Document 2-III

Particular Specifications

Index
Document 2-III
Particular Specifications

Document 2- III

Part A – General Requirements

Index
Document 2-III
Part A - General Requirements

Document 2-III
Part A - General Requirements

Clause 1: Summary of works

a) General:

The Contractor shall execute all the works as specified in the contract requirements in conformance with the Sanitary Engineering General Specifications (2002), General Specifications for Buildings and Engineering Works (1990), Roads administration, General specifications for Kuwait Motorway (2004) and other latest editions of the codes, ordinances, rules and regulations of Ministry of Public Works, EPA (Environment Public Authority) regulations and other Governmental authorities.

b) Scope of the works:

Section A: Demolish, Disconnect, Dismantle and Abandonment existing facilities

1. Demolish Ardiya sewage plant except zones areas (1 & 2) and partial of sanitary sewerage system and partial of storm water drainage system within two (2) years starting from the Date of Enterprise.

   Zone area (1): Main Entrance Gate, Guard House (AB 1041), Mosque (AB 1043), MPW Quality control center (AB 1044), Substation (SU 0241) and Wastewater Pumping Station (PS 0931).

   Zone area (2): Substation (SU 0641), Header tank (CT 0612) which received the treated effluent from Rikka sewage treatment plant, Inlet and outlet channels of header tank, By-pass channel to sea which is connected to outlet channel of second stage contact tank (header tank), Effluent transfer pumping station (PS 0633), effluent transfer pumps (3 Nos. only) with discharge pipe, surge vessels VS 0661 (4 Nos. only) related to effluent transfer pumping station and Inlet and outlet channels of effluent transfer pumping station.

- Partial of Sanitary sewerage system: Wastewater Pumping Station (PS 0931), Main Sewer pipeline and manholes connected to Wastewater Pumping Station (PS 0931) and internal sewer pipelines and manholes of zones areas (1 & 2) connected to main sewer pipeline or wastewater pumping station (PS 0931).

- Main storm water drainage system within the boundary area of the perimeter fence.

2. Demolish Screw Conveyors Lifting Stations S20 and S21 completely except perimeter fences within two (2) years starting from the Date of Enterprise.

Section B: Grout filling unlimited depths and full volumes of underground pressure and gravity pipelines completely

1. Grout filling unlimited depths and full volumes of the following double underground pressure pipelines completely including demolish, dewater, dismantle, break,

remove, abandonment and earth fill of hatch boxes with other related works within three (3) years starting from the Date of Enterprise:

a. (2 ∅ 450 mm, Length 5100 m, asbestos) start from main pumping station (A1) to main pumping station (A11).
b. (2 ∅ 450 mm, Length 5500 m, GRP) start from main pumping station (A13) to main pumping station (A11).
c. (2 ∅ 700 mm, Length 3500 m, asbestos) start from main pumping station (A2) to main pumping station (A11).
d. (2 ∅ 1000 mm, Length 16000 m, asbestos) start from main pumping station (A11) to Ardiya sewage plant.
e. (2 ∅ 1000 mm, Length 3100 m, DI) start from main pumping station (A15) to Rikka sewage plant.

3. Grout filling unlimited depths and full volumes of the following underground gravity pipelines completely including demolish, dewater, dismantle, break, remove, abandonment and earth fill of manholes completely with other related works within three (3) years starting from the Date of Enterprise:

a. (1∅ 1600 mm, Length 3100 m, asbestos) start from Transition Chamber (TC) to main pumping station (A15).
b. (1∅ 450 mm, Length 3240 m, asbestos) start from secondary lifting stations S11/S12 to main pumping station (A2).
c. (1 ∅ 700 mm, Length 2400 m, asbestos) start from secondary lifting station S13 to main pumping station (A2).
d. (1 ∅ 600 mm, Length 2200 m, asbestos) start from secondary lifting station S15 to main pumping station (A1).

Section C: <u>Renovation works at Ardiya Sewage plant</u>

A. Renovation works of new double layers asphalt roadways and storm water drainage system of zones areas (1 & 2) and other related works within two (2) years starting from the Date of Enterprise.
B. Renovation works of street lightings poles, outdoor lightings poles of zones areas (1 & 2) and other related works within two (2) years starting from the Date of Enterprise.
C. Renovation works of chain link boundary fence within the perimeter (800 m + 440 m + 800 m + 440 m) with Barbed Wires completely, height (2 m) and other related works within two (2) years starting from the Date of Enterprise.
D. Renovation works of MPW Quality control center (AB 1044) and other related works within three (3) months starting from the Date of Enterprise.
E. Renovation works of the main Guard House (AB 1041) and other related works within three (3) months starting from the Date of Enterprise.
F. Renovation works of MPW Switchgear room of substation S/S.1 (SU 0241) and other related works within two (2) years starting from the Date of Enterprise.
G. Renovation, Rehabilitation and Modification works of Effluent Transfer Pumping Station (PS 0633) and other related works within two (2) years starting from the Date of Enterprise.
H. Renovation works of MPW Switchgear room of substation S/S.6 (SU 0641) and other related works within two (2) years starting from the Date of Enterprise.
I. Renovation works of Mosque Building and other related works within one (1) month starting from the Date of Enterprise.
J. Provision of new Management System and other related accessories within one (1) year starting from the Date of Enterprise.

K. Renovation works of Laboratory Partition Rooms furniture, equipments and devices, reagents and solutions, miscellaneous, glasses and plastic wares, chemical supplies and other related accessories within one (1) year starting from the Date of Enterprise.

Section D: <u>Partial Operation and Maintenance works at Ardiya Sewage plant</u>

1. Partial Operation works at Ardiya Sewage plant for the duration of one (1) year period after renovation works are completed.

2. Partial Maintenance works at Ardiya Sewage plant:

a. Maintenance works of existing and new mechanical and electrical equipments, Instrumentation, air conditioning units, office equipments, laboratory equipments, street and outdoor lightings poles and networks, furniture, utilities, services and other related works of zone area (1) facilities starting from the Date of Enterprise for the duration of the contract period.

b. Maintenance works of the new mechanical and electrical equipments, instruments, air conditioning units and street and outdoor lightings poles and networks of zone area (2) facilities for the duration of one (1) year period after renovation works are completed.

c. Civil Maintenance works of zone area (1) facilities starting from the Date of Enterprise for the duration of the contract period.

d. Civil Maintenance works of zone area (2) facilities for the duration of one (1) year period after renovation works are completed.

e. Landscaping, Plantation and Irrigation maintenance works of zones areas (1 & 2) starting from the Date of Enterprise for the duration of the contract period.

Clause 2: Definitions

Wherever in the Contract Documents, or on the Drawings, the words "as directed," "as ordered," "as requested," "as required," "as permitted," or words of like import are used, it shall be understood that the direction, order, request, requirement, or permission of the Engineer is intended. Similarly, the words "approved," "acceptable," "suitable," "satisfactory," and words of like import shall mean approved by, acceptable to, suitable to, or satisfactory to the Engineer.

Clause 3: Government Bodies

The Contractor shall carry out all works in strict accordance with current codes, regulations, local and administrative orders, specifications and standards of all Government Bodies whether listed here under. The Contractor shall coordinate with legal Government authorities for approval (if necessary) at his own expense and subject to the Engineer approval.

1. Ministry of Public Works (MPW)
2. Ministry of Electricity and Water (MEW)
3. Ministry of Communications (MOC)
4. The Kuwait Fire Brigade (KFB)
5. The Kuwait Municipality (KM)
6. Ministry of Public Health (MPH)
7. Roads and Drainage Department of MPW

8. Public Authority for Agriculture and Fisheries Resources (PAAFR)
9. Ministry of Interior (Traffic Department)
10. Environment Public Authority (EPA)

Clause 4: Study the sites by the Contractor

A. Notwithstanding anything contained in the contract documents, the Contractor shall deemed to have visited the sites, studied the contract documents, and by his own observation and enquiry acquainted himself with local conditions, the existence and accuracy of local records and drawings, the accessibility of the sites (including all works areas outside the fence) for the full proper execution of the contract requirements including, but not by way of limitation to the following:

- The strict observance of stringent safety precaution regulation.

- The supply and use of labors, materials, equipment, laws, status, rules and regulations relevant there to. The meaning of every item mentioned in this document or specified and/or entered in the bills of quantities.

- The conditions of equipment, structures and all other relevant things necessary for the proper execution of the works required by this contract according to the technical requirements.

B. The sum of the contract price shall be deemed to cover all obligations mentioned in this contract.

C. Any claims brought on the grounds of lack of knowledge or misunderstanding of any of the forgoing of the contract requirements shall not be entertained.

Clause 5: Sites visit

The sites visit is considered obligatory and part of the Contract requirements. The Contractor shall be deemed fully satisfied as to the form and nature of the plant and the required works of the contract. The Contractor shall visit the sites to determine the exact actual conditions and type of the equipment of the plant. In particular, the Contractor shall confirm that his offer covers all the obligations under the contract and all matters necessary for proper completion of the Contract requirements. In no case he shall be relieved from any of his contractual obligations on the grounds that he did not or could not have foreseen any matter which may have affected the execution of the contract works. It is meant that no claim for the lack of information shall be allowed later on. If any other information needed, it is the Contractor responsibility to inquire prior to signing the contract and no claims will be accepted in this regard during the contract period.

The Contractor shall be deemed to have visited the sites prior to submitting his Tender and made all necessary inspections and investigations and to have decided for himself the means of access and working space, the nature of the ground and sub-soil, the presence of existing foundations or other hidden obstructions, the level of the water table and all factors affecting the Works and shall be deemed to have allowed for these in his Tender.

Clause 6: Contractor use of sites

The Contractor shall also ascertain from the public utility authorities and the positions of all existing underground services.

Clause 7: Electricity

The Contractor shall make arrangements with Ministry of Electricity and Water for temporary electricity connection required for removal of existing equipments and new installations, all expenses in connection with installation, and removal thereof, shall be paid by the Contractor. Adequate temporary standby electric generators and distribution network and connections shall be provided by the Contractor as he deems necessary until connections become available for emergency use.

The cost of regular electrical energy consumed for the operation of existing facilities shall be paid by the Ministry.

Clause 8: Water

The Contractor shall furnish water of the required and as may be necessary for work or for other purposes and shall make arrangements for and pay all charges for water services installation, maintenance, and removal thereof and vehicles costs of water. Adequate water storage facilities and vehicles for transport of water shall be provided by the Contractor as he deems to be necessary.

The Contractor shall provide an adequate supply of drinking water of acceptable quality, satisfactorily cooled, for his employees and those of his Sub-contractors and for the Ministry and Engineer's staff on the sites. Where required, the Contractor shall furnish drinking water in suitable containers and provide dispensing units and cups.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 9: Language of correspondence and reports

All correspondence on matter arising out of the contract shall be addressed by the Contractor to the Engineer and not directly to the Employer. The Arabic language shall be considered the official and deserved language for all the contract documents except for those which were prepared and given in the contract in English language not limited to (General Specifications, Particular Specifications, Bills of Quantities and attachments Appendixes, etc.) for which the deserved and official language shall be English language.
All reports, minutes of meetings and other correspondence shall be in both Arabic and English languages. In a case of any contradiction between the Arabic and English versions, the Arabic language shall supersede.

Clause 10: Site Meetings

A. To be held once each month to review both work progress and the Contractor’s 90 days look ahead schedule.

   Progress and schedule reviews shall verify:
   a. Actual start and finish dates for activities completed during the updated period.

b. Remaining durations and percentage of completion for all activities not completed.
c. Contractor's proposed measures to recover lost time and place the project back on schedule by increasing manpower, materials, equipment resources and working extended hours, additional shifts etc.

B. Meetings shall be attended by Engineer and/or, the Engineer's Representative(s), the Contractor and his Project Manager and other staff as necessary. Subcontractors may attend when involved in the matters to be discussed or resolved, but only when requested by the Ministry or the Engineer.

In addition to the attendees named herewith, the meeting shall be attended by the representatives of regulatory agencies having jurisdiction over the Project, if required, and such other persons the Ministry may designate.

C. The time and location of the progress meetings shall be as directed by the Engineer's Representative.

D. Submit the information itemized below to the Engineer at least 3 working days prior to each progress meeting.

1. A list of completed activities.
2. A list of current activities with an estimate of time required for completion.
3. A list of activities planned to start in the next period.
4. Other information required by the Engineer's Representative.

E. Additional meetings as required by the Contractor shall be submitted to the Engineer's Representative in writing.

1. Provide a proposed agenda for the meeting.
2. Provide the names of all personnel who are required to attend.
3. The Engineer's Representative shall chair these meetings.

Clause 11: Co-operation and Co-ordination with other Contractors

The Contractor shall attend all meetings called by the Employer for the purpose of co-ordination and co-operation. The contents of the minutes of such meeting, after approval of the Employer, shall be binding to the Contractor.

The Contractor shall co-operate and co-ordinate his operations with all other parties or Contractor's executing work on sites / or adjacent to his sites of work in order that the minimum interference inconvenience is caused to the public. The Contractor shall continue executing the contract requirements to finish the works on time for the duration of the contract period and shall not have the right to claim for compensation in time or cost.

Clause 12: Reference Standards

1. All manufacturing, testing, storage, installation and maintenance shall comply with the codes, standards, regulations and recommendations referred to throughout the contract documents, unless otherwise stated in the specifications, or unless otherwise approved by the Engineer.
2. All references to codes, regulations, specifications and standards referred to in the Contract Documents shall, unless otherwise stated, mean the latest edition,

amendment or revision of such reference standard in effect as of the date of submission of these Tender Documents by the Tenderers to the issuing authority.

3. The Contractor shall obtain an original copy of the latest edition of all codes, local and administrative orders, regulations, standards and technical literature referred to in the Contract Documents, including those referenced in the Contractor's Quality plans. These shall be given to the Engineer, at no additional cost, within 30 days of receipt of the Engineer's Notice to Proceed.

4. Upon completion of the works the said codes, standards, etc., shall be handed over to the Ministry.

5. Abbreviation Standards:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron & Steel Institute
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
AWS	American Welding Society
BSS	British Standard Specifications
CP	British Standard Code of Practice
DIN	Deutsche Industrial Norm
FS	Federal Specifications
IEC	International Electrical Commission
IEEE	Institute of Electrical and Electronics Engineers
IPCEA	Insulated Power Cable Engineers' Association
ISO	International Standards Organization
MBMA	Metal Building Manufacturers Association
MEW	Ministry of Electricity and Water
MOC	Ministry of Communications, Kuwait
MPW	Ministry of Public Works, Kuwait
NEC	National Electrical Codes
NEMA	National Electrical Manufacturer's Association Standards
NESC	National Electrical Safety Codes
UL	Underwriters Laboratories, Inc.
EPA	Environment Public Authority, State of Kuwait

Clause 13: Project closeout procedures

The Contractor shall complete and submit the following activities but not limited to:

1. Submit clearance certificates and approval from government's authorities as necessary required.
2. Submit final cleaning and works activities of the project are completed in accordance to the requirements of the Contract Documents and obtaining approval final inspection and handover certificates of sites to the Ministry without any objection letter from the Engineer.
3. Submit any other works requested by the Engineer related to contract documents.

Clause 14: Management

1. The Contractor shall manage to execute works in conformance with the specifications of the latest editions of the codes, ordinances, rules and regulations of Ministry of Public Works and other Government authorities.

2. The Contractor shall take upon himself the full and entire responsibility for the sufficiency of all personnel engineers, supervisors, manpower and labors, machineries, equipments, pumps, materials, supplies, consumables, transportation, tools or implements, temporary accommodations and furnishings, and generally for all means used for the fulfillment of the contract requirements which he undertakes to provide on site to carry out the works completely within the contract period. The Contractor shall minimize nuisances and work in a safe manner.

3. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 15: Submittals

1. The Contractor shall submit CPM programs with details plans as specified in Document (2-II) within one (1) month starting from the Date of Enterprise and shall include but not limited to the following requirements:

Section A: Demolish, Disconnect, Dismantle and Abandonment existing facilities.

Section B: Grout filling unlimited depths and full volumes of underground pressure and gravity pipelines completely.

Section C: Renovation works at Ardiya Sewage plant.

Section D: Partial Operation and Maintenance works at Ardiya Sewage plant.

2. The Program shall include the following items as a minimum and not by the way of limitation:
   a. Manpower, Equipment and Machineries required for the execution of each task.
   b. Quality assurance program.
   c. Safety precautions for the works.
   d. Safety equipment and materials shall be used in conducting the works.
   e. Critical path management (CPM) Schedule with details in color print (A1) size paper (2) originals copies and (2) compact discs (CDs) which illustrating progress of Contract works for the approval of the Engineer.

3. The Program shall be revised and periodically updated as required by the Engineer and to his satisfaction.

4. The Engineer shall have all the right to modify, change or cancel any work or any parts of the working program, at any time during the contract period, or to stop the continuity of the work as per the approved program, as he may see useful to the work from his point of view, and the Contractor will not have any right to object or

claim against such change and he should continue the execution of the work without any delay.

5. In addition to providing a step by step description of the work (in sequential order) method statements shall also clarify the following:

   Scope of works covered
   References (procedures or standards)
   Subcontractors utilized
   Products required
   Tools, equipment and machinery required
   Plan of progress works, starting date of the activities and the Period activities to be completed
   Personnel required and designated responsibilities
   Safety Hazards and Precautions to be taken
   Quality Control Measures
   Procedure (step by step sequence of work)

6. The CPM program shall include the following detailed plans but not limited to the following detailed plans and shall be subject to Engineer approval:

   a) Detailed plan of Management progress works such as reports, submittals, manpower categories, inspections requirements, forms and all other works specified in the contract requirements.

   b) Detailed plan for mechanical, electrical, instrumental and civil works required by this Contract showing dates of start and completion, equipment, tools and materials needed, pumps, safety equipment, dewatering system, heavy duty mobile equipment or machinery to carry out the works, techniques, methods and procedures of executing works to the satisfaction of the Engineer as specified in the contract documents.

   c) Detailed plan for provision, installation, test, commissioning and maintenance of preventive maintenance program proposed by the Contractor and other related required works to the satisfaction of the Engineer as specified in the contract documents.

   d) Detailed plan for maintenance and painting works of existing designated equipments, pumps, buildings, panels, substations and other related required works as specified in the contract documents.

   e) Detailed plan of rehabilitation of soil and other related works as specified in the contract requirements.

   f) Detailed plan of clearing the sites, landscaping, removal of all debris, waste and surplus materials off the sites. All cleaning work shall be to the Engineer's satisfaction.

   g) Detailed of safety plans, equipment and materials shall be used in conducting the works in accordance to specifications and standards of government regulations.

   h) Detailed of staff categories experience and curriculum vitae of all contractor staff. For labors, the Contractor may submit only a list of their names.

