PUBLIC WORKS DEPARTMENT
THE GOVERNMENT OF GOA
THE REPUBLIC OF INDIA

No.

STUDY ON AUGMENTATION OF WATER SUPPLY AND SANITATION FOR THE GOA STATE IN THE REPUBLIC OF INDIA

Volume IV
Appendix for Master Plan

November 2006

JAPAN INTERNATIONAL COOPERATION AGENCY

NIHON SUIDO CONSULTANTS CO., LTD.
and
NJS CONSULTANTS CO., LTD.

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PREFACE

In response to a request made by the Government of Republic of India, the Government of Japan decided to conduct the Study on Augmentation of Water Supply and Sanitation for the Goa State in the Republic of India and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to India a study team headed by Mr. Takemasa MAMIYA of Nihon Suido Consultants Co., Ltd. between March 2005 and October 2006. The study team was composed of members from Nihon Suido Consultants Co., Ltd. and NJS Consultants Co., Ltd. JICA also established an Advisory Committee headed by Mr. Yoshiki OMURA, Senior Advisor, Institute for International Cooperation JICA, which, from time to time during the course of the study, provided specialist advice on technical aspects of the study.

The team held discussions with the officials concerned of the Government of the Republic of India and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared present report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of India and Government of Goa for their close cooperation extended to the team.

November, 2006

Ariyuki MATSUMOTO
Vice-President
Japan International Cooperation Agency

November, 2006

Mr. Ariyuki MATSUMOTO
Vice-President
Japan International Cooperation Agency

Letter of Transmittal

Dear Sir,

We are pleased to submit to you this Final Report on the Study on Augmentation of Water Supply and Sanitation for the Goa State in the Republic of India. This report incorporates the views and suggestions of the authorities concerned of the Government of Japan, including your Agency. It also includes the comments made on the Draft Final Report by Public Works Department of the Government of Goa and Ministry of Urban Development of the Government of the Republic of India and other government agencies concerned of the Republic of India.

The Final Report comprises a total of six volumes as listed below.

Volume I	: Executive Summary
Volume II	: Main Report: Master Plan
Volume III	: Main Report: Feasibility Study
Volume IV	: Annex for Master Plan
Volume V	: Annex for Feasibility Study
Volume VI	: Drawings

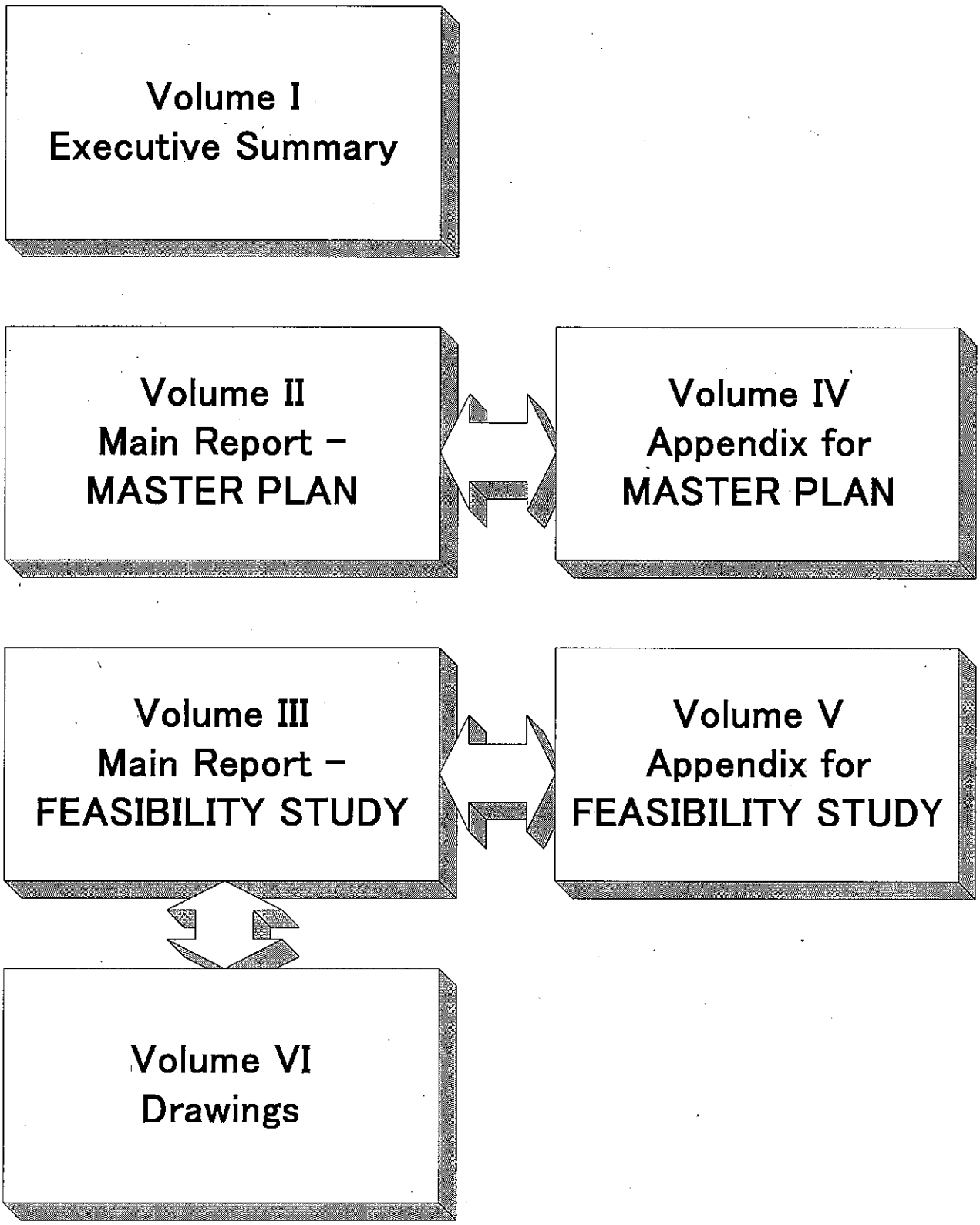
This report contains the Study Team's findings, conclusions and recommendations derived from the three phases of the Study. The main objective of the Phase I was to conducted a reconnaissance survey. That of Phase II was to formulate a long term master plan and to identify priority projects, whilst that of the Phase III was to examine the feasibility of the priority projects which had previously been identified in Master Plan during the course of the Phase II.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs and the Ministry of Health, Labour and Welfare of the Government of Japan for their valuable advice and suggestions. We would also like to express our deep appreciation to the relevant officers of Public Works Department of the Government of Goa and Ministry of Urban Development of the Government of the Republic of India for their close cooperation and assistance extended to us throughout our Study.

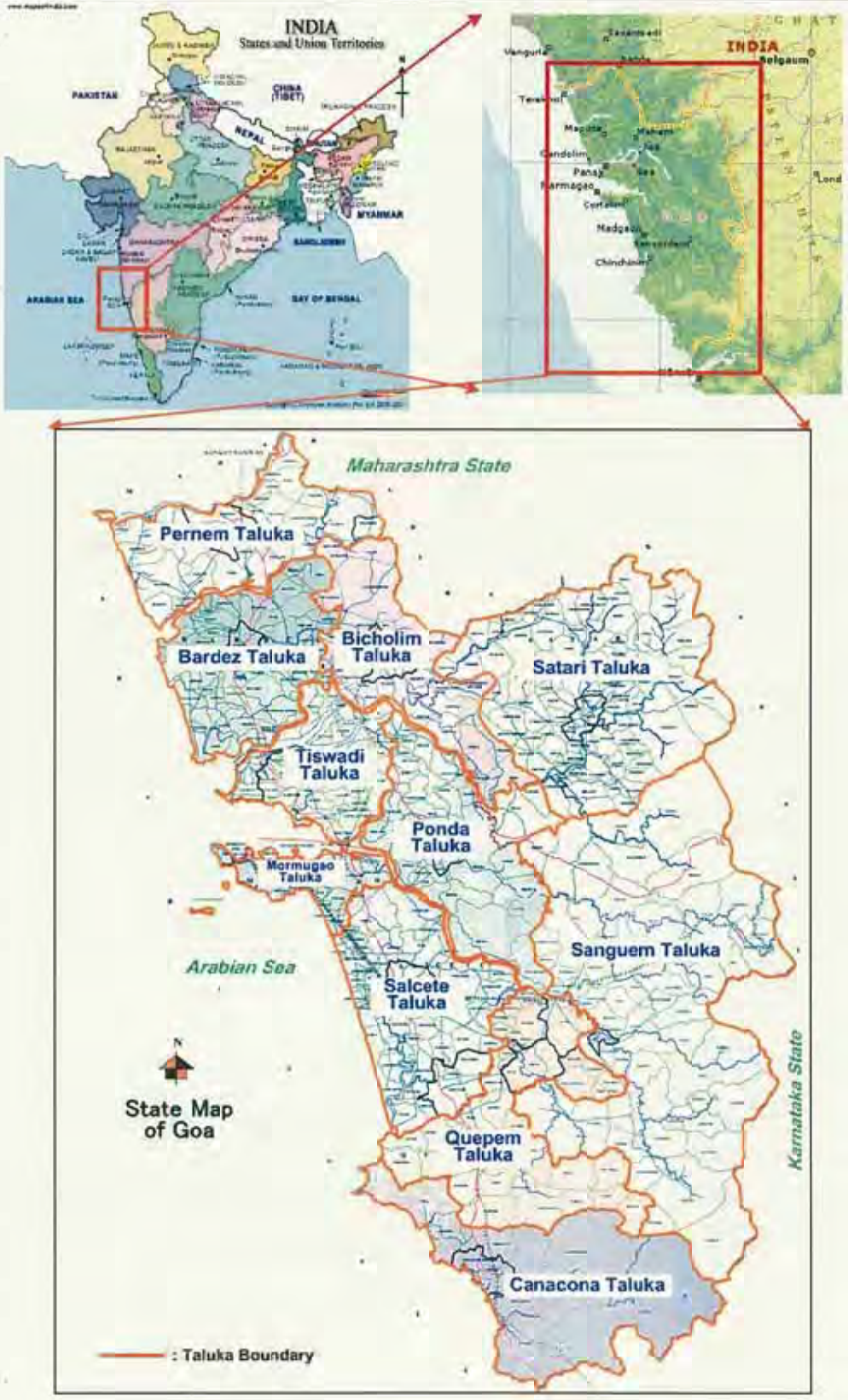
Very truly yours,

Takemasa Mamiya, Team Leader
Study on Augmentation of Water Supply
And Sanitation for Goa State in the
Republic of India

Structure of Report



Location Map



VOLUME IV: APPENDIX FOR VOLUME II
MAIN REPORT – MASTER PLAN

ABBREVIATIONS

ACP	Asbestos Cement Pipe
ADB	Asian Development Bank
ATP	Affordability to Pay
BOD	Biochemical Oxigen Demand
CE	Chief Engineer
CI	Cast Iron
CMMS	Computerised Maintenance Management System
COD	Chemical Oxygen Demand
CPWD	Central Public Works Department
CRZ	Coastal Regulation Zone
CSM	Customer Service Management
D	Diameter
DI	Ductile Cast Iron
DSR	Debt-service Ratio
DST&E	Department of Science, Technology and Environment
EE	Executive Engineer
EIA	Environmental Impact Assessment
FS, F/S	Feasibility Study
GDP	Gross Domestic Product
GI	Galvanised Iron
GIS	Geographical Information System
GLR	Ground Level Reservoir
GOG	Government of Goa
GOI	Government of India
GOJ	Government of Japan
GRDP	Gross Regional Domestic Product
GSDP	Gross State Domestic Product
GVA	Gross Value Added
HDPE	High-density Polyethylene
IEE	Initial Environmental Examination
IS	Information Systems
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KPI	Key Performance Indicator
lpcd	Per Capita Water Demand (liter per capita day)
M&E	Machinery and Electricity
MBR	Master Balancing Reservoir
MIS	Management Information System
MLD	Million Liter per Day
MNF	Minimum Night Flow
MOF	Ministry of Finance
MOUD	Ministry of Urban Development
MP, M/P	Master Plan

ABBREVIATIONS

MS	Mild Steel
NPV	Net Present Value
NRPP	NRW Reduction Pilot Project
NRW	Non Revenue Water
NTU	Nephelometric Turbidity Unit
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OHR	Over Head Reservoir
PHE	Public Health Engineering
PSC	Prestressed Concrete
PSP	Public Stand Post
PVC	Polyvinyl Chloride
PWD	Public Works Department
RCC	Regional Control Centre
RL	Reduced Level (Height above specified datum level)
SC	Steering Committee
SCM	Supply Chain Management
SE	Superintending Engineer
SS	Suspended Solids
STP	Sewage Treatment Plant
TOR	Terms of Reference
UFW	Unaccounted-for Water
WSS	Water Supply Scheme
WTP	Water Treatment Plant
WTP	Willingness To Pay

APPENDIX M1

This appendix is reference to and supporting data of

Volume 2 Main Report – Master Plan
Chapter 1 Introduction

M11 Minutes of Meetings

Appendix M11:

Minutes of Meetings

Contents for Appendix M11

SCOPE OF WORK
FOR
STUDY
ON
AUGMENTATION
OF
WATER SUPPLY AND SANITATION
FOR THE GOA STATE
IN THE REPUBLIC OF INDIA

AGREED UPON BETWEEN
PUBLIC WORKS DEPARTMENT,
THE GOVERNMENT OF GOA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

New Delhi, September 22, 2004

Mr. M Rajamani
Joint Secretary
Ministry of Urban Development,
The Government of India

Mr. Omura Yoshiki
Leader
Preparatory Study Team
Japan International Cooperation Agency
(JICA)

22/9/04

Ms. Debashree Mukherejee
Secretary
Public Works Department,
The Government of Goa

I INTRODUCTION

In response to the request of the Government of the Republic of India (hereinafter referred t as "the Government of India"), the Government of Japan decided to conduct Study c Augmentation of Water Supply and Sanitation for the Goa State in the Republic of Ind (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in forc in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA" the official agency responsible for the implementation of the technical cooperation programs of th Government of Japan, will undertake the Study in close cooperation with the authorities concerne of the Republic of India.

The present document sets forth the Scope of Work with regard to the Study and will be vali after notification of approval by JICA Headquarters. It will be informed through JICA India offic to the Government of India.

II OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To formulate a master plan for augmentation of water supply and sanitation in the Goa state
2. To conduct feasibility study on priority project(s) which will be selected from the master plan
3. To pursue technology transfer to the counterpart personnel in the course of the Study

III STUDY AREA

The Study shall cover the areas shown in the attached sheet of Appendix 1.

IV SCOPE OF THE STUDY

Phase I : Basic Study

A. Review of the existing (current) water supply and sanitation system
   1. Collection and analyses of existing data and information
   2. Survey and investigation of existing water supply system
      (1) Water sources
      (2) Water supply facilities
      (3) Water consumption
   3. Survey and investigation of existing sanitation system
      (1) Sanitation facilities
      (2) Sanitary condition
      (3) Water quality
   4. Survey of present conditions
      (1) Social and economic analysis

(2) Legislation
(3) Institutional structures
(4) Financial conditions
(5) Environmental control and management
(6) Public hygiene, awareness, and participation

5. Problem analyses

Phase II :Formulation of a master plan and conducting feasibility study on priority project(s)

A. Formulation of a master plan
   1. Establishment of scope, goals and strategies for water supply and sanitation
   2. Planning framework
      (1) population growth and urbanization
      (2) social and economic growth
      (3) amount of water source potential, water demand, and sewage quantity
   3. Formulation of master plan
      (1) Water supply and sanitation system
      (2) Institutional structures and duties
      (3) Finance
      (4) Management, operation and maintenance
      (5) Water quality monitoring plan
      (6) Public participation
   4. Technical assistance for initial environmental examination (IEE) and holding of workshop(s)
   5. Preliminary cost estimation and financial plan
   6. Evaluation of the master plan
   7. Selection of priority project(s)
B. Feasibility Study on priority project(s)
   1. Supplemental survey
   2. Confirmation of the framework of the plan
   3. Outline of future facilities
   4. Management, operation and maintenance plan
   5. Economic and financial analysis
   6. Project cost
   7. Technical assistance for environmental impact assessment (EIA) and holding workshop(s)
   8. Implementation plan
   9. Project evaluation
C. Seminar(s) for technical transfer

V STUDY SCHEDULE

The Study will be carried out in accordance with the attached tentative work schedule. (Appendix 2)

VI REPORTS

JICA will prepare and submit the following reports in English to the Government of India:

1. Inception Report:
Twenty (20) copies at the commencement of the Study. This report will describe such as study schedule, methodology, and manning schedule.

2. Progress Report
Twenty (20) copies at the first work period in India.

3. Interim Report:
Twenty (20) copies at the beginning of Phase2

4 Draft Final Report:
Twenty (20) copies at the end of the Study in India
The Government of India shall submit their comments within one(1) month after the receipt of the Draft Final Report.

5. Final Report:
Thirty (30) copies

Ⅶ UNDERTAKING OF THE GOVERNMENT OF INDIA

1. To facilitate the smooth conduct of the Study, the Government of India shall take the following necessary measures:

(1) To provide security related information on as well as measures to ensure the the safety of the Japanese study team (hereinafter referred to as "the Study Team"),

(2) To permit the members of the Study Team to enter, leave and sojourn in India for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,

(3) To exempt the members of the Study Team from taxes, duties, fees and any other charges on equipment, machinery, vehicles, and other materials brought into India for the conduct of the Study,

(4) To exempt the members of the 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 Team for their services in connection with the implementation of the Study,

(5) To provide necessary facilities to the Study Team for remittance as well as utilization of the funds introduced into India from Japan in connection with the implementation of the Study,

(6) To secure permission for the Study Team to enter into private properties or restricted areas for the implementation of the Study,

(7) To secure permission for the Study Team to take all data and documents including photographs and maps related to the Study out of India to Japan, and

(8) To provide medical services as needed. Its expenses will be chargeable to members of the Study Team.

2. The Government of India shall bear claims, if any arises, against the members of the 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 wilful misconduct on the part of the member of the Team.

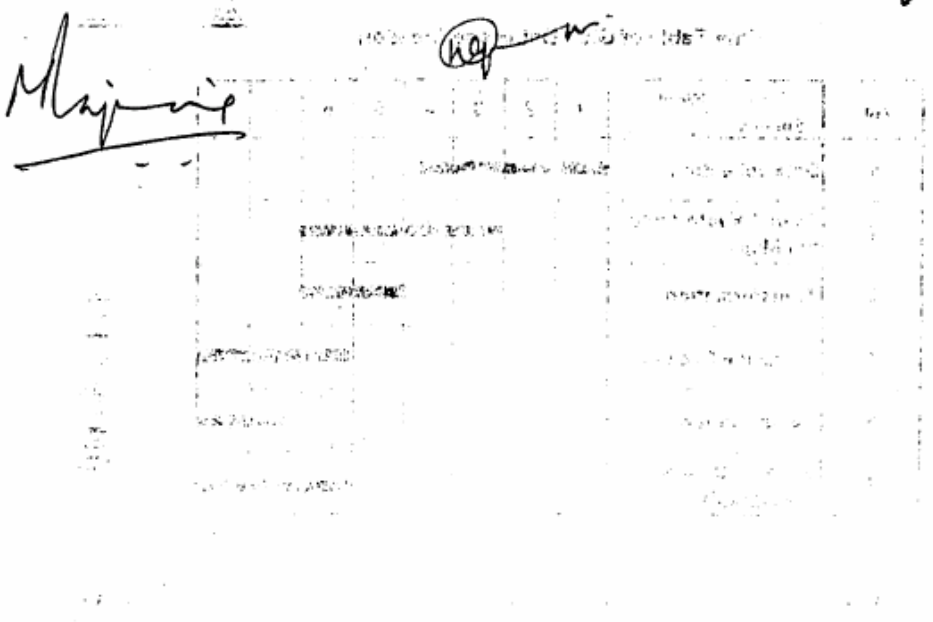
3. Public Works Department of the Government of Goa (hereinafter referred to as "PWD") shall act as a counterpart agency to the Study Team and also as a coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

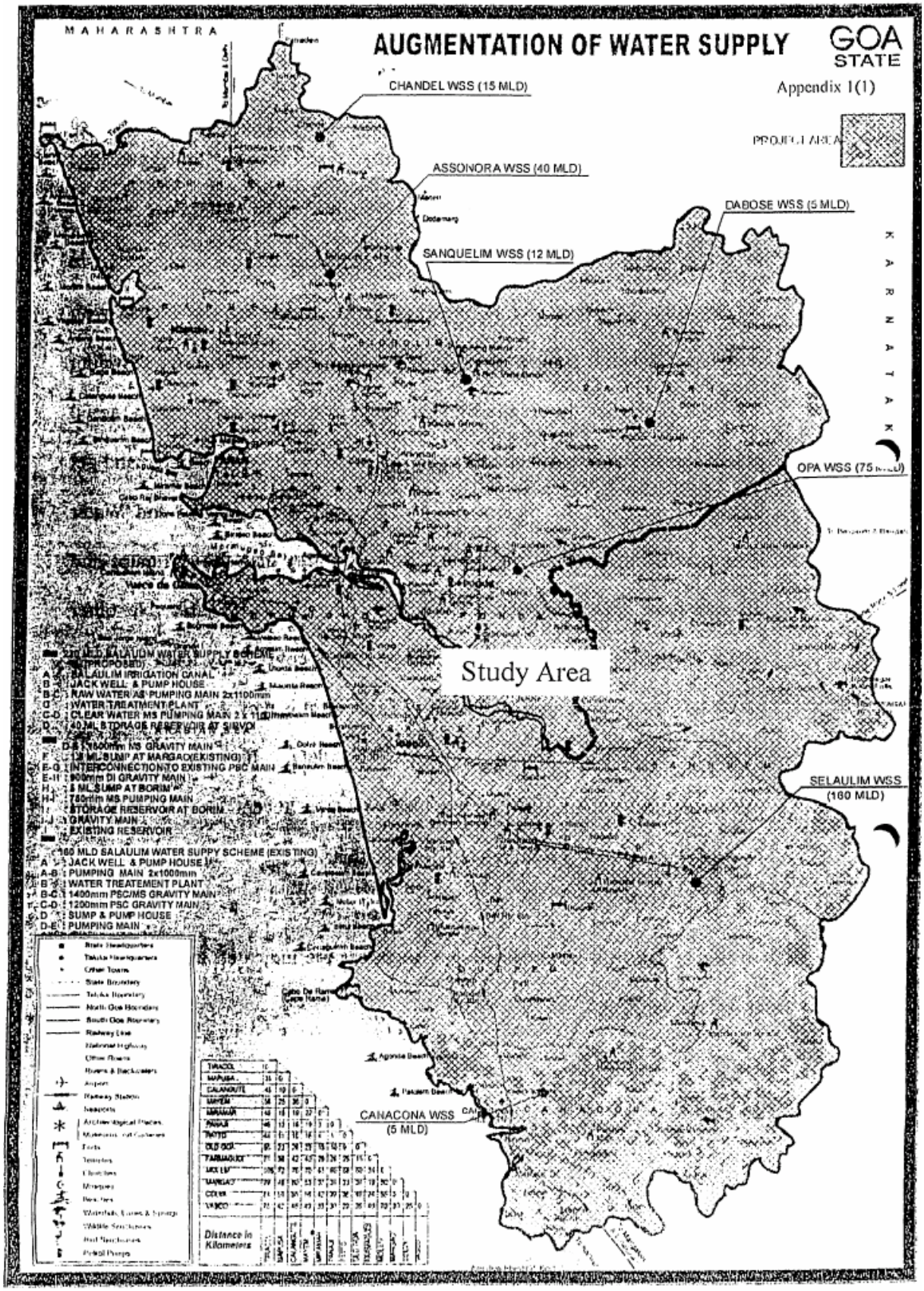
4. PWD shall, at its own expense, provide the Study Team with the following, in cooperation with other organizations concerned:

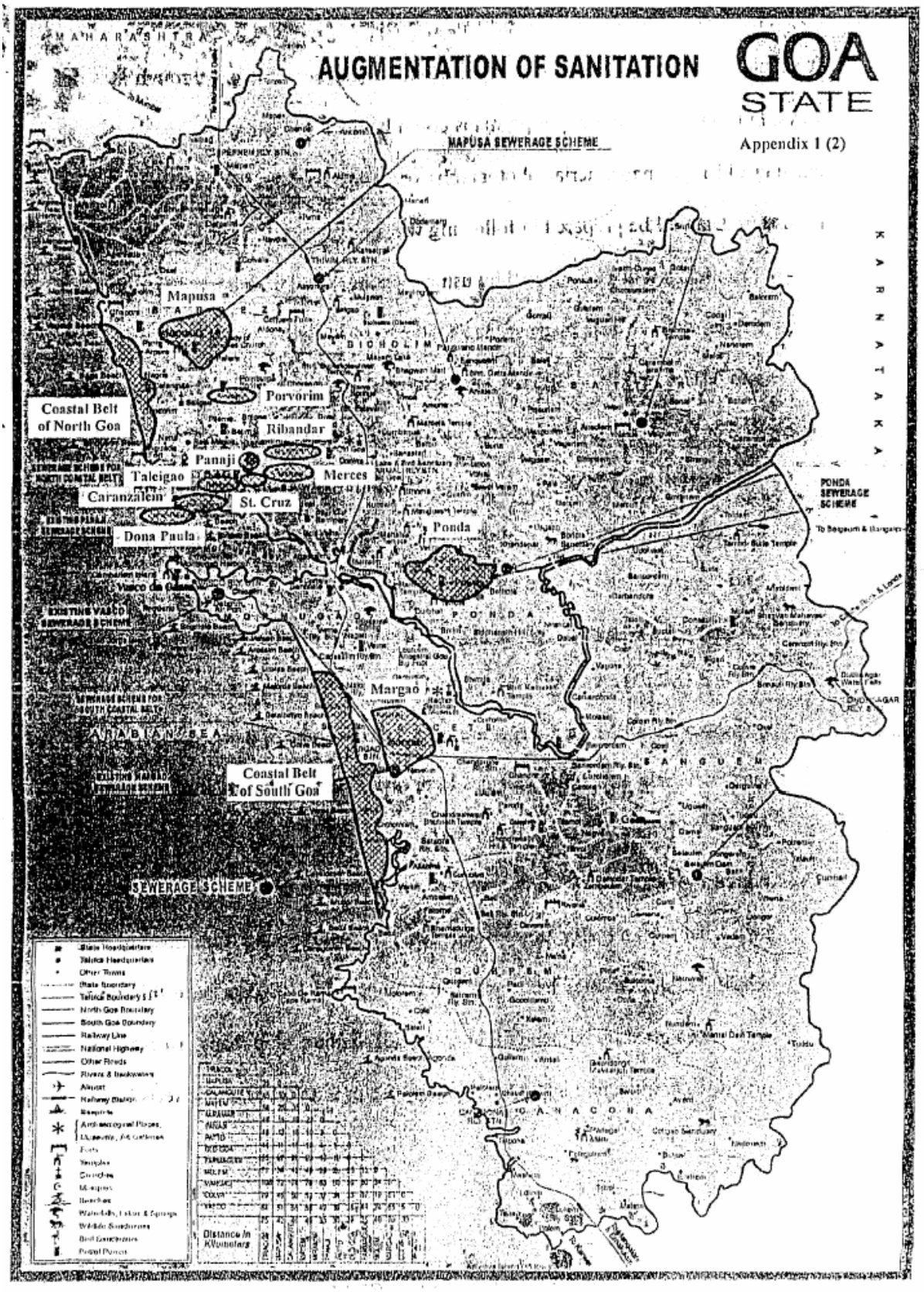
(1) security-related information on as well as measures to ensure the safety of the Japanese study team
(2) information on as well as support in obtaining medical services
(3) available data and information related to the Study
(4) counterpart personnel
(5) suitable office space with necessary equipment in the Goa State, and
(6) credentials or identification cards

VIII CONSULTATION

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

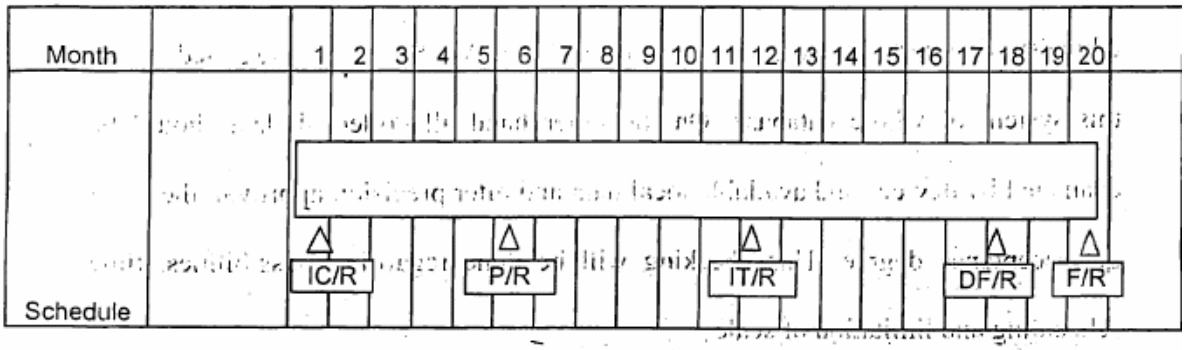



MAHARASHTRA
AUGMENTATION OF WATER SUPPLY
GOA STATE
Appendix I(1)
PROJECT AREA
CHANDEL WSS (15 MLD)
ASSONORA WSS (40 MLD)
DABOSE WSS (5 MLD)
SANQUELIM WSS (12 MLD)
OPA WSS (75 MLD)
SELAULIM WSS (160 MLD)
CANACONA WSS (5 MLD)
Study Area
220 MLD SALAULIM WATER SUPPLY SCHEME (TO BE POSED)
A : SALAULIM IRRIGATION CANAL
B : JACK WELL & PUMP HOUSE
B-C : RAW WATER MS PUMPING MAIN 2x1100mm
C : WATER TREATMENT PLANT
C-D : CLEAR WATER MS PUMPING MAIN 2 X 1100mm
D : 40 ML STORAGE RESERVOIR AT SIRVOI
D-E : 1600mm MS GRAVITY MAIN
E : 3 ML SUMP AT MARGAO(EXISTING)
E-G : INTERCONNECTION TO EXISTING PSC MAIN
E-H : 900mm DI GRAVITY MAIN
H : 5 ML SUMP AT BORIM
H-I : 750mm MS PUMPING MAIN
I : STORAGE RESERVOIR AT BORIM
I-J : GRAVITY MAIN
J : EXISTING RESERVOIR
160 MLD SALAULIM WATER SUPPY SCHEME (EXISTING)
A : JACK WELL & PUMP HOUSE
A-B : PUMPING MAIN 2x1000mm
B : WATER TREATEMENT PLANT
B-C : 1400mm PSC/MS GRAVITY MAIN
C-D : 1200mm PSC GRAVITY MAIN
D : SUMP & PUMP HOUSE
D-E : PUMPING MAIN
Distance in Kilometers


AUGMENTATION OF SANITATION
GOA
STATE
Appendix 1 (2)
MAPUSA SEWERAGE SCHEME
MAHARASHTRA
Mapusa
Coastal Belt of North Goa
Porvorim
Ribandar
Panaji
Taleigao
Merces
Caranzalem
St. Cruz
Dona Paula
Vasco da Gama
Margao
Ponda
PONDA SEWERAGE SCHEME
To Belgaum & Bangalore
Coastal Belt of South Goa
SEWERAGE SCHEME
KARNATAKA
BICHOLIM
PONDA
SANGUEM
QUEPEM
SALCETE
MORMUGAO
ARABIAN SEA
Distance in Kilometers

Appendix 2

TENTATIVE SCHEDULE



Remarks: IC/R :Inception Report
P/R :Progress Report
IT/R :Interim Report
DF/R :Draft Final Report
F/R :Final Report

MINUTES OF MEETING
ON
PREPARATION OF SCOPE OF WORK
FOR
STUDY
ON
AUGMENTATION
OF
WATER SUPPLY AND SANITATION
FOR THE GOA STATE
IN THE REPUBLIC OF INDIA

AGREED UPON BETWEEN
PUBLIC WORKS DEPARTMENT,
THE GOVERNMENT OF GOA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

New Delhi, September 22, 2004

Mr. M Rajamani
Joint Secretary
Ministry of Urban Development,
The Government of India

Mr. Omura Yoshiki
Leader
Preparatory Study Team
Japan International Cooperation Agency
(JICA)

Ms. Debashree Mukherejee
Secretary
Public Works Department,
The Government of Goa

In response to the official request of the Government of the Republic of India, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Study Team (hereinafter referred to as "the Team") headed by Mr. Omura Yoshiki, to India from September 12 to September 28, 2004 to discuss and agree on the Scope of Work (hereinafter referred to as "S/W") for "Study on Augmentation of Water Supply and Sanitation for the Goa State in the Republic of India.

During its stay in India, the Team carried out field surveys in the study area, and held a series of discussions with Public Works Department, the Government of Goa (hereinafter referred to as "PWD"), and other authorities concerned.

The Minutes of Meeting have been prepared for the better understanding of the S/W agreed upon between Indian side and the Team on September 22, 2004.

The main items that were discussed and agreed by both sides are summarized as follows. The list of participants is attached in the Appendix1.

1 The title of the study

Both sides agreed that the title of the study would be "Study on Augmentation of Water Supply and Sanitation for the Goa State in the Republic of India" (hereinafter referred to as "the Study").

2 Target year

Both sides agreed that the target year of the Master Plan should be 2020.

3 Study areas

The Study shall cover the areas shown in Scope of Work. Regarding the master plan for sanitation, the following areas will be covered.

- Margao municipality
- Ponda municipality
- Mapusa municipality
- Coastal belt of south Goa
- Coastal belt of north Goa
- Panaji municipality and its surrounding area (Provorim, Taleigao, Dona Paula, Caranzalem, St. Cruz, Merces, Ribandar)

4 Water supply system

PWD explained that the current water supply system consisted of 7 centralized piped subsystems and future plan should be of the same nature.

5 Counterpart personnel

The Team requested PWD to assign counterpart personnel in the each expertise corresponding to the Study Team members. PWD agreed to select counterpart personnel before the commencement of the Study and assign them in timely manner.

1

6 Steering Committee

Both sides agreed that PWD would set up a steering committee for the smooth implementation of the Study. It will consist of the representatives of relevant organizations under the chairmanship of PWD. Organizations as follows are assumed to join the committee at the present moment. The Japanese Study Team and JICA resident representative will also attend the committee.

(The Government of India)

- Ministry of Urban Development

(The Government of Goa)

- Department of Environment
- Department of Water Resources
- Department of Financial and Planning
- Department of Municipal Administration
- Municipalities and Panchayats relevant to the Study

7 Environmental and social considerations

The Team explained JICA's environmental and social consideration guidelines, and that it will be applied to the Study.

PWD understood the policy of JICA's guidelines, and agreed in principle to the following responsibilities and requirements.

- Based on the guidelines, PWD shall be responsible for conducting Initial Environmental Examination (IEE) in collaboration with the Study Team.
- The Study Team shall provide PWD with technical support in order to conduct IEE.
- In the course of conducting IEE, public consultation with communities and stakeholders shall be included if necessary.
- The disclosure of information such as study reports is necessary to ensure the participation and dialogues with various stakeholders, in order to achieve appropriate environmental and social considerations.
- The above-mentioned responsibilities and requirements will also be applied when EIA is judged to be necessary.

8 Training of Counterpart personnel

PWD requested that counterpart personnel take advantage of training in Japan related to the Study to promote effective technology transfer.

The Team agreed to convey this request to JICA headquarters.

9 Workshop

Workshops will be jointly held by PWD and the Study Team to provide opportunities of dialogue with stakeholders.

Both sides agreed that the subjects of workshops would be discussed and settled during the Study period.

10 Reports

Both sides agreed that the results of the Study would be open to the public, in principle, in

order to achieve maximum use of the study results.

11 Undertaking of the Government of Goa

1) The Government of Goa agreed to provide the Study Team all available data (including geographical maps and photographs) and information related to the Study.
2) The Government of Goa agreed that 2 vehicles with drivers and office space with office furniture, air-conditioning, telephone lines and electricity would be provided in the Goa State for the use by the Study Team.
3) The Government of Goa agreed to allocate enough number of secretaries for the Study Team if needed.

12 Work Schedule

The Team explained PWD that the Study was scheduled for approximately 20 months as shown in Scope of Work, Appendix 2.

13 Others

Upon PWD's enquiry on duration needed up to implementation, the Team suggested as general information, the following example:

- Process in an external financing agency
  (fact finding, project appraisal and loan agreement): 12 months
- Consultant selection, Detailed design, Prequalification of contractors, Tendering, and Contract signing : 25 months
- Construction works : 36 months- 48 months

APPENDIX 1

List of Participants

<Indian side>

Government of India

Mr. Prashant I.A.S	Director, Ministry of Finance (Japan)
Mr. M Rajamani I.A.S	Joint Secretary, Ministry of Urban Development
Mr. Savitur Prasad I.D.A.S	Director, Ministry of Urban Development

Government of Goa

Mr. Monohar Parrikar	Chief Minister (Home, Finance, General Administration, Education)
Mr. Shri Digambar Kamat	Minister for Power, Urban Development & Mines
Mr. Ramakrishna Dhavlikar	Minister for PWD, Archives, Archaeology, Museum, & Fisheries
Mr. Dev Singh Negi I.A.S	Chief Secretary
Mr. Alban Couto	Advisor
Mr. N.P.S. Varde I.A.S	Director & Joint Secretary, Department of Environment
Mr. Dharmendra Sharma	Secretary (Finance) and Planning

Public Works Department, Government of Goa

Ms. Debashree Mukherjee I.A.S	Secretary
Mr. Prakash P. Borkar	Principal Chief Engineer
Mr. V. L. Kamat	Chief Engineer
Mr. Arvind A. Patil	Executive Engineer

<Japanese side>

Preparatory Study Team

Mr. Yoshiki Omura	Leader / Water Supply Planning
Mr. Haruo Iwahori	Sanitation Planning
Ms. Akiko Bushimata	Study planning / Preliminary Evaluation
Mr. Itsuo Nozawa	Water Supply System
Mr. Taketoshi Fujiyama	Sanitation management / Environmental Consideration
Mr. Kenichiro Sugiya	Organization and Management / Social Consideration

JBIC

Mr. Fusato Tanaka	JBIC Indian Office
Ms. Kumiko Uchida	JBIC H.D.Q.

JICA India Office

Mr. Toshifumi Sakai	Resident Representative
Mr. Daisuke Iijima	Assistant Resident Representative

THE STUDY
ON
AUGMENTATION OF WATER SUPPLY AND SANITATION FOR THE GOA STATE
IN
THE REPUBLIC OF INDIA

MINUTES OF MEETING
ON THE

INCEPTION REPORT

Agreed upon in Delhi on March 11th 2005
between

Mr. M. Rajamani
Joint Secretary
Ministry of Urban Development
The Government of India

Mr. Mamiya Takemasa
Team Leader
JICA Study Team

Witnessed by

Ms. Debashree Mukherjee
Secretary
Public Works Department,
The Government of Goa

Mr. Omura Yoshiki
Chairman of JICA Advisory Committee
Senior Advisor
Institute for International Cooperation
Japan International Cooperation Agency

MINUTES OF MEETING

The Ministry of Urban Development, the Government of India (hereinafter referred to as "MOUD") and Public Works Department, the Government of Goa (hereinafter referred to as "PWD"), as the Counterpart Agencies for the Study on Augmentation of Water Supply and Sanitation for the Goa State in the Republic of India (hereinafter referred to as "the Study"), held the Inception Meeting with the Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA Advisory Committee and the JICA Study Team (hereinafter referred to as "the Japanese side"), chaired by Mr. M. Rajamani, Joint Secretary of the MOUD, on March 11th 2005. The participants of the meeting are listed in the Attachment.

JICA fielded a JICA Study Team headed by Mr. Mamiya Takemasa and comprising members from Nihon Suido Consultants Co., Ltd. and NJS Consultants Co., Ltd. to implement the Study, and a JICA Advisory Committee chaired by Mr. Omura Yoshiki, Senior Advisor, Institute for International Cooperation, JICA, to oversee the Study implementation. The Study Team has been dispatched to Goa to commence the Study in cooperation with the PWD.

JICA Study Team presented twenty (20) copies of the Inception Report in English. During the meeting the JICA Study Team explained the main contents of the report, work plan/schedule and expected study outputs. Indian side agreed on the contents of the Inception Report with some comments. The main comments and agreements reached during the meeting were as follows:

1. Target Year of a Master Plan

The MOUD and the PWD requested a extension of the target year of the Master Plan to year 2025 from 2020, which was previously agreed among the MOUD, the PWD and the JICA on September 22, 2004. The JICA agreed the extension to 2025 subject to provision of Goa development plans and other estimates being given to the JICA Study Team for its reference by the PWD.

2. Forecast of Future Population and Water Demand/Sewage Flow

The MOUD and the PWD requested and the Japanese side agreed that future population and water demand/sewage flow should be carefully forecast considering "floating population" and migration such as tourists and seasonal workers to Goa. For the prediction, PWD agreed to provide information/data required concerning number of such populations.

3. Questionnaire Survey Area

The PWD informed that it would conduct house-to-house baseline survey from April 2005 in rural area (covering whole State of Goa excluding cities of Mapusa, Panaji, Ponda, and Margao) concerning water supply and sanitation. Both sides agreed that the JICA questionnaire survey

would be reviewed and conducted in only urban areas. The JICA Study Team requested, and PWD agreed to provide its survey results to the JICA Study Team in around May 2005.

4. MOUD/PWD Assistances Requested

Both parties confirmed contents of "Chapter 7 Responsibilities of the Government of India" and "Annex 3 List of Data/Information Required" of the Inception Report. The JICA Study Team specially requested and the MOUD/PWD agreed to provide assistance among others:.

