

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

THE MINISTRY OF AGRICULTURE AND FISHERIES,  
THE GOVERNMENT OF THE UNITED ARAB EMIRATES

THE MASTER PLAN STUDY  
ON  
THE GROUNDWATER RESOURCES DEVELOPMENT  
FOR AGRICULTURE  
IN  
THE VICINITY OF AL DHAD  
IN  
THE UNITED ARAB EMIRATES

VOLUME THREE:  
APPENDICES

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NOVEMBER, 1996

SANYU CONSULTANTS INC.  
PACIFIC CONSULTANTS INTERNATIONAL

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THE GOVERNMENT OF THE UNITED ARAB EMIRATES

THE MASTER PLAN STUDY  
ON  
THE GROUNDWATER RESOURCES DEVELOPMENT  
FOR AGRICULTURE  
IN  
THE VICINITY OF AL DHAID  
IN  
THE UNITED ARAB EMIRATES

**FINAL REPORT**

**VOLUME THREE:  
APPENDICES**

NOVEMBER, 1996

SANYU CONSULTANTS INC.  
PACIFIC CONSULTANTS INTERNATIONAL



1131575 [1]

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**APPENDIX-1: GENERAL**

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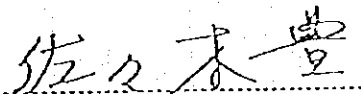
1.1. Scope of Work

SCOPE OF WORK  
FOR  
THE MASTER PLAN STUDY  
ON  
THE GROUNDWATER RESOURCES DEVELOPMENT FOR AGRICULTURE  
IN  
THE VICINITY OF AL DHAIJ IN THE U.A.E.  
AGREED UPON BETWEEN  
MINISTRY OF AGRICULTURE AND FISHERIES  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY

DUBAI, 1ST, NOVEMBER 1994



HAMAD A. AL MUTTAWA  
ASST. DEPUTY MINISTER  
MINISTRY OF AGRICULTURE &  
FISHERIES  
THE UNITED ARAB EMIRATES



YUTAKA SASAKI  
LEADER  
PREPARATORY STUDY TEAM  
JAPAN INTERNATIONAL  
COOPERATION AGENCY



## I. INTRODUCTION

In response to the request of the Government of The United Arab Emirates (hereinafter referred to as "the Government of the U.A.E."), the Government of Japan has decided to conduct the Master Plan Study on the Groundwater Resources Development for Agriculture in the vicinity of Al Dhaid (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan.

Accordingly, Japan International Cooperation Agency (hereinafter referred to as JICA), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of the U.A.E. through the Ministry of Agriculture & Fisheries ( hereinafter referred to as "MAF") The present document sets forth the scope of work with regard to the Study.

## II. OBJECTIVES OF THE STUDY

The objectives of the Study are :

1. To conduct a Master Plan Study on the Groundwater Resources Development for Agriculture in the vicinity of Al Dhaid in the U.A.E.
2. To carry out technology transfer to the counterpart personnel of the Government of the U.A.E. during the course of the Study.

## III. STUDY AREA

The Study covers the U.A.E. area in the boundary of latitude N 25°00' - 25°25' and longitude E 55° 49' - 56° 00'.

## IV. SCOPE OF THE STUDY

In order to achieve the objectives mentioned above, the Study will consist of two phases and shall cover the following items :

PHASE 1. Consolidation, analysis of data and execution of the field work:

1. Collection and review of available data and the information relevant to the study on the following items :
  - 0 Meteorology and Hydrology
  - 0 Topography, geology and hydrogeology
  - 0 Soil condition
  - 0 Water Source and Water quality
  - 0 Socio-economic conditions
  - 0 Irrigation system
  - 0 Agriculture and crop husbandry
  - 0 Agro-economy and Agricultural Institution
  - 0 Land use
  - 0 Regional economy and Project Evaluation
  - 0 Environmental conditions
  - 0 Relevant ongoing and planned projects
  - 0 Laws, regulations policies and customary practices
  - 0 Others



(Handwritten initials)

2. Aerophotograph Mapping
3. Well survey and preparation of well inventory in the study area
4. Farm survey and preparation of farm inventory in the study area
5. Soil survey
6. Geophysical prospecting
7. Test well drilling, core sampling, geophysical logging, pumping test and well development for groundwater level observation.
8. Chemical tests of the groundwater samples from existing and newly established wells.
9. Initial environmental examination

#### PHASE II. Formulation of a Master Plan

1. Comprehensive evaluation of groundwater resources by establishment of groundwater simulation model and data base.
2. Formulation of a master plan on the groundwater resources development for agriculture in the study area. The master plan will mainly include the following :
  - ◇ Groundwater resources development plan
  - ◇ Sustainable agriculture development plan
  - ◇ Groundwater monitoring network plan

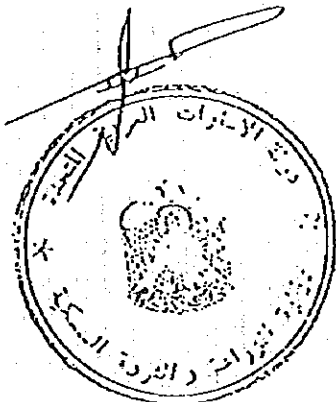
#### V. Study Schedule

The study will be carried out in accordance with the attached tentative working schedule.

#### VI. Report

JICA will prepare and submit the following reports in English to the U.A.E.:

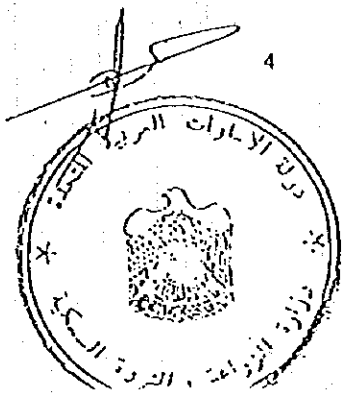
1. Inception Report  
Twenty (20) copies at the commencement of the Phase I field work.
2. Progress Report (1)  
Twenty (20) copies at the end of the Phase I work.
3. Interim Report  
Twenty (20) copies at the commencement of the Phase II work
4. Progress Report (2)  
Twenty (20) copies at the end of the Phase II field work
5. Draft Final Report  
Ten (10) copies at the end of Phase II work. MAF provides JICA with its comments on the Draft final Report within one (1) month after receipt of the Draft Final Report.
6. Final Report  
Sixty (60) copies within two (2) months after receiving the U.A.E.'s comments on the Draft Final Report



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VII. Undertakings of the Government of the U.A.E.

1. The Government of the U.A.E. shall facilitate the carrying out the study in accordance with the prevailing laws and regulations stipulated by the U.A.E. as follows:
  - a) to secure the safety of Japanese Study Team
  - b) to permit members of the Japanese Study Team to enter, leave and sojourn in the U.A.E. for the duration of their assignment therein and exempt them from visa fees.
  - c) to exempt the members of the Japanese Study Team from taxes, duties fees and any other charges on equipment, machinery and other materials to be brought into and out of the U.A.E. for the conduct of the study.
  - d) to exempt the members of the Japanese Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese Study Team for their services in connection with the implementation of the Study if necessary.
  - e) to provide necessary facilities to the Japanese Study Team for the remittance as well as the utilization of the funds introduced into the U.A.E. from Japan in connection with the implementation of the Study if necessary.
  - f) to obtain permission for entry into study area in the U.A.E. for the purpose of implementing the Study
  - g) to secure permission which is considered and issued by the relevant authorities for the Japanese Study Team to take out permissible data and documents including maps and photographs related to the Study out of the U.A.E. to Japan.
  - h) to provide medical services as needed. Its expenses will be chargeable on the members of the Japanese Study Team
2. The MAF shall bear claims, if any arises against members of the Japanese Study Team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese Study Team.
3. MAF has all the responsibilities to facilitate the implementation of the Study and also as coordinating body in relation with other governmental and non-governmental organisations concerned for the smooth implementation of the study. Department of Soil and Water in MAF shall act as a counterpart agency to the Japanese Team.
4. MAF shall, at its own expense provide the Japanese Study Team with the following in cooperation with other organizations concerned :
  - a) available data and information related to the study
  - b) additional survey mutually agreed upon, related to the study if necessary
  - c) counterpart personnel
  - d) suitable office space with necessary equipment and furniture, and
  - e) credentials or identification cards



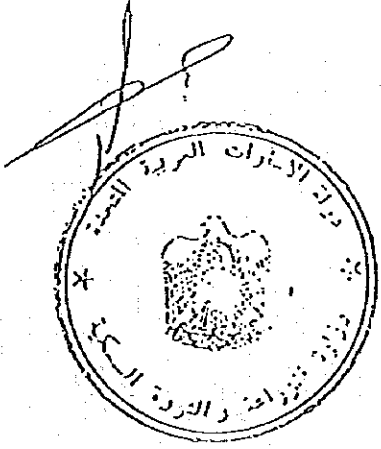
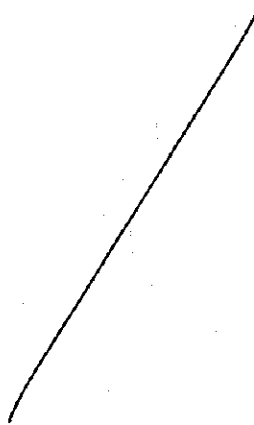
VIII. Undertakings of JICA

For the implementation of the Study, JICA shall take the following measures :

1. Despatch the Study Team to the U.A.E. and execute the required work for this Study at its own expenses
2. Pursue technology transfer to the counterpart personnel of the Government of the U.A.E. in the course of the Study.

IX. Consultation

JICA and the Government of the U.A.E. shall consult with each other in respect of any matter that may arise from or in connection with the Study.



## TENTATIVE SCHEDULE

	2	4	6	8	10	12	14	16	18	20	22
work in U. A. E	-----				-----				-----		
work in JAPAN				-----			-----				
Report	△ IC/R		△ PR/R (1)	△ IT/R		△ PR/R (2)		△ DF/R		△ F/R	
Remark	Phase I					Phase II					

IC/R: Inception Report  
 IT/R: Interim Report  
 PR/R: Progress Report

DF/R: Draft Final Report  
 F/R: Final Report





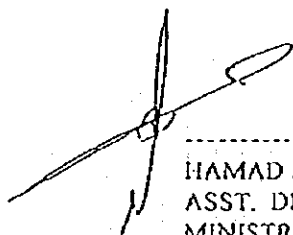
MINUTES OF THE MEETING  
FOR SCOPE OF WORK ON  
THE MASTER PLAN STUDY  
ON

THE GROUNDWATER RESOURCES DEVELOPMENT FOR AGRICULTURE  
IN THE VICINITY OF AL DHAID IN THE U.A.E.

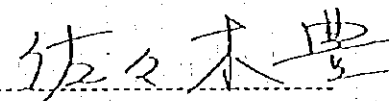
AGREED UPON BETWEEN

MINISTRY OF AGRICULTURE AND FISHERIES  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY

Dubai, 1st. November 1994



HAMAD A. AL MUTTAWA  
ASST. DEPUTY MINISTER  
MINISTRY OF AGRICULTURE &  
FISHERIES  
THE UNITED ARAB EMIREATES



YUTAKA SASAKI  
LEADER,  
PREPARATORY STUDY TEAM  
JAPAN INTERNATIONAL  
COOPERATION AGENCY



MINUTES OF THE MEETING  
FOR SCOPE OF WORK ON  
THE MASTER PLAN STUDY

In response to the request of the Government of the United Arab Emirates (hereinafter referred to as the Government of the U.A.E.), the Government of Japan has decided to dispatch Preparatory Study Team (hereinafter referred to as the "Team") organized by Japan International

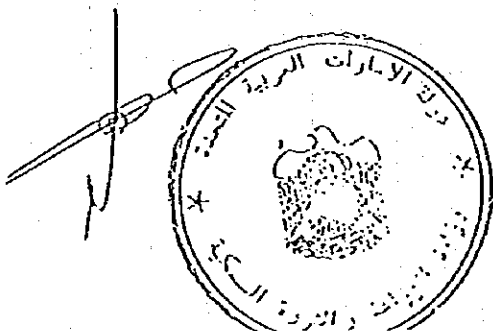
Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan.

The Team, headed by Mr. Yutaka Sasaki, visited the U.A.E. from October 26 to November 2, 1994 for the purpose of discussing and exchanging views on the Master plan Study on the Groundwater Resources Development for Agricultural (hereinafter referred to as "the study"), and had a series of discussions with officials concerned of the Ministry of Agriculture & Fisheries (hereinafter referred to as "MAF").

The list of participants in the meeting is attached in the Annex 1

As a result of the discussion, MAF and the Team agreed on the Scope of Work for the Study. The following are the main issues discussed and agreed upon by both sides in relation to the Scope of Work for the Study.

1. MAF shall supply at its own expense, offices equipped with electricity, airconditioner, water supply and telephones for the Japanese Team.
2. MAF shall assign necessary number of counterpart personnel, who are Government Officials, with U.A.E. nationality during the whole study period at its own expenses.
3. MAF shall provide one vehicle with fuel, driver including maintenance services to the Japanese study Team during the study period at its own expenses.
4. Equipment for groundwater level observation shall be arranged by MAF at its own expenses.
5. MAF shall conduct water chemical tests at its own Laboratory.
6. MAF requested JICA to conduct the existing well survey and farm survey.
7. The Team suggested that a Steering Committee to be formed for the follow up of the study.



10/3/94

ANNEX 1

## LIST OF PARTICIPANTS

### MINISTRY OF AGRICULTURE AND FISHERIES

MOHAMED SAQER AL ASAM	DIRECTOR OF SOIL AND WATER DEPT.
MOHAMED SAEED ABDULLAH	HEAD OF DAMS AND WATER SEC.
MOHAMMED ABDUL HAQ.	HYDROGEOLOGIST.
ABDULLAH RASHID AL MOALLA.	DIRECTOR OF CENTRAL REGION.

### JICA PREPARATORY STUDY TEAM

SASAKI, YUTAKA	TEAM LEADER
MIYAJIMA, KICHIO	GROUNDWATER DEVELOPMENT/Hydrogeology
NAKAMURA, SATOSHI	GROUNDWATER SURVEY EVALUATION
NIKAWA, YOSHIHIKO	GROUNDWATER USE/ IRRIGATION
NAKAMURA, IZURU	COORDINATOR



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I.2. Minutes of Meeting on Inception Report

MINUTES OF MEETING  
ON  
INCEPTION REPORT  
FOR  
THE MASTER PLAN STUDY  
ON  
THE GROUNDWATER RESOURCES DEVELOPMENT FOR AGRICULTURE  
IN  
THE VICINITY OF AL DHAID  
IN  
THE UNITED ARAB EMIRATES

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The Study Team for the "Master Plan Study on the Groundwater Resources Development for Agriculture in the vicinity of Al Dhaid in the United Arab Emirates" (hereinafter referred to as the "Study") organized and dispatched by Japan International Cooperation Agency (hereinafter abbreviated to as "JICA"), led by Mr. Mitsuru Yoshikawa submitted 20 copies of Inception Report of the Study to the Ministry of Agriculture and Fisheries, the Government of the United Arab Emirates (hereinafter referred to as the "Ministry" in accordance with the stipulation in the scope of work for the Study agreed by and between JICA and the Ministry.

The Study Team made a series of explanation to and discussion with the delegation of the Ministry headed by Mr. Hamad A. Al Mutawa, Asst. Deputy Minister on the content of the report.

The participants in the discussion meeting held at the Ministry's head office in Dubai on April 8, 1995 are as shown in the attached list.

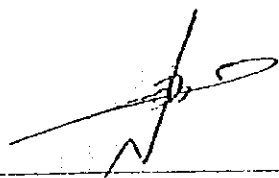
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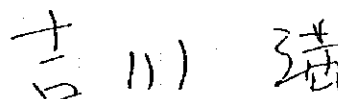
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As the result of discussion, both parties agreed upon to recommend to the respective responsible agencies to take their consideration for the Study on the major issues at the meeting from both parties as attached herewith:

In Dubai, on April 11, 1995



Mr. Hamad A. Al Mutawa,  
Asst. Deputy Minister



Mr. Mitsuru Yoshikawa  
Leader,  
the Study Team,  
JICA



Mr. Satoshi Nagata  
Leader,  
Advisory Committee,  
JICA

Attachment-1: List of Participants for Discussion Meeting  
on Inception Report

1.1. Advisory Committee;

Mr. Satoshi Nagata, Leader

1.2. JICA Headquarter;

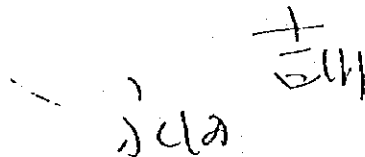
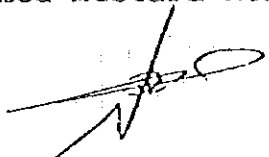
Mr. Hiroyuki Abe Project Officer

1.3. Study Team;

Mr. Mitsuru Yoshikawa, Leader/Groundwater Development  
Mr. Izumi Kato, Deputy Leader/Hydrogeologist  
Mr. Keiji Matsumoto, Irrigation/Drainage Expert  
Dr. Jorge Tokeshi, Project Economist  
Mr. Eichi Shibata, Coordinator

1.4. Ministry of Agriculture and Fisheries;

Mr. Hamad A. Al Mutawa, Asst. Deputy Minister  
Mr. Mohamed Saqer Al Asam, Director, Soil and Water Dept.  
Mr. Abdulla Rashid Al Moalla, Director, Central Region  
Mr. Mohammed Abdul Haq, Hydrogeologist  
Mr. Mohammed Abdullah, Soil and Irrigation Engineer  
Mr. Mohammed Mustafa Mohamed, Soil and Irrigation Engineer

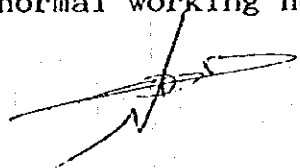


- 2.1. As per the hydrochemical analysis of groundwater (referred to the item [10], page 8) which is to be undertaken by the Ministry's laboratory, the Ministry side suggested that, in connection with the limited capacity of laboratory and the planned number of water samples (100 samples), the detailed schedule of analysis is to be discussed between the Ministry side and the Study Team.
- 2.2. As per the field surveys (referred to the item [7], page 7 onward), the Study Team requested to the Ministry to take permission of land owner for the right-of-way, entry into and use of target points of surveys. The Ministry side agreed on that such arrangements will be undertaken by the Ministry's Regional Office in Al Dhaid based on the plan that will be submitted by the Study Team.
- 2.3. As per the groundwater monitoring and database plan (referred to the item [35], page 19), the Ministry side requested the Study Team to take consideration in the planning that the Ministry wishes to establish the related system at the Regional Office in Al Dhaid and at the Ministry's Main Office in Dubai. The Study Team agreed to the request.
- 2.4. As per the counterpart personnel (referred to the paragraph 4.1, page 22), the Ministry side stated that a steering committee will be formulated, and necessary numbers of counterpart personnel will soon be nominated.
- 2.5. As per the technology transfer (Chapter Five, page 25), the Ministry side inquired the possibility of counterpart training.

in Japan beside the local on-the-job training. The Study Team suggested to the Ministry side to promptly submit the relevant application form through the Embassy of Japan in Abu Dhabi.

2.6. As per the undertakings (Chapter Six, page 27 onward), the Ministry side stated that every necessary steps for the Study are to be taken. In addition, the Ministry proposed the specific provisions as below:

- (1) Office Spaces shall be available inside the Ministry's Main Office in Dubai, beside the necessary spaces within the Ministry's Experimental Station in Al Dhaid.
- (2) As per the request of the Study Team, the Ministry side agreed that the accomodation at the Experimental Station at Al Dhaid may be used for residential purpose by the members of Study Team during the Study period.
- (3) Instead of one vehicle as stipulated in the S/W, two (2) vehicles are provided by the Ministry for the Study. However, these vehicles are to be used for both the Study Team and the counterpart personnel during, in principle, the normal working hours.



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1.3. Minutes of Meeting on Progress Report (I)

MINUTES OF MEETING  
ON  
PROGRESS REPORT (I)  
FOR  
THE MASTER PLAN STUDY  
ON  
THE GROUNDWATER RESOURCES DEVELOPMENT FOR AGRICULTURE  
IN  
THE VICINITY OF AL DHAIID  
IN  
THE UNITED ARAB EMIRATES

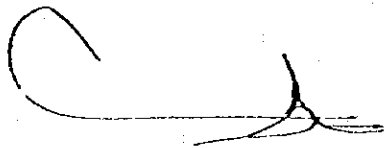
The Study Team for the "Master Plan on the Groundwater Resources Development for Agriculture in the vicinity of Al Dhaid in the United Arab Emirates" (hereinafter referred to as the "Study") organized and dispatched by Japan International Cooperation Agency (hereinafter referred to as "JICA"), led by Mr. Mitsuru Yoshikawa submitted 20 copies of Progress Report (I) of the Study to the Ministry of Agriculture and Fisheries, the Government of United Arab Emirates (hereinafter referred to as the "Ministry") in accordance with the stipulation in the Scope of Work for the Study agreed by and between JICA and the Ministry.

The Study Team made a series of explanation to and discussion with the delegation of the Ministry headed by Mr. Mohammed Mussa Al-Jasim, Acting Deputy Minister on the content of the report.

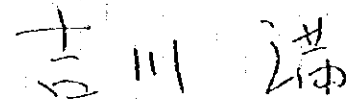
The participants in the discussion meeting held at the Ministry's Head Office in Dubai on July 31, 1995 are shown in the attached list.

As the result of discussion, both parties agreed upon to recommend to the respective responsible agencies to take their consideration for the Study on the major issues at the meeting from both parties as attached herewith:

In Dubai, on August 1, 1995



Mr. Mohammed Mussa Al- Jasim  
Acting Deputy Minister



Mr. Mitsuru Yoshikawa  
Leader, The Study Team,  
JICA

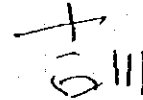
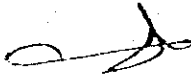
**Attachment-1: List of Participants for Discussion Meeting on Progress Report (I)**

**1.1. The Study Team**

Mr. Mitsuru Yoshikawa,	Leader/ Groundwater Development
Mr. Izumi Kato,	Deputy Leader/Hydrogeologist
Mr. Keiji Matsumoto,	Irrigation/Drainage Expert
Dr. Michio Nozaki,	Agronomist
Mr. Eichi Shibata,	Coordinator

**1.2. The Ministry**

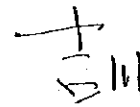
Mr. Mohammed Mussa Al-Jasim,	Acting Deputy Minister
Mr. Mohamed Sager Al Asam,	Director, Soil and Water Department
Mr. Mohammed Abdul Haq,	Hydrogeologist, Soil and Water Dept.
Mr. Mohammed Mustafa Mohamed,	Soil and Irrigation Engineer, Soil and Water Dept.
Mr. Essa Busamra,	Agriculture Engineer, Central Region Office



**Attachment-2:**

**Major Issues of Discussion on Progress Report (I)**

- 2.1. As per the recommendation proposed by the Study Team (Items (3) and (4) of Paragraph 6.3.1) for the deepening the test-well drilling to a 600-m depth and the field experiment for infiltration rate, the Ministry side unanimously agreed on the necessity, and requested to JICA to pay particular consideration for the proposal.
  
- 2.2. In connection with the necessity of investigation on the deep -seated aquifers, the Ministry side requested to JICA to provide an additional TEM prospecting to a 1000-m depth onto selected zones in the Study Area in Field Survey (II) stage.



1.4. Minutes of Meeting on Interim Report

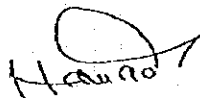
**MINUTES OF MEETING  
ON  
INTERIM REPORT  
FOR  
THE MASTER PLAN STUDY  
ON  
THE GROUNDWATER RESOURCES DEVELOPMENT  
FOR  
AGRICULTURE  
IN  
THE VICINITY OF AL DHAID  
IN  
THE UNITED ARAB EMIRATES**

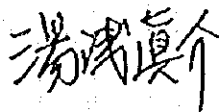
The Study Team for the "Master Plan on the Groundwater Resources Development for Agriculture in the Vicinity of Al Dhaid in the United Arab Emirates" (hereinafter referred to as the "Study") organised and dispatched by Japan International Cooperation Agency (hereinafter referred to as "JICA"), led by Mr. Mitsuru Yoshikawa submitted 20 copies of Interim Report of the Study to the Ministry of Agriculture and Fisheries, the Government of United Arab Emirates (hereinafter referred to as the "Ministry") in accordance with the stipulation in the Scope of Work for the Study agreed by and between JICA and the Ministry.

