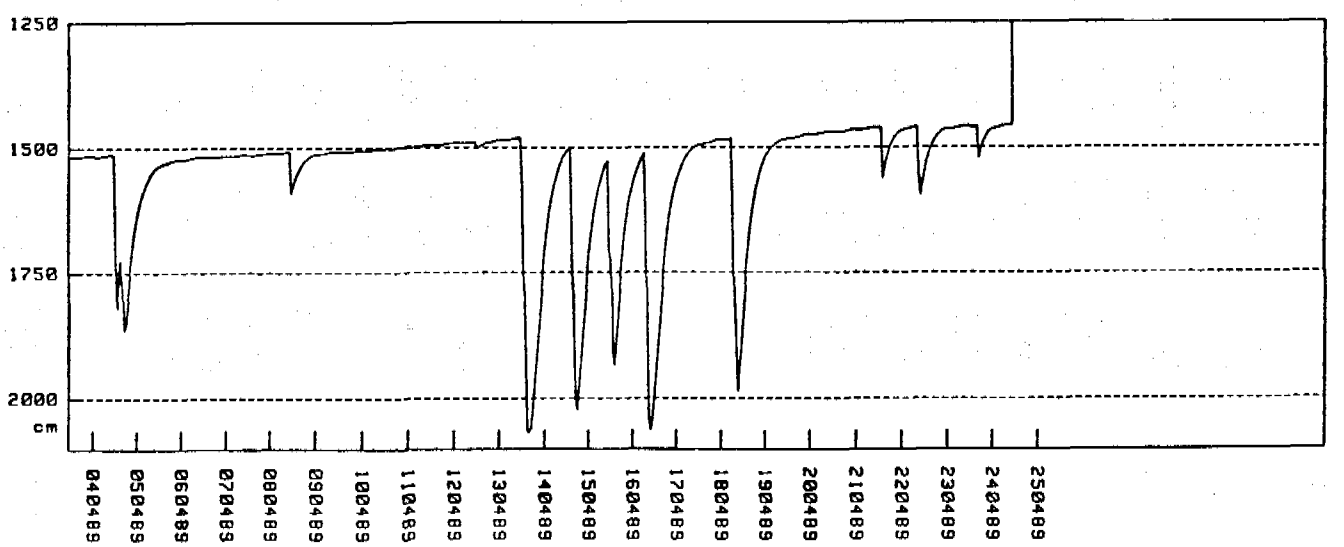
COUNTRY : YEMEN
STATION : Hash'aba - Al Bayda
PROJECT : RIRDP

PLOT OF WATER LEVEL DEPTH

FILE: EP4384P_10
16 Feb 1990 13:20:17



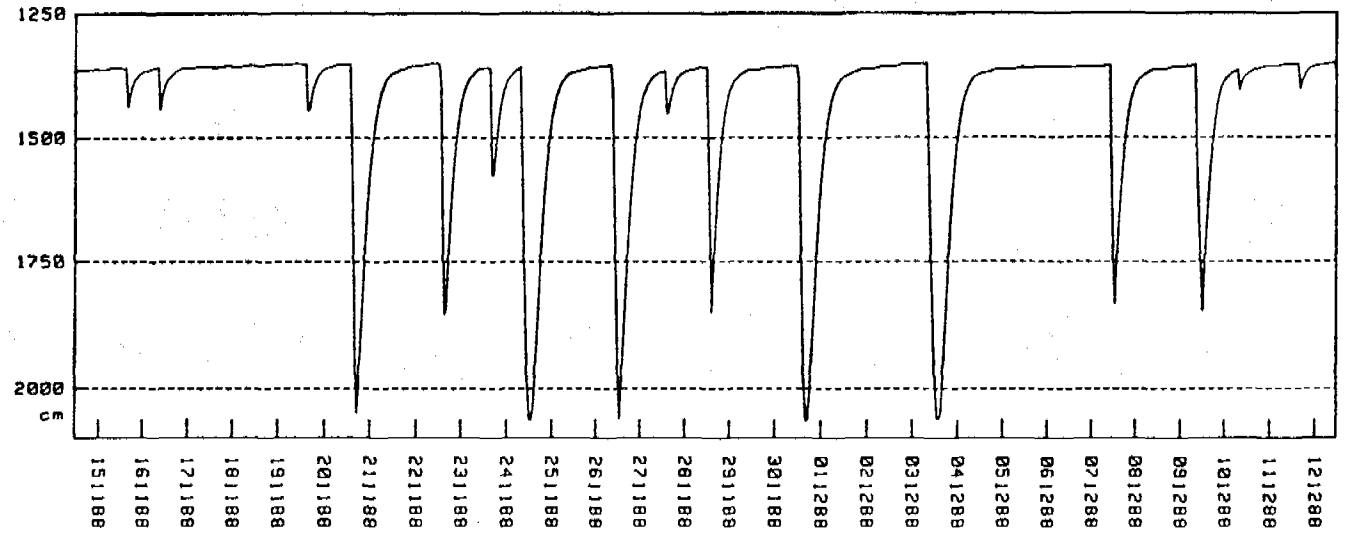


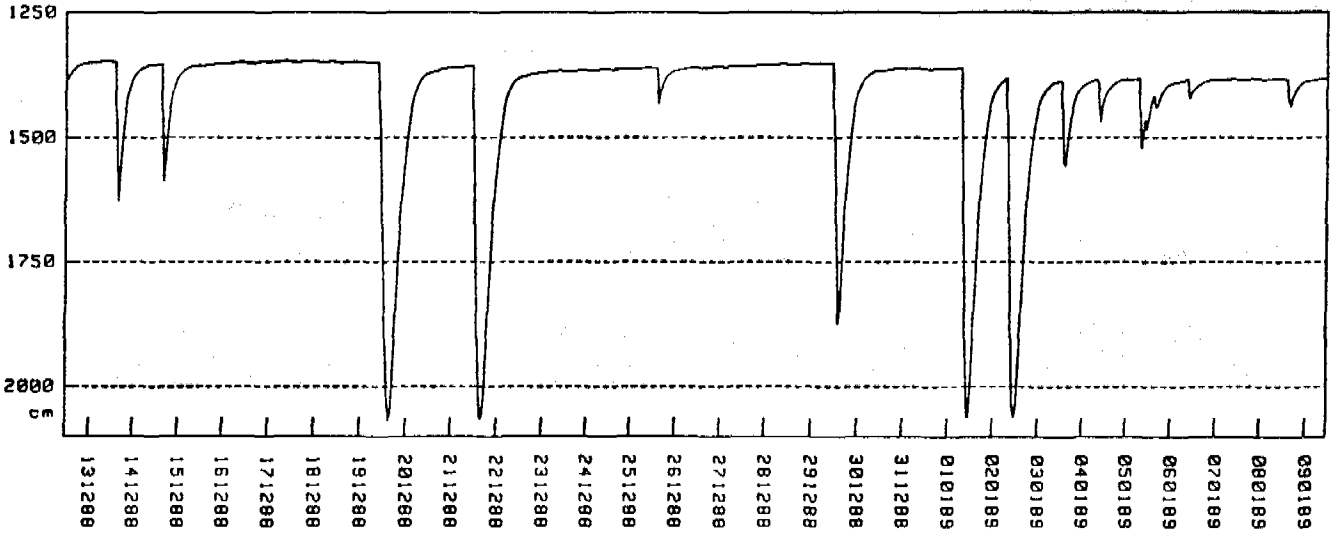


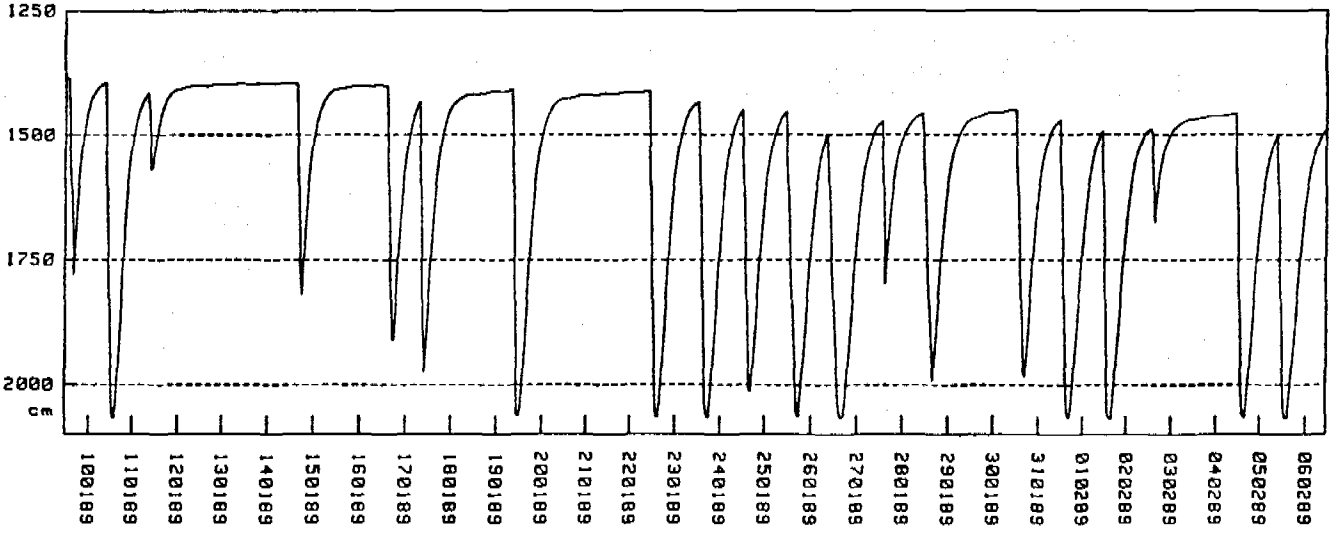
COUNTRY : YEMEN
STATION : Mash'abe - Al Bayda
PROJECT : RIRDP