- Provision of complete set of topographical map of Goa state in middle of April 2005
- Customs clearance when the JICA Study Team brings study equipment such as ultra-sonic flow meters, pressure recorders and etc. into India
- Excavation and backfilling of meter pits for installation of ultra-sonic flow meters during leakage survey
- Replacement of malfunctioning meters/stop cocks in pilot areas for leakage survey

Attachment

List of Participants

【Indian side】

Government of India

Mr. M Rajamani I. A. S.	Joint Secretary, Ministry of Urban Development (MOUD)
Mr. Savitur Prasad I. D. A. S.	Director, MOUD
Mr. Sumit Chatterjee	Under Secretary (PHE II), MOUD
Mr. R. Sethuraman	Joint Advisor (PHEE), CPHEEO, MOUD
Mr. N. N. Hotchandani	Assistant Advisor (PHE), CPHEEO, MOUD

Government of Goa

Ms. Debashree Mukherjee I. A. S.	Secretary

【Japanese side】

JICA Advisory Committee

Mr. Omura Yoshiki	Chairman of the Advisory Committee Senior Advisor (Water Supply Development) Institute for International Cooperation JICA
Ms. Kamata Hiroko	Member of the Advisory Committee Senior Advisor (Environmental Management, Water Supply and Sanitation) Institute for International Cooperation JICA

JICA Tokyo Headquarters

Ms. Sawada Hiromi	Water Resources and Disaster Management Team I, Group III (Water Resources and Disaster Management), Global Environmental Department, JICA

JICA India Office

Mr. Iijima Daisuke	Assistant Resident Representative

JICA Study Team

Mr. Mamiya Takemasa	Team Leader/Water Supply Planning Nihon Suido Consultants Co., Ltd.
Mr. Sano Hirofumi	Co-Team Leader/Sewerage Planning NJS Consultants Co. Ltd.

Attachment - 1

THE STUDY
ON
AUGMENTATION OF WATER SUPPLY AND SANITATION FOR THE GOA STATE
IN
THE REPUBLIC OF INDIA

MINUTES OF MEETING ON THE

PROGRESS REPORT

Agreed upon in Goa on December 1st 2005
between

Mr. Wachasundar Anand Madhav,
Chief Engineer I,
Public Works Department,
The Government of Goa

Mr. Mamiya Takemasa
Team Leader
JICA Study Team

Approved by

Ms. Debashree Mukherjee
Secretary
Public Works Department,
The Government of Goa

MINUTES OF MEETING

The Public Works Department, the Government of Goa (hereinafter referred to as "PWD"), as the Counterpart Agency for the Study on Augmentation of Water Supply and Sanitation for the Goa State in the Republic of India (hereinafter referred to as "the Study"), held the meeting with the JICA Study Team (hereinafter referred to as "the Study Team"), chaired by Mr. Wachasundar Anand Madhav, Chief Engineer I, Public Works Department, the Government of Goa, on November 9th 2005. The participants of the meeting are listed in the Attachment.

The Study Team had already presented twenty (20) copies of the Progress Report. During the meeting the Study Team explained the main contents and the Indian side agreed on the contents of the Progress Report with some comments. The main comments and agreements reached during the meeting were as follows:

1. Future Water Source

The JICA Study Team requested and the Indian side agreed to evaluate availability of future water source for each water supply scheme based on future water requirement presented in the Progress Report. The results of the evaluation will be informed by the Department of Water Resources by the end of November 2005.

2. Water Recycle

The Indian side asked whether water recycle (water reuse) for large housing complex will be taken into account in the course of the preparation of Master Plan. The JICA Study Team replied that water recycle should be considered depending on the water resource availability. Since the water recycle system is usually costly because it requires dual pipe system and advanced wastewater treatment. Application of the recycle system seems not feasible for domestic use.

3. Water Conservation

The Indian side stated that continuous water supply (24 hours for 7 days a week) should be carefully planned since large quantity of water will be wasted upon achievement of the continuous supply. The Study Team replied that public relation activities concerning water conservation will be indispensable together with system improvements.

4. Industrial Water Demand

The Indian side requested and the JICA Study Team agreed that the future industrial water demand should be cross checked with the demand projection by the Goa Industrial Development Corporation.

5. Area-wise Water Demand

The Indian side requested and the JICA Study Team agreed that more detailed area-wise water demand allocation should be presented although Taluka-wise demand is presented in the Progress Report.

6. Evaluation of Water Quality

Both sides agreed that safety of water for water supply should be evaluated based on "Recommended Guidelines for Physical and Chemical Parameters" which is included in the "Manual on Water Supply and Treatment Third Edition, Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, the Government of India, 1999 May".

7. Consultation/Discussion with Other Departments Concerned of the Government of Goa

The Indian side recommended and the JICA Study Team agreed that consultation/discussion with other departments concerned of the Government of Goa is indispensable for preparation of the Master Plan. The JICA Study Team requested and the Indian side agreed to assist the JICA Study Team for holding such meetings with these departments concerned.

Attachment

List of Participants

【Indian side】

PWD Goa

Mr. Wachasundar Anand Madhav	Chief Engineer I
Mr. T.K.Nambiar	Superintendent Engineer
Mr. Arvind A. Patil	Executive Engineer
Mr. Dilip Khaunte	Technical Assistant

Department of Water Resources

Mr.S.D.Sayanak	Chief Engineer

Department of Health Services

Mr. A.V.Salelkar	Director

Department of Municipal Administration

Mr. Vyankatesh. N.Sawant	Engineering Assistant

Department of Industries, Trade and Commerce

Mr. Prasad Lolayekar	General Manager

Department of Country Planning

Mr. Subhash Nilekarni	Landscape Architect

【Japanese side】

JICA Study Team

Mr. Mamiya Takemasa	Team Leader/Water Supply Planning
Mr. Sano Hirofumi	Co-Team Leader/Sewerage Planning
Mr. Takehiko Oga	Water Supply Facility Planning
Mr. Eiichi Ishii	Water Supply Pipeline Planning
Mr. Shusaku Ueno	Sewerage Facility Planning
Mr. Tony De Seta	Operation and Maintenance / NRW Reduction Planning
Mr. Tetsuo Wada	Water Supply Facility Planning - II

Attachment - 1

THE STUDY
ON
AUGMENTATION OF WATER SUPPLY AND SANITATION FOR THE GOA STATE
IN
THE REPUBLIC OF INDIA

MINUTES OF MEETING ON THE INTERIM REPORT

Agreed upon in Goa on June 29 2006
between

Mr. Wachasundar Anand Madhav,
Chief Engineer I,
Public Works Department,
Government of Goa

Mr. Mamiya Takemasa
Team Leader
JICA Study Team

Approved by

Mr. Santosh Dattatraya Vaidya, I.A.S,
Secretary PWD,
Government of Goa

MINUTES OF MEETING

The Public Works Department, the Government of Goa (hereinafter referred to as "PWD"), as the Counterpart Agency for the Study on Augmentation of Water Supply and Sanitation for the Goa State in the Republic of India (hereinafter referred to as "the Study"), held the meeting with the JICA Study Team (hereinafter referred to as "the Study Team"), on April 27th 2006. The participants of the meeting are listed in the Attachment.

The Study Team had already presented twenty (20) copies of the Interim Report to Indian side beforehand with the meeting. During the meeting the Study Team explained the main contents of the Interim Report, which describes Master plan, and the Indian side accepted the Interim Report in principle. The main comments and agreements reached during the meeting were as follows:

1. Additional information to the Master Plan

The Indian side requested the Study Team to include description on additional water sources of Ganjem and Moisal and emergency measures into the Report. According to verbal explanation by the Indian side, these sources are recently made available to water supply. The Indian side also explained that the state government was planning to construct small scale water treatment plants with self-finance utilizing these water sources to mitigate urgent water need until completion of Stage 1 projects in 2012. The Study Team requested, and the Indian side agreed to urgently provide the Study Team with detailed information concerning the water sources for inclusion into the Master Plan.

2. Higher unit consumption

The Indian side requested presentation of a case with higher unit consumptions. The Study Team replied that such a case with demand forecast based on higher unit consumptions will be made, and sketches of facility plan will be drawn. The case study will be annexed into the Master Plan.

3. Selection of Priority Projects

The Study Team explained about selected priority projects for the Feasibility Study as follows :

- Expansion (100 MLD) and rehabilitation of Salaulim Water Treatment Plant including transmission mains and reservoirs required for the system expansion,
- Establishment of new sewerage system in Mapusa,
- Establishment of new sewerage system in North Coastal Belt area, and
- Expansion of existing Margao sewerage system.

The Indian side agreed on the selected priority projects, and agreed to proceed to the Feasibility Study. The Indian side also requested that the Draft Final Report refer to the proposed emergency mitigation measures to be implemented with self-finance.

4. Treatment Method of Sewage Treatment Plant (STP)

The Study Team explained to the Indian side several alternative methods of sewage treatment with their advantages and disadvantages from aspects of qualitative and quantitative. For the expansion of the existing STP, the same method as the existing system would be adopted, namely Sequencing Batch Reactor (SBR) method for Panaji STP and conventional activated sludge method for Margao STP. For the new STPs, although both Oxidation Ditch (OD) method and Aerated Lagoon (AL) method showed advantages comparing with other methods, the Study Team recommended, and the Indian side agreed to employ the OD method for the Study. Because the AL method requires huge land space comparing with the OD, it must be difficult to procure such huge land space around the areas in which sewage treatment plants are required, and the OD method has advantages in odor problem comparing to the AL method especially for tourism area in North and South Coastal Belts.

While, the Feasibility Study shall be conducted by adopting OD method, the Indian side requested and the JICA Study Team agreed to include technical information concerning the SBR method such as dimensions of facilities, drawings of plant layout and major structures including rough cost estimate in the Draft Final Report.

Attachment

List of Participants

【Indian side】

Government of Goa

Mr. J.P.Singh	Chief Secretary
Mr. S.D.Vaidya	Secretary
Mr. Alban Couto	Advisor

Department of Water Resources

Mr. S.T.Nadkarni	Chief Engineer

Department of Finances

Mr. Anupani Kishore	Jr Secretary

GSPCB

Mr. A.K.Vaziranı	M.Secretary

PWD Goa

Mr. Wachasundar Anand Madhav	Chief Engineer
Mr. Arvind A. Patil	Executive Engineer
Mr. K.R.Shrikant	Executive Engineer
Mr. Karunakaran.P	Jr Engineer

【Japanese side】

Japan International Cooperation Agency

Ms. Kamata Hiroko	Advisory Comittee
Mr. Ito Kozo	Deputy Resident Representative

JICA Study Team

Mr. Mamiya Takemasa	Team Leader/Water Supply Planning
Mr. Sano Hirofumi	Co-Team Leader/Sewerage Planning
Mr. Oga Takehiko	Water Supply Facility Planning
Mr. Fukushima Daisuke	Study Coordinator

Attachment - 1

THE STUDY
ON
AUGMENTATION OF WATER SUPPLY AND SANITATION FOR THE GOA STATE
IN
THE REPUBLIC OF INDIA

MINUTES OF MEETING ON THE DRAFT FINAL REPORT

Agreed upon in New Delhi on October 4, 2006
between

Mr. M. Rajamani, I.A.S,
Joint Secretary
Ministry of Urban Development
The Government of India

Mr. Mamiya Takemasa
Team Leader
JICA Study Team

Witnessed by

Por

Mr. Santosh Dattatraya Vaidya,
I.A.S, Secretary PWD,
Government of Goa

Mr. Omura Yoshiki
Chairman of JICA Advisory Committee
Senior Advisor
Institute for International Cooperation
Japan International Cooperation Agency

MINUTES OF MEETING

The Public Works Department, the Government of Goa (hereinafter referred to as "PWD"), as the Counterpart Agency for "the Study on Augmentation of Water Supply and Sanitation for the Goa State in the Republic of India" (hereinafter referred to as "the Study"), held the meeting with the JICA Study Team (hereinafter referred to as "the Study Team"), on September 28th 2006. The participants of the meeting are listed in the Attachment.

The Study Team had already presented twenty (20) copies of the Draft Final Report to Indian side. During the meeting the Study Team explained the main contents of the Draft Final Report, which describes the Master Plan and the Feasibility Study, and the Indian side agreed on the contents of the Draft Final Report with some comments. The main comments and agreements reached during the meeting were as follows:

1. Land Acquisition Costs for Sewage Treatment Plants (STPs)

The Indian side requested to consider the appropriate estimation of the land acquisition costs in the Final Report. According to the Indian side, the proposed STP sites of Mapusa and Baga have selected at the community land and there will be no problems of land acquisition, however, certain amount of costs should be compensated to the community. The Study Team agreed that the request would be considered and additional costs be reflected in the Final Report.

2. Calculation of Unit Cost of Supply Service

The Indian side requested and the Study Team agreed to calculate the unit cost of supply service (Rs./m^3) of water supply under condition that all projects proposed in the Master Plan were implemented.

3. Cost of Distribution System

The Indian side pointed out that the costs for distribution system improvement were not included in the cost estimate of the priority project. The Study Team explained that the costs for distribution system were included in cost estimates in the Master Plan (Table 92.1, Volume II), but not part of the priority projects since this would be developed gradually as the demand increases and the system expands. The Indian side requested and the Study Team agreed to present the costs required for distribution system for the Stage I project in the Final Report. The Indian side stated that they will explore appropriate sources of financing for this component.

4. Water and Sewerage Combined Tariff Schedule

The Indian side requested to consider the possibility of cross-subsidy from water supply revenue to

sewerage expenses. The Indian side pointed out that the sewerage charge was billed at certain percentages of water charge in the present tariff system, therefore, the Indian side requested to consider the water/sewerage combined tariff schedule which is applied same tariff increase rate. The Study Team stated that such combined case could be shown in the Final Report for reference. However, the study team emphasized a principle that operation and maintenance costs for sewerage should be recovered by sewerage tariff revenue without cross-subsidy and in case of water supply, the capital costs should also be recovered.

5. Finalization of the Draft Final Report

The JICA Study Team explained and the Indian side agreed that should there be any further comments from the Indian side, these comments should be congregated by the Indian side and submitted to the JICA India Office by 3rd of November 2006. Upon receipt of the comments from the Indian side, the Draft Final Report will be finalized as the Final Report taking account of those comments from the Indian side. The Final Report will be submitted to the Indian side in December 2006 through the JICA India Office.

Attachment

List of Participants

【Indian side】

Ministry of Urban Development, the Government of India

Mr. M Rajamani, I. A. S.	Joint Secretary, Ministry of Urban Development (MOUD)
Mr. Savitur Prasad, I. D. A. S.	Director, MOUD
Mr. B.B. Uppal	Deputy Advisor, MOUD
Mr. M. Deendayalan	Assistant Advisor, MOUD
Mr. M. Shankar Narayanan	Assistant Advisor, MOUD

Government of Goa

Mr. S.D.Vaidya, I.A.S.	Secretary PWD
Mr. Alban Couto	Advisor
Mr.Dattaram Sardessai	Joint Secretary (Finance)

Directorate of Planning, Statistics & Evaluation

Mr. H.G.P. Chimulkar	Research Assistant

Directorate of Panchayat

Mr. Shri.P.T.Nipanikar	Block Development Officer (H.Q.)

Goa State Pollution Control Board

Mr. S.Joglekar	Assistant Executive Engineer

PWD Goa

Mr. Wachasundar Anand Madhav	Chief Engineer
Mr. Arvind A. Patil	Executive Engineer
Mr. K.R.Shrikant	Executive Engineer
Mr. G.M.N. Parrikar	Executive Engineer
Mr. K.H. Kamaladinni	Executive Engineer
Mr. Karunakaran.P	Junior Engineer

【Japanese side】

Japan International Cooperation Agency

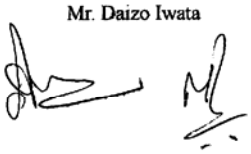
Mr. Omura Yoshiki	Chairman of JICA Advisory Committee
Ms. Sawada Hiromi	Water Resources and Disaster Management Team I, Group III (Water Resources and Disaster Management), Global Environmental Department, JICA

JICA India Office

Mr. Subroto Talukdar	Senior Programme Officer

JICA Study Team

Mr. Mamiya Takemasa	Team Leader/Water Supply Planning
Mr. Sano Hirofumi	Co-Team Leader/Sewerage Planning
Mr. Wilfrido C. Barreiro	Organization and Legislation
Mr. Daizo Iwata	Economic and Financial Analysis



Attachment - 2

APPENDIX M2

This appendix is reference to and supporting data of

Volume 2 Main Report – Master Plan
Chapter 2 Objectives of the Study and Study Area

M21 Soil Corrosiveness Survey

Appendix M21:

Soil Corrosiveness Survey

Contents for Appendix M21

M21 Soil Corrosiveness Survey

M21.1 Methodology

Soil samples, one sample at Salaulim and the other sample from Opa were taken to examine soil corrosiveness. Corrosiveness analysis were conducted conforming to method defined by ANSI (American National Standard Institute, A 21.5) and by German Standard for water and gas, DVGW (Duetshen Verein des Gas und Wasserfaches,GW 9) .

According to the ANSI, in case that the total score becomes more than 10, the soil has corrosiveness and appropriate corrosion protection for underground pipeline is recommended. As of DVGW standard, soil corrosiveness is categorized as follows

Total Score	Soil Corrosiveness
0 or more	Not corrosive
0 to -4	Scant corrosive
-5 to -10	Corrosive
Less than -10	Highly Corrosive

M21.2 Results of Analysis

Results of analysis are as shown on Table M21.2.1.

Table M21.2.1 Results of Soil Corrosiveness Analysis

Soil Analysis

	Sample No. 1: Salaulim			Sample No. 2: Opa		
	Analysis Results	Score		Analysis Results	Score	
		ANSI	DVGW		ANSI	DVGW
Kind of Soil	Clay	-	-2	Sand	-	+2
Groundwater	-	-	-	-	-	-
Soil Condition	Original	-	0	Original	-	0
Specific Resistance (ohm-cm) , Original	30700	-	-	91800	-	-
Specific Resistance (ohm-cm) , Saturated by water	22900	-	-	34900	0	0
Water Content (%)	31.6	2	-	22.7	2	-

Percentage of Water Content (%)	24.0	-	-1	18.5	-	0
E Redox (mV)	620	0	+2	516	0	+2
Sulfide	None	0	0	None	0	0
Sulfur Content (%)	0.009	-	-	0.006	-	-
Forced Oxidation pH by H2O2	7	-	-	6	-	-
Score (Sub-Total)	-	2	-1	-	2	+4

Analysis of Abstracted Water from Soil

	Sample No. 1: Salaulim			Sample No. 2: Opa		
	Analysis Results	Score		Analysis Results	Score	
		ANSI	DVGW		ANSI	DVGW
Specific Resistance (ohm-cm) , Original	16667	0	0	109529	-	-
pH	6.4	0	0	5.8	0	-2
SO2,4 (mg/l)	5	-	0	1	-	0
Cl- (mg/l)	Less than 1	-	0	Less than 1	-	0
Total Residue (mg/l)	43	-	-	4	-	-
Acidity (mg/l)	3	-	-	2	-	-
Alkalinity (mg/l)	2	-	-	1	-	-
Score (Sub-Total)	-	0	0	-	0	-2

Total Score

Sample	No. 1: Salaulim	No. 2: Opa
ANSI	2	2
DVGW	-1	+2

According to the ANSI standard, total scores for both sample are less than 10, therefore, these samples are judged not corrosive. As for DVGW, sample No. 1 shows scant corrosive and No. 2 is not corrosive.

APPENDIX M3

This appendix is reference to and supporting data of

Volume 2 Main Report – Master Plan

Chapter 3 Existing Condition of the Water Supply and Sanitation/ Sewerage Sustems

M31	Existing Water Supply System
M32	Data Concerning Number of Connection and Water Consumption Provided by PWD Goa
M33	Water Quality Analysis for Water Supply System
M34	Results of Leakage Survey
M35	Existing Sanitation System
M36	Water Quality Analysis for Sanitation
M37	Site Visit Reports
M38	Water Supply and Sewerage Tariff Structure
M39	Results of Public Awareness Surveys

Appendix M31

Existing Water Supply System

Contents for Appendix M31

Appendix M31.1 Salaulim Water Supply Scheme

The Salaulim facility was commissioned in 1989 and has a design capacity of 160 MLD although we are told that the plant is currently producing approximately 170 MLD. The raw water pump house supplies water to the plant via 2 No.1000mm rising mains approximately 1 km from the intake. It is expected that the plant will be augmented with a further 40 MLD some time next year (currently being tendered). Plans are also well developed for a new proposed plant of 200 MLD for which the green field site has already been secured. Water for the existing and proposed plants is via the Selaulim Dam.

Table M31.1.1 lists the summary of asset data for the WTP and Table M31.1.2 contains detailed asset data for the WTP. The plant schematic is shown on Figure M31.1.1.

Observations for Operation and Maintenance of Salaulim Water Treatment Plant are as follows.

Both the raw water pumping compound and the treatment plant compound are adequately gated, fenced and secured by 24 hour on-site security personnel. The plant is operated and maintained 24 hours a day, using a three shift system.

The existing flow measurement devices (which are electromagnetic) are out of service. Therefore, the amount of raw water that is supplied to the plant, and the amount of clean water that is fed to the transmission system via the clean water reservoir, is estimated based on the pump design capacities and the number of pumping hours.

The raw water pump house has eight pumps each with a capacity of 1,181 m^3. The maintenance standards are good, however the drive couplings/shafts are not adequately guarded. The study team understood that the 10 tonne O/H crane has not been tested since it was installed in 1989. The chains have been replaced periodically, however records of changes to chains and lifting tackle have not been maintained.

Records of hours of pumping, loads etc are logged, however maintenance records are not kept. Monthly oiling and greasing occurs routinely, however all other maintenance is carried out on a reactive basis. For example, pumps are oiled and greased and the impellers are replaced only when reduced discharge is noted. No operation and maintenance manuals are available and training for new staff is only provided on the job by existing more, experienced staff. Due regard for staff safety during maintenance activities was noted during the site visit (e.g. fuses

are removed when staff work on pumps), however there are no written or formal safety systems.

The treatment plant is manually controlled. Most of the equipment appears to be in good working order (including the alum and lime mixers), considering their age. In generally, good maintenance standards are evident, however the pump couplings/shafts are not adequately guarded.

Records of hours of pumping, loads, filter backwashing, clear water reservoir levels etc are logged. However, there are no maintenance logs for repairs or maintenance.

Laboratory staff keep record logs of chemical usage and treatment parameters.

Disinfection is achieved using gas chlorination. The gas chlorination uses one tonne cylinders. Normally there are approximately five cylinders in the chlorine house at any one time, of which four are vacuum chlorinators ("Aqua Pura Corp – Pune" provide the spares). Chlorinator maintenance is performed in-house, however chlorinators are not periodically calibrated and maintenance records are not kept. Maintenance, installation standards and operation practices for chlorination are generally poor. Ammonia solution is used to detect leakages at connection joints. An immersion tank is the only facility available on-site to detect or contain gas leaks, however it is not easily accessible in an emergency. Personal breathing apparatus is available in the laboratory but it is not used or maintained. The cylinders, chlorinators and the contact tank are connected together using a combination of small bore PVC and flexible plastic hoses. These are not safe for this purpose.

The clean water reservoir has two compartments and is cleaned annually. The reservoir is cleaned manually by approximately 120 unskilled contract labours. The labours hose down the internal surfaces and flush the system clean. The cover is removed during this process to provide natural ventilation, however no safety precautions, safety equipment or safe working systems exist.

Tables M31.1.3 to M31.1.7 and Figures M31.1.2 and M31.1.3 show the data on daily flow rate of raw water and transmitted water, water quality and chemical dosage at Salaulim Water Treatment Plant. Table M31.1.8 shows records on power outages at Salaulim Water Treatment Plant.

Table M31.1.9 shows a list of existing reservoirs for Salaulim Water Supply Scheme.

Table M31.1.1 Summary of Asset Register of Salaulim Water Treatment Plant

Name of Facility		Contents of Facility	Remarks
Raw Water Intake & Raw Water Transmission Facility	Intake Well	3-Gates at Each 3 Stages Inlet Opening	Salaulim Dam
	Pump & Motor	Vertical Turbine Self Water Lubricated Pump: ^{Q}1,181m^3/hr × ^{H}94.56m × 410kw × 4 units/system (1 – Standby) × 2 systems	Design Capability of Intake Pump = 85MLD/system
	Rising Main	D1,000mm × 450m × M.S.P. (Gunning) ×1 Line D1,000mm × 550m × M.S.P. (Gunning) ×1 Line	
	Air Chamber	Each 1 unit/system × 2 systems(Negative Pressure Measure)	Not Working
	Zero Valve	1 unit/system × 2 systems (Positive Pressure Measure)	
	Flow Meter	Electromagnetic Flow Meter: 1 unit/system × 2 systems	Not Working
Treatment Facility	Aerator	Cascade Type: Each 1 unit/system × 2 systems	
	Parshal Flume & Flash Mixer	Each 1 unit/system × 2 systems (for Chemical Dosing)	
	Clariflocculator	Circular Horizontal Flow Type with Center Feed/Peripheral Collection Flocculation & Clarifier: ^{D}40.0m (Flocc. Zone 17.6m) × ^{WD}3.35m × 2 units/system × 2 systems Detention Period: Flocculation – 29min Clarifier – 2 hrs [1)] Surface Loading for Clarifier: 40 m^3/m^2/d (28 mm/min) [2)]	1): 2～2.5 hrs 2): 30～40m^3/m^2/d
	Filter	Gravity Rapid Sand Filter Type ^{W}3.35m × ^{L}9.52m × 2cells/basin × 6 basins/system × 2 systems Effective Size of Sand:0.70mm, Depth of Sand: 0.835m Filter Area: 31.9 m^2/cell, 63.8 m^2/basin Filtration Rate: 9.1 m/hr [3)] (219 m/d) Air Scouring Rate: 51m/hr/cell [4)] (0.85m^3/min/m^2/cell) Backwash Rate: 30m/hr/cell [5)] (0.50m^3/min/m^2/cell)	Based on Specifications of Air Blower & Backwash Pump 3): Higher than Standard(4.8～6.0m/hr) 4): 36～54m/hr 5): 24～36m/hr
Clear Water Transmission Facility	Parshal Flume	1unit for Chlorination	
	Clear Water Reservoir	Total Volume=6,745 m^3/2units Retention Time: 1.0 hr	
Chemical Feeding Facility	Alum Feeding Facility	Dry Aluminum Sulfate Solution Tank: 4 units	
	Lime Feeding Facility	Powder Lime Solution Tank: 4 units	
	Disinfection Facility	Liquid Chlorine (1 tone Container – net 900kg) Chlorinator: 5 units (3 units for Pre-Cl, 2 units for Post-Cl)	
Laboratory	Frequency of Sampling & Analysis	In-Service, Jar Test: Not in Service Every Hour: pH, Turbidity, R-Cl Daily: Turbidity, pH, Alkalinity, Hardness, Chlorine, Mn, Fe, D.O.,R-Cl	
Note: 1) ～ 4) are referring to "Manual on Water Supply and Treatment, Third Edition – Revised and Updated, May 1999"			

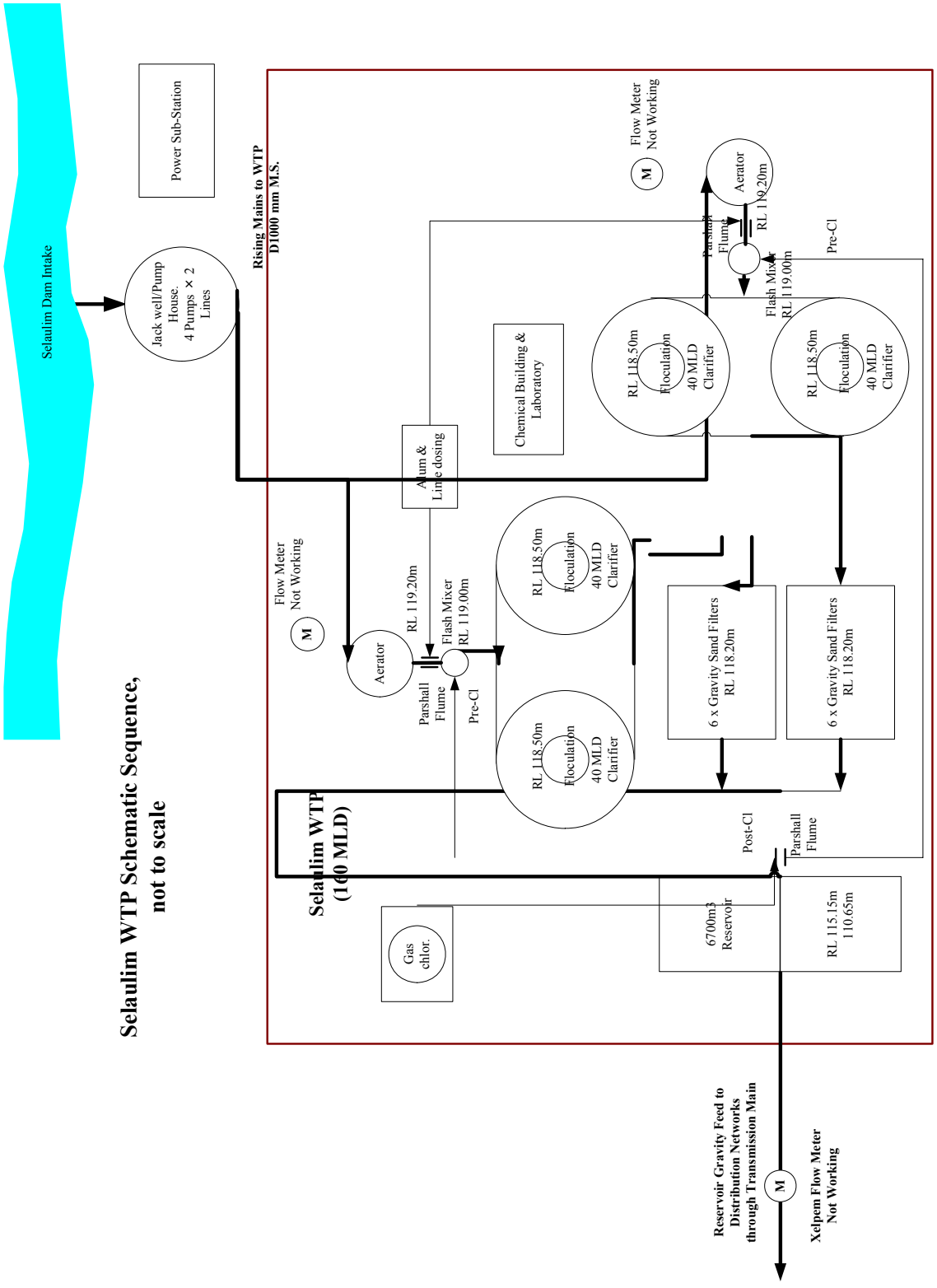
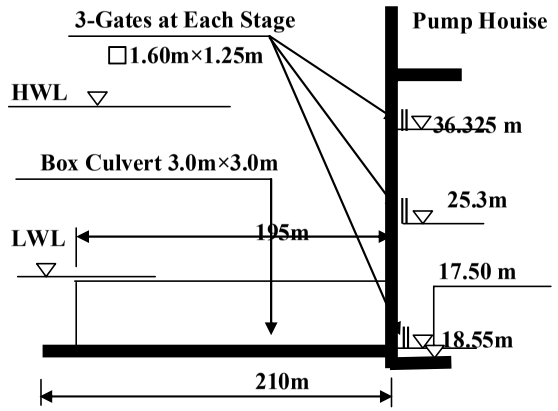


Figure M31.1.1 Schematic Sequence of SalaulimWater Treatment Plant

Table M31.1.2 Present Conditions of Salaulim Water Treatment Plant (1/11)

Item			Contents			Remarks
Background						
Covered Area for Water Supply		Taluka	Morumugao, Salcete, Sanguem, Quepem & Part of			
Name of Plant			Salaulim W.T.P.			
Number of W.T.P.		Number	(1)			
Capacity of Plant (Nominal Capacity)		MLD	160			
		m^3/d	160,000			
Raw Water Resources		River				
		Dam	Salaulim Dam Impoundage			
Year of Construction		Year	1982 work started			
Year of Commission	Intake, Treatment Plant & Transmission Main to the Sanguem (Length of 5 km)	Year	1989	Elapsed Year	16	
	Transmission Line upto Vasco including Verna P/S & M.B.R.	Year	1993	Elapsed Year	12	
	Marugao P/S & M.B.R.	Year	2002	Elapsed Year	3	
Expected Augmentation Plan	Capacity of Plan	MLD	40			
		m^3/d	40,000			
	Intake Pump	unit	2 : 2,000 m3/hr×95m×850kw×2units			☐ The left 2 pumps subustitute 2-existing pumps.
		m^3/hr	2,000			
	Pump Sepcifications		2,000 m3/hr×95m×850kw×2units			
	Ttansformer	unit	1 : 5,000 kVA			☐ The left transformer substitute 1-existing 2,000 kVA.
	Filter	unit	2 : 9.52 m × 6.70 m, Area=63.78 m^2/unit			☐ The left filter basin construct the same as existing.
	Tendering Method		2 - Envelope System (Design, Build & Transfer)			
	Date of Tender Close		Aug. or Sep. 2005			
			220 MLD			

Name of Facility			Contents of Facility		Remarks
Design Capacity of Raw Water Intake & Treated Facility		MLD	163	: 1.88% Loss	☐ Desing Capacity was estimated 5% losses (backwash drain, clarifier's sludge drain, etc.) of nominal capasity reasonable in stead of 23 hours pump running hours which was informed from WTP.
		m^3/d	163,000	:based on 23 hrs instead of 24 hrs	
Head Water Works : Raw Water Intake					
Design Capacity of Water Treatment Plant		MLD	163		
		m^3/d	163,000		: 2% Loss
Intake Channel	Width	m	3.0	: at Bottom	
	Length	m	210.0		
	Height	m	29.0	: Varying up to 25 m	
	Depth (Below LWL)	m			
	H.W.L..	m			
	L.W.L.	m			
Box Culvert	Width	m	2.0		
	Height	m	2.0	Pourpose: Protection for the landslide	
	Length	m	195.0		
	Water Depth	m	at LWL		
	Velocity (Below LWL)	m/sec			
Wet Well (Pump Well)	Width	m	9.40		
	Length	m	11.40		
	Depth	m	28.70		
	Area	m^2	200.0	: more than	
	Water Depth	m	at LWL		
	Volume (Below LWL)	m^3/unit			
	Detention Period	min			
Pump House & Control Room	Width	m			
	Length	m			
	Area of Floor	m^2			



Past Record of L.W.L.

Date	Level (m)
03.06.2000	29.90
04.06.2001	31.85
13.06.2002	31.34
16.06.2003	30.08
08.06.2004	31.40
16.06.2005	29.82

Name of Facility				Contents of Facility	Remarks
	Raw Water Pump	Capacity	ℓ/sec	328.1	☐ No. 5 Pump retrofitted with new Pump (Q=1,180 m3/hr, H=94 m, 3 stagesas) trial employment operation on 16 May 2005.
			ℓ/min	19,685	
			m^3/min	19.685	
			m^3/hr	1,181.0	☐ Pump deficiency decrease year by year.
			m^3/d	28,344	☐ Rated capacity in normally and dry season are estimated 1,100 m^3/hr and 1,020 m3/hr respectively..
		Number	unit	8 : 6-Duty 1-System 4-Pumps (1-Standby)	
		Stand-by	unit	2	☐ Total raw water capacity is estimated based on the above estimated capacity and pumping running hours.
		Total Capacity	m^3/d	163,000 : Design pump running hours : 23 hours.	
		Head	m	94.559	
		Column Pipe Length	m	25.0	☐ Capacity of intake pumps in parallel running operation are not equal to multiple capacity due to insufficient desing of manifold pipe.
		Type of Pump		Vertical Turbine Selfwater Lubricated Pump	
		Number of Stages		4.0	☐ Flow control for raw water conduct to operate by number of pumps in spate of without flow control device despite of varying water level about 25 m in yearly in impoundage.
		Maker		Jyoti Ltd.	
		Year of Manufacture		1989	
		Assessment of Condition		Working	
	Raw Water Motor	Motor Output	HP	550	☐ Spare parts of mechanical & electrical equipment will be replaced each 15,000 running hours per 2 years.
			kW	410	
		Number	Unit	10 : 8 months installed & 2 No. standby	☐ Pump performance curve and O & M manual are not in services.
		Maker		Kirlosker Electric Co.	
		Type of Motor		Induction Motor	☐ 8 pumps are operated in summer season without no standby.
		Year of Manufacture		1989	
		Assessment of Condition		Good MOCB:Bad	
	Level Meter			Not Provided	
	Crane	Capacity	ton	10	
		Type		Semi E.O.T. EOT: Electric Operated Travelling	
		Lift of Crane	m	7.5	
		Span of Crane	m	8.5	
		Long Travel	m	17.5	
		Maker		R.D.Verama & Co.	
		Assessment of Condition		Working	

Name of Facility			Contents of Facility			Remarks
Electrical Equipment	Incommers Panel					
	Number	unit	3			
	Assessment of Condition		Working			
	Motor Control Panel					
	Number	unit	8			
	Assessment of Condition		Working			
	Bus Coupler					
	Number	unit	3			
	Assessment of Condition		Working			
	L.T. Panel					
	Number	unit	1			
	Assessment of Condition		Working			
	Capacitors					
	Number	unit	8			
	Assessment of Condition		Working			
Substation (Transformers)						☐ Electrical Department has provided two 33KV feeders one from the Xeldem Substation, exclusively for Salauli watwer works. And the second feeder is from Sanvordem (Vaddem) Substation which is a standby feeder. Load is changed over to Vaddem feeder only when the Xeldem feeder is reported faulty. The above two Substation are supplied power from Ponda power substation supplied from Maharsashtra and Karthaka States., which is solely power substation with standby system in Goa State. Note 1): For supplying power to the pumps. One for standby. Note 2): For supplying power to the treatment plant, substation, wet well and pump house lighting in case the 160 kVA fails. Note 3): For supplying for substation, wet well and pump house lighting. For supplying the essential load of treatment plant in case of 250 kVA fails.
Number of Transformer			(1)	(2)	(3)	
			33kV/3.3 kV	33kV/440V	33kV/440V	
Pole Mounted / Pad Mounted			Outdoor	Outdoor	Outdoor	
Capacity		kVA	2,000	250	160	
Number		Unit	3	1	1	
			Note 1)	Note 2)	Note 3)	
Stand-by			1	-	-	
Maker			G.E.C. (General Electric Company)	I.T.L. (Indian Transformers Ltd.)	I.T.Ltd.	
Commissioned			1998	1998	1998	
Likely Design Life		Year	20	18	18	
Last Replacement			Not Replaced			
Assessment of Condition			Good, but one of (1) 2,000 kVA was broken on 28 Jun '05, and repair to finish till aroud 10 July '05.			