Clause 16: Manufacturers' specifications

Prepare and submit manufacturers' specifications and installation instructions for new equipments and spare parts specified.

Clause 17: Correspondence, Site memos, Request of inspections, Reports etc.

1. The Contractor shall submit all correspondence, site memos, request of inspections, reports, etc. among MPW Quality control center offices rooms and the Contractor office.

2. The Contract shall submit request of inspections of all required works and shall include but not limited to demolish, disconnect, dismantle, excavate, break, cut, dewater, remove, abandonment, cart away, dispose, deliver, backfill, earth fill, backfill and earth fill materials, calibration and maintenance of laboratory equipments and devices, renovation works, civil, mechanical, HVAC and electrical maintenance works, maintenance and repair works, preventive maintenance, etc. and other related as specified in the contract requirements for the Engineer approval. The Contractor shall not have the right to make any future claims or any extra cost or delay in time not to inspect the works required after working hours of MPW staff.

3. All correspondence, site memos, request of inspection, reports, etc. from the Contractor to the Engineer or Engineer's Representative shall clearly indicate:

    a. Contract Number
    b. Contractor's Name
    c. Date and reference number of the correspondence / site memos

4. Progress reports shall include but not limited to color photos described hereinafter in a form provided by the Engineer or Engineer's Representative. Work activities and procurement reports should be referenced where relevant to the approved Contractor's works Schedule.

5. Daily, Weekly, Monthly, Yearly and Final Report supported with charts and color photographs) described all works activities and contractor staff as specified in the contract requirements for the Engineer approval.

6. Procurement Status Report: Submit the Procurement Status Report shall include but not limited to the submittal and preparation status of shop drawings, materials, submittals, samples, catalogues of equipment, approval status, procurement of materials and delivery dates to site.

7. Monthly Report: Submit a detailed report reflecting the monthly progress and status of work. This report shall include a description of problem areas, current or anticipated causes of delay and their estimated impact on progress, together with a description of corrective measures taken or proposed. One copy of the latest approved Contractors CPM Schedule with updated logic time shall be attached to the Monthly Report.
8. Yearly Report: Submit a detailed report reflecting the yearly progress and status of work. This report shall include a description of problem areas, current or

anticipated causes of delay and their estimated impact on progress, together with a description of corrective measures taken or proposed. One copy of the latest approved Contractors CPM Schedule with updated logic time shall be attached to the Yearly Report.

9. Final Report: Submit a detailed report of all works activities supported with color photos, new equipment, renovation works and other important information needed as directed by the Engineer.

Clause 18: Maintenance Manuals

The Contractor shall submit to the Engineer maintenance manual(s) original copies in accordance to manufacturer specifications for the provision of the new equipments, pumps and motors. The manual(s) shall include but not limited to:

- Description of each equipment, laboratory devices, pumps and motors in details.
- Spare parts required including manufacturer specification and address.
- Tables of preventive maintenance schedule required for all equipments in details, including time schedule, frequency and quantity.
- Description of lubricants types.
- Repairs and trouble shooting guidelines

Clause 19: Quality Control & Inspection

1. Inspection requests shall be developed in a format acceptable to the Engineer and shall include at least the following information:

   - Space for serial number
   - Contract or project number
   - Contractors name, Clients name
   - Discipline (civil, structural, mechanical, electrical, Instrumental)
   - Inspection or test description
   - Facility and location
   - Scheduled time and date for inspection
   - Signature block for contractor with submission time and date
   - Evaluation block for Engineer with date and time inspected results of inspection/test (Approved. Approved as noted, Not Approved) and Engineer's signature block
   - Area for general comments

2. The Contractor must maintain sufficient staff on sites to implement all aspects of the approved Quality Plan. The Contractor shall provide all equipment, instruments, qualified personnel and facilities necessary to inspect the work and perform all the tests required by the contract documents, or provide independent inspection agencies or laboratories to do the same.

3. The Contractor shall repeat inspections after correcting non-conforming work either if the inspection approved as noted or not approved until all works complies with the requirements.

4. Inspections and tests conducted by persons or agencies other than the Contractor shall not in any way relieve the Contractor of his responsibility to conform to the requirements of contract documents and referenced standards.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 20: Quality Assurance

A. Comply with requirements of ASTM D3740 (Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock).

B. Laboratory: Authorized to operate in the State of Kuwait.

C. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.

D. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

E. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full time registered Engineer.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 21: Equipment delivered in original packages

All equipment or parts thereof, instruments, materials and spare parts shall be delivered to the sites in their original packages and shall be easily identified without the necessity of unpacking them. All packages with their manuals shall bear the name and brand of the manufacturer.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 22: Interference and protection of streets

1. The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits therefore from the proper authorities. If any street, road or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities. Streets, roads, private ways, and walks not closed shall be maintained passable and safe by the Contractor, who shall assume and have full responsibility for the adequacy and safety of provisions made therefore.

2. The Contractor shall, at least 24 hours in advance, notify the Police and Fire Departments in writing, with a copy to the Engineer, if the closure of a street or road is necessary. He shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, in order to minimize confusion.

3. Maintenance and protection of vehicular and pedestrian traffic through areas and furnishing, erecting and maintaining temporary traffic control devices including barriers, barricades, cones, drums, warning signs and lights.

4. No work shall be performed during the hours of darkness unless otherwise authorized in writing by the Engineer.

5. Detours Works shall comprise but not be limited to necessary field surveys, the Disconnect, Dismantle, Demolish and Abandonment existing facilities / Renovation, Rehabilitation, Modification and Maintenance works including all earthworks, the provision and installation of metal beam guardrails, barriers, adequate drainage, lighting, traffic signals, signs, barricades, and other traffic control devices, on proposals submitted by the Contractor and approved by the Engineer or as directed by the Engineer. Where required, temporary protection of existing services, in accordance with the requirements of the concerned Service Authority or Company, shall form part of the Detours' Works.

   Restoration of the Detour sites to their original condition or such other condition as directed or approved by the Engineer will be required on completion of use of the Detours.

6. Flagmen: Persons acting as flagmen shall be identified with appropriate and distinctive apparel approved by the Engineer and shall be equipped with a STOP/GO sign conforming to these Specifications. Reflective apparel is required for flagging during darkness.
7. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 23: Reference Standards

1. General Specifications for Kuwait Motorway/Expressway System: State of Kuwait, Ministry of Public Works, Roads Administrations.
2. Kuwait Traffic Signs Manual
3. Institute of Transportation Engineers
4. The Contractor shall, to the maximum extent possible, prevent nuisance as a result of dust raised as a result of the works. Dust Control shall be by watering by tanker trucks with spray attachments or other approved methods.
5. Traffic control devices shall conform to the requirements of the General Specifications for Kuwait Motorway/Expressway System and to the "Kuwait Traffic Signs Manual". All traffic control devices shall be approved by the Engineer before installation on the site. After initial use is complete the Contractor may reuse any approved item as the need arises.

Clause 24: Carting away dismantled equipments and demolished structures

All excavated materials, dismantled equipments, break and demolished structures to be incorporated in the work shall be placed so that free access can be had at all times to all parts of the work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners and occupants.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 25: Safety

1. The Contractor shall take all necessary precautions and provide all necessary safeguards to prevent personal injury and property damage.

2. The Contractor shall provide and maintain all necessary safety equipment such as fences, barriers, signs, lights, walkways, guards and fire prevention and fire-fighting equipment and shall take such other action as is required to fulfil his obligations under this subsection.

3. The Contractor shall comply with all applicable Federal, State and local laws, ordinances, rules and regulations and lawful orders of all authorities having jurisdiction for the safety of persons and protection of property.

4. The Contractor shall provide one safety supervisor for the sites whose duty shall be the prevention of accidents. This responsible person shall have the authority to take immediate action to correct unsafe or hazardous conditions and to enforce safety precautions and programs. This safety supervisor shall be qualified for this position and the Contractor shall submit supportive documents to prove his qualifications and experience for such position.

5. The Contractor shall take all the necessary safety measures to ensure the protection of the public, ministry staff, his staff and sub-contractor's staff, bearing in mind the nature of work. The Contractor shall be responsible for any accidents, which may occur in the Plant during the Contract.

6. All Contractor's and/or subcontractor staff shall have ID cards in clear view during their attendance in the plant. Each ID card shall be signed by the Engineer and shall have the following information as a minimum:
   a. Logo and name of the Company
   b. Personal photograph, passport size
   c. Name and Nationality of the person
   d. Work position in the plant and his grade number

   In case of termination of any approved person, the Contractor shall return his ID card to the MPW. In addition, no replacement for such persons will be made unless the ID card is returned to MPW staff officially. Furthermore, the Contractor shall prepare special ID cards for visitors of the sites, subject to the Engineer's approval. No person shall be allowed to enter the plant or adjacent sites without the ID card prominently displayed.

7. The Contractor shall be responsible to train an adequate number of selected personnel of his staff to cover the three shifts for emergency procedures for fire fighting and First-Aid.

8. The Contractor shall be responsible to provide First Aid and Medical Facilities at the project sites as required. A vicinity map in English & in Arabic, indicating routing to emergency facilities shall be posted in the first aid station and on the Project bulletin board, along with the list of designated emergency facilities; and telephone numbers i.e. hospitals, doctors, ambulances, and fire departments. First Aid boxes

shall conform to SPS standard requirements. Medical personnel will be approved by the Kuwait Ministry of Health.

9. The Contractor shall be responsible for effective control of all nuisance insects, snakes, escaped dogs, lizards, birds nests and animals. He shall spray all areas of the plant subject to FLY or other insect nuisance daily for the duration of the project, with appropriate insect killer spray. The spray, machine, subcontractor, spraying equipment, method and materials used shall be approved by the Engineer.

10. The Contractor shall erect wherever required safety signs and instructions describing any required safety precautions and procedures for emergencies as directed by the Engineer. These signs may contain written instructions or warning drawings or both whichever is applicable, such information and quality of the signs shall be subject to the Engineer's approval. All signs shall be rendered in both Arabic and English languages.

11. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 26: Specific Site works

1. Excavation Activities:

Prior to any excavation activity, efforts must be made to determine whether underground installations (i.e., sewers, telephone, water, fuel, electric lines, etc.), will be encountered and, if so, where such underground installations are located. The walls and faces of all excavation in which personnel are exposed to danger from moving ground, must be guarded by a shoring system, sloping of the ground, or some other equivalent means. A safe means of exit from an excavation must be provided when the excavation depth is 1.5 m or greater. Exit locations must be spaced at lateral intervals of 7 m or less.

Daily inspections of excavations shall be performed by a competent person, for evidence of a possible cave-in. Excavations must also be inspected by a competent person after every rainstorm or other hazard-increasing occurrence and the protection against slides and cave-ins shall be increased if necessary.

2. Confined Space Entry:

A large percentage of the fatal accidents that occur in confined spaces. Clearly the problem is a lack of knowledge of the dangers involved in entering and working in confined spaces and the proper procedures to follow, to prevent accidents.

Definition of Confined Space: A confined space is defined as any enclosed or semi-enclosed space that has restricted means for entry or exit and is not intended for continuous occupancy. Typical confined spaces in the wastewater industry are manholes, metering stations, valve or siphon chambers, digesters, silos, empty tanks, pits, or any other area in the system that has direct contact with wastewater, sludge, sludge gas, or conduits carrying these substances.

Classification of Confined Spaces: Confined spaces are classified based upon existing or potential hazards. The two classifications of confined spaces are non-permit

confined space and permit-required confined space. A non-permit confined space does not contain atmospheric hazards or have the potential to contain any hazard capable of causing death or serious physical harm. Examples of non-permit confined spaces include vented vaults or motor control cabinets. These spaces have either natural or permanent mechanical ventilation to prevent the accumulation of a hazardous atmosphere, and they do not present engulfment or other serious hazards. Since non-permit spaces are free of atmospheric or safety hazards, they do not require special entry protocols. However, entry into these areas must comply with applicable OSHA requirements (i.e., illumination, ladders, etc.). A permit-required confined space has one or more of the following characteristics:

a. Contains or has the potential to contain a hazardous atmosphere.
b. Contains a material that has the potential for engulfing a person.
c. Has an internal configuration such that a person could be trapped by inwardly converging walls or by a floor, which slopes downward and tapers to a smaller cross section.
d. Contains any other recognized serious safety or health hazard.
Atmospheric Testing of Permit-Required Confined Spaces:

- All permit-required confined spaces must be considered dangerous before entry, until proven safe. Air monitoring shall be performed before removing the cover, if practicable. Some covers have openings through which a probe may be inserted. If not, the lid must be removed using appropriate tools and the atmosphere tested before entry.

- Atmospheric testing will be performed by the entry supervisor or attendant for oxygen deficiency and explosive and toxic gases. Multi gas meters shall be provided by the Contractor that test for oxygen deficiency, explosive gases, and certain toxic gases (Hydrogen Sulfide and Carbon monoxide). :

a) Oxygen concentration in the confined space is greater than 19.5 percent and less than 23.5 percent by volume.
b) Presence of flammable gases or vapors is less than 10 percent of the lower flammable limit.
c) Potential toxic gases or vapors are present at concentrations below OSHA permissible exposure limits (e.g., less than 10 part per million (ppm) for Hydrogen Sulfide).

- The Safety Officer shall evaluate the work place to determine if any spaces are permit-required confined spaces. If there are changes in the use or configuration of a non-permit confined space that could increase the hazards to the entrants, the Safety Officer shall re-evaluate the space and reclassify it as a permit-required confined space, if necessary.

- Warning Signs: A plant that contains permit-required confined spaces must post warning signs at the entrance of these spaces.

3. Abandonment of demolished structures and cart away off site:

The Contractor shall require to execute all the works in accordance to the latest regulations of EPA (Environment Public Authority) regulations and other Governmental authorities. The Contractor is obligated to submit methods and procedures for approval by EPA and shall not allow to start any such works unless approval is given to the Engineer. The extent of work shall include but not limited to the following:

a. Odour treatment and neutralize foul odours (H_2S gas and other malodorous gases) especially during demolish process of substructures, excavation and earthwork by using any method approved by the Engineer and EPA.

b. Traffic control with Ministry of Interior, carting away breaking concrete structures and reinforcement to tippers off the site approved by the Engineer and EPA.

c. Abandonment of demolished structures and carting away to tippers off the sites as approved by the Engineer and EPA.

d. Assorting all types of contaminants separately (pipes, debris, metals, concrete, asbestos, polluted soil, chemicals, oil spills, etc.) so that to get rid of them easily and safety.

e. Fencing the site work to avoid any accidents.

f. Follow the regulation code of EPA no. (210) year 2001 regarding the dust during the demolishing and abandonment works.

4. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 27: Contractor's staff

1. The Contractor shall provide all his staff and manpower to be available on sites from the first hour of the date of enterprise for all contract duration. The Contractor shall make his own determination of the required staffing for proper executing the contract requirements.

2. The proposed staff shall be approved by the Engineer (as specified in Document 2-II) are minimum required staff which may be increased according to the work requirements but any arising additional cost during the Contract period shall be borne the Contractor without any extra charge to the Employer.

3. The Contractor staff should be vaccinated with typhoid and tetanus to be protected against injuries from the Date of Enterprise.

4. The Contractor staff shall be responsible to take reasonable precautions to prevent damage to existing services and utilities. If any damages which in the opinion of the Engineer could reasonably have been avoided shall be required at the Contractor expense. The Contractor shall be deemed to have carried out his own investigations to ascertain for himself the nature of the soil conditions and in particular the groundwater pressure level. The Contractor shall not have the right to make any future claims or any extra cost on the basis that he could not inspect the sites and other related works of other components at the time of tendering.

5. The Contractor shall provide one qualified and experienced Store Keeper who shall be available on sites starting from the date of enterprise for all the Contract duration. The duties of the Store Keeper shall include as a minimum preparing and updating the inventory of all remove, clean, paint re-usable way and tag new machine cards indicating the date of inspection should be affixed. The tag shall also be signed by the store keeper and stamped by the Contractor prior to deliver salvageable equipments to MPW stores off site as directed by the Engineer. In addition, the

store keeper shall be responsible to enter all data information of all equipment and materials prior to deliver to the MPW stores off site in a special computer program (CD) as directed by the Engineer. The cost of the store control and inventory works mentioned requirements will be borne by the Contractor and shall be allowed for in the total prices of this Contract.

6. The Contractor shall be responsible for the accommodation, transport, travel, leave, safety, insurance, etc. for all of the staff and labors.

7. The Contractor shall have standard uniform clothing for each along with their badges. Style and color of the uniform clothing and badges shall be submitted to the Engineer for approval.

8. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 28: Specifications and Appendixes

1. The Contractor shall execute all the works as specified in the contract requirements in conformance with the Sanitary Engineering General Specifications (2002), General Specifications for Buildings and Engineering Works (1990), Roads administration, General specifications for Kuwait Motorway (2004) and other latest editions of the codes, ordinances, rules and regulations of Ministry of Public Works, EPA (Environment Public Authority) regulations and other Governmental authorities.

2. The Contractor shall include all information and drawings of appendixes as a part of the contract requirements. However, these appendixes are considered as guidance only to the Contractor and do not cover all require works and does not show all the actual equipment and structures on sites. Therefore, it is obligated that the Contractor to visit all the sites during the period of tendering to determine by himself the actual conditions of the sites and all the components of works such as all types of structures facilities, instruments, mechanical and electrical equipments, underground pipelines, roads, lightings and other related works. The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

3. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 29: Handling and Distribution

The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the Work, as necessary or required; shall provide suitable and adequate storage room for materials and equipment during the progress of the Work, and be responsible for the protection, loss of or damage to materials and equipment furnished by him, until the final completion and acceptance of the Work.