PLOT OF WATER LEVEL DEPTH

FILE: EP4384P_10
16 Feb 1990 13:13:23







Annex F

Pumping hours derived from preslog data

ANNEX F

PUMPING HOURS DERIVED FROM PRESLOG DATA

WELL ABSTRACTIONS

F.3 Pumping hours in a well at As-Sawma'a, Al Bayda, EP4353P-0
F.4 Pumping hours a well at Al Junubah, Al Bayda; file: EP4320P-10
F.5 Pumping hours in well No 2164 at Mash'abah, Al Bayda, EP4345P-0
F.6 Pumping hours in well No 2164 at Mash'abah, Al Bayda, EP4384P-10
F.7 Pumping hours in well No 1272 at Mudhur, Al Bayda area, EP4340-0
F.8 Pumping hours in well No 1272 at Mudhur, Al Bayda area, file EP4340P-0
F.9 Pumping hours in well No 2011 at Qariat Mushair, Al Bayda, EP4347P-0
F.10 Daily pumping in well No 2011 at Qariat Mush in cu.m/d.
F.11 Pumping hours in well No 2011 at Gariat Mushayr, Al Bayda, EP4352P-10
F.12 Daily pumping in well No 2011 at Qariat Mushayr, Al Bayda, in cu.m/d.
F.13 Pumping hours a well at Al Junubah, Al Bayda; file EP4310P-10
F.14 Pumping hours in well No 2164 at Mash'abah, Al Bayda, EP4345P-0
F.15 Pumping hours in well No 2164 at Mash'abah, Al Bayda, EP4384P-10
F.16 Pumping hours in well No 1272 at Mudhur, Al Bayda area; File EP4340-0
F.17 Daily pumping in well No 1272 at Mudhur, Al Bayda area in cu.m/d. EP4340P-0
F.18 Pumping hours in a well at Sharaf, Al Bayda, EP4324P-12
F.19 Pumping hours in well No 6091 at Ar Rubat, Wadi Dhina'm. EP4344P-0
F.20 Pumping hours in well No 4852 at Zanabah, wadi Amad, EP4343P-0
F.21 Pumping hours in well No 5661 at Al Funabah, Wadi Matar, EP4348P-0
F.22 Daily Pumping in well No 5661 at Al Funubah, Wadi Matar, in cu.m/d.
F.23 Pumping hours in well No 736 at Ghawl Azraq, Rada area, EP431P-0
F.24 Pumping hours in well No 736 at Qawl Azraq, Rada area, EP4370P-0
F.25 Pumping hours in well No 259 at Hanaka Masud, Rada area, EP4322P-
F.26 Daily pumping in well No 259 at Hanaka Masud, Rada area in cu.m/d.
F.27 Pumping hours in well No 824 at Maghrabah, Rada area, EP4373p-0
F.28 Daily pumping in well No 824 at Maghrabah, Rada area, in cu.m/d.
F.29 Pumping hours in well No 566 at Qusair, Rada area, EP4324P-0
F.30 Daily pumping in well No 566 at Qusair, Rada area, in cu.m/d.
F.31 Pumping hours in well No 734 at Wadi Sir, Rada area, EP4320P-0

F.3

Daily pumping hours in a well at As-Sawma'a, Al Bayda ,EP4353P_0

	1987			1988			
	Oct	Nov	Dec	Jan	Feb	March	April
1		0	0	0	5	1	3
2		0	0	0	4	1	2
3		2	0	0	1	0	2
4		2	0	0	8	3	4
5		0	0	0	0	8	3
6		0	0	0	0	0	2
7		0	0	0	0	11	2
8		0	2	0	11	0	4
9		0	0	1	0	0	5
10		0	0	0	5	0	4
11	4	0	0	0	0	0	3
12	0	0	0	0	0	4	2
13	0	2	0	0	1	3	4
14	0	0	0	0	0	2	2
15	0	0	0	0	0	3	1
16	0	0	0	1	0	1	9
17	0	0	0	0	15	2	3
18	2	0	0	0	0	0	3
19	3	2	0	0	1	4	3
20	0	0	3	3	2	0	1
21	0	0	0	1	0	2	10
22	2	0	2	4	0	0	2
23	0	0	0	1	16	2	2
24	0	0	0	3	0	3	0
25	1	0	0	2	0	2	1
26	2	3	0	1	10	1	2
27	0	1	0	0	1	4	0
28	0	0	0	11	3	2	3
29	0	0	0	0	1	3	3
30	0	0	5	0	0	0	2
31	2	0	0	0	0	2	0
	16	12	12	28	84	64	87

TOTAL 303

Pumping hours a well at Al Jurubah, Al Bayda; file: EP4320P_10

	1987											1988			
	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April
1		0	0	0	0	4	7	3	9	0	0	4	10	0	0
2		0	0	0	0	9	5	7	5	0	4	0	10	0	9
3		0	0	0	0	8	8	9	2	0	6	0	9	0	0
4		0	0	0	0	0	0	7	0	0	9	10	8	0	0
5		0	0	0	4	0	0	4	3	8	2	7	0	0	11
6		0	0	0	6	7	6	8	5	9	0	7	10	0	11
7		0	0	0	0	8	6	1	6	13	0	4	5	9	7
8		0	0	0	4	8	0	0	0	0	0	0	0	13	8
9		0	0	0	0	11	5	0	6	0	0	6	0	11	0
10		0	0	0	0	10	5	0	8	0	0	0	0	5	10
11		0	0	0	0	10	10	0	0	0	12	9	0	10	4
12	2	0	0	0	10	0	8	1	7	0	11	0	0	11	0
13	0	0	0	0	0	0	9	8	0	0	8	0	0	11	
14	7	0	0	0	3	0	3	9	0	0	8	10	0	0	
15	0	0	0	10	6	0	7	9	0	7	7	0	0	6	
16	0	0	0	11	8	4	6	2	0	1	7	0	0	3	
17	7	0	0	10	9	0	0	8	10	8	0	11	0	9	
18	2	0	0	12	5	0	9	7	9	10	8	10	0	9	
19	4	0	0	12	0	10	8	6	12	4	5	12	0	3	
20	7	0	0	12	0	4	6	7	5	11	7	13	0	12	
21	7	0	0	9	0	4	0	7	11	0	5	0	0	13	
22	0	0	0	0	8	12	0	3	8	4	0	0	0	0	
23	0	0	0	0	10	9	0	4	11	10	0	0	0	13	
24	0	0	0	0	0	5	1	5	4	0	0	0	0	12	
25	0	0	0	0	0	7	0	0	10	9	0	0	0	13	
26	10	0	0	0	0	3	0	0	9	8	0	0	0	0	
27	9	0	0	0	0	1	0	5	2	0	0	0	0	0	
28	0	0	0	0	0	10	0	7	9	13	0	0	0	14	
29	0	0	0	0	0	7	9	6	9	13	0	0	0	2	
30	0	0	0	0	0	11	9	0	0	0	0	0	0	0	
31	0	0	0	0	0	11	8	0	0	0	0	6	0	3	
	55	0	0	76	73	173	135	133	160	128	99	109	52	182	60