Table M31.1.2 Present Conditions of Salaulim Water Treatment Plant (5/11)

Name of Facility			Contents of Facility			Remarks
Other Electrical Equipment	Outdoor Vacuum Circuit Breaker					
	Number	unit	3			
	Assessment of Condition		Working			
	Current Transformer					Used for metering poupose
	Number	unit	6			
	Assessment of Condition		Working			
	Potential Transformer					Used for metering poupose
	Number	unit	6			
	Assessment of Condition		Working			
	Lighting Arrester					
	Number	unit	5			
	Assessment of Condition		Working			
	Battery with Charger					Battery supplies 110V for various controls/relays.
	Maker		Chabhi Electricals			
	Assessment of Condition		Working			
	Oil Filtration Plant					
	Number	unit	1			
	Assessment of Condition		Working			
Rising Main (Raw Water Transmission Line)						
Rising Main (Raw Water Transmission Line)			①	②		
	Diameter	mm	1,000	1,000		Protection agaist crrosion: Gunniting : Reinforced
	Length	m	450	550		Cement Mortal Coating
	Material		M.S.	M.S.		C= 110
	Velocity	m/sec	1.201	1.201		D= 1.00 200 MLD
	Head Loss	m	0.721	0.881		Q= 0.943 1.179
	Assessment of Condition	Pipe	Good			① ②
		Valve	Good			1.089 1.331
Zero Valve	Number	unit	2			: Protection agaist upsurge pressure
	Assessment of Condition		Working			
Air Chamber	Number	unit	2			
	Assessment of Condition		Not Working			
Flow Meter	Number	unit	2			☐ Intake pump manufacturer under trial employment will be planning to install and measure by portable ultrasonic flow menter.
	Type		Electromagnetic Flow Meter			
	Assessment of Condition		Not Working			

Table M31.1.2 Present Conditions of Salaulim Water Treatment Plant (6/11)

Name of Facility			Contents of Facility			Remarks
Aerator			Anser to Questionaire		Cal. on Design Cap.	
	Design Capacity	m^3/hr/unit	3,333.33		3,395.83	
		m^3/d/unit	80,000		81,500	
	Number	Unit	2			
	Construction Material		R.C.C.			
	Diameter	m	5.5			: Aeration Fountain
	El. of Top Aerat	m	120.00			
	Assessment of Condition		Working			
Parshal Flume	Number	unit	2			☐ Parshal flume can be measured raw water flow in stead of flow meter which is not working.
	Assessment of Condition		Working			
Flash Mixer	Number	unit	2			
	Assessment of Condition		Working			
Clarifiers / Settling Tank (Clarifloccul ator Basin)			Anser to Questionaire		Cal. on Design Cap.	
	Dsign Capacity	m^3/min/unit	27.78		28.30	35.37
		m^3/hr/unit	1,666.67		1,697.92	
		m^3/d/unit	40,000		40,750	
	Number	unit	4			
	Construction Material		R.C.C.			
	Overall Diameter	m	40.00			
	Flocc. Zone Dia.	m	17.60			
	Water Depth	m	3.35			
	Frequency of Desludging		Once a day			
			Twice a day at Mn high content			
	Volume					
	Overall	m^3/unit	4,209.7			
	Flocculation Zone	m^3/unit	815.0			
	Clarifying Zone	m^3/unit	3,394.7			
	Detention Period		Re-Calcu.			
	Flocculation Zone	min	30	29.3	28.8	23.0
	Clarifying Zone	min	180	122.2	120.0 OK	2 ～ 2.5 hr OK 96.0
	Surface Area	m^2/unit	1,013.35			1.6hrs
	Surface Loading	mm/min	27.4		27.9 OK	30 ～ 40 m^3/d/m^2 = 20.8 ～ 27.8 mm/min
	W.L. of Clarifier	m	118.50			
	Assessment of Condition		Working			

Table M31.1.2 Present Conditions of Salaulim Water Treatment Plant (7/11)

Name of Facility				Contents of Facility		Remarks
Flocculator	Number	unit		4		
	Consturuction Material			M.S.		
	Drive Motor	HP		2.0 750 rpm	Maker: ABB Motor	
		kW		1.5		
	Reduction Gear			50 : 1		
	Rotating Bridge			Peripheral Type		
	Assessment of Condition			Working		
Drive Arrangement of Bridge	Number	unit		4		
	Carriage	HP		2.0 1,500 rpm	Maker: ABB Motor	
		kW		1.5		
	Reduction Gear			1 : 5		
	Chain Sprocket Ratio			1 : 5		
	Chain Sprocket Ratio			1 : 5		
	Assessment of Condition			Working		
Filter				Anser to Questionaire	Cal. on Design Cap.	
	Number	Unit		12		: 1 unit divided 2 independent cells.
	Construction Material			R.C.C.		
	Type			Rapid Dand Gravity		
	Design Capacity	m^3/hr/unit		550	566.7	
		m^3/d/unit		13,200	13,600	14,553.6
	Width	m		9.52		
	Length	m		6.70		
	Filtered Area	m^2/unit		63.78		
	Velocity	$m^3/d/m^2$		206.9	213.2	: Rather high filtration rate 228.2
	Filter Media					: 4.8～6.0m/hr (115～144$m^3/d/m^2$)
	Sand			Effective Size - 0.70mm		: 0.45～0.70mm
	Depth of Sand	mm		835		: 0.60～0.75m
	Support of Underdrain			3 Layers × 350 mm Depth, 3 Layer × 175 mm Depth		
	Type of Underdrain System			CI Pipe Laterals		
	Year Replacement of Media			Replacement of top layer (20 cm) every 2 years		
	Water Level of Filter	m		118.20		
	Assessment of Condition			Working		

Table M31.1.2 Present Conditions of Salaulim Water Treatment Plant (8/11)

Name of Facility			Contents of Facility	Remarks
Filter Washing Method	Air Scouring Rate	$m^3/min/m^2$	0.85 : at per 1 cell using 2 pumps OK	: 36～54 m/hr (0.60～0.90 $m^3/min/m^2$)
		$m^3/min/m^2$	0.43 : at per 1 unit using 2 pump NO	
	Air Scouring Time	min	5	: 1 cell = 3 min, another cell = 9 min
	Backwash Rate	$m^3/min/m^2$	0.50 : at per 1 cell using 2 pumps OK	: 24～36 m/hr (0.40～0.60 m3/min/m2)
		$m^3/min/m^2$	0.37 : at per 1 unit using 3 pump NO	
	Backwashing Time	min	10	: 1 cell = 14 min, another cell = 6 min
	Frequency of Washing		Nomal : each basin - 1 time/day No. 1 - No. 4 : 06:00 am - 02:00 pm No. 5 - No. 8 : 02:00 pm - 10:00 pm No. 9 - No.12 : 10:00 pm - 06:00 am High Mn Content : each basin - 2 times/day	Back Wash 3,800 m^3/d Drain Water = Max. = 7,600 m^3/d □ Dosing rate of Pre-CL increase the rate in case of high Mn content.
Backwash Pump & Motor	Capacity	m^3/min	7.92	
		m^3/hr	475.0	
	Number	unit	4.0	
	Stand-by	unit	2.0	
	Total Capacity	m^3/min	15.83	
		m^3/d	22,800	
	Head	m	7.1	
	Type of Pump		Vertical Turbine Selfwater Lubricated Pump	
	Motor Output	HP	37.8	
		kW	28.2	
	Maker		Warthiengton Prv. Ltd.	
	Assessment of Condition		Working	
Air Blower	Capacity	m^3/min	13.6	
		m^3/hr	815.0	
	Number	unit	3	
	Stand-by	unit	1	
	Total Capacity	m^3/min	27.2	
		m^3/d	39,120	
	Head		3,500 mmWG	
	Motor Output	HP	20.1	
		kW	15.0	
	Maker		Swam Pnematics Prv. Ltd.	
	Assessment of Condition		Working	

Table M31.1.2 Present Conditions of Salaulim Water Treatment Plant (9/11)

Name of Facility				Contents of Facility		Remarks
Parshal Flume	Number		unit	2		☐ Parshal flume can be measured filtered water flow in stead of estimation of running hours
	Assessment of Condition			Working		
Clear Water Reservoir	Number of C.W.R.		Unit	(1)	(2)	
	Width		m	31.2	50.0	
	Length		m	24.0	15.0	
	Water Depth		m	4.5	4.5	
	Number		Unit	1	1	
	Volume		m^3	3,370	3,375	
	Last Date of Cleaning					
	Total		m^3	6,745		
	Detention Time		hr	1.0		
	Water Level		m	H.W.L. +117.15 m L.W.L. +110.65 m (Bottom of Clear Water Reservoir)		
	Assessment of Condition			Good		
Chemical Facility						
Alum Feeding Facility	Number		Unit	4		Production Site : Manufakture by Goa
		Stand-by				
	Alum Storage Volume			At least 1 month		
	Assessment of Condition			Working		
Lime Feeding Facility	Number		Unit	4		Production Site : Rajasthan
		Stand-by				
	Lime Storage Volume			At least 1 month		
	Assessment of Condition			Working		
Disinfection System	Chemical Used			1 ton (Net: 900 kg) Container		
	Type of Plant & Machinery			Aquapura Make Chlorinator		
	Capacity		kg/hr	7.0		
	Number		Unit	5 : 3 for Pre-Cl, 2 for Post-CL		
		Stand-by		1		
	Safty Measures Taken			Neutralization Tanks with Caustic Soda Solution		
				Solution are available : Protection Masks		
	Commissioned			1992		
	Storage Volume			At least 1 month		Production Site : Mumbai, Karwar
	Assessment of Condition			Working		

Table M31.1.2 Present Conditions of Salaulim Water Treatment Plant (10/11)

Name of Facility	Contents of Facility	Remarks
Laboratory		
Chemical Testing Laboratory	In-service Physical, Chemical & Bacteriological	☐ Sampling send to laboratoruy of Marugao and Panaji for water quality analysis ever once a month.
Jar Testing	Not in-servise	
Availability of Skilled Chemists	Four (Lab. Technician)	
Availability of Required Chemicals	Good : Min. storage for Alum, lime & Chlorine1 month is 1 month.	
Use of Test Reports	As per Format	
Frequency of Sampling & Analysis	Every Hour: pH, Turb. R. Cl, Daily : Other (Turb., pH, Alkalinity, Hardness, Chloride, Mn, Fe, D.O., Fe, R.-Cl)Test Bacteriological : Raw water 1 time/week : Clear water daily	☐ Mn : Nov.～Mar. - Very Low Content
General Quality of Water	Good	
Raw Water Quality	Turb. Mn (seasonal high), Low pH	
Clear Water Quality	Good	
Equipment Status		
Flow Meters	Not-Working	
Other Operating Valves	Working	
Other Important Assets		
Valve's Condition	Working	
Visible Leakage and Locations	Nil	
Wastewater Disposal Arrangements	Disposal through Canal to Dam Impoundage	

Table M31.1.2 Present Conditions of Salaulim Water Treatment Plant (11/11)

Organization & Staff Deployed

General Shift	Working Hour :	08:30 am → 05:30 pm			
	Staff Deployed :	Assistant Engineer	1 Person		
		Junior Engineer	2 Persons	: in charge of Intake Pumping Station & Treatment Plant	
		Chemist	2 Persons		
		Electriciann	1 Person		
		Mechanic	2 Persons		
		Helper	2 Persons		
		Labour	12 Persons		
		Total	22 Persons		
Shift in Plant Operation	3 Shifting System Covering 24 Hours				
	Working Hour :	①: 06:00 am → 02:00 pm, ②: 02:00 pm → 10:00 pm, ③: 10:00 pm → 06:00 am			
	Grouping Staff Deployed :	Junior Engineer	1 Person	: 02:00 pm → 06:00 am on alternate days	
		(1 of 2 Junior Engineers is Electrician to be promoted in shift charge)			
		Intake	3 Persons		
		Clarifier & Filter	4 Persons		
		Chemical	4 Persons	: including 1-Chemist	
		Total	12 Persons		

Staff Deployed at the Plant		Person	Qualification	Year of Service	Service at plant
Management Staff - Engineers					
	Assistant Engineer	1	B.E. (Mech)	24	2 : 11 years at Verna Pumping Station
	Junior Engineer	1	D.M.E.	23	10 : in charge of Treatment Plant
		1	D.E.E.	9	9 : in charge of Intake Pumping Station
		1	D.E.E.	4	4 : in charge of shifting
	Sub-total	4			
Skilled Staff - Operators / Quality Testing					
	Lab - Technician (Chemist)	2	BSC (Chemist)	14	14
	Chlorine Operator ?	1	S.S.C.	13	13
	Filter Operator ?	2	S.S.C.	12	12
	Other Skilled Staff ?	45			
	Sub-total	50			
Unskilled Staff		55			
Total Number		109			

Table M31.1.3 Daily Flow Rate, Water Quality and Chemical Dosage at Salaulim WTP in 2003 (1/6)

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			Alum*	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}			mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Jan-03	158,232	141,496	1,620	0.92	0.90	0.40	2,736	9.35	6.56	8.46	16.00	28.00			1.20					1.20
2-Jan-03	162,741	143,241	1,620	0.90	0.90	0.30	2,736	9.09	6.56	8.50	15.00	28.00			1.20					1.20
3-Jan-03	167,340	148,794	810	0.44	0.80	0.20	1,672	5.40	6.63	8.54	16.00	29.00	112.5	0.67	0.20					1.20
4-Jan-03	167,501	147,405	780	0.42			1,216	3.92					112.5	0.67						
5-Jan-03	167,444	154,692	720	0.39			1,162	3.75					112.5	0.67						
6-Jan-03	165,109	155,614	720	0.39			1,140	3.73					112.5	0.68						
7-Jan-03	163,596	154,698	720	0.40	0.80	0.20	988	3.26	6.98	8.00	17.00	27.00	112.5	0.69						1.20
8-Jan-03	162,878	156,143	600	0.33	0.80	0.20	836	2.77	6.70	7.98	16.00	24.00	112.5	0.69						1.20
9-Jan-03	163,231	156,838	360	0.20			684	2.27					112.5	0.69						
10-Jan-03	153,272	158,011	360	0.21	0.80	0.20	684	2.41	7.00	7.65	17.00	23.00	225.0	1.47					0.20	0.80
11-Jan-03	140,629	157,161	360	0.23			608	2.34					112.5	0.80						
12-Jan-03	165,486	157,628	360	0.20			456	1.49					112.5	0.68						
13-Jan-03	166,653	161,018	360	0.19			449	1.46					187.5	1.13						
14-Jan-03	166,930	160,410	360	0.19	1.00	0.30	510	1.65	6.97	7.37	16.00	19.00	187.5	1.12					0.30	0.70
15-Jan-03	167,711	162,756	360	0.19	0.80	0.20	510	1.64	6.98	7.39	16.00	20.00	187.5	1.12					0.30	0.80
16-Jan-03	167,558	162,613	360	0.19	0.80	0.20	510	1.65	6.95	7.34	16.00	19.00	187.5	1.12					0.30	0.80
17-Jan-03	167,471	163,068	360	0.19	1.00	0.30	510	1.65	6.90	7.38	16.00	19.00	300.0	1.79					0.20	0.80
18-Jan-03	166,952	162,458	360	0.19			510	1.65					187.5	1.12						
19-Jan-03	166,669	162,377	360	0.19			510	1.65					187.5	1.12						
20-Jan-03	163,728	161,453	360	0.20			510	1.68					187.5	1.15						
21-Jan-03	166,845	164,146	360	0.19	0.80	0.20	510	1.65	6.89	7.32	16.00	19.00	187.5	1.12					0.30	0.80
22-Jan-03	165,062	161,864	360	0.20	0.80	0.30	510	1.67	6.95	7.30	15.00	19.00	187.5	1.14					0.30	0.80
23-Jan-03	168,032	163,920	360	0.19			510	1.64					187.5	1.12						
24-Jan-03	167,241	163,190	360	0.19	0.80	0.20	510	1.65	6.80	7.20	15.00	18.00	377.5	2.26					0.10	1.00
25-Jan-03	166,950	159,389	360	0.19			510	1.65					190.0	1.14						
26-Jan-03	172,376	166,619	360	0.19			510	1.60					190.0	1.10						
27-Jan-03	171,049	163,403	360	0.19			510	1.61					190.0	1.11						
28-Jan-03	174,261	168,677	360	0.19	0.80	0.30	510	1.58	6.80	7.25	15.00	17.00	190.0	1.09					0.10	1.00
29-Jan-03	145,969	142,466	360	0.22	0.80	0.30	510	1.89	6.95	7.23	15.00	18.00	190.0	1.30					0.30	0.80
30-Jan-03	175,345	169,924	360	0.18			510	1.57					190.0	1.08						
31-Jan-03	169,483	166,466	360	0.19	1.00	0.50	510	1.63	6.90	7.25	15.00	18.00	190.0	1.12					0.30	0.70
Total	5,113,744	4,917,938	15,870				24,547						5,120.0							
Maximum	175,345	169,924	1,620	0.92	1.00	0.50	2,736	9.35	7.00	8.54	17.00	29.00	377.5	2.26	1.20	0.00	0.00	0.00	0.30	1.20
Minimum	140,629	141,496	360	0.18	0.80	0.20	449	1.46	6.56	7.20	15.00	17.00	112.5	0.67	0.20	0.00	0.00	0.00	0.10	0.70
Average	164,959	158,643	512	0.28	0.85	0.27	792	2.61	6.85	7.64	15.75	21.56	176.6	1.07	0.87	#DIV/0!	#DIV/0!	#DIV/0!	0.25	0.94

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3*14.3H_2O$.

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			Alum*	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}			mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Feb-03	168,532	165,551	360	0.19	0.80	0.30	510	1.64	6.98	7.25	15.00	18.00							0.10	0.70
2-Feb-03	169,715	167,359	360	0.19	0.80	0.30	510	1.62	6.97	7.24	15.00	18.00							0.30	1.00
3-Feb-03	170,757	167,187	360	0.19	1.00	0.30	510	1.61	6.97	7.32	15.00	19.00	90.0	0.53					0.30	0.80
4-Feb-03	167,451	164,207	360	0.19	1.50	0.60	510	1.65	6.80	7.20	17.00	20.00	202.5	1.21					0.20	0.80
5-Feb-03	147,344	146,121		0.00	1.30	0.70	510	1.87	6.80	7.20	17.00	19.00	202.5	1.37					0.20	0.70
6-Feb-03	167,629	164,063					510	1.64					202.5	1.21						
7-Feb-03	165,878	165,232					510	1.66					202.5	1.22						
8-Feb-03	166,635	166,140					510	1.65					202.5	1.22						
9-Feb-03	165,987	166,252					510	1.66					202.5	1.22						
10-Feb-03	164,665	166,303					510	1.67					277.5	1.69						
11-Feb-03	165,392	168,072					510	1.67					316.1	1.91						
12-Feb-03	164,333	168,823					510	1.68					203.6	1.24						
13-Feb-03	163,970	168,184					510	1.68					203.6	1.24						
14-Feb-03	164,343	167,851					510	1.68					203.6	1.24						
15-Feb-03	166,816	169,623					510	1.65					203.6	1.22						
16-Feb-03	167,113	168,966					510	1.65					203.6	1.22						
17-Feb-03	169,829	170,015					510	1.62					316.1	1.86						
18-Feb-03	160,198	156,408	360	0.20	1.40	0.70	510	1.72	6.88	7.20	16.00	20.00	187.5	1.17					0.20	0.70
19-Feb-03	155,795	153,270	360	0.21	1.40	0.70	510	1.77	6.87	7.05	16.00	18.00	187.5	1.20					0.20	0.70
20-Feb-03	164,109	162,045	360	0.20			510	1.68					187.5	1.14						
21-Feb-03	162,007	160,042	360	0.20			510	1.70					262.5	1.62						
22-Feb-03	168,247	168,872	360	0.19			510	1.64					187.5	1.11						
23-Feb-03	167,998	166,176	360	0.19			510	1.64					187.5	1.12						
24-Feb-03	167,708	167,595	360	0.19	1.20	0.50	510	1.64	6.70	7.12	15.00	18.00	337.5	2.01					0.30	0.70
25-Feb-03	168,944	169,939	360	0.19	1.40	0.60	510	1.63	6.75	7.05	16.00	19.00	225.0	1.33					0.20	0.70
26-Feb-03	168,116	168,881	360	0.19	1.70	0.60	1,240	3.99	6.68	7.00	15.00	17.00	225.0	1.34					0.30	0.70
27-Feb-03	172,318	171,954	360	0.19			1,458	4.57					225.0	1.31						
28-Feb-03	170,815	167,671	360	0.19	1.50	0.60	1,458	4.61	6.58	7.34	14.00	19.00	225.0	1.32					0.20	0.70
Total	4,642,644	4,632,802	5,400				16,906						5,670.0							
Maximum	172,318	171,954	360	0.21	1.70	0.70	1,458	4.61	6.98	7.34	17.00	20.00	337.5	2.01	0.00	0.00	0.00	0.00	0.30	1.00
Minimum	147,344	146,121	360	0.00	0.80	0.30	510	1.61	6.58	7.00	14.00	17.00	90.0	0.53	0.00	0.00	0.00	0.00	0.10	0.70
Average	165,809	165,457	360	0.18	1.27	0.54	604	1.96	6.82	7.18	15.55	18.64	218.1	1.32	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.23	0.75

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3*14.3H_2O$.

Table M31.1.3 Daily Flow Rate, Water Quality and Chemical Dosage at Salaulim WTP in 2003 (2/6)

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			$Alum^*$	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}	mg/l		mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Mar-03	162,514	153,041	480	0.27			1,620	5.39												
2-Mar-03	167,469	160,237	540	0.29			1,944	6.27												
3-Mar-03	161,128	152,147	540	0.30			1,944	6.52					165.0	1.02						
4-Mar-03	166,992	155,835	540	0.29			1,944	6.29					229.3	1.37						
5-Mar-03	161,514	151,494	540	0.30			1,944	6.51					154.3	0.96						
6-Mar-03	159,461	145,402	540	0.30	1.60	0.70	1,944	6.59	6.63	7.71	15.00	20.00	154.3	0.97	0.30				0.30	0.80
7-Mar-03	165,080	148,149	540	0.29	1.50	0.70	1,944	6.37	6.54	8.00	16.00	26.00	154.3	0.93	0.30				0.20	0.60
8-Mar-03	174,067	157,149	540	0.28	1.80	0.70	1,944	6.04	6.59	8.10	16.00	27.00	154.3	0.89	0.40				0.30	0.80
9-Mar-03	174,766	158,664	540	0.28	1.80	0.70	1,951	6.03	6.57	8.08	16.00	27.00	154.3	0.88	0.50					1.20
10-Mar-03	174,059	157,601	540	0.28	1.80	0.60	1,963	6.10	6.62	7.90	17.00	26.00	154.3	0.89	0.40					1.00
11-Mar-03	173,920	157,341	540	0.28			1,965	6.11					244.3	1.40						
12-Mar-03	169,592	153,675	540	0.29	1.60	0.70	1,965	6.26	6.63	7.90	17.00	25.00	154.3	0.91	0.30					1.00
13-Mar-03	173,240	154,510	540	0.28	1.40	0.40	1,968	6.14	6.76	8.24	17.00	25.00	154.3	0.89	0.40					1.20
14-Mar-03	170,241	151,062	540	0.29	1.60	0.40	1,968	6.25	6.72	8.37	16.00	26.00	154.3	0.91	0.40					1.20
15-Mar-03	167,781	150,414	540	0.29	1.50	0.50	1,968	6.34	6.65	8.18	16.00	25.00	154.3	0.92	0.30					1.20
16-Mar-03	167,289	149,821	540	0.29			1,968	6.36					154.3	0.92						
17-Mar-03	167,326	147,641	540	0.29			1,968	6.36					218.6	1.31						
18-Mar-03	168,368	149,539	540	0.29			1,968	6.32					154.3	0.92						
19-Mar-03	169,170	149,638	540	0.29			1,907	6.09					154.3	0.91						
20-Mar-03	169,738	150,933	540	0.29			1,960	6.24					214.3	1.26						
21-Mar-03	167,880	149,942	600	0.32	1.80	0.70	1,960	6.31	6.90	8.38	16.00	27.00	124.3	0.74	0.50					1.20
22-Mar-03	171,768	154,300	720	0.38			1,960	6.17					124.3	0.72						
23-Mar-03	176,199	155,541	720	0.37			1,890	5.80					124.3	0.71						
24-Mar-03	23,251	16,236	120	0.46			175	4.07					124.3	5.35						
25-Mar-03	83,328	71,839	540	0.58	1.50	0.70	1,540	9.99	6.70	8.10	16.00	25.00	124.3	1.49	0.80					1.20
26-Mar-03	160,160	137,064	720	0.40	1.50	0.70	1,924	6.49	6.70	8.05	16.00	25.00	124.3	0.78	0.40					1.00
27-Mar-03	161,732	137,251	720	0.40	1.50	0.70	1,998	6.68	6.75	8.18	16.00	27.00	124.3	0.77	0.40					1.20
28-Mar-03	162,193	139,104	720	0.40			1,850	6.17					124.3	0.77						
29-Mar-03	163,634	138,391	720	0.40			1,776	5.87					124.3	0.76						
30-Mar-03	164,346	140,861	720	0.39			1,702	5.60					224.3	1.36						
31-Mar-03	165,593	140,969	720	0.39			1,554	5.07					160.0	0.97						
Total	4,963,799	4,435,791	17,760				57,076						4,580.0							
Maximum	176,199	160,237	720	0.58	1.80	0.70	1,998	9.99	6.90	8.38	17.00	27.00	244.3	5.35	0.80	0.00	0.00	0.00	0.30	1.20
Minimum	23,251	16,236	120	0.27	1.40	0.40	175	4.07	6.54	7.71	15.00	20.00	124.3	0.71	0.30	0.00	0.00	0.00	0.20	0.60
Average	160,123	143,090	573	0.33	1.61	0.63	1,841	6.22	6.67	8.09	16.15	25.46	157.9	1.13	0.42	#DIV/0!	#DIV/0!	#DIV/0!	0.27	1.05

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3*14.3H_2O$.

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			$Alum^*$	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}	mg/l		mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Apr-03	165,488	141,994	720	0.39	1.40	0.60	1,628	5.32	6.80	7.70	15.00	24.00			0.40					1.00
2-Apr-03	163,948	141,325	720	0.40	1.20	0.60	1,896	6.25	6.85	8.40	16.00	26.00			0.30					1.00
3-Apr-03	163,864	143,420	720	0.40			1,633	5.39					210.0	1.28						
4-Apr-03	162,167	144,011	720	0.40			1,406	4.69					150.0	0.92						
5-Apr-03	163,331	147,080	720	0.40			1,332	4.41					150.0	0.92						
6-Apr-03	162,465	153,719	720	0.40			1,480	4.92					150.0	0.92						
7-Apr-03	158,768	157,806	720	0.41			1,554	5.29					225.0	1.42						
8-Apr-03	159,259	164,751	720	0.41	1.80	0.70	1,332	4.52	6.86	7.75	16.00	24.00	125.0	0.78	0.30					1.00
9-Apr-03	161,757	172,793	720	0.40	1.60	0.60	1,332	4.45	6.81	7.53	15.00	22.00	125.0	0.77	0.40					1.00
10-Apr-03	153,793	167,198	720	0.42			1,554	5.46					125.0	0.81						
11-Apr-03	139,340	151,340	720	0.47	1.80	0.70	1,406	5.45	6.80	7.70	17.00	24.00	125.0	0.90	0.40					1.00
12-Apr-03	144,939	159,628	720	0.45			1,332	4.97					125.0	0.86						
13-Apr-03	145,371	165,426	660	0.41			1,110	4.13					125.0	0.86						
14-Apr-03	142,765	166,167	360	0.23			888	3.36					125.0	0.88						
15-Apr-03	142,632	168,390	360	0.23	1.80	0.50	666	2.52	6.98	7.60	18.00	24.00	125.0	0.88					0.30	0.60
16-Apr-03	140,663	168,879	360	0.23			444	1.71					125.0	0.89						
17-Apr-03	143,504	171,545	360	0.23			444	1.67					125.0	0.87						
18-Apr-03	140,348	172,419	360	0.23			444	1.71					194.2	1.38						
19-Apr-03	143,008	174,090	360	0.23			444	1.68					119.2	0.83						
20-Apr-03	138,957	177,690	360	0.23			444	1.73					209.2	1.51						
21-Apr-03	141,512	167,198	360	0.23			444	1.70					159.2	1.13						
22-Apr-03	108,601	149,966	360	0.30	2.00	0.80	444	2.21	6.95	7.25	17.00	21.00	159.2	1.47					0.30	0.70
23-Apr-03	135,322	172,084	360	0.24	2.80	1.40	444	1.77	6.98	7.20	17.00	20.00	159.2	1.18					0.30	0.60
24-Apr-03	141,061	173,261	360	0.23			444	1.70					159.2	1.13						
25-Apr-03	140,606	176,709	360	0.23			444	1.71					159.2	1.13						
26-Apr-03	141,770	178,521	360	0.23			444	1.69					159.2	1.12						
27-Apr-03	140,101	172,565	360	0.23			444	1.71					159.2	1.14						
28-Apr-03	149,733	171,784	360	0.22			444	1.60					159.2	1.06						
29-Apr-03	144,963	175,336	360	0.22	3.30	1.50	444	1.66	7.00	7.28	17.00	22.00	259.2	1.79					0.20	0.60
30-Apr-03	146,618	175,459	360	0.22			444	1.64					244.2	1.67						
Total	4,426,654	4,922,554	15,420				27,209						4,435.0							
Maximum	165,488	178,521	720	0.47	3.30	1.50	1,896	6.25	7.00	8.40	18.00	26.00	259.2	1.79	0.40	0.00	0.00	0.00	0.30	1.00
Minimum	108,601	141,325	360	0.22	1.20	0.50	444	1.60	6.80	7.20	15.00	20.00	119.2	0.77	0.30	0.00	0.00	0.00	0.20	0.60
Average	147,555	164,085	514	0.31	1.97	0.82	907	3.23	6.89	7.60	16.44	23.00	158.4	1.09	0.36	#DIV/0!	#DIV/0!	#DIV/0!	0.28	0.83

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3*14.3H_2O$.

Table M31.1.3 Daily Flow Rate, Water Quality and Chemical Dosage at Salaulim WTP in 2003 (3/6)

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			Alum*	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}	mg/l		mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-May-03	146,706	174,362	360	0.22			444	1.64												
2-May-03	143,444	170,246	360	0.23	3.00	1.50	444	1.67	6.90	7.28	17.00	20.00							0.30	0.50
3-May-03	141,533	172,073	360	0.23			444	1.70					175.0	1.24						
4-May-03	141,951	171,021	360	0.23			444	1.69					175.0	1.23						
5-May-03	139,342	169,673	360	0.23			432	1.68					175.0	1.26						
6-May-03	137,703	169,867	360	0.24	2.80	1.20	432	1.70	7.05	7.28	17.00	20.00	303.6	2.20					0.20	0.60
7-May-03	129,340	157,812	360	0.25	2.00	1.20	432	1.81	7.00	7.18	18.00	20.00	203.6	1.57					0.20	0.60
8-May-03	140,330	175,757	360	0.23			432	1.66					203.6	1.45						
9-May-03	138,069	174,295	360	0.23			432	1.69					203.6	1.47						
10-May-03	142,137	177,710	360	0.23			432	1.64					303.6	2.14						
11-May-03	138,843	178,150	360	0.23			432	1.68					228.6	1.65						
12-May-03	140,374	179,077	360	0.23	2.20	1.20	432	1.66	6.94	7.24	17.00	19.00	341.1	2.43					0.10	0.50
13-May-03	132,531	171,360	360	0.24	1.50	0.70	432	1.76	7.03	7.15	16.00	20.00	212.5	1.60			0.04		0.20	0.60
14-May-03	140,744	173,698	360	0.23	1.50	0.50	432	1.66	7.10	7.32	17.00	21.00	212.5	1.51			0.04		0.30	0.60
15-May-03	133,188	166,245	360	0.24			432	1.75					212.5	1.60						
16-May-03	133,111	167,093	360	0.24	1.50	0.50	432	1.75	7.10	7.26	17.00	19.00	212.5	1.60			0.04		0.30	0.60
17-May-03	139,078	171,368	360	0.23	1.60	0.50	432	1.68	7.14	7.32	17.00	19.00	212.5	1.53			0.04		0.30	0.60
18-May-03	135,480	170,472	360	0.24			432	1.72					212.5	1.57						
19-May-03	144,470	169,553	360	0.22			432	1.62					225.0	1.56						
20-May-03	157,969	172,281	360	0.21	1.60	0.60	478	1.64	7.14	7.35	17.00	19.00	112.5	0.71			0.04		0.30	0.60
21-May-03	159,028	171,640	360	0.20	1.60	0.50	468	1.59	7.14	7.36	17.00	20.00	187.5	1.18			0.02		0.30	0.60
22-May-03	150,709	158,175	360	0.21	1.50	0.50	468	1.68	7.03	7.30	17.00	19.00	187.5	1.24			0.04		0.30	0.60
23-May-03	157,766	172,848	360	0.21	1.50	0.50	468	1.60	7.11	7.36	17.00	20.00	187.5	1.19			0.04		0.30	0.60
24-May-03	154,390	162,123	360	0.21	1.50	0.50	468	1.64	7.06	7.32	17.00	19.00	187.5	1.21			0.02		0.30	0.60
25-May-03	159,941	171,501	360	0.20			468	1.58					187.5	1.17						
26-May-03	154,579	166,030	360	0.21	1.50	0.50	468	1.64	7.08	7.36	17.00	20.00	316.1	2.04			0.04		0.30	0.60
27-May-03	150,321	159,169	360	0.22	1.50	0.50	468	1.68	7.10	7.39	17.00	20.00	203.6	1.35			0.04		0.30	0.60
28-May-03	154,857	158,989	360	0.21	2.70	1.00	468	1.63	7.08	7.20	18.00	20.00	203.6	1.31			0.04		0.20	0.60
29-May-03	162,882	167,614	360	0.20	2.00	0.80	468	1.55	7.10	7.32	17.00	19.00	203.6	1.25			0.04		0.20	0.60
30-May-03	164,837	167,931	360	0.20	2.70	1.20	468	1.53	7.14	7.26	17.00	18.00	203.6	1.23			0.01	0.01	0.20	0.60
31-May-03	165,229	168,030	360	0.20	2.80	1.00	468	1.53	7.10	7.25	17.00	19.00	203.6	1.23			0.01		0.20	0.50
Total	4,530,882	5,256,163	11,160				13,882						6,196.4							
Maximum	165,229	179,077	360	0.25	3.00	1.50	478	1.81	7.14	7.39	18.00	21.00	341.1	2.43	0.00	0.00	0.04	0.01	0.30	0.60
Minimum	129,340	157,812	360	0.20	1.50	0.50	432	1.53	6.90	7.15	16.00	18.00	112.5	0.71	0.00	0.00	0.01	0.01	0.10	0.50
Average	146,157	169,554	360	0.22	1.95	0.78	448	1.66	7.07	7.29	17.05	19.53	213.7	1.47	#DIV/0!	#DIV/0!	0.03	0.01	0.25	0.58

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3*14.3H_2O$.

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			Alum*	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}	mg/l		mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Jun-03	157,841	160,384	360	0.21			468	1.60					368.6	2.34						
2-Jun-03	162,783	164,359	360	0.20	2.60	1.40	468	1.55	7.02	7.26	16.00	19.00	165.0	1.01			0.01		0.20	0.60
3-Jun-03	161,947	169,003	360	0.20	2.50	1.50	468	1.56	7.02	7.25	16.00	19.00	165.0	1.02			0.01		0.20	0.60
4-Jun-03	136,428	140,926	360	0.24	2.40	1.40	468	1.85	7.01	7.26	16.00	19.00	165.0	1.21			0.01		0.20	0.60
5-Jun-03	164,083	170,054	360	0.20	2.40	1.20	468	1.54	7.03	7.22	16.00	19.00	165.0	1.01			0.01		0.20	0.60
6-Jun-03	162,443	169,234	360	0.20	2.40	1.20	468	1.56	7.04	7.22	16.00	18.00	165.0	1.02			0.01		0.20	0.60
7-Jun-03	163,474	172,902	360	0.20			468	1.55					165.0	1.01						
8-Jun-03	159,603	168,904	360	0.20	2.40	1.20	468	1.59	7.04	7.24	16.00	19.00	165.0	1.03			0.01		0.20	0.60
9-Jun-03	160,716	169,277	360	0.20	2.40	1.20	468	1.57	7.04	7.23	16.00	18.00	165.0	1.03			0.02		0.20	0.50
10-Jun-03	159,872	169,480	360	0.20	2.80	1.20	468	1.58	7.10	7.32	17.00	20.00	221.3	1.38			0.04	0.01		0.60
11-Jun-03	158,813	159,544	360	0.20	2.90	1.30	468	1.59	7.05	7.20	18.00	21.00	131.3	0.83			0.05	0.01	0.20	0.60
12-Jun-03	149,592	152,007	360	0.22	2.80	1.40	468	1.69	7.06	7.23	17.00	20.00	213.1	1.42			0.06	0.01	0.20	0.40
13-Jun-03	147,077	151,659	360	0.22	3.00	1.50	468	1.72	7.10	7.40	17.00	20.00	138.1	0.94			0.06	0.01	0.20	0.60
14-Jun-03	143,086	148,578	360	0.23	3.00	1.50	468	1.77	7.08	7.39	17.00	20.00	138.1	0.96			0.06	0.02	0.20	0.50
15-Jun-03	138,771	146,091	360	0.23	6.00	2.00	468	1.82	7.03	7.31	17.00	20.00	138.1	0.99			0.08	0.02	0.20	0.60
16-Jun-03	138,227	150,748	540	0.35			936	3.66					138.1	1.00						
17-Jun-03	134,528	135,903	600	0.40	4.20	1.20	936	3.76	6.96	7.84	16.00	22.00	138.1	1.03	0.10		0.08	0.02	0.20	0.60
18-Jun-03	149,150	154,394	720	0.43	7.00	2.00	1,092	3.96	7.01	7.98	18.00	22.00	138.1	0.93	0.30		0.06	0.02	0.20	0.60
19-Jun-03	141,215	147,801	780	0.50	6.40	2.20	1,170	4.48	7.04	7.96	18.00	22.00	138.1	0.98	0.30		0.05	0.02	0.20	0.60
20-Jun-03	141,008	148,495	900	0.57	7.00	2.00	1,170	4.49	7.16	8.47	18.00	24.00	138.1	0.98	0.30		0.05	0.05	0.20	0.60
21-Jun-03	135,020	145,473	900	0.60	7.60	2.20	1,170	4.68	7.10	8.07	18.00	23.00	138.1	1.02	0.30		0.05	0.02	0.20	0.60
22-Jun-03	148,369	155,043	1,140	0.69			1,409	5.13					228.1	1.54						
23-Jun-03	145,831	152,303	1,620	1.00	18.20	2.50	2,772	10.27	6.87	7.61	20.00	26.00	146.3	1.00	3.20	0.05	0.08	0.05		0.50
24-Jun-03	133,121	141,593	1,500	1.01	22.00	1.80	2,772	11.26	6.90	8.04	20.00	26.00	146.3	1.10	3.60	0.30	0.70	0.05		1.20
25-Jun-03	145,788	150,992	1,440	0.89	25.00	2.30	3,234	11.99	6.78	8.10	21.00	30.00	215.5	1.48	3.00	0.20	0.50	0.05		1.00
26-Jun-03	139,278	145,038	1,440	0.93	24.00	2.20	3,188	12.37	6.81	8.21	21.00	32.00	159.2	1.14	3.00	0.20	0.50	0.05		1.00
27-Jun-03	135,116	136,816	1,440	0.96	28.00	2.50	3,192	12.77	6.67	8.03	20.00	31.00	159.2	1.18	2.80	0.10	0.80	0.06		1.20
28-Jun-03	136,293	132,384	1,440	0.95	22.00	2.20	3,040	12.06	6.86	8.41	18.00	32.00	159.2	1.17	1.80	0.05	0.50	0.03		1.20
29-Jun-03	136,052	132,315	1,440	0.95			2,584	10.27					159.2	1.17						
30-Jun-03	140,556	138,610	1,440	0.92	20.00	2.00	2,102	8.08	6.81	8.48	18.00	29.00	159.2	1.13	1.20		0.60	0.05		0.60
Total	4,426,081	4,580,310	22,740				37,787						5,029.0							
Maximum	164,083	172,902	1,620	1.01	28.00	2.50	3,234	12.77	7.16	8.48	21.00	32.00	368.6	2.34	3.60	0.30	0.80	0.06	0.20	1.20
Minimum	133,121	132,315	360	0.20	2.40	1.20	468	1.54	6.67	7.20	16.00	18.00	131.3	0.83	0.10	0.05	0.01	0.01	0.20	0.40
Average	147,536	152,677	758	0.48	9.16	1.72	1,260	4.79	6.98	7.67	17.64	22.84	167.6	1.13	1.66	0.15	0.18	0.03	0.20	0.68

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3*14.3H_2O$.

Table M31.1.3 Daily Flow Rate, Water Quality and Chemical Dosage at Salaulim WTP in 2003 (4/6)

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			Alum*	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}			mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Jul-03	132,745	122,981	1,440	0.98	20.00	1.80	1,920	7.82	6.78	8.03	18.00	27.00	249.2	1.88			0.60	0.05		0.60
2-Jul-03	140,564	134,258	1,440	0.92	20.00	2.00	1,920	7.38	6.70	7.91	16.00	25.00	159.2	1.13			0.80	0.06		1.00
3-Jul-03	140,934	129,385	1,440	0.92	18.00	2.00	1,920	7.36	6.71	7.93	16.00	24.00	159.2	1.13	0.80		0.60	0.05		1.00
4-Jul-03	131,573	117,943	1,440	0.99	15.00	2.00	1,920	7.89	6.71	7.85	16.00	24.00	159.2	1.21	0.60		0.70	0.06		1.00
5-Jul-03	138,674	124,450	1,440	0.93			1,920	7.48					159.2	1.15						
6-Jul-03	134,330	126,267	1,200	0.80			1,280	5.15					159.2	1.19						
7-Jul-03	137,165	130,034	1,080	0.71			1,152	4.54					228.5	1.67						
8-Jul-03	130,343	117,211	1,080	0.75	10.00	2.00	1,152	4.78	6.83	7.64	16.00	22.00	159.2	1.22	0.30		0.60	0.05		1.00
9-Jul-03	135,954	119,483	720	0.48	6.00	1.80	960	3.82	6.81	7.67	16.00	20.00	159.2	1.17			0.40	0.02		0.80
10-Jul-03	142,033	126,685	720	0.46	6.00	2.10	960	3.65	6.75	7.60	16.00	19.00	271.7	1.91			0.40	0.01		1.00
11-Jul-03	144,793	129,072	720	0.45	5.00	2.00	960	3.58	6.82	7.60	17.00	20.00	181.7	1.26			0.10	0.02		1.01
12-Jul-03	146,617	130,172	720	0.44	5.00	2.00	960	3.54	6.93	7.56	17.00	19.00	181.7	1.24			0.20	0.02		0.80
13-Jul-03	147,343	132,960	720	0.44			960	3.52					181.7	1.23						
14-Jul-03	143,314	124,807	720	0.45	5.00	1.80	960	3.62	6.86	7.51	17.00	19.00	181.7	1.27			0.10	0.02	0.20	0.80
15-Jul-03	146,687	132,059	720	0.44	4.00	2.00	960	3.54	6.80	7.60	17.00	20.00	181.7	1.24			0.10	0.05	0.20	0.60
16-Jul-03	147,226	130,293	720	0.44	4.50	1.60	960	3.52	6.85	7.64	17.00	20.00	181.7	1.23			0.10	0.05	0.20	0.70
17-Jul-03	149,318	132,184	720	0.43	5.00	1.60	960	3.48	6.82	7.60	17.00	20.00	181.7	1.22			0.10	0.05	0.20	0.50
18-Jul-03	149,223	133,052	720	0.43	4.50	1.60	960	3.48	6.87	7.61	16.00	20.00	151.0	1.01			0.10	0.02		1.00
19-Jul-03	146,174	128,472	720	0.44	4.00	1.50	960	3.55	6.86	7.62	16.00	19.00	226.0	1.55			0.01	0.05	0.20	0.80
20-Jul-03	148,569	132,254	720	0.44			960	3.49					156.8	1.06						
21-Jul-03	150,779	133,882	720	0.43	4.00	1.50	960	3.44	6.81	7.59	16.00	19.00	156.8	1.04			0.20	0.01	0.20	0.60
22-Jul-03	149,852	135,457	720	0.43	4.00	1.80	960	3.46	6.80	7.54	16.00	20.00	156.8	1.05			0.20	0.02		1.00
23-Jul-03	149,049	133,583	720	0.43	3.80	1.80	960	3.48	6.80	7.60	16.00	19.00	156.8	1.05			0.20	0.02		0.60
24-Jul-03	146,728	133,738	720	0.44	4.00	1.60	985	3.63	6.81	7.59	16.00	19.00	156.8	1.07			0.20	0.01	0.20	0.80
25-Jul-03	140,340	125,089	720	0.46	3.50	1.70	1,095	4.22	6.80	7.63	15.00	20.00	156.8	1.12			0.50		0.20	0.60
26-Jul-03	143,290	130,436	720	0.45	4.00	1.50	1,095	4.13	6.80	7.63	16.00	19.00	156.8	1.09			0.10	0.05	0.20	0.60
27-Jul-03	144,362	127,754	720	0.45			1,095	4.10					156.8	1.09						
28-Jul-03	144,906	129,995	720	0.45	3.50	1.50	1,095	4.08	6.72	7.58	16.00	18.00	238.6	1.65			0.01		0.20	0.60
29-Jul-03	146,155	131,003	720	0.44	4.00	1.00	1,095	4.05	6.65	7.57	16.00	19.00	156.8	1.07			0.05		0.20	0.60
30-Jul-03	144,071	129,636	720	0.45	4.00	1.80	1,095	4.11	6.60	7.60	15.00	20.00	156.8	1.09			0.10	0.05	0.20	0.60
31-Jul-03	147,683	131,045	720	0.44	3.80	1.60	1,095	4.01	6.64	7.59	16.00	20.00	210.4	1.42			0.10	0.05	0.20	0.60
Total	4,440,794	3,995,640	27,120				36,234						5,530.5							
Maximum	150,779	135,457	1,440	0.99	20.00	2.10	1,920	7.89	6.93	8.03	18.00	27.00	271.7	1.91	0.80	0.00	0.80	0.06	0.20	1.01
Minimum	130,343	117,211	720	0.43	3.50	1.00	960	3.44	6.60	7.51	15.00	18.00	151.0	1.01	0.30	0.00	0.01	0.01	0.20	0.50
Average	143,251	128,892	875	0.56	6.82	1.74	1,169	4.45	6.78	7.65	16.24	20.44	178.4	1.25	0.57	#DIV/0!	0.26	0.04	0.20	0.77

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3$*14.$3H_2O$.