The Contractor shall be solely responsible for any damage to public or private utilities or installations that may result from any negligence or default, on his part or the part of his agents, employees or labor. Any such damage shall be repaired

at his own expense and according to invoices sent by the authorities and parties concerned.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 30: Sign Board

The Contractor shall provide and erect where directed by the Engineer a Sign Board of the standard dimensions not less than 3x4 meters, Materials and method of installation as given by the MPW General Conditions (Document II-1).

The Sign Board shall indicate in Arabic and English (but not by the way of limitation) the following:

Name of Ministry
Name of Contractor
Nature of Work
Date of Enterprise
Date of completion of the project
Contract value

The Sign Board shall be supplied with 3 Nos. - 500 watt Halogen light fittings mounted on the top of each Sign Board and to be connected to the power source.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 31: Temporary Fire Protection

A. The type, location and sufficiency of the fire fighting facilities and equipment shall be to the Engineer's or Engineer's Representative's satisfaction. Provide all fire fighting facilities and equipment required by the Kuwait Fire Department, whether or not specifically detailed herein.

B. Take adequate safety precautions during metal welding and torch cutting operations as follows:

1. Welding or torch cutting operations shall be carried out only in well ventilated spaces having little or no combustible materials in the vicinity, and preferably in an area designated and used exclusively as a 'welding shop.

2. Where welding or torch cutting operations are carried out in-situ, surrounding areas shall be suitably protected by the covering or screening off, and suitable portable fire extinguishers shall be kept immediately available with an attendant standing-by.

3. The number of gas cylinders in any working area and the storage of such cylinders, full or empty, shall be in accordance with the FOC leaflet, 'Precautions to be observed in connection with the use of gas or electric welding and cutting apparatus'.

C. Gasoline and other flammable liquids shall be stored in and dispensed from 'UL' listed safety containers and in conformance with requirements of the local fire authority. Storage shall not be within the building.

D. Make all arrangements for periodical inspection by local Fire Authorities and Insurance Underwriters' Inspectors, cooperate with such Authorities and promptly carry out their recommendations.

E. Ensure that adequate, and to the extent possible, unimpeded means of egress from all parts of the Works, is available at all times in case fire.

F. At the completion of the Work, or at such times as the Engineer or Engineer's Representative may direct, remove all temporary fire fighting installations and equipment and replace all worn or damaged parts of the permanent systems leaving such systems in first-class condition equal to new.

G. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 32: Temporary stairs, scaffolding, ladders, ramps, runways

1. Provide and maintain all equipment such as temporary stairs, scaffolding, ladders, ramps, runways, chutes, tower cranes and/or other hoisting facilities etc., as required for the proper execution of works.

2. As soon as permanent stairs are erected, provide temporary protective treads, handrails and shaft enclosures.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 33: Temporary material and personnel hoists

A. Provide temporary material hoists to the Engineer's or Engineer's Representative's approval and as required to facilitate execution of the Works. Such hoists shall be erected and maintained in compliance with any local regulations and in accordance with ANSI A10.5 "Safety Requirements for Material Hoists", and shall not be used for transporting personnel.

B. Hoists shall be erected and maintained in compliance with any local regulations and in accordance with ANSI A10.4 "Safety Requirements for Personnel Hoists".

C. All hoists shall be constructed, maintained and removed so as not to cause damage, staining of the permanent work.

D. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 34: Barriers and Enclosures

A. Provide to prevent public entry, and to protect existing facilities and adjacent properties from damage for the proper execution of the work and for meeting the Government Regulations.

B. Provide 2.5m high safety fence and barrier as necessary enclosing all open excavations for the duration of the Project.

C. The fence shall consist of new mild steel angle or RHS posts and rails with minimum 1.8mm thick galvanized trough section sheeting panels pre-painted in two colors to the approval of the Engineer. Posts shall be at maximum 2.4m centre, set in concrete foundation minimum size 450 x 450 x 450mm.

D. Give all necessary notices, obtain licence permits and pay any fees in connection with the work herein.

E. Remove temporary materials and equipment at Substantial Completion. Repair damage caused by installation or use of barricades and enclosures.

F. Provide adequate safety barriers, guardrails and handrails around any excavations as required by the requirements of the Authorities having jurisdiction.

G. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 35: Utilities

1) The Contractor shall contact the service authorities to determine the extent, locations and invert levels of utilities affected by the Contractor's work. Confirmation of the exact location of utilities will be the responsibility of the Contractor where necessary by hand digging, slit trenching, and trial pits. Electronic detectors may be used for preliminary investigation. This work shall be carried out in consultation with the various service authorities.

2) The Contractor shall make his own determination of the existence and locations of such utility facilities such as the locations, depths, and spacing of smaller utility branches, services, vaults, valve boxes, manholes, joining boxes, ducts, duct banks, thrust blocks, and the like.

3) <u>Existing Utilities:</u>

a. The Contractor shall, prior to commencement of the work, obtain information and drawings required from service authorities whose facilities might be affected by the works. Two sets of these drawings shall be submitted to the Engineer.

b. The Contractor shall uncover by hand digging and verify locations of all services where necessary in accordance with any special requirements of the service authority concerned.

4) <u>Notice of Intent:</u>

The Contractor shall file a Notice of Intent with the service authorities who have services at the site or works in progress at the site at least two (2) weeks before

he desires to carry out any work near, above, or under their services. He shall submit a detailed programmed for each area in which the work shall be commenced and the anticipated date of commencement in addition to a report, signed by the Engineer, the service authority Engineer, and the Contractor confirming the Notice of Intent.

5) Protection of Existing Structures and Utilities:
The Contractor shall be responsible for the care and protection of all existing utilities or other facilities and structures which may be encountered in or near the area of work. Temporary support, adequate protection and maintenance of all underground and surface utilities encountered in the progress of the work shall be furnished by the Contractor at his expense and under the direction of the Engineer and the service authority. Any structures that have been disturbed shall be restored immediately.

6) Damage to Utilities and Properties:
In the event of any damage to utilities or properties during the progress of the Works due to the Contractor's failure to exercise the proper precautions, or the failure of the Contractor or his agents, employees, the Subcontractor will be held liable for the cost of repairs, penalties enforced by the authorities and protection of all such utilities or property. The decision of the Employer regarding responsibility for any damage or interruption of any utility or service lines shall be final.

7) The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 36: Security

A. The Contractor shall be fully responsible not to allow any unauthorized persons or vehicle entering the sites without prior permission from the Ministry. The Contractor shall be fully responsible to protect his staff from escaped wild animals especially dogs. The Contractor shall provide two persons security officers to be available in the plant for 24 hours during the contract period.

B. Restrict entrance of persons and vehicles into Project sites. Allow entrance only to authorised persons with proper identification. Maintain log of workmen and visitors, make available to Employer or Engineer on request.

C. Coordinate access of Employer's personnel to sites.

D. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 37: Temporary Controls

A. Dust Control: Execute work by methods to minimise raising dust from the sites. Provide positive means to prevent airborne dust from dispersing into atmosphere.

B. Erosion and Sediment Control:

1. Plan and execute methods to control surface drainage from cuts and fills,

from borrow and waste disposal areas. Prevent erosion and sedimentation.
2. Minimize amount of bare soil exposed at one time.
3. Provide temporary measures such as dikes and drains to prevent water overflow.
4. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
5. Periodically inspect earthwork to detect evidence of erosion and sedimentation promptly apply corrective measures.

C. Noise Control

1. Fit all generators, compressors, percussion tools and vehicles with effective silencers of a type recommended by manufacturers of the generators compressors, tools, or vehicles.
2. Comply with Municipality Regulations.
3. Electrical generators and other heavy equipment are to be housed in Sound proof enclosure.

D. Pest and Rodent Control: Provide proper measures to control pests in occupied temporary accommodation and storage areas.

E. Pollution Control: Provide methods, means and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants.

F. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 38: Temporary Drainage

Upon taking possession of the Sites, the Contractor shall assume full responsibility for draining rainwater, ground water and water arising from the Work in a manner approved by the Engineer's Representative and so as not to adversely affect the permanent works or adjacent areas and properties.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 39: Lines, Grades and Measurements

The Contractor shall employ a competent field engineer, registered within the State as a Professional Engineer or Land Surveyor. The Contractor shall require to establish all lines, elevations, references, marks, etc., needed by the Contractor for landscaping after finishing the activities works of demolish.

The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Clause 40: Information and Photography

No information, photographs etc., shall be released by the Contractor to any person or news media without the prior authority and consent of the Engineer.

Clause 41: Final Cleaning

1. Remove waste, debris, and abandoned items or surplus materials from sites. Clean grounds; remove stains, spills, and foreign substances from paved areas and sweep clean. All cleaning work shall be to the Engineer's satisfaction.

2. Remove unsuitable material not marked for salvage, such as rotted wood, rusted metals, pipes, gears, and deteriorated masonry and concrete.

3. Prepare surfaces and remove surface finishes to provide for proper installation of new work and new finishes.

4. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

5. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

Document 2- III

Part B – Particular Requirements

Index
Document 2- III
Part B - **Particular Requirements**

Section A: <u>Demolish, Disconnect, Dismantle and Abandonment existing facilities</u>

Clause 1: Demolish, Disconnect, Dismantle and Abandonment Ardiya sewage plant and other related works.

Clause 2: Demolish, Disconnect, Dismantle and Abandonment Screw Conveyors Lifting Stations S20 and S21 completely and other related works.

Clause 1: Demolish, Disconnect, Dismantle and Abandonment Ardiya sewage plant and other related works

The price fixed for this item is lump sum and shall include all personnel engineers, supervisors, drivers, manpower and labors, machineries, equipments, pumps, materials, supplies, consumables, transportation, tools or implements, temporary accommodations and furnishings, and generally for all means used for the fulfillment of the contract requirements which he undertakes to provide on site to carry out the works completely within the contract period. The Contractor shall minimize nuisances and work in a safe manner but not limited to all the following works and subject to Engineer approval:

i) General:

1. The existing odour control facility and degritter (one unit with four chambers, one traveling bridge equipped with two diaphragm grit pumps and tipper flushing tank, two inlet and two outlet tanks, electrical panel and collecting container) are located outside existing boundary fence area. The extension boundary fence area of theses facilities shall be included as part of the contract requirements.

2. The following types of structures, mechanical and electrical equipment of the following zones areas and partial of sanitary sewerage system and partial storm water drainage system shall **not** be included in the abandonment works:

Zone Area (1):

- Main Entrance Gate.
- Guard House (Module 10: AB 1041).
- MPW Quality control center (Module 10: AB 1044).
- Mosque (AB 1043).
- Substation (SU 0241) which is located near the machine house.
- Wastewater Pumping Station (PS 0931).

Zone Area (2):

- Substation (SU 0641) which is located near effluent transfer pumping station.
- Second stage contact tank (Module 06: CT0612) or header tank which received the treated effluent from Rikka sewage treatment plant.
- Inlet and outlet channels of second stage contact tank or header tank (Module 06: CT0612).
- By-pass channel to sea which is connected to outlet channel of second stage contact tank or header tank (Module 06: CT0612).
- Effluent transfer pumping station (Module 06: PS 0633).
- Effluent transfer pumps (3 Nos. only) with discharge pipe.
- Inlet and outlet channels of effluent transfer pumping station (Module 06: PS 0633).
- Surge vessels tanks (Module 06: VS 0661): 4 Nos. only related to effluent transfer pumping station (Module 06: PS 0633).

Partial of Sanitary sewerage system:

Wastewater Pumping Station (PS 0931), Main Sewer pipeline and manholes connected to Wastewater Pumping Station (PS 0931) and internal sewer pipelines and manholes of zones areas (1 & 2) connected to main sewer pipeline or wastewater pumping station (PS 0931).

Main storm water drainage system within the boundary area of the perimeter fence.

3. The Contractor shall co-operate, co-ordinate and not interfere his operations with all other parties or Contractor's executing works on sites / or adjacent to his sites.

4. The Contractor is required to provide more than one of required machineries on site in order to work concurrently in different locations to finish all the works of the contract requirements on time for the duration of the contract period and shall not have the right to claim for compensation in time or cost.

5. The Contractor shall execute all the works as specified in the contract requirements in conformance with the Sanitary Engineering General Specifications (2002), General Specifications for Buildings and Engineering Works (1990), Roads administration, General specifications for Kuwait Motorway (2004) and other latest editions of the codes, ordinances, rules and regulations of Ministry of Public Works, EPA (Environment Public Authority) regulations and other Governmental authorities.

6. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations, MPW and other governmental authorities to execute demolishing works of all types of structures facilities, gravity and pressure pipelines, manholes, etc. within one (1) month from the Date of Enterprise.

7. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations and other governmental authorities to remove and transport pollutants in a safety manner shall include but not limited to polluted soil, equipments, metals, demolished structures, wood, debris, pipes, asbestos, chemicals, oil, grease, wastewater, groundwater, heavy metals, etc. within one (1) month starting from the Date of Enterprise.

8. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations and other governmental authorities for the safety of manpower and fire precaution on sites within one (1) month from the Date of Enterprise.

9. The Contract shall submit request of inspection of all required activities works and shall include but not limited to demolish and break concrete structures, disconnect the electricity supplies, dismantle mechanical and electrical equipments, cut pipes and abandonment all types of the structures facilities, excavate, dewatering, remove, abandonment, cart away, dispose and deliver, backfill and earth fill and all other contract requirements for approval by the EPA and the Engineer.

10. The Contractor shall provide all necessary safety personnel materials and equipments, lightings, precaution against fire, fencing, excavation support and protection, safety signs, and temporary power supply for proper completion of the work.

11. The Contractor shall require to pre-clean and flush unlimited depth of manholes, sewers, pits, channels, chambers, culverts , drying beds, sand filters, underground gravity and pressure pipelines completely, remove wastewater, sludge, sand, gravels and other contaminants completely, cart away to a tippers off the site, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The quantities of machineries (trips) are not limited to be available on demand and shall include but not limited to tractors, tippers, Lorries, mud suckers, tankers

flushers, cranes, tools, equipment including manpower, drivers, and fuel to execute the works completely.

12. The Contractor shall be responsible for maintaining and rectification of all damaged utilities and other services affected during the works at no extra cost.

13. All trees on the site shall be protected and watered by the Contractor and provide all measures necessary to ensure safe working conditions unless the Engineer directed the Contractor to cut some trees completely. The extent of works shall include but not limited to replace all trees that are destroyed, regardless of size, in accordance with applicable codes and regulations.

14. The Contractor shall consider all information of appendices as a part of contract requirements. However, these appendices are considered as guidance only and do not covers all requirement of the works. it is the Contractor responsibility to visit all the sites and conduct full survey during the period of tendering to determine all the components of works calls by the contract and as directed by the Engineer. The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

15. The Contractor shall be responsible to provide adequate mobile diesel generators to be available on demand for electricity loading required execute the works without any interruption for the works.

16. In the case, the Contractor may find unforeseen old structures, equipments or underground pipelines, need to be demolished, he should take the action to include such equipment in the demolishing works and shall be allowed in the total sum of the contract.

17. The Contractor shall be responsible to clean and remove sewage, sludge, debris and other contaminants, cart away off the site, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

18. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

ii) <u>Description of the works:</u>

Demolish all types of structures facilities, disconnect the electricity supplies, dismantle mechanical and electrical equipments, cut pipes, remove, abandonment, cart away to a tippers off the site, earth filling excess areas with new imported borrow soil, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings for all types of the structures facilities completely on site within the boundary area of the fence perimeter (800 m + 440 m + 800 m + 440 m) completely except zones areas (1 & 2) within two (2) years starting from the Date of Enterprise.

All types of structures facilities are divided into ten (10) modules. These modules in Appendix (1) and attached drawings as guidance only to the Contractor and do not

cover all require works and does not show all the actual equipment and structures on sites.

The extent of works shall include but not limited to demolish, dismantle, dewater, break, cut, remove, abandonment, cart away to a tippers off the site unlimited depth, of underground gravity sewer, underground storm water drainage pipelines, underground pipelines (gravity and pressure pipelines), all types of pipes materials, all different sizes of pipes diameters, dry and wet manholes, transition chambers (TC), wells and pits, channels, distribution chambers, culverts, roads, lightings, buildings and all other underground chambers within the boundary area of the fence perimeter (800 m + 440 m + 800 m + 440 m) completely except partial of sanitary sewerage system and partial of storm water drainage system, earth filling excess areas with new imported borrow soil as approved by the EPA and the Engineer, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

Therefore, it is obligated that the Contractor to visit the site during the period of tendering to determine by himself the actual conditions of the site and all the components of works.

The Contractor shall be deemed to be fully conversant with the prevailing conditions (above ground and below ground) and the nature and complexity of the works to be undertaken. The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

A. <u>Demolish all types of structures facilities, disconnect the electricity supplies, dismantle mechanical and electrical equipments and instruments, break concrete structures, cut pipes, remove, abandonment, cart away to a tippers off the site, earthfill, landscape, grading soil to be reinstated and restored the site to a condition match its surrounding as approved by the EPA and the Engineer:</u>

1. The Contractor shall be responsible to demolish all types of the structures facilities completely within the boundary area of the fence perimeter (800 m + 440 m + 800 m + 440 m) within two (2) years starting from the Date of Enterprise except zones areas (1 & 2), disconnect the electricity supplies completely, dismantle mechanical and electrical equipments and instruments completely, break concrete structures completely, cut pipes, remove, abandonment, cart away to a tippers off the site.