TOTAL 1435

Pumping hours in well No 2164 at Nash'abah, Al Bayda,EP4345P_0

	1985	1986					
	Dec	Jan	Feb	March	April	May	June
1		2	0	0	2	0	0
2		0	4	2	0	12	0
3		0	0	17	1	3	0
4		0	1	16	0	0	0
5		0	0	0	0	0	0
6		0	0	0	15	12	0
7		0	1	9	0	0	0
8		0	0	2	15	4	0
9		15	0	10	0	0	17
10		0	10	9	0	0	0
11	1	14	0	9	0	4	3
12	0	0	0	0	0	2	5
13	0	0	2	0	0	0	6
14	0	0	14	1	2	0	1
15	2	0	1	3	0	12	13
16	8	0	10	13	0	0	8
17	11	0	0	10	11	2	0
18	12	0	8	0	0	3	0
19	10	9	0	0	0	0	0
20	0	0	13	6	0	7	14
21	0	0	0	0	0	1	3
22	0	11	0	0	0	0	2
23	2	0	7	15	4	0	4
24	0	0	10	2	0	0	7
25	0	12	0	4	11	0	0
26	0	12	0	0	0	2	6
27	8	0	4	6	8	0	0
28	0	0	0	2	1	0	0
29	1	11		1	7	0	0
30	0	0		8	0	0	0
31	0	15		2		0	0
	55	101	85	147	77	64	89
TOTAL	618						

Pumping hours in well No. 2164 at Mashabe ,Al Bayda , EP4384P_10

	1988								1989			
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April
1		0	1	1	0	2	0	0	4	5	6	1
2		11	2	0	0	6	0	0	5	1	4	0
3		13	1	0	0	0	5	8	2	0	6	0
4		6	1	3	1	0	5	0	1	5	6	5
5		0	1	0	0	3	0	0	3	6	5	0
6		13	1	0	0	0	0	0	1	0	5	0
7		1	2	0	0	0	0	3	0	4	2	0
8		1	4	11	2	0	0	0	2	0	0	1
9		2	1	9	0	6	6	4	3	1	6	0
10		1	1	0	0	3	0	1	5	6	2	0
11		0	1	0	2	5	0	1	3	0	4	0
12		14	2	0	2	0	0	2	0	6	0	0
13		2	1	10	1	4	0	2	0	0	5	6
14		1	1	0	1	4	0	1	3	5	4	4
15		1	1	10	0	4	1	0	0	1	6	4
16		1	2	7	1	0	1	0	4	5	6	4
17		1	2	0	0	4	0	0	3	3	0	0
18	0	1	1	0	1	2	0	0	0	4	5	4
19	0	1	1	0	0	0	2	7	4	0	0	0
20	0	1	1	9	1	7	4	0	0	0	1	0
21	0	1	1	0	1	0	0	5	0	6	0	1
22	0	1	0	0	0	0	3	0	5	4	4	2
23	0	1	7	2	2	0	2	0	6	3	0	1
24	0	3	0	0	7	0	6	0	5	0	0	
25	0	1	8	0	5	8	0	1	7	4	0	
26	0	1	9	0	0	6	5	0	9	0	5	
27	0	2	1	2	4	0	2	0	2	8	5	
28	0	1	1	3	0	0	3	0	6	0	5	
29	0	1	0	0	0	2	0	3	0		5	
30	1	1	4	0	0	0	6	0	5		0	
31	1		0	3		4		0	5		0	
	2	84	59	70	31	70	51	38	93	77	97	33

TOTAL 705

Pumping hours in well no 1272 at Mudhur, Al Bayda area; file EP4340-0

	1986			
	Aug	Sep	Oct	Nov
1		5	3	1
2		4	4	0
3		3	3	0
4		4	3	0
5		5	2	0
6		3	3	0
7		3	2	0
8		4	3	0
9		3	3	1
10		2	3	0
11		3	3	0
12		4	3	0
13	3	3	3	0
14	5	4	2	0
15	2	2	3	0
16	3	2	2	1
17	7	4	2	0
18	3	2	3	0
19	3	2	2	0
20	5	2	4	3
21	4	2	4	1
22	3	3	2	4
23	3	3	3	1
24	2	3	3	3
25	1	2	1	2
26	0	3	3	1
27	0	1	3	0
28	0	5	2	11
29	2	7	4	0
30	1	3	3	0
31	6	0	3	0
	53	96	87	29

TOTAL 265

Daily pumping in well No.1272 at Mudhur,Al Bayda area in cu.m/d. EP4340P_0

	1986			
	Aug	Sep	Oct	Nov
1		145	87	29
2		116	116	0
3		87	87	0
4		116	87	0
5		145	58	0
6		87	87	0
7		87	58	0
8		116	87	0
9		87	87	29
10		58	87	0
11		87	87	0
12		116	87	0
13	87	87	87	0
14	145	116	58	0
15	58	58	87	0
16	87	58	58	29
17	203	116	58	0
18	87	58	87	0
19	87	58	58	0
20	145	58	116	87
21	116	58	116	29
22	87	87	58	116
23	87	87	87	29
24	58	87	87	87
25	29	58	29	58
26	0	87	87	29
27	0	29	87	0
28	0	145	58	319
29	58	203	116	0
30	29	87	87	0
31	174		87	
	1537	2784	2523	841
TOTAL	7685			

pumping rate in cu.m/hour 29

Pumping hours in well no 2011 at Qariat Mushair,Al Bayda,EP4347P_0

	1985	1986			
	Dec	Jan	Feb	March	Apr
1		8	18	7	0
2		9	22	10	0
3		9	10	0	0
4		10	11	0	0
5		10	13	0	0
6		11	14	2	2
7		0	10	2	0
8		10	10	2	9
9		10	11	1	10
10		11	12	0	1
11	5	10	11	0	0
12	11	0	16	0	13
13	6	17	12	10	0
14	10	17	12	12	11
15	11	17	14	12	0
16	5	0	10	2	12
17	2	17	11	0	16
18	7	18	12	11	15
19	5	0	0	11	12
20	6	17	14	2	12
21	7	17	12	2	0
22	12	18	20	0	0
23	8	18	19	11	0
24	8	0	0	11	0
25	16	12	12	10	0
26	16	10	0	11	0
27	18	11	16	11	0
28	8	13	1	12	0
29	17	11	0	10	0
30	7	10	0	13	0
31	8	16		0	0
	193	337	323	175	113
TOTAL	1141				

F.10

Daily pumping in well No.2011 at Qariat Mush in cu.m/d.

	1985	1986			
	Dec	Jan	Feb	March	Apr
1		200	450	175	0
2		225	550	250	0
3		225	250	0	0
4		250	275	0	0
5		250	325	0	0
6		275	350	50	50
7		0	250	50	0
8		250	250	50	225
9		250	275	25	250
10		275	300	0	25
11	125	250	275	0	0
12	275	0	400	0	325
13	150	425	300	250	0
14	250	425	300	300	275
15	275	425	350	300	0
16	125	0	250	50	300
17	50	425	275	0	400
18	175	450	300	275	375
19	125	0	0	275	300
20	150	425	350	50	300
21	175	425	300	50	0
22	300	450	500	0	0
23	200	450	475	275	0
24	200	0	0	275	0
25	400	300	300	250	0
26	400	250	0	275	0
27	450	275	400	275	0
28	200	325	25	300	0
29	425	275		250	0
30	175	250		325	0
31	200	400		0	
	4825	8425	8075	4375	2825
TOTAL	28525				

pumping rate in cu.m/hour 25

Pumping hours in well no 2011 at Gariat Mushayr, Al Bayda,EP4352P_10

	1988								1989			
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April
1		0	1	0	0	2	0	5	6	0	5	0
2		0	0	0	1	2	0	0	5	0	6	0
3		1	0	1	0	0	0	0	2	6	6	0
4		0	3	0	0	0	0	2	5	6	5	0
5		2	0	0	1	7	0	0	0	6	4	0
6		0	0	0	0	7	3	0	3	2	0	0
7		0	1	1	1	7	1	0	2	4	3	0
8		1	0	0	0	2	2	0	5	0	2	0
9		0	0	0	0	1	1	0	1	0	3	0
10		0	1	0	0	4	0	0	2	0	3	0
11		1	0	0	0	0	0	6	0	4	1	0
12		0	0	1	0	1	0	0	0	0	3	0
13		0	1	0	0	0	1	3	0	0	3	0
14		0	0	0	0	0	1	0	3	7	3	0
15		1	0	1	2	4	0	0	0	3	3	0
16		0	0	0	0	0	0	0	4	0	3	0
17		0	7	0	0	3	4	0	0	0	1	0
18		1	0	0	0	0	0	3	0	0	1	5
19		0	0	1	4	1	0	0	0	4	1	3
20		1	1	0	0	5	0	0	0	2	4	0
21		0	0	0	0	6	2	0	0	4	0	0
22		1	0	1	0	0	2	0	6	3	0	0
23		0	2	0	3	0	0	0	4	0	0	0
24		0	0	0	0	0	0	0	0	5	0	0
25		1	0	1	3	3	0	7	0	4	0	
26		0	2	0	0	4	0	0	3	0	0	
27		0	0	0	0	0	4	0	2	6	0	
28		1	0	1	0	3	0	2	0	3	1	
29		0	1	1	0	0	0	0	4		0	
30		0	0	1	4	0	0	0	6		0	
31	1	0	0	2	0	2	0	4	2		0	
	1	11	20	12	19	64	21	32	65	69	61	8

TOTAL 383

Daily pumping in well No.2011 at Qariat Mushayr,Al Bayda, in cu.m/d.