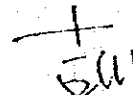
The Study Team made a series of explanation to and discussion with the delegation of the Ministry headed by Mr. Mohamed Sager Al Asam, Director, Soil and Water Department on the content of the report.

The participants in the discussion meeting held at the Ministry's Head Office in Dubai on November 7, 1995 are shown in the attached list.

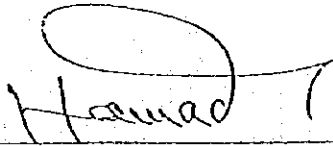
As the result of discussion, both parties agreed upon to recommend to their respective responsible agencies to take consideration for the Study on the major issues at the meeting from both parties as attached herewith:



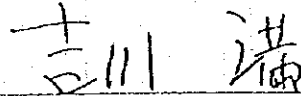




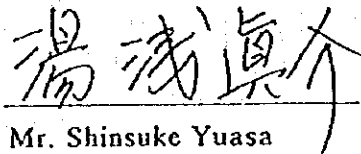
In Dubai, on November 11, 1995



Mr. Hamad Abdulla Al Mutawa,  
Assistant Deputy Minister,  
The Ministry



Mr. Mitsuru Yoshikawa  
Leader,  
The Study Team, JICA



Mr. Shinsuke Yuasa  
Leader,  
Advisory Committee,  
JICA

**Attachment-1: List of Participants for Discussion Meeting  
on Interim Report**

**1.1. The Advisory Committee:**

Mr. Shinsuke Yuasa, Leader,  
Deputy Director, Planning Dep't,  
Water Resources Development Public  
Corporation

**1.2. JICA Headquarters:**

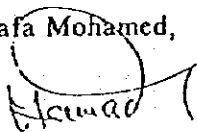
Mr. Satoshi Yoshida, Project Officer,  
Agriculture, Forestry and Fisheries  
Development Study Department

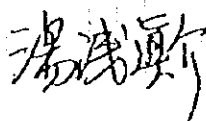
**1.3. The Study Team:**

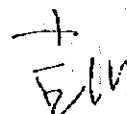
Mr. Mitsuru Yoshikawa, Leader/ Groundwater Development  
Mr. Izumi Kato, Deputy Leader/Hydrogeologist  
Mr. Keiji Matsumoto, Irrigation/Drainage Expert  
Dr. Michio Nozaki, Agronomist  
Mr. Keiji Iizuka, Rural Sociology

**1.3. The Ministry:**

Mr. Mohamed Sager Al Asam, Director, Soil and Water Department  
(SWD)  
Mr. Mohammed Abdul Haq, Hydrogeologist, SWD  
Mr. Mohamed Saeed Abdullah, Head, Dams and Water Section, SWD  
Mr. Humaid Al Zaabi, Head, Meteorology Section, SWD  
Mr. Abubaker Mohamed, Dam Engineer, SWD  
Mr. Ahmed Abdel-Rahim, Civil Engineer, SWD  
Ms. Wajeaha Talib Nasser, Geologist, SWD  
Mr. Mohammed Mustafa Mohamed, Soil and Irrigation Engineer, SWD







Attachment-2: Major Issues of Discussion on Interim Report

2.1. As per the "farm economy" in the Farm Inventory Survey, the Ministry side pointed out that an additional survey is to be conducted inclusive of commercial farm(s). The Study Team replied that the additional farm economy survey by the Team is already planned in the Field Survey (II) period in order to confirm the results in the Inventory Survey which was carried out by the local consultant.

2.2. The Ministry side expressed the importance of the soil survey since it will be the first detailed survey leading to production of soil map of the area.

2.3. On the Hydrogeology and Groundwater:

(1) The Study Team explained in detail on the hydrogeological and groundwater conditions of the Study Area based on the facts obtained through the previous survey works.

(2) The Ministry side placed the following major questions and the Study Team explained additionally;

- the horizontal distribution of aquifers, particularly alluvial aquifer,
- the rock facies of aquifers in Juweiza Formation,
- the identification and thickness of chalky aquatard layer,
- the horizontal distribution of groundwater quality.

2.4. On the Development Strategies:

2.4.1. As per Groundwater Development;

(1) The Ministry side pointed out that the estimated figure of 5 billion m<sup>3</sup> of groundwater mined during the past 20 years is deemed to be over-estimated since the groundwater abstraction in the Area has been increased gradually. The Study Team expressed its view that the fact is to be clarified through the groundwater simulation study in the Home Work (II) period inclusive of a time-series groundwater abstraction within the past 20 years.

(2) The Ministry side inquired that whether or not the design, cost estimate and evaluation of environmental impacts of three schemes in the groundwater augmentation plan are to be made; and which criteria is to be adopted in the design of facilities. The Study Team replied that those estimate, inclusive of

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preliminary design of facilities, and evaluation are to be made to the level of the master plan study, and the design criteria prevailing in UAE if any, unless otherwise those in Japan, are to be adopted.

- (3) The Ministry side inquired the concept, viability and effectiveness of underground dam scheme. The Study Team replied a workshop on this subject is to be held during this Field Survey (II) period.

2.4.2. As per Profitable Agriculture proposed by the Study Team:

- (1) The Ministry side suggested to examine sufficient improvement measures of transmission of market information to the farmers. The Study Team replied that the examination and proposal on the market information system are to be made through the further survey and study.
- (2) The Ministry side inquired that whether or not new crops, other than the existing crops, are considered to be introduced in the proposed agriculture development plan. The Study Team replied that the existing high-income and water-economic crops are now under consideration, but new crops are under consideration if the experimental data of them are available from the research institute(s) in UAE.

2.4.3. As per the WID in the agricultural sector, the Ministry side pointed out that particular considerations are to be taken in view from the specific social features in UAE.

2.5. On the test-well drilling and field infiltration experiment, the Ministry side advised to the Study Team to make a prior consultation with the Ministry and the relevant Municipalities for the approval of the sites for the drilling, trial pits and experiment. The Study Team promised to submit in advance a plan of works inclusive of exact site locations to the Ministry.

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Handwritten signature and date: 12/11



1.5. Minutes of Meeting on Progress Report (II)

**MINUTES OF MEETING  
ON  
PROGRESS REPORT (II)  
FOR  
THE MASTER PLAN STUDY  
ON  
THE GROUNDWATER RESOURCES DEVELOPMENT  
FOR  
AGRICULTURE  
IN  
THE VICINITY OF AL DHAID  
IN  
THE UNITED ARAB EMIRATES**

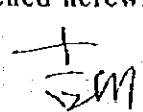
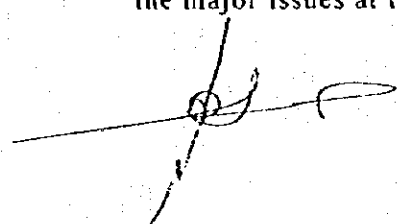
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The Study Team for the "Master Plan on the Groundwater Resources Development for Agriculture in the Vicinity of Al Dhaid in the United Arab Emirates" (hereinafter referred to as the "Study") organised and dispatched by Japan International Cooperation Agency (hereinafter referred to as "JICA"), led by Mr. Mitsuru Yoshikawa submitted 20 copies of Progress Report (II) of the Study, and other outcomes as attached list hereof, to the Ministry of Agriculture and Fisheries, the Government of United Arab Emirates (hereinafter referred to as the "Ministry") in accordance with the stipulation in the Scope of Work for the Study agreed by and between JICA and the Ministry.

The Study Team made a series of explanation to and discussion with the delegation of the Ministry headed by Mr. Mohamed Sager Al Asam, Director, Soil and Water Department on the content of the report.

The participants in the discussion meeting held at the Ministry's Head Office in Dubai on January 24, 1996 are shown in the attached list.

As the result of discussion, both parties agreed upon to recommend to their respective responsible agencies to take consideration for the Study on the major issues at the meeting from both parties as attached herewith:



In Dubai, on January 28, 1996



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Mr. Hamad Abdulla Al Mutawa,  
Assistant Deputy Minister,  
The Ministry



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Mr. Mitsuru Yoshikawa  
Leader,  
The Study Team, JICA

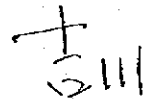
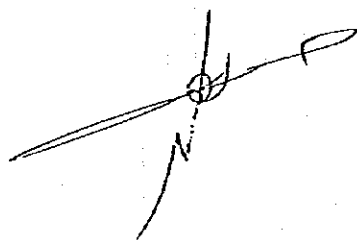
**Attachment-1: List of Participants for Discussion Meeting  
on Progress Report (II)**

**1.1. The Study Team:**

Mr. Mitsuru Yoshikawa,	Leader/ Groundwater Development
Mr. Izumi Kato,	Deputy Leader/Hydrogeologist
Dr. Jorge E. Tokesi	Project Economy
Dr. Toshihiko Kuno	Facility Design
Dr. Michiaki Hosono	Environment Conservation and WID
Mr. Eichi Shibata	Coordination

**1.2. The Ministry:**

Mr. Mohamed Sager Al Asam,	Director, Soil and Water Department (SWD)
Mr. Mohammed Abdul Haq,	Hydrogeologist, SWD
Mr. Mohammed Mustafa Mohamed,	Soil and Irrigation Engineer, SWD



**Attachment-2: Major Issues of Discussion on Interim Report**

2.1. The Ministry side pointed out that a number of inaccurate descriptions particularly on the sociology, economy, policy, administration and so forth have been found out in the present and previous reports. The Ministry side suggested to the Study Team to exclude such descriptions as far as possible and to concentrate on the water and agriculture sectors. The Ministry side stated that its comments on such descriptions will be sent in writing to the Study Team after receiving the draft final report.

The Study Team stated that the most descriptions were referred to the published materials and information obtained from official personnel, but the comments have been noted and those sections which deemed to be inaccurate would be revised in the further report, based on the Ministry's comments.

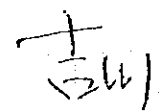
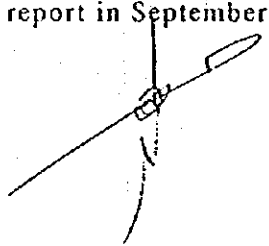
2.2. As per the item (2) of the paragraph 3.3.4 (Groundwater Extraction for Irrigation), the Ministry side pointed out that an average annual groundwater extraction of 237,500 cu.m/ha (650 cu.m/day/ha) is incredibly large.

The Study Team explained that the figure was based on replies from workers in the farms sampled by the Farm Inventory Survey.

The Ministry side also pointed out another averaged figure of 340 cu.m/day/ha (Table 3.2.4 in the paragraph 3.2.5).

The Study Team explained that the figures have been obtained from the actual measurement by the Study Team in nine (9) sample farms only during the field survey periods. The Study Team expressed its intention that the groundwater extraction of the Study Area shall be carefully evaluated in the further Home Work.

2.3. The Ministry side confirmed the schedule of further report. The Study Team explained that the draft final report will be sent to the Ministry in advance of the next visit of Study Team to Dubai for the explanation and discussion on the report in September, 1996.



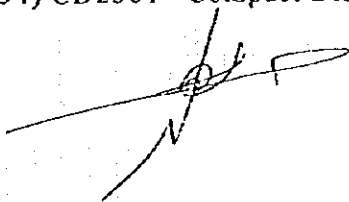
**Attachment-3: List of Outcomes Submitted with Progress Report (II)  
to the Ministry**

**3.1. Data of Farm Inventory Survey**

- |              |                           |                                   |
|--------------|---------------------------|-----------------------------------|
| 1) Vol. I    | : Soil Analysis, Al Dhaid | CO-8303-039                       |
| 2) Vol. II   | : Farm & Tube Well Survey | 2) General Farm Details           |
| 3) Vol. III  | : Farm & Tube Well Survey | 3) Crop Details                   |
| 4) Vol. VI   | : Farm & Tube Well Survey | 4) Finance Details                |
| 5) Vol. V    | : Farm & Tube Well Survey | 5) Livestock Details              |
| 6) Vol. VI   | : Farm & Tube Well Survey | 6) Intention Details              |
| 7) Vol. VII  | : Farm & Tube Well Survey | 7) Well Details                   |
| 8) Vol. VIII | : Farm & Tube Well Survey | 8) Water Details                  |
| 9) Vol. IX   | : Farm & Tube Well Survey | 9) Fertiliser & Pesticide Details |

**3.2. Digital Orthophoto Map**

- |             |                   |                  |
|-------------|-------------------|------------------|
| 10) 380-810 | Hard Copy         | Scale = 1:10,000 |
| 11) 380-805 | Hard Copy         | Scale = 1:10,000 |
| 12) 380-800 | Hard Copy         | Scale = 1:10,000 |
| 13) 380-795 | Hard Copy         | Scale = 1:10,000 |
| 14) 380-790 | Hard Copy         | Scale = 1:10,000 |
| 15) 380-785 | Hard Copy         | Scale = 1:10,000 |
| 16) 380-780 | Hard Copy         | Scale = 1:10,000 |
| 17) 380-775 | Hard Copy         | Scale = 1:10,000 |
| 18) 380-770 | Hard Copy         | Scale = 1:10,000 |
| 19) 380-765 | Hard Copy         | Scale = 1:10,000 |
| 20) 390-810 | Hard Copy         | Scale = 1:10,000 |
| 21) 390-805 | Hard Copy         | Scale = 1:10,000 |
| 22) 390-800 | Hard Copy         | Scale = 1:10,000 |
| 23) 390-795 | Hard Copy         | Scale = 1:10,000 |
| 24) 390-790 | Hard Copy         | Scale = 1:10,000 |
| 25) 390-785 | Hard Copy         | Scale = 1:10,000 |
| 26) 390-780 | Hard Copy         | Scale = 1:10,000 |
| 27) 390-775 | Hard Copy         | Scale = 1:10,000 |
| 28) 390-770 | Hard Copy         | Scale = 1:10,000 |
| 29) 390-765 | Hard Copy         | Scale = 1:10,000 |
| 30) Report  | (Survey Report)   |                  |
| 31) CD2358  | Compact Disk, 1/4 | Version 1.0      |
| 32) CD2359  | Compact Disk, 2/4 | Version 1.0      |
| 33) CD2360  | Compact Disk, 3/4 | Version 1.0      |
| 34) CD2361  | Compact Disk, 4/4 | Version 1.0      |



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1.6. Minutes of Meeting on Draft Final Report

**MINUTES OF MEETING  
ON  
DRAFT FINAL REPORT  
FOR  
THE MASTER PLAN STUDY  
ON  
THE GROUNDWATER RESOURCES DEVELOPMENT FOR AGRICULTURE  
IN  
THE VICINITY OF AL DHAID  
IN  
THE UNITED ARAB EMIRATES**

.....

The Study Team for the "Master Plan on the Groundwater Resources Development for Agriculture in the Vicinity of Al Dhaid in the United Arab Emirates" (hereinafter referred to as the "Study") organized and dispatched by Japan International Cooperation Agency (hereinafter referred to as "JICA"), led by Mr. Mitsuru Yoshikawa submitted ten(10) copies of Draft Final Report of the Study to the Ministry of Agriculture and Fisheries, the Government of United Arab Emirates (hereinafter referred as the "Ministry") in accordance with the stipulation in the Scope of Work for the Study agreed by and between JICA and the Ministry.

The Study Team made series of explanation to and discussion with the delegation of the Ministry headed by Mr. Mohamed Saqer Al Asam, Director, Soil and Water Department, on the content of the Report.

The participants in the discussion meetings held at the Ministry's Head Office in Dubai from September 5 up to 8, 1996 are shown in the attached list.

As the result of discussion, both parties agreed upon to recommended to their respective responsible agencies to take consideration for the Study on the major issues at the meetings from both parties as attached herewith:



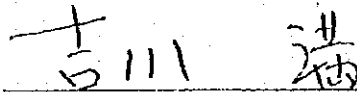
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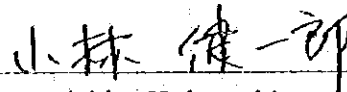
in Dubai, on September 9, 1996



Mr. Mohammed Mussa Al-Jasim  
Acting Deputy Minister



Mr. Mitsuru Yoshikawa  
Leader, The Study Team,  
JICA



Mr. Kenichiro Kobayashi  
Advisory Team, JICA

**Attachment-2 : Major Issues of Discussions on Draft Final Report**

2.1. The Ministry agreed to send its comments in writing on the Draft Final Report to the JICA headquarters by October 9, 1996. Based on the review of the comments by Study Team, the final reports will be send to the Ministry by the official channel of Government of Japan within two months after receiving the Ministry's comments, as stated in the Scope of Work.

2.2. The Ministry agreed that the Final Report would be available to any person who have interests in the Study.

2.3. The Ministry requested to revise the number of copies of the Final Reports as follows:

Volume I: Main Report	30 copies
Volume II: Sector Report	30 copies
Volume III: Appendices	30 copies
Volume IV: Supplemental Data	30 copies

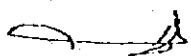
The Study Team promised to convey the request to JICA headquarters.

2.4. Hydrogeology and Groundwater

As per Section 4.6. (Hydrological Balance and Groundwater Resources), the Ministry side requested to the Study Team to clearly indicate the change of total groundwater storage in the Study Area and the comparison of current groundwater balance made by the previous IWACO study and the Study Team.

2.5. Groundwater Extraction Amount

The Ministry side pointed out that the estimated groundwater extraction amount at 33 m<sup>3</sup>/ha/day in the Study is too small comparing with the Ministry's estimate of 50 to 60 m<sup>3</sup>/ha/day. The Ministry side requested to show the detailed estimation of irrigation water extraction amount. The Study Team agreed to show the detailed estimation in the Final Report.



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**Attachment-1 : List of Participants for the Discussion Meetings on Draft Final Report**

**1.1. The JICA Headquarters:**

Mr. Kenichiro Kobayashi,

Advisory Team,

Agriculture, Forestry and Fishery

Development Study Department

**1.2. The Study Team**

Mr. Mitsuru Yoshikawa,

Mr. Keiji Matsumoto,

Leader/Groundwater Development

Irrigation/Drainage Expert

**1.3. The Ministry**

Mr. Mohamed Seqer Al Asam,

Director, Soil and Water Department

(SWD)

Mr. Mohammed Abdul Haq,

Hydrogeologist, SWD

Mr. Humaid Al Zaabi,

Head, Meteorology Section, SWD

Mr. Ahmed Dorabi,

Civil Engineer, SWD

Ms. Mona Al Hashimi,

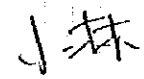
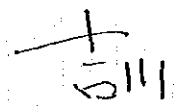
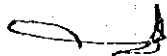
Meteorologist, SWD