   - **All types of structures facilities** shall include foundations, columns, footings, slabs, walls, roofs, beams, foundations and concrete reinforcement structures but not limited to buildings facilities (underground floors, ground floors, upper floors), pumps gallery facility building, workshop, stores, substations, diesel generator houses, chlorine buildings, sludge pumping station, dewatering building, scum pumping station, boiler house, turbid water pumping station, machine house, screw conveyors lifting stations, site wastewater pumping station, odour control building, Rabya pumping station, substations including transformers buildings, mosque (prefabricated house), laboratory building and other related facilities.

     a) The extent of work shall include disconnect the electricity supplies, dismantle mechanical and electrical equipments and instruments, demolish and break

concrete structures, cut pipes, remove, abandonment, cart away to a tippers off the site, transport and dispose to dumping area outside the site, but not limited to lighting installations, plumbing system, pipes, plumping specialties, sewage, contaminants, hazardous materials and polluted soil, sanitary sewerage system, toilets, sanitary fixtures, exhaust fan, tiles, storage tanks, fittings and other connections, hoses, electrical control boxes, ferrous materials, columns, foundations, louvers and vents, telephone central system, lightings fixtures, installations and fittings, lightings networks, equipments and wiring installations, air conditioning units all equipment or parts thereof, instruments, motors, pumps, valves, screw pumps, compressors, surge vessels, filters, vessels, fans, drums, platform scales, detectors, filling points, tanks, inlets and outlets channels, valves, control panels, transformers, windows, doors, safety equipment, laboratory devices and equipments, sucking fans, ventilation fans, scrubbers, storage tanks, foul air pipes, belt filter presses, polymer storage, dosing tanks, belt conveyors, fuel tanks, lightings installations, chlorinators, ejectors, evaporators, inlets and outlets channels, blowers, control rooms, panels, underground services and utilities (cables, wires, earthling, rods, electrodes, MCC, sensors, etc.) and all related fixtures and accessories.

b) The extent of work shall include disconnect the electricity supplies, dismantle mechanical and electrical equipments and instruments laboratory rooms of building AB 1042, demolish and break concrete structures, cut pipes, remove, abandonment, cart away to a tippers off the site, transport and dispose to dumping area outside the site, but not limited to instruments, equipments and devices, motors, ovens, pumps, control panels, cabinets, furniture, safety parts, plumbing system, pipes, plumping specialties, sanitary sewer system, pipelines, gas pipes, ovens, sanitary fixtures, boiler, exhaust fan, tiles and all related civil, mechanical, electrical and instrumentation parts to the satisfaction of the Engineer.

c) The extent of works shall include but not limited to cutting steel structures and beams, puncturing the base slabs, foundation, footings and surrounding walls including excavating depth of 2.5 meters beyond the horizontal limits of the foundations, footings, slabs, columns, walls of all types of structures facilities

- **All types of structures facilities** shall include foundations, columns, footings, slabs, walls, beams and concrete reinforcement structures but not limited to ground structure tank or chamber, substructure tanks or underground chambers, superstructures, wastewater retaining structures, inlet chambers, coarse screens, fine screens, degritters, bioreactors or aeration tanks, clarifiers, contact tanks, rapid sand filters, parshall measuring flume, thickeners, digesters, drying beds, holding balancing tanks, potable and brackish water complex and other related facilities.

a) The extent of work shall include disconnect the electricity supplies, dismantle mechanical and electrical equipments and instruments, demolish and break concrete structures, cut pipes, remove, abandonment, cart away to a tippers off the site, transport and dispose to dumping area outside the site, but not limited to inlet and outlet channels, scum networks, scum removal facilities, pipes, valves, bridges, scrapers, discharge underground pipes, scum/liquid separators, scum skimming boards, scum boxes, bolts, motors, hoppers, gear boxes, diffuse airs, gates, air injection system, belts conveyors, force mains pipelines, agitators, screens, electrical control panels, collecting containers, penstocks, inlets and outlets discharge pipelines, v-notches, hoppers, weirs,

oxygen meters, drive wheels units, screw classifiers, air blowers, mixers, transmitters boxes, gas filtrations, injectors, storage tanks, guard rails, fences, pipelines, columns and foundations of columns, walls, slabs, blowers, turbine aerators, heat exchangers, boilers, burners, fire extinguishers, biogas piping, diesel fuel tanks, water tanks, vessels, platforms, batteries, drainage pipelines, foundations of control panels and pumps, wall of gates and steel ladders, sewage, contaminants, hazardous materials, sand, gravels, bushes, debris, sensors, booster system, polluted soil, motors, pumps, control panels, safety equipment, underground services and utilities (cables, wires, earthling, rods, electrodes, sensors, etc.) and all other ferrous metals.

b) The extent of works shall include but not limited to cutting steel structures and beams, puncturing the base slabs, foundations, footings and surrounding walls including excavating depth of 2.5 meters beyond the horizontal limits of the foundations, footings, slabs, columns, walls of all types of structures facilities.

- All types of structures facilities shall include foundations, columns, footings, slabs, walls, beams and concrete reinforcement structures but not limited to domes, chemicals storage tank, foul air trestle bridges, concrete and steel basins, gas holders (steel tank, valve house), air compressor station, waste gas flare (steel stack 15 m high, gas gate valves flare ignition panel, and main gas burner), waste gas burner (tower stack 4 m high made of bricks, 10 nozzles gas burner, control valve and control panel), steel truss structures, parshall measuring flume, parking shelters, oil and grease shelters, control rooms, water display fountain, effluent filling station, foundation of control panels and pumps, concrete and steel ladders and other related parts.

a) The extent of work shall include disconnect the electricity supplies, dismantle mechanical and electrical equipments and instruments, demolish and break concrete structures, cut pipes, abandonment, cart away to a tippers off the site, transport and dispose to dumping area outside the site, but not limited to underground services and utilities (cables, wires, earthling, rods, electrodes, sensors, etc.), sewage, contaminants, hazardous materials and polluted soil.

b) The extent of works shall include but not limited to cutting steel structures and beams, puncturing the base slabs, foundation, footings and surrounding walls including excavating depth of 2.5 meters beyond the horizontal limits of the foundations, footings, slabs, columns, walls of all types of structures facilities.

2. The extent of works shall include but not limited to trench excavation, termite control, groundwater pressure investigation, soil rehabilitation and treatment of polluted soil on site, backfill excavated area after treatment of polluted soil, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

3. The extent of works shall include but not limited to demolish concrete structures, asphalt roadways, concrete roadways, foot pathways, interlock tiles, curbstones and sites paving areas, break, remove, abandonment, cart away to a tippers off the sites, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

4. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill excess unlimited depth of excess areas as approved by the EPA and the Engineer, landscaping, grading (compacting 95% MDD) soil to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

5. The Contractor shall be responsible to identify, locate, check and follow all safety precautions requirements to demolish, disconnect, dismantle, remove, abandonment, dispose, cart away to a tippers off the site and transport off site diesel, fuel, chemicals, gases and hazardous materials and equipment in a safe manner to avoid any risks in accordance with KNPC, EPA and other concerned authorities rules and regulations shall include but limited to closed confined structures, diesel and other fuels storage tanks, chemical storage tanks, gas pipes, gas pipelines, gas cylinders, gas holder steel tanks, waste gas flare steel stack, surge vessels, and other specific facilities such as odour control building, chlorine building, pumping station and laboratory.

6. The extent of works shall include but not limited to disconnect the electricity supplies, dismantle mechanical and electrical equipments and instruments, clean, grease, paint and coating surface metals areas, remove, cart away to a tippers off the site and transport usable (salvage items) as directed by the Engineer to MPW stores outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval and shall include but not limited to all equipment or parts thereof, instruments, motors, pumps, control panels, safety equipment, laboratory devices and equipments, spare parts and all salvage of mechanical, electrical and instrumentation shall be carried in closed containers and delivered to MPW stores off site in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

   The extent of work shall include but not limited to following requirements and subject to the Engineer approval:

   a. Disconnect electricity supply permanently at source, remove reusable cables from the control panels, insulate the cores individually with heat shrink tube, provide a heat shrink overall end cab on top of the cables, cart away to a tippers off the site and transport to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them as approved by MEW and the Engineer.

   b. Disconnect reusable motor cables (main and auxiliary) from both ends, remove the cables, insulate the ends, roll them into individual rolls, tag them (metal tags) detailing type, voltage, number and size of cores, length etc., cart away to a tippers off the site and transport to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them as approved by MEW and the Engineer.

   c. Disconnect the electricity supplies, dismantle mechanical and electrical equipments and instruments, clean, grease, paint and coating motors from the drive shafts and base plate, clean and grease the motors, plug cable entry boxes, apply a coat of rust proof sealant on the bare shaft, cart away to a tippers off the site and transport to MPW stores in new fitting packages

similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

d. Disconnect the electricity supplies, dismantle mechanical and electrical equipments and instruments, clean, grease, paint and coating all types of the reusable pumps including sump pumps after applying a coat of rust proof sealant on the bare shaft and protecting it from damage, cart away to a tippers off the site and transport to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them as approved by MEW and the Engineer. The pumps shall be metal tagged with all the relevant information prior to delivery to MPW stores off site.

e. Disconnect, dismantle, remove, clean, cart away to a tippers off the site and transport to MPW stores all reusable lighting fixtures, switches, sockets, fans, cable trays and all other electrical items in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

f. Disconnect the electricity supplies, dismantle mechanical and electrical equipments, clean, grease, cart away to a tippers off the site and transport to MPW stores reusable A/C split units, central A/C unit and window air conditioners, clean units, tag them in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

g. Disconnect, remove, clean, cart away to a tippers off the site and transport to MPW stores reusable mounted panels in control rooms and substations and shall include but not limited to MCC, cables, control room panels and hardware, sensors, transmitters, alarms and all other related electrical accessories and connections to be carried in closed containers , cart away to a tippers off the site, transport and dispose to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking the. Care shall be taken to protect switches, instruments, etc. on the front of the panels during transport to MPW stores off site.

h. Disconnect the electricity supplies, dismantle mechanical and electrical equipments, remove, clean, grease, paint re-usable spare parts of different equipment sets, then assemble them together of similar equipments to make complete equipment sets, remove, cart away to a tippers off the site and delivered to MPW stores off site in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

i. Clean, paint re-usable spare parts shall include but not limited to all existing mechanical and electrical equipments, instruments and devices, tools, pumps, valves, hoses, etc available in stores and other storages areas within the boundary area of the perimeter fence, then , cart away to a tippers off the site and delivered to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

j. The Contractor shall be responsible to submit three (3) compact discs (CD) of detailed inventory lists of delivered reusable items to MPW stores off the site to the satisfaction of the Engineer and shall include but not limited to pumps, valves, hoses, tools, materials, spare parts, equipment, valid chemical solutions and all other different items available in Ardiya plant stores and buildings within the boundary area of perimeter fence, etc..

7. The Contractor shall be deemed to have carried out his own investigations to ascertain himself the nature of the soil conditions and the groundwater level. The Contractor shall provide, install and operate pumps, plugs, conduits, dewatering system and all other required machineries and equipments with all hoses, connections, mechanical and electrical installations.

8. The Contractor is obligated to execute all preliminary works and coordinate with MEW to disconnect, remove, abandonment and deliver transformers with all other related electrical accessories and connections off sites for all substations required to be demolished, removed and abandonment as specified in the contract requirements. The extent of work shall include but not limited to all cables overhead and underground cables as approved by MEW and the Engineer.

9. The Contractor shall be responsible to clean, flush and remove accumulated wastewater, dry and wet sludge, gravels, sand, debris, hazardous materials and polluted soil, groundwater and other contaminants, drying beds media, sand filters media and any locations under any circumstances, cart away off the site, transport and dispose to dumping area outside the site in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The Contractor shall be responsible to provide jet flushers tankers (if necessary) and provide mud suckers tankers to remove wastewater and discharge off the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The Contractor shall not be allowed to divert wastewater flow to any emergency by-pass gulf sea lines.

10. The Contractor shall provide, erect and maintain all temporary staging, scaffolding, rigging, shuttering, over pumping and flow diversions, dewatering system and related connections, excavation, backfilling and earth filling of unlimited underground depth area required to carry out the works close to existing structures in order to prevent subsidence of the foundations such as building, tanks or other structures without any hazard to persons or existing services and carried out with all necessary precaution needed.

11. The extent of works shall include but not limited to disconnect the electricity supplies, dismantle non usable mechanical and electrical equipments, remove, abandonment, cart away to a tippers off the site and transport to MPW stores off the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval and shall include but not limited to all types of ferrous metals such as bridges, valves, gates, supports, scrapers, filling stations, conveyors screw pumps, etc. and all other non usable mechanical, electrical and instrumental parts. All non salvage ferrous metals surfaces shall be delivered to MPW stores without packing, but shall be covered with large plastic sheets as approved by the Engineer.

12. The extent of works shall include but not limited to clean and remove sewage, sludge, debris and other contaminants, cart away to a tippers off the site, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

B. <u>Demolish underground pipelines, internal sewers pipelines, internal storm water drainage pipelines, manholes, transition chambers, hatch boxes, wells, pits, channels, culverts and other underground chambers, dewater, dismantle, cut, break, remove, abandonment, cart away to a tippers off site, earthfill, landscape, grading soil to be reinstated and restored the site to a condition match its surrounding as approved by the EPA and the Engineer:</u>

1. Demolish unlimited distances (lengths) and unlimited depths of all existing pipelines types materials and all different pipes sizes diameters of underground gravity sewer pipelines, storm water drainage pipelines, gravity pipelines and pressure pipelines (open cut method) within the boundary area of the fence perimeter (800 m + 440 m + 800 m + 440 m) completely within two (2) years starting from the Date of Enterprise except partial of sanitary sewerage system and partial of storm water drainage system, dewater, cut pipes, remove, abandonment unlimited depth and cart away to a tippers off the site.

2. Demolish unlimited depth dry and wet manholes, transition chambers (TC), hatch boxes, wells and pits, channels, distribution chambers, culverts and other underground chambers within the boundary area of the fence perimeter (800 m + 440 m + 800 m + 440 m) completely within two (2) years starting from the Date of Enterprise except partial of sanitary sewerage system and partial of storm water drainage system, disconnect electricity supplies, dismantle mechanical and electrical equipments, dewater, break concrete structures, cut pipes, remove, abandonment, cart away to a tippers off the site, transport and dispose to dumping area outside the site to any unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The extent of works shall include but not limited to all existing step irons, ladders, fences, concrete passing slabs, concrete surfaces (walls, slabs and columns), passing slabs, covers, air release valves, chambers, valves chambers, drainage valves, by-pass pipelines, frames, and all other related parts.

3. The Wastewater Pumping Station (PS 0931), Main Sewer pipeline and manholes connected to Wastewater Pumping Station (PS 0931), Internal sewer pipelines and manholes of zones areas (1 & 2) connected to main sewer pipeline or wastewater pumping station (PS 0931) and Main Storm water drainage system within the boundary area of the perimeter fence shall be **excluded** from demolishing works.

   However, the Contractor shall dismantle, remove, abandonment and cart away to a tippers off site the existing internal storm water drainage system of zones areas (1 & 2) and shall renovate, provide, erect, install, test, commission and maintenance new internal storm water drainage systems of zones areas (1 & 2) and shall be connected to main storm water drainage system as specified in the contract requirements.

4. The extent of works shall include but not limited to all non usable ferrous metals within the boundary area of the perimeter fence, cart away to a tippers

off the site and delivered to MPW stores without packing, but shall be covered with large plastic sheets as approved by the Engineer.

5. The extent of works shall include but not limited to break concrete reinforcement structures, walls, slabs, reinforced concrete cover slab, puncturing the base slabs and surrounding walls including excavating depth of 2.5 meters beyond the horizontal limits of the foundation, slab and walls of substructures, removing and carting away to a tippers off the site. The concrete cover slabs shall be carefully broken to maintain metals covers and frames. Metals and frames covers shall be cleaned and sand blast to remove any corrosion product, paint with two coats of coal tar paints and deliver to MPW stores off site. The Contractor shall not be allowed to divert wastewater flow to any emergency by-pass gulf sea lines.

6. The extent of works shall include but not limited to demolish concrete structures, break, remove, abandonment, cart away to a tippers off the site, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

7. The extent of works shall include but not limited to trench excavation, termite control, groundwater pressure investigation, soil rehabilitation and treatment of polluted soil on site, backfill excavated area after treatment of polluted soil, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

8. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill excess unlimited depth areas of manholes, transition chambers (TC), hatch boxes, wells, pits, channels, culverts, distribution chambers and other underground chambers as approved by the EPA and the Engineer, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

9. The extent of works shall include but not limited to demolish unlimited distances (lengths) and unlimited depths of all existing types and sizes diameters of underground pressure pipelines (Dimensions of pipelines: 7 x DN 1000, 2 x DN 700, 2 x DN 300, 1 x DN 150) of the inlets chambers (IS 0151, IS 0152) completely within the boundary area of the perimeter fence, dewater, cut pipes, remove, abandonment and cart away to a tippers off the site. The extent of works shall include but not limited to provide, install and commission suitable plug or cap pipelines ends surfaces of pressure pipelines completely within the boundary area of the perimeter fence either by filling pipelines ends surfaces with dry pack grout mixture or install manufactured cap to form water tight seal.

   However, the Contractor shall require to sharp edges after cutting pipes and smoothen by means of grinding with suitable disc. All the works shall be approved by the Engineer and EPA.

10. The Contractor shall be deemed to have carried out his own investigations to ascertain himself the nature of the soil conditions and the groundwater level. The Contractor shall provide, install and operate pumps, plugs, conduits,

dewatering system and all other required machineries and equipments with all hoses, connections, mechanical and electrical installations.

11. The extent of works shall include but not limited to clean, flush, remove, cart away to a tippers off the site accumulated wastewater, sludge, sand, gravels, debris, groundwater, polluted soil and other contaminants shall include but not limited to manholes, hatch boxes, transition chambers (TC), underground pipelines, wells, pits, channels, distribution chambers and other underground chambers structures. The Contractor shall be responsible to provide jet flushers tankers (if necessary) and provide mud suckers tankers to remove wet wastewater and discharge to any areas as approved by the Engineer and EPA. The Contractor shall not be allowed to divert wastewater flow to any emergency by-pass gulf sea lines. The quantities of machineries (trips) are not limited to be available on demand and shall include but not limited to tractors, tippers, Lorries, mud suckers, tankers flushers, cranes, tools, equipment including manpower, drivers, and fuel to execute the works completely during the contract period.

12. The Contractor shall provide, erect and maintain all temporary staging, scaffolding, rigging, shuttering, over pumping and flow diversions to carry out the works close to existing structures in order to prevent subsidence of the foundations of other structures without any hazard to persons or existing services and carried out with all necessary precaution needed.

13. The extent of works shall include video with closed circuit television to identify open joints and connections, broken pipelines, assess condition of pipelines and locate any other obstructions, but not limited to dismantle, cut, remove and abandonment damaged pressure pipelines or parts of pipelines including bends, fittings, junctions, joints, jointing parts, supports, anchors and other related connections to be carted away to a tippers off the site as approved by the Engineer and EPA.

14. The extent of works shall include but not limited to capping and sealing additional unknown single pipeline diameter 300 mm (1 ∅ 300 mm) and double pipelines diameters 700 mm (2 ∅ 700 mm) connected to Ardiya sewage plant outside the perimeter fence.