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			Alum*	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}			mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Aug-03	148,338	132,282	600	0.36	3.00	1.00	949	3.46	6.66	7.50	11.00	19.00	210.4	1.42			0.05		0.20	0.50
2-Aug-03	149,209	133,230	360	0.22	3.00	1.00	657	2.38	6.60	7.42	15.00	18.00	210.4	1.41			0.05		0.20	0.60
3-Aug-03	151,135	135,357	360	0.21			730	2.61					210.4	1.39						
4-Aug-03	151,311	137,214	360	0.21	3.00	1.00	1,095	3.91	6.51	7.20	15.00	17.00	210.4	1.39			0.02	0.05	0.20	0.60
5-Aug-03	151,513	137,871	360	0.21	3.00	1.00	1,095	3.91	6.54	7.22	16.00	18.00	210.4	1.39			0.05		0.20	0.60
6-Aug-03	59,621	137,189	360	0.54	3.00	1.50	1,095	9.93	6.60	7.29	17.00	20.00	300.4	5.04			0.05	0.02	0.20	0.60
7-Aug-03		135,124	360		3.00	1.00	1,125		6.58	7.26	16.00	19.00	246.8				0.08	0.03	0.20	0.40
8-Aug-03		135,170	360		3.00	1.00	1,140		6.62	7.37	16.00	19.00	165.0				0.05	0.02	0.20	0.50
9-Aug-03		132,195	360		3.00	1.00	1,140		6.48	7.24	15.00	18.00	165.0				0.05		0.20	0.60
10-Aug-03	32,590	131,755	360	0.99	3.00	1.00	1,167	19.36	6.51	7.28	16.00	19.00	165.0	5.06			0.05		0.20	0.60
11-Aug-03	150,161		360	0.22			1,245	4.48					165.0	1.10						
12-Aug-03	147,022		360	0.22	3.00	1.00	1,162	4.27	6.50	7.53	16.00	20.00	165.0	1.12			0.05		0.20	0.50
13-Aug-03	148,478		360	0.22	3.00	1.00	996	3.63	6.57	7.52	15.00	20.00	165.0	1.11			0.05		0.20	0.60
14-Aug-03	149,912		360	0.22	3.00	1.00	996	3.59	6.51	7.41	15.00	19.00	165.0	1.10			0.03		0.20	0.60
15-Aug-03	147,187		360	0.22	3.00	1.00	996	3.66	6.50	7.41	15.00	19.00	255.0	1.73			0.05		0.20	0.60
16-Aug-03	145,367		360	0.22	3.00	1.00	996	3.70	6.43	7.36	15.00	18.00	165.0	1.14			0.04		0.20	0.60
17-Aug-03	145,680		360	0.22			996	3.70					165.0	1.13						
18-Aug-03	143,956		360	0.23			996	3.74					246.8	1.71						
19-Aug-03	142,296		360	0.23	3.00	1.00	996	3.78	6.47	7.33	15.00	18.00	171.8	1.21			0.05		0.20	0.60
20-Aug-03	143,210		360	0.23	3.00	1.00	996	3.76	6.40	7.28	15.00	17.00	171.8	1.20			0.08	0.01	0.20	0.60
21-Aug-03	145,451		360	0.22	3.00	1.00	996	3.70	6.41	7.31	16.00	19.00	171.8	1.18			0.04		0.20	0.60
22-Aug-03	143,789		360	0.23	3.00	1.20	996	3.74	6.50	7.30	15.00	19.00	171.8	1.19			0.04		0.20	0.50
23-Aug-03	147,081		360	0.22	3.00	1.00	996	3.66	6.50	7.30	15.00	19.00	171.8	1.17			0.03		0.20	0.60
24-Aug-03	145,925		360	0.22			996	3.69					261.8	1.79						
25-Aug-03	145,162		360	0.22	2.50	0.80	996	3.71	6.51	7.31	1.00	18.00	171.8	1.18			0.04		0.20	0.50
26-Aug-03	146,474		360	0.22	2.80	1.00	996	3.68	6.50	7.30	15.00	19.00	171.8	1.17			0.03		0.20	0.50
27-Aug-03	146,342		360	0.22	3.00	1.00	996	3.68	6.46	7.27	15.00	19.00	171.8	1.17			0.03		0.20	0.60
28-Aug-03	143,253		360	0.23	3.00	1.00	996	3.76	6.53	7.31	15.00	19.00	246.8	1.72			0.03		0.20	0.60
29-Aug-03	148,657		360	0.22	3.00	1.00	996	3.62	6.48	7.29	15.00	18.00	165.0	1.11			0.04		0.20	0.50
30-Aug-03	148,847		360	0.22			996	3.62					165.0	1.11						
31-Aug-03	150,994		360	0.21			996	3.57					165.0	1.09						
Total	3,918,961	1,347,387	11,400				31,524						5,964.2							
Maximum	151,513	137,871	600	0.99	3.00	1.50	1,245	19.36	6.66	7.53	17.00	20.00	300.4	5.06	0.00	0.00	0.08	0.05	0.20	0.60
Minimum	32,590	131,755	360	0.21	2.50	0.80	657	2.38	6.40	7.20	1.00	17.00	165.0	1.09	0.00	0.00	0.02	0.01	0.20	0.40
Average	139,963	134,739	368	0.26	2.97	1.02	1,017	4.44	6.52	7.33	14.58	18.67	192.4	1.56	#DIV/0!	#DIV/0!	0.05	0.03	0.20	0.56

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3$*14.$3H_2O$.

Table M31.1.3 Daily Flow Rate, Water Quality and Chemical Dosage at Salaulim WTP in 2003 (5/6)

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			$Alum^{+}$	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}	mg/l		mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Sep-03	73,267		360		2.90	1.50	1,041		6.55	7.25	15.00	19.00	165.0				0.05	0.05	0.20	0.60
2-Sep-03	73,767		360				912						255.0							
3-Sep-03	79,801		360		2.80	1.20	912		6.43	7.22	14.00	19.00	165.0				0.01	0.02	0.20	0.60
4-Sep-03	74,329		360		3.00	1.20	1,368		6.30	7.40	14.00	19.00	165.0				0.05	0.05	0.20	0.60
5-Sep-03	74,318		360		3.00	1.50	1,368		6.33	7.53	14.00	19.00	165.0				0.05	0.03	0.20	0.60
6-Sep-03	73,191		360		3.00	1.00	1,368		6.34	7.47	14.00	20.00	165.0				0.04		0.20	0.50
7-Sep-03	73,453		360				1,368						165.0							
8-Sep-03	136,762		360	0.24	3.00	1.00	1,368	5.41	6.33	7.31	15.00	19.00	246.8	1.80			0.03		0.20	0.60
9-Sep-03	145,353		360	0.22	3.00	1.50	1,368	5.09	6.40	7.40	15.00	19.00	171.8	1.18			0.05	0.05	0.20	0.60
10-Sep-03	142,374		360	0.23	3.00	1.20	1,215	4.61	6.40	7.40	14.00	19.00	171.8	1.21			0.05	0.02	0.20	0.60
11-Sep-03	137,771		360	0.24	3.50	1.20	1,194	4.68	6.41	7.43	14.00	19.00	253.6	1.84			0.05	0.02	0.20	0.60
12-Sep-03	136,501		360	0.24	3.00	1.20	1,245	4.93	6.60	7.30	15.00	19.00	163.6	1.20			0.05		0.20	0.60
13-Sep-03	132,614		360	0.24	3.00	1.00	1,245	5.07	6.47	7.31	14.00	19.00	163.6	1.23			0.05	0.01	0.20	0.60
14-Sep-03	34,312		360	0.94			1,245	19.61					163.6	4.77						
15-Sep-03	73,557		360	0.44	2.50	1.00	1,079	7.93	6.43	7.30	14.00	19.00	163.6	2.22			0.03		0.20	0.60
16-Sep-03	142,327		360	0.23	3.00	1.20	1,079	4.10	6.62	7.28	16.00	20.00	163.6	1.15			0.05		0.20	0.60
17-Sep-03	65,862		180	0.25			498	4.09					163.6	2.48						
18-Sep-03	139,654		360	0.23	3.80	1.40	996	3.86	6.32	7.21	14.00	18.00	238.6	1.71			0.03		0.20	0.80
19-Sep-03	151,230		360	0.21	3.00	1.20	996	3.56	6.55	7.35	15.00	20.00	156.8	1.04			0.05		0.20	0.60
20-Sep-03	153,927		360	0.21	3.40	1.20	996	3.50	6.50	7.30	15.00	19.00	156.8	1.02			0.04		0.20	0.60
21-Sep-03	153,579		360	0.21			996	3.51					231.8	1.51						
22-Sep-03	152,659		360	0.21	2.00	1.00	996	3.53	6.85	7.54	15.00	19.00	150.0	0.98			0.02		0.20	0.60
23-Sep-03	154,520		360	0.21	2.00	1.00	830	2.90	6.90	7.60	15.00	20.00	150.0	0.97			0.02		0.20	0.70
24-Sep-03	152,986		360	0.21	2.00	1.00	747	2.64	6.91	7.49	15.00	20.00	150.0	0.98			0.01		0.20	0.80
25-Sep-03	153,545		360	0.21	2.00	0.80	747	2.63	6.97	7.41	15.00	19.00	150.0	0.98					0.20	0.80
26-Sep-03	75,983		360		2.00	1.00	747		7.02	7.32	15.00	19.00	150.0				0.02		0.20	1.00
27-Sep-03	75,320		360		2.00	1.00	747		7.03	7.34	15.00	18.00	150.0				0.01		0.20	1.00
28-Sep-03	73,237		360				740						150.0							
29-Sep-03	148,610	126,745	360	0.22	2.80	0.60	666	2.42	7.02	7.35	16.00	19.00	214.3	1.44			0.02	0.02	0.20	0.80
30-Sep-03	150,714	130,985	360	0.21	2.20	0.80	666	2.39	7.01	7.34	16.00	19.00	221.1	1.47			0.01		0.20	1.20
Total	3,405,523	257,730	10,620				30,743						5,340.4							
Maximum	154,520	130,985	360	0.94	3.80	1.50	1,368	19.61	7.03	7.60	16.00	20.00	255.0	4.77	0.00	0.00	0.05	0.05	0.20	1.20
Minimum	34,312	126,745	180	0.21	2.00	0.60	498	2.39	6.30	7.21	14.00	18.00	150.0	0.97	0.00	0.00	0.01	0.01	0.20	0.50
Average	113,517	128,865	354	0.27	2.75	1.11	1,025	4.82	6.61	7.37	14.75	19.13	178.0	1.56	#DIV/0!	#DIV/0!	0.03	0.03	0.20	0.69

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3*14.3H_2O$.

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			$Alum^{+}$	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}	mg/l		mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Oct-03	152,866	133,563	360	0.21	2.80	0.70	666	2.36	6.84	7.32	16.00	19.00					0.05		0.20	1.00
2-Oct-03	147,476	126,862	360	0.22	2.50	1.00	666	2.44	6.48	7.36	15.00	19.00					0.05	0.02	0.20	0.80
3-Oct-03	144,009	125,462	360	0.22	2.50	1.00	666	2.50	6.93	7.24	15.00	18.00	146.1	1.01			0.02		0.20	1.20
4-Oct-03	148,450	123,752	360	0.22	2.50	1.00	666	2.43	6.94	7.31	15.00	19.00	146.1	0.98			0.05	0.02	0.20	1.00
5-Oct-03	105,644	110,277	360	0.31	2.50	1.00	666	3.41	6.98	7.32	15.00	18.00	146.1	1.38			0.02		0.20	0.80
6-Oct-03	151,620	137,367	360	0.21	2.00	1.00	666	2.37	7.00	7.36	15.00	18.00	146.1	0.96			0.05	0.02	0.20	0.80
7-Oct-03	154,289		360	0.21	2.50	1.00	666	2.33	7.10	7.45	15.00	19.00	146.1	0.95						
8-Oct-03	153,001		360	0.21	1.80	0.80	666	2.35	7.14	7.47	16.00	19.00	146.1	0.95			0.05		0.20	0.80
9-Oct-03	154,019		360	0.21	2.20	1.00	666	2.34	7.05	7.37	15.00	19.00	146.1	0.95			0.02		0.20	0.80
10-Oct-03	151,747		360	0.21			666	2.37					236.1	1.56						
11-Oct-03	151,517		360	0.21	2.20	0.80	666	2.38	7.02	7.29	15.00	19.00	154.3	1.02			0.02		0.20	0.80
12-Oct-03	149,486		360	0.22	2.00	1.00	666	2.41	7.02	7.33	4.00	19.00	244.3	1.63			0.02		0.20	0.80
13-Oct-03	152,660		360	0.21			666	2.36					180.0	1.18						
14-Oct-03	153,606		360	0.21	2.00	0.80	666	2.34	6.95	7.30	14.00	19.00	180.0	1.17			0.05	0.02	0.20	0.90
15-Oct-03	151,181		360	0.21	1.80	1.00	666	2.38	6.94	7.31	14.00	19.00	180.0	1.19			0.05		0.20	0.80
16-Oct-03	153,899		360	0.21	2.00	1.00	666	2.34	6.96	7.28	14.00	18.00	180.0	1.17			0.05	0.02	0.20	0.80
17-Oct-03	151,810		360	0.21	1.80	0.80	666	2.37	7.05	7.25	15.00	19.00	180.0	1.19					0.20	1.00
18-Oct-03	151,099		360	0.21	1.80	1.00	666	2.38	6.98	7.24	15.00	18.00	180.0	1.19					0.20	0.80
19-Oct-03	148,273		360	0.22			666	2.43					292.5	1.97						
20-Oct-03	126,592		360	0.26	2.00	0.80	666	2.84	7.00	7.31	15.00	19.00	202.5	1.60			0.04		0.20	0.80
21-Oct-03	141,742		360	0.23	1.80	1.00	666	2.54	6.95	7.28	15.00	19.00	255.4	1.80			0.05		0.20	0.80
22-Oct-03	149,706		360	0.22	1.80	0.70	666	2.40	6.90	7.27	15.00	19.00	165.4	1.11					0.20	1.00
23-Oct-03	150,208		360	0.22	2.00	0.80	666	2.40	6.98	7.29	15.00	19.00	165.4	1.10			0.02		0.20	0.80
24-Oct-03	148,414		360	0.22			704	2.56					165.4	1.11						
25-Oct-03	149,447		360	0.22	2.00	0.80	720	2.60	7.00	7.30	15.00	19.00	294.0	1.97			0.03		0.20	0.80
26-Oct-03	148,781		360	0.22			720	2.62					294.0	1.98						
27-Oct-03	146,911		360	0.22	2.00	1.00	720	2.65	6.48	7.30	14.00	18.00	181.5	1.24			0.02		0.20	0.80
28-Oct-03	147,422		360	0.22	1.80	0.80	720	2.64	6.89	7.23	15.00	19.00	181.5	1.23			0.05	0.02	0.20	0.80
29-Oct-03	150,657		360	0.22	2.00	0.80	720	2.58	6.90	7.24	14.00	19.00	181.5	1.20			0.04	0.02	0.20	0.80
30-Oct-03	149,189		360	0.22	2.00	0.80	720	2.61	6.93	7.24	14.00	19.00	181.5	1.22			0.03	0.02	0.20	0.80
31-Oct-03	149,107	137,213	360	0.22	1.50	0.80	720	2.61	6.85	7.29	15.00	19.00	256.5	1.72			0.05	0.02	0.20	0.80
Total	4,584,828	894,496	11,160				21,062						5,554.8							
Maximum	154,289	137,367	360	0.31	2.80	1.00	720	3.41	7.14	7.47	16.00	19.00	294.0	1.98	0.00	0.00	0.05	0.02	0.20	1.20
Minimum	105,644	110,277	360	0.21	1.50	0.70	666	2.33	6.48	7.23	4.00	18.00	146.1	0.95	0.00	0.00	0.02	0.02	0.20	0.80
Average	147,898	127,785	360	0.22	2.07	0.89	679	2.50	6.93	7.31	14.42	18.77	191.5	1.30	#DIV/0!	#DIV/0!	0.04	0.02	0.20	0.85

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3*14.3H_2O$.

Table M31.1.3 Daily Flow Rate, Water Quality and Chemical Dosage at Salaulim WTP in 2003 (6/6)

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			Alum*	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}			mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Nov-03	128,038		360	0.25			720	3.04					127.9	1.00						
2-Nov-03	45,064		360	0.72	1.80	1.00	686	8.23	6.81	7.24	15.00	19.00	127.9	2.84			0.04	0.02	0.20	0.80
3-Nov-03			360		1.50	0.80	684		6.41	7.25	14.00	19.00	127.9				0.04	0.02	0.20	0.80
4-Nov-03	78,061		360	0.42	1.60	0.70	684	4.74	6.90	7.30	15.00	19.00	127.9	1.64			0.05	0.02	0.20	0.80
5-Nov-03	151,831		360	0.21	1.60	0.80	684	2.44	6.41	7.29	15.00	18.00	127.9	0.84			0.03		0.20	0.80
6-Nov-03	152,774		360	0.21	1.80	0.80	684	2.42	6.98	7.30	15.00	19.00	217.9	1.43			0.04	0.02	0.20	0.50
7-Nov-03	80,666		360		1.80	0.80	684		7.04	7.40	16.00	20.00	165.0				0.05	0.02	0.20	0.80
8-Nov-03	146,617		360	0.22	1.50	0.80	698	2.57	7.00	7.30	15.00	20.00	165.0	1.13			0.04	0.02	0.20	0.90
9-Nov-03	151,063		360	0.21			720	2.58					165.0	1.09						
10-Nov-03	118,557		360	0.27	1.50	0.80	720	3.28	7.03	7.36	15.00	19.00	165.0	1.39			0.04		0.20	0.80
11-Nov-03	149,287		360	0.22	1.60	0.70	720	2.61	7.07	7.32	15.00	19.00	255.0	1.71			0.05	0.02	0.20	0.60
12-Nov-03	150,480		360	0.22	1.80	0.90	720	2.59	7.10	7.38	16.00	20.00	180.0	1.20			0.05	0.05	0.20	1.00
13-Nov-03	148,930		360	0.22	1.50	0.80	720	2.61	7.04	7.39	15.00	20.00	180.0	1.21			0.05	0.02	0.20	0.80
14-Nov-03	141,467		360	0.23	1.80	0.90	720	2.75	7.07	7.38	16.00	21.00	180.0	1.27			0.05	0.05	0.20	0.80
15-Nov-03	148,248		360	0.22			720	2.63					270.0	1.82						
16-Nov-03	145,942		360	0.22			720	2.67					180.0	1.23						
17-Nov-03	146,702		360	0.22	1.40	0.80	720	2.65	7.00	7.35	15.00	21.00	180.0	1.23			0.04	0.02	0.20	1.00
18-Nov-03	144,033		360	0.22	1.70	0.80	724	2.72	7.02	7.32	15.00	20.00	180.0	1.25			0.05	0.05	0.20	0.80
19-Nov-03	143,533		360	0.23	1.40	0.80	738	2.78	7.02	7.36	15.00	20.00	180.0	1.25			0.04	0.02	0.20	0.50
20-Nov-03	136,123		360	0.24	1.20	0.80	738	2.93	7.00	7.39	15.00	19.00	270.0	1.98			0.05	0.02	0.20	0.60
21-Nov-03	68,784		360		1.50	0.90	738		7.06	7.44	16.00	20.00	180.0				0.04	0.02	0.20	1.00
22-Nov-03	75,492		360		1.40	0.80	738		7.01	7.38	16.00	19.00	180.0				0.03		0.20	0.80
23-Nov-03	71,231		360				738						180.0							
24-Nov-03	75,799		360		1.40	0.80	738		7.04	7.41	15.00	20.00	334.3				0.03	0.01	0.20	0.80
25-Nov-03	74,288		360		2.00	1.00	1,312		7.10	7.38	17.00	21.00	244.3		0.20		0.02	0.02	0.20	1.00
26-Nov-03	70,419		420		2.00	1.00	1,476		7.06	7.57	16.00	20.00	244.3		0.10		0.03	0.02	0.20	0.80
27-Nov-03	76,413		540		1.40	0.80	1,476		7.08	7.61	16.00	22.00	244.3		0.20		0.04	0.02	0.20	0.80
28-Nov-03	72,525		540		1.40	0.80	1,476		7.08	7.67	16.00	22.00	244.3		0.20		0.04	0.01	0.20	0.80
29-Nov-03	75,168		540		1.80	0.80	1,476		7.03	7.56	15.00	22.00	244.3		0.20		0.03	0.01	0.20	0.60
30-Nov-03	71,249		540				1,476						154.3							
Total	3,238,784	0	11,580				25,848						5,822.6							
Maximum	152,774	0	540	0.72	2.00	1.00	1,476	8.23	7.10	7.67	17.00	22.00	334.3	2.84	0.20	0.00	0.05	0.05	0.20	1.00
Minimum	45,064	0	360	0.21	1.20	0.70	684	2.42	6.41	7.24	14.00	18.00	127.9	0.84	0.10	0.00	0.02	0.01	0.20	0.50
Average	111,682	#DIV/0!	386	0.26	1.60	0.83	862	3.12	6.97	7.39	15.38	19.96	194.1	1.42	0.18	#DIV/0!	0.04	0.02	0.20	0.79

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3$*14.3H_2O.

Data	Raw Water Flow Rate	Transmission Flow Rate	Alum Dosing		Turbidity		$Ca(OH)_2$ Dosing		pH		Alkalinity		Cl Dosing		Mn^{2+}		Iron		Residual Chlorine	
			Alum*	Al^{3+}	NTU		$Ca(OH)_2$	Ca^{2+}			mg/l		Cl_2(gas)	Cl^{2+}	mg/l		mg/l		mg/l	
	m^3/d	m^3/d	kg/d	mg/l	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	kg/d	mg/l	Raw	Treated	Raw	Treated	Pre	Treated
1-Dec-03	151,921		540	0.32	1.40	1.00	1,476	5.25	7.02	7.65	16.00	22.00	154.3	1.02			0.03	0.02	0.20	1.00
2-Dec-03	149,540		540	0.32	1.50	0.80	1,476	5.34	7.00	7.73	17.00	23.00	154.3	1.03			0.04	0.02	0.20	0.80
3-Dec-03	145,895		540	0.33			1,476	5.47					244.3	1.67						
4-Dec-03	143,332		600	0.38			1,476	5.57					154.3	1.08						
5-Dec-03	141,957		900	0.57	1.20	0.60	1,942	7.39	7.00	7.59	16.00	22.00	154.3	1.09	0.40		0.04	0.01		1.20
6-Dec-03	139,440		900	0.58			1,920	7.44					154.3	1.11						
7-Dec-03	140,456		900	0.58			1,844	7.10					244.3	1.74						
8-Dec-03	136,887		900	0.59	1.00	0.70	1,824	7.20	7.01	8.10	16.00	26.00	180.0	1.31	0.40		0.30	0.02		1.20
9-Dec-03	129,171		900	0.63	2.00	0.90	1,824	7.63	6.94	8.29	18.00	27.00	180.0	1.39	0.40		0.05	0.04		1.50
10-Dec-03	129,806		900	0.62	2.00	1.00	1,824	7.60	6.90	8.25	18.00	28.00	180.0	1.39	0.40		0.05	0.04		1.50
11-Dec-03	133,715		900	0.61	2.00	1.00	1,824	7.37	6.91	8.19	18.00	27.00	180.0	1.35	0.40		0.04	0.02		1.40
12-Dec-03	132,901		900	0.61	2.20	1.00	1,824	7.42	6.95	8.04	18.00	26.00	261.8	1.97	0.30		0.05	0.03		1.60
13-Dec-03	132,760		900	0.61	2.00	1.00	2,026	8.25	6.90	8.21	17.00	26.00	171.8	1.29	0.40		0.04	0.02		1.60
14-Dec-03	128,522		900	0.63			2,112	8.88					171.8	1.34						
15-Dec-03	579,631		900	0.14	1.20	0.80	2,112	1.97	7.01	8.01	17.00	26.00	171.8	0.30	0.40		0.04	0.02		1.50
16-Dec-03	118,689		900	0.68	1.50	1.00	2,112	9.62	7.02	8.15	18.00	27.00	236.1	1.99	0.40		0.04	0.04		1.50
17-Dec-03	113,804		900	0.71	1.80	1.00	2,112	10.03	6.95	8.17	18.00	28.00	146.1	1.28	0.40		0.05	0.02		1.50
18-Dec-03	107,787		900	0.75	1.60	1.00	2,112	10.59	7.00	8.18	18.00	27.00	146.1	1.36	0.50		0.04	0.03		1.50
19-Dec-03	103,041		900	0.79			2,112	11.08					146.1	1.42						
20-Dec-03	99,088		900	0.82	1.60	1.00	2,112	11.52	7.00	8.15	18.00	26.00	146.1	1.47	0.40		0.03	0.02		1.50
21-Dec-03	90,807		900	0.89			2,112	12.57					146.1	1.61						
22-Dec-03	81,388		1,080	1.19	1.50	1.00	2,112	14.03	7.00	8.14	18.00	27.00	236.1	2.90	0.50		0.04	0.02		1.50
23-Dec-03	95,884		1,080	1.01	1.50	1.00	2,112	11.91	6.95	8.00	20.00	29.00	154.3	1.61	0.40		0.03	0.02		1.50
24-Dec-03	93,459		1,080	1.04	1.50	1.00	2,112	12.22	7.00	8.01	19.00	29.00	154.3	1.65	0.50		0.04	0.02		1.50
25-Dec-03	72,475		1,080	1.34			2,112	15.75					154.3	2.13						
26-Dec-03	92,695		1,080	1.05	1.50	1.00	2,112	12.32	7.02	8.06	19.00	29.00	154.3	1.66	0.50		0.03	0.02		1.50
27-Dec-03	92,122		1,080	1.06	1.50	1.00	2,112	12.39	7.03	8.13	17.00	28.00	154.3	1.67	0.40		0.03	0.02		1.50
28-Dec-03	91,449		1,080	1.06			2,112	12.48					154.3	1.69						
29-Dec-03	93,206		1,080	1.04	1.20	1.00	2,112	12.25	7.04	8.21	17.00	27.00	154.3	1.66	0.30		0.04	0.02		1.50
30-Dec-03	93,241		720	0.69	0.40	1.00	1,584	9.18	7.06	8.26	18.00	28.00	90.0	0.97	0.20		0.03	0.02		1.50
31-Dec-03	93,267		720	0.69	1.50	1.00	1,584	9.18	7.01	7.95	17.00	25.00	90.0	0.96	0.10		0.03	0.02		1.40
Total	4,048,336	0	27,600				59,716						5,220.0							
Maximum	579,631	0	1,080	1.34	2.20	1.00	2,112	15.75	7.06	8.29	20.00	29.00	261.8	2.90	0.50	0.00	0.30	0.04	0.20	1.60
Minimum	72,475	0	540	0.14	0.40	0.60	1,476	1.97	6.90	7.59	16.00	22.00	90.0	0.30	0.10	0.00	0.03	0.01	0.20	0.80
Average	130,591	#DIV/0!	890	0.72	1.53	0.95	1,926	9.26	6.99	8.07	17.64	26.50	168.4	1.45	0.39	#DIV/0!	0.05	0.02	0.20	1.42

Concentration was calculated by dividing the dose of chemical into Intake flow.
Formula of alum was assumed as $Al_2(SO_4)_3$*14.3H_2O.

Table M31.1.4 Water Quality at Salaulim WTP in 2003 (1/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Jan-03	6.56	8.46	0.9	0.4	16	28	17	34	5.5	6	1.2		6.2	6.8				1.2
2-Jan-03	6.56	8.50	0.9	0.3	15	28	17	33	5.5	6	1.2		6.2	7				1.2
3-Jan-03	6.63	8.54	0.8	0.2	16.0	29.0	18.0	36.0	6.0	6.5	0.2		6.0	6.8				1.2
4-Jan-03																		
5-Jan-03																		
6-Jan-03																		
7-Jan-03	6.98	8.00	0.8	0.2	17.0	27.0	18.0	30.0	6.0	6.5			6.2	7.0				1.2
8-Jan-03	6.70	7.98	0.8	0.2	16.0	24.0	17.0	28.0	6.0	6.5			6.4	7.0				1.2
9-Jan-03																		
10-Jan-03	7.00	7.65	0.8	0.2	17.0	23.0	18.0	26.0	6.0	6.5			6.0	6.8			0.2	0.8
11-Jan-03																		
12-Jan-03																		
13-Jan-03																		
14-Jan-03	6.97	7.37	1.0	0.3	16.0	19.0	17.0	21.0	6.0	6.0			6.0	7.0			0.3	0.7
15-Jan-03	6.98	7.39	0.8	0.2	16.0	20.0	18.0	21.0	6.0	6.5			6.0	7.2			0.3	0.8
16-Jan-03	6.95	7.34	0.8	0.2	16.0	19.0	17.0	21.0	6.0	6.5			6.2	7.0			0.3	0.8
17-Jan-03	6.90	7.38	1.0	0.3	16.0	19.0	17.0	20.0	6.0	6.5			6.0	6.8			0.2	0.8
18-Jan-03																		
19-Jan-03																		
20-Jan-03																		
21-Jan-03	6.89	7.32	0.8	0.2	16.0	19.0	17.0	21.0	5.5	6.0			6.0	6.8			0.3	0.8
22-Jan-03	6.95	7.30	0.8	0.3	15.0	19.0	17.0	21.0	5.5	6.0			6.2	6.8			0.3	0.8
23-Jan-03																		
24-Jan-03	6.80	7.20	0.8	0.2	15.0	18.0	17.0	20.0	5.5	6.0			6.0	6.8			0.1	1.0
25-Jan-03																		
26-Jan-03																		
27-Jan-03																		
28-Jan-03	6.80	7.25	0.8	0.3	15.0	17.0	17.0	20.0	6.0	6.5			6.0	7.0			0.1	1.0
29-Jan-03	6.95	7.23	0.8	0.3	15.0	18.0	18.0	21.0	6.0	6.5			6.2	7.0			0.3	0.8
30-Jan-03																		
31-Jan-03	6.90	7.25	1.0	0.5	15.0	18.0	18.0	20.0	6.0	6.0			6.2	7.2			0.3	0.7
Max	7.0	8.5	1.0	0.5	17.0	29.0	18.0	36.0	6.0	6.5			6.4	7.2	0	0	0.3	1.2
Min	6.6	7.2	0.8	0.2	15.0	17.0	17.0	20.0	5.5	6.0			6.0	6.8	0.00	0.00	0.1	0.7
Average	6.9	7.5	0.8	0.3	15.8	20.6	17.4	23.3	5.9	6.3			6.1	6.9	#DIV/0!	#DIV/0!	0.2	0.9

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Feb-03	6.98	7.25	0.8	0.3	15.0	18.0	17.0	21.0	6.0	6.0			6.0	7.0			0.1	0.7
2-Feb-03	6.97	7.24	0.8	0.3	15.0	18.0	17.0	21.0	6.0	6.5			6.2	7.0			0.3	1.0
3-Feb-03	6.97	7.32	1.0	0.3	15.0	19.0	18.0	21.0	6.0	6.5			6.0	6.8			0.3	0.8
4-Feb-03	6.80	7.20	1.5	0.6	17.0	20.0	18.0	22.0	6.0	6.5			6.0	7.0			0.2	0.8
5-Feb-03	6.80	7.20	1.3	0.7	17.0	19.0	18.0	21.0	6.0	6.5			6.0	7.2			0.2	0.7
6-Feb-03																		
7-Feb-03																		
8-Feb-03																		
9-Feb-03																		
10-Feb-03																		
11-Feb-03																		
12-Feb-03																		
13-Feb-03																		
14-Feb-03																		
15-Feb-03																		
16-Feb-03																		
17-Feb-03																		
18-Feb-03	6.88	7.20	1.4	0.7	16.0	20.0	18.0	22.0	5.5	6.0			6.0	6.8			0.2	0.7
19-Feb-03	6.87	7.05	1.4	0.7	16.0	18.0	18.0	19.0	5.5	6.0			6.2	7.0			0.2	0.7
20-Feb-03																		
21-Feb-03																		
22-Feb-03																		
23-Feb-03																		
24-Feb-03	6.70	7.12	1.2	0.5	15.0	18.0	16.0	19.0	6.0	6.5			6.2	6.8			0.3	0.7
25-Feb-03	6.75	7.05	1.4	0.6	16.0	19.0	18.0	20.0	5.5	6.0			6.0	7.0			0.2	0.7
26-Feb-03	6.68	7.00	1.7	0.6	15.0	17.0	18.0	20.0	5.5	6.0			6.0	7.0			0.3	0.7
27-Feb-03																		
28-Feb-03	6.58	7.34	1.5	0.6	14.0	19.0	16.0	21.0	6.0	6.5			6.0	6.8			0.2	0.7
Max	7.0	7.3	1.7	0.7	17.0	20.0	18.0	22.0	6.0	6.5			6.2	7.2	0	0	0.3	0.8
Min	6.6	7.0	1.0	0.3	14.0	17.0	16.0	19.0	5.5	6.0			6.0	6.8	0.00	0.00	0.2	0.7
Average	6.8	7.2	1.4	0.6	15.7	18.8	17.6	20.6	5.8	6.3			6.0	6.9	#DIV/0!	#DIV/0!	0.2	0.7

Table M31.1.4 Water Quality at Salaulim WTP in 2003 (2/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Mar-03																		
2-Mar-03																		
3-Mar-03																		
4-Mar-03																		
5-Mar-03																		
6-Mar-03	6.63	7.71	1.6	0.7	15.0	20.0	17.0	25.0	5.5	6.0	0.3		6.2	6.8			0.3	0.8
7-Mar-03	6.54	8.00	1.5	0.7	16.0	26.0	17.0	30.0	6.0	6.5	0.3		6.0	7.0			0.2	0.6
8-Mar-03	6.59	8.10	1.8	0.7	16.0	27.0	17.0	31.0	6.0	6.5	0.4		6.2	7.0			0.3	0.8
9-Mar-03	6.57	8.08	1.8	0.7	16.0	27.0	18.0	30.0	6.0	6.5	0.5		6.0	7.0				1.2
10-Mar-03	6.62	7.90	1.8	0.6	17.0	26.0	19.0	30.0	6.0	6.5	0.4		6.0	7.0				1.0
11-Mar-03																		
12-Mar-03	6.63	7.90	1.6	0.7	17.0	25.0	18.0	30.0	6.0	6.5	0.3		6.0	7.0				1.0
13-Mar-03	6.76	8.24	1.4	0.4	17.0	25.0	18.0	30.0	5.5	6.5	0.4		6.0	6.8				1.2
14-Mar-03	6.72	8.37	1.6	0.4	16.0	26.0	18.0	32.0	6.0	6.5	0.4		6.2	6.8				1.2
15-Mar-03	6.65	8.18	1.5	0.5	16.0	25.0	18.0	32.0	6.0	6.5	0.3		6.0	6.8				1.2
16-Mar-03																		
17-Mar-03																		
18-Mar-03																		
19-Mar-03																		
20-Mar-03																		
21-Mar-03	6.90	8.38	1.8	0.7	16.0	27.0	18.0	34.0	6.5	7.0	0.5		6.0	6.8				1.2
22-Mar-03																		
23-Mar-03																		
24-Mar-03																		
25-Mar-03	6.70	8.10	1.5	0.7	16.0	25.0	18.0	30.0	6.5	7.0	0.8		6.0	6.8				1.2
26-Mar-03	6.70	8.05	1.5	0.7	16.0	25.0	18.0	30.0	6.5	6.5	0.4		6.0	7.0				1.0
27-Mar-03	6.75	8.18	1.5	0.7	16.0	27.0	18.0	32.0	6.6	7.0	0.4		6.0	7.0				1.2
28-Mar-03																		
29-Mar-03																		
30-Mar-03																		
31-Mar-03																		
Max	6.9	8.4	1.8	0.7	17.0	27.0	19.0	34.0	6.6	7.0	0.8	0.0	6.2	7	0	0	0.3	1.2
Min	6.5	7.7	1.4	0.4	15.0	20.0	17.0	25.0	5.5	6.0	0.3	0.0	6.0	6.8	0.00	0.00	0.2	0.6
Average	6.7	8.1	1.6	0.6	16.2	25.5	17.8	30.5	6.1	6.6	0.4	#DIV/0!	6.0	6.9	#DIV/0!	#DIV/0!	0.3	1.0

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Apr-03	6.80	7.70	1.4	0.6	15.0	24.0	17.0	25.0	6.0	6.5	0.4		6.0	7.0				1
2-Apr-03	6.85	8.40	1.2	0.6	16.0	26.0	17.0	27.0	6.0	6.5	0.3		6.0	7.0				1
3-Apr-03																		
4-Apr-03																		
5-Apr-03																		
6-Apr-03																		
7-Apr-03																		
8-Apr-03	6.86	7.75	1.8	0.7	16.0	24.0	17.0	26.0	6.0	6.5	0.3		6.2	7.0				1.0
9-Apr-03	6.81	7.53	1.6	0.6	15.0	22.0	16.0	24.0	6.0	6.5	0.4		6.2	6.8				1.0
10-Apr-03																		
11-Apr-03	6.80	7.70	1.8	0.7	17.0	24.0	18.0	28.0	6.0	6.5	0.4		6.0	7.0				1.0
12-Apr-03																		
13-Apr-03																		
14-Apr-03																		
15-Apr-03	6.98	7.60	1.8	0.5	18.0	24.0	20.0	26.0	6.0	6.5			6.2	7.2			0.3	0.6
16-Apr-03																		
17-Apr-03																		
18-Apr-03																		
19-Apr-03																		
20-Apr-03																		
21-Apr-03																		
22-Apr-03	6.95	7.25	2.0	0.8	17.0	21.0	18.0	23.0	6.0	6.5			6.2	7.0			0.3	0.7
23-Apr-03	6.98	7.20	2.8	1.4	17.0	20.0	19.0	24.0	6.0	6.5			6.2	7.0			0.3	0.6
24-Apr-03																		
25-Apr-03																		
26-Apr-03																		
27-Apr-03																		
28-Apr-03																		
29-Apr-03	7.00	7.28	3.3	1.5	17.0	22.0	19.0	24.0	6.5	7.0			6.0	7.0			0.2	0.6
30-Apr-03																		
Max	7.0	7.8	3.3	1.5	18.0	24.0	20.0	28.0	6.5	7.0	0.4	0.0	6.2	7.2	0	0	0.3	1.0
Min	6.8	7.2	1.6	0.5	15.0	20.0	16.0	23.0	6.0	6.5	0.3	0.0	6.0	6.8	0.00	0.00	0.2	0.6
Average	6.9	7.5	2.2	0.9	16.7	22.4	18.1	25.0	6.1	6.6	0.4	#DIV/0!	6.1	7.0	#DIV/0!	#DIV/0!	0.3	0.8

Table M31.1.4 Water Quality at Salaulim WTP in 2003 (3/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-May-03																		
2-May-03	6.90	7.28	3	1.5	17.0	20.0	19.0	23.0	6.5	7.0			6.2	7.4			0.3	0.5
3-May-03																		
4-May-03																		
5-May-03																		
6-May-03	7.05	7.28	2.8	1.2	17.0	20.0	18.0	23.0	6.0	6.5			6.0	7.0			0.2	0.6
7-May-03	7.00	7.18	2.0	1.2	18.0	20.0	20.0	22.0	6.0	6.5			6.0	7.2			0.2	0.6
8-May-03																		
9-May-03																		
10-May-03																		
11-May-03																		
12-May-03	6.94	7.24	2.2	1.2	17	19	18	22	6.0	6.5			6.2	7.0			0.1	0.5
13-May-03	7.03	7.15	1.5	0.7	16	20	19	22	6.5	7.0			6.0	7.2	0.04		0.2	0.6
14-May-03	7.10	7.32	1.5	0.5	17	21	20	23	6.5	7.0			6.0	7.2	0.04		0.3	0.6
15-May-03																		
16-May-03	7.10	7.26	1.5	0.5	17	19	19	22	6.0	6.5			6.2	7.0	0.04		0.3	0.6
17-May-03	7.14	7.32	1.6	0.5	17	19	19	22	6.0	6.5			6.2	7.2	0.04		0.3	0.6
18-May-03																		
19-May-03																		
20-May-03	7.14	7.35	1.6	0.6	17	19	20	23	6.0	6.5			6.4	7.2	0.04		0.3	0.6
21-May-03	7.14	7.36	1.6	0.5	17	20	20	23	6.0	6.5			6.2	7.0	0.02		0.3	0.6
22-May-03	7.03	7.30	1.5	0.5	17	19	18	22	6.0	6.5			6.4	7.0	0.04		0.3	0.6
23-May-03	7.11	7.36	1.5	0.5	17	20	18	23	6.0	6.5			6.2	7.2	0.04		0.3	0.6
24-May-03	7.06	7.32	1.5	0.5	17	19	18	20	6.0	6.5			6.2	7.0	0.02		0.3	0.6
25-May-03																		
26-May-03	7.08	7.36	1.5	0.5	17	20	18	22	6.0	6.5			6.2	7.2	0.04		0.3	0.6
27-May-03	7.10	7.39	1.5	0.5	17	20	19	23	6.0	6.5			6.2	7.0	0.04		0.3	0.6
28-May-03	7.08	7.20	2.7	1.0	18	20	20	24	6.0	7.0			6.0	7.2	0.04		0.2	0.6
29-May-03	7.10	7.32	2.0	0.8	17	19	20	23	5.5	6.5			6.0	7.2	0.04		0.2	0.6
30-May-03	7.14	7.26	2.7	1.2	17	18	20	23	6.0	7.0			6.0	7.0	0.01	0.01	0.2	0.6
31-May-03	7.10	7.25	2.8	1.0	17	19	19	22	6.0	7.0			6.0	7.0	0.01		0.2	0.5
Max	7.1	7.4	2.8	1.2	18.0	21.0	20.0	24.0	6.5	7.0	0.0	0.0	6.4	7.2	0.04	0.01	0.3	0.6
Min	6.9	7.2	1.5	0.5	16.0	18.0	18.0	20.0	5.5	6.5	0.0	0.0	6.0	7.0	0.01	0.01	0.1	0.5
Average	7.1	7.3	1.9	0.7	17.1	19.5	19.1	22.4	6.0	6.6	#DIV/0!	#DIV/0!	6.1	7.1	0.03	0.01	0.3	0.6