	1988								1989		
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April
1		0	25	0	0	50	0	125	150	0	110	0
2		0	0	0	25	50	0	0	125	0	132	0
3		25	0	25	0	0	0	0	50	150	132	0
4		0	75	0	0	0	0	50	125	150	110	0
5		50	0	0	25	175	0	0	0	150	88	0
6		0	0	0	0	175	75	0	75	50	0	0
7		0	25	25	25	175	25	0	50	100	66	0
8		25	0	0	0	50	50	0	125	0	44	0
9		0	0	0	0	25	25	0	25	0	66	0
10		0	25	0	0	100	0	0	50	0	66	0
11		25	0	0	0	0	0	150	0	100	22	0
12		0	0	25	0	25	0	0	0	0	66	0
13		0	25	0	0	0	25	75	0	0	66	0
14		0	0	0	0	0	25	0	75	175	66	0
15		25	0	25	50	100	0	0	0	75	66	0
16		0	0	0	0	0	0	0	100	0	66	0
17		0	175	0	0	75	100	0	0	0	22	0
18		25	0	0	0	0	0	75	0	0	22	110
19		0	0	25	100	25	0	0	0	100	22	66
20		25	25	0	0	125	0	0	0	50	88	0
21		0	0	0	0	150	50	0	0	100	0	0
22		25	0	25	0	0	50	0	150	75	0	0
23		0	50	0	75	0	0	0	100	0	0	0
24		0	0	0	0	0	0	0	0	125	0	0
25		25	0	25	75	75	0	175	0	100	0	
26		0	50	0	0	100	0	0	75	0	0	
27		0	0	0	0	0	100	0	50	150	0	
28		25	0	25	0	75	0	50	0	75	22	
29		0	25	25	0	0	0	0	100		0	
30		0	0	25	100	0	0	0	150		0	
31	25		0	50		50		100	50		0	
	25	275	500	300	475	1600	525	800	1625	1725	1342	176
TOTAL	9575											

pumping rate in cu,m/hour 25

Pumping hours a well at Al Junubah, Al Bayda; file: EP4320P_10

	1987											1988			
	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April
1		0	0	0	0	4	7	3	9	0	0	4	10	0	0
2		0	0	0	0	9	5	7	5	0	4	0	10	0	9
3		0	0	0	0	8	8	9	2	0	6	0	9	0	0
4		0	0	0	0	0	0	7	0	0	9	10	8	0	0
5		0	0	0	4	0	0	4	3	8	2	7	0	0	11
6		0	0	0	6	7	6	8	5	9	0	7	10	0	11
7		0	0	0	0	8	6	1	6	13	0	4	5	9	7
8		0	0	0	4	8	0	0	0	0	0	0	0	13	8
9		0	0	0	0	11	5	0	6	0	0	6	0	11	0
10		0	0	0	0	10	5	0	8	0	0	0	0	5	10
11		0	0	0	0	10	10	0	0	0	12	9	0	10	4
12	2	0	0	0	10	0	8	1	7	0	11	0	0	11	0
13	0	0	0	0	0	0	9	8	0	0	8	0	0	11	
14	7	0	0	0	3	0	3	9	0	0	8	10	0	0	
15	0	0	0	10	6	0	7	9	0	7	7	0	0	6	
16	0	0	0	11	8	4	6	2	0	1	7	0	0	3	
17	7	0	0	10	9	0	0	8	10	8	0	11	0	9	
18	2	0	0	12	5	0	9	7	9	10	8	10	0	9	
19	4	0	0	12	0	10	8	6	12	4	5	12	0	3	
20	7	0	0	12	0	4	6	7	5	11	7	13	0	12	
21	7	0	0	9	0	4	0	7	11	0	5	0	0	13	
22	0	0	0	0	8	12	0	3	8	4	0	0	0	0	
23	0	0	0	0	10	9	0	4	11	10	0	0	0	13	
24	0	0	0	0	0	5	1	5	4	0	0	0	0	12	
25	0	0	0	0	0	7	0	0	10	9	0	0	0	13	
26	10	0	0	0	0	3	0	0	9	8	0	0	0	0	
27	9	0	0	0	0	1	0	5	2	0	0	0	0	0	
28	0	0	0	0	0	10	0	7	9	13	0	0	0	14	
29	0	0	0	0	0	7	9	6	9	13	0	0	0	2	
30	0	0	0	0	0	11	9	0	0	0	0	0	0	0	
31	0	0	0	0	0	11	8	0	0	0	0	6	0	3	
	55	0	0	76	73	173	135	133	160	128	99	109	52	182	60

TOTAL 1435

Pumping hours in well No 2164 at Mash'abah, Al Bayda,EP4345P_0

	1985	1986					
	Dec	Jan	Feb	March	April	May	June
1		2	0	0	2	0	0
2		0	4	2	0	12	0
3		0	0	17	1	3	0
4		0	1	16	0	0	0
5		0	0	0	0	0	0
6		0	0	0	15	12	0
7		0	1	9	0	0	0
8		0	0	2	15	4	0
9		15	0	10	0	0	17
10		0	10	9	0	0	0
11	1	14	0	9	0	4	3
12	0	0	0	0	0	2	5
13	0	0	2	0	0	0	6
14	0	0	14	1	2	0	1
15	2	0	1	3	0	12	13
16	8	0	10	13	0	0	8
17	11	0	0	10	11	2	0
18	12	0	8	0	0	3	0
19	10	9	0	0	0	0	0
20	0	0	13	6	0	7	14
21	0	0	0	0	0	1	3
22	0	11	0	0	0	0	2
23	2	0	7	15	4	0	4
24	0	0	10	2	0	0	7
25	0	12	0	4	11	0	0
26	0	12	0	0	0	2	6
27	8	0	4	6	8	0	0
28	0	0	0	2	1	0	0
29	1	11		1	7	0	0
30	0	0		8	0	0	0
31	0	15		2		0	0
	55	101	85	147	77	64	89

TOTAL 618

Pumping hours in well No. 2164 at Mashaba ,Al Bayda , EP4384P_10

	1988								1989			
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April
1		0	1	1	0	2	0	0	4	5	6	1
2		11	2	0	0	6	0	0	5	1	4	0
3		13	1	0	0	0	5	8	2	0	6	0
4		6	1	3	1	0	5	0	1	5	6	5
5		0	1	0	0	3	0	0	3	6	5	0
6		13	1	0	0	0	0	0	1	0	5	0
7		1	2	0	0	0	0	3	0	4	2	0
8		1	4	11	2	0	0	0	2	0	0	1
9		2	1	9	0	6	6	4	3	1	6	0
10		1	1	0	0	3	0	1	5	6	2	0
11		0	1	0	2	5	0	1	3	0	4	0
12		14	2	0	2	0	0	2	0	6	0	0
13		2	1	10	1	4	0	2	0	0	5	6
14		1	1	0	1	4	0	1	3	5	4	4
15		1	1	10	0	4	1	0	0	1	6	4
16		1	2	7	1	0	1	0	4	5	6	4
17		1	2	0	0	4	0	0	3	3	0	0
18	0	1	1	0	1	2	0	0	0	4	5	4
19	0	1	1	0	0	0	2	7	4	0	0	0
20	0	1	1	9	1	7	4	0	0	0	1	0
21	0	1	1	0	1	0	0	5	0	6	0	1
22	0	1	0	0	0	0	3	0	5	4	4	2
23	0	1	7	2	2	0	2	0	6	3	0	1
24	0	3	0	0	7	0	6	0	5	0	0	
25	0	1	8	0	5	8	0	1	7	4	0	
26	0	1	9	0	0	6	5	0	9	0	5	
27	0	2	1	2	4	0	2	0	2	8	5	
28	0	1	1	3	0	0	3	0	6	0	5	
29	0	1	0	0	0	2	0	3	0		5	
30	1	1	4	0	0	0	6	0	5		0	
31	1		0	3		4		0	5		0	
	2	84	59	70	31	70	51	38	93	77	97	33