C. <u>Demolish Extraneous materials, pipes, etc. accumulated on site, cut, remove, abandonment and cart away to a tippers off the site:</u>

1. Demolish all extraneous materials, pipes, etc. accumulated on site, remove and abandonment within the boundary area of the fence perimeter (800 m + 440 m + 800 m + 440 m) completely within two (2) years starting from the Date of Enterprise, dismantle electrical and mechanical equipments, cut, remove, abandonment, cart away to a tippers off the site, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The extent of works shall include but not limited to bushes, dirt, trash, sand, debris, debris containers, sand and cement bags, grits, gravels, stones, precast concrete blocks, polluted soil, corroded pipes, tanks, concrete blocks, rubbers, woods, tires, chains, oil, grease, dry sludge, wet sludge, wastewater, sand and gravels of drying beds, sand and gravels of sand filters, dry trees, plastics, non usable office equipments, non usable office and laboratory furniture, not valid chemicals and solutions, oil and grease barrels, sand and gravels of drying beds, sand

and gravels of sand filters, fence pipes, screens, fence barbed wires, shelters and other non usable parts and other contaminants accumulated on site.

2. The extent of works shall include but not limited to clean, paint re-usable extraneous mechanical and electrical equipments, instruments and devices, tools, pumps, valves, hoses, etc. accumulated on site within the boundary area of the perimeter fence, cart away to a tippers off the site and delivered to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

3. The extent of work shall include but not limited to clean, remove all extraneous non usable ferrous metals (equipments, pumps, motors, etc.) accumulated on site within the boundary area of the perimeter fence, cart away to a tippers off the site and delivered to MPW stores without packing, but shall be covered with large plastic sheets as approved by the Engineer.

D. <u>Demolish miscellaneous structures completely, disconnect the electricity supplies, dismantle miscellaneous mechanical and electrical equipments and instruments completely, cut pipes, break concrete structures, remove, abandonment, cart away to a tippers off the site:</u>

1. Demolish miscellaneous structures completely within two (2) years starting from the Date of Enterprise, disconnect the electricity supplies, dismantle miscellaneous mechanical and electrical equipments and instruments completely, cut pipes, break concrete structures, remove, abandonment, cart away to a tippers off the site, transport to MPW stores outside the site to any unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

2. The extent of works shall include but not limited to gates, weirs, pipes, steel basins, chlorine residue measurement stations, chlorine cylinders rolling stands, chlorine pipes and pipelines, air injection pipes, chlorinators, ejectors, gas pipes. gas cylinders, mimic panels, control rooms, control room panels and hardware, flow meters, safety equipments, valve VC 0751, composite sampler SL 0354, pH meters, steel bridges, storage tanks, surge vessels, ventilation fans, FRP pipes, caustic soda pipes, air pipelines, basins, valves, gates, oxygen meters, Hydrogen sulfide monitoring system, storage tanks, distribution chambers, inlet discharge pipes, out discharge pipes, guard rails around basins, switches, drying beds filter media pipes networks, scraper machine (equipment) for drying beds, sand filters pipes networks, detectors, alarms, lights fixtures, central telephone system and other related connections, concrete and steel ladders, oil and grease shelters, parking shelters, shutter doors, panels, A/C units, concrete ladders, concrete columns, ferrous ladders, irrigation networks (pipes, valves, equipments, control system, rotary impact sprinklers, PVC main irrigation pressure pipelines and fitting for water distribution, polyphone tubes and micro tubes, nozzles, heads, sub-lateral irrigation lines, drip emitters with single and multi outlets, gates, couplers, vacuum breakers, reducers, T-connections, elbows, screen filters, valves boxes, fertilizer injectors, station controllers, Y-strainers and other related irrigation parts), fountain, sludge piping with valves, drainage sewer submersible pumps, drainage sumps, pumps, compressors, bathroom fixtures, fans, pressure gauges, traveling overhead cranes, overhead gantry beam, mimic panels, electric panels (steel cabinets), belt filter presses, diesel pumps, hoses, fuel tanks, filters, fire extinguishers, garbage containers, collecting containers, roof FRP, water tanks,

boilers, sanitary fittings, doors, windows, tiles, safety fences, materials and equipments of stores and workshop, civil, instrumentation, mechanical and electrical miscellaneous parts completely within the boundary area of the fence and all related fixtures and accessories.

3. The extent of works shall include but not limited to clean, paint re-usable miscellaneous mechanical and electrical equipments, instruments and devices, tools, pumps, valves, hoses, etc., cart away to a tippers off the site and delivered to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

4. The extent of work shall include but not limited to clean, remove non usable ferrous metals accumulated on site within the boundary area of the perimeter fence, cart away to a tippers off the site and delivered to MPW stores without packing, but shall be covered with large plastic sheets as approved by the Engineer.

5. The extent of works shall include but not limited to trench excavation, termite control, groundwater pressure investigation, soil rehabilitation and treatment of polluted soil on site, backfill excavated area after treatment of polluted soil, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

6. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill unlimited depth of excess areas, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings as approved by the EPA and the Engineer. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

E. <u>Rehabilitation of soil:</u>

1. Rehabilitation of soil on site within the perimeter chain link fence (800 m + 440 m + 800 m + 440 m) completely within two (2) years starting from the Date of Enterprise shall include but not limited to earthworks are required to determine the properties of the soil underlying the site by taking samples tests in different locations within the perimeter chain link fence (800 m + 440 m + 800 m + 440 m) as approved by the Engineer to test that the soil is not polluted and the strength soil load bearing capacity. The Contractor shall require treatment of polluted soil and submit a certificate for laboratory testing after treatment of polluted soil and the strength soil load bearing capacity as approved by the Engineer and EPA.

2. The extent of work shall include but not limited to excavate and remove of excess soil above ground surfaces areas or upper hill surfaces areas**,** landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings as approved by the Engineer and EPA.

3. The extent of works shall include but not limited to remove polluted soil, abandonment, cart away to a tippers off the site, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of

Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

4. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill unlimited depth of excess areas, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings as approved by the EPA and the Engineer. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

F. <u>Demolish street lightings poles, towers lightings poles and all other types of exterior lightings poles, control cables and lightings networks, disconnect, dismantle, break, remove, abandonment and cart away off the site:</u>

1. Demolish street lightings poles, towers lightings poles and all other types of exterior lightings poles, control cables, panels and lightings networks installations within the perimeter chain link fence (800 m + 440 m + 800 m + 440 m) completely within two (2) years starting from the Date of Enterprise, disconnect the electricity supplies, dismantle electrical and mechanical equipments, break concrete structures, remove, abandonment, cart away to a tippers off the site and transport to MPW stores off the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The extent of works shall include but not limited to lightings installations and fixtures, electric panels, control cables, foundations, underground services and utilities (cables, wires, earthling, rods, electrodes, MCC, sensors, etc.), mast lamps near structure facilities and all other related connections and accessories.

2. The extent of works shall include but not limited to trench excavation, termite control, groundwater pressure investigation, soil rehabilitation and treatment of polluted soil on site, backfill excavated area after treatment of polluted soil, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

3. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill excess unlimited depth of excess areas as approved by the EPA and the Engineer, landscaping, grading (compacting 95% MDD) soil to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

4. The extent of works shall include but not limited to demolish concrete structures, break, remove, abandonment, cart away to a tippers off the site, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

G. <u>Disconnect, remove, shift, transport on site, reinstall, test and commission existing Telemetry system from Administration Building (AB 1042) to MPW Quality Control Centre (AB 1044):</u>

1. Disconnect the electricity supplies, dismantle electrical equipments and instruments, remove, shifting all Telemetry systems from the Administration Building (AB 1042), transport on site, reinstall, test and commission existing Telemetry system to MPW Quality Control Center (AB 1044) **prior to demolish the Administration Building (AB 1042)** within three (3) months starting from the Date of Enterprise. The location of new Telemetry system partition room shall be approved by the Engineer. All works, materials and specifications shall be subject to the Engineer approval. The Contractor shall be responsible for obtaining MPW approval to such design prior to the start the execution of the works.

2. The Contractor shall visit the site location and inspect the master station at Ardiya sewage plant and study all equipment of the system in order to acquaint himself with existing equipment and all details required.

3. The Contractor shall also be responsible to maintain the proper operation and calibration of the system as much as possible during the moving process, and submit proposed time table for shifting the equipment to the new location for the Engineer for approval, before starting the work. Any damage to the equipment or malfunctioning of the software program developed due to shifting the system, the Contractor should replace the software at his own cost which must be allowed in the contact sum.

4. The Contractor shall conduct a radio survey process, to allocate the messing signals due to shifting operation and ensure a full signal transmission of outstation equipment.

5. The re-installation of the system equipment shall be carried out in strict accordance with the manufacturer written instruction subject to the approval of the Engineer. If for any reason the proper location of any part of the telemetry system needs to be shifted, or to provide any additional items, to complete the installation work, it is the Contractor's responsibility to execute the necessary modification or to provide any provisional item and carry out the work at no additional charge.

6. The work assigned by this item shall be carried out with a full co-ordination and supervision of MEW. It is the Contractor responsibility to obtain MEW approval of his design criteria and installation ideas on the shop drawings prior to start of any Electrical Works and for the connection of the Electrical supply. Upon completion of the Electrical Work the Contractor shall be responsible for obtaining MEW approval for the whole installation or modification (or any part thereof) including supervision of MEW representative on the final testing and energizing the panels, and setting to work. The Contractor shall acquaint himself with the latest issue of the rules and regulations of Electrical installation work of the Ministry of Electricity and water (MEW). It is the Contractor responsibility to obtain the latest copies of these regulations at his own expense and there will be no consideration for any such unawareness of these requirements. The Contractor shall check and allow in the Contract prices for obtaining any permits, licenses, or paying rents and fees for any authorities necessary for starting, carrying out, completing, setting to work and handing over in an operating and good performance. A complete installation shall

include any sundry items or components may be necessary or as specified by the Engineer. Such items, whether mentioned or not, shall be included at no extra cost to the contract sum.

7. All builder's works, such as chasing of walls, grouting of bolts, construction of foundation as necessary, trenches with Chaucer plate covers, building of cable manholes, earthling pits and fitting laying of ducts, ceiling of ducts, excavation of trenches backfilling and consolidation, carting away of surplus spoil, etc. shall be executed by the Contractor and the full and entire cost of all such builder's works and materials shall be included in the total bid amount.

8. The Contractor shall co-operate and co-ordinate with all other parties or Contractor's executing work on sites / or adjacent to his sites of work in order that the minimum interference inconvenience is caused to the public.

9. The extent of work shall include but not limited to underground services and utilities (cables, wires, earthling, rods, electrodes, MCC, sensors, etc.) and all required mechanical, electrical, instrument and civil works in accordance to the regulations of the authorities, EPA and Engineer approval. No claims will be admitted if the Engineer specifies additional requirements or any modification to achieve the system to his satisfaction; such work will be executed and carried out through the same contract price without any additional cost to the ministry.

10. The extent of works shall include but not limited to trench excavation, termite control, groundwater pressure investigation, soil rehabilitation and treatment of polluted soil on site, backfill excavated area after treatment of polluted soil, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

11. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill excess unlimited depth of excess areas as approved by the EPA and the Engineer, landscaping, grading (compacting 95% MDD) soil to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

H. <u>Demolish Chain Link Fence with barbed wires (800 m + 440 m + 800 m + 440 m) completely, main entrance gate and conveyor rod, remove, abandonment and cart away to a tippers off the site:</u>

1. Demolish chain link fence with barbed wires of perimeter (800 m + 440 m + 800 m + 440 m), main entrance gate and conveyor rod completely within two (2) years starting from the Date of Enterprise, cut, excavate, break foundation (0.5 m) concrete structure, remove, abandonment, cart away to a tippers off the site and transport to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

2. The extent of works shall include but not limited to trench excavation, termite control, groundwater pressure investigation, soil rehabilitation and treatment of polluted soil on site, backfill excavated area after treatment of polluted soil,

landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

3. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill excess unlimited depth of excess foundation areas as approved by the EPA and the Engineer, landscaping, grading (compacting 95% MDD) soil to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

I. <u>Demolish Asphalt and Concrete Roadways, Internal roadways and Pavements, break, remove, abandonment, cart away to a tippers off the site:</u>

Demolish asphalt and concrete roadways, internal roadways and pavements, break, remove, abandonment within the perimeter chain link fence (800 m + 440 m + 800 m + 440 m) completely within two (2) years starting from the Date of Enterprise, cart away to a tippers off the site, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

The extent of works shall include but not limited to demolish foot pathways, interlock tiles, concrete tiles, curbstones and sites paving, break, remove, abandonment and cart away to a tippers off site, transport and dispose to dumping area outside the site to different locations as directed by the Engineer in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill unlimited depth of excess foundation areas as approved by the EPA and the Engineer, landscaping, grading (compacting 95% MDD) soil to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

Clause 2: Demolish, Disconnect, Dismantle and Abandonment Screw Conveyors Lifting Stations S20 and S21 completely and other related works

The price fixed for this item is lump sum and shall include all personnel engineers, supervisors, drivers, manpower and labors, machineries, equipments, pumps, materials, supplies, consumables, transportation, tools or implements, temporary accommodations and furnishings, and generally for all means used for the fulfillment of the contract requirements which he undertakes to provide on site to carry out the works completely within the contract period. The Contractor shall minimize nuisances and work in a safe manner but not limited to all the following works and subject to Engineer approval:

i) <u>General:</u>

1. The Contractor shall execute all the works as specified in the contract requirements in conformance with the Sanitary Engineering General Specifications (2002), General Specifications for Buildings and Engineering Works (1990), Roads administration, General specifications for Kuwait Motorway (2004) and other latest editions of the codes, ordinances, rules and regulations of Ministry of Public Works, EPA (Environment Public Authority) regulations and other Governmental authorities.

2. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations, MPW and other governmental authorities to execute demolishing works of all types of structures facilities, pipelines, manholes, etc. within one (1) month starting from the Date of Enterprise.

3. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations and other governmental authorities of soil and groundwater investigations, rehabilitation and treatment of polluted soil within one (1) month starting from the Date of Enterprise.

4. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations and other governmental authorities to remove and transport pollutants in a safety manner shall include but not limited to polluted soil, equipments, metals, demolished structures, wood, debris, pipes, asbestos, chemicals, oil, sewage, groundwater, heavy metals, etc within one (1) month starting from the Date of Enterprise.

5. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations and other governmental authorities for the safety of manpower and fire precaution on sites within one (1) month starting from the Date of Enterprise.

6. The Contract shall submit request of inspection of all required activities works in according to contract requirements for approval by the EPA and the Engineer.

7. The Contractor shall provide all necessary safety personnel materials and equipments, lightings, precaution against fire, fencing, excavation support and protection, safety signs, and temporary power supply for proper completion of the work.

8. The Contractor shall be responsible for maintenance and rectification of all damaged utilities and other services affected during the works at no extra cost.

9. In the case, the Contractor may find unforeseen old structures, equipments or underground pipelines, need to be demolished, he should take the action to include such equipment in the demolishing works and shall be allowed in the total sum of the contract.

10. The Contractor shall be responsible to provide adequate mobile diesel generators to be available on demand for electricity loading required to execute the works without any interruption for the works.

11. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

ii) <u>Description of the works:</u>

Demolish Screw Conveyors Lifting Stations S20 and S21 completely within two (2) years starting from the Date of Enterprise, disconnect the electricity supplies completely, dismantle mechanical and electrical equipments and instruments completely, break concrete structures completely, cut pipes, remove, abandonment all types of the structures facilities, underground services and utilities (cables, wires, earthling, rods, electrodes, MCC, sensors, etc.) within the boundary area of the fence perimeter completely except the fence, cart away to a tippers off the site.

Screw Conveyors Lifting Stations S20 and S21 in Appendix (2) and attached drawings are considered as guidance only to the Contractor and do not cover all require works and does not show all the actual equipment and structures on sites. Therefore, it is obligated that the Contractor to visit all the sites during the period of tendering to determine by himself the actual conditions of the site and all the components of works. The Contractor shall be deemed to be fully conversant with the prevailing conditions (above ground and below ground) and the nature and complexity of the work to be undertaken. The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

1. Demolish Screw Conveyors Lifting Stations S20 within boundary area (900 m^2) completely and S21 within boundary area (900 m^2) completely, disconnect the electricity supplies completely, dismantle mechanical and electrical equipments and instruments completely, break concrete structures completely, cut pipes and abandonment all types structures facilities completely and cart away off the site.

   All types of structures facilities shall include but not limited to ground structure tank or chamber, concrete reinforcement structures, substructure (underground) tanks or chambers, superstructures, small pumping stations structures, culvert pipelines, channels and other structures facilities.

   The extent of work shall include the following structures and equipments but not limited to:

   a. Underground screw pumps covered with metals.
   b. Small pumping stations.
   c. Auxiliaries: Grease oil pumps, Dewatering and submersible pumps, Gear boxes, Screw conveyors motors, Main pumps motors, Grease oil pumps motors, Ventilators pipelines, and Exhaust fans.
   d. Existing odour control equipments, tanks, pipes and other related facilities.

e. Diesel generator set and other related connections.
f. Manholes, transition chambers (TC) and underground pipelines.
g. Discharge pipelines and manhole outside the boundary area of the fence.

2. Clean, paint re-usable parts shall include but not limited to all existing mechanical and electrical equipments, instruments, pumps, valves, hoses, etc within the boundary area of the perimeter fence, then cart away off the sites and delivered to MPW stores off site in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

3. The extent of works shall include but not limited to demolish concrete structures, asphalt roadways, concrete roadways, foot pathways, interlock tiles, concrete tiles, curbstones and sites paving areas, break, remove, abandonment, cart away to a tippers off the sites, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

4. The Contractor shall be deemed to have carried out his own investigations to ascertain himself the nature of the soil conditions and the groundwater level. The Contractor shall provide, install and operate pumps, plugs, conduits, dewatering system and all other required machineries and equipments with all hoses, connections, mechanical and electrical installations.

5. The Contractor shall be responsible to clean, flush and remove accumulated wastewater, dry and wet sludge, gravels, sand, debris, hazardous materials and polluted soil, groundwater and other contaminants, cart away off the site, transport and dispose to dumping area outside the site in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The Contractor shall be responsible to provide jet flushers tankers (if necessary) and provide mud suckers tankers to remove wastewater and discharge off the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The Contractor shall not be allowed to divert wastewater flow to any emergency by-pass gulf sea lines.