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Jun-03																		
2-Jun-03	7.02	7.26	2.6	1.4	16.0	19.0	18.0	22.0	6.0	6.5			6.2	7	0.01		0.2	0.6
3-Jun-03	7.02	7.25	2.5	1.5	16.0	19.0	19.0	22.0	6.0	6.5			6.2	7.0	0.01		0.2	0.6
4-Jun-03	7.01	7.26	2.4	1.4	16.0	19.0	18.0	22.0	6.0	6.5			6.4	7.2	0.01		0.2	0.6
5-Jun-03	7.03	7.22	2.4	1.2	16.0	19.0	18.0	22.0	6.0	6.5			6.2	7.0	0.01		0.2	0.6
6-Jun-03	7.04	7.22	2.4	1.2	16.0	18.0	18.0	22.0	6.0	6.5			6.4	7.0	0.01		0.2	0.6
7-Jun-03																		
8-Jun-03	7.04	7.24	2.4	1.2	16.0	19.0	18.0	23.0	6.0	6.5			6.4	7.2	0.01		0.2	0.6
9-Jun-03	7.04	7.23	2.4	1.2	16.0	18.0	18.0	22.0	6.0	6.5			6.4	7.0	0.02		0.2	0.5
10-Jun-03	7.10	7.32	2.8	1.2	17.0	20.0	18.0	22.0	6.5	7.0			6.2	7.4	0.04	0.01		0.6
11-Jun-03	7.05	7.20	2.9	1.3	18.0	21.0	19.0	23.0	6.0	6.5			6.4	7.8	0.05	0.01	0.2	0.6
12-Jun-03	7.06	7.23	2.8	1.4	17.0	20.0	18.0	23.0	6.0	6.5			6.4	7.4	0.06	0.01	0.2	0.4
13-Jun-03	7.10	7.40	3.0	1.5	17.0	20.0	19.0	23.0	6.0	6.5			6.4	7.2	0.06	0.01	0.2	0.6
14-Jun-03	7.08	7.39	3.0	1.5	17.0	20.0	19.0	24.0	6.0	6.5			6.4	7.2	0.06	0.02	0.2	0.5
15-Jun-03	7.03	7.31	6.0	2.0	17.0	20.0	18.0	23.0	6.0	6.5			6.2	7.0	0.08	0.02	0.2	0.6
16-Jun-03																		
17-Jun-03	6.96	7.84	4.2	1.2	16.0	22.0	18.0	25.0	6.0	6.5	0.1		6.4	7.2	0.08	0.02	0.2	0.6
18-Jun-03	7.01	7.98	7.0	2.0	18.0	22.0	19.0	25.0	6.0	6.5	0.3		6.4	7.0	0.06	0.02	0.2	0.6
19-Jun-03	7.04	7.96	6.4	2.2	18.0	22.0	19.0	26.0	6.0	6.5	0.3		6.4	7.2	0.05	0.02	0.2	0.6
20-Jun-03	7.16	8.47	7.0	2.0	18.0	24.0	20.0	30.0	6.0	6.5	0.3		6.2	7.4	0.05	0.05	0.2	0.6
21-Jun-03	7.10	8.07	7.6	2.2	18.0	23.0	20.0	26.0	6.0	6.5	0.3		6.2	7.2	0.05	0.02	0.2	0.6
22-Jun-03																		
23-Jun-03	6.87	7.61	18.2	2.5	20.0	26.0	22.0	32.0	6.0	6.5	3.2	0.05	6.4	7.0	0.08	0.05		0.5
24-Jun-03	6.90	8.04	22.0	1.8	20.0	26.0	22.0	33.0	6.0	6.5	3.6	0.3	6.2	7.4	0.7	0.05		1.2
25-Jun-03	6.78	8.10	25.0	2.3	21.0	30.0	24.0	37.0	6.0	6.5	3	0.2	6.2	7.4	0.5	0.05		1.0
26-Jun-03	6.81	8.21	24.0	2.2	21.0	32.0	25.0	37.0	6.0	6.5	3	0.2	6.2	7.2	0.5	0.05		1.0
27-Jun-03	6.67	8.03	28.0	2.5	20.0	31.0	24.0	36.0	6.0	6.5	2.8	0.1	6.4	7.2	0.8	0.06		1.2
28-Jun-03	6.86	8.41	22.0	2.2	18.0	32.0	21.0	36.0	6.0	6.5	1.8	0.05	6.4	7.2	0.5	0.03		1.2
29-Jun-03																		
30-Jun-03	6.81	8.48	20.0	2.0	18.0	29.0	20.0	36.0	6.0	6.5	1.2		6.4	7.4	0.6	0.05		0.6
Max	7.2	8.5	28.0	2.5	21.0	32.0	25.0	37.0	6.5	7.0	3.6	0.3	6.4	7.8	0.8	0.06	0.2	1.2
Min	6.7	7.2	2.4	1.2	16.0	18.0	18.0	22.0	6.0	6.5	0.1	0.1	6.2	7.0	0.01	0.01	0.2	0.4
Average	7.0	7.7	9.4	1.7	17.7	23.0	19.8	27.1	6.0	6.5	1.7	0.2	6.3	7.2	0.18	0.03	0.2	0.7

Table M31.1.4 Water Quality at Salaulim WTP in 2003 (4/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Jul-03	6.78	8.03	20	1.8	18.0	27.0	19.0	31.0	6.0	6.5	1.0		6.2	7.2	0.60	0.05		0.6
2-Jul-03	6.70	7.91	20	2	16.0	25.0	18.0	32.0	6.0	6.5	0.8		6.2	7	0.80	0.06		1
3-Jul-03	6.71	7.93	18.0	2.0	16.0	24.0	18.0	32.0	6.0	6.5	0.8		6.2	7.2	0.60	0.05		1.0
4-Jul-03	6.71	7.85	15.0	2.0	16.0	24.0	18.0	29.0	6.0	6.5	0.6		6.4	7.2	0.70	0.06		1.0
5-Jul-03																		
6-Jul-03																		
7-Jul-03																		
8-Jul-03	6.83	7.64	10.0	2.0	16.0	22.0	18.0	25.0	6.0	6.5	0.3		6.2	7.0	0.60	0.05		1.0
9-Jul-03	6.81	7.67	6.0	1.8	16.0	20.0	17.0	24.0	6.0	6.5			6.4	7.2	0.40	0.02		0.8
10-Jul-03	6.75	7.60	6.0	2.1	16.0	19.0	17.0	23.0	6.0	6.5			6.4	7.0	0.40	0.01		1.0
11-Jul-03	6.82	7.60	5.0	2.0	17.0	20.0	17.0	23.0	6.0	6.5			6.4	7.2	0.10	0.02		1.0
12-Jul-03	6.93	7.56	5.0	2.0	17.0	19.0	18.0	22.0	6.0	6.5			6.4	7.2	0.20	0.02		0.8
13-Jul-03																		
14-Jul-03	6.86	7.51	5.0	1.8	17.0	19.0	18.0	22.0	6.0	6.5			6.4	7.2	0.10	0.02	0.2	0.8
15-Jul-03	6.80	7.60	4.0	2.0	17.0	20.0	18.0	22.0	6.0	6.5			6.4	7.2	0.10	0.05	0.2	0.6
16-Jul-03	6.85	7.64	4.5	1.6	17.0	20.0	18.0	23.0	6.0	6.5			6.4	7.2	0.10	0.05	0.2	0.7
17-Jul-03	6.82	7.60	5.0	1.6	17.0	20.0	18.0	22.0	6.0	6.5			6.2	7.0	0.10	0.05	0.2	0.5
18-Jul-03	6.87	7.61	4.5	1.6	16.0	20.0	18.0	23.0	6.0	6.5			6.4	7.0	0.10	0.02		1.0
19-Jul-03	6.86	7.62	4.0	1.5	16.0	19.0	17.0	22.0	6.0	6.5			6.2	7.2	0.01	0.05	0.2	0.8
20-Jul-03																		
21-Jul-03	6.81	7.59	4.0	1.5	16.0	19.0	17.0	22.0	6.0	6.5			6.6	7.3	0.20	0.01	0.2	0.6
22-Jul-03	6.80	7.54	4.0	1.8	16.0	20.0	17.0	23.0	6.0	6.5			6.4	7.2	0.20	0.02		1.0
23-Jul-03	6.80	7.60	3.8	1.8	16.0	19.0	17.0	22.0	6.0	6.5			6.4	7.2	0.20	0.02		0.6
24-Jul-03	6.81	7.59	4.0	1.6	16.0	19.0	17.0	21.0	6.0	6.5			6.4	7.2	0.20	0.01	0.2	0.8
25-Jul-03	6.80	7.63	3.5	1.7	15.0	20.0	17.0	24.0	6.0	6.5			6.4	7.2	0.50		0.2	0.6
26-Jul-03	6.80	7.63	4.0	1.5	16.0	19.0	17.0	23.0	6.0	6.5			6.4	7.0	0.10	0.05	0.2	0.6
27-Jul-03																		
28-Jul-03	6.72	7.58	3.5	1.5	16.0	18.0	17.0	22.0	6.0	6.5			6.4	7.0	0.01		0.2	0.6
29-Jul-03	6.65	7.57	4.0	1.0	16.0	19.0	17.0	23.0	6.0	6.5			6.2	7.2	0.05		0.2	0.6
30-Jul-03	6.60	7.60	4.0	1.8	15.0	20.0	18.0	23.0	6.0	6.5			6.2	7.4	0.10	0.05	0.2	0.6
31-Jul-03	6.64	7.59	3.8	1.6	16.0	20.0	17.0	23.0	6.0	6.5			6.2	7.2	0.10	0.05	0.2	0.6
Max	6.9	7.9	18.0	2.1	17.0	24.0	18.0	32.0	6.0	6.5	0.8	0.0	6.6	7.4	0.7	0.06	0.2	1.0
Min	6.6	7.5	3.5	1.0	15.0	18.0	17.0	21.0	6.0	6.5	0.3	0.0	6.2	7.0	0.01	0.01	0.2	0.5
Average	6.8	7.6	5.7	1.7	16.2	20.0	17.4	23.4	6.0	6.5	0.6	#DIV/0!	6.3	7.2	0.22	0.03	0.2	0.8

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Aug-03	6.66	7.50	3.0	1.0	11.0	19.0	17.0	22.0	6.0	6.5			6.2	7.4	0.05		0.2	0.5
2-Aug-03	6.60	7.42	3.0	1.0	15.0	18.0	17.0	20.0	6.0	6.5			6.2	7.2	0.05		0.2	0.6
3-Aug-03																		
4-Aug-03	6.51	7.20	3.0	1.0	15.0	17.0	16.0	19.0	6.0	6.5			6.4	7.2	0.02	0.05	0.2	0.6
5-Aug-03	6.54	7.22	3.0	1.0	16.0	18.0	17.0	20.0	6.0	6.5			6.4	7.2	0.05		0.2	0.6
6-Aug-03	6.60	7.29	3.0	1.5	17.0	20.0	18.0	22.0	6.0	6.5			6.4	7.2	0.05	0.02	0.2	0.6
7-Aug-03	6.58	7.26	3.0	1.0	16.0	19.0	18.0	22.0	6.0	6.5			6.4	7.0	0.08	0.03	0.2	0.4
8-Aug-03	6.62	7.37	3.0	1.0	16.0	19.0	18.0	23.0	6.0	6.5			6.2	7.0	0.05	0.02	0.2	0.5
9-Aug-03	6.48	7.24	3.0	1.0	15.0	18.0	18.0	22.0	6.0	6.5			6.2	7.0	0.05		0.2	0.6
10-Aug-03	6.51	7.28	3.0	1.0	16.0	19.0	18.0	22.0	6.0	6.5			6.4	7.2	0.05		0.2	0.6
11-Aug-03																		
12-Aug-03	6.50	7.53	3.0	1.0	16.0	20.0	18.0	23.0	6.0	6.5			6.2	7.4	0.05		0.2	0.5
13-Aug-03	6.57	7.52	3.0	1.0	15.0	20.0	17.0	23.0	6.0	6.5			6.2	7.2	0.05		0.2	0.6
14-Aug-03	6.51	7.41	3.0	1.0	15.0	19.0	17.0	22.0	6.0	6.5			6.4	7.2	0.03		0.2	0.6
15-Aug-03	6.50	7.41	3.0	1.0	15.0	19.0	17.0	21.0	6.0	6.5			6.2	7.0	0.05		0.2	0.6
16-Aug-03	6.43	7.36	3.0	1.0	15.0	18.0	17.0	21.0	6.0	6.5			6.2	7.0	0.04		0.2	0.6
17-Aug-03																		
18-Aug-03																		
19-Aug-03	6.47	7.33	3.0	1.0	15.0	18.0	16.0	22.0	6.0	6.5			6.4	7.0	0.05		0.2	0.6
20-Aug-03	6.40	7.28	3.0	1.0	15.0	17.0	16.0	21.0	6.0	6.5			6.2	7.0	0.08	0.01	0.2	0.6
21-Aug-03	6.41	7.31	3.0	1.0	16.0	19.0	17.0	22.0	6.0	6.5			6.4	7.2	0.04		0.2	0.6
22-Aug-03	6.50	7.30	3.0	1.2	15.0	19.0	17.0	22.0	6.0	6.5			6.4	7.0	0.04		0.2	0.5
23-Aug-03	6.50	7.30	3.0	1.0	15.0	19.0	17.0	21.0	6.0	6.5			6.2	7.0	0.03		0.2	0.6
24-Aug-03																		
25-Aug-03	6.51	7.31	2.5	0.8	1.0	18.0	17.0	21.0	6.0	6.5			6.4	7.0	0.04		0.2	0.5
26-Aug-03	6.50	7.30	2.8	1.0	15.0	19.0	17.0	21.0	6.0	6.5			6.2	7.0	0.03		0.2	0.5
27-Aug-03	6.46	7.27	3.0	1.0	15.0	19.0	17.0	21.0	6.0	6.5			6.4	7.0	0.03		0.2	0.6
28-Aug-03	6.53	7.31	3.0	1.0	15.0	19.0	17.0	22.0	6.0	6.5			6.2	7.0	0.03		0.2	0.6
29-Aug-03	6.48	7.29	3.0	1.0	15.0	18.0	17.0	21.0	6.0	6.5			6.4	7.2	0.04		0.2	0.5
30-Aug-03																		
31-Aug-03																		
Max	6.6	7.5	3.0	1.5	17.0	20.0	18.0	23.0	6.0	6.5	0.0	0.0	6.4	7.4	0.08	0.05	0.2	0.6
Min	6.4	7.2	2.5	0.8	1.0	17.0	16.0	19.0	6.0	6.5	0.0	0.0	6.2	7.0	0.02	0.01	0.2	0.4
Average	6.5	7.3	3.0	1.0	14.7	18.7	17.1	21.5	6.0	6.5	#DIV/0!	#DIV/0!	6.3	7.1	0.04	0.03	0.2	0.6

Table M31.1.4 Water Quality at Salaulim WTP in 2003 (5/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Sep-03	6.55	7.25	2.9	1.5	15.0	19.0	17.0	21.0	6.0	6.5			6.4	7.2	0.05	0.05	0.2	0.6
2-Sep-03																		
3-Sep-03	6.43	7.22	2.8	1.2	14.0	19.0	17.0	21.0	6.0	6.0			6.2	7.0	0.01	0.02	0.2	0.6
4-Sep-03	6.30	7.40	3.0	1.2	14.0	19.0	16.0	23.0	6.0	6.5			6.2	7.0	0.05	0.05	0.2	0.6
5-Sep-03	6.33	7.53	3.0	1.5	14.0	19.0	17.0	22.0	6.0	6.5			6.2	7.2	0.05	0.03	0.2	0.6
6-Sep-03	6.34	7.47	3.0	1.0	14.0	20.0	17.0	23.0	6.0	6.5			6.4	7.0	0.04		0.2	0.5
7-Sep-03																		
8-Sep-03	6.33	7.31	3.0	1.0	15.0	19.0	17.0	22.0	6.0	6.5			6.2	7.0	0.03		0.2	0.6
9-Sep-03	6.40	7.40	3.0	1.5	15.0	19.0	17.0	21.0	6.0	6.5			6.2	7.4	0.05	0.05	0.2	0.6
10-Sep-03	6.40	7.40	3.0	1.2	14.0	19.0	17.0	21.0	6.0	6.0			6.0	7.4	0.05	0.02	0.2	0.6
11-Sep-03	6.41	7.43	3.5	1.2	14.0	19.0	17.0	22.0	6.0	6.5			6.2	7.2	0.05	0.02	0.2	0.6
12-Sep-03	6.60	7.30	3.0	1.2	15.0	19.0	17.0	21.0	6.0	6.5			6.2	7.0	0.05		0.2	0.6
13-Sep-03	6.47	7.31	3.0	1.0	14.0	19.0	17.0	21.0	6.0	6.5			6.2	7.0	0.05	0.01	0.2	0.6
14-Sep-03																		
15-Sep-03	6.43	7.30	2.5	1.0	14.0	19.0	17.0	22.0	6.0	6.5			6.4	7.2	0.03		0.2	0.6
16-Sep-03	6.62	7.28	3.0	1.2	16.0	20.0	17.0	23.0	6.5	6.5			6.5	7.8	0.05		0.2	0.6
17-Sep-03																		
18-Sep-03	6.32	7.21	3.8	1.4	14.0	18.0	16.0	21.0	6.0	6.5			6.4	7.4	0.03		0.2	0.8
19-Sep-03	6.55	7.35	3.0	1.2	15.0	20.0	17.0	22.0	6.0	6.5			6.6	7.8	0.1		0.2	0.6
20-Sep-03	6.50	7.30	3.4	1.2	15.0	19.0	16.0	21.0	6.0	6.5			6.5	7.6	0.04		0.2	0.6
21-Sep-03																		
22-Sep-03	6.85	7.54	2.0	1.0	15.0	19.0	17.0	22.0	6.0	6.5			6.4	7.4	0.02		0.2	0.6
23-Sep-03	6.90	7.60	2.0	1.0	15.0	20.0	16.0	22.0	6.0	6.5			6.6	7.8	0.02		0.2	0.7
24-Sep-03	6.91	7.49	2.0	1.0	15.0	20.0	16.0	22.0	6.0	6.5			6.6	7.4	0.01		0.2	0.8
25-Sep-03	6.97	7.41	2.0	0.8	15.0	19.0	16.0	21.0	6.0	6.5			6.5	7.4			0.2	0.8
26-Sep-03	7.02	7.32	2.0	1.0	15.0	19.0	17.0	23.0	6.0	6.5			6.6	7.8	0.02		0.2	1.0
27-Sep-03	7.03	7.34	2.0	1.0	15.0	18.0	17.0	22.0	6.0	6.5			6.4	7.6	0.01		0.2	1.0
28-Sep-03																		
29-Sep-03	7.02	7.35	2.8	0.6	16.0	19.0	17.0	22.0	5.5	6.0			6.4	7.8	0.0	0.02	0.2	0.8
30-Sep-03	7.01	7.34	2.2	0.8	16.0	19.0	17.0	21.0	5.5	6.0			6.6	7.6	0.0		0.2	1.2
Max	7.0	7.6	3.8	1.5	16.0	20.0	17.0	23.0	6.5	6.5	0.0	0.0	6.6	7.8	0.05	0.05	0.2	1.2
Min	6.3	7.2	2.0	0.6	14.0	18.0	16.0	21.0	5.5	6.0	0.0	0.0	6.0	7.0	0.01	0.01	0.2	0.5
Average	6.6	7.4	2.7	1.1	14.7	19.1	16.7	21.8	6.0	6.4	#DIV/0!	#DIV/0!	6.4	7.4	0.03	0.03	0.2	0.7

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Oct-03	6.84	7.32	2.8	0.7	16.0	19.0	18.0	22.0	5.5	6.0			6.6	7.8	0.05		0.2	1.0
2-Oct-03	6.48	7.36	2.5	1.0	15.0	19.0	17.0	21.0	5.5	6.0			6.4	7.6	0.05	0.02	0.2	0.8
3-Oct-03	6.93	7.24	2.5	1.0	15.0	18.0	16.0	21.0	5.5	6.0			6.6	7.6	0.02		0.2	1.2
4-Oct-03	6.94	7.31	2.5	1.0	15.0	19.0	17.0	21.0	5.5	6.0			6.4	7.4	0.05	0.02	0.2	1.0
5-Oct-03	6.98	7.32	2.5	1.0	15.0	18.0	17.0	21.0	5.5	6.0			6.6	7.4	0.02		0.2	0.8
6-Oct-03	7.00	7.36	2.0	1.0	15.0	18.0	17.0	21.0	5.5	6.0			6.6	7.8	0.05	0.02	0.2	0.8
7-Oct-03	7.10	7.45	2.5	1.0	15.0	19.0	17.0	21.0	5.5	6.0			6.6	7.8				
8-Oct-03	7.14	7.47	1.8	0.8	16.0	19.0	17.0	22.0	5.5	6.0			6.8	7.8	0.05		0.2	0.8
9-Oct-03	7.05	7.37	2.2	1.0	15.0	19.0	16.0	20.0	5.5	5.5			6.8	7.6	0.02		0.2	0.8
10-Oct-03																		
11-Oct-03	7.02	7.29	2.2	0.8	15.0	19.0	16.0	20.0	5.5	6.0			6.6	7.6	0.02		0.2	0.8
12-Oct-03	7.02	7.33	2.0	1.0	4.0	19.0	16.0	20.0	5.5	5.5			6.8	7.6	0.02		0.20	0.8
13-Oct-03																		
14-Oct-03	6.95	7.30	2.0	0.8	14.0	19.0	16.0	21.0	5.5	6.0			6.6	7.6	0.05	0.02	0.2	0.9
15-Oct-03	6.94	7.31	1.8	1.0	14.0	19.0	16.0	20.0	5.5	6.0			6.4	7.6	0.05		0.20	0.8
16-Oct-03	6.96	7.28	2.0	1.0	14.0	18.0	16.0	20.0	6.0	6.0			6.6	7.6	0.05	0.02	0.2	0.8
17-Oct-03	7.05	7.25	1.8	0.8	15.0	19.0	16.0	21.0	6.0	6.5			6.4	7.6			0.2	1.0
18-Oct-03	6.98	7.24	1.8	1.0	15.0	18.0	16.0	20.0	6.0	6.5			6.6	7.6			0.2	0.8
19-Oct-03																		
20-Oct-03	7.00	7.31	2.0	0.8	15.0	19.0	16.0	21.0	6.0	6.0			6.6	7.4	0.04		0.2	0.8
21-Oct-03	6.95	7.28	1.8	1.0	15.0	19.0	17.0	22.0	6.0	6.5			6.4	7.4	0.05		0.2	0.8
22-Oct-03	6.90	7.27	1.8	0.7	15.0	19.0	16.0	20.0	6.0	6.0			6.2	7.4			0.2	1.0
23-Oct-03	6.98	7.29	2.0	0.8	15.0	19.0	16.0	21.0	6.0	6.5			6.2	7.2	0.02		0.2	0.8
24-Oct-03																		
25-Oct-03	7.00	7.30	2.0	0.8	15.0	19.0	16.0	21.0	5.5	6.0			6.4	7.4	0.03		0.2	0.8
26-Oct-03																		
27-Oct-03	6.48	7.30	2.0	1.0	14.0	18.0	15.0	20.0	6.0	6.0			6.4	7.6	0.02		0.2	0.8
28-Oct-03	6.89	7.23	1.8	0.8	15.0	19.0	16.0	21.0	6.0	6.5			6.0	7.8	0.05	0.02	0.2	0.8
29-Oct-03	6.90	7.24	2.0	0.8	14.0	19.0	16.0	21.0	6.0	6.5			6.4	7.6	0.04	0.02	0.2	0.8
30-Oct-03	6.93	7.24	2.0	0.8	14.0	19.0	16.0	22.0	6.0	6.5			6.6	7.8	0.03	0.02	0.2	0.8
31-Oct-03	6.85	7.29	1.5	0.8	15.0	19.0	15.0	22.0	6.0	6.5			6.6	7.8	0.05	0.02	0.2	0.8
Max	7.1	7.5	2.5	1.0	16.0	19.0	17.0	22.0	6.0	6.5	0.0	0.0	6.8	7.8	0.05	0.02	0.2	1.2
Min	6.5	7.2	1.5	0.7	4.0	18.0	15.0	20.0	5.5	5.5	0.0	0.0	6.0	7.2	0.02	0.02	0.2	0.8
Average	7.0	7.3	2.0	0.9	14.3	18.8	16.2	20.8	5.8	6.1	#DIV/0!	#DIV/0!	6.5	7.6	0.04	0.02	0.2	0.8

Table M31.1.4 Water Quality at Salaulim WTP in 2003 (6/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Nov-03																		
2-Nov-03	6.81	7.24	1.8	1.0	15.0	19.0	15.0	21.0	6.0	6.5			6.6	7.6	0.04	0.02	0.2	0.8
3-Nov-03	6.41	7.25	1.5	0.8	14.0	19.0	16.0	20.0		6.5			6.6	7.8	0.04	0.02	0.2	0.8
4-Nov-03	6.90	7.30	1.6	0.7	15.0	19.0	16.0	22.0	6.0	6.0			6.4	7.6	0.05	0.02	0.2	0.8
5-Nov-03	6.41	7.29	1.6	0.8	15.0	18.0	16.0	21.0	6.0	6.5			6.4	7.6	0.03		0.2	0.8
6-Nov-03	6.98	7.30	1.8	0.8	15.0	19.0	16.0	21.0	6.0	6.5			6.6	7.6	0.04	0.02	0.2	0.5
7-Nov-03	7.04	7.40	1.8	0.8	16.0	20.0	17.0	22.0	6.0	6.5			6.4	7.6	0.05	0.02	0.2	0.8
8-Nov-03	7.00	7.30	1.5	0.8	15.0	20.0	16.0	22.0	6.0	6.5			6.4	7.4	0.04	0.02	0.2	0.9
9-Nov-03																		
10-Nov-03	7.03	7.36	1.5	0.8	15.0	19.0	16.0	21.0	6.0	6.5			6.6	7.6	0.04		0.2	0.8
11-Nov-03	7.07	7.32	1.6	0.7	15.0	19.0	17.0	22.0	6.0	6.5			6.6	7.4	0.05	0.02	0.2	0.6
12-Nov-03	7.10	7.38	1.8	0.9	16.0	20.0	17.0	22.0	6.0	6.5			6.6	7.6	0.05	0.05	0.2	1.0
13-Nov-03	7.04	7.39	1.5	0.8	15.0	20.0	16.0	22.0	6.0	6.5			6.6	7.4	0.05	0.02	0.2	0.8
14-Nov-03	7.07	7.38	1.8	0.9	16.0	21.0	17.0	23.0	6.0	6.5			6.4	7.2	0.05	0.05	0.2	0.8
15-Nov-03																		
16-Nov-03																		
17-Nov-03	7.00	7.35	1.4	0.8	15.0	21.0	16.0	22.0	6.0	6.5			6.4	7.4	0.04	0.02	0.2	1.0
18-Nov-03	7.02	7.32	1.7	0.8	15.0	20.0	16.0	22.0	6.0	6.5			6.4	7.6	0.05	0.05	0.2	0.8
19-Nov-03	7.02	7.36	1.4	0.8	15.0	20.0	16.0	22.0	6.0	6.5			6.4	7.4	0.04	0.02	0.2	0.5
20-Nov-03	7.00	7.39	1.2	0.8	15.0	19.0	16.0	21.0	6.0	6.0			6.6	7.4	0.05	0.02	0.2	0.6
21-Nov-03	7.06	7.44	1.5	0.9	16.0	20.0	18.0	24.0	6.0	6.5			6.4	7.2	0.04	0.02	0.2	1.0
22-Nov-03	7.01	7.38	1.4	0.8	16.0	19.0	18.0	22.0	6.0	6.5			6.4	7.2	0.03		0.2	0.8
23-Nov-03																		
24-Nov-03	7.04	7.41	1.4	0.8	15.0	20.0	17.0	22.0	6.0	6.5			6.4	7.4	0.03	0.01	0.2	0.8
25-Nov-03	7.10	7.38	2.0	1.0	17.0	21.0	19.0	24.0	6.0	6.5	0.2		6.6	7.2	0.02	0.02	0.2	1.0
26-Nov-03	7.06	7.57	2.0	1.0	16.0	20.0	18.0	24.0	6.0	6.5	0.1		6.4	7.4	0.03	0.02	0.2	0.8
27-Nov-03	7.08	7.61	1.4	0.8	16.0	22.0	17.0	24.0	6.0	6.5	0.2		6.4	7.2	0.04	0.02	0.2	0.8
28-Nov-03	7.08	7.67	1.4	0.8	16.0	22.0	17.0	25.0	6.0	6.5	0.2		6.4	7.2	0.04	0.01	0.2	0.8
29-Nov-03	7.03	7.56	1.8	0.8	15.0	22.0	17.0	24.0	6.0	6.5	0.2		6.6	7.4	0.03	0.01	0.2	0.6
30-Nov-03																		
Max	7.1	7.7	2.0	1.0	17.0	22.0	19.0	25.0	6.0	6.5	0.2	0.0	6.6	7.8	0.05	0.05	0.2	1.0
Min	6.4	7.3	1.2	0.7	14.0	18.0	16.0	20.0	6.0	6.0	0.1	0.0	6.4	7.2	0.02	0.01	0.2	0.5
Average	7.0	7.4	1.6	0.8	15.4	20.0	16.7	22.3	6.0	6.5	0.2	#DIV/0!	6.5	7.4	0.04	0.02	0.2	0.8

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Dec-03	7.02	7.65	1.4	1.0	16.0	22.0	17.0	25.0	6.0	6.5	0.3		6.4	7.2	0.03	0.02	0.2	1.0
2-Dec-03	7.00	7.73	1.5	0.8	17.0	23.0	19.0	27.0	6.0	6.5	0.4		6.6	7.4	0.04	0.02	0.2	0.8
3-Dec-03																		
4-Dec-03																		
5-Dec-03	7.00	7.59	1.2	0.6	16.0	22.0	19.0	26.0	6.0	6.5	0.4		6.2	7.2	0.04	0.01		1.2
6-Dec-03																		
7-Dec-03																		
8-Dec-03	7.01	8.10	1.0	0.7	16.0	26.0	17.0	29.0	6.0	6.5	0.4		6.4	7.4	0.30	0.02		1.2
9-Dec-03	6.94	8.29	2.0	0.9	18.0	27.0	20.0	31.0	6.0	6.5	0.4		6.2	7.4	0.05	0.04		1.5
10-Dec-03	6.90	8.25	2.0	1.0	18.0	28.0	20.0	32.0	6.0	6.5	0.4		6.4	7.4	0.05	0.04		1.5
11-Dec-03	6.91	8.19	2.0	1.0	18.0	27.0	19.0	32.0	6.0	6.5	0.4		6.2	7.4	0.04	0.02		1.4
12-Dec-03	6.95	8.04	2.2	1.0	18.0	26.0	19.0	30.0	6.0	6.5	0.3		6.2	7.4	0.05	0.03		1.6
13-Dec-03	6.90	8.21	2.0	1.0	17.0	26.0	19.0	31.0	6.0	6.5	0.4		6.4	7.4	0.04	0.02		1.6
14-Dec-03																		
15-Dec-03	7.01	8.01	1.2	0.8	17.0	26.0	18.0	31.0	6.0	6.5	0.4		6.4	7.4	0.04	0.02		1.5
16-Dec-03	7.02	8.15	1.5	1.0	18.0	27.0	20.0	32.0	5.5	6.0	0.4		6.4	7.2	0.04	0.04		1.5
17-Dec-03	6.95	8.17	1.8	1.0	18.0	28.0	20.0	33.0	6.0	6.5	0.4		6.2	7.4	0.05	0.02		1.5
18-Dec-03	7.00	8.18	1.6	1.0	18.0	27.0	20.0	32.0	6.0	6.5	0.5		6.4	7.4	0.04	0.03		1.5
19-Dec-03																		
20-Dec-03	7.00	8.15	1.6	1.0	18.0	26.0	19.0	30.0	6.0	6.5	0.4		6.2	7.4	0.03	0.02		1.5
21-Dec-03																		
22-Dec-03	7.00	8.14	1.5	1.0	18.0	27.0	20.0	32.0	6.0	6.5	0.5		6.4	7.4	0.04	0.02		1.5
23-Dec-03	6.95	8.00	1.5	1.0	20.0	29.0	22.0	34.0	6.0	6.5	0.4		6.2	7.0	0.03	0.02		1.5
24-Dec-03	7.00	8.01	1.5	1.0	19.0	29.0	22.0	34.0	6.0	6.5	0.5		6.2	7.2	0.04	0.02		1.5
25-Dec-03																		
26-Dec-03	7.02	8.06	1.5	1.0	19.0	29.0	21.0	32.0	6.0	6.5	0.5		6.4	7.2	0.03	0.02		1.5
27-Dec-03	7.03	8.13	1.5	1.0	17.0	28.0	19.0	32.0	6.0	6.0	0.4		6.2	7.2	0.03	0.02		1.5
28-Dec-03																		
29-Dec-03	7.04	8.21	1.2	1.0	17.0	27.0	18.0	32.0	6.0	6.5	0.3		6.4	7.2	0.04	0.02		1.5
30-Dec-03	7.06	8.26	0.4	1.0	18.0	28.0	19.0	32.0	6.0	6.5	0.2		6.4	7.4	0.03	0.02		1.5
31-Dec-03	7.01	7.95	1.5	1.0	17.0	25.0	18.0	30.0	6.0	6.5	0.1		6.4	7.6	0.03	0.02		1.4
Max	7.1	8.3	2.2	1.0	20.0	29.0	22.0	34.0	6.0	6.5	0.5	0.0	6.4	7.6	0.3	0.04	0.0	1.6
Min	6.9	7.6	0.4	0.6	16.0	22.0	17.0	26.0	5.5	6.0	0.1	0.0	6.2	7.0	0.03	0.01	0.0	1.2
Average	7.0	8.1	1.5	1.0	17.8	26.9	19.5	31.4	6.0	6.5	0.4	#DIV/0!	6.3	7.3	0.05	0.02	#DIV/0!	1.5

Table M31.1.5 Water Quality at Salaulim WTP in 2004 (1/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Jan-04																		
2-Jan-04																		
3-Jan-04	7.0	7.8	1.5	1.0	17.0	26.0	20.0	29.0	6.0	6.5			6.2	7.4	0.04	0.02	0.2	1.0
4-Jan-04																		
5-Jan-04	7.0	7.7	1.5	1.0	17.0	24.0	18.0	25.0	6.0	6.5			6.4	7.2	0.04	0.02	0.2	1.0
6-Jan-04	7.0	7.7	1.4	1.0	16.0	24.0	17.0	25.0	6.0	6.5			6.6	7.4	0.03	0.03	0.2	1.0
7-Jan-04	7.1	7.7	1.5	0.8	18.0	25.0	20.0	28.0	5.5	6.0			6.6	7.4	0.07	0.02	0.2	0.8
8-Jan-04	7.1	7.5	1.2	0.7	17.0	24.0	18.0	26.0	6.0	6.0			6.4	7.4	0.05	0.03	0.2	0.8
9-Jan-04	7.1	7.5	1.2	0.8	17.0	23.0	19.0	26.0	6.0	6.5			6.6	7.4	0.05	0.03	0.2	1.0
10-Jan-04	7.1	7.5	1.2	0.8	17.0	22.0	19.0	26.0	6.0	6.5			6.4	7.4	0.04	0.03	0.2	0.8
11-Jan-04	7.0	7.5	1.2	0.8	17.0	23.0	19.0	27.0	6.0	6.5			6.6	7.6	0.03	0.02	0.2	1.0
12-Jan-04	7.1	7.5	1.4	1.0	17.0	22.0	19.0	26.0	6.0	6.5			6.6	7.4	0.06	0.04	0.2	1.0
13-Jan-04	7.0	7.5	1.2	0.8	17.0	22.0	18.0	26.0	6.0	6.5			6.4	7.2	0.05	0.03	0.2	1.0
14-Jan-04	7.0	7.5	1.2	0.8	17.0	22.0	18.0	25.0	6.0	6.5			6.6	7.4	0.04	0.04	0.2	0.5
15-Jan-04	7.0	7.5	1.2	0.8	17.0	22.0	19.0	25.0	6.0	6.5			6.4	7.4	0.05	0.03	0.2	0.8
16-Jan-04	7.1	7.5	1.2	0.8	16.0	23.0	20.0	26.0	6.0	6.5			6.2	7.3	0.05	0.04	0.2	0.8
17-Jan-04	7.0	7.5	1.2	0.8	16.0	23.0	19.0	26.0	6.0	6.5			6.2	7.2	0.04	0.02	0.2	0.8
18-Jan-04	7.0	7.5	1.2	0.8	16.0	22.0	18.0	26.0	6.0	6.5			6.4	7.4	0.04	0.03	0.2	1.0
19-Jan-04	7.0	7.5	1.2	0.7	17.0	23.0	18.0	26.0	6.0	6.5			6.4	7.2	0.04	0.02	0.2	0.5
20-Jan-04	7.1	7.5	1.4	1.0	17.0	23.0	19.0	26.0	6.0	6.5			6.0	7.2	0.06	0.03	0.2	0.5
21-Jan-04	7.1	7.4	1.2	1.0	16.0	22.0	18.0	24.0	5.5	6.0			6.4	7.2	0.04	0.02	0.2	0.6
22-Jan-04	7.0	7.5	1.2	0.8	16.0	23.0	19.0	25.0	6.0	6.0			6.6	7.4	0.04	0.03	0.2	1.0
23-Jan-04	7.1	7.5	1.2	0.8	16.0	22.0	19.0	25.0	6.0	6.0			6.4	7.4	0.05	0.03	0.2	1.0
24-Jan-04	7.0	7.5	1.2	0.7	15.0	22.0	19.0	25.0	6.0	6.5			6.6	7.4	0.05	0.04	0.2	0.8
25-Jan-04	7.0	7.5	1.2	0.8	15.0	23.0	19.0	26.0	6.0	6.0			6.4	7.2	0.04	0.03	0.2	0.8
26-Jan-04	7.0	7.5	1.2	0.8	15.0	22.0	19.0	26.0	6.0	6.5			6.6	7.4	0.05	0.02	0.2	0.8
27-Jan-04	7.1	7.4	7.0	0.8	15.0	21.0	19.0	24.0	6.0	6.0			6.4	7.4	0.05	0.02	0.2	0.8
28-Jan-04	7.1	7.5	1.4	1.0	16.0	23.0	18.0	24.0	6.0	6.0			6.2	7.6	0.05	0.02	0.2	1.0
29-Jan-04	7.1	7.5	1.2	0.8	15.0	23.0	18.0	25.0	6.0	6.5			6.2	7.4	0.04	0.03	0.2	0.8
30-Jan-04	7.1	7.5	1.4	0.8	16.0	22.0	18.0	25.0	6.0	6.5			6.4	7.6	0.06	0.02	0.2	0.8
31-Jan-04	7.2	7.5	1.2	1.0	16.0	23.0	18.0	25.0	6.0	6.5			6.4	7.4	0.05	0.03	0.2	1.0
Max	7.2	7.8	7.0	1.0	18.0	26.0	20.0	29.0	6.0	6.5			6.6	7.6	0.07	0.04	0.2	1.0
Min	7.0	7.4	1.2	0.7	15.0	21.0	17.0	24.0	5.5	6.0			6.0	7.2	0.03	0.02	0.2	0.5
Average	7.1	7.5	1.5	0.8	16.3	22.8	18.6	25.6	6.0	6.4			6.4	7.4	0.05	0.03	0.2	0.8