Mr. Mohammed Mustafa Mohammed,

Soil and Irrigation Engineer, SWD

Mr. Habib Hussain Aboodi

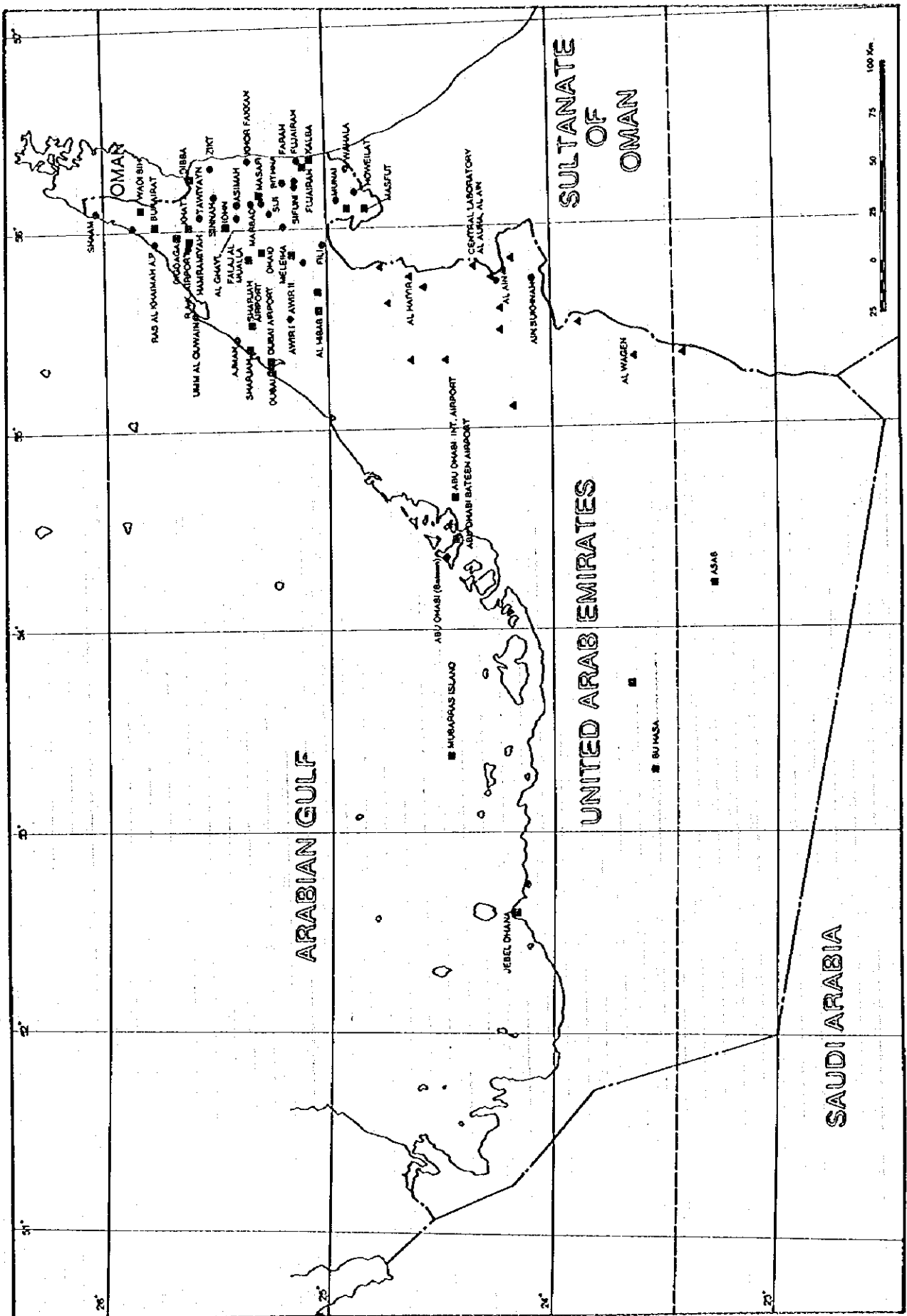
Head of Planning Unit



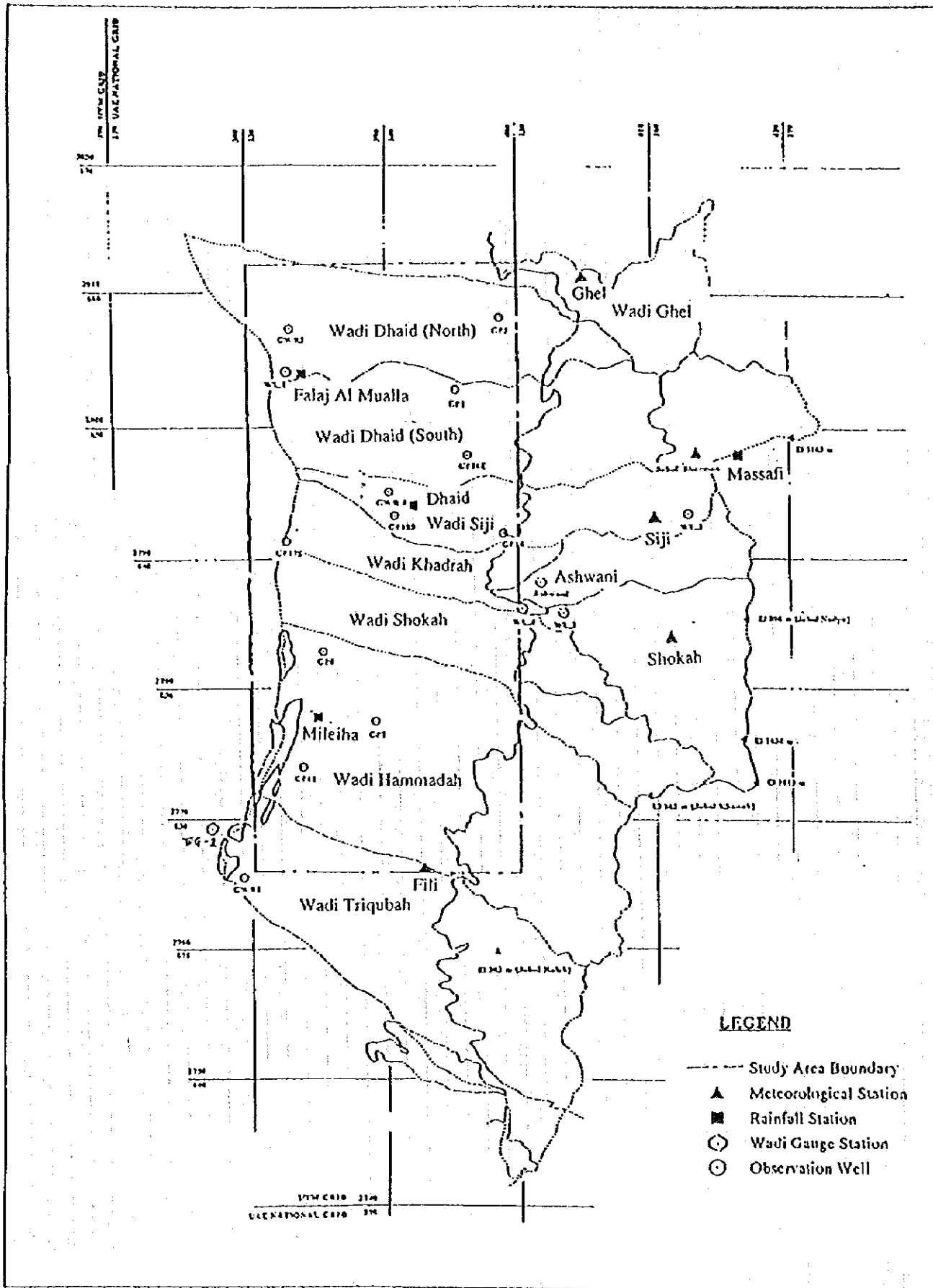
**VOLUME THREE : APPENDICES**

**APPENDIX-2: METEOROLOGY AND HYDROLOGY**

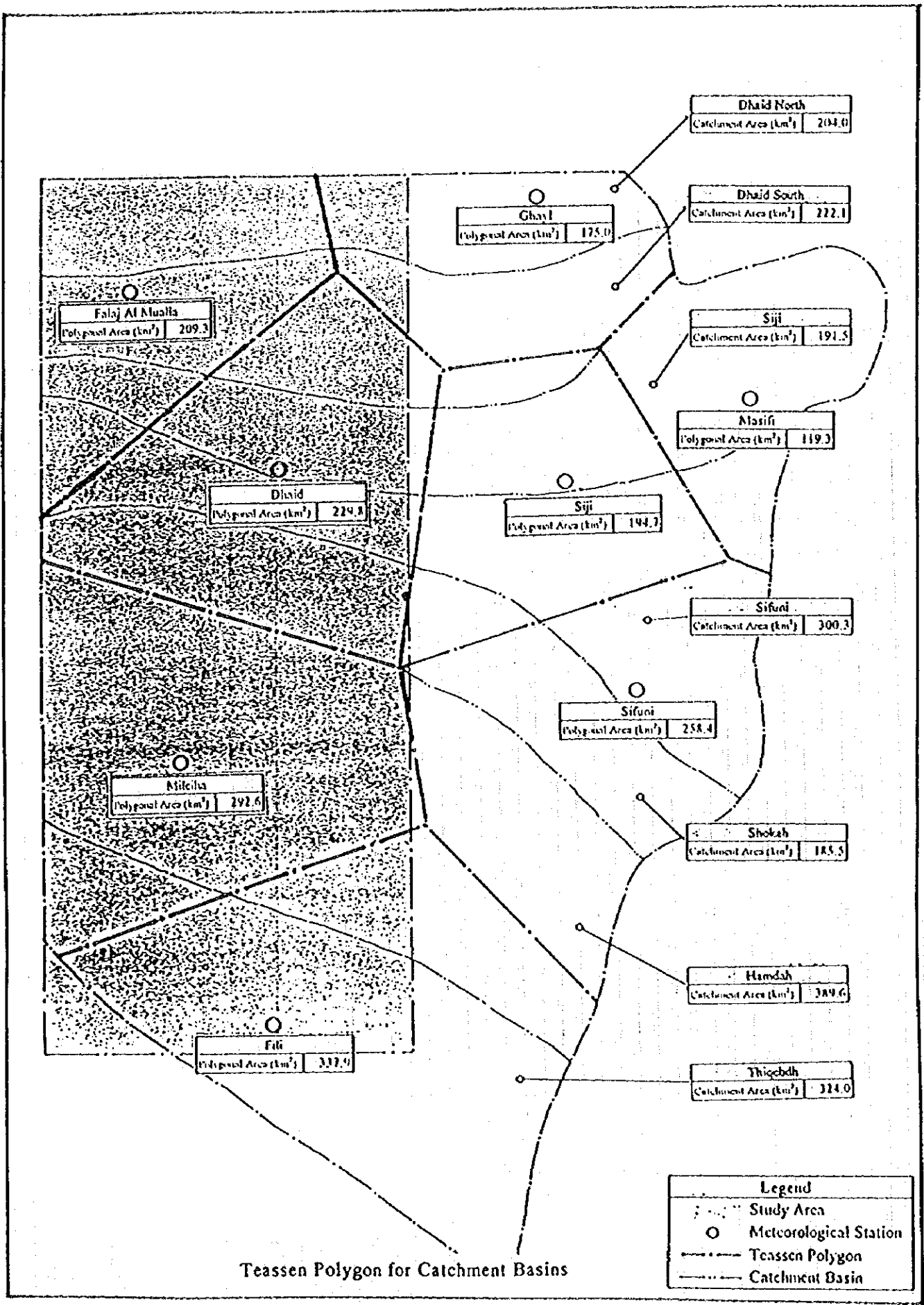
2.1. General  
2.1.1. Location of Climate or Rainfall Station in UAE



2.1.2. Meteo-hydrological Stations and Observation Well In the Study Area

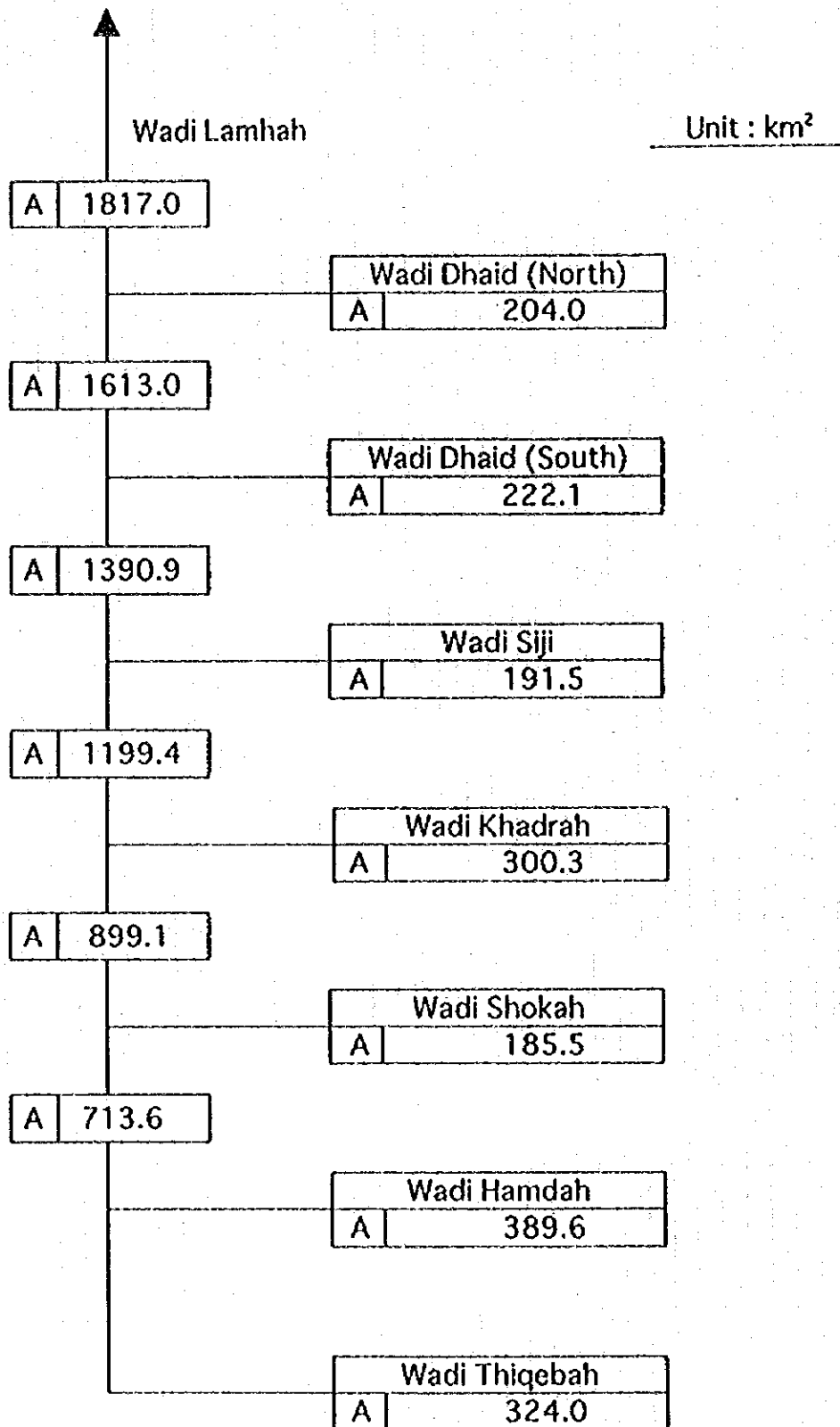


### 2.1.3. Thiessen Polygon for the Study Area Basin



Teassen Polygon for Catchment Basins

2.1.4. Schematic Wadi Basin in the Study Area



Schematic of Wadi Basin in the Study Area

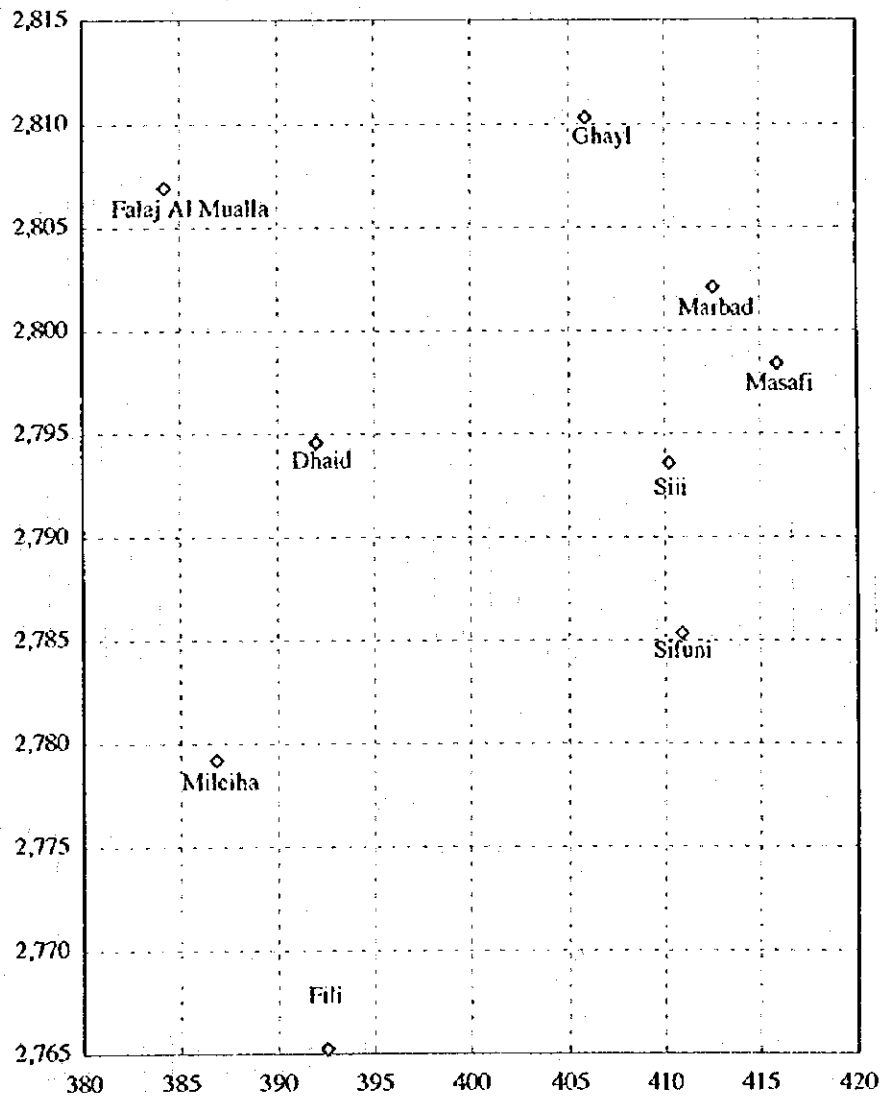
### 2.1.5. Location List of Climate and Rainfall Stations in the Study Area Basin

No.	Name of Station	Type of Station	Installed Date	Latitude	Longitude	Elevation AMSL	Gauge Type	Installation Date of Recorder	Remarks
				' N	' E				
1	Dhaid	Rain(Met)	Oct-79	25 16	55 56	135	ord.	Shifted in 19?	within Study Area
2	Falaj Al Mualla	Met	Oct-65	25 23	55 51	95	rec	27-Mar-78	within Study Area
3	Fili	Rain	Apr-71	25 0	55 56	240	rec	28-Jun-79	within Study Area
4	Meleiha	Met	Jul-67	25 8	55 53	160	rec	24-Feb-82	within Study Area
5	Al Ghayl	Rain	Apr-71	25 24	56 4	260	rec	25-May-78	within catchment area
6	Marbad	Rain	Jan-81	25 20	56 8	450	rec	21-Feb-80	within catchment area
7	Masafi	Met	Oct-65	25 18	56 10	450	rec	15-Dec-75	within catchment area
8	Sifuni	Rain	Aug-76	25 11	56 7	335	rec	17-May-78	within catchment area
9	Siji	Rain	Oct-75	25 15	56 7	315	rec	5-Apr-78	within catchment area

Notes: ord : ordinary rain gauge, rec: automatic recorder

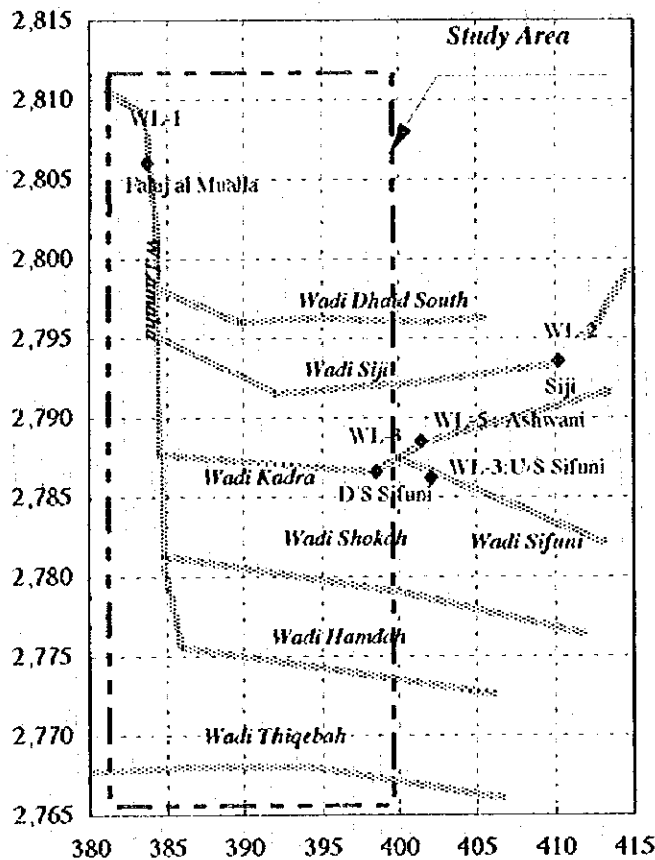
Met : Meteorological Station

Source : Climatological Data Volume 3: 1979-80 to 1991-92, January 1993, MAF Department of Soil & Water



### 2.1.6. Location List of Hydrological Stations in the Study Area Basin

r.No. of station	Name of Wadi	Name of Wadi Gauge	Catchment Area (km <sup>2</sup> )	Location			Installation Date	Present Conditions
				UTM-N	UTM-B	Elevation		
<b>Within the Catchment Area of the Study Area</b>								
/L-1	Lamhah	Falaj Al Mualla	1,484.00	2,806.037	383.732		before 1975	no AWLR
/L-2	Siji	U/S Siji Village	86.60	2,793.533	410.236	310.0	before 1975	w/cable
/L-3	Sifuni	U/S Ashwani Junc.	137.90	2,786.159	402.118	190.0	before 1975	in Quarry
/L-4	Sifuni	D/S Ashwani Junc.	215.60	2,786.558	398.546		1977	no AWLR
/L-5	Ashwani	U/S Sifni Junc.	46.00	2,788.494	401.448	182.0	1980	wide channe
<b>Out of and Adjacent to the Study Area</b>								
/B-1	Bhi	Digdga Rd.	770.00				before 1975	
/B-2	Bhi	Burayrat	474.70				before 1975	
/B-3	Naqab	Outflow from Mountains	92.30				before 1975	
/H-1	Ham	D/S of Bithna Weir	90.48				before 1975	
/G-1	Guor(East)	D/S Howelat Munnai Junc	303.00				1979	
/G-2	Guir(West)	Jabel Fayah	1,640.00				before 1975	





## 2.2. Meteorological Analysis

**2.2.1. Correlation Coefficient of Monthly Rainfall Analysis among Stations in the Study Area Basin**

Station Name	Falaj Al Mualla	Ghayl	Dhaid	Masafi	Siji	Meleha	Sifuni	Fili
Available Data	156	156	156	156	156	156	156	156
Falaj Al Mualla	.	0.914	0.955	0.912	0.898	0.871	0.874	0.827
Ghayl	.	.	0.924	0.932	0.926	0.899	0.926	0.870
Dhaid	.	.	.	0.928	0.925	0.925	0.910	0.866
Masafi	.	.	.	.	0.967	0.930	0.958	0.879
Siji	.	.	.	.	.	0.948	0.975	0.896
Meleha	.	.	.	.	.	.	0.951	0.919
Sifuni	.	.	.	.	.	.	.	0.904
Fili	.	.	.	.	.	.	.	.

**2.2.2. Correlation Coefficient of Monthly Rainfall during Rainy Season among Stations in the Study Area Basin**

Station Name	Falaj Al Mualla	Ghayl	Dhaid	Masafi	Siji	Meleha	Sifuni	Fili
Available Data	117	117	117	117	117	117	117	117
Falaj Al Mualla	.	0.908	0.952	0.905	0.891	0.862	0.865	0.815
Ghayl	.	.	0.919	0.926	0.920	0.891	0.919	0.859
Dhaid	.	.	.	0.922	0.920	0.919	0.903	0.856
Masafi	.	.	.	.	0.965	0.925	0.954	0.869
Siji	.	.	.	.	.	0.944	0.973	0.887
Meleha	.	.	.	.	.	.	0.947	0.912
Sifuni	.	.	.	.	.	.	.	0.896
Fili	.	.	.	.	.	.	.	.

**2.2.3. Correlation Coefficient of Annual Rainfall among Stations in the Study Area Basin**

Station Name	Falaj Al Mualla	Meleha	Dhaid	Fili	Al Ghayl	Sifuni	Siji	Marbad	Masafi	Sharmah
Available Data	21	21	13	13	16	16	16	11	21	11
Falaj Al Mualla	.	0.791	0.968	0.837	0.927	0.885	0.874	0.966	0.791	0.946
Meleha	.	.	0.876	0.950	0.878	0.945	0.913	0.941	0.818	0.936
Dhaid	.	.	.	0.842	0.897	0.874	0.925	0.964	0.903	0.945
Fili	.	.	.	.	0.896	0.943	0.931	0.924	0.874	0.889
Al Ghayl	.	.	.	.	.	0.937	0.846	0.939	0.793	0.914
Shifuni	.	.	.	.	.	.	0.913	0.948	0.880	0.938
Siji	.	.	.	.	.	.	.	0.962	0.939	0.979
Marbad	.	.	.	.	.	.	.	.	0.951	0.976
Masafi	.	.	.	.	.	.	.	.	.	0.991
Jebel Sharmah	.	.	.	.	.	.	.	.	.	.