6. The Contractor shall provide, erect and maintain all temporary staging, scaffolding, rigging, shuttering, dewatering system and carried out with all necessary precaution needed.

7. Demolish unlimited depth and distances (lengths) of all existing types and sizes diameters of underground gravity sewer, culverts and pressure pipelines, dewater, cut pipes, remove, abandonment, cart away off site, transport and dispose to dumping area outside the sites to any unlimited distances locations areas in the state of Kuwait in a legal manner. The extent of works shall include but not limited to trench excavation, soil and groundwater investigation, treatment of polluted soil on site, termite control, groundwater pressure investigation, soil rehabilitation, backfill excavated area after treatment of polluted soil and all required mechanical, electrical and civil works in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

   All non salvage ferrous metals surfaces shall be delivered to MPW stores without packing, but shall be covered with large plastic sheets as approved by the Engineer. The Contractor shall not be allowed to divert wastewater flow to any

emergency by-pass gulf sea line and shall use tankers (mud suckers) to remove wastewater off sites to any unlimited distances locations areas in the state of Kuwait in a legal manner.

8. Demolish unlimited depth dry and wet manholes, transition chambers (TC), hatch boxes, wells, pits, channels, distribution chambers and other underground chambers completely, dismantle, dewater, break, remove, abandonment, cart away off site, transport and dispose to dumping area outside the site to any unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The extent of work shall include but not limited to all existing step irons, ladders, fences, concrete passing slabs, concrete surfaces (walls, slabs and columns), passing slabs, covers, air release valves, chambers, valves chambers, drainage valves, by-pass pipelines, frames and all other related parts within the boundary area of the fence.

   The extent of works shall include but not limited to break concrete reinforcement structures, walls, slabs, reinforced concrete cover slab, puncturing the base slabs and surrounding walls including excavating depth of 2.5 meters beyond the horizontal limits of the foundation, slab and walls of substructures, removing and carting away to a tippers off the site. The concrete cover slab shall be carefully broken to maintain metals covers and frames. Metals and frames covers shall be cleaned and sand blast to remove any corrosion product, paint with two coats of coal tar paints and deliver to MPW stores off site.

   All non salvage ferrous metals surfaces shall be delivered to MPW stores without packing, but shall be covered with large plastic sheets as approved by the Engineer. The Contractor shall not be allowed to divert wastewater flow to any emergency by-pass gulf sea lines and shall use tankers (mud suckers) to remove wastewater off site.

9. The extent of works shall include but not limited to trench excavation, termite control, groundwater pressure investigation, soil rehabilitation and treatment of polluted soil on site, backfill excavated area after treatment of polluted soil, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

10. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill excess unlimited depth of excess areas as approved by the EPA and the Engineer, landscaping, grading (compacting 95% MDD) soil to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

11. Dismantle existing extraneous materials, pumps, equipments, woods, debris, metals, pipes, non usable parts, etc. completely accumulated on site within the boundary area of the fence perimeter, remove, cart away off the site, transport and dispose all to dumping area outside the site to any unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. All non salvage ferrous metals surfaces shall be delivered to MPW stores without packing, but shall be covered with large plastic sheets as approved by the Engineer.

12. The Contractor is obligated to execute all preliminary works and coordinate with MEW to disconnect, remove, abandonment and deliver transformers with all other related electrical accessories and connections off sites for all substations required to be demolished, removed and abandonment as specified in the contract requirement. The extent of work shall include but not limited to all cables overhead and underground cables as approved by MEW and the Engineer.

13. Rehabilitation of soil on sites within the boundary areas of Screw Conveyors Lifting Stations S20 and S21 completely and shall include but not limited to earthworks are required to determine the properties of the soil underlying the site by taking samples tests in different locations within the boundary areas as approved by the Engineer to test that the soil is not polluted and the strength soil load bearing capacity. The Contractor shall require treatment of polluted soil and submit a certificate for laboratory testing after treatment of polluted soil and the strength soil load bearing capacity as approved by the Engineer and EPA.

14. Demolish street lightings poles, towers lightings poles and all other types of exterior lightings poles, control cables, panels and lightings networks installations, disconnect electrical supplies, break concrete structures, remove, abandonment and cart away off site and transport to MPW stores to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The extent of works shall include but not limited to lightings installations and fixtures, electric panels, control cables, foundations, mast lamps near structure facilities and all other related connections and accessories.

15. The Contractor shall be responsible to identify, locate, check and follow all safety precautions requirements to dispose of diesel, fuel, chemicals and release gas in a safe manner to avoid any risks shall include but limited to closed confined structures, diesel and other fuels storage tanks, chemical storage tanks, gas pipes, gas pipelines, manholes, wells, pits and other specific facilities such as odour control facility and substructures screw conveyors lifting stations. Then, disconnect, remove and abandon the tanks, pipes, pipelines and other structures in accordance with EPA and other concerned authorities rules and regulation.

16. The Contractor shall execute civil maintenance works of the perimeter fences of Screw Conveyors Lifting Stations S20 and S21 completely. The extent of works shall include but not limited to painting and coating ferrous metals and main gate, replacing the metal chains and metal lockers, repair of concrete surface, treatment and repair of cracks and joints leakages, cure of damaged concrete surface, making good irregularities and defects including expansion and other joints, corrective measures to ensure water tightness, replacing defective joints and water-stops and painting of interior and exterior fence to be applicable outside and shall not be carried out in wet, dusty or foggy weather and interior work shall not proceed in dusty conditions. Plaster shall be clean, dry and free from loose to materials.

Index
Document 2- III
Part B - **Particular Requirements**

Section B: Grout filling unlimited depths and full volumes of underground pressure and gravity pipelines completely

Clause 1: Grout filling unlimited depths and full volumes of underground pressure pipelines completely including demolish, dismantle, break, remove, abandonment and earth fill of hatch boxes completely with other related works.

Clause 2: Grout filling unlimited depths and full volumes of underground gravity pipelines completely including demolish, dewater, dismantle, break, remove, abandonment and earth fill of manholes completely with other related works.

Clause 1: Grout filling unlimited depths and full volumes of underground pressure pipelines completely including demolish, dismantle, break, remove, abandonment and earth fill of hatch boxes completely with other related works:

The price fixed for this item is lump sum and shall include all personnel engineers, supervisors, drivers, manpower and labors, machineries, equipments, pumps, materials, supplies, consumables, transportation, tools or implements, temporary accommodations and furnishings, and generally for all means used for the fulfillment of the contract requirements which he undertakes to provide on site to carry out the works completely within the contract period. The Contractor shall minimize nuisances and work in a safe manner but not limited to all the following works and subject to Engineer approval:

i) <u>General:</u>

1. The Contractor shall submit the method of grout filling unlimited depths and full volumes of the underground pressure pipelines completely start from the inlet pressure pipeline (end) to the outlet pressure pipeline (end) of different pressure pipelines lengths (m), diameters (mm) and materials (type of pipes) until the volumes of the underground pressure pipelines are completely full within one (1) month starting from the Date of Enterprise for approval by EPA (Environment Public Authority) regulations, MPW and other governmental authorities and shall include but not limited to techniques of cut pressure pipeline into different segments (sections) to install pipes for the injection points until the mix flowable fill materials emerges from vent pipes (discharge pipes) to ensure no voids remain unfilled, plug or cap and sealing pipes ends surfaces and other open surfaces of pipelines, preparation works to clean pipelines and remove wastewater or any other blockages prior to grout fill pipelines, plan activities, compressive strength test report, mix flowable fill materials with admixtures, grout fill equipment and pumps, operational procedures, groundwater investigations, proposed of grouting sequence, grout pressure flow and other related works. The extent of works shall include but not limited to demolish, dewater, dismantle, break, remove, abandonment and earth fill of hatch boxes completely with other related works.

2. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations and other governmental authorities for the safety of manpower and site work within one (1) month starting from the Date of Enterprise.

3. The Contractor is obligated to visit the locations of the pressure pipelines during the period of tendering to determine by himself the actual conditions of the site and all the components of works.

4. The Contractor shall require working concurrently in different locations to finish the contract requirements on time.

5. The Contractor shall submit request of inspection of all required works as approved by the EPA and the Engineer.

6. The Contractor shall provide all necessary safety personnel materials and equipments, lightings, safety precaution against fire, fencing, safety signs and temporary power supply for proper completion of the work.

7. The Contractor shall be responsible for maintenance and rectification of all damaged utilities and other services affected during the works at no extra cost.

8. The Contractor shall be responsible to provide adequate mobile diesel generators to be available on demand for electricity loading required to execute the works without any interruption for the works.

9. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

ii) <u>Description of the works:</u>

The Contracted is obligated to grout filling unlimited depths and full volumes of the underground pressure pipelines completely within three (3) years starting from the Date of Enterprise from the inlets pressure pipelines (ends) to the outlets pressure pipelines (ends) until the volumes of the underground pressure pipelines are completely full with mix flowable fill materials with no voids remain unfilled.

The extent of works shall include but not limited to demolish, dismantle, dewater, cut pipes, break, remove, abandonment, cart away to a tippers off the site unlimited depths of hatch boxes completely, earth filling excess areas with new imported borrow soil as approved by the EPA and the Engineer, landscaping, grading soil (compacting 95% MDD) and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

The Contractor shall be deemed to be fully conversant with the prevailing conditions (above ground and below ground) and the nature and complexity of the work to be undertaken. The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

1. Grout filling unlimited depths and full volumes of the following underground pressure pipelines completely start from the inlets pressure pipelines (ends) to the outlets pressure pipelines (ends) of minimum pressure pipelines lengths (m) until the volumes of the underground pressure pipelines are completely full with mix flowable fill materials with no voids remain unfilled. All the works shall be approved by the Engineer and EPA.

Type of pipeline (material)	Diameter of pipeline (mm)	Nos. of pipelines	Length of pipeline (m)	Outlet of pipeline	Inlet of Pipeline	Item
Asbestos	450	2	5100	A11	A1	1
GRP	450	2	5500	A11	A13	2
Asbestos	700	2	3500	A11	A2	3
Asbestos	1000	2	16000	Ardiya sewage plant	A11	4
DI	1000	2	3100	Rikka sewage Plant	A15	5

Note:

- Item 1 means:

Grout filling unlimited depth and full volumes of underground double pressure pipelines completely (each pipeline: Length 5100 m, Diameter 450 mm, Type asbestos) start from the inlets of double pressure pipelines (ends) connected to main pumping station (A1) to the outlets of double pressure pipelines (ends) connected to main pumping station (A11). Therefore, the total length required to grout filling unlimited depth and full volumes of underground pressure pipelines is 5100 m x 2 pressure pipelines = 10200 m until the volumes of the underground double pressure pipelines are completely full with mix flowable fill materials with no voids remain unfilled.

- Item 2 means:

Grout filling unlimited depth and full volumes of underground double pressure pipelines completely (each pipeline: Length 5500 m, Diameter 450 mm, Type GRP) start from the inlets of double pressure pipelines (ends) connected to main pumping station (A13) to the outlets of double pressure pipelines (ends) connected to main pumping station (A11). Therefore, the total length required to grout filling unlimited depth and full volumes of underground pressure pipelines is 5500 m x 2 pressure pipelines = 11000 m until the volumes of the underground double pressure pipelines are completely full with mix flowable fill materials with no voids remain unfilled.

- Item 3 means:

Grout filling unlimited depth and full volumes of underground double pressure pipelines completely (each pipeline: Length 3500 m, Diameter 700 mm, Type asbestos) start from the inlets of double pressure pipelines (ends) connected to main pumping station (A2) to the outlets of double pressure pipelines (ends) connected to main pumping station (A11). Therefore, the total length required to grout filling unlimited depth and full volumes of underground pressure pipelines is 3500 m x 2 pressure pipelines = 7000 m until the volumes of the underground double pressure pipelines are completely full with mix flowable fill materials with no voids remain unfilled.

- Item 4 means:

completely (each pipeline: Length 16000 m, Diameter 1000 mm, Type asbestos) start from the inlets of double pressure pipelines (ends) connected to main pumping station (A11) to the outlets of double pressure pipelines (ends) connected to Ardiya sewage plant. Therefore, the total length required to grout filling unlimited depth and full volumes of underground pressure pipelines is 16000 m x 2 pressure pipelines = 32000 m until the volumes of the underground double pressure pipelines are completely full with mix flowable fill materials with no voids remain unfilled.

- Item 5 means:

Grout filling unlimited depth and full volumes of underground double pressure pipelines completely (each pipeline: Length 3100 m, Diameter 1000 mm, Type DI) start from the inlets of double pressure pipelines (ends) connected to main pumping station (A15) to the outlets of double pressure pipelines (ends) connected to Rikka sewage plant. Therefore, the total length required to grout filling unlimited depth and full volumes of underground pressure pipelines is 3100 m x 2 pressure pipelines = 6200 m until the volumes of the underground double pressure pipelines are completely full with mix flowable fill materials completely with no voids remain unfilled.

2. Provide, grout fill, test and commission mix flowable fill materials (long term hardened strength materials) consist of fluid mixture of 1:10 cement sand and shall include but not limited to aggregates, fly ashes, potable water, additives and admixtures as necessary required to control of pumping mix flowable fill materials properly and self leveling placements without shrinkage. All the works shall be approved by the Engineer and EPA.

3. Provide, install, transport and commission grouting equipments and pumps of mix flowable fill to the site in ready unlimited quantities of mix trucks to pump mix flowable fill continuously with sufficient pressure to overcome friction and prevent nesting and void formation. The Contractor shall follow procedures with sufficient safety precautions and care to avoid damage to existing underground utilities structures. The quantities of machineries (trips) are not limited to be available on demand. The Contractor shall maintain safe access to adjacent property and buildings. The Contractor shall provide experienced crews to perform filling operation to monitor density of mix flowable fill and to control pressure. The extent of works shall include but not limited to furnishing, installing and maintaining temporary traffic control devices, barriers, barricades, cones, drums, warning signs, fencing and lights for the protection of vehicular and pedestrian traffic. After the termination of the contract, the mobile equipment or machineries shall remain the property of the Contractor. All the works shall be approved by the Engineer, EPA and Ministry of Interior (Traffic Department).

4. The Contractor shall require a second stage pressure grouting (Back grouting) to ensure that voids have been filled. Back grouting will be required at critical locations only (roadways, adjacent to structures and buildings, sidewalks, passageways, etc.) to ensure that mix flowable fill materials placements are completed full. All the works shall be approved by the Engineer and EPA.

5. The extent of works shall include but not limited to cut pressure pipeline into different segments (sections) and cut open heads surfaces areas suitable to install temporarily pipes for the injection points to pump mix flowable fill materials with sufficient pressure and suitable to install temporarily vent pipes (discharge pipes) to ensure that mix flowable fill materials are completely emerges from vent pipes (discharge pipes) with no voids remain unfilled.

6. The extent of works shall include but not limited to clean, flush, remove, cart away, transport to any distance locations areas and dispose off site wastewater, debris and other substances completely that degrade the performance of fill and accumulated in the underground pressure pipelines in accordance to the regulations of the authorities and municipality **prior to start grout filling placements**.

7. The extent of works shall include but not limited to provide, transport and commission jet flushers tankers (if necessary) and provide mud suckers tankers to remove wastewater, debris and other substances, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner. The quantities of machineries (trips) are not limited to be available on demand and shall include but not limited to tractors, tippers, Lorries, mud suckers, tankers flushers, cranes, tools, equipment, etc. to execute the works completely. After the termination of the contract, the mobile equipment or machineries shall remain the property of the Contractor. All the works shall be approved by the Engineer, EPA and Ministry of Interior (Traffic Department).

8. The extent of works shall include but not limited to trench excavation, groundwater pressure investigation, backfill excavated area after treatment of polluted soil, landscaping, grading soil (compacting 95% MDD) and to be reinstated and restored the site to a condition match its surroundings and all required mechanical, electrical and civil works as approved by the Engineer and EPA.

9. The extent of works shall include but not limited to provide, install and commission suitable plug or cap pipelines ends surfaces completely connecting to the inlets and outlets of pressure pipelines (ends) and hatch boxes either by filling pipelines ends surfaces with dry pack grout mixture or install manufactured cap to form water tight seal.

10. The extent of works shall include but not limited to dismantle, cut, remove and abandonment pressure pipelines installed in galleries under express rings roads including bends, fittings, junctions, joints, jointing parts, supports, anchors and other related connections to be carted away to a tippers off the site as approved by the Engineer and EPA.

11. The extent of works shall include but not limited to provide, install and maintain all temporary staging, scaffolding, rigging, shuttering to carry out the works in order to prevent subsidence of the foundations of other structures without any hazard to persons or existing services and carried out with all necessary precaution needed.

12. The Contractor shall be deemed to have carried out his own investigations to ascertain himself the nature of the soil conditions and the groundwater level. The Contractor shall provide, install and operate pumps, plugs, conduits, dewatering system and all other required machineries and equipments with all hoses, connections, mechanical and electrical installations.