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Feb-04	7.12	7.52	1.2	0.8	15.0	23.0	18.0	25.0	6.0	6.5			6.2	7.4	0.04	0.02	0.2	0.8
2-Feb-04	7.14	7.44	1.5	0.6	17.0	21.0	19.0	24.0	6.0	6.0			6.4	7.6	0.04	0.03	0.2	0.8
3-Feb-04	7.14	7.52	1.2	0.8	16.0	22.0	19.0	25.0	6.0	6.5			6.6	7.4	0.04	0.02	0.2	0.6
4-Feb-04	7.15	7.50	1.4	0.7	17.0	21.0	19.0	23.0	6.0	6.0			6.6	7.6	0.04	0.03	0.2	1.0
5-Feb-04	7.12	7.49	1.4	0.8	17.0	21.0	18.0	23.0	6.0	6.0			6.4	7.4	0.04	0.02	0.2	0.6
6-Feb-04	7.20	7.56	1.6	0.8	16.0	21.0	18.0	24.0	6.0	6.0			6.4	7.6	0.02	0.03		1.0
7-Feb-04	7.15	7.56	1.4	0.8	16.0	21.0	17.0	24.0	6.0	6.5			6.4	7.4	0.05	0.03	0.2	1.0
8-Feb-04	7.15	7.52	1.4	0.8	17.0	22.0	18.0	24.0	6.0	6.5			6.2	7.4	0.04	0.02	0.2	0.8
9-Feb-04	7.17	7.58	1.2	0.7	17.0	22.0	18.0	25.0	6.0	6.5			6.4	7.6	0.04	0.03	0.2	1.0
10-Feb-04	7.11	7.49	1.2	0.8	17.0	21.0	18.0	24.0	6.0	6.5			6.6	7.6	0.04	0.04	0.2	0.8
11-Feb-04	7.17	7.58	1.2	0.8	17.0	21.0	18.0	24.0	6.0	6.5			6.6	7.8	0.05	0.03	0.2	1.0
12-Feb-04	7.14	7.49	1.2	0.8	17.0	21.0	18.0	23.0	6.0	6.5			6.4	7.6	0.04	0.03	0.2	0.8
13-Feb-04	7.12	7.50	1.2	0.8	17.0	22.0	18.0	24.0	6.0	6.5			6.6	7.6	0.05	0.04	0.2	0.8
14-Feb-04	7.15	7.49	1.2	0.8	17.0	21.0	18.0	23.0	6.0	6.0			6.4	7.4	0.04	0.02	0.2	0.8
15-Feb-04	7.13	7.50	1.2	0.8	17.0	21.0	18.0	22.0	6.0	6.5			6.6	7.6	0.03	0.02	0.2	0.8
16-Feb-04	7.14	7.52	1.2	0.8	17.0	22.0	18.0	24.0	6.0	6.5			6.4	7.4	0.03	0.02	0.2	0.8
17-Feb-04	7.16	7.50	1.2	0.7	16.0	22.0	19.0	25.0	6.0	6.0			6.6	7.8	0.05	0.03	0.2	1.0
18-Feb-04	7.15	7.50	1.0	0.6	16.0	21.0	19.0	25.0	6.0	6.5			6.6	7.6	0.06	0.04	0.2	1.0
19-Feb-04	7.15	7.52	1.0	0.7	16.0	22.0	19.0	25.0	6.0	6.5			6.4	7.6	0.05	0.03	0.2	1.2
20-Feb-04	7.15	7.52	1.0	0.7	17.0	22.0	18.0	25.0	6.0	6.5			6.6	7.8	0.07	0.04	0.2	1.0
21-Feb-04	7.14	7.51	1.0	0.6	17.0	22.0	18.0	25.0	6.0	6.5			6.4	7.6	0.05	0.03	0.2	0.8
22-Feb-04	7.11	7.49	1.0	0.6	16.0	21.0	18.0	24.0	6.0	6.5			6.6	7.6	0.06	0.04	0.2	0.6
23-Feb-04	7.15	7.54	1.0	0.6	17.0	21.0	18.0	25.0	6.0	6.5			6.6	7.6	0.05	0.04	0.2	1.0
24-Feb-04	7.13	7.54	1.0	0.7	17.0	22.0	18.0	25.0	6.0	6.5			6.4	7.4	0.05	0.03	0.2	0.8
25-Feb-04	7.05	7.44	1.0	0.7	17.0	21.0	18.0	23.0	6.0	6.5			6.6	7.8	0.06	0.03	0.2	1.0
26-Feb-04	7.10	7.48	1.0	0.8	17.0	21.0	18.0	22.0	6.0	6.5			6.4	7.6	0.05	0.04	0.2	0.6
27-Feb-04																		
28-Feb-04	7.13	7.52	1.0	0.7	17.0	22.0	18.0	23.0	6.0	6.5			6.6	7.6	0.06	0.03	0.2	0.8
29-Feb-04	7.12	7.48	1.0	0.7	17.0	22.0	18.0	24.0	6.0	6.5			6.6	7.6	0.04	0.02	0.2	0.8
Max	7.2	7.6	1.6	0.8	17.0	22.0	19.0	25.0	6.0	6.5			6.6	7.8	0.07	0.04	0.2	1.2
Min	7.1	7.4	1.0	0.6	16.0	21.0	17.0	22.0	6.0	6.0			6.2	7.4	0.02	0.02	0.2	0.6
Average	7.1	7.5	1.2	0.7	16.7	21.5	18.2	24.0	6.0	6.4			6.5	7.6	0.05	0.03	0.2	0.9

Table M31.1.5 Water Quality at Salaulim WTP in 2004 (2/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Mar-04	7.10	7.49	1.0	0.8	16.0	21.0	18.0	24.0	6.0	6.5			6.8	7.6	0.03	0.02	0.2	0.8
2-Mar-04	7.15	7.42	1.0	0.7	15.0	20.0	18.0	25.0	6.0	6.5			6.6	7.4	0.06	0.04	0.2	0.8
3-Mar-04	7.05	7.39	1.0	0.8	15.0	20.0	18.0	25.0	6.0	6.5			6.4	7.4	0.05	0.03	0.2	1.0
4-Mar-04	7.02	7.38	1.0	0.8	15.0	20.0	17.0	22.0	6.0	6.5			6.4	7.4	0.04	0.03	0.2	0.8
5-Mar-04	7.04	7.35	1.0	0.6	15.0	20.0	18.0	24.0	6.0	6.5			6.4	7.6	0.05	0.04	0.2	1.0
6-Mar-04	7.03	7.34	1.0	0.6	15.0	20.0	17.0	22.0	6.0	6.5			6.4	7.4	0.05	0.03	0.2	0.8
7-Mar-04																		
8-Mar-04	7.09	7.41	1.0	0.7	16.0	21.0	18.0	23.0	6.0	6.5			6.6	7.4	0.06	0.04	0.2	0.6
9-Mar-04	6.95	7.36	1.0	0.8	15.0	20.0	18.0	24.0	6.0	6.5			6.4	7.2	0.05	0.04	0.2	1.0
10-Mar-04	6.86	7.38	1.0	0.8	15.0	21.0	18.0	23.0	6.0	6.5			6.8	7.6	0.05	0.04	0.2	1.0
11-Mar-04	6.93	7.34	1.0	0.8	15.0	20.0	17.0	22.0	6.0	6.5			6.6	7.4	0.05	0.03	0.2	0.8
12-Mar-04	6.85	7.28	1.0	0.8	15.0	20.0	17.0	22.0	6.0	6.5			6.6	7.8	0.05	0.02	0.2	1.0
13-Mar-04	6.81	7.39	1.0	0.8	15.0	21.0	17.0	23.0	6.0	6.5			6.4	7.6	0.05	0.03	0.2	1.0
14-Mar-04	6.91	7.61	1.0	0.8	16.0	23.0	19.0	24.0	6.0	6.5			6.6	7.6	0.04	0.02	0.2	1.0
15-Mar-04	6.96	7.60	1.0	0.8	16.0	22.0	18.0	26.0	6.0	6.5	0.1		6.4	7.4	0.05	0.03	0.2	1.0
16-Mar-04	6.95	7.59	1.0	0.8	16.0	22.0	18.0	25.0	6.0	6.5	0.05		6.6	7.8	0.06	0.04	0.2	0.8
17-Mar-04	6.90	7.58	1.0	0.8	15.0	22.0	18.0	27.0	6.0	6.5	0.1		6.6	7.8			0.2	0.8
18-Mar-04	6.94	7.61	1.0	0.8	15.0	22.0	18.0	26.0	6.0	6.5	0.1		6.4	7.6			0.2	0.8
19-Mar-04	6.96	7.54	1.2	0.8	17.0	22.0	18.0	28.0	6.5	6.5	0.25		6.4	7.6			0.2	0.7
20-Mar-04	6.98	7.76	1.4	1.0	16.0	23.0	18.0	28.0	6.0	6.5	0.3		6.4	7.4			0.2	1.0
21-Mar-04	7.00	7.81	1.4	1.0	16.0	23.0	19.0	28.0	6.0	6.5	0.3		6.6	7.4			0.2	0.8
22-Mar-04	7.01	7.76	1.4	1.0	16.0	22.0	18.0	27.0	6.0	6.5	0.3		6.4	7.4			0.2	0.6
23-Mar-04	6.96	7.84	1.4	1.0	15.0	23.0	17.0	27.0	6.0	6.5	0.4		6.4	7.4				1.2
24-Mar-04	7.00	7.85	1.2	1.0	15.0	24.0	19.0	30.0	6.0	6.5	0.35		6.4	7.6				1.5
25-Mar-04	6.98	7.93	1.2	1.0	15.0	24.0	18.0	29.0	6.0	6.5	0.4		6.6	7.6				1.4
26-Mar-04	7.00	7.96	1.2	0.8	15.0	25.0	17.0	31.0	6.0	6.5	0.4		6.4	7.4				1.4
27-Mar-04	7.00	8.01	1.2	0.8	15.0	26.0	18.0	32.0	6.0	6.5	0.4		6.4	7.2				1.5
28-Mar-04	7.00	8.10	1.2	0.8	16.0	26.0	18.0	32.0	6.0	6.5	0.4		6.6	7.4				1.4
29-Mar-04	7.00	8.10	1.2	1.0	16.0	26.0	19.0	32.0	6.0	6.5	0.4		6.4	7.2				1.4
30-Mar-04	7.00	8.11	1.2	1.0	16.0	26.0	19.0	33.0	6.0	6.5	0.45		6.6	7.4				1.4
31-Mar-04	7.08	8.05	1.4	1.0	17.0	26.0	19.0	32.0	6.0	7.0	0.5		6.6	7.6				1.4
Max	7.1	8.1	1.4	1.0	17.0	26.0	19.0	33.0	6.5	7.0	0.5	0.0	6.8	7.8	0.06	0.04	0.2	1.5
Min	6.8	7.3	1.0	0.6	15.0	20.0	17.0	22.0	6.0	6.5	0.1	0.0	6.4	7.2	0.04	0.02	0.2	0.6
Average	7.0	7.7	1.1	0.8	15.5	22.5	18.0	26.7	6.0	6.5	0.3	#DIV/0!	6.5	7.5	0.05	0.03	0.2	1.0

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Apr-04	7.01	8.00	1.4	1.0	16.0	26.0	19.0	31.0	6.0	6.5	0.6		6.6	7.4				1.4
2-Apr-04	7.15	8.10	1.5	1.0	17.0	26.0	20.0	34.0	6.0	6.5	0.7		6.6	7.4				1.4
3-Apr-04	7.06	8.08	1.4	1.0	16.0	26.0	19.0	33.0	6.0	6.5	0.6		6.6	7.6				1.4
4-Apr-04	7.08	8.07	1.5	1.0	16.0	26.0	19.0	32.0	6.0	6.5	0.5		6.4	7.4				0.8
5-Apr-04	6.98	8.10	1.5	1.0	16.0	27.0	18.0	33.0	6.0	6.5	0.5		6.6	7.4				1.5
6-Apr-04	7.02	8.02	1.5	1.0	17.0	26.0	19.0	34.0	6.0	6.5	0.5		6.6	7.2				1.4
7-Apr-04	7.20	8.17	1.2	0.8	17.0	25.0	20.0	34.0	6.0	6.5	0.5		6.6	7.6	0.05	0.02		1.4
8-Apr-04	7.20	8.23	1.4	1.0	17.0	27.0	19.0	34.0	6.0	6.5	0.5		6.6	7.4	0.05	0.03		1.2
9-Apr-04	7.14	8.20	1.4	1.0	17.0	26.0	19.0	34.0	6.0	6.5	0.5		6.4	7.4	0.04	0.02		1.2
10-Apr-04	7.16	8.20	1.4	1.0	17.0	27.0	19.0	35.0	6.0	6.5	0.5		6.6	7.6	0.04	0.02		1.2
11-Apr-04																		
12-Apr-04	7.14	8.26	1.4	1.0	17.0	27.0	19.0	35.0	6.0	6.5	0.3		6.6	7.4	0.04	0.02		1.5
13-Apr-04	7.20	8.45	1.2	0.8	16.0	27.0	20.0	33.0	6.0	6.5	0.1		6.4	7.2	0.05	0.03		1.5
14-Apr-04	7.00	7.85	1.2	0.8	16.0	23.0	20.0	29.0	6.0	6.5	0.2		6.4	7.4	0.06	0.02		1.5
15-Apr-04	7.06	7.53	1.2	0.8	16.0	23.0	18.0	25.0	6.0	6.5	0.1		6.4	7.2	0.05	0.03		1.5
16-Apr-04	7.15	7.70	1.2	0.8	16.0	22.0	18.0	25.0	6.0	6.5	0.1		6.6	7.6	0.06	0.03		1.5
17-Apr-04	7.15	7.67	1.2	0.8	17.0	22.0	18.0	24.0	6.0	6.5	0.1		6.6	7.6	0.06	0.02		1.5
18-Apr-04	7.16	7.67	1.2	0.8	16.0	22.0	18.0	24.0	6.0	6.5	0.1		6.4	7.2	0.05	0.03		1.4
19-Apr-04	7.13	7.70	1.2	0.8	16.0	23.0	18.0	24.0	6.0	6.5			6.6	7.4	0.05	0.02	0.2	1.2
20-Apr-04	7.12	7.67	1.2	0.8	16.0	22.0	18.0	24.0	6.0	6.5			6.4	7.2	0.04	0.02	0.2	1.0
21-Apr-04	7.20	7.82	1.4	1.0	16.0	21.0	19.0	25.0	6.5	7.0			6.6	7.4	0.05	0.02	0.2	1.0
22-Apr-04	7.18	7.78	1.2	1.0	16.0	21.0	19.0	25.0	6.0	6.5			6.4	7.4	0.04	0.02	0.2	0.8
23-Apr-04	7.22	7.81	1.2	1.0	16.0	22.0	20.0	27.0	6.5	7.0	0.1		6.4	7.6	0.05	0.02	0.2	0.8
24-Apr-04	7.16	7.71	1.2	0.8	16.0	21.0	19.0	26.0	6.5	7.0	0.1		6.4	7.4	0.04	0.02	0.2	0.8
25-Apr-04	7.18	7.79	1.4	0.8	16.0	22.0	19.0	26.0	6.0	6.5	0.1		6.6	7.4	0.05	0.03	0.2	0.6
26-Apr-04	7.14	7.73	1.4	0.8	16.0	21.0	18.0	25.0	6.0	6.5	0.1		6.4	7.4	0.04	0.02	0.2	0.8
27-Apr-04	7.20	7.80	1.5	1.0	17.0	22.0	18.0	26.0	6.0	6.5	0.1		6.4	7.6	0.05	0.02	0.2	0.8
28-Apr-04	7.20	7.75	1.5	1.0	17.0	22.0	18.0	27.0	6.5	7.0			6.4	7.6	0.05	0.02	0.2	0.8
29-Apr-04	7.16	7.76	1.4	1.0	16.0	21.0	18.0	26.0	6.5	7.0	0.1		6.4	7.4	0.04	0.02	0.2	0.8
30-Apr-04	7.24	7.83	1.4	0.8	16.0	22.0	18.0	27.0	6.5	7.0			6.2	7.4	0.05	0.03	0.2	0.8
Max	7.2	8.5	1.5	1.0	17.0	27.0	20.0	35.0	6.5	7.0	0.6	0.0	6.6	7.6	0.06	0.03	0.2	1.5
Min	7.0	7.5	1.2	0.8	16.0	21.0	18.0	24.0	6.0	6.5	0.1	0.0	0.4	7.2	0.04	0.02	0.2	0.6
Average	7.1	7.9	1.3	0.9	16.3	23.6	18.7	28.6	6.1	6.6	0.3	#DIV/0!	6.3	7.4	0.05	0.02	0.2	1.1

Table M31.1.5 Water Quality at Salaulim WTP in 2004 (3/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-May-04	7.21	7.60	1.2	0.8	16.0	22.0	18.0	26.0	6.5	7.0			6.4	7.4	0.06	0.03	0.2	0.8
2-May-04	7.20	7.64	1.2	0.8	16.0	22.0	18.0	26.0	6.5	7.0			6.4	7.4	0.06	0.03	0.2	0.8
3-May-04	7.18	7.71	1.2	0.8	16.0	22.0	18.0	25.0	6.5	7.0	0.1		6.4	7.2	0.06	0.04	0.2	0.8
4-May-04	7.14	7.65	1.2	0.8	16.0	21.0	18.0	26.0	6.0	6.5			6.4	7.4	0.05	0.02	0.2	0.8
5-May-04	7.15	7.64	1.4	0.8	16.0	21.0	18.0	25.0	6.0	6.5			6.4	7.2	0.05	0.02	0.2	0.8
6-May-04	7.18	7.71	1.4	0.8	16.0	22.0	19.0	26.0	6.0	6.5	0.1		6.4	7.2	0.05	0.02	0.2	0.8
7-May-04	7.15	7.69	1.2	0.8	16.0	22.0	18.0	25.0	6.0	6.5	0.1		6.2	7.2	0.04	0.02	0.2	0.8
8-May-04																		
9-May-04																		
10-May-04	7.27	7.69	1.2	0.8	17	22	19	25	6.0	6.5			6.4	7.2	0.04	0.02	0.2	0.8
11-May-04	7.29	7.61	1.2	0.8	17	22	19	24	6.0	6.5			6.6	7.2	0.04	0.03	0.2	0.8
12-May-04	7.26	7.58	1.2	0.8	17	22	19	24	6.0	6.5			6.4	7.4	0.05	0.02	0.2	0.8
13-May-04	7.26	7.60	1.2	0.8	16	21	18	24	6.0	6.5			6.4	7.2	0.04	0.02	0.2	0.8
14-May-04	7.30	7.61	1.2	0.8	16	21	18	24	6.0	6.5			6.6	7.4	0.04	0.02	0.2	0.8
15-May-04	7.27	7.60	1.2	0.8	16	21	17	24	6.0	6.5			6.4	7.2	0.05	0.02	0.2	0.8
16-May-04	7.29	7.60	1.2	0.8	16	22	17	24	6.0	6.5			6.6	7.4	0.04	0.02	0.2	0.8
17-May-04	7.32	7.61	1.0	0.7	16	20	17	23	6.0	6.5			6.4	7.2	0.05	0.02	0.2	0.8
18-May-04	7.28	7.57	1.0	0.8	16	21	17	22	6.0	6.5			6.4	7.4	0.06	0.02	0.2	0.8
19-May-04	7.35	7.64	1.4	1.0	15	20	17	22	6.0	6.5			6.6	7.7	0.05	0.02	0.2	0.8
20-May-04																		
21-May-04	7.30	7.67	2.5	1.0	17	21	19	24	5.5	6.0			6.4	7.4	0.05	0.02	0.2	0.8
22-May-04	7.30	7.66	2.3	1.0	17	21	20	24	6.0	6.5			6.4	7.6	0.06	0.02	0.2	0.8
23-May-04	7.32	7.62	2.8	1.0	17	21	19	24	6.0	6.5			6.6	7.4	0.05	0.02	0.2	0.6
24-May-04	7.34	7.67	2.5	1.0	17	22	20	25	6.0	6.0			6.6	7.6	0.07	0.04	0.2	0.8
25-May-04																		
26-May-04	7.35	7.65	2.5	1.0	17	22	20	25	6.0	6.0			6.4	7.6	0.05	0.03	0.2	0.8
27-May-04																		
28-May-04	7.28	7.59	2.9	1.2	17	21	21	25	6.0	6.5			6.6	7.8	0.06	0.03	0.2	0.8
29-May-04	7.27	7.61	3.5	1.0	16	21	20	24	6.0	6.5			6.6	7.6	0.05	0.03	0.2	0.8
30-May-04	7.30	7.65	3.0	1.2	17	21	19	24	6.0	6.5			6.4	7.4	0.05	0.03	0.2	0.8
31-May-04	7.31	7.62	2.4	1.2	17	21	18	24	6.0	6.5			6.6	7.4	0.04	0.02	0.2	0.8
Max	7.4	7.7	3.5	1.2	17.0	22.0	21.0	26.0	6.5	7.0	0.1	0.0	6.6	7.8	0.07	0.04	0.2	0.8
Min	7.1	7.6	1.0	0.7	15.0	20.0	17.0	22.0	5.5	6.0	0.1	0.0	6.2	7.2	0.04	0.02	0.2	0.6
Average	7.3	7.6	1.8	0.9	16.4	21.3	18.5	24.3	6.0	6.5	0.1	#DIV/0!	6.5	7.4	0.05	0.02	0.2	0.8

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Jun-04	7.21	7.54	2.6	1	17.0	20.0	18.0	23.0	6.5	7.0			6.4	7.6	0.05	0.03	0.2	0.8
2-Jun-04	7.28	7.62	3	1	17.0	21.0	18.0	24.0	6.5	7.0			6.4	7.6	0.05	0.03	0.2	0.8
3-Jun-04																		
4-Jun-04	7.32	7.59	2.4	1.0	18.0	21.0	20.0	25.0	6.5	7.0			6.6	7.2	0.06	0.02	0.2	0.8
5-Jun-04	7.30	7.56	2.2	1.0	18.0	21.0	19.0	25.0	6.5	7.0			6.6	7.4	0.05	0.03	0.2	0.8
6-Jun-04	7.26	7.59	2.5	1.0	17.0	21.0	19.0	24.0	6.5	7.0			6.4	7.2	0.06	0.03	0.2	0.8
7-Jun-04	7.26	7.54	2.4	1.0	17.0	20.0	18.0	24.0	6.0	6.5			6.4	7.2	0.04	0.02	0.2	0.8
8-Jun-04	7.28	7.60	2.5	1.2	18	20	20	23	6.5	7.0	0.1		6.4	7.2	0.06	0.03	0.2	0.8
9-Jun-04	7.25	7.54	3.2	1.5	18	20	20	22	6.0	6.5			6.4	7.2	0.05	0.03	0.2	1.0
10-Jun-04	7.24	7.53	3.2	1.2	17	20	20	22	6.0	6.5			6.4	7.2	0.04	0.02	0.2	1.0
11-Jun-04	6.48	7.46	7.2	1.4	16	19	17	20	6.0	6.5			6.4	7.2	0.05	0.02	0.2	0.8
12-Jun-04	7.00	7.50	6.0	1.6	16	19	17	21	6.0	6.5			6.6	7.4	0.06	0.03	0.2	1.0
13-Jun-04																		
14-Jun-04	7.00	7.51	8.2	1.8	16	19	17	20	6.0	6.5	0.3		6.4	7.4	0.06	0.03	0.2	1.0
15-Jun-04	7.01	7.60	8.6	1.8	16	20	17	21	6.0	6.5	1.2		6.2	7.2	0.06	0.04		0.8
16-Jun-04	7.05	8.06	8.0	1.8	18	27	22	36	6.0	6.5	1.8		6.4	7.6	0.06	0.03		1.5
17-Jun-04	7.00	8.31	6.0	1.5	18	28	20	34	6.0	6.5	1.5		6.4	7.4	0.06	0.04		1.5
18-Jun-04	7.08	8.37	6.0	1.7	18	28	21	35	6.0	6.5	1.5		6.4	7.4	0.06	0.03		1.6
19-Jun-04	7.04	8.39	7.4	1.8	18	28	20	34	6.0	6.5	1.8		6.4	7.4	0.06	0.04		1.5
20-Jun-04	7.04	8.38	7.0	16.0	18	29	21	35	6.0	6.5	1.5		6.4	7.2	0.06	0.03		1.5
21-Jun-04	7.12	8.42	7.0	1.5	18	28	21	35	6.0	6.5	1.7		6.6	7.4	0.05	0.02		1.5
22-Jun-04	7.08	8.41	7.2	1.5	19	28	20	34	6.0	6.5	1.6		6.4	7.2	0.06	0.03		1.6
23-Jun-04	7.10	8.23	6.5	1.7	19	27	21	33	6.0	6.5	1.4		6.4	7.2	0.06	0.02		1.5
24-Jun-04	7.03	8.09	5.0	1.4	17	26	18	29	6.0	6.5	1		6.4	7.4	0.05	0.03		1.5
25-Jun-04	7.10	8.00	5.8	1.2	18	27	19	34	6.0	6.5	1		6.6	7.4	0.06	0.04		1.5
26-Jun-04	7.09	8.00	6.0	1.2	18	27	19	32	6.0	6.5	1		6.4	7.2	0.05	0.02		1.5
27-Jun-04	7.04	7.95	6.0	1.2	18	26	20	32	6.0	6.5	1		6.4	7.4	0.06	0.04		1.5
28-Jun-04	7.09	7.88	4.2	1.0	18	24	19	28	6.0	6.5	0.8		6.2	7.2	0.05	0.02		1.6
29-Jun-04	7.13	7.70	5.0	1.0	18	25	19	29	6.0	6.5	0.3		6.9	7.6	0.1	0.03		1.8
30-Jun-04	6.95	7.59	4.0	1.0	17	25	18	20	6.0	6.5	0.3		6.6	7.9	0.05	0.02		1.6
Max	7.3	8.4	8.6	16.0	19.0	29.0	22.0	36.0	6.5	7.0	1.8	0.0	6.9	7.9	0.06	0.04	0.2	1.8
Min	6.5	7.5	2.2	1.0	16.0	19.0	17.0	20.0	6.0	6.5	0.1	0.0	6.2	7.2	0.04	0.02	0.2	0.8
Average	7.1	7.9	5.4	1.9	17.6	24.0	19.3	28.0	6.1	6.6	1.1	#DIV/0!	6.5	7.3	0.06	0.03	0.2	1.3

Table M31.1.5 Water Quality at Salaulim WTP in 2004 (4/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Jul-04	7.01	7.65	4.4	1	17.0	23.0	18.0	28.0	6.0	6.5	0.2		6.4	7.4	0.05	0.03		0.8
2-Jul-04	6.96	7.48	5	1	17.0	23.0	18.0	25.0	6.0	6.5	0.3		6.4	7.6	0.06	0.03		1.8
3-Jul-04	7.00	7.45	4.0	1.0	17.0	21.0	18.0	25.0	6.0	6.5	0.3		6.6	7.4	0.1	0.03		1.5
4-Jul-04	7.01	7.42	3.8	1.0	17.0	20.0	18.0	24.0	6.0	6.5	0.2		6.4	7.2	0.04	0.03		1.8
5-Jul-04	7.10	7.59	4.0	1.0	18.0	21.0	19.0	25.0	6.0	6.5	0.1		6.6	7.4	0.05	0.03		1.8
6-Jul-04	7.15	7.62	2.8	1.0	17.0	22.0	18.0	27.0	6.0	6.5			6.4	7.6	0.06	0.03	0.0	1.0
7-Jul-04	7.14	7.50	2.5	1.0	17.0	22.0	18.0	26.0	6.0	6.5			6.4	7.4	0.05	0.03	0.2	1.0
8-Jul-04	7.13	7.46	2.8	1.0	17.0	21.0	18.0	24.0	6.0	6.5			6.4	7.2	0.06	0.04	0.2	1.0
9-Jul-04	7.12	7.47	2.6	1.0	17.0	22.0	18.0	25.0	6.0	6.5			6.6	7.4	0.05	0.03	0.2	0.8
10-Jul-04	7.10	7.48	2.8	1.0	16.0	22.0	18.0	25.0	6.0	6.5			6.6	7.4	0.06	0.04	0.2	0.8
11-Jul-04	7.09	7.46	2.8	1.0	16.0	22.0	18.0	24.0	6.0	6.5			6.4	7.2	0.05	0.02	0.2	0.8
12-Jul-04	7.12	7.54	2.5	1.0	18.0	22.0	19.0	24.0	6.0	6.5			6.6	7.4	0.05	0.02	0.2	1.0
13-Jul-04	7.16	7.52	2.3	1.0	18.0	22.0	18.0	25.0	6.0	6.5			6.4	7.4	0.06	0.03	0.2	1.0
14-Jul-04	7.14	7.50	2.8	1.0	18.0	22.0	20.0	24.0	6.0	6.5			6.4	7.8	0.05	0.03	0.2	0.8
15-Jul-04	7.14	7.50	2.2	1.0	17.0	22.0	19.0	24.0	6.0	6.5			6.4	7.6	0.05	0.02	0.2	0.8
16-Jul-04	7.16	7.60	2.4	0.8	17.0	22.0	19.0	25.0	6.0	6.5			6.6	7.6	0.05	0.02	0.2	0.8
17-Jul-04	7.20	7.61	2.0	1.0	17.0	21.0	19.0	25.0	6.0	6.5			6.4	7.4	0.06	0.04	0.2	0.8
18-Jul-04	7.21	7.62	2.4	1.0	18.0	23.0	19.0	25.0	6.0	6.5			6.6	7.4	0.06	0.04	0.2	0.8
19-Jul-04	7.20	7.61	2.0	0.8	18.0	22.0	19.0	24.0	6.0	6.5			6.6	7.6	0.05	0.04	0.2	0.8
20-Jul-04	7.25	7.64	2.0	0.8	18.0	20.0	18.0	22.0	6.0	6.5			6.6	7.4	0.06	0.03	0.2	1.0
21-Jul-04	7.18	7.65	2.0	1.0	16.0	20.0	19.0	23.0	6.0	6.5			6.4	7.6	0.04	0.04	0.2	1.0
22-Jul-04	7.20	7.62	1.8	0.8	17.0	20.0	19.0	24.0	6.0	6.5			6.4	7.5	0.05	0.03	0.2	1.0
23-Jul-04	7.20	7.60	1.8	0.8	17.0	20.0	19.0	23.0	6.0	6.5			6.6	7.4	0.05	0.04	0.2	1.0
24-Jul-04	7.20	7.60	1.8	0.8	16.0	20.0	19.0	23.0	6.5	7.0			6.6	7.6	0.06	0.04	0.2	1.0
25-Jul-04	7.21	7.60	2.0	1.0	17.0	21.0	19.0	25.0	6.5	7.0			6.4	7.4	0.05	0.04	0.2	1.0
26-Jul-04	7.21	7.60	2.0	0.8	16.0	20.0	19.0	24.0	6.0	6.5			6.6	7.6	0.06	0.04	0.2	0.8
27-Jul-04	7.02	7.40	2.2	1.0	16.0	20.0	18.0	23.0	6.0	6.5			6.4	7.6	0.06	0.04	0.2	0.8
28-Jul-04	7.00	7.44	1.8	0.8	16.0	20.0	18.0	24.0	6.0	6.5			6.4	7.4	0.05	0.04	0.2	0.8
29-Jul-04	6.98	7.50	1.8	0.8	17.0	20.0	18.0	24.0	6.0	6.5			6.4	7.4	0.1	0.04	0.2	1.0
30-Jul-04	6.98	7.35	1.8	1.0	16.0	19.0	18.0	22.0	6.5	7.0			6.8	7.4	0.1	0.09	0.2	1.0
31-Jul-04	7.00	7.42	1.6	0.8	17.0	19.0	18.0	22.0	6.0	6.5			6.6	7.4	0.1	0.04	0.2	1.0
Max	7.3	7.7	4.0	1.0	18.0	23.0	20.0	27.0	6.5	7.0	0.3	0.0	6.8	7.8	0.06	0.09	0.2	1.8
Min	7.0	7.4	1.6	0.8	16.0	19.0	18.0	22.0	6.0	6.5	0.1	0.0	6.4	7.2	0.04	0.02	0.0	0.8
Average	7.1	7.5	2.4	0.9	17.0	21.0	18.5	24.1	6.1	6.6	0.2	#DIV/0!	6.5	7.5	0.05	0.04	0.2	1.0

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Aug-04	6.90	7.35	1.8	0.8	16.0	19.0	18.0	22.0	6.0	7.0			6.6	7.6	0.05	0.04	0.2	1.0
2-Aug-04	6.98	7.39	1.8	0.8	16.0	20.0	17.0	22.0	6.0	6.5			6.4	7.4	0.06	0.03	0.2	1.0
3-Aug-04	6.95	7.40	2.0	1.0	16.0	20.0	18.0	22.0	6.0	6.5			6.6	7.4	0.05	0.04	0.2	0.8
4-Aug-04	6.95	7.38	2.2	1.0	16.0	19.0	18.0	22.0	6.0	6.5			6.8	7.2	0.05	0.04	0.2	0.8
5-Aug-04	6.96	7.35	2.0	1.0	16.0	19.0	17.0	22.0	6.0	6.5			6.6	7.4	0.05	0.04	0.2	1.0
6-Aug-04	7.00	7.38	2.5	1.0	16.0	19.0	18.0	23.0	6.0	6.5			6.6	7.2	0.06	0.05	0.2	1.0
7-Aug-04	7.00	7.39	2.2	1.0	17.0	19.0	18.0	22.0	6.0	6.5			6.4	7.2	0.05	0.04	0.2	0.8
8-Aug-04	6.98	7.39	2.6	1.0	17.0	19.0	18.0	22.0	6.0	6.5			6.6	7.4	0.06	0.04	0.2	0.8
9-Aug-04	7.00	7.40	2.2	1.0	17.0	19.0	18.0	22.0	6.0	6.5			6.4	7.4	0.05	0.03	0.2	1.0
10-Aug-04	7.02	7.42	2.8	1.0	15.0	19.0	17.0	22.0	6.0	6.0			6.6	7.2	0.06	0.03	0.2	0.6
11-Aug-04	6.90	7.40	2.9	1.0	15.0	19.0	16.0	22.0	6.0	6.0			6.6	7.4	0.05	0.03	0.2	1.0
12-Aug-04	6.98	7.38	4.0	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.4	7.4	0.06	0.03	0.2	0.8
13-Aug-04	6.95	7.32	3.8	1.0	15.0	18.0	17.0	22.0	6.0	6.0			6.6	7.4	0.05	0.04		1.5
14-Aug-04	6.95	7.33	4.2	1.4	15.0	19.0	17.0	21.0	6.0	6.5			6.4	7.4	0.06	0.04	0.2	0.8
15-Aug-04	6.97	7.33	5.2	1.4	15.0	19.0	17.0	22.0	6.0	6.0			6.6	7.4	0.05	0.04	0.2	1.0
16-Aug-04	7.00	7.32	5.0	1.2	16.0	19.0	17.0	22.0	6.0	6.0			6.4	7.4	0.06	0.04	0.2	0.6
17-Aug-04	7.04	7.31	6.2	1.2	15.0	19.0	16.0	23.0	6.5	7.0	0.1		6.8	7.4	0.08	0.05	0.2	1.0
18-Aug-04	7.01	7.25	6.5	1.3	15.0	19.0	17.0	23.0	6.5	7.0			7.0	7.8	0.1	0.05	0.2	1.0
19-Aug-04	6.97	7.38	6.8	1.2	15.0	19.0	17.0	22.0	6.5	7.0			6.8	7.6	0.1	0.04	0.2	1.0
20-Aug-04	7.00	7.30	6.0	1.2	15.0	19.0	18.0	21.0	6.5	7.0			6.6	7.4	0.15	0.05	0.2	0.8
21-Aug-04	7.00	7.29	6.0	1.2	15.0	18.0	17.0	21.0	6.0	6.5			6.8	7.6	0.1	0.04	0.2	1.0
22-Aug-04	7.00	7.33	5.5	1.0	17.0	19.0	18.0	22.0	6.0	6.5			6.6	7.4	0.08	0.04	0.2	0.8
23-Aug-04	7.00	7.34	5.0	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.6	7.6	0.1	0.04	0.2	0.6
24-Aug-04	6.98	7.33	4.4	1.0	16.0	19.0	18.0	21.0	6.0	6.5			6.8	7.6	0.1	0.04	0.2	1.0
25-Aug-04	7.00	7.32	4.0	1.0	16.0	19.0	18.0	20.0	6.0	6.5			6.6	7.4	0.08	0.04	0.2	0.8
26-Aug-04	7.00	7.34	4.0	1.0	16.0	18.0	18.0	20.0	6.0	6.5			6.6	7.6	0.1	0.05	0.2	0.6
27-Aug-04	7.00	7.32	3.4	1.0	16.0	19.0	18.0	21.0	6.0	6.5			6.4	7.6	0.08	0.05	0.2	0.8
28-Aug-04	7.00	7.30	3.5	1.0	16.0	19.0	18.0	20.0	6.0	6.5			6.6	7.4	0.1	0.04	0.2	0.8
29-Aug-04	7.00	7.28	3.0	1.0	16.0	18.0	18.0	20.0	6.5	7.0			6.8	7.4	0.1	0.05	0.2	0.8
30-Aug-04	7.00	7.31	3.0	1.0	16.0	19.0	17.0	21.0	6.5	7.0			6.6	7.6	0.1	0.04	0.2	1.0
31-Aug-04	7.00	7.32	3.0	1.2	16.0	19.0	18.0	22.0	6.0	6.5			6.8	7.6	0.1	0.05	0.2	0.8
Max	7.0	7.4	6.8	1.4	17.0	20.0	18.0	23.0	6.5	7.0	0.1	0.0	7	7.8	0.15	0.05	0.2	1.5
Min	6.9	7.3	2.0	1.0	15.0	18.0	16.0	20.0	6.0	6.0	0.1	0.0	6.4	7.2	0.05	0.03	0.2	0.6
Average	7.0	7.3	3.9	1.1	15.8	18.9	17.4	21.6	6.1	6.5	0.1	#DIV/0!	6.6	7.4	0.08	0.04	0.2	0.9

Table M31.1.5 Water Quality at Salaulim WTP in 2004 (5/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Sep-04	7.00	7.33	3.0	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.6	7.6	0.08	0.04	0.2	0.8
2-Sep-04	7.00	7.26	3.0	1.0	16.0	18.0	17.0	20.0	6.0	6.5			6.8	7.4	0.1	0.05	0.2	0.8
3-Sep-04	7.00	7.25	4.0	1.0	15.0	19.0	17.0	21.0	6.0	6.5			6.8	7.6	0.08	0.05	0.2	1.0
4-Sep-04	7.00	7.26	3.0	1.0	16.0	19.0	18.0	22.0	6.0	6.5			6.8	7.6	0.08	0.05	0.2	0.8
5-Sep-04	7.00	7.27	3.0	1.0	16.0	18.0	18.0	22.0	6.0	6.5			6.6	7.4	0.08	0.04	0.2	0.8
6-Sep-04	6.93	7.25	2.5	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.8	7.6	0.1	0.05	0.2	0.3
7-Sep-04	6.95	7.29	3.0	1.0	16.0	20.0	17.0	22.0	6.0	6.5			6.6	7.4	0.1	0.06	0.2	1.0
8-Sep-04	6.92	7.30	3.4	1.0	15.0	19.0	17.0	22.0	6.0	6.5			6.4	7.5	0.1	0.05	0.2	1.0
9-Sep-04	6.91	7.30	3.0	1.0	15.0	19.0	17.0	22.0	6.0	6.5			6.6	7.4	0.1	0.05	0.2	0.8
10-Sep-04	6.90	7.22	2.8	1.0	16.0	19.0	18.0	21.0	6.0	6.5			6.6	7.6	0.1	0.05	0.2	0.8
11-Sep-04	6.90	7.25	3.0	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.8	7.4	0.1	0.05	0.2	0.8
12-Sep-04	6.96	7.29	2.8	1.0	16.0	19.0	17.0	22.0	6.0	6.5			6.6	7.4	0.1	0.05	0.2	0.8
13-Sep-04	6.90	7.25	2.5	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.4	7.4	0.1	0.05	0.2	0.8
14-Sep-04	6.95	7.23	2.6	1.0	16.0	19.0	18.0	22.0	6.0	6.5			6.2	7.4	0.08	0.05	0.2	1.0
15-Sep-04	6.91	7.30	2.0	0.8	16.0	20.0	17.0	23.0	6.0	6.5			6.5	7.4	0.07	0.04	0.2	1.0
16-Sep-04																		
17-Sep-04	6.90	7.36	2.5	1.0	15.0	19.0	16.0	21.0	6.0	6.5			6.4	7.2	0.08	0.05	0.2	1.0
18-Sep-04	6.97	7.23	2.0	1.0	15.0	19.0	16.0	20.0	6.0	6.5			6.3	7.3	0.06	0.04	0.2	0.8
19-Sep-04	7.00	7.29	2.3	1.0	15.0	19.0	17.0	22.0	6.0	6.5			6.2	7.6	0.1	0.07	0.2	1.0
20-Sep-04	6.90	7.26	2.8	1.0	15.0	18.0	17.0	21.0	6.0	6.0			6.4	7.2	0.1	0.05	0.2	1.0
21-Sep-04	6.95	7.23	2.0	1.0	15.0	18.0	16.0	20.0	6.0	6.5			6.2	7.4	0.08	0.04	0.2	1.0
22-Sep-04	6.90	7.22	1.8	1.0	15.0	18.0	17.0	21.0	6.0	6.5			6.6	7.4	0.08	0.05	0.2	1.0
23-Sep-04	6.90	7.23	2.0	1.0	16.0	18.0	17.0	21.0	6.0	6.5			6.6	7.4	0.1	0.05	0.2	0.8
24-Sep-04	6.93	7.27	2.2	1.0	16.0	18.0	17.0	22.0	6.0	6.5			6.4	0.2	0.08	0.05	0.2	0.8
25-Sep-04	6.90	7.22	2.0	1.0	15.0	18.0	17.0	21.0	6.0	6.5			6.4	7.4	0.08	0.05	0.2	0.8
26-Sep-04	6.90	7.23	2.4	1.0	15.0	18.0	17.0	21.0	6.0	6.5	0.1		6.6	7.4	0.1	0.05	0.2	0.8
27-Sep-04	6.99	7.15	2.4	1.0	16.0	19.0	17.0	22.0	6.0	6.5			6.4	7.4	0.08	0.05	0.2	1.0
28-Sep-04	6.90	7.21	2.0	1.0	16.0	18.0	17.0	22.0	6.0	6.5			6.4	7.4	0.08	0.05	0.2	0.8
29-Sep-04	6.97	7.20	1.8	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.6	7.2	0.1	0.05	0.2	1.0
30-Sep-04	6.95	7.21	2.0	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.6	7.4	0.1	0.05	0.2	0.8
Max	7.0	7.4	4.0	1.0	16.0	20.0	18.0	23.0	6.0	6.5	0.1	0.0	6.8	7.6	0.1	0.07	0.2	1.0
Min	6.9	7.2	1.8	0.8	15.0	18.0	16.0	20.0	6.0	6.0	0.1	0.0	6.2	0.2	0.06	0.04	0.2	0.3
Average	6.9	7.3	2.5	1.0	15.6	18.7	17.0	21.4	6.0	6.5	0.1	#DIV/0!	6.5	7.1	0.09	0.05	0.2	0.9