#### 2.2.4. Probability Analysis of Dally Rainfall

Unit : mm/day

Return Period	Dhaid	Sifuni	Masafi	Siji	Meleiha	Marbad	Sharjah	Munai	Fili
Available Data	17.0	19.0	19.0	19.0	16.0	14.0	18.0	18.0	
2 years	31.8	32.3	34.9	34.9	31.4	39.0	27.8	27.8	37.8
3 years	42.3	47.1	45.6	46.8	46.0	53.9	41.3	41.3	54.6
5 years	55.5	67.4	58.9	62.0	66.1	73.6	60.2	60.2	77.7
7 years	64.5	82.1	67.9	72.3	80.7	87.3	74.1	74.1	94.2
10 years	74.3	99.0	77.6	83.7	97.6	102.6	90.2	90.2	113.2
20 years	94.6	136.0	97.3	107.2	134.5	135.1	125.9	125.9	154.6
30 years	107.2	160.5	109.4	122.0	158.9	155.8	149.8	149.8	181.7
50 years	124.0	194.5	125.5	141.7	193.0	184.0	183.2	183.2	219.4
75 years	138.1	224.2	138.9	158.4	222.9	208.1	212.8	212.8	252.2
100 years	148.6	246.9	148.8	170.7	245.6	226.2	235.4	235.4	277.2
200 years	175.3	307.1	173.8	202.4	306.3	273.2	296.1	296.1	343.3

2.2.5. Results of Drought Annual Rainfall Probability Analysis

Return Period	Annual Rain Fall				Rainy Days Number of Years	
	Basin Rainfall Year mm/year	Falaj al Mualla Year mm/year	Dhaid Year mm/year	Meleiha Year mm/year	Falaj al Mualla Year times	Meleiha Year times
				1984 6.2		1984 1
200	19.1	14.1	11.5	7.9	2.5	1.1
100	22.9	17.0	14.1	10.1	2.9	1.3
					1983 3	
75	24.9	18.5	15.5	11.2	3.0	1.4
	1984 27.8					
50	28.0	20.8	17.8	13.2	3.3	1.6
			1984 19.2			
30	33.0	24.5	21.4	16.3	3.7	1.9
			1983 22.3			
20	37.9	28.2	25.2	19.5	4.1	2.2
		1983 30.6				
10	49.5	36.9	34.2	27.8	4.9	3.0
	1983 54.3					
7	57.9	43.3	41.0	34.2	5.5	3.5
					1984 5	
5	68.4	51.2	49.6	42.6	6.1	4.2
	1990 68.8	1984 54.4	1985 66.3	1983 56.4	1988 7	1983 4
	1988 77.4	1990 63.7		1990 57.8		
	1985 83.9	1985 64.2				
3	92.6	69.4	70.2	63.4	7.6	5.8
		1980 80.4	1990 77.2	1988 66.8	1980 8	1980 5
		1988 83.0	1988 77.5	1979 78.5	1990 8	1988 7
				1985 80.8	1986 9	1979 8
					1987 9	1985 8
						1990 8
2	127.1	95.5	100.9	96.2	9.4	8.2
	1980 124.5	1991 149.2	1979 103.7	1980 136.3	1979 11	1987 11
	1979 149.4	1979 166.6	1980 117.0	1991 158.1	1985 12	1989 13
	1991 164.0	1986 167.6	1986 141.4	1986 190.2	1989 13	1981 14
	1986 195.1	1982 188.0	1991 153.6	1987 208.0	1991 15	1991 15
	1982 245.8	1987 196.6	1982 175.8	1982 249.6	1982 16	1982 17
	1989 247.5	1989 223.4	1987 182.7	1989 250.7	1981 20	1986 20
	1987 289.5	1981 381.0	1989 213.2	1981 259.6		
	1981 318.3		1981 368.9			

### 2.2.6. Catchment Calculation by Thiessen Polygon

Unit : km <sup>2</sup>								
Wadi Basin Name	Study Basin	Dhaid	Dhaid	Siji	Sifuni	Shokah	Hamdah	Thiqebdh
Station Name	Area	North	South					
Falaj Al Mualla	209.3	98.9	65.7	19.0	25.7	0.0	0.0	0.0
Ghayl	175.0	105.1	69.9	0.0	0.0	0.0	0.0	0.0
Dhaid	229.8	0.0	63.7	43.0	58.1	64.9	0.0	0.0
Masafi	119.3	0.0	0.0	75.6	43.7	0.0	0.0	0.0
Siji	194.7	0.0	22.8	53.9	83.2	34.8	0.0	0.0
Mileiha	292.6	0.0	0.0	0.0	0.0	0.0	231.4	61.2
Sifuni	258.4	0.0	0.0	0.0	89.6	85.7	83.0	0.0
Fili	337.9	0.0	0.0	0.0	0.0	0.0	75.2	262.8
	1817.0	204.0	222.1	191.5	300.3	185.5	389.6	324.0

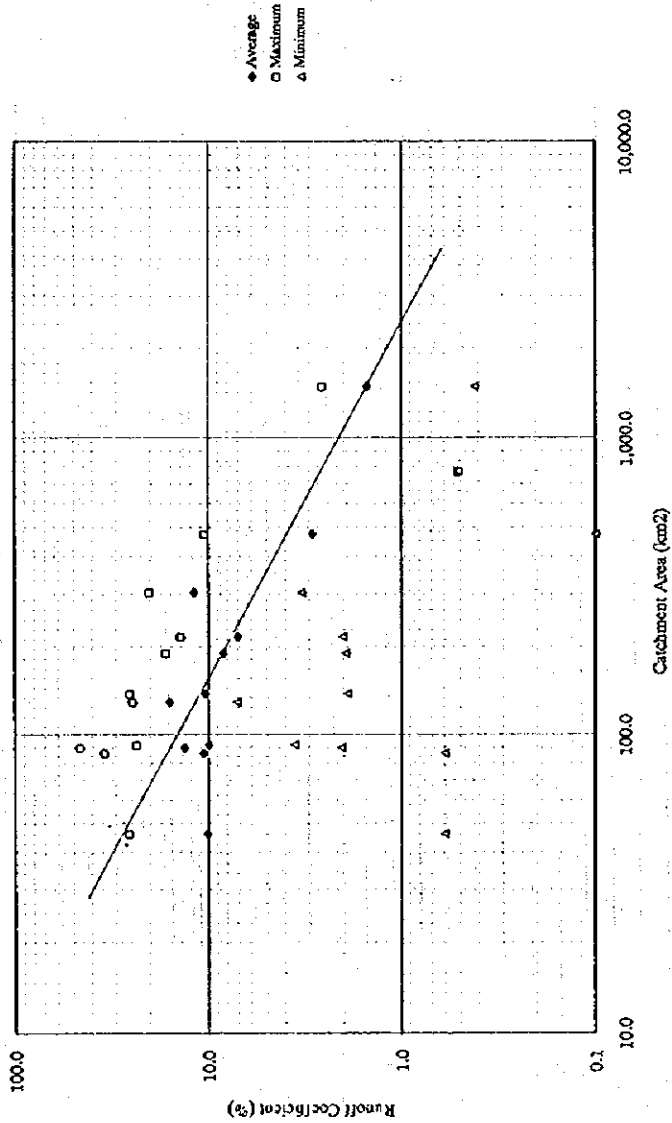
### 2.2.7. Annual Rainfall of the Study Area by Thiessen Polygon

(mm/hydrological year)

Year	Study Basin	Ghayl	Dhaid	Falaj Al	Fili	Masafi	Meleiha	Sifuni	Siji
Hydrology	Area			Mualla					
1967	-	-	-	79.9	-	106.6	120.0	-	-
1968	-	-	-	129.5	-	181.2	209.8	-	-
1969	-	-	-	82.2	-	40.3	58.8	-	-
1970	-	-	-	18.0	-	-	-	-	-
1971	-	156.1	-	193.3	130.1	192.9	198.6	-	-
1972	-	36.0	-	29.7	27.1	83.2	65.4	-	-
1973	-	60.1	-	45.8	28.0	41.0	8.6	-	-
1974	-	-	-	138.1	-	325.5	134.6	-	-
1975	-	193.6	-	210.7	-	357.1	275.9	-	334.5
1976	-	145.2	-	129.2	-	263.6	133.9	228.8	244.3
1977	-	77.9	-	46.6	-	197.9	69.9	59.4	68.1
1978	-	72.9	-	74.8	-	104.0	58.1	76.6	77.4
1979	149.4	193.2	103.7	166.6	182.6	184.6	78.5	167.2	149.4
1980	124.5	121.4	117.0	80.4	179.6	95.0	136.3	105.6	113.2
1981	318.3	296.8	368.9	381.0	292.4	348.2	259.6	316.2	328.0
1982	245.8	255.4	175.8	188.0	271.2	249.5	249.6	311.0	243.4
1983	54.3	15.4	22.3	30.6	91.8	110.4	56.4	36.2	73.6
1984	27.8	39.6	19.2	54.4	21.0	33.6	6.2	31.8	34.4
1985	83.9	88.6	66.3	64.2	102.2	77.6	80.8	97.4	80.8
1986	195.1	190.0	141.4	167.6	264.8	158.8	190.2	210.4	180.8
1987	289.5	171.9	182.7	196.6	272.0	242.4	208.0	264.8	222.8
1988	77.4	99.8	77.5	83.0	103.6	65.0	66.8	57.6	55.6
1989	247.5	249.0	213.2	223.4	247.4	291.0	250.7	291.6	222.4
1990	68.8	92.6	77.2	63.7	79.8	79.8	57.8	63.2	41.2
1991	164.0	153.6	153.6	149.2	205.6	143.2	158.1	181.0	128.2

## 2.3. Hydrological Analysis

	Catchment km <sup>2</sup>	Year														Runoff Coefficient					
		197	197	197	197	197	197	197	197	197	197	197	197	197	197	197	Average	Minimum			
Bhi at Dirgaga	770.0																0.5	0.51			
Bhi at Burayrat	474.4	1.9	1.3	0.1	0.3	6.2	0.4	2	1.9							4.4	11	2.9	10.5	0.1	
Naqab	92.3	15	3.6	8.5	24	18	6.6	4.2	9.8							4.5	6.4	10.0	23.5	3.6	
Lamaha at Falaj al Mualla	1,484.0																		1.5	2.59	0.42
Siji	86.6	9.5	14	0.6	4	5.5	6.8	20	6.9							4.2	3.5	10.6	34.5	0.6	
Sifni	137.9	9.9	10	2.2	2.5	1.9	16	12	11	2.5						4.9	18	10.4	25.3	1.92	
Ashwani	215.6																	7.1	13.93	2.03	
Fam	46.0																	10.1	25.57	0.6	
Guor	90.4	9.4	4.7	3.6	5.1	9.49	2.1	4.6	12							3	19	13.3	46.19	2.06	
Wurayab	303.0																	11.8	20.05	3.51	
Fam Dam	129.0																	15.8	24.54	7.13	
	190.0																	8.4	16.5	1.96	



2.3.1. Runoff Coefficient of Wadis in UAE

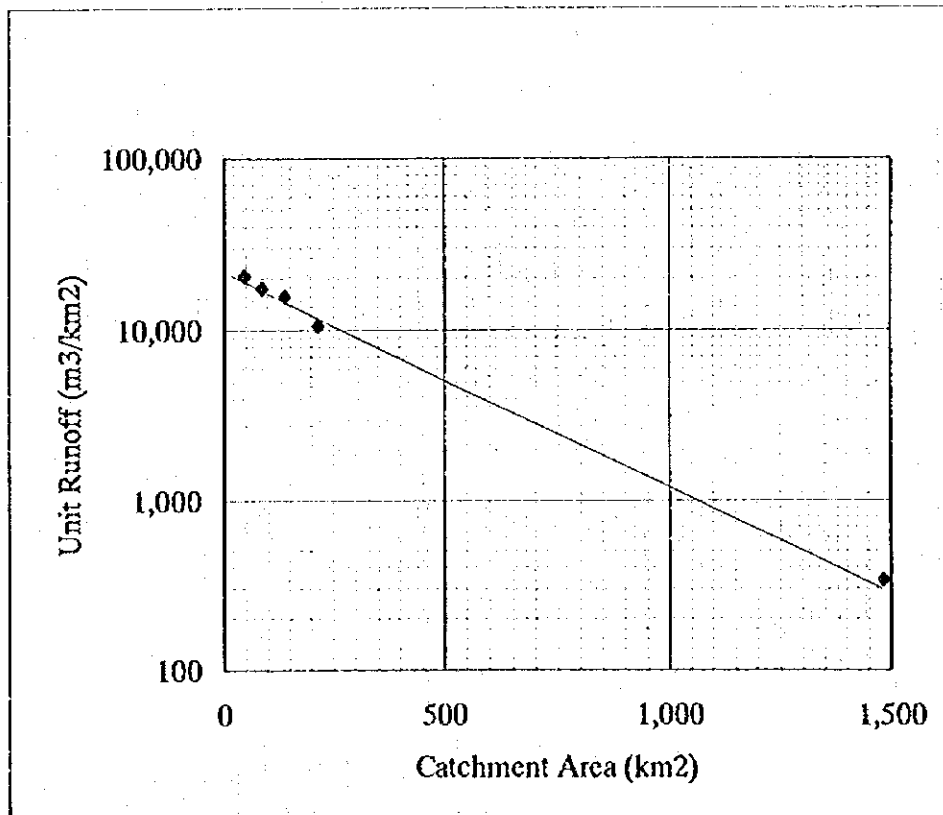
**2.3.2. Flood Probability Analysis for Daily Runoff Discharges  
in the Study Area Basin**

Unit :  $\times 10^3 \text{m}^3/\text{day}$

Return Period	W.L.1	W.L.2	W.L.3	W.L.4	W.L.5
Available Data					
2 years	595	443	532	626	154
3 years	966	831	909	1,108	425
5 years	1,534	1,517	1,517	1,910	1,117
7 years	1,978	2,111	2,010	2,577	1,900
10 years	2,518	2,889	2,625	3,423	3,145
20 years	3,790	4,917	4,126	5,540	7,394
30 years	4,689	6,485	5,222	7,118	11,538
50 years	6,005	8,944	6,865	9,525	19,347
75 years	7,214	11,353	8,410	11,821	28,387
100 years	8,165	13,337	9,645	13,677	36,777
200 years	10,816	19,220	13,163	19,042	66,177

### 2.3.3. Annual Runoff of Wadis in the Study Area

	WL-1	WL-2	WL-3	WL-4	WL-5
Name of Waji	Lamaha	Siji	Sifuni U/S	Sifuni D/S	Ashwani
Location	Falaji Al Mualla	Siji	Sifni	Shifni	Ahwani
Catchment Area (km <sup>2</sup> )	1,484.0	86.6	137.9	215.6	46.0
1975 - 1976	570,000	292,400	3,550,000	-	-
1976 - 1977	160,000	3,270,000	1,898,000	-	-
1977 - 1978	0	70,000	390,000	214,000	-
1978 - 1979	30,000	314,200	2,348,000	739,000	-
1979 - 1980	92,234	798,207	310,794	431,022	-
1980 - 1981	2,159,769	260,181	1,468,026	294,450	14,787
1981 - 1982	2,028,440	7,067,420	4,087,470	4,460,220	3,742,200
1982 - 1983	0	1,183,610	3,178,370	3,590,120	100,370
1983 - 1984	0	0	453,957	-	31,410
1984 - 1985	0	0	481,335	-	-
1985 - 1986	0	0	95,073	-	-
1986 - 1987	0	621,520	1,253,097	2,014,520	252,000
1987 - 1988	968,000	7,447,255	6,077,350	5,355,120	2,245,007
1988 - 1989	0	500,000	6,000	-	0
1989 - 1990	1,497,620	873,719	6,887,915	3,500,000	1,187,786
1990 - 1991					



## 2.4. Floods in July and December 1995

### 2.4.1. Rainfall in the Study Area Basin in July 1995

<i>Maraft</i>				<i>Sij</i>				<i>Sifwat</i>			
Date/Time	Period (min.)	Rainfall (mm)	Rf. Intensity (mm/hr)	Date/Time	Period (min.)	Rainfall (mm)	Rf. Intensity (mm/hr)	Date/Time	Period (min.)	Rainfall (mm)	Rf. Intensity (mm/hr)
21/07/1995 23.00	0	0		21/07/1995 20.05	0	0		21/07/1995 20.10	0	0	
21/07/1995 23.05	300	1.0	12.0	21/07/1995 20.10	300	0.6	7.2	21/07/1995 20.15	300	0.4	4.8
								21/07/1995 22.20	7500	0.2	0.1
22/07/1995 02.50	0	0.0		22/07/1995 13.25	0	0.0		22/07/1995 13.25	0	0.0	
22/07/1995 02.55	300	0.2	2.4	22/07/1995 13.30	300	0.2	2.4	22/07/1995 13.30	300	0.6	7.2
22/07/1995 13.25	0	0.0		22/07/1995 22.35	0	0.0		22/07/1995 13.40	600	0.6	3.6
22/07/1995 13.30	300	0.8	9.6	22/07/1995 22.40	300	0.4	4.8	22/07/1995 13.50	600	0.1	0.6
22/07/1995 22.35	0	0.0		22/07/1995 23.00	1200	0.8	2.4	22/07/1995 22.45	0	0.0	
22/07/1995 22.40	300	0.6	7.2					22/07/1995 22.50	300	0.3	3.6
22/07/1995 23.00	1200	0.8	2.4					22/07/1995 23.00	600	0.4	2.4
								22/07/1995 23.05	300	0.2	2.4
23/07/1995 05.55	0	0.0		23/07/1995 05.55	0	0.0		23/07/1995 00.25	0	0.0	
23/07/1995 06.00	300	0.2	2.4	23/07/1995 06.00	300	0.2	2.4	23/07/1995 00.30	300	0.2	2.4
23/07/1995 06.05	300	0.2	2.4	23/07/1995 06.15	900	0.2	0.8	23/07/1995 05.35	0	0.0	
23/07/1995 06.50	2700	23.6	31.5	23/07/1995 06.30	900	4.1	16.4	23/07/1995 05.40	300	0.2	2.4
23/07/1995 07.00	600	0.2	1.2					23/07/1995 05.45	300	0.2	2.4
23/07/1995 07.50	3000	6.4	7.7					23/07/1995 05.50	300	0.2	2.4
23/07/1995 07.55	300	0.2	2.4					23/07/1995 06.35	2700	19.0	25.3
23/07/1995 08.05	600	0.2	1.2					23/07/1995 06.40	300	0.2	2.4
23/07/1995 08.10	300	0.2	2.4					23/07/1995 07.35	0	0.0	
23/07/1995 09.05	0	0.0						23/07/1995 07.40	300	0.2	2.4
23/07/1995 09.10	300	0.2	2.4					23/07/1995 07.50	600	0.2	1.2
23/07/1995 11.25	0	0.0						23/07/1995 08.00	600	0.4	2.4
23/07/1995 11.30	300	0.4	4.8					23/07/1995 08.10	600	0.4	2.4
23/07/1995 11.35	0	0.0						23/07/1995 08.15	300	0.2	2.4
23/07/1995 12.00	1500	0.2	0.5					23/07/1995 08.35	1200	0.4	1.2
								23/07/1995 08.45	600	0.4	2.4
								23/07/1995 08.50	300	0.2	2.4
								23/07/1995 09.00	600	0.1	0.6
								23/07/1995 09.15	900	0.2	0.8
24/07/1995 01.55	0	0.0						24/07/1995 01.25	0	0.0	
24/07/1995 02.00	300	0.2	2.4					24/07/1995 01.30	300	0.2	2.4
24/07/1995 02.05	300	0.2	2.4					24/07/1995 01.40	600	0.2	1.2
24/07/1995 03.10	0	0.0						24/07/1995 02.10	1800	0.2	0.4
24/07/1995 05.15	300	0.2	2.4					24/07/1995 06.15	0	0.0	
24/07/1995 05.25	0	0.0						24/07/1995 06.20	300	0.2	2.4
24/07/1995 05.30	300	0.2	2.4					24/07/1995 06.45	1500	0.2	0.5
24/07/1995 06.00	1800	1.2	2.4					24/07/1995 07.00	900	0.2	0.8
24/07/1995 06.05	0	0.0									
24/07/1995 06.10	300	0.6	7.2								
24/07/1995 06.25	0	0.0									
24/07/1995 06.30	300	0.6	7.2								
24/07/1995 07.00	1800	10.8	21.6								
24/07/1995 07.15	0	0.0									
24/07/1995 07.45	1800	8.0	16.0								
24/07/1995 07.50	300	0.2	2.4								
24/07/1995 08.00	600	1.0	6.0								
24/07/1995 08.25	0	0.0									
24/07/1995 08.30	300	0.2	2.4								
24/07/1995 08.50	1200	3.4	10.2								
24/07/1995 08.55	300	0.4	4.8								
24/07/1995 09.00	300	0.2	2.4								
24/07/1995 09.05	0	0.0									
24/07/1995 09.15	600	0.4	2.4								
24/07/1995 09.20	300	1.8	21.6								
24/07/1995 09.40	0	0.0									
24/07/1995 10.10	1800	3.0	6.0								
24/07/1995 10.25	0	0.0									
24/07/1995 10.30	300	0.4	4.8								
24/07/1995 14.10	0	0.0									
24/07/1995 14.15	300	0.2	2.4								
27/07/1995 14.05	0	0.0						27/07/1995 11.30	0	0.0	
27/07/1995 15.00	3300	21.8	23.8					27/07/1995 11.35	300	0.5	6.0
27/07/1995 15.05	300	0.2	2.4					27/07/1995 12.40	3900	19.9	18.4
27/07/1995 15.10	0	0.0									
27/07/1995 15.15	600	0.2	1.2								
		90.8				6.5				47.1	

Source: MAF



### 2.4.2. Runoff Measurement in the Study Area in July 1995

<i>Siji</i>			<i>Ashwani</i>			<i>Sifunt</i>		
Date/Time	Discharge (m <sup>3</sup> /sec.)	Runoff Volume (m <sup>3</sup> )	Date/Time	Discharge (m <sup>3</sup> /sec.)	Runoff Volume (m <sup>3</sup> )	Date/Time	Discharge (m <sup>3</sup> /sec.)	Runoff Volume (m <sup>3</sup> )
24/07/1995 06:00	0.0	0	24/07/1995 06:00	0.0	0			
24/07/1995 06:30	0.0	0	24/07/1995 06:30	4.5	4,068			
24/07/1995 07:00	38.0	34,200	24/07/1995 07:00	18.5	20,718			
24/07/1995 07:15	450.0	219,600	24/07/1995 07:30	38.5	51,300			
24/07/1995 07:30	550.0	450,000	24/07/1995 08:00	43.0	73,350			
24/07/1995 07:45	570.0	504,000	24/07/1995 08:15	222.5	119,475			
24/07/1995 08:00	606.0	529,200	24/07/1995 08:30	155.5	170,100			
24/07/1995 08:15	550.0	520,200	24/07/1995 08:45	142.5	134,100			
24/07/1995 08:30	450.0	450,000	24/07/1995 09:00	123.1	119,520			
24/07/1995 08:45	220.0	301,500	24/07/1995 10:00	100.5	402,480			
24/07/1995 09:00	200.0	189,000	24/07/1995 10:30	90.4	171,810			
24/07/1995 09:15	180.0	171,000	24/07/1995 11:00	76.0	149,760			
24/07/1995 09:30	47.0	102,150	24/07/1995 11:30	62.1	124,290			
24/07/1995 09:45	38.0	38,250	24/07/1995 12:00	48.0	99,090			
24/07/1995 10:00	22.0	27,000	24/07/1995 12:30	38.5	77,850			
24/07/1995 10:30	19.0	36,900	24/07/1995 13:00	28.0	59,850			
24/07/1995 11:00	19.0	34,200	24/07/1995 13:30	23.5	46,305			
24/07/1995 11:30	16.0	31,500	24/07/1995 14:00	18.5	37,755			
24/07/1995 12:00	13.5	26,550	24/07/1995 14:30	11.4	26,865			
24/07/1995 13:00	13.5	48,600	24/07/1995 15:00	4.5	14,283			
24/07/1995 14:00	11.0	44,100	24/07/1995 15:30	0.4	4,383			
24/07/1995 15:00	9.8	37,350	24/07/1995 16:00	0.0	315			
24/07/1995 16:00	8.5	32,850						
24/07/1995 17:00	8.5	30,600						
24/07/1995 18:00	2.5	19,800						
24/07/1995 19:00	1.0	6,300						
24/07/1995 20:00	0.5	2,700						
24/07/1995 21:00	0.2	1,170						
24/07/1995 22:00	0.1	405						
24/07/1995 23:00	0.1	270						
25/07/1995 00:00	0.1	270						
25/07/1995 12:00	0.1	2,916						
26/07/1995 00:00	0.1	2,376						
26/07/1995 12:00	0.0	1,728						
27/07/1995 00:00	0.0	648				27/07/1995 12:00	0.0	0
27/07/1995 11:30	0.0	0				27/07/1995 12:05	0.0	0
27/07/1995 11:45	0.1	34				27/07/1995 13:45	0.0	0
27/07/1995 12:00	369.3	166,219				27/07/1995 14:00	14.6	6,570
27/07/1995 12:15	220.0	265,185				27/07/1995 14:15	66.6	36,540
27/07/1995 12:30	180.0	180,000				27/07/1995 14:30	68.9	60,975
27/07/1995 12:45	130.0	139,500				27/07/1995 14:45	102.4	77,085
27/07/1995 13:00	120.0	112,500				27/07/1995 15:00	66.6	76,050
27/07/1995 13:30	38.0	142,200				27/07/1995 15:15	52.5	53,595
27/07/1995 14:00	30.0	61,200				27/07/1995 15:30	25.3	34,992
27/07/1995 14:30	13.5	39,150				27/07/1995 15:45	16.5	18,792
27/07/1995 15:00	9.8	20,925				27/07/1995 16:00	12.7	13,117
27/07/1995 16:00	8.5	32,850				27/07/1995 16:30	1.1	12,330
27/07/1995 17:00	8.5	30,600				27/07/1995 17:00	0.4	1,287
27/07/1995 18:00	0.2	15,624				27/07/1995 17:30	0.3	621
27/07/1995 19:00	0.2	648				27/07/1995 18:00	0.2	414
27/07/1995 20:00	0.1	459				27/07/1995 18:30	0.1	225
27/07/1995 21:00	0.1	270				27/07/1995 19:00	0.1	162
27/07/1995 22:00	0.1	270						
27/07/1995 23:00	0.1	270						
28/07/1995 00:00	0.1	270				28/07/1995 00:00	0.0	720
28/07/1995 12:00	0.1	2,700						
29/07/1995 00:00	0.0	1,728						
29/07/1995 12:00	0.0	1,080						
30/07/1995 00:00	0.0	432						
		5,111,446			1,907,667			393,475

Source: MAF

#### 2.4.4. Flow Rate and Electric Conductivity of Surface Water in December 1995

No Survey Point	EC ( $\mu\text{S/cm}$ )	W.Tmp. ( $^{\circ}\text{C}$ )	Section	Width (m)	Depth (m)	Cross Section ( $\text{m}^2$ )	Velocity ( $\text{m/sec.}$ )	Flow Rate ( $\text{m}^3/\text{sec.}$ )
1 Downstream of Siji Dam	664	20.6	Total	14.70		2.573		1.16
			Deep	7.35	0.30	2.205	0.45	1.00
			Shallow	7.35	0.05	0.368	0.43	0.16
2 Siji Dam	679	21.7	Total	7.94		2.491		1.08
			Deep	2.60	0.65	1.690	0.43	0.73
			Shallow	5.34	0.15	0.801	0.43	0.35
3 Upstream of Siji G.St.	714	22.2	Total	8.25		2.055		1.23
			Deep	4.05	0.30	1.215	0.83	1.01
			Shallow	4.20	0.20	0.840	0.26	0.22
4 Upstream of Ashwani G.St.	772	24.1	Total	4.30		0.645		0.42
			Deep	2.15	0.20	0.430	0.56	0.24
			Shallow	2.15	0.10	0.215	0.83	0.18
5 Upstream of Sifuni G.St.	1660	21.6	Total	4.90		1.274		1.06
			Deep	2.45	0.32	0.784	0.83	0.65
			Shallow	2.45	0.20	0.490	0.83	0.41

\* "EC", "W.Tmp.", and "G.St." means the electric conductivity, water temperature and gauging station.