13. Demolish unlimited depths of all hatch boxes among underground pressure pipelines completely, dismantle mechanical equipment and other related connections, break concrete structure, dewater, cut pipes, remove, abandonment and cart away to a tippers off the site.

    a. The extent of works shall include but not limited to breaking concrete reinforcement structures (walls, slabs, cover slabs and foundations), puncturing the base slab and surrounding walls including excavating depth of 2.5 meters beyond the horizontal limits of the foundations, slabs and walls of hatch boxes. The reinforced concrete cover slabs shall be carefully broken to maintain metals covers and frames.

    b. The extent of work shall include but not limited to dismantle, remove, abandonment and cart away to a tippers off the site other related parts and connections shall include but not limited to all existing step irons, ladders, fences, concrete passing slabs, covers, air release valves, chambers, valves chambers, drainage valves, by-pass pipelines, frames, and all other related parts. Frames and metals covers shall be cleaned and sand blast to remove any corrosion product, paint with two coats of coal tar paints and deliver to MPW stores off site.

    c. The extent of works shall include but not limited to provide, install and commission suitable plug or cap and sealing pipes ends surfaces completely connecting to the hatch boxes either by filling pipe ends surfaces with dry pack grout mixture or installing manufactured cap to form water tight seal.

    d. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill excess unlimited depth areas after demolishing hatch boxes as approved by the EPA and the Engineer, landscaping, grading soil (compacting 95% MDD) and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

    e. The extent of works shall include but not limited to collect, remove, cart away off the site, transport and dispose all existing extraneous materials and shall include but not limited to debris, metals, pipes, non usable parts, etc. after completion of the works to dumping area outside the site in accordance to the regulations of the authorities and municipality.

    f. The extent of works shall include but not limited to provide, install and operate pumps, plugs, conduits, dewatering system and all other required machineries and equipments with all hoses, connections, mechanical and electrical installations.

    g. The extent of works shall include but not limited to provide, erect and maintain all temporary staging, scaffolding, rigging, shuttering to carry out the works in order to prevent subsidence of the foundations of other structures without any hazard to persons or existing services

Clause 2: Grout filling unlimited depths and full volumes of underground gravity pipelines completely including demolish, dewater, dismantle, break, remove, abandonment and earth fill of manholes completely with other related works:

The price fixed for this item is lump sum and shall include all personnel engineers, supervisors, drivers, manpower and labors, machineries, equipments, pumps, materials, supplies, consumables, transportation, tools or implements, temporary accommodations and furnishings, and generally for all means used for the fulfillment of the contract requirements which he undertakes to provide on site to carry out the works completely within the contract period. The Contractor shall minimize nuisances and work in a safe manner but not limited to all the following works and subject to Engineer approval:

i) <u>General:</u>

1. The Contractor shall submit the method of grout filling unlimited depths and full volumes of the underground gravity pipelines completely start from the inlets gravity pipelines (ends) to the nearest manhole, then pump mix flowable fill materials from manhole to manhole continuously to the outlets gravity pipelines (ends) of different gravity pipelines lengths (m), diameters (mm) and materials (type of pipes) until the volumes of the underground gravity pipelines are completely full within one (1) month starting from the Date of Enterprise for approval by EPA (Environment Public Authority) regulations, MPW and other governmental authorities and shall include but not limited to plan activities, techniques of the injection points until the mix flowable fill materials emerges from vent pipes (discharge pipes) to ensure no voids remain unfilled, compressive strength test report, mix flowable fill materials with admixtures, grout fill equipment and pumps, preparation works to clean pipelines and remove wastewater or any other blockages, operational procedures, groundwater investigations, proposed of grouting sequence, grout pressure flow, grout plug or cap and sealing pipe sides ends connecting to the inlet and outlet gravity pipelines (ends) and manholes pipes ends and other related works. The extent of works shall include but not limited to demolish, dewater, dismantle, break, remove, abandonment and earth fill of manholes completely with other related works.

2. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations and other governmental authorities for the safety of manpower and site work within one (1) month starting from the Date of Enterprise.

3. The Contractor is obligated to visit the locations of the gravity pipelines during the period of tendering to determine by himself the actual conditions of the site and all the components of works.

4. The Contractor shall require working concurrently in different locations to finish the contract requirements on time.

5. The Contract shall submit request of inspection of all required works as approved by the EPA and the Engineer.

6. The Contractor shall provide all necessary safety personnel materials and equipments, lightings, safety precaution against fire, fencing, safety signs and temporary power supply for proper completion of the work.

7. The Contractor shall be responsible for maintenance and rectification of all damaged utilities and other services affected during the works at no extra cost.

8. The Contractor shall be responsible to provide adequate mobile diesel generators to be available on demand for electricity loading required to execute the works without any interruption for the works.

9. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

ii) <u>Description of the works:</u>

The Contractor is obligated to grout filling unlimited depths and full volumes of the underground gravity pipelines completely within three (3) years starting from the Date of Enterprise from the inlets of gravity pipelines (ends) to the outlets of gravity pipelines (ends) until the volumes of the underground gravity pipelines are completely full with mix flowable fill materials with no voids remain unfilled.

The extent of works shall include but not limited to demolish, dismantle, dewater, break, remove, abandonment, cart away to a tippers off the site unlimited depths of manholes completely, earth filling excess areas with new imported borrow soil as approved by the EPA and the Engineer, landscaping, grading soil (compacting 95% MDD) and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

The Contractor shall be deemed to be fully conversant with the prevailing conditions (above ground and below ground) and the nature and complexity of the work to be undertaken. The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

1. Grout filling unlimited depths and full volumes of the following underground gravity pipelines completely start from the inlets gravity pipelines (ends) to the outlets gravity pipelines (ends) of minimum lengths (m) until the volumes of the underground gravity pipelines are completely full with no voids remain unfilled. All the works shall be approved by the Engineer and EPA.

Type of pipeline (material)	Diameter of pipeline (mm)	No. of pipeline	Length of pipeline (m)	Outlet of pipeline	Inlet of Pipeline	Item
Asbestos	1600	1	3100	A15	TC	1
Asbestos	450	1	3240	A2	S11/S12	2
Asbestos	700	1	2400	A2	S13	3
Asbestos	600	1	2200	A1	S15	4

Note:

- Item 1 means:

Grout filling unlimited depth and full volume of underground gravity pipeline completely (Length 3100 m, Diameter 1600 mm, Asbestos) start from the inlet of gravity pipeline (end) connected to Transition Chamber (TC) to the outlet of gravity pipeline (end) connected to main pumping station (A15) until the volume of the underground gravity pipeline is completely full with mix flowable fill materials with no voids remain unfilled.

- Item 2 means:

Grout filling unlimited depth and full volume of underground gravity pipeline completely (Length 3240 m, Diameter 450 mm, Asbestos) start from the inlet of gravity pipeline (end) connected to secondary lifting stations (S11/S12) to the outlet of gravity pipeline (end) connected to main pumping station (A2) until the volume of the underground gravity pipeline is completely full with mix flowable fill materials with no voids remain unfilled.

- Item 3 means:

Grout filling unlimited depth and full volume of underground gravity pipeline completely (Length 2400 m, Diameter 700 mm, Asbestos) start from the inlet of gravity pipeline (end) connected to secondary lifting station (S13) to the outlet of gravity pipeline (end) connected to main pumping station (A2) until the volume of the underground gravity pipeline is completely full with mix flowable fill materials with no voids remain unfilled.

- Item 4 means:

Grout filling unlimited depth and full volume of underground gravity pipeline completely (Length 2200 m, Diameter 600 mm, Asbestos) start from the inlet of gravity pipeline (end) connected to secondary lifting station (S15) to the outlet of gravity pipeline (end) connected to main pumping station (A1) until the volume of the underground gravity pipeline is completely full with mix flowable fill materials with no voids remain unfilled.

2. Provide, grout fill, test and commission mix flowable fill materials (long term hardened strength materials) consist of fluid mixture of 1:10 cement sand and shall include but not limited to aggregates, fly ashes, potable water, additives and admixtures as necessary required to control of pumping mix flowable fill properly and self leveling placements without shrinkage until the volume of the underground gravity pipelines is completely full. The extent of works shall include but not limited to video with closed circuit television to ensure no voids remain unfilled. The Contractor shall submit a certificate of mix flowable fill materials for approval by the Engineer and EPA.

3. Provide, install, transport and commission grouting equipments and pumps of mix flowable fill to the site in ready unlimited quantities of mix trucks to pump mix flowable fill continuously with sufficient pressure to overcome friction and prevent nesting and void formation. The Contractor shall follow procedures with sufficient safety precautions and care to avoid damage to existing underground utilities structures. The quantities of machineries (trips) are not limited to be available on demand. The Contractor shall maintain safe access to adjacent property and buildings. The Contractor shall provide experienced crews to perform filling operation to monitor density of mix flowable fill and to control pressure. The extent of works shall include but not limited to furnishing, installing and maintaining temporary traffic control devices, barriers, barricades, cones, drums, warning signs, fencing and lights maintenance for the protection of vehicular and pedestrian traffic. After the termination of the contract, the mobile equipment or machineries shall remain the property of the Contractor. All the works shall be approved by the Engineer, EPA and Ministry of Interior (Traffic Department).

4. The Contractor shall require a second stage pressure grouting (Backgrouting) to ensure that voids have been filled. Backgrouting will be required at critical locations only (roadways, adjacent to structures and buildings, sidewalks, passageways, etc.) to ensure that flowable fill materials placements are completed. The extent of works shall include but not limited to video with closed circuit television to ensure no voids remain unfilled. All the works shall be approved by the Engineer and EPA.

5. The extent of works shall include but not limited to clean, flush, remove, cart away, transport to any distance locations areas and dispose off site wastewater, debris and other substances that degrade the performance of fill and accumulated in the underground gravity pipelines completely in accordance to the regulations of the authorities and municipality **prior to start grout filling placements**.

6. The extent of works shall include but not limited to provide, transport and commission jet flushers tankers (if necessary) and provide mud suckers tankers to remove wastewater, debris and other substances, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner. The quantities of machineries (trips) are not limited to be available on demand and shall include but not limited to tractors, tippers, Lorries, mud suckers, tankers flushers, cranes, tools, equipment, etc. to execute the works completely. After the termination of the contract, the mobile equipment or machineries shall remain the property of the Contractor. All the works shall be approved by the Engineer, EPA and Ministry of Interior (Traffic Department).

7. The extent of works shall include but not limited to provide, install and commission suitable plug or cap and sealing pipe ends surfaces completely connecting to the inlet and outlet gravity pipelines (ends) and manholes either by filling pipe ends surfaces with dry pack grout mixture or installing manufactured cap to form water

tight seal. The extent of works shall include but not limited to plug other open surfaces areas with dry pack grout mixture to form water tight seal.

8. Demolish unlimited depths of all manholes among underground gravity pipelines completely, dewater, break concrete structure, remove, abandonment and cart away to tippers off the site.

    a. The extent of works shall include but not limited to breaking concrete reinforcement structures (walls, slabs, cover slabs and foundations), puncturing the base slab and surrounding walls including excavating depth of 2.5 meters beyond the horizontal limits of the foundations, slabs and walls of manholes. The reinforced concrete cover slabs shall be carefully broken to maintain metals covers and frames.

    b. The extent of work shall include but not limited to dismantle, remove, abandonment and cart away to a tippers off the site other related parts and connections shall include but not limited to all existing step irons, ladders, fences, concrete passing slabs, covers, frames and all other related parts. Frames and metals covers shall be cleaned and sand blast to remove any corrosion product, paint with two coats of coal tar paints and deliver to MPW stores off site.

    c. The extent of works shall include but not limited to provide, install and commission suitable plug or cap and sealing pipes ends surfaces completely connecting to the manholes either by filling pipe ends surfaces with dry pack grout mixture or installing manufactured cap to form water tight seal.

    d. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill excess unlimited depth areas after demolishing manholes as approved by the EPA and the Engineer, landscaping, grading soil (compacting 95% MDD) and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

    e. The extent of works shall include but not limited to clean, remove, cart away off the site, transport and dispose all existing extraneous materials shall include but not limited to debris, metals, pipes, non usable parts, etc. completely to dumping area outside the site to any unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

    f. The extent of works shall include but not limited to provide, install and operate pumps, plugs, conduits, dewatering system and all other required machineries and equipments with all hoses, connections, mechanical and electrical installations.

    g. The extent of works shall include but not limited to provide, erect and maintain all temporary staging, scaffolding, rigging, shuttering to carry out the works in order to prevent subsidence of the foundations of other structures without any hazard to persons or existing services and carried out with all necessary precaution needed.

Index
Document 2- III
Part B - Particular Requirements

Section C: <u>Renovation works at Ardiya Sewage plant</u>

Clause 1: Renovation works at Ardiya Sewage plant:

A. Renovation works of new double layers asphalt roadways and storm water drainage system of zones areas (1 & 2) and other related works.

B. Renovation works of street lightings poles, outdoor lightings poles of zones areas (1 & 2) and other related works.

C. Renovation works of chain link boundary fence within the perimeter (800 m + 440 m + 800 m + 440 m) with Barbed Wires completely, height (2 m) and other related works.

D. Renovation works of MPW Quality control center (AB 1044) and other related works.

E. Renovation works of the main Guard House (AB 1041) and other related works.

F. Renovation works of MPW Switchgear room of substation S/S.1 (SU 0241) and other related works.

G. Renovation, Rehabilitation and Modification of Effluent Transfer Pumping Station (PS 0633) and other related works.

H. Renovation works of MPW Switchgear room of substation S/S.6 (SU 0641) and other related works.

I. Renovation works of Mosque Building and other related works.

J. Provision of new Management System and other related accessories.

K. Renovation works of Laboratory partitions rooms furniture, equipments and devices, reagents and solutions, miscellaneous, glasses and plastic wares, chemical supplies and other related accessories.

Clause 1: Renovation works at Ardiya Sewage plant

The price fixed for this item is lump sum and shall include all personnel engineers, supervisors, drivers, manpower and labors, machineries, equipments, pumps, materials, supplies, consumables, transportation, tools or implements, temporary accommodations and furnishings, and generally for all means used for the fulfillment of the contract requirements which he undertakes to provide on site to carry out the works completely within the contract period. The Contractor shall minimize nuisances and work in a safe manner but not limited to all the following works and subject to Engineer approval:

i) General:

1. The Contractor shall execute all the works as specified in the contract requirements in conformance with the Sanitary Engineering General Specifications (2002), General Specifications for Buildings and Engineering Works (1990), Roads administration, General specifications for Kuwait Motorway (2004) and other latest editions of the codes, ordinances, rules and regulations of Ministry of Public Works, EPA (Environment Public Authority) regulations and other Governmental authorities.

2. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations, MPW and other governmental authorities to execute renovation works at Ardiya sewage plant within two (2) weeks from the Date of Enterprise.

3. The Contractor shall submit the methods and procedures for approval by EPA (Environment Public Authority) regulations and other governmental authorities for the safety of manpower and fire precaution on sites within two (2) weeks from the Date of Enterprise.

4. The Contract shall submit request of inspection of all required activities works in according to contract requirements for approval by the EPA and the Engineer.

5. The Contractor shall be responsible for maintenance and rectification of all damaged utilities and other services affected during the works at no extra cost.

6. The Contractor shall require work concurrently in different locations to execute all contract requirements on time.

7. Renovation works of zone area (1) shall be isolated from zone area (2) such as asphalt roadways, street lightings poles and other works as specified in the contract **except** sanitary sewerage system, storm water drainage system, irrigation network system, services, utilities and other works as specified in the contract. The remaining boundary area of the perimeter fence (800 m + 440 m + 800 m + 440 m) shall be landscaped, graded (compacted 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

8. The Contractor shall consider all information of appendices as a part of contract requirements. However, these appendices are considered as guidance only and do not covers all requirement of the works. it is the Contractor responsibility to visit all the sites and conduct full survey during the period of tendering to determine all the components of works calls by the contract and as directed by the Engineer.

The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

9. The Contract shall submit request of inspection of all required activities works in according to contract requirements for approval by the EPA and the Engineer.

10. The Contractor shall provide all necessary safety personnel materials and equipments, lightings, safety precaution against fire, fencing, signs for proper completion of the work.

11. The Contractor shall co-operate, co-ordinate and not interfere his operations with all other parties or Contractor's executing works on sites / or adjacent to his sites.

12. The Contractor shall be responsible to provide adequate mobile diesel generators to be available on demand for electricity loading required to execute the works without any interruption for the works.

13. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

ii) <u>Description of Works:</u>

A. Renovation works of new double layers asphalt roadways and storm water drainage system of zones areas (1 & 2) and other related works:

1. The Contractor shall design, renovate, provide, erect, test, commission and maintenance of new main double layers asphalt roadways, new internal strip double layers asphalt roadways of zones areas (1 & 2) and parking areas within two (2) years starting from the Date of Enterprise as approved by the Engineer. The new asphalt roadways shall withstand loading stresses of heavy duty vehicles and shall allow passing at least two (2) separate paths ways forward and backward directions where double traffic lanes pathways of main roadways shall be painted clearly with traffic dash painting lines and separated with traffic solid painting line. The works shall be executed in conformance with the requirements of the latest editions of the codes and regulations of "Roads administration, General specifications for Kuwait Motorway".

2. The extent of works shall include but not limited to design, renovate, provide, erect, install, test, commission and maintenance color painting precast curbstones, site paving, concrete tiles, interlocking of different colors bricks, street furniture, foot pathways for pedestrians and colour decorative tiles along both sides of main double layers asphalt roadways and internal strip double layers asphalt roadways of zones areas (1 & 2) and parking areas as approved by the Engineer.

3. The extent of works shall design, renovate, provide, irrigate, plant, landscape, commission and maintenance new lawn (grass) areas, grown shrubs as minimum (100 Nos.), grown color yearly season flowers of zones areas (1 & 2) and parking areas as approved by the Engineer. The extent of works shall include but not limited to:

a. Grown shrubs along both sides of new main roadways and internal roadways, site parking area and buildings as directed by the Engineer.

b. Grown vines and ground covers along both sides of new main roadways and internal roadways, site parking area and buildings as directed by the Engineer.

c. Grown color yearly season flowers along both sides of new main roadways and internal roadways, site parking area and buildings as directed by the Engineer.

4. The Contractor shall dismantle existing storm water drainage system of zones areas (1 & 2), dewater, cut pipes, break concrete structure, remove, abandonment and cart away to a tippers off site.

5. The Contactor shall design, renovate, provide, erect, install, test, commission and maintenance new storm water drainage system of zone areas (1 & 2) along new main roadways and internal strip double layers asphalt roadways and parking shelters within two (2) years starting from the Date of Enterprise and shall be connected to the main storm water drainage system within the boundary perimeter new fence (area: 800 m long x 440 m width) on site as approved by the Engineer. The extent of work shall include but not limited to trench excavation, gravity pipelines and fittings, coating pipes, suitable bedding arrangement is essential to ensure stability of pipelines for the entire life span and under varying conditions underground and above the ground fittings, Laying and jointing of pipes, pipes alignment and lining, concrete manholes and chambers, cast iron manholes covers and gratings.

6. The extent of works shall include but not limited to provide, plant, commission and maintenance of unlimited excess underground depth area of planting soil mix within the boundary area of new fence (area: 800 m long x 440 m width) as approved by the Engineer.

7. The extent of works shall include but not limited to renovate, provide, erect, install, commission and maintenance along both sides of new double layers main roadways and internal strip double layers asphalt roadways with different new street signals and signboards (e.g. arrows, direction to reach all facilities, road markings and signs, safety signals, signboard for each facilities names, etc.