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Oct-04	6.93	7.20	4.0	1.0	16.0	18.0	17.0	20.0	6.0	6.5			6.4	7.2	0.08	0.05		0.8
2-Oct-04	6.96	7.21	3.0	1.0	16.0	18.0	17.0	21.0	6.0	6.5			6.6	7.4	0.10	0.05		0.8
3-Oct-04	6.95	7.21	2.5	1.0	16.0	18.0	17.0	22.0	6.0	6.5			6.4	7.2	0.08	0.04	0.2	0.8
4-Oct-04	6.90	7.21	2.5	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.4	7.2	0.10	0.05	0.2	0.8
5-Oct-04	6.90	7.16	1.5	1.0	16.0	18.0	17.0	20.0	6.0	6.5			6.6	7.4	0.08	0.05	0.2	0.8
6-Oct-04	6.99	7.29	1.8	1.0	15.0	18.0	17.0	21.0	6.0	6.5			6.6	7.2	0.10	0.05	0.2	1.0
7-Oct-04	6.90	7.20	2.0	1.0	16.0	18.0	17.0	20.0	6.0	6.5			6.4	7.2	0.08	0.05	0.2	1.0
8-Oct-04	6.90	7.20	2.2	1.0	16.0	19.0	17.0	22.0	6.0	6.5			6.6	7.4	0.08	0.06	0.2	1.0
9-Oct-04	6.90	7.20	1.8	0.8	16.0	18.0	17.0	21.0	6.0	6.5			6.4	7.4	0.08	0.06	0.2	0.8
10-Oct-04	6.90	7.20	2.0	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.6	7.4	0.08	0.06	0.2	0.8
11-Oct-04																		
12-Oct-04	6.90	7.20	2.4	1.0	15.0	18.0	16.0	21.0	6.0	6.5			6.6	7.2	0.10	0.06	0.2	0.8
13-Oct-04	6.97	7.24	2.0	1.0	15.0	19.0	16.0	21.0	6.0	6.5			6.4	7.4	0.08	0.04	0.2	0.8
14-Oct-04	6.95	7.20	2.0	1.0	15.0	18.0	16.0	21.0	6.0	6.5			6.6	7.4	0.08	0.03	0.2	0.8
15-Oct-04	6.94	7.26	2.5	1.0	15.0	18.0	17.0	21.0	6.0	6.5			6.6	7.4	0.08	0.06	0.2	1.0
16-Oct-04	6.95	7.24	2.2	1.0	16.0	18.0	17.0	21.0	6.0	6.5			6.6	7.4	0.06	0.05	0.2	0.8
17-Oct-04	6.91	7.22	2.2	1.0	16.0	18.0	17.0	21.0	6.0	6.5			6.6	7.4	0.08	0.05	0.2	0.8
18-Oct-04	6.91	7.20	2.0	1.0	16.0	17.0	17.0	21.0	6.0	6.5			6.4	7.4	0.08	0.06	0.2	0.8
19-Oct-04	6.94	7.25	2.3	0.8	15.0	19.0	17.0	22.0	6.0	6.5			6.6	7.2	0.10	0.05	0.2	0.8
20-Oct-04	6.93	7.23	2.0	1.0	15.0	18.0	17.0	22.0	6.0	6.5			6.4	7.2	0.10	0.05	0.2	0.8
21-Oct-04	6.91	7.20	2.0	1.0	15.0	18.0	16.0	21.0	6.0	6.5			6.6	7.4	0.08	0.05	0.2	0.8
22-Oct-04	6.93	7.21	2.0	1.0	16.0	18.0	17.0	21.0	6.0	6.5			6.6	7.4	0.08	0.04	0.2	0.8
23-Oct-04	6.92	7.20	2.0	1.0	16.0	17.0	17.0	21.0	6.0	6.5			6.4	7.2	0.10	0.05	0.2	0.8
24-Oct-04	6.92	7.23	2.0	1.0	16.0	18.0	17.0	22.0	6.6	6.5			6.6	7.4	0.08	0.04	0.2	0.8
25-Oct-04	6.90	7.22	2.0	1.0	16.0	17.0	17.0	21.0	6.0	6.5			6.4	7.2	0.10	0.05	0.2	0.8
26-Oct-04	7.00	7.29	2.4	1.0	15.0	18.0	16.0	20.0	6.0	6.5			6.4	7.2	0.08	0.07	0.2	0.8
27-Oct-04	7.00	7.30	2.0	1.0	15.0	19.0	17.0	21.0	6.0	6.5			6.9	7.9	0.08	0.06	0.2	0.8
28-Oct-04	6.97	7.28	2.0	1.0	15.0	18.0	17.0	21.0	6.0	6.5			6.4	7.4	0.10	0.05	0.2	0.8
29-Oct-04	6.99	7.32	1.8	0.8	15.0	18.0	17.0	20.0	6.0	6.5			6.6	7.9	0.08	0.06	0.2	0.8
30-Oct-04	6.98	7.30	2.0	1.0	15.0	18.0	17.0	21.0	6.0	6.5			6.6	7.4	0.10	0.05	0.2	1.0
31-Oct-04																		
Max	7.0	7.3	2.5	1.0	16.0	19.0	17.0	22.0	6.6	6.5	0.0	0.0	6.9	7.9	0.1	0.07	0.2	1.0
Min	6.9	7.2	1.5	0.8	15.0	17.0	16.0	20.0	6.0	6.5	0.0	0.0	6.4	7.2	0.06	0.03	0.2	0.8
Average	6.9	7.2	2.1	1.0	15.5	18.1	16.8	21.0	6.0	6.5	#DIV/0!	#DIV/0!	6.5	7.4	0.09	0.05	0.2	0.8

Table M31.1.5 Water Quality at Salaulim WTP in 2004 (6/6)

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Nov-04																		
2-Nov-04	6.95	7.26	2.0	1.0	15.0	18.0	16.0	20.0	6.0	6.5			6.4	7.4	0.08	0.04	0.2	0.8
3-Nov-04																		
4-Nov-04	6.95	7.28	2.0	1.0	16.0	18.0	17.0	22.0	6.0	6.5			6.6	7.4	0.10	0.05	0.2	0.8
5-Nov-04	7.03	7.38	1.8	1.0	17.0	20.0	18.0	21.0	6.0	6.5			6.4	7.6	0.08	0.05	0.2	1.0
6-Nov-04	6.98	7.30	2.0	1.0	16.0	19.0	18.0	22.0	6.0	6.5			6.6	7.4	0.08	0.05	0.2	0.8
7-Nov-04	6.46	7.28	1.8	1.0	16.0	19.0	18.0	21.0	6.0	6.5			6.4	7.4	0.10	0.05	0.2	1.0
8-Nov-04																		
9-Nov-04	7.01	7.32	1.8	1.0	17.0	19.0	18.0	22.0	6.0	6.5			6.4	7.2	0.08	0.05	0.2	0.8
10-Nov-04	7.07	7.32	1.8	1.0	16.0	19.0	16.0	20.0	6.0	6.5			6.4	7.4	0.06	0.04	0.2	0.8
11-Nov-04																		
12-Nov-04	6.97	7.30	2.0	1.0	16.0	19.0	17.0	21.0	6.0	6.5			6.4	7.2	0.06	0.04	0.2	0.8
13-Nov-04	6.94	7.30	2.0	0.8	16.0	18.0	17.0	21.0	6.0	6.5			6.6	7.4	0.08	0.04	0.2	0.8
14-Nov-04	6.98	7.30	2.0	1.0	16.0	19.0	17.0	22.0	6.0	6.5			6.4	7.2	0.08	0.04	0.2	0.8
15-Nov-04	7.00	7.34	2.0	1.0	16.0	19.0	17.0	22.0	6.0	6.5	0.1		6.4	7.4	0.08	0.05	0.2	0.8
16-Nov-04	7.00	7.36	2.0	1.0	16.0	19.0	17.0	24.0	6.0	6.5	0.1		6.6	7.4	0.06	0.04	0.2	0.8
17-Nov-04	7.02	7.42	2.0	1.0	16.0	20.0	17.0	24.0	6.0	6.5	0.1		6.4	7.2	0.08	0.05	0.2	0.8
18-Nov-04																		
19-Nov-04	7.08	7.39	2.2	1.0	15.0	19.0	17.0	22.0	6.5	6.7			6.6	7.4	0.08	0.05	0.2	0.8
20-Nov-04	7.03	7.38	1.8	1.0	16.0	20.0	17.0	22.0	6.5	7.0	0.1		6.2	7.4	0.08	0.05	0.2	0.8
21-Nov-04																		
22-Nov-04	7.07	7.46	2.0	1.0	16.0	21.0	17.0	25.0	6.5	7.0	0.1		6.4	7.4	0.08	0.06	0.2	0.8
23-Nov-04	7.06	7.48	2.0	1.0	16.0	21.0	17.0	24.0	6.0	6.5	0.1		6.4	7.6	0.08	0.05	0.2	1.0
24-Nov-04	7.00	7.54	1.8	1.0	16.0	22.0	17.0	25.0	6.0	6.5	0.1		6.6	7.6	0.06	0.04	0.2	0.8
25-Nov-04	7.01	7.47	1.5	1.0	16.0	21.0	17.0	24.0	6.0	6.5	0.1		6.6	7.4	0.06	0.04	0.2	0.8
26-Nov-04	7.03	7.43	1.8	1.0	16.0	21.0	17.0	25.0	6.0	6.5	0.2		6.9	7.9	0.08	0.05	0.2	1.0
27-Nov-04	7.03	7.46	2.2	1.0	16.0	22.0	17.0	24.0	6.0	6.5	0.1		6.6	7.4	0.08	0.05	0.2	0.8
28-Nov-04	7.03	7.46	2.4	1.0	16.0	21.0	17.0	24.0	6.0	6.5	0.1		6.4	7.2	0.08	0.04	0.2	0.6
29-Nov-04	7.02	7.44	2.0	1.0	16.0	20.0	17.0	23.0	6.0	6.5	0.1		6.6	7.4	0.06	0.05	0.2	0.8
30-Nov-04	7.00	7.42	2.0	1.2	16.0	20.0	17.0	22.0	6.0	6.5	0.2		6.6	7.4	0.08	0.05	0.2	0.8
Max	7.1	7.5	2.4	1.2	17.0	22.0	18.0	25.0	6.5	7.0	0.2	0.0	6.9	7.9	0.1	0.06	0.2	1.0
Min	6.5	7.3	1.5	0.8	15.0	18.0	16.0	20.0	6.0	6.5	0.1	0.0	6.2	7.2	0.06	0.04	0.2	0.6
Average	7.0	7.4	2.0	1.0	16.0	19.8	17.1	22.7	6.1	6.6	0.1	#DIV/0!	6.5	7.4	0.08	0.05	0.2	0.8

Date	pH		Turbidity NTU		Alkalinity mg/L		Hardness mg/L		Chloride ion mg/L		Mn^{2+} mg/L		DO mg/L		Iron mg/L		Residual Chlorine mg/L	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Pre	Treated
1-Dec-04	7.08	7.60	1.5	0.9	15.0	21.0	16.0	24.0	6.5	7.0	0.1		6.6	7.4	0.06	0.05	0.2	1.0
2-Dec-04	7.04	7.55	2.0	1.0	16.0	21.0	17.0	24.0	6.0	6.5	0.2		6.6	7.4	0.08	0.05	0.2	0.6
3-Dec-04	7.04	7.62	2.0	1.0	16.0	21.0	17.0	24.0	6.0	6.5	0.1		6.4	7.2	0.06	0.04	0.2	0.8
4-Dec-04	7.00	7.61	2.0	1.0	16.0	20.0	17.0	24.0	6.0	6.5	0.1		6.6	7.4	0.08	0.04	0.2	1.0
5-Dec-04	6.98	7.61	1.8	1.0	16.0	22.0	17.0	25.0	6.0	6.5	0.2		6.4	7.4	0.06	0.04	0.2	0.8
6-Dec-04																		
7-Dec-04																		
8-Dec-04																		
9-Dec-04	7.00	7.61	2.0	1.0	16.0	21.0	17.0	25.0	6.0	6.5	0.2		6.4	7.2	0.08	0.04		1.2
10-Dec-04	7.00	7.55	2.0	1.0	17.0	21.0	18.0	26.0	6.0	7.0	0.2		6.4	7.4	0.06	0.06		1.5
11-Dec-04																		
12-Dec-04	7.00	7.62	2.0	1.0	16.0	22.0	18.0	25.0	6.0	6.5	0.2		6.6	7.4	0.08	0.04		1.2
13-Dec-04	7.00	7.69	2.0	1.0	16.0	22.0	17.0	25.0	6.5	7.0	0.2		6.4	7.4	0.08	0.06		1.4
14-Dec-04	6.95	7.70	1.8	0.8	16.0	23.0	17.0	26.0	6.5	7.0	0.2		6.2	7.4	0.06	0.04		1.4
15-Dec-04	7.00	7.68	1.8	0.9	16.0	22.0	17.0	26.0	6.0	6.5	0.2		6.2	7.6	0.05	0.05		1.6
16-Dec-04																		
17-Dec-04	7.00	7.98	2.0	0.8	16.0	25.0	18.0	29.0	6.0	7.0	0.4		6.2	7.0	0.06	0.05		1.5
18-Dec-04	7.04	8.12	1.6	0.9	16.0	26.0	18.0	31.0	6.0	7.0	0.3		6.4	7.2	0.05	0.05		1.4
19-Dec-04																		
20-Dec-04	7.00	8.04	2.2	0.8	16.0	25.0	18.0	30.0	6.5	7.0	0.3		6.2	7.0	0.08	0.05		1.5
21-Dec-04	7.02	8.11	2.0	0.8	16.0	25.0	17.0	30.0	6.0	7.0	0.4		6.2	7.2	0.08	0.04		1.6
22-Dec-04	7.05	8.14	2.0	1.0	16.0	25.0	18.0	31.0	6.0	7.0	0.3		6.2	7.2	0.06	0.05		1.6
23-Dec-04	7.01	8.03	2.2	1.0	16.0	25.0	18.0	31.0	6.0	7.0	0.4		6.2	7.0	0.08	0.05		1.6
24-Dec-04	7.00	8.03	2.0	1.0	16.0	24.0	17.0	29.0	6.0	6.5	0.4		6.4	7.2	0.08	0.04		1.4
25-Dec-04	7.00	7.79	2.0	1.0	15.0	22.0	17.0	26.0	6.0	6.5	0.2		6.2	7.2	0.06	0.04		1.4
26-Dec-04	7.00	7.82	2.0	1.0	15.0	23.0	16.0	25.0	6.0	6.5	0.1		6.4	7.2	0.06	0.04		1.4
27-Dec-04	7.00	7.72	2.0	1.0	15.0	22.0	17.0	25.0	6.0	6.5			6.4	7.4	0.08	0.05		1.4
28-Dec-04	7.04	7.60	1.8	0.8	15.0	21.0	17.0	23.0	6.0	6.5			6.2	7.0	0.06	0.04		1.4
29-Dec-04	7.12	7.61	2.4	1.0	16.0	20.0	17.0	24.0	6.0	6.5			6.2	7.2	0.05	0.05		1.2
30-Dec-04																		
31-Dec-04	7.01	7.42	2.0	1.0	15.0	19.0	17.0	22.0	6.0	6.5			6.2	7.2	0.06	0.04	0.2	0.8
Max	7.1	8.1	2.4	1.0	17.0	26.0	18.0	31.0	6.5	7.0	0.4	0.0	6.6	7.6	0.08	0.06	0.2	1.6
Min	7.0	7.4	1.6	0.8	15.0	19.0	16.0	22.0	6.0	6.5	0.1	0.0	6.2	7.0	0.05	0.04	0.2	0.8
Average	7.0	7.8	2.0	0.9	15.8	22.5	17.3	26.5	6.1	6.7	0.2	#DIV/0!	6.3	7.2	0.07	0.05	0.2	1.3

Table M31.1.6 Results on Manganese Concentration of Raw Water at Salaulim WTP in 1997 and from 2000 to 2004 (1/2)

Unit : mg/l

Date	1997		2000		2001		2002		2003		2004		Date	1997		2000		2001		2002		2003		2004	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated		Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated
Max	1.8	0.1	2.8	0.0	3.0	0.0	2.0	0.0	3.6	0.3	1.8	0.0	Max	1.8	0.1	2.8	0.0	3.0	0.0	2.0	0.0	3.6	0.3	1.8	0.0
Min	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	Min	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0
Average	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0	Average	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0
1-Jan	0.4				0.5				1.2				1-Apr	0.3				0.6				0.4		0.6	
2-Jan	1.0				0.6				1.2				2-Apr	0.5				0.6		0.4		0.3		0.7	
3-Jan	1.0		0.6		0.5				0.2				3-Apr					0.5		0.3				0.6	
4-Jan	0.8				0.5		0.2						4-Apr	0.5				0.4		0.5				0.5	
5-Jan	1.0		0.1		0.4		0.2						5-Apr	0.5				0.5		0.5				0.5	
6-Jan	0.8				0.4								6-Apr	0.8				0.4						0.5	
7-Jan	1.0		0.1		0.4								7-Apr	1.0				0.4						0.5	
8-Jan	0.8		0.1		0.4		0.2						8-Apr	1.0				0.4				0.3		0.5	
9-Jan	0.8				0.3		0.1						9-Apr	0.8				0.4		0.4		0.4		0.5	
10-Jan					0.2		0.1						10-Apr	0.8				0.4		0.5				0.5	
11-Jan					0.2								11-Apr	0.8				0.4		0.5		0.4			
12-Jan	0.4				0.2								12-Apr	1.0				0.4		0.4				0.3	
13-Jan	0.5				0.2								13-Apr	1.0				0.4		0.3				0.1	
14-Jan	0.6				0.2								14-Apr	0.8				0.2						0.2	
15-Jan	0.6				0.1								15-Apr	1.0				0.3						0.1	
16-Jan	0.2												16-Apr	1.0				0.2		0.4				0.1	
17-Jan					0.2								17-Apr	0.8				0.4		0.2				0.1	
18-Jan					0.1								18-Apr	0.6				0.4		0.3				0.1	
19-Jan					0.1								19-Apr	0.8				0.4		0.1					
20-Jan					0.1								20-Apr	0.8				0.4							
21-Jan					0.1								21-Apr	0.3				0.3							
22-Jan					0.1								22-Apr	0.4				0.4							
23-Jan					0.1								23-Apr	0.6				0.4		0.2				0.1	
24-Jan					0.2								24-Apr	0.5				0.4		0.2				0.1	
25-Jan													25-Apr	0.3				0.4		0.1				0.1	
26-Jan	0.1				0.1								26-Apr	0.2				0.4		0.2				0.1	
27-Jan	0.1				0.1								27-Apr	0.3				0.4						0.1	
28-Jan	0.2												28-Apr	0.3				0.4							
29-Jan													29-Apr	0.8				0.5						0.1	
30-Jan													30-Apr	0.1				0.3		0.2					
31-Jan																									
1-Feb													1-May	0.2				0.3							
2-Feb													2-May	0.2				0.3		0.1					
3-Feb													3-May	0.2				0.4						0.1	
4-Feb													4-May	0.3				0.4							
5-Feb					0.1								5-May					0.4							
6-Feb					0.1								6-May	0.3				0.4						0.1	
7-Feb					0.2								7-May	0.2				0.4						0.1	
8-Feb					0.2								8-May	0.2				0.4							
9-Feb					0.1								9-May	0.2				0.4							
10-Feb					0.1								10-May	0.2				0.5							
11-Feb					0.2								11-May	0.1				0.4		0.8					
12-Feb					0.1								12-May	0.1				0.3							
13-Feb					0.1								13-May	0.1				0.3							
14-Feb					0.1								14-May					0.3							
15-Feb					0.1								15-May					0.2							
16-Feb					0.1								16-May					0.2							
17-Feb					0.1								17-May												
18-Feb	0.1				0.1								18-May												
19-Feb					0.1								19-May												
20-Feb					0.1								20-May												
21-Feb					0.2								21-May												
22-Feb					0.2								22-May												
23-Feb					0.1								23-May												
24-Feb					0.1								24-May												
25-Feb					0.2								25-May												
26-Feb					0.2								26-May												
27-Feb					0.2								27-May												
28-Feb					0.2								28-May												
													29-May												
													30-May												
													31-May												
1-Mar					0.4								1-Jun												
2-Mar					0.4								2-Jun												
3-Mar	0.1				0.4								3-Jun												
4-Mar					0.4								4-Jun												
5-Mar					0.4								5-Jun												
6-Mar					0.8				0.3				6-Jun												
7-Mar					0.6				0.3				7-Jun												
8-Mar					0.7				0.4				8-Jun											0.1	
9-Mar					0.6				0.5				9-Jun			2.4									
10-Mar					0.6				0.4				10-Jun			2.8									
11-Mar					0.8								11-Jun												
12-Mar					0.7				0.3				12-Jun			2.2									
13-Mar					0.7				0.4				13-Jun												
14-Mar					1.0		0.1		0.4				14-Jun			0.8		0.1						0.3	
15-Mar					0.8		0.1		0.3		0.1		15-Jun					1.4						1.2	
16-Mar					1.0						0.1		16-Jun			0.2		2.4						1.8	
17-Mar					1.0						0.1		17-Jun			0.1		3.0				0.1		1.5	
18-Mar					1.0						0.1		18-Jun					2.5				0.3		1.5	
19-Mar					1.0						0.3		19-Jun					2.5		0.5		0.3		1.8	
20-Mar					1.0		0.1				0.3		20-Jun					2.2		1.0		0.3		1.5	
21-Mar	0.2				1.2				0.5		0.3		21-Jun					2.5		2.0		0.3		1.7	
22-Mar	0.1				1.0		0.1				0.3		22-Jun					2.2						1.6	
23-Mar	0.1				0.8						0.4		23-Jun					2.0				3.2	0.05	1.4	
24-Mar	0.1				0.8						0.4		24-Jun	0.1				1.5				3.6	0.3	1.0	
25-Mar	0.1				0.8				0.8		0.4		25-Jun	0.1				1.0		1.2		3.0	0.2	1.0	
26-Mar	0.2				0.6		0.2		0.4		0.4		26-Jun	0.2				0.6				3.0	0.2	1.0	
27-Mar	0.1				0.6		0.2		0.4		0.4		27-Jun	0.2				0.6				2.8	0.1	1.0	
28-Mar	0.1				0.6		0.2				0.4		28-Jun	0.2				0.6		1.0		1.8	0.05	0.8	
29-Mar					0.6						0.4		29-Jun	0.2				0.6						0.3	
30-Mar	0.1				0.6						0.5		30-Jun	1.0				0.4				1.2		0.3	
31-Mar	0.3				0.6						0.5														

Table M31.1.6 Results on Manganese Concentration of Raw Water at Salaulim WTP in 1997 and from 2000 to 2004 (2/2)

Unit : mg/l

Date	1997		2000		2001		2002		2003		2004		Date	1997		2000		2001		2002		2003		2004	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated		Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated
Max	1.8	0.1	2.8	0.0	3.0	0.0	2.0	0.0	3.6	0.3	1.8	0.0	Max	1.8	0.1	2.8	0.0	3.0	0.0	2.0	0.0	3.6	0.3	1.8	0.0
Min	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	Min	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0
Average	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0	Average	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0
1-Jul	1.8	0.05			0.3		1.0		1.0		0.2		1-Oct												
2-Jul	1.4				0.4		1.0		0.8		0.3		2-Oct												
3-Jul	1.0				0.3		0.8		0.8		0.3		3-Oct												
4-Jul	0.8				0.4		0.6		0.6		0.2		4-Oct												
5-Jul	0.1				0.2		0.6				0.1		5-Oct												
6-Jul	0.1				0.2								6-Oct												
7-Jul	0.1				0.2								7-Oct												
8-Jul	0.1				0.1		0.6		0.3				8-Oct												
9-Jul	0.1				0.1		0.2						9-Oct												
10-Jul							0.4						10-Oct												
11-Jul							0.3						11-Oct												
12-Jul							0.3						12-Oct												
13-Jul													13-Oct												
14-Jul													14-Oct												
15-Jul													15-Oct												
16-Jul							0.5						16-Oct												
17-Jul							0.5						17-Oct												
18-Jul							0.2						18-Oct												
19-Jul							0.2						19-Oct												
20-Jul													20-Oct												
21-Jul													21-Oct												
22-Jul							0.1						22-Oct												
23-Jul													23-Oct												
24-Jul													24-Oct												
25-Jul													25-Oct												
26-Jul													26-Oct												
27-Jul													27-Oct												
28-Jul													28-Oct												
29-Jul													29-Oct												
30-Jul													30-Oct												
31-Jul													31-Oct												
1-Aug													1-Nov												
2-Aug													2-Nov												
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8-Aug													8-Nov												
9-Aug													9-Nov												
10-Aug													10-Nov												
11-Aug													11-Nov												
12-Aug													12-Nov												
13-Aug													13-Nov												
14-Aug													14-Nov												
15-Aug													15-Nov											0.1	
16-Aug													16-Nov											0.1	
17-Aug											0.1		17-Nov											0.1	
18-Aug													18-Nov												
19-Aug													19-Nov							0.1					
20-Aug													20-Nov											0.1	
21-Aug													21-Nov												
22-Aug													22-Nov							0.1				0.1	
23-Aug													23-Nov											0.1	
24-Aug													24-Nov											0.1	
25-Aug													25-Nov									0.2		0.1	
26-Aug													26-Nov							0.2		0.1		0.2	
27-Aug													27-Nov							0.4		0.2		0.1	
28-Aug													28-Nov									0.2		0.1	
29-Aug													29-Nov							0.4		0.2		0.1	
30-Aug													30-Nov											0.2	
31-Aug																									
1-Sep													1-Dec											0.1	
2-Sep													2-Dec											0.2	
3-Sep													3-Dec											0.1	
4-Sep													4-Dec							0.2				0.1	
5-Sep													5-Dec											0.2	
6-Sep													6-Dec	0.1											
7-Sep													7-Dec	0.1											
8-Sep													8-Dec	0.1											
9-Sep													9-Dec	0.1										0.2	
10-Sep													10-Dec	0.4						0.3				0.2	
11-Sep													11-Dec	0.4						0.2					
12-Sep													12-Dec	0.4										0.2	
13-Sep													13-Dec	0.4										0.2	
14-Sep													14-Dec	0.3										0.2	
15-Sep													15-Dec	0.4										0.2	
16-Sep													16-Dec	0.4											
17-Sep													17-Dec	0.4						1.0				0.4	
18-Sep													18-Dec	0.6						1.2				0.3	
19-Sep													19-Dec	0.6											
20-Sep													20-Dec	0.6		0.2				1.0				0.3	
21-Sep													21-Dec	0.6		0.4								0.4	
22-Sep													22-Dec			0.4								0.3	
23-Sep													23-Dec	0.6		0.4								0.4	
24-Sep													24-Dec	0.6		0.4				1.4				0.4	
25-Sep													25-Dec	0.5		0.3				1.6				0.2	
26-Sep											0.1		26-Dec	0.6		0.3								0.1	
27-Sep													27-Dec	1.0		0.4									
28-Sep													28-Dec	1.0		0.4									
29-Sep													29-Dec	1.0		0.4									
30-Sep													30-Dec	0.8		0.5									
													31-Dec			0.5									

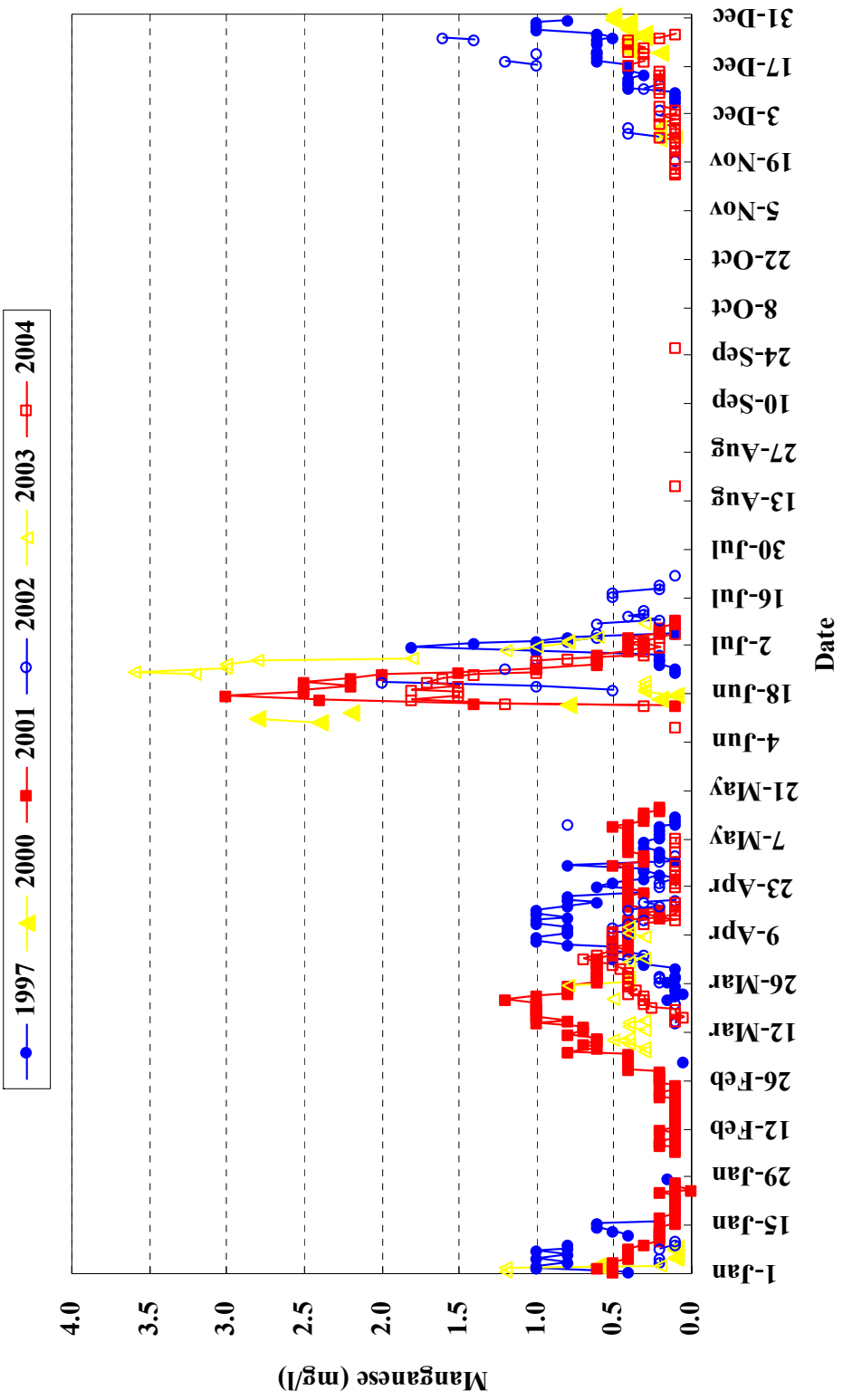

Figure M31.1.2 Fluctuation on Manganese Concentration of Raw Water at Salaulim WTP in 1997 and from 2000 to 2004

Table M31.1.7 Monthly Water Quality of Salaulim WTP Analysed by PWD's Laboratory from January 2003 to May 2005 (1/2)

	Color			Odor			Taste			Turbidity (NTU)			pH			Specific Conductivity (/u mhos/cm)		
	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated
Jan-03	0	0		Unobjectable			Unobjectable			2.3	1.5		6.9	7.1		41.1	49.4	
Feb-03	0	0		Unobjectable			Unobjectable			0.8	0.3		6.7	7.1		44.3	53.8	
Mar-03	0	0		Unobjectable			Unobjectable			3.2	1.2		6.3	7.3		51.0	72.4	
Apr-03	0	0		Unobjectable			Unobjectable			3.0	1.5		6.7	6.8		58.4	59.8	
May-03	0	0		Unobjectable			Unobjectable			3.2	2.0		6.8	6.8		56.6	58.9	
Jun-03	0	0		Unobjectable			Unobjectable			13.6	2.5		6.1	7.6		46.5	73.7	
Jul-03	0	0		Unobjectable			Unobjectable			3.8	1.5		6.7	7.2		43.3	62.7	
Aug-03	0	0		Unobjectable			Unobjectable			2.8	1.0		6.4	6.8		38.8	47.7	
Sep-03	0	0		Unobjectable			Unobjectable			3.3	0.9		6.9	7.1		47.4	56.0	
Oct-03	0	0		Unobjectable			Unobjectable			1.0	0.6		6.9	7.2		39.9	53.2	
Nov-03	0	0		Unobjectable			Unobjectable			1.3	0.8		6.8	7.0		42.4	53.8	
Dec-03	0	0		Unobjectable			Unobjectable			0.9	0.5		7.0	7.9		47.3	63.0	
Jan-04	0	0		Unobjectable			Unobjectable			1.4	0.5		7.0	8.8		46.7	60.8	
Feb-04	0	0		Unobjectable			Unobjectable			1.4	0.3		7.3	7.5		41.2	47.6	
Mar-04	0	0	0	Unobjectable			Unobjectable			2.0	0.7	0.7	6.8	7.2	7.0	47.1	56.0	56.7
Apr-04	0	0	0	Unobjectable			Unobjectable			2.9	0.5	0.5	6.8	7.9	7.5	48.6	70.3	71.4
May-04	0	0	0	Unobjectable			Unobjectable			6.3	1.6	1.5	7.3	7.1	7.1	102.4	101.4	109.5
Jun-04	0	0	0	Unobjectable			Unobjectable			2.6	1.3	1.0	6.8	7.0	7.1	53.1	56.3	56.0
Jul-04	0	0	0	Unobjectable			Unobjectable			6.2	1.4	1.0	6.7	7.9	7.7	55.2	64.7	64.9
Aug-04	0	0	0	Unobjectable			Unobjectable			4.8	1.5	1.4	7.0	7.2	7.2	48.1	52.1	53.5
Sep-04	0	0	0	Unobjectable			Unobjectable			4.8	2.0	1.4	6.9	7.3	7.2	50.8	51.2	52.2
Oct-04	0	0	0	Unobjectable			Unobjectable			1.0	0.5	0.4	7.1	7.3	7.2	48.8	40.0	40.4
Nov-04	0	0	0	Unobjectable			Unobjectable			1.0	0.8	0.9	6.7	6.8	6.8	44.3	50.8	53.6
Dec-04	0	0	0	Unobjectable			Unobjectable			2.0	1.2	1.5	7.2	7.5	8.1	44.6	56.0	56.9
Jan-05	0	0	0	Unobjectable			Unobjectable			1.8	1.0	1.0	7.2	7.5	7.5	45.8	54.6	56.5
Feb-05	0	0	0	Unobjectable			Unobjectable			2.0	1.7	1.7	6.9	7.1	7.1	44.5	56.3	57.0
Mar-05	0	0	0	Unobjectable			Unobjectable			2.5	1.3	1.3	6.7	7.1	7.0	45.9	58.6	58.5
Apr-05	0	0	0	Unobjectable			Unobjectable			3.0	1.5	1.3	6.5	7.1	7.1	53.2	65.5	65.7
May-05	0	0	0	Unobjectable			Unobjectable			3.4	1.9	2.0	7.1	7.2	7.2	50.3	59.8	62.2
Max	0.0	0.0	0.0							13.6	2.5	2.0	7.3	8.8	8.1	102.4	101.4	109.5
Min	0.0	0.0	0.0	Unobjectable			Unobjectable			0.8	0.3	0.4	6.1	6.8	6.8	38.8	40.0	40.4
Ave	0.0	0.0	0.0							3.0	1.2	1.2	6.8	7.3	7.3	49.2	58.8	61.0

	Total Solids (mg/L)			Total Dissolved Solids(TDS) (mg/L)			Suspended Solids (mg/L)			Total Hardness as $CaCO_3$ (TA (mg/L)			Ca^{2+} (mg/L)			Mg^{2+} (mg/L)		
	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated
Jan-03	26.0	31.0		26.0	31.0		0.0	0.0		12.0	14.0		3.6	4.4		0.8	0.3	
Feb-03	29.0	35.0		29.0	35.0		0.0	0.0		13.0	16.0		3.6	1.8		1.0	1.0	
Mar-03	33.0	45.0		32.0	46.0		1.5	0.0		17.0	28.0		3.6	8.4		2.0	2.0	
Apr-03	38.0	39.0		37.0	39.0		1.0	0.0		23.0	24.0		4.0	4.4		3.3	3.3	
May-03	38.0	37.0		36.0	37.0		2.0	0.0		25.0	25.0		4.8	4.8		3.3	3.3	
Jun-03	34.0	47.0		30.0	47.0		4.0	0.0		19.0	37.0		3.6	9.6		2.5	3.3	
Jul-03	29.5	40.0		28.0	40.0		1.5	0.0		15.0	23.0		3.6	6.0		1.5	2.0	
Aug-03	26.0	31.0		25.0	31.0		1.0	0.0		16.0	20.0		3.2	4.8		2.0	2.0	
Sep-03	31.5	36.0		30.0	36.0		1.5	0.0		16.0	23.0		3.2	6.0		2	2.0	
Oct-03	26.0	34.5		26.0	34.5		0.0	0.0		16.0	20.0		3.2	5.6		2.0	1.0	
Nov-03	27.0	34.0		27.0	34.0		0.0	0.0		16.0	22.0		3.6	5.6		1.8	2.0	
Dec-03	30.0	39.0		30.0	39.0		0.0	0.0		17.0	26.0		3.6	6.4		2.0	2.5	
Jan-04	30.0	39.0		30.0	39.0		0.0	0.0		16.0	25.0		3.6	6.4		1.8	2.3	
Feb-04	26.0	30.0		26.0	30.0		0.0	0.0		14.0	19.0		3.6	5.2		1.3	1.5	
Mar-04	29.5	36.0	36.0	30.0	36.0	36.0	0.5	0.0	0.0	15.0	20.0	20.0	3.6	5.6	5.6	1.5	1.5	1.5
Apr-04	31.5	45.0	45.5	31.0	45.0	45.5	0.5	0.0	0.0	15.0	25.0	25.0	3.2	7.2	7.2	1.8	1.8	1.8
May-04	67.0	65.0	70.0	65.0	65.0	70.0	2.0	0.0	0.0	40.0	40.0	40.0	10.0	10.0	10.0	3.8	3.8	3.8
Jun-04	34.0	36.0	36.0	33.5	36.0	36.0	0.5	0.0	0.0	14.0	16.0	16.0	3.2	4.0	4.0	1.5	1.5	1.5
Jul-04	37.5	41.5	41.5	35.5	41.5	41.5	2.0	0.0	0.0	18.0	26.0	26.0	4.4	7.2	7.2	1.8	2.0	2.0
Aug-04	32.0	33.0	34.0	31.0	33.0	34.0	1.0	0.0	0.0	17.0	20.0	20.0	4.0	4.8	4.8	1.8	2.0	2.0
Sep-04	33.0	33.0	33.5	32.0	33.0	33.5	1.0	0.0	0.0	15.0	19.0	19.0	4.0	4.8	4.8	1.3	1.8	1.8
Oct-04	31.0	31.5	31.5	31.0	31.5	31.5	0.0	0.0	0.0	17.0	17.0	17.0	4.8	4.8	4.8	1.3	1.3	1.3
Nov-04	28.0	32.5	34.0	28.0	32.5	34.0	0.0	0.0	0.0	14.0	18.0	18.0	3.6	4.8	4.8	1.3	1.5	1.5
Dec-04	29.5	36.0	36.5	28.5	36.0	36.5	0.0	0.0	0.0	15.0	20.0	21.0	3.6	5.6	6.0	1.5	1.5	1.5
Jan-05	29.5	35.0	36.0	29.0	35.0	36.0	0.5	0.0	0.0	14.0	17.0	17.0	3.6	4.8	4.8	1.2	1.3	1.3
Feb-05	28.0	36.0	36.0	28.0	36.0	36.0	0.0	0.0	0.0	13.0	17.0	17.0	3.2	4.8	4.8	1.3	1.3	1.3
Mar-05	29.0	37.5	37.5	29.0	37.5	37.5	0.0	0.0	0.0	14.0	18.0	18.0	3.2	4.8	4.8	1.5	1.5	1.5
Apr-05	35.0	42.0	42.0	34.0	42.0	42.0	1.0	0.0	0.0	19.0	25.0	25.0	5.2	7.2	7.2	1.5	1.8	1.8
May-05	33.0	38.0	40.0	32.0	38.0	40.0	1.0	0.0	0.0	17.0	20.0	20.0	4.0	5.2	5.2	1.8	1.8	1.8
Max	67.0	65.0	70.0	65.0	65.0	70.0	4.0	0.0	0.0	40.0	40.0	40.0	10.0	10.0	10.0	3.8	3.8	3.8
Min	26.0	30.0	31.5	25.0	30.0	31.5	0.0	0.0	0.0	12.0	14.0	16.0	3.2	1.8	4.0	0.8	0.3	1.3
Ave	32.1	37.8	39.3	31.4	37.8	39.3	0.8	0.0	0.0	17.0	22.1	21.3	3.9	5.7	5.7	1.8	1.9	1.7

Table M31.1.7 Monthly Water Quality of Salaulim WTP Analysed by PWD's Laboratory from January 2003 to May 2005 (2/2)