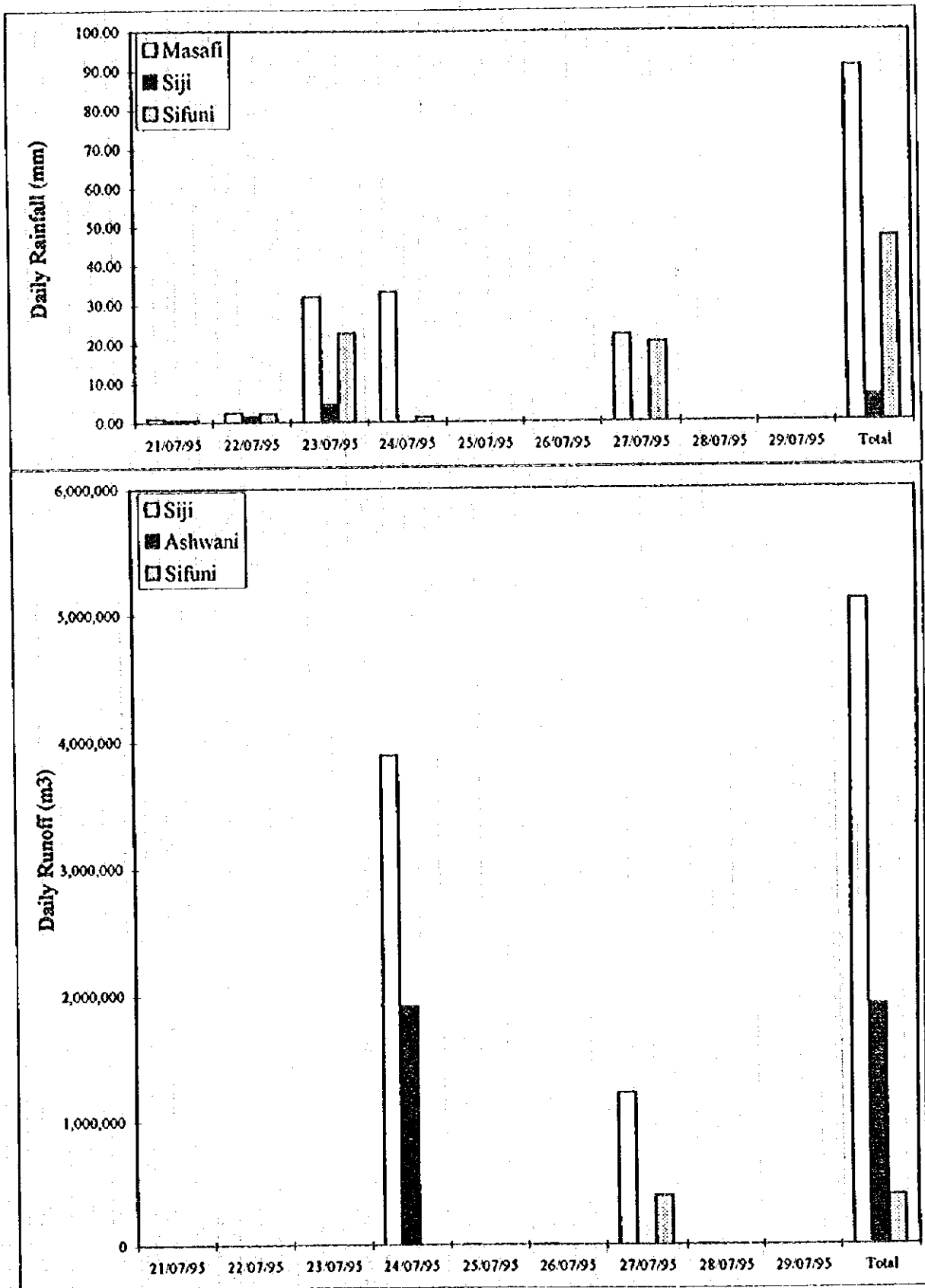
\*\* Both velocities, which are deep and shallow sections, were measured at each survey point.

(Survey Date: December 27, 1995)

#### 2.4.3. Preliminary Runoff Analysis of Flood in July 1995

		21.07.95	22.07.95	23.07.95	24.07.95	25.07.95	26.07.95	27.07.95	28.07.95	29.07.95	Total
Daily	Masafi	1.00	2.40	32.00	33.20			22.20			90.80
Reinfall (mm)	Siji	0.60	1.40	4.50							6.50
	Sifuni	0.60	2.20	22.70	1.20			20.40			47.10
Basin Reinfall (mm)	Siji	0.94	2.25	27.94	28.30	0.00	0.00	18.93	0.00	0.00	78.37
	Ashwani	0.60	1.57	8.45	0.26	0.00	0.00	4.43	0.00	0.00	15.32
Daily Runoff ( $\text{m}^3$ )	Sifuni	0.60	2.20	22.70	1.20	0.00	0.00	20.40	0.00	0.00	47.10
	Siji	0	0	0	3,889,665	5,292	2,376	1,208,173	4,428	1,512	5,111,446
Daily Loss (mm)	Ashwani	0	0	0	1,907,667	0	0	0	0	0	1,907,667
	Sifuni	0	0	0	0	0	0	393,475	0	0	393,475
Daily Runoff (mm)	Siji	0.00	0.00	0.00	44.92	0.06	0.03	13.95	0.03	0.02	59.02
	Ashwani	0.00	0.00	0.00	41.47	0.00	0.00	0.00	0.00	0.00	41.47
Initial Loss (mm)	Sifuni	0.00	0.00	0.00	0.00	0.00	0.00	2.85	0.00	0.00	2.85
	Siji										19.34
Loss (mm)	Ashwani										-26.15
	Sifuni										44.25

2.4.5. Daily Rainfall (mm) and Daily Runoff (m<sup>3</sup>) in July of 1995



2.5. Meteorological Data in the Study Area

2.5.1. Meteorological Data Period and Stations Collected

Station	Month	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
<b>Temperature</b>																														
Falaj al Mualla		Oct			Sept		Oct		Oct	Sept																				
Meleha																														
<b>Relative Humidity</b>																														
Falaj al Mualla																														
Meleha																														
<b>Pan Evaporation</b>																														
Falaj al Mualla		Oct			Sept																									
Meleha																														
<b>Wind Velocity</b>																														
Falaj al Mualla																														
Meleha																														
<b>Rainfall (Monthly)</b>																														
Falaj al Mualla		Oct		Sept																										
Dhaid																														
Meleha																														
Fili																														
Ghayl																														
Marbad																														
Masafi																														
Jebel Sharmah																														
Sifoni																														
Siji																														
<b>Monthly Snow Days</b>																														
Falaj al Mualla																														
Meleha																														
<b>One Day Maximum Rainfall</b>																														
Falaj al Mualla																														
Meleha																														
<b>Short Term Rainfall Intensity</b>																														
Falaj al Mualla																														
Masafi																														
Sifoni																														
Fili																														
Siji																														

2.5.2. Monthly Temperature at Falaj Al Mualla and Mleiha Stations

Monthly Mean Temperature in °C

Mleiha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	28.5	24.2	17.6	17.5	16.9	22.2	25.2	29.6	32.5	35.1	34.6	32.4	26.3
1968/1969	27.7	23.3	20.5	16.5	14.0	22.1	24.7	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	27.5	24.0	18.5	-	-	-	-	-	-	-	-	-	-
1974/1975	28.1	23.7	19.2	18.1	18.9	23.3	26.3	31.9	33.9	34.2	33.9	33.1	27.0
1975/1976	-	-	-	-	18.8	21.9	-	-	-	34.2	33.7	31.0	-
1976/1977	-	21.4	19.7	17.0	19.0	24.4	26.5	32.1	32.6	35.3	36.1	-	-
1977/1978	-	-	-	-	-	22.3	27.8	30.7	34.4	36.2	35.9	31.8	-
1978/1979	28.1	23.6	20.5	17.8	19.8	21.9	27.4	31.4	34.8	35.3	35.2	32.9	27.4
1979/1980	29.5	21.6	19.3	17.7	20.2	23.6	29.1	31.7	34.7	36.6	35.5	32.9	27.7
1980/1981	29.7	24.4	19.6	19.6	20.1	23.1	28.8	31.1	35.2	35.8	35.1	32.3	27.7
1981/1982	27.4	22.2	19.2	16.9	17.9	21.5	26.8	31.0	34.9	34.4	34.1	32.3	26.5
1982/1983	28.0	21.1	17.0	16.3	16.0	18.4	22.4	30.2	33.5	34.7	35.6	32.5	25.4
1983/1984	28.5	26.0	21.0	19.0	19.6	25.3	29.2	31.4	33.4	34.8	35.2	32.7	28.0
1984/1985	27.1	23.4	20.0	19.5	18.9	23.4	26.5	31.8	33.9	36.5	36.4	32.7	27.5
1985/1986	28.9	24.4	20.1	17.4	19.1	22.2	27.7	33.3	34.7	36.5	35.8	32.6	27.7
1986/1987	29.7	25.0	20.6	18.4	20.0	23.0	26.9	32.4	34.3	36.2	36.2	33.8	28.0
1987/1988	28.6	23.9	19.3	17.6	19.4	23.3	28.3	31.7	34.4	36.5	36.3	33.0	27.7
1988/1989	29.2	24.5	20.3	16.4	18.4	22.0	25.2	31.0	33.9	37.2	36.3	32.9	27.2
1989/1990	28.8	25.4	20.0	17.9	19.7	22.3	27.6	32.7	34.9	36.7	36.4	35.2	28.1
1990/1991	28.6	24.4	20.0	19.6	19.6	22.7	28.2	29.8	34.4	36.0	35.3	33.0	27.6
1991/1992	28.7	23.7	20.9	17.0	18.3	20.2	25.5	32.5	34.4	35.4	35.8	32.4	-
1992/1993	28.4	23.8	21.0	18.1	20.4	22.9	26.5	31.8	34.2	36.5	35.8	33.8	27.7
1993/1994	28.4	24.6	20.6	-	-	-	-	-	-	-	-	-	-
Average	28.4	23.7	19.7	17.8	18.7	22.4	26.8	31.4	34.0	35.7	35.4	32.8	27.3

Monthly Mean Temperature in °C

Falaj Al Mualla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	28.9	24.4	17.9	17.3	16.9	22.2	25.5	29.6	32.6	35.4	34.2	32.3	26.4
1968/1969	28.3	23.9	20.5	19.4	13.7	20.6	24.9	30.2	32.5	32.8	34.9	31.6	26.1
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	31.5	-	-	-	19.4	22.5	25.3	29.2	33.0	-	35.2	32.7	-
1974/1975	26.7	23.0	18.7	17.8	19.0	22.6	26.0	32.1	34.1	36.3	35.9	32.5	27.0
1975/1976	28.0	23.9	20.5	16.8	17.6	21.6	25.6	30.3	32.6	34.1	34.5	32.4	26.5
1976/1977	29.4	22.7	20.0	17.6	19.3	23.7	25.7	30.8	32.8	34.8	34.9	32.0	27.0
1977/1978	29.1	24.7	21.2	18.3	19.1	21.8	27.0	28.0	32.8	35.6	35.6	31.7	27.1
1978/1979	28.1	23.9	20.3	18.0	18.9	22.3	25.0	30.8	35.1	36.6	34.7	32.3	27.2
1979/1980	29.9	21.7	19.3	17.8	19.6	23.1	28.8	30.8	33.2	34.3	34.7	32.5	27.1
1980/1981	29.1	25.1	19.6	19.6	21.0	23.0	28.5	29.7	31.5	34.3	33.6	30.6	27.1
1981/1982	26.3	22.7	19.9	16.3	16.2	19.2	24.6	32.3	34.0	35.2	35.5	32.8	26.2
1982/1983	29.3	20.4	16.8	15.6	16.2	18.2	22.2	30.2	33.5	36.4	35.8	33.2	25.6
1983/1984	27.8	23.4	19.2	17.7	19.2	23.6	28.9	30.5	32.5	35.2	33.0	31.5	26.9
1984/1985	26.8	22.7	20.0	20.3	19.3	-	-	32.1	33.7	-	-	-	-
1985/1986	-	24.9	20.5	17.7	18.2	21.6	27.3	33.3	33.8	36.6	36.4	33.7	-
1986/1987	29.7	23.4	20.0	18.8	21.2	24.0	28.5	33.6	35.4	39.5	-	-	-
1987/1988	-	24.4	18.9	17.5	19.6	22.8	26.3	31.1	33.6	35.9	35.5	31.8	27.0
1988/1989	28.8	24.7	17.1	-	18.4	22.9	24.8	30.6	33.9	36.4	35.8	32.5	-
1989/1990	28.2	-	-	18.1	18.1	21.9	27.2	31.1	34.2	35.9	36.0	34.6	-
1990/1991	29.5	24.3	21.6	19.5	20.4	23.3	26.9	31.0	33.7	35.2	34.3	33.0	27.7
1991/1992	28.4	24.6	21.0	17.1	18.1	19.9	24.6	31.5	33.1	35.0	34.8	31.6	26.6
1992/1993	28.2	23.3	20.8	17.8	20.1	24.5	28.8	32.1	33.8	35.6	28.3	33.8	27.2
1993/1994	29.0	24.2	20.7	-	-	-	-	-	-	-	-	-	-
Average	28.6	23.6	19.7	17.9	18.6	22.1	26.3	30.9	33.4	35.5	34.7	32.4	27.0

Monthly Mean Maximum Temperature in °C

Mesleha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	38.2	31.9	24.9	24.0	22.2	30.8	34.2	39.0	42.6	45.4	43.9	42.1	34.9
1968/1969	37.8	32.6	27.9	24.3	22.8	34.5	36.1	41.1	44.2	44.1	43.2	41.8	35.9
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	38.1	31.2	26.2	-	-	-	-	-	-	-	-	-	-
1974/1975	35.8	32.5	26.1	24.8	25.1	31.2	34.7	41.8	44.3	44.0	43.1	42.3	35.5
1975/1976	-	-	-	-	23.5	25.3	32.3	40.6	44.3	43.0	43.9	41.3	-
1976/1977	37.6	30.8	27.4	22.0	26.4	33.3	34.4	41.6	42.6	43.8	44.1	42.0	35.5
1977/1978	37.7	32.7	28.3	25.9	26.1	30.0	36.8	40.8	43.7	43.3	43.4	40.7	35.8
1978/1979	37.8	31.0	28.3	25.0	28.2	28.5	37.4	40.8	44.8	43.6	43.3	41.8	35.9
1979/1980	38.0	30.9	25.6	23.7	26.5	31.6	39.3	41.6	44.9	45.9	44.0	41.7	36.1
1980/1981	38.4	31.9	27.1	26.8	27.7	30.6	38.6	40.3	43.0	44.5	44.4	41.6	36.2
1981/1982	37.0	31.5	27.5	24.8	23.1	27.0	35.0	40.8	45.7	43.7	41.7	41.7	35.0
1982/1983	38.1	30.1	24.3	24.2	24.5	27.0	31.8	42.4	45.5	45.3	43.6	41.7	34.9
1983/1984	36.4	32.1	26.4	25.2	27.0	33.4	38.3	40.5	42.5	45.1	42.7	41.4	35.9
1984/1985	36.3	32.0	26.9	26.1	26.9	31.9	35.0	41.0	43.4	43.6	44.9	42.1	35.8
1985/1986	37.5	32.0	26.9	24.9	24.8	29.1	35.4	42.8	42.9	44.5	43.0	41.7	35.5
1986/1987	38.2	31.9	26.0	26.1	29.1	30.1	35.1	42.0	43.8	45.5	43.6	42.2	36.1
1987/1988	37.3	32.8	26.9	24.2	24.9	30.9	36.2	41.7	44.1	42.9	43.8	41.6	35.6
1988/1989	38.3	32.5	27.7	23.6	24.9	28.9	32.7	40.8	42.3	44.6	44.3	41.3	35.2
1989/1990	37.7	30.5	25.7	23.5	25.4	30.6	36.0	42.7	44.8	45.4	43.9	42.1	35.7
1990/1991	36.9	32.4	27.2	25.8	26.7	29.2	36.5	38.2	43.7	44.2	42.3	40.9	35.3
1991/1992	37.1	31.6	27.4	22.0	23.6	26.7	33.1	41.8	44.2	43.9	43.7	41.5	34.7
1992/1993	36.6	32.3	27.3	23.9	26.3	30.2	35.1	41.3	44.2	45.3	44.4	42.3	35.8
1993/1994	37.6	32.7	28.1	-	-	-	-	-	-	-	-	-	-
Average	37.5	31.8	26.9	24.6	26.0	29.9	35.7	41.2	43.9	44.4	43.6	41.7	35.6

Monthly Mean Maximum Temperature in °C

Falaj Al-Mu'alla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	38.4	32.4	25.4	24.3	21.8	30.6	34.2	38.9	42.3	45.3	43.7	42.0	35.0
1968/1969	38.1	32.9	28.2	25.2	17.5	26.8	32.4	40.3	43.1	43.1	43.8	41.3	34.4
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	39.7	33.3	-	-	25.8	31.5	35.0	38.6	42.7	-	43.8	42.0	-
1974/1975	37.1	32.5	25.6	25.3	24.9	31.0	34.8	42.5	43.8	43.5	42.7	41.9	35.5
1975/1976	37.4	32.3	27.0	23.4	22.9	28.3	34.0	40.3	42.7	42.0	42.3	40.4	34.4
1976/1977	37.2	30.8	28.4	23.1	27.0	32.5	33.6	40.9	41.7	42.7	43.4	41.2	35.2
1977/1978	37.8	32.6	28.6	26.0	26.5	29.2	35.8	37.0	42.8	43.2	43.2	40.1	35.2
1978/1979	37.4	31.3	28.6	25.1	27.0	28.7	32.5	39.8	43.8	43.3	43.3	41.5	35.2
1979/1980	39.1	31.2	25.5	24.1	25.5	30.9	39.0	40.8	43.1	44.0	43.2	41.1	35.6
1980/1981	38.4	35.6	26.6	27.1	29.0	31.0	38.0	39.2	41.8	43.6	43.4	41.3	36.3
1981/1982	36.6	32.7	28.2	24.5	22.1	26.2	34.1	41.6	44.2	44.2	43.0	42.4	35.0
1982/1983	37.7	29.3	24.2	24.2	24.3	26.1	31.1	41.0	44.8	45.6	42.1	42.1	34.4
1983/1984	37.3	32.6	26.9	25.4	27.5	32.8	39.1	40.0	41.6	44.8	42.7	40.7	36.0
1984/1985	36.1	31.4	26.6	26.5	27.8	33.5	35.4	41.6	42.5	-	-	-	-
1985/1986	-	33.1	27.7	25.7	24.0	29.3	35.4	44.7	42.2	44.5	44.2	42.8	-
1986/1987	40.0	31.3	25.5	26.5	29.4	32.6	36.9	42.5	44.7	45.5	43.5	42.3	36.7
1987/1988	37.5	33.6	27.0	24.3	25.0	30.5	36.0	41.1	43.4	42.3	43.0	40.1	35.3
1988/1989	38.0	33.0	22.7	-	24.9	31.2	32.5	41.0	43.1	44.2	43.9	41.4	-
1989/1990	37.2	-	-	-	23.5	23.5	30.4	36.3	41.2	44.2	44.7	43.6	42.3
1990/1991	38.2	32.6	29.0	25.9	27.2	30.6	35.3	36.7	43.6	43.5	42.0	41.0	35.5
1991/1992	36.2	32.2	27.1	22.0	23.2	26.4	32.5	41.3	43.5	43.9	42.6	41.1	34.3
1992/1993	36.4	31.5	26.8	23.3	25.9	32.9	37.3	40.0	42.3	42.9	28.3	40.5	34.0
1993/1994	36.9	31.2	27.0	-	-	-	-	-	-	-	-	-	-
Average	37.7	32.2	26.8	24.8	25.1	30.1	35.1	40.5	43.1	43.8	42.5	41.4	35.3

Monthly Mean Minimum Temperature in °C

Meluhla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	18.8	16.5	10.2	10.9	11.6	13.5	16.1	20.1	22.4	24.8	25.3	22.6	17.7
1968/1969	17.5	13.9	13.1	8.6	5.2	9.6	13.3	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	16.9	16.8	10.7	-	-	-	-	-	-	-	-	-	-
1974/1975	20.4	14.8	12.3	11.3	12.7	15.3	17.8	21.9	23.4	24.3	24.7	23.9	18.6
1975/1976	-	-	-	-	14.0	18.4	-	-	-	25.4	23.5	20.7	-
1976/1977	-	12.0	12.0	12.0	11.6	15.4	18.5	22.5	22.5	26.8	28.0	-	-
1977/1978	-	-	-	-	-	14.5	18.8	20.5	25.0	29.1	28.3	22.9	-
1978/1979	18.4	16.1	12.7	10.6	11.3	15.2	17.4	21.9	24.7	27.0	27.1	23.9	18.9
1979/1980	20.9	12.2	12.9	11.7	13.9	15.6	18.9	21.7	24.5	27.3	26.9	24.1	19.2
1980/1981	21.0	16.8	12.1	12.3	12.5	15.5	19.0	21.8	23.3	27.1	25.7	22.9	19.2
1981/1982	17.8	12.8	10.8	9.0	12.7	16.0	18.5	21.1	24.0	25.1	26.5	22.9	18.1
1982/1983	17.8	12.1	9.7	8.4	7.5	9.7	12.9	17.9	21.4	24.0	27.5	23.3	16.0
1983/1984	20.5	19.9	15.5	12.7	12.1	17.1	20.0	22.2	24.3	24.5	27.6	24.0	20.0
1984/1985	17.9	14.7	13.0	12.8	10.9	14.9	18.0	22.5	24.4	29.4	27.9	23.3	19.1
1985/1986	20.2	16.7	13.2	9.8	13.3	15.2	19.9	23.8	26.4	28.5	28.5	23.4	19.9
1986/1987	21.1	18.1	15.2	10.6	10.9	15.9	18.6	22.8	24.7	26.9	28.8	25.4	19.9
1987/1988	19.9	15.0	11.6	10.9	13.9	15.7	20.4	21.7	24.7	30.1	28.7	24.4	19.8
1988/1989	20.0	16.5	12.8	9.2	11.9	15.0	17.7	21.1	25.5	29.7	28.2	24.4	19.3
1989/1990	19.9	20.2	14.2	12.2	14.0	14.0	19.2	22.6	25.0	28.0	28.8	28.3	20.5
1990/1991	20.3	16.3	12.8	13.3	12.5	16.2	19.8	21.3	25.0	27.7	28.3	25.1	19.9
1991/1992	20.2	15.8	14.3	11.9	12.9	13.7	17.8	23.2	24.5	26.8	27.8	23.2	19.3
1992/1993	20.1	15.2	14.7	12.3	14.5	15.5	17.8	22.2	24.2	27.7	27.2	25.3	19.7
1993/1994	19.1	16.4	13.0	-	-	-	-	-	-	-	-	-	-
Average	19.7	15.7	13.0	11.2	12.3	15.0	18.4	21.8	24.4	27.4	27.8	24.2	19.3