TOTAL 705

Pumping hours in well no 1272 at Mudhur, Al Bayda area; file EP4340-0

	1986			
	Aug	Sep	Oct	Nov
1		5	3	1
2		4	4	0
3		3	3	0
4		4	3	0
5		5	2	0
6		3	3	0
7		3	2	0
8		4	3	0
9		3	3	1
10		2	3	0
11		3	3	0
12		4	3	0
13	3	3	3	0
14	5	4	2	0
15	2	2	3	0
16	3	2	2	1
17	7	4	2	0
18	3	2	3	0
19	3	2	2	0
20	5	2	4	3
21	4	2	4	1
22	3	3	2	4
23	3	3	3	1
24	2	3	3	3
25	1	2	1	2
26	0	3	3	1
27	0	1	3	0
28	0	5	2	11
29	2	7	4	0
30	1	3	3	0
31	6	0	3	0
	53	96	87	29

TOTAL 265

Daily pumping in well No.1272 at Mudhur,Al Bayda area in cu.m/d. EP4340P_0

	1986			
	Aug	Sep	Oct	Nov
1		145	87	29
2		116	116	0
3		87	87	0
4		116	87	0
5		145	58	0
6		87	87	0
7		87	58	0
8		116	87	0
9		87	87	29
10		58	87	0
11		87	87	0
12		116	87	0
13	87	87	87	0
14	145	116	58	0
15	58	58	87	0
16	87	58	58	29
17	203	116	58	0
18	87	58	87	0
19	87	58	58	0
20	145	58	116	87
21	116	58	116	29
22	87	87	58	116
23	87	87	87	29
24	58	87	87	87
25	29	58	29	58
26	0	87	87	29
27	0	29	87	0
28	0	145	58	319
29	58	203	116	0
30	29	87	87	0
31	174		87	
	1537	2784	2523	841
TOTAL	7685			

pumping rate in cu.m/hour 29

Pumping hours in a well at Sharaf,Al Bayda ,EP4324P_12

	1987				1988									
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct
1		5	3	24	0	4	0	5	4	2	2	2	5	11
2		4	0	0	0	4	0	5	3	0	6	0	0	12
3		3	0	3	0	6	0	5	3	0	3	0	0	8
4		4	3	0	0	5	0	0	4	0	2	0	0	11
5		6	0	2	0	4	0	0	2	1	2	0	0	12
6		3	0	5	1	4	5	0	1	4	0	0	0	7
7		3	0	0	0	5	2	5	3	1	6	0	0	12
8		3	0	0	0	4	0	4	3	2	0	0	3	11
9	13	2	2	0	3	6	0	6	2	0	0	0	0	11
10	4	0	2	0	0	6	3	4	0	0	0	0	0	12
11	4	2	0	0	0	4	4	5	0	5	2	0	0	12
12	4	3	0	1	3	2	1	6	0	4	0	0	2	9
13	5	0	0	0	0	0	6	0	1	4	0	0	0	12
14	4	0	0	0	2	3	7	2	7	3	2	1	0	7
15	5	3	1	0	3	0	4	0	2	0	2	1	0	11
16	4	3	1	4	4	3	3	4	0	0	0	0	0	11
17	5	0	0	0	3	2	5	1	3	0	0	0	0	3
18	4	4	0	3	0	2	4	0	1	0	3	0	0	10
19	0	0	2	6	1	3	5	2	1	1	0	3	0	12
20	5	0	0	3	0	4	0	3	5	0	0	0	0	1
21	3	0	0	0	0	5	3	0	3	3	3	0	0	11
22	3	4	0	3	0	3	1	1	3	0	1	2	0	5
23	3	0	0	3	3	4	2	1	5	0	2	3	0	0
24	3	0	0	2	3	4	1	0	6	2	0	2	0	9
25	3	2	0	0	0	6	4	0	5	2	0	0	0	2
26	4	1	3	0	0	5	5	0	5	5	0	0	12	0
27	4	0	1	3	0	6	3	3	3	2	0	0	12	7
28	4	0	0	4	4	4	5	0	4	2	0	0	13	2
29	2	0	0	4	2		6	0	1	3	0	0	12	
30	4	1	0	0	2		5	3	4	3	0	0	12	
31		0		0	6		4		1		0	4		
	90	56	18	70	40	108	88	65	85	49	36	18	71	231

TOTAL 1025

Pumping hours in well no 6091 at Ar Rubat, Wadi Dhina'm. EP4344P_0

	1985	1986										
	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov
1		4	6	6	10	12	9	9	0	7	2	9
2		6	5	7	11	9	12	12	0	10	8	9
3		3	6	7	3	9	12	6	0	5	8	10
4		4	5	7	9	9	8	4	0	10	8	7
5		4	5	5	8	8	11	9	0	8	8	9
6		5	5	5	6	12	11	6	0	3	10	10
7		4	6	7	8	12	3	7	0	2	10	10
8		2	7	8	11	6	2	7	0	2	8	
9		4	6	8	8	15	6	10	1	12	7	
10		4	5	13	10	11	5	9	7	4	9	
11	2	5	7	9	10	10	8	5	7	9	5	
12	4	6	6	9	6	11	9	7	9	8	9	
13	6	5	5	8	9	8	11	3	2	10	8	
14	5	6	7	8	6	7	6	6	6	8	9	
15	5	5	6	9	5	4	4	6	3	7	9	
16	7	5	5	9	10	11	9	8	3	4	9	
17	6	5	5	8	14	11	10	4	5	3	8	
18	4	6	6	12	11	10	7	7	3	2	11	
19	4	5	6	12	14	12	13	4	4	6	9	
20	5	7	5	11	11	8	11	8	6	5	8	
21	5	5	4	9	7	9	9	8	6	1	9	
22	5	5	6	10	16	7	11	9	3	5	9	
23	4	7	5	11	16	13	8	9	8	6	9	
24	5	9	5	10	15	14	12	9	9	8	9	
25	5	7	6	8	12	12	2	6	6	2	9	
26	4	7	8	12	10	14	4	6	8	3	9	
27	6	6	8	12	9	9	6	6	1	2	9	
28	5	5	6	12	13	9	7	3	4	2	9	
29	5	5		10	9	10	8	9	3	0	9	
30	6	5		13	6	9	7	8	0	5	9	
31	4	6		12		13		4	0		9	
	102	162	162	287	293	314	241	214	104	159	262	64

TOTAL 2364

Pumping hours in well no 4852 at Zanabah, wadi Amad.EP4343P_0.

	1985	1986									
	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct
1		1	2	0	0	0	2	0	0	9	10
2		0	3	1	1	0	0	0	4	6	9
3		0	0	0	0	1	2	2	0	6	3
4		0	0	8	0	0	0	0	0	0	3
5		0	0	0	0	0	0	1	0	1	5
6		5	0	0	0	0	0	0	0	2	12
7		2	0	0	4	0	0	0	0	3	8
8		1	4	0	0	0	0	0	2	9	
9		0	4	0	0	1	0	0	6	11	
10		1	6	3	0	0	0	0	0	11	
11		0	4	2	0	0	0	0	0	8	
12		0	6	3	0	0	0	0	0	10	
13	0	2	5	6	0	5	0	0	0	5	
14	0	2	1	0	0	0	5	0	11	0	
15	0	5	0	0	0	0	0	0	0	0	
16	0	4	0	0	0	0	0	0	4	8	
17	0	2	0	0	0	0	0	0	5	13	
18	0	2	0	0	2	1	0	0	0	12	
19	5	4	0	0	0	0	0	0	6	9	
20	0	4	0	0	0	0	0	2	9	6	
21	0	0	3	0	0	3	0	0	0	6	
22	0	0	0	1	0	2	0	2	0	8	
23	0	1	0	0	1	0	0	0	0	5	
24	0	0	0	0	0	0	0	0	0	7	
25	0	2	2	0	0	0	1	0	0	9	
26	6	2	0	3	0	0	0	0	0	11	
27	3	4	0	0	0	0	2	0	0	8	
28	0	2	0	0	0	0	0	0	0	4	
29	0	4	0	9	1	0	0	0	0	7	
30	0	4	0	0	1	1	0	0	0	5	
31	0	4		0	0	1	0	0	8		
	14	58	40	36	10	15	12	7	55	199	50

TOTAL 496

Pumping hours in well no 5661 at Al Funabah , Wadi Matar ,EP4348P_0

	1985						1986		
	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug
1		1	0	10	10	0	0	7	0
2		0	0	12	11	0	0	16	0
3		0	4	0	19	0	0	0	0
4		0	11	8	0	5	0	0	1
5		9	14	14	9	0	0	4	0
6		0	1	0	10	7	6	5	0
7		10	11	11	1	0	0	0	1
8		7	14	11	0	0	7	7	2
9		0	6	0	0	0	6	12	0
10		0	8	2	0	0	0	5	0
11		0	11	11	0	0	7	7	0
12	0	0	14	0	0	0	0	9	4
13	8	17	2	12	0	0	0	6	0
14	7	11	18	0	0	0	0	13	0
15	8	6	8	8	0	0	0	7	0
16	8	12	9	11	5	0	3	3	1
17	8	10	8	0	0	0	17	16	3
18	9	6	10	16	0	0	9	7	
19	6	7	9	10	0	0	8	0	
20	4	12	11	0	0	0	13	11	
21	9	1	9	8	0	0	9	10	
22	6	6	1	10	21	12	10	0	
23	0	13	12	2	8	13	0	12	
24	9	16	6	11	5	13	9	10	
25	5	7	10	9	17	12	2	0	
26	15	7	10	3	1	10	4	10	
27	9	7	3	11	0	12	12	0	
28	12	7	10	10	0	4	13	0	
29	0	7	0	10	0	7	15	10	
30	0	0	1	11	0	13	6	0	
31	8	0		9	0	16	0	10	
	131	179	231	230	117	124	156	197	12
TOTAL	1377								

Daily pumping in well No.5661 at Al Funabah, Wadi Matar in cu.m/d.