	Cl^- (mg/L)			Total Alkalinity as $CaCO_3$ (mg/L)			SO_4^- (mg/L)			Fe^{2+} (mg/L)			Mn^{2+} (mg/L)			NO_3^{2-} (mg/L)			$KMnO_4$ oxidizability as O_2 (mg/L)		
	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated
Jan-03	6.0	6.0		12.0	13.0		0.0	0.0		0.05	0.05		0.00	0.00		0.6	0.0		0.2	0.0	
Feb-03	6.0	6.0		13.0	16.0		0.0	0.0		0.05	0.05		0.24	0.00		0.4	0.0		0.2	0.0	
Mar-03	6.0	6.0		16.0	29.0		0.0	0.0		0.06	0.05		0.00	0.00		1.3	0.0		0.2	0.0	
Apr-03	6.0	6.0		21.0	23.0		0.0	0.0		0.30	0.05		0.00	0.00		0.7	0.0		0.2	0.0	
May-03	6.0	6.0		23.0	23.0		0.0	0.0		0.06	0.05		0.00	0.00		0.4	0.0		0.2	0.0	
Jun-03	4.0	4.0		20.0	32.0		0.0	0.0		0.45	0.06		0.00	0.00		0.8	0.0		0.4	0.0	
Jul-03	6.0	6.0		16.0	20.0		0.0	0.0		0.10	0.05		0.00	0.00		0.9	0.0		0.3	0.0	
Aug-03	6.0	6.0		17.0	17.0		0.0	0.0		0.20	0.05		0.00	0.00		0.4	0.0		0.3	0.0	
Sep-03	6	6.0		17.0	20.0		0.0	0.0		0.05	0.05		0.00	0.00		0.8	0.0		0.2	0.0	
Oct-03	6.0	6.0		23.0	25.0		0.0	0.0		0.10	0.05		0.00	0.00		0.9	0.0		0.2	0.0	
Nov-03	6.0	6.0		20.0	23.0		0.0	0.0		0.05	0.05		0.10	0.00		0.4	0.0		0.2	0.0	
Dec-03	6.0	6.0		18.0	24.0		0.0	0.0		0.06	0.05		0.08	0.00		0.8	0.0		0.4	0.0	
Jan-04	6.0	6.0		18.0	26.0		0.0	0.0		0.10	0.05		0.00	0.00		1.9	0.0		0.4	0.0	
Feb-04	6.0	6.0		18.0	22.0		0.0	0.0		0.05	0.05		0.00	0.00		1.5	0.0		0.3	0.0	
Mar-04	6.0	6.0	6.0	20.0	23.0	23.0	0.0	0.0	0.0	0.12	0.05	0.05	0.00	0.00	0.00	1.2	0.0	0.0	0.3	0.0	0.0
Apr-04	6.0	6.0	6.0	21.0	35.0	32.0	0.0	0.0	0.0	0.08	0.05	0.05	0.00	0.00	0.00	1.0	0.0	0.0	0.3	0.0	0.0
May-04	7.0	7.0	9.0	44.0	44.4	44.0	0.0	0.0	0.0	0.60	0.10	0.10	0.00	0.00	0.00	1.4	0.0	0.0	0.6	0.0	0.0
Jun-04	7.0	7.0	7.0	15.0	18.0	18.0	0.0	0.0	0.0	0.06	0.05	0.05	0.00	0.00	0.00	0.6	0.0	0.0	0.2	0.0	0.0
Jul-04	7.0	7.0	7.0	17.0	28.0	28.0	0.0	0.0	0.0	0.30	0.05	0.05	0.12	0.00	0.00	0.8	0.0	0.0	0.4	0.0	0.0
Aug-04	6.0	6.0	7.0	17.0	18.0	18.0	0.0	0.0	0.0	0.20	0.10	0.10	0.00	0.00	0.00	0.5	0.0	0.0	0.3	0.0	0.0
Sep-04	6.0	6.0	7.0	16.0	21.0	21.0	0.0	0.0	0.0	0.06	0.06	0.06	0.00	0.00	0.00	0.4	0.0	0.0	0.2	0.0	0.0
Oct-04	6.0	6.0	6.0	18.0	19.0	19.0	0.0	0.0	0.0	0.06	0.05	0.05	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Nov-04	6.0	6.0	7.0	16.0	19.0	19.0	0.0	0.0	0.0	0.06	0.05	0.05	0.10	0.00	0.00	0.2	0.0	0.0	0.0	0.0	0.0
Dec-04	6.0	6.0	6.0	19.0	24.0	25.0	0.0	0.0	0.0	0.06	0.05	0.05	0.00	0.00	0.00	0.0	0.0	0.0	0.2	0.0	0.0
Jan-05	6.0	7.0	8.0	18.0	19.0	19.0	0.0	0.0	0.0	0.40	0.06	0.06	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Feb-05	6.0	6.0	6.0	17.0	21.0	21.0	0.0	0.0	0.0	0.06	0.05	0.05	0.00	0.00	0.00	0.6	0.0	0.0	0.3	0.0	0.0
Mar-05	7.0	7.0	7.0	16.0	20.0	20.0	0.0	0.0	0.0	0.10	0.06	0.06	0.00	0.00	0.00	0.4	0.0	0.0	0.2	0.0	0.0
Apr-05	7.0	7.0	8.0	17.0	25.0	25.0	0.0	0.0	0.0	0.10	0.06	0.06	0.12	0.00	0.00	0.5	0.0	0.0	0.3	0.0	0.0
May-05	6.0	8.0	10.0	17.0	18.0	18.0	0.0	0.0	0.0	0.20	0.10	0.10	0.00	0.00	0.00	0.8	0.0	0.0	0.3	0.0	0.0
Max	7.0	8.0	10.0	44.0	44.4	44.0	0.0	0.0	0.0	0.60	0.10	0.10	0.24	0.00	0.00	1.9	0.0	0.0	0.6	0.0	0.0
Min	4.0	4.0	6.0	12.0	13.0	18.0	0.0	0.0	0.0	0.05	0.05	0.05	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Ave	6.1	6.2	7.1	18.6	22.9	23.3	0.0	0.0	0.0	0.14	0.06	0.06	0.03	0.00	0.00	0.7	0.0	0.0	0.3	0.0	0.0

	BOD at 27°C and 3days (mg/L)			DO (mg/L)			F^- (mg/L)			Al^{3+} (mg/L)			Plate Count on nutrient agar no/100mL			MPN of Coliform no/100mL			MPN of E.Coli. no/100mL		
	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated	Raw	Filtered	Treated
Jan-03	0.5	0.0					0.0	0.0		0.00	0.00		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Feb-03	0.5	0.0					0.0	0.0		0.00	0.00		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Mar-03	0.5	0.0					0.0	0.0		0.00	0.00		86.0	2.0		1,100.0	0.0	0.0	150.0	0.0	0.0
Apr-03	0.5	0.0					0.0	0.0		0.00	0.00		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
May-03	0.5	0.0					0.0	0.0		0.00	0.00		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Jun-03	1.0	0.0					0.0	0.0		0.00	0.33		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Jul-03	1.0	0.0					0.0	0.0		0.00	0.21		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Aug-03	0.5	0.0					0.0	0.0		0.00	0.04		127.0	3.0		150.0	0.0	0.0	93.0	0.0	0.0
Sep-03	0.5	0.0					0.0	0.0		0.00	0.02		140.0	1.0		93.0	0.0	0.0	43.0	0.0	0.0
Oct-03	0.5	0.0		7.1	7.2		0.0	0.0		0.00	0.04		137.0	0.0		460.0	0.0	0.0	240.0	0.0	0.0
Nov-03	0.5	0.0		7.1	7.2		0.0	0.0		0.00	0.04		70.0	28.0	1.0	430.0	0.0	0.0	230.0	0.0	0.0
Dec-03	1.9	0.0		7.2			0.0	0.0		0.00	0.05		82.0	13.0	0.0	460.0	23.0	0.0	460.0	0.0	0.0
Jan-04	1.2	0.0		7.3	7.4		0.0	0.0		0.00	0.00		82.0	13.0	0.0	460.0	23.0	0.0	460.0	0.0	0.0
Feb-04	0.8	0.0		7.3	7.4		0.0	0.0		0.00	0.00		88.0	40.0	0.0	460.0	460.0	0.0	460.0	240.0	0.0
Mar-04	0.8	0.0	0.0	7.2	7.3	7.3	0.0	0.0	0.0	0.00	0.00	0.00	104.0	4.0	2.0	43.0	0.0	0.0	23.0	0.0	0.0
Apr-04	0.6	0.0	0.0	7.2	7.4	7.5	0.0	0.0	0.0	0.00	0.00	0.00	135.0	75.0	2.0	240.0	93.0	0.0	9.0	7.0	0.0
May-04	1.2	0.0	0.0	6.9	7.0	7.2	0.0	0.0	0.0	0.00	0.00	0.00	107.0	67.0	2.0	1,100.0	460.0	0.0	460.0	93.0	0.0
Jun-04	0.6	0.0	0.0	6.9	7.5	7.5	0.0	0.0	0.0	0.00	0.00	0.00	87.0	12.0	1.0	240.0	4.0	0.0	240.0	0.0	0.0
Jul-04	1.1	0.0	0.0	7.1	7.2	7.2	0.0	0.0	0.0	0.00	0.10	0.10	220.0	140.0	3.0	93.0	93.0	0.0	43.0	21.0	0.0
Aug-04	0.5	0.0	0.0	7.0	7.3	7.4	0.0	0.0	0.0	0.00	0.05	0.05	123.0	12.0	0.0	240.0	43.0	0.0	93.0	0.0	0.0
Sep-04	0.5	0.0	0.0	7.0	7.4	7.4	0.0	0.0	0.0	0.00	0.05	0.05	192.0	15.0	0.0	240.0	21.0	0.0	21.0	0.0	0.0
Oct-04	0.0	0.0	0.0	7.2	7.4	7.4	0.0	0.0	0.0	0.00	0.04	0.04	180.0	4.0	0.0	460.0	9.0	0.0	240.0	0.0	0.0
Nov-04	0.0	0.0	0.0	7.1	7.3	7.4	0.0	0.0	0.0	0.00	0.01	0.01	140.0	25.0	2.0	460.0	39.0	0.0	21.0	7.0	0.0
Dec-04	0.5	0.0	0.0	7.5	7.6	7.6	0.0	0.0	0.0	0.00	0.01	0.01	71.0	12.0	2.0	1,100.0	23.0	0.0	240.0	4.0	0.0
Jan-05	0.0	0.0	0.0	7.5	7.6	7.6	0.0	0.0	0.0	0.00	0.01	0.01	88.0	5.0	3.0	93.0	0.0	0.0	28.0	0.0	0.0
Feb-05	0.5	0.0	0.0	7.3	7.5	7.5	0.0	0.0	0.0	0.00	0.00	0.00	45.0	35.0	2.0	93.0	4.0	0.0	0.0	0.0	0.0
Mar-05	0.5	0.0	0.0	7.5	7.8	7.8	0.0	0.0	0.0	0.00	0.00	0.00	112.0	12.0	0.0	93.0	15.0	0.0	23.0	0.0	0.0
Apr-05	0.5	0.0	0.0	7.4	7.6	7.6	0.0	0.0	0.0	0.00	0.00	0.00	178.0	15.0	2.0	460.0	4.0	0.0	240.0	0.0	0.0
May-05	0.6	0.0	0.0	7.0	7.2	7.2	0.0	0.0	0.0	0.00	0.02	0.02	120.0	35.0	0.0	1,100.0	3.0	0.0	23.0	0.0	0.0
Max	1.9	0.0	0.0	7.5	7.8	7.8	0.0	0.0	0.0	0.00	0.33	0.10	220.0	140.0	3.0	1,100.0	460.0	0.0	460.0	240.0	0.0
Min	0.0	0.0	0.0	6.9	7.0	7.2	0.0	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ave	0.6	0.0	0.0	7.2	7.4	7.4	0.0	0.0	0.0	0.00	0.04	0.02	93.6	19.6	1.2	333.4	45.4	0.0	132.4	12.8	0.0

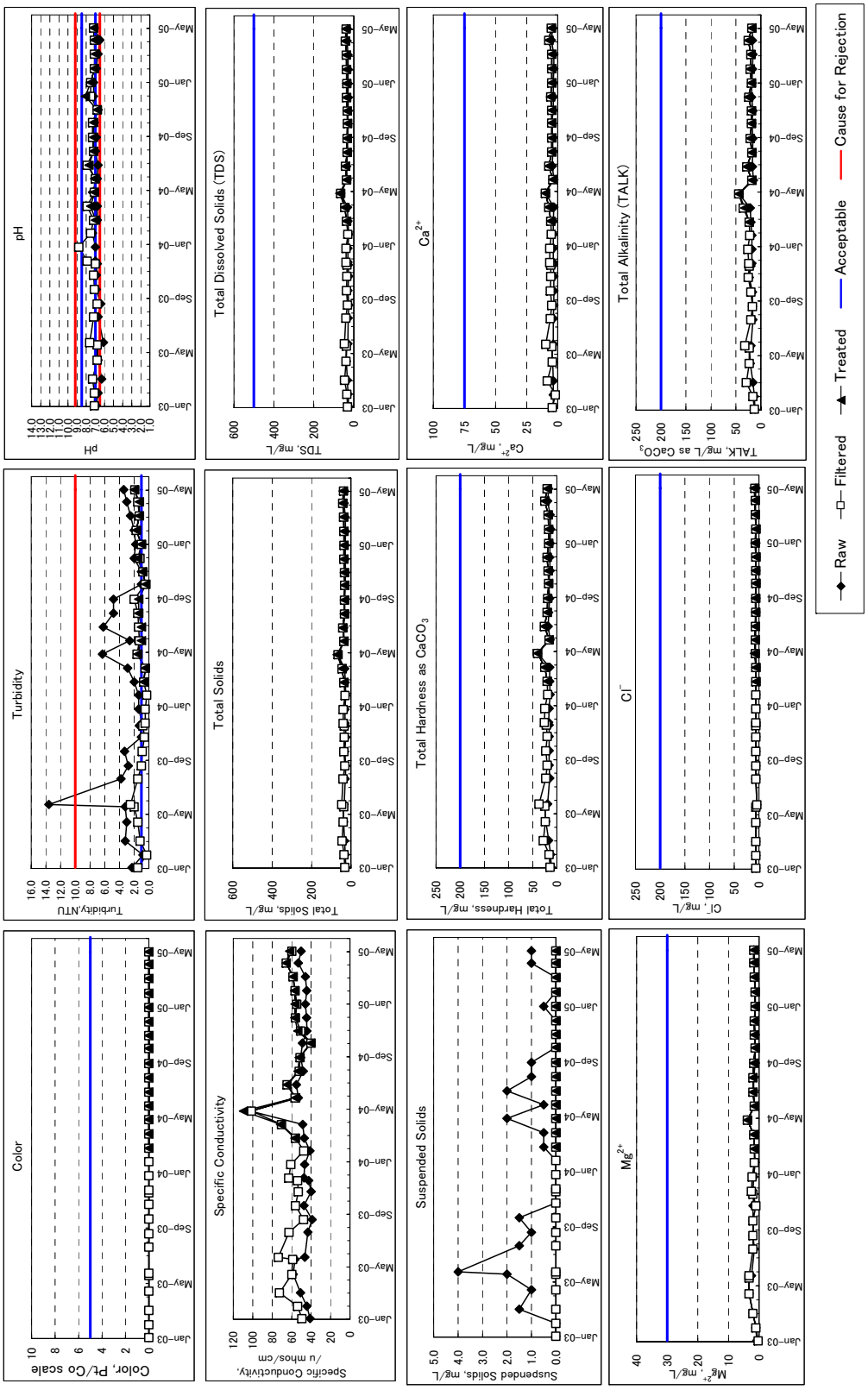

Figure M31.1.3 Monthly Water Quality of Salaulim WTP Analysed by PWD's Laboratory from January 2003 to May 2005 (1/2)

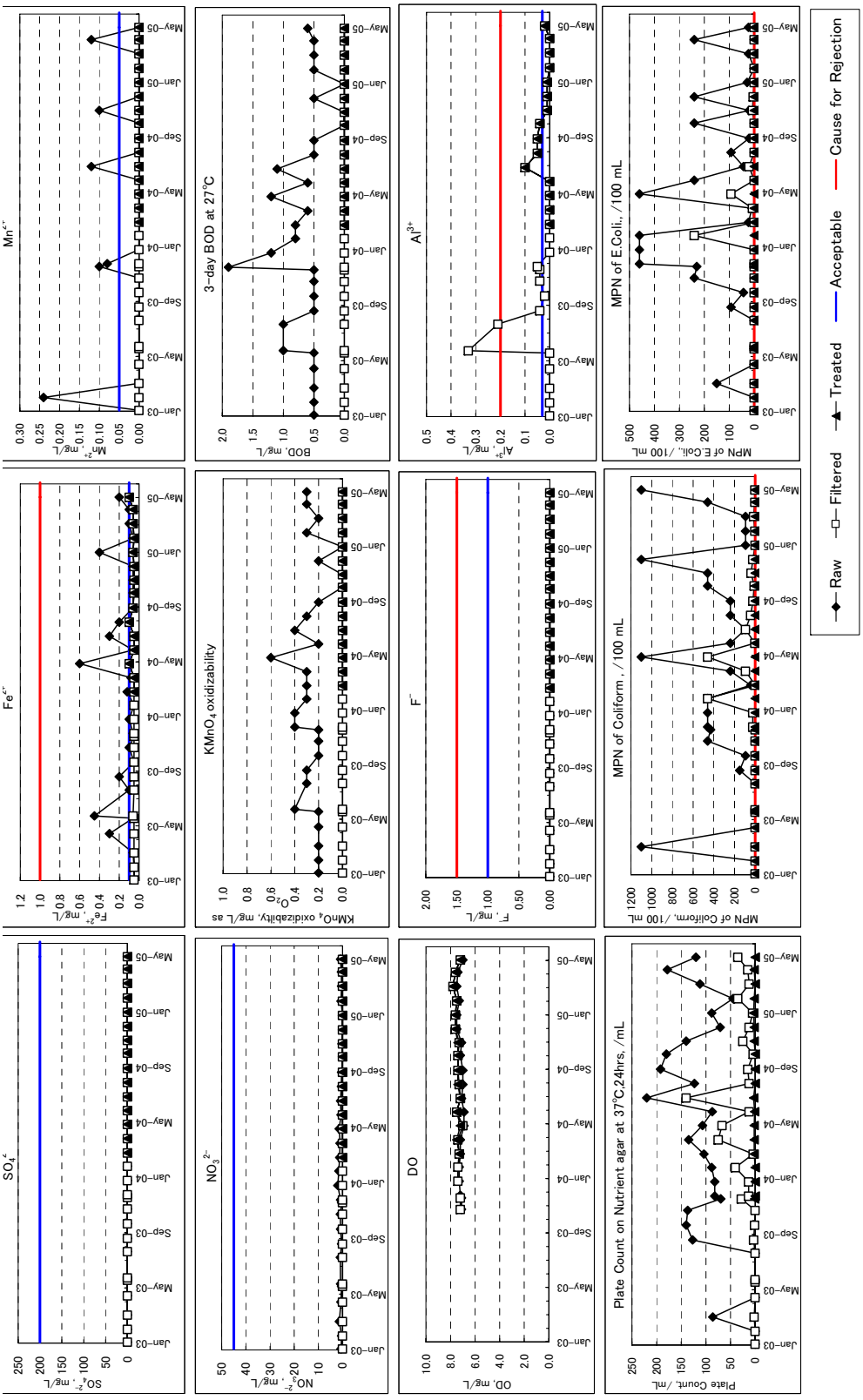

Figure M31.1.3 Monthly Water Quality of Salaulim WTP Analysed by PWD's Laboratory from January 2003 to May 2005 (2/2)

Table M31.1.8 Records on Power Interruption at Salaulim WTP (1/3)

Year	2003	Ave.	6.1	Max.	95.0	Min.	1.0				Unit:	min.
Date	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
1			30.0			23.0	81.0	16.0		34.0		
2	1.0			11.0		4.0				15.0	3.0	
3	5.0	5.0	18.0			14.0		4.0		26.0	5.0	
4		9.0								63.6		
5		95.0				2.0				2.0	4.0	
6			27.0		35.0	2.0				3.0		
7	7.0		27.0		6.0			1.0	4.0	23.0	25.0	
8			1.0			17.0	59.0				40.0	
9					12.0		12.0	5.0	4.0	8.0	12.0	
10					1.0	8.0	10.0	16.0		4.0	2.0	
11	12.0			66.0	3.0	14.0					2.0	
12	4.0		15.0	3.0	2.0		20.0		26.0	29.0		
13									9.0	21.0		2.0
14	10.0			2.0		3.0	46.0	2.0	13.0		10.0	2.0
15					25.0					6.0	2.0	
16						8.0	6.0		1.0			2.0
17					2.0	64.2	4.0		7.0	2.0		
18		50.0			3.0	29.0	3.0		7.0	10.0	2.0	
19		18.0			4.0	16.0	31.0		9.0	44.0	9.0	
20		10.0				4.0	2.0			4.0	10.0	
21		23.0		1.0	20.0	27.0			5.0	4.0	1.0	
22				45.0	2.0			7.0	5.0	11.0	9.0	1.2
23				35.0		1.0			2.0	1.0	55.0	2.0
24					5.0	19.0		2.0		11.0		
25	15.0		1.0	12.0	4.0		9.0	4.0		4.0		2.0
26					10.0		12.0	9.0				
27	2.0			17.0			10.0	2.0	5.0			20.0
28				5.0			4.0	17.0	30.0	9.0	13.0	2.0
29		-	15.0						37.0	5.0	8.0	
30		-		22.0					23.0	3.0	6.0	
31		-		-	25.0	-			-	5.0	-	
Total (min./month)	56.0	210.0	134.0	219.0	159.0	255.2	309.0	85.0	187.0	347.6	218.0	33.2
Ave. (min./day)	1.8	7.5	4.3	7.3	5.1	8.5	10.0	2.7	6.2	11.2	7.3	1.1
Max. (min./day)	15.0	95.0	30.0	66.0	35.0	64.2	81.0	17.0	37.0	63.6	55.0	20.0
Min. (min./day)	1.0	5.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.2

Note: Average interruption period means the interruption minutes per day per month .

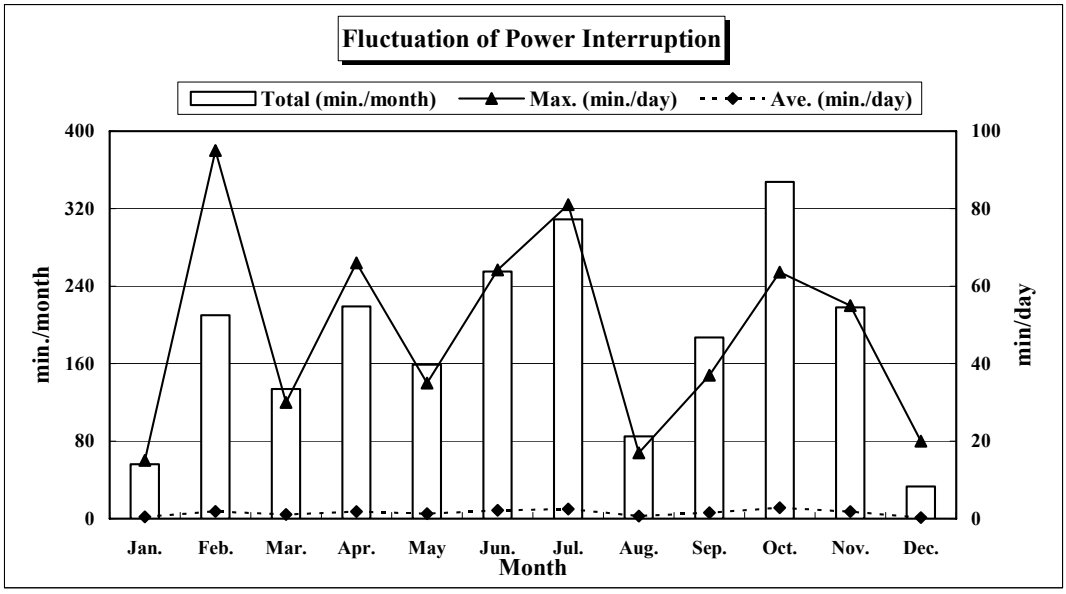

Table M31.1.8 Records on Power Interruption at Salaulim WTP (2/3)

Year	2004	Ave.	8.7	Max.	318.6	Min.	0.1				Unit:	min.
Date	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
1				23.0	2.0	1.3			18.0			
2		4.0		1.0	42.0	7.0						
3		5.0		30.0	14.0			27.0	24.0			
4			3.0	45.0		5.0		95.4		7.0	10.0	
5	15.0		5.0		79.2			17.0				17.0
6	37.0				5.0		51.0	1.0				2.0
7	66.0				2.0			6.0				
8	2.0	5.0		7.0	9.0	26.0		1.0				1.0
9	6.0			10.0		318.6	3.0	23.0		1.0	33.0	
10	60.0				0.1	1.1			66.0	26.0	1.0	16.0
11	4.0				2.0			8.0	3.0	10.0	10.0	
12				1.0		1.0		25.0	2.0			5.0
13			50.0			274.2		7.0	7.0	40.0		
14						183.6			9.0			16.0
15	37.0	3.0	13.0		5.0	73.8	2.0		14.0	25.0		1.0
16		6.0				12.0	50.0	30.0	30.0			
17			3.0			5.0	63.0		30.0		5.0	
18						20.0	7.0	21.0		1.0		
19	10.0			25.0		14.0						
20	1.0	66.0		56.0		17.0		4.0		2.0		
21	1.0	2.0		2.0	4.0	3.0				11.0		
22		2.0		3.0		5.0			3.0			
23	1.0					6.0			5.0	4.0		
24	2.0	3.0	2.0			1.0					75.0	
25	5.0							64.8		2.0		
26							3.0		4.0	15.0		
27			35.0				4.0	11.0	15.0			3.0
28								2.0	2.0		61.8	5.0
29		60.0		18.0	30.0	1.0		17.0	5.0			
30		-			5.0		55.0		2.0			
31		-		-		-	15.0		-		-	
Total (min./month)	247.0	156.0	111.0	221.0	199.3	975.6	253.0	360.2	239.0	144.0	195.8	66.0
Ave. (min./day)	8.0	5.6	3.6	7.4	6.4	32.5	8.2	11.6	8.0	4.6	6.5	2.1
Max. (min./day)	66.0	66.0	50.0	56.0	79.2	318.6	63.0	95.4	66.0	40.0	75.0	17.0
Min. (min./day)	1.0	2.0	2.0	1.0	0.1	1.0	2.0	1.0	2.0	1.0	1.0	1.0

Note: Average interruption period means the interruption minutes per day per month .

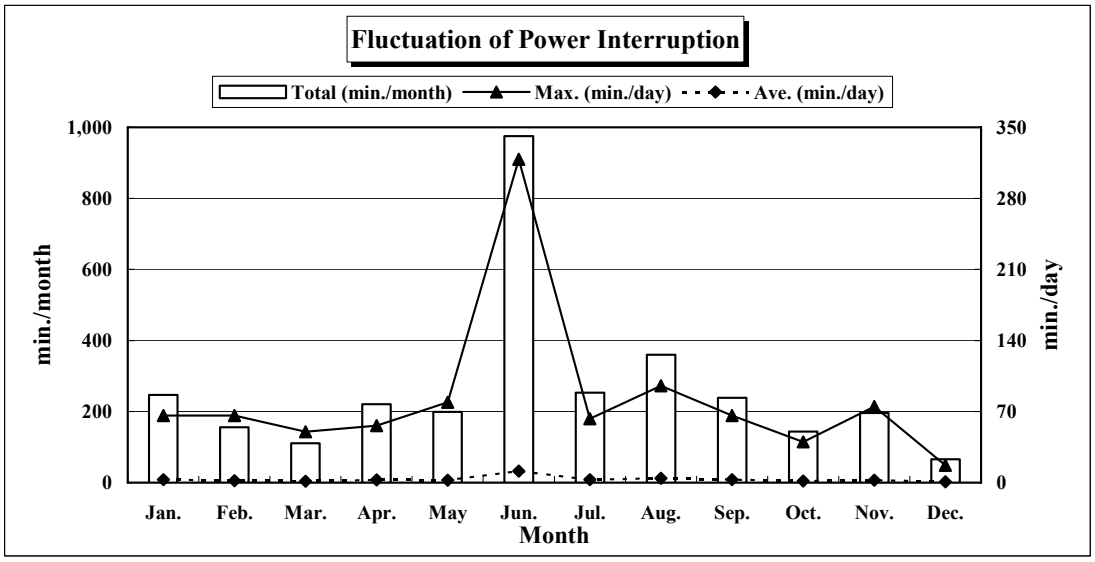

Table M31.1.8 Records on Power Interruption at Salaulim WTP (3/3)

Year	2005	Ave.	4.8	Max.	124.8	Min.	0.1				Unit:	min.
Date	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
1			2.0			47.0						
2				15.0								
3												
4												
5		2.0				1.0						
6						9.0						
7	2.0	11.0	5.0		0.3							
8						2.0						
9	12.0	1.0										
10	8.0											
11	7.0				0.7							
12			2.0									
13			9.0		0.2							
14	3.0		40.0		0.2							
15												
16			41.0	11.0	0.2							
17		3.0		4.0	0.3	20.0						
18					0.5	40.0						
19		4.0	2.0		0.5	7.0						
20			14.0	10.0	60.0	7.0						
21			2.0		53.0							
22												
23				69.6	2.0	31.0						
24												
25						4.0						
26												
27			5.0		0.2	50.0						
28					0.2	18.0						
29		-			2.0	124.8						
30		-	55.0		51.0	2.0						
31		-		-	0.1	-			-		-	
Total (min./month)	32.0	21.0	177.0	109.6	171.3	362.8	0.0	0.0	0.0	0.0	0.0	0.0
Ave. (min./day)	1.0	0.8	5.7	3.7	5.5	12.1	0.0	0.0	0.0	0.0	0.0	0.0
Max. (min./day)	12.0	11.0	55.0	69.6	60.0	124.8	0.0	0.0	0.0	0.0	0.0	0.0
Min. (min./day)	2.0	1.0	2.0	4.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Average interruption period means the interruption minutes per day per month .

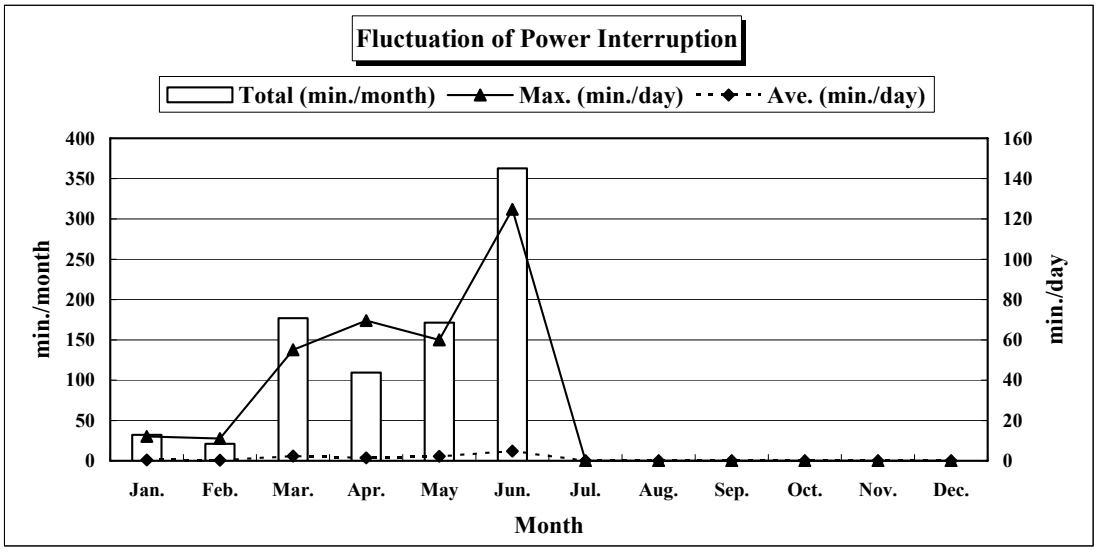

Table M31.1.9 List of Reservoirs for the Salaulim Water Supply Scheme (1/3)

Series No.	Tapping No.	Tapping Main Dia. (mm)	Tapping Main Material	Name of GLR / OHR / Sump (Name of Location)	GLR / OHR / Sump Type	GLR / OHR / Sump Capacity (m3)	GLR / OHR / Sump Elevation (m) GL	GLR / OHR / Sump Elevation (m) HWL	GLR / OHR / Sump Elevation (m) LWL	Supply Area Taluka	Supply Area Village Name	Remarks
1				CWR (Salaulim WTP)	GLR	3,370		115.15	110.50			Bottom EL of Outlet
2					GLR	3,370		115.15	110.50			Chamber=110.0m
3	0	300	CIP	Xelpem (1990)	GLR	200	83.00			Sanguem	Xelpem(30), Cotarli(29), Muguli(28)	
4		300	CIP	Sanguem	GLR	200	40.00			ditto-	Cotarli(29), Sanguem(M Cl)(50), Costi(25), Uguem(32)	
5		300	CIP	Pontemol (1993)	GLR	800	61.00			Quepem	Curchorem Cacora(MCl)(37)	
6	1	200	ACP	Malkernem (1990)	GLR	100	76.00			ditto-	Molcarnem(14):2,000persons	
7	2	200	CIP	Zambaulim (1995)	GLR	300	58.00			Sanguem	Rivona(43)(Zambaulim Village)	
8		200	CIP	Rivona (1992)	GLR	200	60.00			ditto-	Rivona(43):Supply from Kushavari River	Idle
9	3	300	CIP	Shivoi (1992)	GLR	800	70.00			Quepem	Sirvoi(9)	Idle-Not Accessible
10	7	350	CIP	Veroda (1995)	GLR	800	46.00			Salcete	Cuncolim(48):from Feb. '06	Idle
11		300	CIP	Velim	GLR	800	42.00			ditto-	Velim(38)	Idle
12		300	CIP	Balli	Sump	400	15.00			Quepem	Bali(17), Fatorpa(18), Tiloi(22):7,000persons	w/Pump House
13					GLR	650	115.00			ditto-	Bali(17), Fatorpa(18), Tiloi(22):7,000persons	
14		300	CIP	Khanaguinim	GLR	25	40.00			ditto-	Naquerim(20):500persons, from Spring	Not Commission
15	10	200	CIP	Baida (1993)	Sump	300	16.00			Salcete	Chinchinim (CT)(47):from Jan. '06	w/Pump House
16					GLR	300	40.00			ditto-	Chinchinim (CT)(47):from Jan. '06	
17		150	CIP	Deusa	GLR	100	32.00			ditto-	Duessua(35)	
18		200	CIP	Sarzora	GLR	300	41.00			ditto-	Sarzora(31), Cuncolim(48):Mar./Apr. '06	Idle
19	11	250	CIP	Chandor	GLR	150	53.00			ditto-	Chandor(28), Cavorim(27)	
20	12	250	CIP	St. Jose De Areal	GLR	800	40.00			ditto-	Sao Jose de Areal(CT)(46), Dicarpale(26)	
21	14	300	CIP	Curtorim	Sump	100	14.00			ditto-	Curtorim(20), Macasana(18)	w/Pump House
22					GLR	300	75.00			ditto-	-ditto-	
23		300	CIP	Curtorim (1990)	GLR	650	65.00			ditto-	-ditto-	
24				Makazana	GLR	100	40.00			ditto-	Macasana(18):from Jun. '06	Idle
25		300	CIP	Girdolim (1990)	GLR	300	58.00			ditto-	Guirdolim(19):from Jun. '06	Idle
26	15	600	CIP	Borda (1980)	GLR	800	55.00	58.80		ditto-	Margao(40)	w/Pump House
27					GLR	800	55.00	58.80		ditto-	-ditto-	
28		600	CIP	Aquem (1990)	GLR	800	63.00	66.80		ditto-	-ditto-	Idle
29					GLR	800	63.00	66.80		ditto-	-ditto-	
30		600	CIP	Monte Hill (Aquem) 1990	OHR	150	80.00	107.50		ditto-	-ditto-	Pumping from Borda
31	18	400	CIP	Monte Hill (1975)	GLR	500	42.50	45.80		ditto-	-ditto-	
32					GLR	500	42.50	45.80		ditto-	-ditto-	
33		400	CIP	Monte Hill (2005)	GLR	4,000	44.00	48.00		ditto-	-ditto-	Sep. '05 in Completion
34		400	CIP	Monte Hill (TB Hospital)	GLR	800	65.00	68.80		ditto-	-ditto-	from Monte Hill (1975)
35		600	MSP	Gogol (Jan. 2000)	Sump	1,500	53.00	56.00		ditto-	-ditto-	w/Pump House
36		600	MSP	Margao MBR : Gogol (2000)	GLR	10,000	110.00	114.00		ditto-	-ditto-	
37		300	CIP	Near MBR : Margao	GLR	800	55.00	58.80		ditto-	-ditto-	
38		150	CIP	Vasant Nagar : Margao	GLR	150	70.00	73.80		ditto-	-ditto-	
39		400		Fatorda (1992)	GLR	800	55.00	58.80		Salcete	Margao(40)	
40		400	CIP	Gavli Wada (2004)	Sump	400	26.50	29.20		ditto-	-ditto-	w/Pump House
41		400	CIP	Dongar Wada (2004)	GLR	800	56.00	59.80		ditto-	-ditto-	

Table M31.1.9 List of Reservoirs for the Salaulim Water Supply Scheme (2/3)

Series No.	Tap -ping No.	Tapping Main		Name of GLR / OHR / Sump (Name of Location)	GLR / OHR / Sump				Supply Area		Remarks
		Dia. (mm)	Material		Type	Capacity (m3)	Elevation (m) GL	HWL	LWL	Taluka	Village Name	
42	20	500	CIP	Colva (1980)	GLR	300	42.00			ditto-	Colva(12), Vanelim(13), Seraulim(14), Duncolim(15), Betalbatim(10), Gandaulim(11),	Idle
43				Betalbatim	OHR	150	16.00			ditto-	Betalbatim(10), Gonsua(9)	
44	21	150	CIP	Damon Raia	GLR	800	62.00	65.80		ditto-	Raia(16)	
45		250	CIP	Camurlim (2003)	Sump	400	36.00			ditto-	Raia(16), Camurlim(4), Loutulim(3)	w/Pump House
46		250	CIP	Camurlim	GLR	800	52.00			ditto-	-ditto-	
47		250	CIP	Loutoulim (2000)	Sump	400	36.00			ditto-	Loutulim(3)	w/Pump House
48					GLR	300	60.00			ditto-	-ditto-	
49		250	CIP		GLR	800	60.00			ditto-	-ditto-	
50		150	CIP	Raia (2000)	Sump	400	15.00			ditto-	Raia(16), Rachol(17)	w/Pump House
51		150	CIP	Collea Dongor : Raia (1980)	GLR	300	55.00			ditto-	-ditto-	
52	23			Monora Raia (1985)	GLR	300	55.00			ditto-	Raia(16)	Idle
53					OHR	150	55.00			ditto-	-ditto-	Idle-Not Accessible
54	24			Nuvem (2001)	GLR	800	68.00			ditto-	Nuvem(5), Calata(6), Majorda(7), Utorda(8)	
55				Nuvem (2005)	Sump	400	28.00			ditto-	-ditto-	w/Pump House
56	28	200	ACP	Cansua (1987)	GLR	300	46.00			ditto-	Nagao(1), Verna(2), Gonsua(9)	
										Mormugao	Cortalim(3)	
57		200	ACP	Curlim (1985)	GLR	300	46.00			ditto-	Cortalim(3)	
58	Verna			Verna P.S. (1992)	Sump	1,500	56.00		40.00			w/Pump House
59				Verna MBR (1992)	GLR	10,000	113.00		100.00			
60	31	200	CIP	Upasnagar, Sancle (1997)	GLR	300	95.00			Mormugao	Sancoale(CT)(14)	
61		250	CIP	Nagoa (1995)	GLR	800	54.00			Salcete	Nagao(1)	
62	37			Dabolim (2000)	GLR	300	52.00			Mormugao	Dabolim(1)	w/Pump House
63				Dabolim (1985)	OHR	150	73.00			ditto-	Dabolim(1)	
64	38	100	CIP	Quelossim (1982)	GLR	300	27.00			ditto-	Cortalim(3), Quelossim(4)	Idle
										Salcete	Loutulim(3)	
65		100		Rua Escirao De Maria (1982)	GLR	150	50.00			Mormugao	Sancoale(CT)(14)	Not Accessible
66				Cortalim (1980)	GLR	300	27.00			ditto-	Cortalim(3)	Not Located / Idle
67		80	CIP	St. Jacino Island (1985)	GLR	25	22.00			ditto-	Sao Jacinto Island(2)	
68		150	CIP	Sancole	GLR	150	50.00			ditto-	Dabolim(1), Sancoale(CT)(14)	Idle
69		200	CIP	Head-Land Sada (1992)	GLR	800	55.00			ditto-		
70					OHR	650	55.00			ditto-		
71		200	CIP	Head-Land Sada (2004)	GLR	800	55.00			ditto-	Mormugao(MCI)(12):Ward(1)～(5)	w/Pump House
72		200	CIP	PHE Qrts. Sada (1982)	GLR	300	53.00			ditto-		w/Pump House
73					OHR	150	53.00			ditto-		
74		250	CIP	Mid-Land Sada : MPT (1980)	GLR	300	47.00			ditto-		w/Pump House
75	38	200	CIP	Chicalim (2000)	GLR	600	45.00			Mormugao		w/Pump House
76					OHR	300	45.00			ditto-	Chicalim(13), Part of Dabolim(1)	
77		200	CIP	Chicalim (1981)	OHR	300	45.00			ditto-		w/Pump House

Table M31.1.9 List of Reservoirs for the Salaulim Water Supply Scheme (3/3)

Series No.	Tapping No.	Tapping Main Dia. (mm)	Tapping Main Material	Name of GLR / OHR / Sump (Name of Location)	GLR / OHR / Sump Type	GLR / OHR / Sump Capacity (m3)	GLR / OHR / Sump Elevation (m) GL	GLR / OHR / Sump Elevation (m) HWL	GLR / OHR / Sump Elevation (m) LWL	Supply Area Taluka	Supply Area Village Name	Remarks
78	38	250	CIP	New Vaddem : Sai Baba Temple (1982)	GLR	300	40.00			ditto-	Mormugao(MCI)(12):Ward(1)～(5)	w/Pump House
79					OHR	150	40.00			ditto-		
80					GLR	800	40.00			ditto-		w/Pump House
81		300	CIP	INS Gomantak, Vasco	GLR	800	35.00			ditto-		
82					GLR	800	35.00			ditto-		from Monte Hill (1975)
83	39	250	CIP	Issorcim (1990)	GLR	300	52.00			ditto-	Issorcim(7), Chicolna(8)	
84		250	CIP	Bogmalo (1982)	GLR	150	45.00			ditto-	Chicolna(8)	Idle
85	44	300	CIP	New Vaddem Bharat Nagar (2000)	GLR	800	47.00			ditto-		
86					OHR	650	47.00			ditto-		
87	47			Baina (1980)	GLR	300	32.00			ditto-	Mormugao(MCI)(12):Ward(1)～(5)	
88		250	CIP	Mangor (2005)	GLR	800	31.00			ditto-		
89		250	CIP	Mangor (1975)	GLR	300	31.00			ditto-		w/Pump House
90					OHR	650	31.00			ditto-		
91	48	250	CIP	Gandhi Nagar (1997)	GLR	800	34.00			ditto-		
				Total		**71,990**						
				Retention Time		**10.8 hrs**						

Note: GL=Ground Level, HWL=High Water Level in Reservoir, LWL=Low Water Level in Reservoir, GLR=Ground Level Reservoir, OHR=Over Head Reservoir, Sump=Pumping Suction Well, MBR=Master Balancing Reservoir