Monthly Mean Minimum Temperature in °C

Fabji AL-Mugalla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	19.4	16.3	10.3	10.2	11.9	13.8	16.5	20.2	22.8	25.4	24.6	22.6	17.8
1968/1969	18.5	14.8	12.8	13.6	9.9	14.3	17.4	20.1	21.8	22.5	26.0	21.9	17.8
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	23.2	-	-	12.9	13.5	15.5	19.7	23.2	-	26.5	23.3	-	-
1974/1975	16.3	13.5	11.7	10.3	13.1	14.2	17.2	21.6	24.4	29.0	29.0	23.0	18.6
1975/1976	18.6	15.4	13.9	10.1	12.3	14.9	17.2	20.2	22.5	26.1	26.6	24.3	18.5
1976/1977	21.6	14.6	11.6	12.1	11.5	14.9	17.8	20.6	23.9	26.9	26.3	22.8	18.7
1977/1978	20.5	16.8	13.7	10.7	11.7	14.4	18.1	19.0	22.7	28.0	28.0	23.3	18.9
1978/1979	18.8	16.4	12.0	10.9	10.7	15.9	17.6	21.2	26.3	29.9	26.2	23.1	19.1
1979/1980	20.7	12.1	13.0	11.5	13.6	15.2	18.5	20.7	23.2	24.5	26.2	23.8	18.6
1980/1981	19.7	14.6	12.5	12.1	12.9	15.0	18.9	20.2	21.1	25.0	23.8	19.8	18.0
1981/1982	16.0	12.6	11.6	8.1	10.3	12.2	15.0	22.9	23.7	26.1	27.9	23.2	17.5
1982/1983	20.8	11.5	9.3	7.0	8.1	10.3	13.3	19.4	22.1	27.2	29.5	24.2	16.9
1983/1984	18.2	14.2	11.4	10.0	10.9	14.3	18.6	21.0	23.3	25.6	23.3	22.2	17.8
1984/1985	17.5	13.9	13.4	14.0	10.7	-	-	22.5	24.8	-	-	-	-
1985/1986	-	16.7	13.2	9.6	12.3	13.9	19.2	21.8	25.4	28.6	28.6	24.5	-
1986/1987	19.4	15.5	14.5	11.1	13.0	15.3	20.0	24.7	26.1	33.5	-	-	-
1987/1988	-	15.1	10.7	10.6	14.1	15.1	16.6	21.0	23.8	29.4	28.0	23.5	-
1988/1989	19.6	16.4	11.5	-	11.8	14.6	17.1	20.2	24.6	28.6	27.6	23.6	-
1989/1990	19.1	-	-	12.6	12.6	13.3	18.1	21.0	24.2	27.1	28.3	26.9	-
1990/1991	20.7	15.9	14.2	13.1	13.5	16.0	18.5	25.3	23.7	26.9	26.6	25.0	20.0
1991/1992	20.5	16.9	14.9	12.2	12.9	13.4	16.7	21.7	22.7	26.1	27.0	22.0	18.9
1992/1993	20.0	15.1	14.9	12.3	14.2	16.0	20.2	24.1	25.3	28.3	28.3	27.1	20.5
1993/1994	21.1	17.1	14.3	-	-	-	-	-	-	-	-	-	-
Average	19.5	15.0	12.6	11.1	12.0	14.3	17.5	21.3	23.7	27.2	26.9	23.5	18.7

Monthly Absolute Maximum Temperature in °C

Melutba

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	40.0	34.5	31.0	29.0	32.5	39.0	40.0	43.0	45.5	46.0	46.0	45.0	39.3
1977/1978	40.2	37.5	31.0	30.0	30.5	38.0	41.3	44.0	48.0	48.0	46.4	46.4	39.7
1978/1979	39.2	35.2	33.0	29.0	33.2	36.1	42.4	44.4	48.0	46.1	46.4	46.4	40.0
1979/1980	41.8	35.0	31.0	29.4	32.6	39.8	42.8	44.8	48.6	47.6	46.0	45.0	40.4
1980/1981	42.2	34.0	30.0	31.8	34.4	38.0	42.4	47.0	46.6	47.6	47.4	43.0	40.4
1981/1982	40.8	34.4	29.0	30.2	29.6	31.8	40.8	42.9	47.6	47.2	45.2	44.0	38.6
1982/1983	44.4	35.0	30.0	30.4	31.0	32.0	39.0	45.5	47.6	49.0	46.0	44.5	39.5
1983/1984	40.8	36.0	30.0	28.8	30.8	39.6	42.2	45.8	46.2	47.5	45.7	44.6	39.8
1984/1985	39.6	35.0	30.6	29.8	31.0	39.4	40.0	46.2	46.6	47.4	46.4	45.4	39.8
1985/1986	41.6	34.8	31.0	27.2	29.6	36.5	40.6	47.0	45.6	47.2	45.5	43.4	39.2
1986/1987	42.0	35.6	33.0	31.0	33.0	35.4	42.5	44.0	46.2	47.5	47.2	45.8	40.3
1987/1988	42.4	36.8	29.6	29.4	28.4	37.4	41.8	45.2	47.5	46.5	47.6	46.2	39.9
1988/1989	41.4	36.6	30.2	27.4	34.5	36.0	40.0	46.2	47.2	47.4	47.4	44.2	39.9
1989/1990	40.8	36.2	30.4	28.6	29.6	36.4	41.2	46.6	47.2	48.5	46.2	44.8	39.7
1990/1991	40.3	34.9	31.3	33.6	32.5	38.0	41.6	42.8	47.6	47.0	47.6	44.5	40.1
1991/1992	40.5	36.4	31.8	27.6	30.2	34.4	40.6	46.0	47.4	46.6	46.4	44.2	39.3
1992/1993	38.6	34.5	32.0	31.0	32.6	37.0	40.1	44.6	45.0	45.5	44.7	42.5	39.0
1993/1994	40.0	35.5	29.0	-	-	-	-	-	-	-	-	-	-
1993/1994	40.6	38.4	30.0	-	-	-	-	-	-	-	-	-	-
Maximum	44.4	38.4	33.0	33.6	34.5	39.8	42.8	47.0	48.6	49.0	47.6	46.4	49.0

Monthly Absolute Maximum Temperature in °C

Falsai Al-Mur'alla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	40.0	34.5	31.0	29.0	32.5	39.0	40.0	43.0	45.5	46.0	46.0	45.0	39.3
1977/1978	40.2	37.5	31.0	30.0	30.5	38.0	41.3	44.0	48.0	48.0	46.4	46.4	39.7
1978/1979	39.2	35.2	33.0	29.0	33.2	36.1	42.4	44.4	48.0	46.1	46.4	46.4	40.0
1979/1980	41.8	35.0	31.0	29.4	32.6	39.8	42.8	44.8	48.6	47.6	46.0	45.0	40.4
1980/1981	42.2	34.0	30.0	31.8	34.4	38.0	42.4	47.0	46.6	47.6	47.4	43.0	40.4
1981/1982	40.8	34.4	29.0	30.2	29.6	31.8	40.8	42.9	47.6	47.2	45.2	44.0	38.6
1982/1983	44.4	35.0	30.0	30.4	31.0	32.0	39.0	45.5	47.6	49.0	46.0	44.5	39.5
1983/1984	40.8	36.0	30.0	28.8	30.8	39.6	42.2	45.8	46.2	47.5	45.7	44.6	39.8
1984/1985	39.6	35.0	30.6	29.8	31.0	39.4	40.0	46.2	46.6	47.4	46.4	45.4	39.8
1985/1986	41.6	34.8	31.0	27.2	29.6	36.5	40.6	47.0	45.6	47.2	45.5	43.4	39.2
1986/1987	42.0	35.6	33.0	31.0	33.0	35.4	42.5	44.0	46.2	47.5	47.2	45.8	40.3
1987/1988	42.4	36.8	29.6	29.4	28.4	37.4	41.8	45.2	47.5	46.5	47.6	46.2	39.9
1988/1989	41.4	36.6	30.2	27.4	34.5	36.0	40.0	46.2	47.2	47.4	47.4	44.2	39.9
1989/1990	40.8	36.2	30.4	28.6	29.6	36.4	41.2	46.6	47.2	48.5	46.2	44.8	39.7
1990/1991	40.3	34.9	31.3	33.6	32.5	38.0	41.6	42.8	47.6	47.0	47.6	44.5	40.1
1991/1992	40.5	36.4	31.8	27.6	30.2	34.4	40.6	46.0	47.4	46.6	46.4	44.2	39.3
1992/1993	38.6	34.5	32.0	31.0	32.6	37.0	40.1	44.6	45.0	45.5	44.7	42.5	39.0
1993/1994	40.0	35.5	29.0	-	-	-	-	-	-	-	-	-	-
1993/1994	40.6	38.4	30.0	-	-	-	-	-	-	-	-	-	-
Maximum	44.4	37.5	33.0	33.6	34.5	39.8	42.8	47.0	48.6	49.0	47.6	46.4	49.0



Monthly Absolute Minimum Temperature in °C

Meishta

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	17.5	7.0	8.5	7.0	7.0	11.0	12.0	13.5	19.5	23.0	22.0	19.0	13.9
1977/1978	18.0	10.0	9.0	6.0	7.0	10.5	14.2	16.4	18.0	22.3	22.3	18.4	14.3
1978/1979	15.0	11.0	7.0	2.4	6.2	5.3	14.2	12.2	23.0	22.0	22.2	20.0	13.4
1979/1980	18.0	5.4	9.4	8.0	7.4	7.4	10.8	17.0	20.4	24.0	22.4	21.0	14.3
1980/1981	18.4	13.0	7.6	6.0	7.4	12.0	10.0	18.2	19.0	22.4	23.4	19.6	14.8
1981/1982	9.8	6.0	4.2	4.2	8.0	9.6	13.6	19.8	21.0	20.5	22.8	19.8	13.3
1982/1983	17.2	8.0	6.4	5.0	2.0	5.0	8.4	14.0	14.8	19.0	24.8	21.0	12.1
1983/1984	17.0	16.4	8.0	9.2	6.9	10.5	15.0	17.0	20.0	23.8	24.2	17.5	15.5
1984/1985	11.2	11.0	9.0	9.4	6.4	8.8	11.6	15.8	21.6	22.0	24.2	19.0	14.2
1985/1986	17.0	12.6	7.0	6.2	9.4	11.6	13.6	18.4	23.0	23.8	25.6	19.8	15.7
1986/1987	17.0	13.8	10.0	8.0	7.0	10.5	13.6	19.4	22.4	23.2	24.0	20.0	15.7
1987/1988	11.6	9.4	6.0	5.5	8.4	12.4	16.5	18.0	19.6	26.4	26.4	19.5	15.0
1988/1989	16.0	11.6	4.4	4.0	7.2	9.0	11.5	14.6	22.5	25.6	25.0	18.0	14.1
1989/1990	14.6	14.4	9.0	7.6	7.4	9.4	12.6	19.2	20.6	23.4	24.0	25.3	15.6
1990/1991	16.7	11.9	4.4	9.2	5.0	10.6	13.6	16.8	20.6	23.4	25.8	20.5	14.9
1991/1992	15.0	10.5	9.4	5.2	8.4	6.6	12.2	19.4	20.2	21.0	24.4	19.2	14.3
1992/1993	15.4	12.6	10.2	7.8	10.4	9.8	13.2	15.0	20.0	21.5	22.8	21.4	15.0
1993/1994	15.5	10.4	10.5	-	-	-	-	-	-	-	-	-	-
Minimum	9.8	5.4	4.2	2.4	2.0	5.0	8.4	12.2	14.8	19.0	22.0	17.5	2.0

Monthly Absolute Minimum Temperature in °C

Fateh Al-Musalla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	17.5	7.0	8.5	7.0	7.0	11.0	12.0	13.5	19.5	23.0	22.0	19.0	13.9
1977/1978	18.0	10.0	9.0	6.0	7.0	10.5	14.2	16.4	18.0	22.3	22.3	18.4	14.3
1978/1979	15.0	11.0	7.0	2.4	6.2	5.3	14.2	12.2	23.0	22.0	22.2	20.0	13.4
1979/1980	17.0	5.4	9.2	8.1	7.3	8.2	15.0	16.2	19.2	20.4	20.2	20.2	13.8
1980/1981	14.0	12.1	8.0	6.1	8.4	14.0	14.3	15.3	17.3	20.4	20.0	16.3	13.9
1981/1982	8.4	6.2	5.4	4.0	6.4	6.4	11.2	19.4	20.4	22.0	23.5	20.0	12.8
1982/1983	17.8	4.8	4.0	2.4	2.8	6.0	8.8	11.4	18.4	21.2	25.0	18.0	11.7
1983/1984	13.0	12.0	4.5	6.0	6.0	9.0	17.0	17.0	19.0	20.0	19.0	17.0	13.3
1984/1985	10.9	10.8	8.7	9.0	5.0	-	-	16.2	21.8	-	-	-	-
1985/1986	-	12.6	6.0	6.0	7.0	9.0	15.0	18.0	22.0	23.0	23.0	19.0	14.6
1986/1987	14.0	11.4	10.0	7.0	7.0	10.0	15.0	20.0	22.0	25.0	-	-	-
1987/1988	-	8.6	6.5	7.0	7.6	10.5	14.0	18.5	19.0	25.0	25.1	18.7	-
1988/1989	14.3	12.1	5.0	-	6.1	8.4	11.9	14.6	20.1	23.4	24.3	17.5	-
1989/1990	15.2	-	-	8.8	7.6	6.9	12.0	17.7	19.5	22.0	22.4	24.2	-
1990/1991	16.0	11.2	5.4	7.0	5.1	10.1	13.2	16.0	18.8	21.5	23.8	19.8	14.0
1991/1992	15.9	10.9	9.2	6.5	8.5	7.0	12.8	16.8	18.9	22.0	21.4	18.0	14.0
1992/1993	15.7	11.8	11.2	6.8	10.7	10.4	15.2	19.4	23.0	24.5	24.9	23.0	16.4
1993/1994	16.5	12.0	10.5	-	-	-	-	-	-	-	-	-	-
Minimum	8.4	4.8	4.0	2.4	2.8	5.3	8.8	11.4	17.3	19.2	19.0	16.3	2.4

Monthly Mean Relative Humidity in %

Fataj Al-Mualla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	49	44	61	65	62	50	31	31	37	36	46	46	47
1980/1981	47	46	63	65	56	50	31	35	28	33	36	38	44
1981/1982	37	46	58	54	61	58	45	46	37	50	52	51	50
1982/1983	56	62	68	63	64	62	55	44	49	50	48	50	56
1983/1984	47	54	63	49	-	52	44	-	-	-	-	48	-
1984/1985	45	49	59	60	49	-	-	49	46	-	-	-	-
1985/1986	-	57	57	58	63	59	52	45	52	-	53	48	-
1986/1987	55	55	61	55	53	53	47	48	52	51	55	55	53
1987/1988	52	55	63	66	66	48	48	44	45	54	51	49	53
1988/1989	54	57	-	-	63	55	61	50	43	-	55	52	-
1989/1990	45	-	-	67	-	53	43	47	48	43	51	55	-
1990/1991	45	52	60	57	-	-	47	53	49	58	62	50	-
1991/1992	50	-	53	63	66	-	45	38	49	55	56	45	-
1992/1993	56	-	66	67	71	60	45	36	37	45	46	53	-
1993/1994	44	59	64	-	-	-	-	-	-	-	-	-	-
Average	49	53	61	61	61	55	46	43	44	47	51	49	52

Monthly Mean Relative Humidity in %

Melaha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	40	39	55	62	67	40	22	21	26	31	41	39	40
1980/1981	35	45	54	54	49	48	28	32	27	30	34	35	39
1981/1982	35	41	56	57	65	56	42	46	29	57	50	47	48
1982/1983	-	54	59	55	57	64	63	71	44	43	46	40	54
1983/1984	-	50	62	55	52	49	46	42	45	45	55	49	-
1984/1985	53	56	63	65	59	49	51	45	43	47	35	47	51
1985/1986	55	55	57	56	61	57	51	46	59	49	53	53	54
1986/1987	47	59	61	-	57	55	53	49	52	48	49	55	-
1987/1988	57	59	63	63	68	47	48	45	57	57	57	52	56
1988/1989	52	57	61	59	62	56	51	41	46	51	50	57	54
1989/1990	55	61	70	71	67	59	50	55	46	43	52	61	58
1990/1991	43	61	63	64	59	68	-	-	39	47	49	50	-
1991/1992	49	56	62	69	67	51	48	31	35	46	48	41	50
1992/1993	52	53	66	69	66	48	45	40	36	41	43	50	50
1993/1994	39	58	64	-	-	-	-	-	-	-	-	-	-
Average	47	54	61	61	61	53	46	43	42	45	47	48	51

Monthly Mean Maximum Relative Humidity in %

Melcha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	-	-	-	-	-	-	-	-	-	-	-	-	-
1980/1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1981/1982	-	-	-	-	-	81	-	88	-	98	87	88	-
1982/1983	-	87	85	84	88	99	98	98	79	74	70	71	-
1983/1984	-	82	86	82	82	81	79	73	81	77	89	86	-
1984/1985	91	90	90	91	94	80	86	78	79	77	62	87	84
1985/1986	93	86	84	86	87	88	80	72	92	81	82	90	85
1986/1987	71	93	88	-	92	86	92	85	91	85	77	93	-
1987/1988	92	96	96	96	95	69	81	93	85	93	91	89	89
1988/1989	93	93	96	93	92	85	79	69	77	76	79	88	85
1989/1990	89	82	96	98	96	95	81	86	79	71	81	95	87
1990/1991	81	92	91	91	89	96	-	-	71	77	77	81	-
1991/1992	82	88	85	94	95	83	77	52	61	75	80	75	79
1992/1993	88	83	93	96	97	75	75	71	66	73	76	86	82
1993/1994	66	89	93	-	-	-	-	-	-	-	-	-	-
Average	85	88	90	91	92	85	83	78	79	79	79	86	84

Monthly Mean Maximum Relative Humidity in %

Falsi Al-Mu'alla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	-	-	-	-	-	-	-	-	-	-	-	-	-
1980/1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1981/1982	-	-	-	-	-	-	-	86	45	90	88	95	-
1982/1983	97	99	99	99	98	98	96	83	94	90	81	93	94
1983/1984	88	95	73	86	-	93	84	-	-	-	-	93	-
1984/1985	88	91	95	95	91	-	-	86	85	-	-	-	-
1985/1986	-	92	90	92	94	96	88	81	91	-	86	66	-
1986/1987	88	88	89	89	90	85	85	89	96	91	88	93	89
1987/1988	91	94	97	95	90	85	85	84	82	85	90	88	89
1988/1989	96	98	-	-	99	94	99	92	81	-	92	93	-
1989/1990	99	-	-	99	-	95	80	83	88	79	89	95	-
1990/1991	94	91	97	91	-	-	85	88	81	95	96	88	-
1991/1992	79	-	86	92	98	-	81	71	89	93	95	86	-
1992/1993	99	-	89	91	97	87	72	58	59	68	71	82	-
1993/1994	68	89	94	-	-	-	-	-	-	-	-	-	-
Average	90	95	91	93	95	92	86	82	81	85	88	88	89

Monthly Mean Minimum Relative Humidity in %

Fahai Ak-Metalla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	-	-	-	-	-	-	-	-	-	-	-	-	-
1980/1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1981/1982	-	-	-	-	-	-	-	5	21	7	16	7	-
1982/1983	14	26	37	28	29	25	14	5	3	9	15	8	18
1983/1984	6	13	53	12	-	11	5	-	-	-	-	3	-
1984/1985	2	7	24	25	6	-	-	11	7	-	-	-	-
1985/1986	-	22	23	24	31	23	16	9	13	-	20	-	-
1986/1987	18	19	32	21	17	21	8	7	8	11	23	18	17
1987/1988	13	15	28	36	41	10	11	4	7	23	13	9	18
1988/1989	11	17	-	-	28	17	22	8	5	-	13	11	-
1989/1990	10	-	-	34	-	11	7	10	8	6	13	14	-
1990/1991	5	13	23	23	-	-	10	19	17	21	28	12	-
1991/1992	20	-	19	33	34	-	9	5	9	16	17	5	-
1992/1993	12	-	43	42	45	33	18	14	15	21	21	23	-
1993/1994	19	28	34	-	-	-	-	-	-	-	-	-	-
Average	12	18	32	28	29	19	12	9	10	14	18	11	18

Monthly Mean Minimum Relative Humidity in %

Meleha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	-	-	-	-	-	-	-	-	-	-	-	-	-
1980/1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1981/1982	-	-	-	-	-	31	-	3	-	15	12	6	-
1982/1983	-	21	33	26	26	29	29	44	9	12	32	8	-
1983/1984	-	19	39	28	21	16	14	11	9	13	20	13	-
1984/1985	16	22	37	39	24	18	17	13	7	17	9	7	19
1985/1986	17	25	31	26	35	25	23	20	25	18	23	15	24
1986/1987	23	25	34	-	23	25	15	14	13	11	20	18	-
1987/1988	21	22	31	29	40	24	15	10	22	30	21	13	23
1988/1989	11	20	25	26	31	26	23	12	15	25	21	26	22
1989/1990	20	40	45	45	39	24	19	21	13	16	23	27	28
1990/1991	5	31	34	37	30	40	-	-	8	17	21	19	-
1991/1992	16	23	39	45	39	20	19	10	8	17	16	6	22
1992/1993	15	22	39	41	35	20	15	9	5	8	10	13	19
1993/1994	12	26	35	-	-	-	-	-	-	-	-	-	-
Average	16	25	35	34	31	25	19	15	12	17	19	14	22

2.5.4. Monthly Mean Pan Evaporation at Falaj Al Mualla and Mileiha Stations

Mean Monthly Pan Evaporation in mm/day

Falaj Al Mualla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	8.9	6.1	4.7	4.9	5.6	8.4	10.6	13.3	14.4	16.4	14.4	11.6	9.9
1968/1969	9.8	7.2	4.8	6.3	4.1	8.5	10.1	13.4	15.7	12.7	12.7	12.2	9.8
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	9.8	6.8	6.0	-	5.3	8.1	11.6	14.7	16.5	-	14.5	11.2	-
1974/1975	10.5	5.5	3.8	4.8	4.1	7.9	11.1	15.7	14.7	15.4	13.9	13.5	10.1
1975/1976	9.8	7.1	3.3	2.7	3.3	3.9	6.9	14.4	15.4	16.3	17.3	16.5	9.7
1976/1977	13.7	7.5	4.1	4.0	5.0	7.6	9.1	15.2	13.8	15.5	12.5	13.9	10.2
1977/1978	12.3	6.8	4.1	3.6	3.6	5.0	13.2	11.2	19.0	17.8	17.8	13.9	10.7
1978/1979	10.2	8.0	5.9	5.5	6.9	8.4	15.6	17.5	18.3	17.8	17.5	14.2	12.2
1979/1980	10.6	7.6	4.4	4.0	4.1	9.4	10.6	11.4	12.3	13.8	12.6	13.6	9.5
1980/1981	8.5	6.7	3.8	4.8	6.2	7.7	11.7	11.8	13.5	15.0	13.8	14.9	9.9
1981/1982	10.5	7.7	-	5.1	5.3	6.9	9.8	11.8	10.8	11.3	11.8	10.9	-
1982/1983	8.7	5.3	4.4	4.4	4.4	6.1	7.3	13.8	14.0	12.2	10.6	9.0	8.4
1983/1984	7.4	4.8	3.8	3.7	5.5	6.5	10.4	12.1	10.8	9.9	10.7	10.7	8.0
1984/1985	7.9	6.3	4.1	3.9	5.6	7.4	9.7	11.0	12.6	-	-	-	-
1985/1986	6.7	5.8	5.5	3.3	5.0	6.5	8.3	11.8	10.6	12.2	11.4	8.6	8.0
1986/1987	6.4	5.0	3.6	3.7	6.1	6.7	6.7	11.2	-	13.5	12.5	9.3	-
1987/1988	6.8	4.6	4.3	3.7	3.8	6.0	7.4	-	13.2	10.9	10.7	9.0	-
1988/1989	7.5	4.7	3.6	3.7	3.4	-	-	-	-	-	-	-	-
1989/1990	-	-	-	-	-	-	-	-	-	-	-	-	-
1990/1991	-	-	-	-	-	-	-	-	-	-	-	-	-
1991/1992	-	-	-	-	-	-	-	-	-	-	-	-	-
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	9.2	6.3	4.4	4.2	4.9	7.1	10.0	13.1	14.1	14.0	13.4	12.1	9.4