	1985						1986		
	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug
1		14.4	0	144	144	0	0	100.8	0
2		0	0	172.8	158.4	0	0	230.4	0
3		0	57.6	0	273.6	0	0	0	0
4		0	158.4	115.2	0	72	0	0	14.4
5		129.6	201.6	201.6	129.6	0	0	57.6	0
6		0	14.4	0	144	100.8	86.4	72	0
7		144	158.4	158.4	14.4	0	0	0	14.4
8		100.8	201.6	158.4	0	0	100.8	100.8	28.8
9		0	86.4	0	0	0	86.4	172.8	0
10		0	115.2	28.8	0	0	0	72	0
11		0	158.4	158.4	0	0	100.8	100.8	0
12	0	0	201.6	0	0	0	0	129.6	57.6
13	115.2	244.8	28.8	172.8	0	0	0	86.4	0
14	100.8	158.4	259.2	0	0	0	0	187.2	0
15	115.2	86.4	115.2	115.2	0	0	0	100.8	0
16	115.2	172.8	129.6	158.4	72	0	43.2	43.2	14.4
17	115.2	144	115.2	0	0	0	244.8	230.4	43.2
18	129.6	86.4	144	230.4	0	0	129.6	100.8	
19	86.4	100.8	129.6	144	0	0	115.2	0	
20	57.6	172.8	158.4	0	0	0	187.2	158.4	
21	129.6	14.4	129.6	115.2	0	0	129.6	144	
22	86.4	86.4	14.4	144	302.4	172.8	144	0	
23	0	187.2	172.8	28.8	115.2	187.2	0	172.8	
24	129.6	230.4	86.4	158.4	72	187.2	129.6	144	
25	72	100.8	144	129.6	244.8	172.8	28.8	0	
26	216	100.8	144	43.2	14.4	144	57.6	144	
27	129.6	100.8	43.2	158.4	0	172.8	172.8	0	
28	172.8	100.8	144	144	0	57.6	187.2	0	
29	0	100.8	0	144	0	100.8	216	144	
30	0	0	14.4	158.4	0	187.2	86.4	0	
31	115.2	0	0	129.6	0	230.4	0	144	
	1886.	2577.	3326.	3312	1684.	1785.	2246.	2836.	172.8
TOTAL	19828								

Pumping rate: 14.4 cu,m/hour

Pumping hours in well no 736 at Ghawl Azraq, Rada area,EP4314P_0

	1985				1986								
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept
1		6	3	0	8	4	6	8	12	12	0	12	3
2		5	10	0	9	0	5	12	11	9	10	7	10
3		6	9	3	6	4	9	13	5	8	0	6	10
4		12	11	12	5	0	10	2	2	12	8	0	4
5		7	0	10	10	11	5	7	2	12	7	0	12
6		11	12	9	10	10	0	4	3	13	2	0	13
7		9	10	0	4	8	0	0	1	12	12	0	17
8		0	7	7	2	8	0	10	0	0	12	3	10
9		0	0	0	0	2	0	0	9	6	6	10	6
10		9	0	4	0	11	0	0	0	0	0	10	2
11		11	0	12	4	4	13	4	0	8	4	13	10
12	7	10	8	0	11	11	12	0	8	0	0	12	13
13	5	12	10	0	8	12	8	0	4	0	0	14	3
14	4	11	11	0	3	6	11	0	3	0	11	13	13
15	7	10	0	0	9	12	12	0	2	0	7	9	4
16	8	6	10	3	2	13	12	0	1	11	12	13	
17	0	4	0	0	3	12	11	0	4	13	6	13	
18	4	10	0	0	4	4	11	0	13	12	6	11	
19	0	0	10	2	7	0	0	0	14	4	5	10	
20	0	0	7	9	11	0	5	0	13	0	13	12	
21	8	3	0	0	6	0	6	0	13	2	13	13	
22	11	3	0	6	0	3	5	0	14	11	4	5	
23	1	10	0	10	7	7	2	0	14	13	13	0	
24	13	11	0	3	12	12	1	0	14	7	13	8	
25	13	4	0	7	9	10	6	2	13	0	15	0	
26	9	3	0	9	6	2	2	0	13	0	0	0	
27	9	2	0	2	3	0	10	0	10	3	7	2	
28	6	9	0	10	12	0	13	3	0	10	0	12	
29	12	1	0	9	12		0	0	0	2	9	10	
30	13	5	0	9	7		0	0	11	5	2	8	
31		9		2	6		4		0		13	12	
	130	199	118	138	196	166	179	65	209	185	210	238	130
TOTAL	2163												

Pumping hours in well no 736 at Qawl Azraq, Rada area EP4370P_0

	1986				1987										
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov
1		11	0	12	10	0	0	0	11	12	6	13	9	10	7
2		13	7	3	10	0	9	0	12	13	0	13	4	10	6
3		12	5	2	10	0	3	0	13	10	5	3	13	8	5
4		12	12	0	5	0	2	0	0	13	13	0	12	13	0
5		12	12	11	10	0	0	0	2	13	13	11	7	15	9
6		11	8	0	11	0	0	0	2	7	13	11	11	14	11
7		12	4	5	10	7	0	0	0	13	13	11	8	11	1
8		12	6	12	9	0	0	0	0	13	11	12	11	10	8
9		11	2	6	7	11	0	0	4	10	0	9	12	12	0
10		8	11	1	6	8	0	4	0	10	10	0	5	3	0
11		9	11	11	0	9	0	0	0	12	5	1	12	6	2
12	0	12	0	11	0	7	0	0	0	13	5	0	12	7	4
13	0	13	4	9	4	8	0	0	1	7	11	0	7	9	7
14	0	4	11	3	0	11	0	0	12	4	12	2	9	11	6
15	0	4	8	0	10	10	0	0	5	0	7	13	11	5	4
16	0	9	7	9	5	9	0	0	12	11	3	13	13	11	5
17	0	10	11	11	7	0	0	2	6	13	10	4	11	5	4
18	9	0	10	0	0	0	0	4	10	13	12	11	13	11	
19	12	11	6	10	0	3	0	1	13	11	11	10	13	11	
20	13	10	9	0	4	2	0	0	13	7	11	12	14	10	
21	13	7	5	0	2	5	0	0	14	11	13	12	12	10	
22	9	7	10	0	1	6	0	8	13	13	10	12	12	11	
23	11	7	0	2	6	11	0	9	13	10	14	12	12	2	
24	9	11	0	5	11	0	0	2	11	2	9	12	12	3	
25	13	4	0	2	10	0	0	10	4	0	12	13	12	8	
26	13	6	0	0	9	9	0	0	13	1	11	13	0	2	
27	10	11	0	0	11	4	0	0	5	7	0	13	13	5	
28	0	11	11	1	11	0	0	6	0	10	11	0	13	4	
29	13	11	0	0	9		0	11	2	4	11	11	5	3	
30	3	10	0	0	8		0	2	13	4	0	8	9	1	
31		7		2	12		0		1		10	11		7	
	128	288	170	128	208	120	14	59	205	267	272	266	307	248	79

TOTAL 2759

Pumping hours in well no 259 at Hanaka Masud, Rada area ,EP4322P_

	1985				1986				
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May
1		4	0	2	0	0	0	3	0
2		2	2	1	2	1	0	3	0
3		3	0	2	2	3	0	3	0
4		2	2	3	0	2	2	3	1
5		1	0	3	1	4	2	0	0
6		0	2	2	0	3	0	0	0
7		1	0	4	0	2	0	2	1
8		3	0	4	0	1	0	1	2
9		3	1	2	0	1	3	2	0
10		2	1	1	2	0	3	1	0
11		0	2	1	0	2	1	0	0
12		2	0	1	3	2	2	2	4
13		1	2	0	0	2	3	0	0
14		0	0	0	4	2	2	0	0
15		0	0	0	3	2	2	0	0
16		2	2	0	2	2	2	0	1
17		0	0	3	0	2	3	0	3
18	3	1	0	3	2	0	2	0	
19	4	2	0	1	2	1	2	3	
20	0	0	3	0	2	0	0	4	
21	3	4	3	0	2	1	1	1	
22	3	3	2	1	0	1	3	2	
23	2	0	2	0	2	1	2	0	
24	4	0	2	0	0	3	1	0	
25	5	0	0	0	3	2	2	2	
26	2	2	1	0	2	2	1	3	
27	3	3	0	1	0	2	0	2	
28	1	1	0	0	3	0	0	1	
29	3	0	0	1	1		0	2	
30	3	0	1	2	1		3	2	
31		0		0	2		2		
	36	42	28	38	41	44	44	42	12

TOTAL 327

Daily pumping in well No.259 at Hanaka Masud, Rada area in cu.m/d.