Annual total evaporation 3,440.2 mm

Mean Monthly Pan Evaporation in mm/day

Mileiha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	11.6	6.9	4.5	7.7	4.7	8.7	11.7	16.8	20.8	18.3	17.8	12.4	11.8
1968/1969	11.1	7.6	5.6	6.2	5.6	10.2	12.3	15.6	20.0	20.0	20.0	13.6	12.3
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	15.2	11.1	6.2	-	-	-	-	-	-	-	-	-	-
1974/1975	11.8	8.3	5.6	4.1	5.6	9.9	13.4	18.1	19.9	22.5	23.8	22.9	13.8
1975/1976	-	12.9	6.3	5.7	5.2	6.4	9.6	15.6	17.6	17.0	18.0	18.3	-
1976/1977	13.3	8.0	5.1	3.3	5.7	4.6	9.7	16.1	16.8	15.7	16.0	14.8	10.8
1977/1978	11.3	7.5	6.0	5.8	6.0	7.3	12.5	16.5	18.2	17.1	15.3	12.6	11.3
1978/1979	10.5	7.6	5.0	4.3	6.1	6.8	12.9	16.8	18.5	19.9	17.4	13.3	11.6
1979/1980	10.3	7.6	4.5	3.9	5.8	9.8	16.3	20.0	22.9	21.1	18.7	16.2	13.1
1980/1981	13.5	8.1	5.7	6.3	7.5	8.0	15.0	-	-	12.9	11.6	-	-
1981/1982	9.3	7.7	5.5	5.0	4.2	4.6	10.0	11.5	12.9	12.3	12.2	11.2	8.9
1982/1983	8.7	5.3	4.6	5.0	4.8	6.1	7.3	11.5	12.3	12.2	10.9	9.1	8.2
1983/1984	7.8	5.9	4.5	4.5	5.6	7.5	11.5	13.0	12.0	12.8	10.3	10.6	8.8
1984/1985	7.9	6.3	4.5	4.4	6.3	7.9	10.4	12.8	13.8	12.8	14.2	11.3	9.4
1985/1986	9.1	6.5	5.5	5.0	5.2	7.1	9.9	14.7	13.3	12.7	12.4	11.0	9.4
1986/1987	9.3	6.1	5.3	5.1	5.6	6.9	9.6	12.2	12.5	13.4	11.6	10.2	9.0
1987/1988	8.6	6.2	5.1	4.6	4.6	7.7	9.3	11.5	12.5	10.9	10.9	10.4	8.5
1988/1989	8.5	6.1	4.7	4.8	5.5	7.3	7.3	11.0	11.6	12.0	10.9	10.1	8.3
1989/1990	7.8	5.4	3.4	3.6	4.7	6.5	8.9	11.2	12.6	12.9	11.4	9.2	8.1
1990/1991	7.5	5.4	4.9	4.7	5.3	6.6	8.9	10.8	12.1	10.6	10.5	9.6	8.1
1991/1992	-	-	-	-	-	-	-	-	-	-	-	-	-
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	10.2	7.3	5.1	4.9	5.5	7.4	10.9	14.2	15.6	15.2	14.5	12.5	10.3

Annual total evaporation 3,799.4 mm

2.5.5. Monthly Mean Surface Wind at Falaj Al Mualla and Mileiha Stations

Mean Monthly Surface Wind (km/day)

Falaj Al Mualla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	64.0	52.3	48.6	45.1	59.6	70.5	67.0	78.2	89.4	107.2	111.2	91.7	73.7
1980/1981	88.9	69.7	55.4	82.6	82.1	120.7	98.5	116.7	101.1	118.9	107.1	85.3	93.9
1981/1982	72.2	60.1	49.9	67.6	90.7	76.3	69.6	85.8	73.1	88.3	97.4	103.7	103.7
1982/1983	71.8	60.1	57.1	60.6	69.4	94.1	76.9	91.8	79.7	102.1	142.7	79.3	142.7
1983/1984	65.8	46.3	47.6	57.1	80.0	91.9	84.3	88.7	83.1	96.0	89.6	78.1	96.0
1984/1985	62.1	56.0	46.3	54.7	72.8	64.5	89.3	75.0	90.9	-	-	-	-
1985/1986	62.5	50.3	71.5	58.3	75.3	87.0	76.9	79.4	120.2	103.4	121.4	79.0	121.4
1986/1987	62.1	72.5	63.3	46.8	59.9	68.5	67.6	71.6	80.6	78.9	93.6	75.6	93.6
1987/1988	59.7	39.4	46.5	54.0	84.4	28.1	48.4	-	70.4	102.0	87.7	68.8	-
1988/1989	54.6	32.9	44.5	62.5	57.2	-	-	-	-	-	-	-	-
1989/1990	-	-	-	-	-	-	-	-	-	-	-	-	-
1990/1991	-	-	-	-	-	-	-	-	-	-	-	-	-
1991/1992	-	-	-	-	-	-	-	-	-	-	-	-	-
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	66.4	54.0	53.1	58.9	73.1	78.0	75.4	85.9	87.6	99.6	106.3	82.7	76.7

Mean Monthly Surface Wind (km/day)

Mileiha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	82.4	63.3	73.9	70.6	85.3	99.6	100.3	107.4	100.7	101.9	101.7	99.6	90.6
1980/1981	94.4	69.4	60.7	72.4	89.4	102.0	118.8	-	-	107.1	110.2	-	-
1981/1982	99.8	84.3	91.3	113.2	133.6	111.9	116.8	86.2	118.4	116.6	105.8	103.4	133.6
1982/1983	100.9	89.4	96.9	96.9	89.0	127.2	106.2	145.4	118.9	117.2	151.6	96.2	151.6
1983/1984	-	71.7	96.2	99.6	106.2	106.1	136.8	147.9	128.0	118.4	112.8	110.7	147.9
1984/1985	80.9	80.6	70.2	81.3	115.6	105.2	139.2	123.5	146.2	140.7	130.5	101.7	146.2
1985/1986	90.8	81.7	93.8	79.8	119.8	131.4	120.8	137.8	153.9	125.5	125.8	98.1	153.9
1986/1987	88.1	84.1	82.6	70.7	78.7	104.8	106.4	121.3	123.9	120.3	118.4	83.7	123.9
1987/1988	81.0	56.1	58.5	69.9	87.2	120.1	93.0	97.6	109.8	109.1	88.5	74.8	120.1
1988/1989	51.4	31.8	36.4	68.5	49.7	62.6	44.5	50.8	68.6	70.8	56.5	56.9	70.8
1989/1990	31.4	45.7	52.2	43.7	64.3	65.3	53.8	65.7	69.7	88.5	68.5	51.3	88.5
1990/1991	-	37.8	71.2	65.3	82.4	81.9	98.1	129.3	93.7	84.3	92.4	95.1	129.3
1991/1992	52.0	58.4	55.8	94.2	111.8	77.2	94.1	93.7	107.3	99.3	92.9	74.1	111.8
1992/1993	57.6	36.0	64.8	91.2	60.0	69.6	105.6	168.0	146.4	146.4	139.2	132.0	168.0
1993/1994	100.8	98.4	55.2	-	-	-	-	-	-	-	-	-	-
Maximum	77.8	65.9	70.8	79.8	91.1	97.5	102.5	113.4	114.3	110.7	106.6	92.0	93.5

2.5.6. Monthly Mean Daily Sunshine Duration at Ras Al Khaima Airport and Sharjah International Airport

Mean Monthly Sunshine Duration (hr./day)

Sharjah International Airport

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average			
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-			
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-			
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-			
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-			
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-			
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-			
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-			
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-			
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-			
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-			
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-			
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-			
1979/1980	-	-	-	-	-	-	-	-	-	-	-	-	-			
1980/1981	9.8	9.5	8.7	8.0	8.1	6.9	8.5	6.9	8.6	10.5	11.5	11.4	11.0	10.4	10.0	3,531.8
1981/1982	10.1	9.7	9.0	8.1	6.9	5.6	10.1	10.6	10.9	11.0	10.9	11.0	11.0	10.9	10.1	3,398.1
1982/1983	9.4	8.7	7.0	7.2	7.6	7.6	8.8	11.3	11.7	10.6	8.7	9.7	9.7	9.7	9.7	3,295.6
1983/1984	10.1	9.6	9.1	8.8	9.5	7.9	10.8	11.5	11.4	11.4	10.8	10.3	10.3	10.3	10.3	3,697.3
1984/1985	9.8	9.2	7.3	8.0	9.4	9.1	10.7	11.5	12.0	11.0	11.3	10.7	10.7	10.7	10.7	3,649.2
1985/1986	10.0	9.1	8.0	8.5	8.2	9.4	9.7	11.7	12.0	11.1	11.2	10.5	10.5	10.5	10.5	3,635.5
1986/1987	9.8	8.8	7.6	8.7	8.7	7.7	10.7	11.5	11.7	11.6	10.7	10.5	10.5	10.5	10.5	3,596.8
1987/1988	9.9	9.4	8.2	7.6	6.3	9.1	10.0	11.8	11.9	10.9	11.1	10.4	10.4	10.4	10.4	3,560.3
1988/1989	9.7	9.1	8.1	7.7	7.3	8.1	8.8	11.3	11.6	11.0	10.8	10.2	10.2	10.2	10.2	3,463.1
1989/1990	9.5	8.9	6.6	6.5	7.2	9.3	9.8	11.7	11.6	10.9	10.7	10.2	10.2	10.2	10.2	3,457.8
1990/1991	9.6	8.9	8.0	5.8	6.7	6.9	9.2	10.2	10.9	10.4	10.4	9.6	9.6	9.6	9.6	3,245.9
1991/1992	8.8	8.5	7.0	5.3	7.4	6.8	9.5	10.9	11.6	10.6	10.6	10.3	10.3	10.3	10.3	3,264.2
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	9.7	9.1	7.8	7.6	7.8	8.0	9.9	11.2	11.6	10.9	10.5	10.2	10.2	10.2	10.2	3,481.2

0.3979964

Mean Monthly Sunshine Duration (hr./day)

Ras Al Khaima Airport

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average			
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-			
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-			
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-			
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-			
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-			
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-			
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-			
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-			
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-			
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-			
1977/1978	10.0	8.9	7.9	8.0	8.9	7.8	10.3	10.9	11.1	8.8	10.2	10.2	10.2	10.2	10.2	3,405.8
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	9.2	10.0	6.6	8.0	6.2	8.2	10.5	11.4	10.4	10.6	10.5	10.2	10.2	10.2	10.2	3,412.3
1980/1981	9.7	8.9	8.2	7.0	9.5	7.4	10.0	10.9	11.6	10.4	10.7	10.5	10.5	10.5	10.5	3,489.3
1981/1982	10.1	9.6	8.2	7.2	6.4	5.4	10.4	10.5	10.6	10.6	9.2	10.0	10.0	10.0	10.0	3,294.4
1982/1983	9.5	8.2	5.8	6.9	7.3	7.6	8.3	-	10.9	10.5	8.5	10.2	10.2	10.2	10.2	-
1983/1984	10.1	9.6	8.1	8.3	9.0	7.6	10.6	10.8	10.3	10.2	9.3	9.8	9.8	9.8	9.8	3,466.4
1984/1985	9.7	9.2	7.1	7.4	9.6	7.7	10.2	10.4	11.5	8.7	10.5	10.5	10.5	10.5	10.5	3,417.3
1985/1986	10.1	9.3	8.1	8.8	8.2	8.4	8.2	11.6	11.1	9.6	10.7	10.3	10.3	10.3	10.3	3,482.9
1986/1987	9.9	8.6	8.1	9.1	8.8	7.1	10.2	11.1	10.6	11.1	9.2	10.1	10.1	10.1	10.1	3,465.0
1987/1988	10.1	9.7	8.4	7.8	6.5	8.5	9.2	11.7	11.5	9.1	10.7	10.1	10.1	10.1	10.1	3,456.8
1988/1989	10.2	9.7	8.3	7.6	8.0	7.7	8.0	11.4	11.0	10.1	10.1	9.9	9.9	9.9	9.9	3,409.4
1989/1990	10.1	9.6	7.2	7.0	6.9	9.4	8.7	11.5	11.2	10.3	10.2	9.9	9.9	9.9	9.9	3,411.9
1990/1991	10.0	-	8.6	6.6	7.1	7.1	9.6	9.6	10.4	9.9	10.8	9.4	9.4	9.4	9.4	-
1991/1992	9.2	8.8	6.4	5.4	6.6	6.0	8.9	10.1	10.8	9.7	9.6	10.0	10.0	10.0	10.0	3,088.2
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	9.8	9.2	7.6	7.5	7.8	7.6	9.5	11.0	10.9	9.9	10.0	10.1	10.1	10.1	10.1	3,402.6

0.3884236

Monthly Rainfall in mm

Kalsial Moulia

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	0.0	0.0	6.1	0.0	73.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.9
1968/1969	0.0	0.0	14.5	105.4	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	129.5
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	0.0	21.9	0.7	15.0	3.0	148.5	4.2	0.0	0.0	0.0	0.0	0.0	193.3
1972/1973	0.0	0.0	0.0	29.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.7
1973/1974	0.0	0.0	0.0	0.0	40.9	0.3	4.6	0.0	0.0	0.0	0.0	0.0	45.8
1974/1975	2.3	0.0	8.4	70.8	31.7	1.8	1.3	0.8	0.0	0.0	21.0	0.0	138.1
1975/1976	0.0	0.0	0.0	3.7	145.4	36.0	23.1	0.0	0.0	0.0	2.5	0.0	210.7
1976/1977	0.0	0.0	2.5	70.6	39.0	1.2	15.5	0.0	0.0	0.0	0.0	0.0	129.2
1977/1978	0.0	0.1	7.2	0.1	30.8	2.7	1.7	0.0	0.0	1.8	0.0	0.0	46.4
1978/1979	1.2	0.0	1.0	3.8	1.0	67.2	0.4	0.0	0.0	0.0	0.0	0.0	74.8
1979/1980	2.0	0.6	76.0	4.4	42.8	26.0	0.2	0.0	0.0	2.6	0.0	0.0	166.6
1980/1981	0.4	0.8	7.6	4.4	1.2	16.4	26.6	23.0	0.0	0.0	0.0	0.0	80.4
1981/1982	8.2	1.4	0.6	4.0	150.6	214.2	1.2	0.6	0.0	0.2	0.0	0.0	381.0
1982/1983	0.2	19.8	37.2	29.6	48.2	38.4	14.0	0.0	0.0	0.0	0.0	0.0	188.0
1983/1984	0.2	0.4	10.6	0.8	0.6	17.6	0.4	0.0	0.0	0.0	0.0	0.0	30.6
1984/1985	1.0	0.8	19.6	26.0	0.0	4.8	1.2	0.0	0.0	0.0	0.0	0.0	54.4
1985/1986	0.4	1.2	0.6	20.8	26.0	13.6	0.2	0.0	0.0	0.0	0.0	0.0	64.2
1986/1987	1.2	0.2	30.8	2.2	4.4	115.6	12.2	0.0	0.2	0.0	0.0	0.0	167.6
1987/1988	0.0	1.8	9.4	3.0	154.4	1.2	23.0	0.4	0.0	3.0	0.0	0.0	196.6
1988/1989	2.2	0.4	8.0	0.0	16.8	49.6	6.0	0.0	0.0	0.0	0.0	0.0	83.0
1989/1990	0.6	48.0	62.8	33.2	60.0	6.4	4.2	0.0	0.0	0.4	7.6	0.2	225.4
1990/1991	0.2	0.6	0.8	14.4	8.8	38.9	0.0	0.0	0.0	0.0	0.0	0.0	63.7
1991/1992	2.6	0.2	18.8	36.2	55.6	2.6	31.6	0.0	0.4	0.0	0.2	1.0	149.2
1992/1993	0.8	0.2	47.0	13.4	154.6	2.0	0.4	0.0	0.0	0.0	0.0	1.0	219.4
1993/1994	21.4	1.2	8.8	-	-	-	-	-	-	-	-	-	-
Average	1.8	4.0	15.2	20.5	45.4	33.5	7.2	1.0	0.0	0.3	1.3	1.2	131.5

131.1

Monthly Rainfall in mm

Meleha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	0.0	0.0	45.5	4.3	53.2	0.0	13.7	0.0	0.0	2.3	1.0	0.0	120.0
1968/1969	0.0	0.0	29.7	150.5	0.0	0.0	0.0	0.0	0.0	0.0	12.2	17.4	209.8
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	2.9	24.2	0.2	12.5	0.0	145.5	13.0	0.0	0.0	0.3	0.0	0.0	198.6
1972/1973	2.3	0.0	0.9	35.1	0.0	0.0	0.0	0.0	0.0	11.4	15.7	0.0	65.4
1973/1974	0.0	0.0	0.0	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.6
1974/1975	0.0	0.0	5.8	22.9	56.5	10.2	0.0	0.0	0.0	0.0	38.8	0.4	134.6
1975/1976	0.0	15.2	0.0	50.8	97.7	46.8	55.4	0.7	0.0	0.0	9.3	0.0	275.9
1976/1977	0.0	0.0	7.2	35.0	36.6	3.3	30.8	19.8	0.0	1.2	0.0	0.0	133.9
1977/1978	0.0	0.0	2.8	0.0	45.3	0.7	0.8	0.0	0.0	6.6	13.7	0.0	69.9
1978/1979	0.0	0.0	0.0	1.6	0.0	0.0	45.7	0.0	0.0	0.0	1.3	9.5	58.1
1979/1980	1.1	0.0	32.3	5.9	15.6	5.6	0.0	0.0	0.0	18.0	0.0	0.0	78.5
1980/1981	0.0	0.0	0.0	8.2	0.0	17.9	30.4	62.8	0.0	0.0	17.0	0.0	136.3
1981/1982	0.0	0.0	0.0	4.7	137.2	117.3	0.4	0.0	0.0	0.0	0.0	0.0	259.6
1982/1983	0.2	11.6	30.0	35.4	39.0	35.4	51.6	0.0	0.0	0.0	45.8	0.6	249.6
1983/1984	0.0	0.0	1.6	2.6	0.4	43.0	0.0	0.0	0.0	8.8	0.0	0.0	56.4
1984/1985	0.0	0.0	0.4	0.8	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.2	6.2
1985/1986	0.0	0.2	0.4	23.4	20.4	18.8	3.0	0.0	0.0	8.8	3.4	2.4	80.3
1986/1987	27.6	0.0	29.4	0.0	5.0	113.0	11.0	0.0	0.0	0.0	4.2	0.0	190.2
1987/1988	0.0	0.6	8.4	5.6	182.4	2.4	6.8	0.0	0.0	1.8	0.0	0.0	208.0
1988/1989	6.4	0.4	0.0	0.0	13.0	34.4	6.8	0.0	0.0	0.0	5.8	0.0	66.8
1989/1990	0.6	36.8	52.4	7.5	121.6	2.2	21.6	0.0	0.0	5.4	0.0	2.6	250.7
1990/1991	0.2	0.0	0.4	9.0	5.2	40.8	0.5	0.0	0.0	0.0	0.0	1.4	57.5
1991/1992	0.0	0.2	10.8	29.4	36.3	5.2	55.2	0.0	0.0	19.6	1.4	0.0	158.1
1992/1993	0.4	0.0	16.5	18.4	126.8	1.5	0.2	0.0	0.0	0.0	11.4	0.4	175.6
1993/1994	4.6	4.0	8.2	-	-	-	-	-	-	-	-	-	-
Average	1.9	3.7	11.3	19.7	41.3	28.9	12.6	3.5	0.0	3.5	7.5	1.5	135.4

135.4



Monthly Rainfall in mm

Dhaid

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	0.0	0.0	41.1	3.7	33.2	20.0	0.0	0.0	0.0	5.7	0.0	0.0	103.7
1980/1981	0.0	0.0	0.0	0.2	0.0	16.0	42.7	51.9	0.0	0.0	6.2	0.0	117.0
1981/1982	52.1	0.0	0.0	3.0	145.6	165.9	0.0	0.0	0.0	2.3	0.0	0.0	368.9
1982/1983	12.0	20.6	17.1	27.8	35.5	37.2	19.0	0.0	0.0	0.0	6.6	0.0	175.8
1983/1984	0.0	0.0	1.8	0.0	0.0	20.5	0.0	0.0	0.0	0.0	0.0	0.0	22.3
1984/1985	0.0	0.0	0.6	17.1	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	19.2
1985/1986	0.0	0.0	1.6	19.2	9.4	15.0	0.0	0.0	0.0	17.4	0.0	3.7	66.3
1986/1987	0.0	0.0	31.0	0.0	0.0	99.4	11.0	0.0	0.0	0.0	0.0	0.0	141.4
1987/1988	0.0	0.0	8.5	1.7	157.2	1.6	12.0	0.0	0.0	1.7	0.0	0.0	182.7
1988/1989	0.0	0.0	0.0	0.0	15.8	44.8	9.8	0.0	0.0	0.0	7.1	0.0	77.5
1989/1990	0.0	30.0	58.2	19.7	78.3	4.7	13.5	0.0	0.0	8.8	0.0	0.0	213.2
1990/1991	0.0	0.0	0.0	20.3	7.1	49.8	0.0	0.0	0.0	0.0	0.0	0.0	77.2
1991/1992	0.0	0.0	7.9	53.7	34.0	1.1	52.5	0.0	0.0	4.4	0.0	0.0	153.6
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	4.9	3.9	12.9	12.8	39.7	36.7	12.3	4.0	0.0	3.1	1.5	0.3	132.2

132.2

Monthly Rainfall in mm

FBI

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	0.0	1.1	2.2	0.0	4.2	122.6	0.0	0.0	0.0	0.0	0.0	0.0	130.1
1972/1973	0.0	0.0	0.0	27.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.1
1973/1974	0.0	0.0	0.0	7.5	10.5	0.0	0.0	0.0	0.0	0.0	0.0	10.0	28.0
1974/1975	-	-	-	74.0	31.0	0.0	0.0	0.0	0.0	0.0	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	0.0	16.0	4.4	-
1979/1980	28.2	0.0	90.0	7.8	14.6	11.8	0.0	0.0	4.0	0.0	0.0	26.2	182.6
1980/1981	0.0	0.2	0.4	0.0	0.0	21.8	22.8	134.4	0.0	0.0	0.0	0.0	179.6
1981/1982	0.0	0.0	0.0	6.2	145.0	114.8	0.0	2.2	17.2	7.0	0.0	0.0	292.4
1982/1983	0.6	24.0	34.2	26.2	39.6	40.0	92.2	0.0	0.0	2.2	12.2	0.0	271.2
1983/1984	0.0	0.0	0.6	1.0	0.0	16.8	0.0	0.2	0.0	37.2	36.0	0.0	91.8
1984/1985	0.0	0.0	6.2	7.4	0.4	1.4	1.0	0.0	0.0	0.0	4.6	0.0	21.0
1985/1986	0.0	0.2	0.0	24.6	18.0	0.4	3.8	0.0	0.6	0.0	3.8	50.8	102.2
1986/1987	16.2	0.0	33.6	0.0	8.0	163.4	27.0	0.0	0.2	0.0	16.4	0.0	264.8
1987/1988	0.4	0.0	6.0	5.6	236.0	0.2	8.2	0.0	0.0	12.0	3.6	0.0	272.0
1988/1989	0.0	0.0	1.4	0.0	21.2	58.0	7.2	0.0	0.0	0.0	3.4	12.4	103.6
1989/1990	0.0	27.0	52.4	12.8	102.6	0.4	15.6	0.0	18.2	14.2	4.2	0.0	247.4
1990/1991	0.0	1.0	0.0	12.0	20.0	27.0	0.0	0.0	0.0	18.4	0.0	1.4	79.8
1991/1992	0.2	4.4	8.4	44.2	39.0	4.4	57.0	0.0	0.0	45.2	2.8	0.0	205.6
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	2.9	3.6	14.7	15.1	40.6	34.3	13.8	8.0	2.4	7.6	6.1	6.2	155.2

156.2

Station established on 28 June 1979

Monthly Rainfall in mm

Jebel Sharmah

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	-	-	-	-	-	-	-	-	-	-	-	-	-
1980/1981	-	-	-	2.4	0.2	12.8	11.0	35.4	0.0	0.0	0.2	0.0	-
1981/1982	4.6	0.0	0.0	9.4	201.4	188.6	0.0	0.0	0.0	1.0	0.0	6.4	411.4
1982/1983	5.8	17.6	29.0	39.2	55.2	57.4	53.8	0.0	0.0	0.0	32.8	0.0	290.8
1983/1984	0.0	0.0	5.8	5.4	0.0	30.2	0.0	0.0	0.0	48.0	9.2	13.0	111.6
1984/1985	0.0	0.0	7.8	22.2	0.4	3.6	1.6	0.0	0.0	0.0	0.0	1.4	37.0
1985/1986	0.0	0.0	2.4	25.2	24.4	11.6	1.6	0.0	5.0	1.0	4.6	1.6	77.4
1986/1987	11.0	0.0	1.6	0.2	4.2	116.8	15.4	6.2	0.0	0.0	8.8	0.0	164.2
1987/1988	0.0	1.0	10.0	6.6	181.2	3.2	37.2	0.0	0.0	13.6	0.0	0.0	252.8
1988/1989	0.0	0.0	2.2	0.0	10.2	42.2	9.4	0.0	0.0	0.0	0.0	0.4	64.4
1989/1990	3.4	0.0	73.2	24.0	156.0	4.2	21.0	0.0	0.0	8.4	0.0	0.0	290.2
1990/1991	3.4	0.0	0.0	31.6	6.8	34.2	0.4	0.0	0.0	0.0	0.0	0.2	76.6
1991/1992	0.2	17.8	6.6	58.4	44.2	3.6	39.8	0.0	0.0	4.8	0.0	0.0	175.4
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	2.6	3.3	12.6	18.7	57.0	42.4	15.9	3.5	0.4	6.4	4.6	1.9	169.4

177.4

Monthly Rainfall in mm

ALChari

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	6.0	13.2	0.7	0.0	0.0	118.0	0.0	0.0	0.0	0.0	0.0	18.2	156.1
1972/1973	2.5	1.1	2.0	30.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0
1973/1974	0.0	0.0	0.0	19.1	33.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	60.1
1974/1975	-	-	-	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	-	-
1975/1976	0.0	0.0	0.0	4.2	91.4	52.7	33.5	0.0	0.0	0.0	11.8	0.0	193.6
1976/1977	0.0	1.2	4.5	78.9	33.1	0.0	27.5	0.0	0.0	0.0	0.0	0.0	145.2
1977/1978	0.0	3.0	9.8	11.2	43.1	0.0	0.0	0.0	0.0	0.0	8.3	2.5	77.9
1978/1979	0.0	0.0	0.0	12.1	0.0	60.8	0.0	0.0	0.0	0.0	0.0	0.0	72.9
1979/1980	53.0	0.8	75.8	0.4	48.0	15.2	0.0	0.0	0.0	0.0	0.0	0.0	193.2
1980/1981	0.0	0.0	5.2	1.4	1.2	28.8	44.8	40.0	0.0	0.0	0.0	0.0	121.4
1981/1982	0.0	0.0	0.0	24.3	139.3	133.0	0.0	0.2	0.0	0.0	0.0	0.0	296.8
1982/1983	0.0	30.4	38.6	44.4	42.0	60.4	26.8	0.0	0.0	0.0	9.8	3.0	255.4
1983/1984	0.0	0.4	4.4	0.6	0.2	9.8	0.0	0.0	0.0	0.0	0.0	0.0	15.4
1984/1985	0.0	0.0	15.8	19.6	0.6	2.4	0.6	0.0	0.0	0.0	0.0	0.6	39.6
1985/1986	0.2	2.4	1.4	36.4	18.4	11.4	0.0	0.0	0.0	0.0	0.0	18.4	88.6
1986/1987	1.8	0.0	44.6	1.0	0.4	111.4	14.8	7.0	0.0	0.0	9.0	0.0	190.0
1987/1988	0.0	8.6	0.6	0.2	138.5	1.4	15.4	0.0	0.0	7.2	0.0	0.0	171.9
1988/1989	0.0	0.0	0.0	0.0	19.4	69.6	10.8	0.0	0.0	0.0	0.0	0.0	99.8
1989/1990	0.2	4.8	82.4	25.8	113.4	7.2	15.0	0.0	0.0	0.2	0.0	0.0	249.0
1990/1991	0.0	0.0	0.0	33.0	10.0	47.4	0.4	0.0	1.8	0.0	0.0	0.0	92.6
1991/1992	0.4	1.0	9.4	57.0	41.4	2.4	39.6	0.0	0.0	0.0	2.4	0.0	153.6
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	3.2	3.3	14.8	19.0	36.8	35.3	10.9	2.2	0.1	0.4	2.0	2.5	130.6

135.5

Monthly Rainfall in mm

Masafi

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	0.0	2.8	18.9	0.9	58.6	0.0	0.0	0.0	0.0	0.0	25.4	0.0	106.6
1968/1969	0.0	0.0	36.3	127.9	11.2	0.0	0.2	0.0	0.0	0.0	5.6	0.0	181.2
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	10.2	20.2	15.2	3.9	0.9	128.2	3.2	0.0	1.9	0.0	0.0	0.0	192.9
1972/1973	0.8	2.2	0.0	80.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.2
1973/1974	0.0	0.0	0.0	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	41.0
1974/1975	21.0	0.0	0.0	95.0	129.5	0.0	0.0	0.0	0.0	0.0	80.0	0.0	325.5
1975/1976	0.0	0.0	3.8	23.8	130.8	58.8	61.4	0.0	0.0	0.0	78.5	0.0	357.1
1976/1977	84.0	2.5	4.0	57.4	37.6	5.2	40.8	22.6	9.2	0.0	0.3	0.0	263.6
1977/1978	28.3	31.1	9.2	0.8	63.8	2.2	0.6	0.0	0.0	5.0	56.6	0.0	197.6
1978/1979	0.2	0.6	0.8	10.4	1.0	51.0	0.0	0.0	22.0	14.0	0.0	4.0	104.0
1979/1980	12.6	0.0	71.2	5.8	47.6	13.8	0.0	0.0	0.0	9.6	0.0	24.0	184.6
1980/1981	0.0	10.2	1.0	3.6	2.2	22.6	13.2	41.8	0.0	0.0	0.0	0.0	95.0
1981/1982	6.6	0.4	0.6	6.8	188.2	165.6	0.0	0.0	0.0	0.0	0.0	0.0	348.2
1982/1983	4.0	31.2	28.6	21.6	48.0	41.9	35.8	0.0	0.0	0.0	38.4	0.0	249.5
1983/1984	0.0	0.6	1.8	5.2	0.2	27.4	0.0	2.6	0.0	36.2	29.8	6.6	110.4
1984/1985	0.0	0.2	7.8	17.6	0.0	1.8	0.8	0.0	0.0	0.0	0.0	5.4	33.6
1985/1986	0.0	0.2	1.4	25.0	23.8	8.8	2.0	0.0	1.8	3.2	7.0	4.4	77.6
1986/1987	5.2	1.0	14.8	0.4	9.8	97.8	18.8	9.8	0.0	0.0	0.4	0.8	188.8
1987/1988	0.0	17.2	5.6	4.6	168.9	2.6	29.5	0.0	0.0	14.0	0.0	0.0	242.4
1988/1989	0.0	0.0	2.4	0.0	8.4	39.6	9.0	0.0	0.0	5.6	0.0	0.0	65.0
1989/1990	3.8	0.4	71.8	20.2	150.2	4.0	15.6	0.0	8.0	17.0	0.0	0.0	291.0
1990/1991	14.2	1.4	0.0	22.0	6.4	35.6	0.0	0.0	0.0	0.0	0.0	0.2	79.8
1991/1992	0.2	5.2	5.6	49.4	40.4	3.4	38.0	0.0	0.0	0.6	0.4	0.0	143.2
1992/1993	0.8	0.0	17.0	210.8	108.4	5.4	0.0	0.0	0.0	0.0	1.0	0.2	343.6
1993/1994	14.0	0.0	11.0	-	-	-	-	-	-	-	-	-	-
Average	8.2	5.1	13.2	34.3	50.7	29.8	11.2	3.2	1.8	4.4	13.5	2.8	178.1

Monthly Rainfall in mm

Marbad

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	-	-	-	-	-	-	-	-	-	-	-	-	-
1980/1981	-	-	-	2.0	3.4	30.2	13.4	39.6	0.0	0.0	0.4	0.0	-
1981/1982	6.2	0.2	0.4	11.2	231.4	204.8	0.0	0.0	0.0	0.0	0.0	0.0	454.2
1982/1983	1.2	51.6	34.8	55.6	50.2	53.2	46.0	0.0	0.0	0.0	24.6	0.0	317.2
1983/1984	0.0	0.0	2.2	1.8	0.2	18.2	0.0	0.0	0.0	32.8	2.0	9.8	67.0
1984/1985	0.0	0.0	15.8	18.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	34.8
1985/1986	0.0	0.0	1.6	24.0	28.2	9.2	1.8	0.0	0.0	3.4	0.0	20.2	88.4
1986/1987	6.0	0.6	20.6	0.6	1.0	121.2	13.2	15.4	0.0	0.0	33.4	0.0	212.0
1987/1988	0.0	14.2	17.8	13.4	200.4	2.0	19.6	0.0	0.0	13.2	0.0	0.0	280.6
1988/1989	0.0	0.0	0.0	0.0	12.4	53.4	9.6	0.0	0.0	0.4	5.0	0.0	80.8
1989/1990	5.2	0.0	64.6	24.8	151.4	6.0	7.6	0.0	0.0	1.6	0.0	0.8	262.0
1990/1991	0.0	3.6	0.0	30.6	8.2	33.2	0.0	0.0	0.0	0.0	0.0	0.0	75.6
1991/1992	0.0	11.2	8.6	61.4	60.0	1.8	39.2	0.8	0.0	29.8	9.4	0.0	222.2
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	1.7	7.4	15.1	20.3	62.2	44.4	12.6	4.7	0.0	6.8	6.2	2.6	184.0

Monthly Rainfall in mm

Siti

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	0.0	0.0	0.0	15.0	165.5	44.0	60.0	0.0	0.0	0.0	0.0	50.0	334.5
1976/1977	54.5	30.8	3.5	33.4	42.0	1.7	19.3	59.1	0.0	0.0	0.0	0.0	244.3
1977/1978	7.1	0.0	5.8	0.0	54.0	0.0	0.4	0.0	0.0	0.8	0.0	0.0	68.1
1978/1979	0.0	0.0	0.0	8.2	0.0	62.8	0.0	0.0	6.2	0.2	0.0	0.0	77.4
1979/1980	29.2	0.2	43.4	7.8	33.0	23.4	0.0	0.0	0.0	0.0	0.0	12.4	149.4
1980/1981	0.0	1.8	0.2	3.0	0.2	27.4	12.8	59.4	0.0	0.0	8.4	0.0	113.2
1981/1982	9.2	0.2	0.0	3.4	157.4	151.6	0.0	0.0	0.0	4.2	0.0	2.0	328.0
1982/1983	2.4	4.6	29.4	31.0	51.0	41.8	47.0	0.0	0.0	0.0	36.2	0.0	243.4
1983/1984	0.0	0.0	0.0	3.0	0.0	31.6	0.0	0.0	0.0	2.6	15.0	21.4	73.6
1984/1985	0.0	0.0	6.2	22.6	0.0	2.6	1.0	0.0	0.0	0.0	0.0	2.0	34.4
1985/1986	0.0	0.2	0.2	26.6	24.0	12.2	1.8	0.0	0.0	0.0	13.0	2.8	80.8
1986/1987	12.6	0.0	20.6	1.0	7.4	112.0	6.8	4.8	0.0	0.0	15.6	0.0	180.8
1987/1988	0.0	0.0	7.0	4.4	166.0	2.0	42.0	0.0	0.0	1.4	0.0	0.0	222.8
1988/1989	0.0	0.0	0.0	0.0	7.6	40.4	7.6	0.0	0.0	0.0	0.0	0.0	55.6
1989/1990	0.6	1.8	38.6	15.0	143.6	2.4	16.6	0.0	2.2	1.6	0.0	0.0	222.4
1990/1991	2.0	0.0	0.0	18.0	6.8	14.4	0.0	0.0	0.0	0.0	0.0	0.0	41.2
1991/1992	0.0	2.2	2.0	49.2	43.6	1.2	20.6	0.0	0.0	0.0	9.4	0.0	128.2
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	6.9	2.5	9.2	14.2	53.1	33.6	13.9	7.3	0.5	0.6	8.7	2.4	152.3

152.8

Monthly Rainfall in mm

Sifeni

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	71.5	0.0	-	-
1976/1977	7.2	20.6	5.2	32.2	31.2	0.0	84.2	48.2	0.0	0.0	0.0	0.0	228.8
1977/1978	0.0	0.0	0.0	0.0	59.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	59.4
1978/1979	0.0	0.0	0.0	14.2	0.0	62.0	0.0	0.0	0.4	0.0	0.0	0.0	76.6
1979/1980	22.8	0.0	63.8	3.0	40.4	21.6	0.0	0.0	0.0	0.0	0.0	15.6	167.2
1980/1981	0.0	0.0	0.0	2.4	0.6	17.0	29.0	48.6	0.0	8.0	0.0	0.0	105.6
1981/1982	0.0	0.0	0.4	11.4	169.6	134.2	0.0	0.0	0.0	0.2	0.0	0.4	316.2
1982/1983	15.0	4.8	30.6	35.4	67.2	52.8	65.2	0.0	0.0	0.0	40.0	0.0	311.0
1983/1984	0.0	0.0	1.4	1.2	0.0	21.6	0.0	5.0	0.0	0.0	7.0	0.0	36.2
1984/1985	0.0	0.0	6.6	21.2	0.0	3.0	0.0	0.0	0.0	0.0	0.0	1.0	31.8
1985/1986	10.0	0.0	1.4	38.8	8.0	23.0	3.6	0.0	0.0	0.0	12.0	0.6	97.4
1986/1987	1.0	0.0	22.8	0.0	14.0	118.8	26.0	4.2	0.0	0.0	23.6	0.0	210.4
1987/1988	0.0	11.8	4.8	7.4	206.2	0.0	29.2	0.0	0.0	4.8	0.6	0.0	264.8
1988/1989	0.0	0.0	2.4	0.0	12.8	33.0	8.8	0.0	0.0	0.0	0.0	0.6	57.6
1989/1990	0.0	7.8	44.8	16.0	166.8	2.2	25.2	0.0	24.8	0.0	4.0	0.0	291.6
1990/1991	1.8	0.0	0.0	19.4	12.6	29.4	0.0	0.0	0.0	0.0	0.0	0.0	63.2
1991/1992	0.0	1.4	22.6	32.4	55.4	4.4	63.0	0.0	0.0	0.0	1.8	0.0	181.0
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	3.6	2.9	12.9	14.7	52.8	32.7	20.9	6.6	1.6	0.8	9.4	1.1	160.0

156.2

Monthly Rainy Day ( more than 2.5 mm)

Falaj Al Musalla

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	0	0	4	0	3	3	0	0	0	0	0	1	11
1980/1981	0	0	1	1	0	3	1	2	0	0	0	0	8
1981/1982	2	0	0	0	9	9	0	0	0	0	0	0	20
1982/1983	0	4	3	1	3	4	1	0	0	0	0	0	16
1983/1984	0	0	1	0	0	2	0	0	0	0	0	0	3
1984/1985	0	0	3	1	0	1	0	0	0	0	0	0	5
1985/1986	0	0	0	0	2	2	0	0	0	0	0	6	12
1986/1987	0	0	2	0	1	5	1	0	0	0	0	0	9
1987/1988	0	0	1	0	5	0	2	0	0	1	0	0	9
1988/1989	0	0	1	0	2	3	1	0	0	0	0	0	7
1989/1990	0	1	4	2	4	1	0	0	0	0	1	0	13
1990/1991	0	0	0	3	2	3	0	0	0	0	0	0	8
1991/1992	0	0	2	5	4	0	4	0	0	0	0	0	15
1992/1993	0	0	0	1	3	0	0	0	0	0	0	0	4
1993/1994	1	1	1	-	-	-	-	-	-	-	-	-	-
Average	0	0	2	1	3	3	1	0	0	0	0	1	10

Monthly Rainy Day ( more than 2.5 mm)

Melriha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	0	0	3	1	2	1	0	0	0	1	0	0	8
1980/1981	0	0	0	1	0	1	1	2	0	0	0	0	5
1981/1982	0	0	0	1	7	6	0	0	0	0	0	0	14
1982/1983	0	3	2	1	2	4	2	0	0	0	3	0	17
1983/1984	0	0	0	1	0	2	0	0	0	1	0	0	4
1984/1985	0	0	0	0	0	1	0	0	0	0	0	0	1
1985/1986	0	0	0	2	2	1	1	0	0	1	1	0	8
1986/1987	2	0	1	0	1	6	10	0	0	0	0	0	20
1987/1988	0	0	2	1	7	0	1	0	0	0	0	0	11
1988/1989	1	0	0	0	2	2	1	0	0	0	1	0	7
1989/1990	0	2	2	2	5	0	1	0	0	1	0	0	13
1990/1991	0	0	0	2	1	5	0	0	0	0	0	0	8
1991/1992	0	0	1	4	5	1	3	0	0	1	0	0	15
1992/1993	0	0	2	1	3	0	0	0	0	0	2	0	8
1993/1994	1	1	1	-	-	-	-	-	-	-	-	-	-
Average	0	0	1	1	3	2	1	0	0	0	1	0	10

Monthly Maximum One Day Rainfall in mm

Meleha

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Maximum
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	1.1	0.0	14.4	4.7	8.8	4.4	0.0	0.0	0.0	18.0	0.0	0.0	18.0
1980/1981	0.0	0.0	0.0	8.2	0.0	12.4	30.4	31.4	0.0	0.0	17.0	0.0	31.4
1981/1982	0.0	0.0	0.0	4.2	94.0	53.4	0.0	0.0	0.0	0.0	0.0	0.0	94.0
1982/1983	0.0	4.6	22.0	28.0	16.2	16.4	41.2	0.0	0.0	0.0	24.0	0.0	41.2
1983/1984	0.0	0.0	1.6	5.2	0.2	32.0	0.0	0.0	0.0	8.8	0.0	0.0	32.0
1984/1985	0.0	0.0	0.2	0.8	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.2	4.8
1985/1986	0.0	0.2	0.2	20.6	14.6	18.0	2.8	0.0	0.0	8.8	3.4	1.4	20.6
1986/1987	24.6	0.0	26.6	0.0	4.8	50.4	10.0	0.0	0.0	0.0	2.2	0.0	50.4
1987/1988	0.0	0.4	3.2	5.2	126.0	1.2	6.2	0.0	0.0	1.8	0.0	0.0	126.0
1988/1989	5.0	0.4	0.0	0.0	6.4	24.6	5.4	0.0	0.0	0.0	5.2	0.0	24.6
1989/1990	0.2	29.0	47.4	3.0	102.5	2.2	20.0	0.0	0.0	5.2	0.0	2.2	102.5
1990/1991	0.2	0.0	0.2	4.2	3.4	10.6	0.8	0.0	0.0	0.0	0.0	0.0	10.6
1991/1992	0.0	0.2	9.6	12.2	13.5	2.5	23.2	0.0	0.0	19.6	1.4	0.0	23.2
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Maximum	24.6	29.0	47.4	28.0	126.0	53.4	41.2	31.4	0.0	19.6	24.0	2.2	126.0

Monthly Maximum One Day Rainfall in mm

Falaj AlMusalia

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Maximum
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	0.4	0.2	36.2	1.0	23.8	12.6	0.2	0.0	0.0	0.0	0.0	12.0	36.2
1980/1981	0.2	0.2	6.8	3.7	0.4	4.6	25.2	19.4	0.0	0.0	0.0	0.0	25.2
1981/1982	4.8	0.4	0.4	1.6	70.8	113.6	0.0	0.4	0.0	1.0	0.0	0.0	113.6
1982/1983	0.0	7.0	25.2	24.8	29.6	13.0	7.8	0.0	0.0	0.0	0.0	0.0	29.6
1983/1984	0.0	0.4	7.2	0.8	0.2	8.0	0.2	0.0	0.0	0.0	0.0	0.0	8.0
1984/1985	0.4	0.2	6.2	24.2	0.0	4.6	0.8	0.0	0.0	0.0	0.0	0.0	24.2
1985/1986	0.2	0.2	0.2	16.6	19.6	7.6	0.2	0.0	0.0	0.0	0.0	0.2	19.6
1986/1987	0.4	0.0	22.2	0.4	2.8	53.6	9.6	0.0	0.2	0.0	0.0	0.2	53.6
1987/1988	0.0	0.4	5.6	1.6	110.2	0.4	14.0	0.2	0.0	3.0	0.0	0.0	110.2
1988/1989	0.4	0.2	8.0	0.0	9.8	34.2	4.6	0.0	0.0	0.0	0.0	0.0	34.2
1989/1990	0.4	46.4	31.4	16.0	39.6	6.4	1.6	0.0	0.0	0.4	7.6	0.2	46.4
1990/1991	0.2	0.2	0.2	6.4	5.4	18.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0
1991/1992	0.0	0.2	8.2	15.2	34.6	1.2	10.6	0.0	0.2	0.0	0.2	0.2	34.6
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	4.8	46.4	36.2	24.8	110.2	113.6	25.2	19.4	0.2	3.0	7.6	12.0	113.6

Monthly Maximum One Day Rainfall in mm

Massa

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Maximum
1967/1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1968/1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1969/1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1970/1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1971/1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1972/1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1973/1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1974/1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1975/1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1978/1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1979/1980	5.6	0.0	41.0	2.4	18.6	10.6	0.0	0.0	0.0	9.6	0.0	21.0	41.0
1980/1981	0.0	10.0	0.4	3.4	1.2	8.4	12.8	22.8	0.0	0.0	0.0	0.4	22.8
1981/1982	6.2	0.4	0.4	7.2	129.4	74.4	0.0	0.0	4.6	0.0	0.0	0.0	129.4
1982/1983	3.4	23.6	15.5	20.8	28.6	25.7	19.4	0.0	0.0	0.0	25.8	0.0	28.6
1983/1984	0.0	0.6	1.3	0.4	0.2	11.6	0.0	2.6	0.0	20.2	29.8	3.6	29.8
1984/1985	0.0	0.2	3.4	17.0	0.0	1.0	0.4	0.0	0.0	0.0	0.0	2.4	17.0
1985/1986	0.0	0.2	1.4	15.8	17.4	6.6	1.0	0.0	1.8	3.2	2.0	2.0	17.4
1986/1987	4.4	0.0	12.8	0.2	6.2	46.4	18.6	9.8	0.0	0.0	0.4	0.0	46.4
1987/1988	0.0	17.0	2.6	2.6	136.8	2.6	24.0	0.0	0.0	14.0	0.0	0.0	136.8
1988/1989	0.0	0.0	2.4	0.0	5.6	23.0	6.2	0.0	0.0	4.8	0.0	0.0	23.0
1989/1990	2.6	0.2	55.4	14.6	94.8	4.0	13.6	0.0	8.0	17.0	0.0	0.0	94.8
1990/1991	8.0	1.4	0.0	7.6	5.2	13.6	0.0	0.0	0.0	0.0	0.0	0.0	13.6
1991/1992	0.0	5.2	4.6	15.8	23.4	1.8	17.8	0.0	0.0	0.6	0.2	0.0	23.4
1992/1993	-	-	-	-	-	-	-	-	-	-	-	-	-
1993/1994	-	-	-	-	-	-	-	-	-	-	-	-	-
Maximum	8.0	23.6	55.4	20.8	129.4	74.4	24.0	22.8	8.0	20.2	29.8	21.0	129.4

**VOLUME THREE : APPENDICES**

**APPENDIX-3: HYDROGEOLOGY AND GROUNDWATER**



3.1. Geophysical Survey  
 3.1.1. Location Map of Survey