	1985				1986				
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May
1		116	0	58	0	0	0	87	0
2		58	58	29	58	29	0	87	0
3		87	0	58	58	87	0	87	0
4		58	58	87	0	58	58	87	29
5		29	0	87	29	116	58	0	0
6		0	58	58	0	87	0	0	0
7		29	0	116	0	58	0	58	29
8		87	0	116	0	29	0	29	58
9		87	29	58	0	29	87	58	0
10		58	29	29	58	0	87	29	0
11		0	58	29	0	58	29	0	0
12		58	0	29	87	58	58	58	116
13		29	58	0	0	58	87	0	0
14		0	0	0	116	58	58	0	0
15		0	0	0	87	58	58	0	0
16		58	58	0	58	58	58	0	29
17	0	0	0	87	0	58	87	0	87
18	87	29	0	87	58	0	58	0	0
19	116	58	0	29	58	29	58	87	
20	0	0	87	0	58	0	0	116	
21	87	116	87	0	58	29	29	29	
22	87	87	58	29	0	29	87	58	
23	58	0	58	0	58	29	58	0	
24	116	0	58	0	0	87	29	0	
25	145	0	0	0	87	58	58	58	
26	58	58	29	0	58	58	29	87	
27	87	87	0	29	0	58	0	58	
28	29	29	0	0	87	0	0	29	
29	87	0	0	29	29		0	58	
30	87	0	29	58	29		87	58	
31		0		0	58		58		
	1044	1218	812	1102	1189	1276	1276	1218	348
TOTAL	9483								

pumping rate in cu,m/hour 29

Pumping hours in well no 824 at Maghrabah, Rada area,EP4373P_0

	1987	1988											1989		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1		1	2	1	3	0	0	2	1	0	4	3	0	0	5
2		1	3	4	2	0	0	2	1	0	2	3	0	0	5
3		1	3	2	2	0	0	2	0	0	5	2	0	2	
4		0	2	2	3	0	0	1	0	0	3	3	0	0	
5		1	3	2	2	0	0	3	0	0	4	3	0	0	
6		5	1	2	4	0	0	2	0	0	3	1	0	0	
7		4	2	4	3	0	0	2	0	0	4	2	0	0	
8		4	2	3	2	0	0	2	0	0	3	2	0	0	
9		4	2	4	2	0	0	2	0	0	2	2	0	0	
10		4	2	3	2	0	4	3	0	0	2	4	0	0	
11		3	2	3	0	0	4	4	0	0	3	2	0	0	
12		3	2	3	2	0	3	3	0	4	4	3	0	0	
13		2	2	3	3	0	6	3	0	2	3	1	0	0	
14	0	2	2	3	2	0	4	3	0	1	3	4	0	0	
15	0	3	2	2	3	0	5	2	0	2	4	0	0	3	
16	0	2	3	3	2	0	3	2	0	2	3	4	0	2	
17	0	4	3	2	3	0	3	3	0	2	4	0	0	0	
18	0	4	2	2	2	0	5	2	0	2	4	0	0	3	
19	0	3	2	3	2	0	3	3	0	2	2	0	0	3	
20	0	3	3	2	3	0	3	1	0	6	3	0	0	4	
21	0	3	3	3	2	0	6	2	0	6	2	0	2	0	
22	0	2	3	2	2	0	2	2	0	4	3	0	3	0	
23	0	1	3	4	2	0	3	3	0	2	3	0	2	4	
24	0	2	3	3	2	0	3	1	0	3	3	0	2	4	
25	0	3	4	2	0	0	2	3	0	5	2	0	0	2	
26	0	2	2	2	0	0	2	0	0	6	3	0	0	0	
27	4	3	4	2	0	0	3	0	0	3	2	0	4	3	
28	4	2	2	2	0	0	3	0	0	4	3	0	0	0	
29	5	2	3	2	0	0	2	2	1	4	4	0	0	1	
30	3	2	0	2	0	0	4	2	0	3	2	0	0	4	
31	1	3	0	3	0	0	0	0	0		3		0	3	
	17	79	72	80	55	0	73	62	3	63	95	39	13	38	10
TOTAL	699														

Daily pumping in well No.824 at Maghrabah, Rada area in cu.m/d.

	1988												1989		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1		22	44	22	66	0	0	44	22	0	88	66	0	0	110
2		22	66	88	44	0	0	44	22	0	44	66	0	0	110
3		22	66	44	44	0	0	44	0	0	110	44	0	44	
4		0	44	44	66	0	0	22	0	0	66	66	0	0	
5		22	66	44	44	0	0	66	0	0	88	66	0	0	
6		110	22	44	88	0	0	44	0	0	66	22	0	0	
7		88	44	88	66	0	0	44	0	0	88	44	0	0	
8		88	44	66	44	0	0	44	0	0	66	44	0	0	
9		88	44	88	44	0	0	44	0	0	44	44	0	0	
10		88	44	66	44	0	88	66	0	0	44	88	0	0	
11		66	44	66	0	0	88	88	0	0	66	44	0	0	
12		66	44	66	44	0	66	66	0	88	88	66	0	0	
13		44	44	66	66	0	132	66	0	44	66	22	0	0	
14	0	44	44	66	44	0	88	66	0	22	66	88	0	0	
15	0	66	44	44	66	0	110	44	0	44	88	0	0	66	
16	0	44	66	66	44	0	66	44	0	44	66	88	0	44	
17	0	88	66	44	66	0	66	66	0	44	88	0	0	0	
18	0	88	44	44	44	0	110	44	0	44	88	0	0	66	
19	0	66	44	66	44	0	66	66	0	44	44	0	0	66	
20	0	66	66	44	66	0	66	22	0	132	66	0	0	88	
21	0	66	66	66	44	0	132	44	0	132	44	0	44	0	
22	0	44	66	44	44	0	44	44	0	88	66	0	66	0	
23	0	22	66	88	44	0	66	66	0	44	66	0	44	88	
24	0	44	66	66	44	0	66	22	0	66	66	0	44	88	
25	0	66	88	44	0	0	44	66	0	110	44	0	0	44	
26	0	44	44	44	0	0	44	0	0	132	66	0	0	0	
27	88	66	88	44	0	0	66	0	0	66	44	0	88	66	
28	88	44	44	44	0	0	66	0	0	88	66	0	0	0	
29	110	44	66	44	0	0	44	44	22	88	88	0	0	22	
30	66	44	0	44	0	0	88	44	0	66	44	0	0	88	
31	22	66	0	66	0	0	0	0	0	0	66	0	0	66	
	374	1738	1584	1760	1210	0	1606	1364	66	1386	2090	858	286	836	220
TOTAL	15378														

pumping rate in cu,m/hour 22

Pumping hours in well no 566 at Qusair, Rada area ,EP4324P_0

	1985				1986							
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug
1		11	10	0	0	9	10	12	8	7	8	12
2		8	12	0	10	9	1	13	0	10	9	17
3		7	13	9	9	6	1	13	0	14	9	12
4		11	11	11	4	7	4	12	0	11	14	6
5		12	7	11	5	6	5	10	0	11	2	0
6		6	0	11	0	10	7	0	0	11	19	0
7		10	0	12	4	13	10	0	0	12	14	9
8		11	11	12	5	7	2	0	0	0	13	0
9		11	0	11	12	3	0	1	5	10	16	13
10		9	0	10	12	6	0	0	12	0	11	13
11		11	7	10	5	11	13	5	5	8	16	13
12		11	11	4	5	5	14	5	12	1	13	5
13		11	10	10	6	8	11	5	12	12	12	14
14		13	11	3	10	12	12	0	12	10	12	13
15		10	8	0	11	13	12	0	11	11	16	3
16		0	11	10	7	10	12	0	12	11	9	11
17		10	11	9	9	8	12	0	5	8	12	11
18		11	11	14	7	11	10	0	6	0	14	13
19		0	10	4	7	12	10	0	0	1	8	12
20	11	0	0	8	7	13	14	0	0	7	6	3
21	12	0	0	0	11	12	12	0	12	12	12	12
22	8	0	13	11	12	12	13	0	14	4	0	12
23	5	0	2	0	12	12	9	0	13	13	9	11
24	8	0	0	3	12	12	6	0	13	14	5	12
25	9	11	10	11	12	2	8	0	0	14	13	11
26	9	11	6	8	12	6	7	0	12	13	14	
27	8	7	0	9	11	0	8	0	12	11	12	
28	6	10	0	6	11	0	7	0	13	12	5	
29	11	9	0	4	11		10	0	13	8	12	
30	8	8	0	2	14		12	0	13	8	1	
31		12		1	11		13		0		3	
	95	241	185	214	264	235	265	76	215	264	319	238

TOTAL 2611

Daily pumping in well no 566 at Qusair, Rada area in cu.m\d.

	1985				1986							
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug
1		242	220	0	0	198	220	264	176	154	176	264
2		176	264	0	220	198	22	286	0	220	198	374
3		154	286	198	198	132	22	286	0	308	198	264
4		242	242	242	88	154	88	264	0	242	308	132
5		264	154	242	110	132	110	220	0	242	44	0
6		132	0	242	0	220	154	0	0	242	418	0
7		220	0	264	88	286	220	0	0	264	308	198
8		242	242	264	110	154	44	0	0	0	286	0
9		242	0	242	264	66	0	22	110	220	352	286
10		198	0	220	264	132	0	0	264	0	242	286
11		242	154	220	110	242	286	110	110	176	352	286
12		242	242	88	110	110	308	110	264	22	286	110
13		242	220	220	132	176	242	110	264	264	264	308
14		286	242	66	220	264	264	0	264	220	264	286
15		220	176	0	242	286	264	0	242	242	352	66
16		0	242	220	154	220	264	0	264	242	198	242
17		220	242	198	198	176	264	0	110	176	264	242
18		242	242	308	154	242	220	0	132	0	308	286
19		0	220	88	154	264	220	0	0	22	176	264
20	242	0	0	176	154	286	308	0	0	154	132	66
21	264	0	0	0	242	264	264	0	264	264	264	264
22	176	0	286	242	264	264	286	0	308	88	0	264
23	110	0	44	0	264	264	198	0	286	286	198	242
24	176	0	0	66	264	264	132	0	286	308	110	264
25	198	242	220	242	264	44	176	0	0	308	286	242
26	198	242	132	176	264	132	154	0	264	286	308	0
27	176	154	0	198	242	0	176	0	264	242	264	0
28	132	220	0	132	242	0	154	0	286	264	110	0
29	242	198	0	88	242		220	0	286	176	264	0
30	176	176	0	44	308		264	0	286	176	22	0
31		264		22	242		286		0		66	0
	2090	5302	4070	4708	5808	5170	5830	1672	4730	5808	7018	5236
TOTAL	57442											

Pumping rate: 22 cu.m/hour

Pumping hours in well no 734 at Wadi Sir, Rada area ,EP4320P_0

	1985				1986							
	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug
1		10	0	0	0	0	5	0	0	0	6	4
2		0	4	11	0	0	0	0	0	0	0	5
3		1	0	6	0	0	0	0	0	0	0	5
4		0	1	0	5	5	0	0	0	0	0	3
5		7	0	3	5	8	0	0	7	2	7	0
6		10	7	0	0	0	0	0	5	0	7	0
7		9	0	4	7	0	0	0	0	0	6	3
8		11	0	8	10	5	9	0	2	0	4	0
9		9	6	7	8	0	5	3	10	0	0	0
10		0	5	0	5	0	2	0	7	0	0	3
11		0	0	0	0	0	0	0	8	0	3	5
12	0	0	7	3	0	1	9	6	6	6	0	8
13	0	0	8	0	0	0	10	7	9	0	0	3
14	6	9	6	7	0	0	0	0	7	0	9	13
15	5	10	4	3	8	9	0	0	0	0	7	0
16	0	9	0	0	0	6	0	0	11	0	7	0
17	4	0	7	0	0	6	0	4	0	0	8	3
18	7	0	7	0	0	0	0	2	0	0	2	0
19	6	9	4	0	6	0	0	6	0	5	0	3
20	8	7	2	0	6	0	0	5	0	0	0	7
21	6	0	0	0	5	0	2	0	3	0	0	5
22	6	7	0	0	4	0	6	0	0	0	6	5
23	0	4	0	0	5	5	5	0	0	0	0	5
24	0	0	0	6	0	3	0	0	0	0	0	7
25	1	0	0	4	4	0	4	1	0	0	0	0
26	7	9	5	0	5	7	0	4	1	0	0	7
27	0	7	0	0	6	8	0	0	0	0	5	6
28	9	9	0	0	5	0	0	4	6	8	0	0
29	10	3	0	0	0		8	0	0	6	0	0
30	9	0	6	0	0		6	0	0	0	0	
31		4		0	0		10		0		4	
	84	144	79	62	94	63	81	42	82	27	81	100

TOTAL 939

Annex G

Terms of Reference Relation between Wadi-flow and recharge of groundwater

ANNEX G
TERMS OF REFERENCE
RELATION BETWEEN WADI-FLOW AND RECHARGE OF GROUNDWATER
as set up
by
G.J. Leereveld
Land and water conservation Subsection

For a junior hydrologist to the Rada'a integrated rural development project,
The land and water conservation subsection from December 1990 until June 1991.

- To evaluate the past and present information available on surface water hydrology in the RIRDP and in Yemen.

- To collect in the Netherlands relevant information and publications on surface water hydrology in arid zones;

- To evaluate the set-up of the surface water observation network and if possible, improve the installation of Preslogs in wadi's.

- To evaluate the data available of all Preslog measurements in the LWC section.

- To participate field measurements

- To process data of Preslogs by computer

- To determine a relation between the water level and the discharge (Q-h relation) in several wadis;

- To prepare a numerical model to study wadi flow- infiltration and infiltration- aquifer recharge

- To participate in the LCW-program as a whole

Requirements: M.Sc.-student of the University of Delft or Wageningen
- specialised in hydrology with preference for surface water of arid areas.

Time schedule:
December 1990 until February 1991: Introductions, set-up of Preslogs in the field, interpretation of available data getting familiar with instruments and software.

February until May 1990: Monitoring the ongoing activities in the field, reading and processing the collected data by computer, interpretation of the results and start to find relations.

May - June 1990
Define relations between wadi-flow and wadi flood level (Q-h relation) in several wadis. Preparation of numerical models to study the relation between wadi-flow - wadi-bed infiltration - aquifer recharge;

Place in the Organisation
- under the team leader of the Technical Assistance Unit and functionally within the RIRDP Land and Water Conservation Subsection.

Justification:
1 Review of the Land and water conservation program, visitor's report, March 1988, Ilaco.

page 16 P.8.2 The need of surface water observations.

Surface water data are almost lacking in the Province. In the Reconnaissance Survey of 1985-1986 hydrological theories had to be developed on interviews and indirect observations. Initiation of a limited program of surface water data collection was advised and is planned to be carried out before April 1990.

Annex H

EC-values at several locations in the Rada' Basin over 1988

EC VALUES AT SEVERAL LOCATIONS IN THE RADA' BASIN OVER 1988
(values in microSiemens/cm)

well no.	village	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0392	Ghawlays as Sianim	-	1190	-	NP	-	NP	*	*	*	*	*	*
	Ghawlays as Sianim	-	-	-	-	-	-	1190	-	-	1250	-	1280
	Ghawl Azraq	-	1800	-	NP	-	1780	1790	1760	-	-	-	NP
0328	Dar Mas'ab	-	-	-	1690	-	-	-	-	-	-	-	1930
0366	Mawka	-	-	-	-	-	-	-	-	-	1030	-	900
0367	Hajafah	-	1580	-	-	-	**	**	**	**	**	**	**
0706	Rada'	-	1560	1560	1460	1524	-	1550	-	-	1440	-	1371
0259	Hanakah al Mas'ud	-	1560	-	-	1610	1570	1560	1520	-	-	-	1590
0771	Qariah as Sawdah	-	-	1320	-	-	-	-	1130	-	-	-	1120
0734	Wadi as Sir	-	1280	-	-	-	-	-	-	-	1290	-	1260

remarks:

* pump removed
** well (almost) dry
NP no pumping