8. The extent of works shall include but not limited to trench excavation, termite control, groundwater pressure investigation, soil rehabilitation and treatment of polluted soil on site, backfill excavated area after treatment of polluted soil, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

9. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill unlimited depth of excess areas as approved by the EPA and the Engineer, landscaping, grading (compacting 95% MDD) soil to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

10. The Contractor shall be deemed to have carried out his own investigations to ascertain himself the nature of the soil conditions and the groundwater level. The Contractor shall provide, install and operate pumps, plugs, conduits, dewatering

system and all other required machineries and equipments with all hoses, connections, mechanical and electrical installations.

11. The Contractor shall provide, erect and maintain all temporary staging, scaffolding, rigging, shuttering, over pumping and flow diversions to carry out the works close to existing structures in order to prevent subsidence of the foundations of other structures without any hazard to persons or existing services and carried out with all necessary precaution needed.

12. All works, materials and specifications shall be subject to the Engineer approval. The Contractor shall be responsible for obtaining MPW approval to such design prior to the start the execution of the works.

B. Renovation works of street lightings poles, outdoor lightings poles of zones areas (1 & 2) and other related works:

1. The Contractor shall design, renovate, provide, install, erect, test, commission, operation and maintenance new street lightings poles as minimum (15 Nos.) to be mounted along new main double layers asphalt roadways of zone area (1) and parking areas and shall include but not limited to main front entrance gate, guard house, mosque, MPW Quality Control Center, substations No. 1 (SU 0241) and wastewater pumping station (PS 0931) within two (2) years starting from the Date of Enterprise in accordance with MEW standard specifications for street and external lightings.

2. The Contractor shall design, renovate, provide, install, erect, test, commission, operation and maintenance new street lightings poles as minimum (15 Nos.) to be mounted along new main double layers asphalt roadways of zone area (2) and parking areas and shall include but not limited to back entrance gate, substation No. 6 (SU 0641), second stage contact tank (Module 06: CT 0612) or header tank, inlet and outlet channels of header tank, by-pass channel to sea which is connected to outlet channel of header tank, effluent transfer pumping station (Module 06: PS 0633) or new pumping station, surge vessels tanks (Module 06: VS 0661): 4 Nos. within two (2) years starting from the Date of Enterprise in accordance with MEW standard specifications for street and external lightings.

3. The Contractor shall acquaint himself with the latest issue of the rules and regulations of Electrical installation work of the Ministry of Electricity and water (MEW) in Kuwait. It is the Contractor responsibility to obtain the latest copies of these regulations at his own expense and there will be no consideration for any such unawareness of these requirements.

4. The extent of works shall include but not limited to design, provide, renovate, install, erect, test, commission, operation and maintenance as minimum (15 Nos.) new outdoor type bollard poles with 70 watts MLL lamps for landscape and beautification areas, parking areas around MPW Quality control centre and other restoration areas of zone area (1) as directed by the Engineer within two (2) years from the Date of Enterprise in accordance with MEW standard specifications for street and external lightings.

5. The system of road lighting shall be provided to illuminate all road ways and walkways with a lantern lighting fitting incorporated high pressure mercury vapor discharge lamps giving a design light output of 5000 to 6000 luminaries.

6. The extent of works shall include but not limited to renovate, provide, install, erect, test, commission, operation and maintenance, wherever required by the approved design, a new outdoor stand alone lighting distribution boards equipped with electric photo cell for auto operation of the system, for each domain as specified by the Engineer.

7. All works, materials and specifications shall be subject to the Engineer approval. The Contractor shall be responsible for obtaining MPW approval prior to the start the execution of the works and shall include but not limited to the following requirements:

a. All the fixtures used by the Contractor shall be of THORN make and the lighting poles shall be of a hot dip galvanized type.

b. Outdoor lightings system shall include all necessary cables, fittings, materials, chokes, capacitors, holders, wires, lamps, reflectors, bulbs, connectors and any other accessories required for the proper installation and operation of the system, replacement of all necessary spare parts during the contract period.

c. The lighting circuit shall be supplied and controlled from the L.T. Switchboard of S/S No. 1 (Module 0241) for zone area (1) and substation No. 6 (SU 0641) for zone area (2), bath network shall be monitored on the mimic panel of the control board of substations, which will indicate the proper operation and electrical faults of the lighting system.

d. The Contractor shall design and select the area of lighting zones where the estimated loads can be easily covered by the power supply available on the LT distribution board of substations. The Contractor shall submit his proposal of zone selection and calculations of the lighting loads estimated for zone, as required by the contract specification, to the Engineer for approval before conducting the work.

e. The extent of works shall include (but not limited to) all related civil and builder works of the concrete reinforcement for the foundation base of the outdoor street lightings tower and poles.

f. The Contractor shall be responsible for all related civil, mechanical, electrical and instrumental works required for the proper installation and operation.

C. Renovation works of chain link boundary fence within the perimeter (800 m + 440 m + 800 m + 440 m) with Barbed Wires completely, height (2 m) and other related works:

1. The Contractor shall renovate, provide, install, test, commission and maintenance new chain link boundary fence with barbed wires within the perimeter chain link fence (800 m + 440 m + 800 m + 440 m) completely, height (2 m) and shall include but not limited to concrete foundation (0.5 m) for the perimeter fence, columns rods to tighten the new chain link boundary fence and barbed wires within two (2) years starting from the Date of Enterprise.

   All works, materials and specifications shall be subject to the Engineer approval. The Contractor shall be responsible for obtaining MPW approval prior to the start the execution of the works.

2. The Contractor shall renovate, provide, install, test, commission, operate and maintenance two (2) new isolated separatesmotorized front entrances gates for the exit/entry vehicle entrance gate and new pedestrian entrance gate of zone area (1) with all required accessories within two (2) years starting from the Date of Enterprise. One gate width of at least 6.0 m for vehicular entrances and height of 2.5 m from finished grade with metal lockers. The other isolated separate gate shall be width of at least 2.0 m for pedestrian entrances and height of 2.5 m from finished grade with metal lockers. The operation of the gates shall be controlled from the guard house completely. The new main gates shall be motor operated gates which move on rail laid across the access operating to the entrance.

3. The Contractor shall renovate, provide, install, test, commission, operate and maintenance two (2) new isolated separatesmotorized back entrances gates for the exit/entry vehicle entrance gate and new pedestrian entrance gate of zone area (2) with all required accessories within two (2) years starting from the Date of Enterprise. One gate width of at least 6.0 m for vehicular entrances and height of 2.5 m from finished grade with metal lockers. The other isolated separate gate shall be width of at least 2.0 m for pedestrian entrances and height of 2.5 m from finished grade with metal lockers. The operation of the gates shall be controlled from the guard house completely. The new main gates shall be motor operated gates which move on rail laid across the access operating to the entrance.

4. The extent of works shall include but not limited to supply, install, test, commission and maintenance new emergency high loud ring bells, motor conveyor rods with lights to be controlled by safety officers at the guard house and new external lightings at least 500 W metal halide type fixtures (4 Nos.) for each front entrance gate and back entrance gate with all related wires and electric installations outside the guard house.

5. The extent of works shall include but not limited to the following requirements and subject for the Engineer approval:

    a) The frame, verticals and bracings shall be of mild steel hollow sections.
    b) Accessories and other components shall be hot dip galvanized.
    c) The finished fabricated product shall be painted using approved quality primer and enamel paint, black colour.
    d) Gates must be motorized remote controlled and horizontally sliding type:

        1. System shall be suitable to be operated under local power supply system 240/415V, 50Hz.
        2. The assembly shall consist of photo-electric cells and the pressure switches connected together in series with contacts normally closed for remote operation.
        3. Heavy gauge steel frame for pad mounting.
        4. All-weather hinged cover with provision for padlocking.
        5. Adjustable safety friction clutch.
        6. Adjustable limit switches, rotary type.
        7. Magnetic solenoid locking brake.
        8. Emergency disconnect for manual operation in case of power failure.
        9. Magnetic reversing starter (size "1" contactor type) with overload and under voltage protection.
        10. Factory pre-wired electrical system.
        11. Permanent lubricated heavy-duty bearings and heavy-duty roller chain.
        12. The motor shall be provided with removable hood.
        13. Operator shall be suitable to withstand the local weather conditions IP54.

14. Motor shall meet the international standards, IEC and shall be suitable for remote operation.

e) Electric gates operator to consist of the following:

1. Electric gates operator to be located as indicated. Operator to have parallel three-button illuminated control stations ("OPEN", "STOP" AND "CLOSE").

2. Provide electrical conduit, switches, wiring and connections as specified in the contract requirement.

f) Pedestrian gates shall be having manually operated.

1. The extent of works shall include but not limited to all related civil works for the concrete reinforcement of the foundation base for columns rods to tighten the chain link of the fence and barbed wires.

2. The Contractor shall provide all necessary materials and temporary power supply for proper completion of the work.

References:

A. ASTM/A 120 Pipe steel block and hot dipped zinc coated (galvanised) welded and seamless for ordinary use.
B. ASTM/A 126 Zinc (hot galvanized) coating on products fabricated from rolled pressed and forged steel shapes, plates, bars and strips.
C. ASTM/A 143 Safeguarding against embrittling of hot dip galvanized structural steel products and procedure for detecting embrittling.
D. ASTM/A 153 Zinc coating (hot dip) on iron and steel hardware.
E. ASTM/A 385 Providing high quality zinc coatings (hot dip) on assembled products.
F. ASTM/A 505 General requirements for steel sheet and strip.
G. ASTM/A 558 Welding electrodes.
H. ASTM/A 559 Welding electrodes.

Quality Assurance:

A. Manufacturer: Company specialized in commercial quality motorized gate with five years experience.
B. Installation: In accordance with manufacturer's installation procedure.
C. Work to be performed to comply with specifications and to the satisfaction of the Engineer.

Shop Drawings:

1. Submit shop drawings and product data, including plan layout, grid, spacing of components, accessories, fittings, hardware, anchorages, height elevations of the same and schedule of components.
2. Submit manufacturer's installation instructions.

D. Renovation works of MPW Quality control center (AB 1044) and other related works:

The Contractor shall renovate MPW Quality control center (Module 10: AB 1044) with all related accessories completely and shall include but not limited to offices partition rooms, telemetry partition room, laboratory partition rooms, kitchen, toilets and all other partition rooms within three (3) months starting from the Date of Enterprise and shall include the following requirements but not limited to all related mechanical, electrical, instrumental and civil works as approved by the Engineer:

1. <u>Telemetry system Partition Room:</u>

a. The Contractor shall reinstall, test, commission a Telemetry system in partition room of MPW Quality control center (Module 10: AB 1044) as specified in the contract requirements and shall include but not limited to all related mechanical, electrical, instrumentation and civil works for the operation of the telemetry system as directed by the Engineer.

b. The extent of works shall include but not limited to provide, install, test, commission and maintenance new lightings fixtures, A/C split unit (3.5 ton) with compressor, oil heater, office desk L-shape, swivel leather chairs with arms, wooden doors with lockers or aluminum doors with lockers, glazing windows with mesh screens frames and curtains, louvers, vents, electric installations and other accessories, new interior lightings fixtures, accessories and switching devices, power outlets, PVC false roof ceiling sheets in aluminum framing and sealed with silicon, gypsum board assemblies and all required civil, mechanical, electrical and instrumental works as approved by the Engineer. All works, specifications and materials shall be subject to the Engineer approval.

c. The Contractor shall co-operate and co-ordinate his operations with all other parties or Contractor's executing work on sites / or adjacent to his sites of work in order that the minimum interference inconvenience is caused to the public.

2. <u>New equipment, utilities and services</u>:

a. The Contractor shall dismantle, remove, abandonment of the existing pipelines, valves, fittings and other connections, cart away to a tippers off the site from the main water source point to MPW Quality control centre. The Contractor shall renovate, supply, erect, install, test, commission and maintenance new UPVC pipelines connected from the main water source point to MPW Quality control centre with all fittings and other related civil works. All works, specifications and materials shall be subject to the Engineer approval.

b. The Contractor shall dismantle, remove, abandonment of the existing water proofing insulation, cart away to a tippers off the site to any unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The Contractor shall renovate, supply, erect, install, test, commission and maintenance new water proofing roof insulation (75 mm thick) closed cell non absorbent rigid polystyrene insulation board. The insulation boards shall be placed immediately after the membrane has been laid. Flexible waterproofing membrane for roofing shall be bitumen based to accepted standards and approved by the Engineer. Surfaces to receive the membrane shall be smooth, dry and free from dust. Roof screed shall be laid to falls over the concrete roof slab and have a minimum

thickness of 35 mm. The screed shall be laid, compacted and shall be leveled and finished with steel trowel. Primer for concrete shall be suitable for use with the waterproofing membrane. All works, specifications and materials shall be subject to the Engineer approval.

c. The Contractor shall disconnect, remove, abandonment of the existing electrical power supply system installations and connections, cart away to a tippers off the site to any unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The Contractor shall renovate, supply, erect, install, test, commission and maintenance new combined electrical power supply system installations and connections for the renovation of MPW Quality control Center. The power supply and telephone network of the MPW Quality Control Center shall be taken from substation No. 1 (SU0241). The panel shall be housed in a separate room which shall house the telephone exchange, fire alarm, control panel and electrical power supply panel. All works, specifications and materials shall be subject to the Engineer approval.

d. The Contractor shall provide, install, test, commission, operation and maintenance of a new motor control center, enunciator panel, control relay panel, motor starters, distribution boards, other auxiliary equipment, electrical power cables, instrumentation control cables, earthling and bonding, batteries, battery charger, light fittings, supporting brackets and all other associated necessary components connection to existing substation No. 1 (SU0241) for the new loads. The extent of works shall include but not limited to:

    1. All equipment shall be connected to the new Motor Control Center with new cables, and configured on the control board.

    2. The Contractor shall provide, install, test, commission, operation and maintenance of a new motor control center, enunciator panel, control relay panel, motor starters, distribution boards, and other auxiliary equipment. The Contractor shall be responsible to house the new MCC in a separate room erected in the building. The newly room for the MCC shall be provided with air conditioner split type in sufficient nos. so that the temperature of the panel room shall be maintained to 20^{o}C at any given time.

    3. The Contractor shall be fully responsible for any civil works required for the panels foundation, seal all sleeves of the cables, wiring, cable trays, trunking, conduits and conduit boxes, cable trench and ducts shall be protected with waterproofing membrane. All works, specifications and materials shall be subject to the Engineer approval.

    4. The Contractor shall prepare on his own a safety place as spare parts store to keep, store the new spare parts and materials which required for maintenance works during the contract period.

    5. Any failure of equipment or a part of it shall be replaced with new tested without any extra cost to MPW.

    6. The Contractor shall be responsible for related civil, mechanical, electrical and instrumental works required for the proper installation and operation.

    7. Maintaining and rectification of all damaged utilities and other services affected during the works at no extra cost.

8. All works, specifications and materials shall be subject to the Engineer approval.

e. The Contractor shall disconnect, dismantle, remove, abandonment old HVAC package units with compressors and its related ducting system completely and split air conditioning units with compressors, cart away to a tippers off the site and delivered to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them. The Contractor shall renovate, supply, erect, install, test, commission and maintenance new HVAC system units not less than (2 Nos. x 25 tons) with two (2 Nos.) compressors for MPW Quality control center (Module 10: AB 1044) and its related ducting system completely. The HVAC package units shall have a cooling capacity not less than 1.5 times the existing systems. The Contractor shall renovate, supply, erect, install, test, commission and maintenance the ducting system according to the system capacity for the cooling and the ventilation requirements. The extent of work shall include but not limited to provide, install, test, commission and maintenance new split air conditioning units (3.5 tons) with compressors in each partition room. All works, specifications and materials shall be subject to the Engineer approval.

f. The Contractor shall disconnect, dismantle, remove all existing lighting system, cart away to a tippers off the site. The Contractor shall renovate, supply, erect, install, test, commission and maintenance new lighting system and shall include but not limited to the entire lighting fixtures, control networks, cables, motor control, etc. in each partition room. The lightings fixtures shall be 250 W pendent types - high bay type fixtures with HPMV lamps; all control devices like power outlets and switches, all wiring accessories, conducts, wires etc. The power supply cables shall be supplied and installed by the Contractor and shall be sufficient to operate an electrical load not less than 500 KW. All works, specifications and materials shall be subject to the Engineer approval.

g. The Contractor shall provide, install, test, commission and maintenance the following equipment but not limited to curtains, insect killer lights with twin tubes, oil heaters, new files metal cabinet (metal multi shelves and double glass rolling doors), new swivel leather chairs with arms and other required accessories for each partitions rooms. The extent of works shall include but not limited to provide, install, commission two (2) sets of first aid kit (large size) and two (2) sets of steel keys cabinets (large size) in the corridor. All office equipments specifications and furniture shall be subject to the Engineer approval.

h. The Contractor provide, install, test, commission and maintenance with sufficient smoke and heat detectors in each partition room as per the KFB approved procedures especially the laboratory partition rooms and shall be connected to FCAP and sufficient numbers of fire alarms (sound & light alarms), bells and shall be installed to alert the guard man and shift operator during any fire condition. All works, specifications and materials shall be subject to the Engineer approval.

i. The Contractor shall disconnect, remove and cart away existing fire extinguishers and provide, install, test, commission and maintenance new double fire extinguishers to be hanged on the wall. Out of the two extinguishers one shall be water type and one shall be CO_2 type and these shall be of Minimum of 10 Kg capacity. Better alternate shall be also provided as per

recommendation of KFB regulations and shall be refilled or inspected by KFB yearly. Also, the Contractor shall consider the approval according to KFB regulations. The Contractor shall provide, install, test, commission and maintenance new fire protection system, and cabinet, fire hoses, racks and nozzles, fire detection, alarm system and lightning protection according to KFB regulations. All works, specifications and materials shall be subject to the Engineer approval.

j. The Contractor shall disconnect, dismantle, remove the existing EPABX central telephone system completely and cart away to a tippers off the site and delivered to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them. The Contractor shall renovate, supply, erect, install, test, commission and maintenance one new EPABX central telephone system with capacity of handling at least 40 CO. lines and a provision of 200 extension-lines for the MPW Quality control center. The exchange shall be with all modern facilities of operation as specified in particular specifications. The Contractor shall renovate, supply, erect, install, test, commission and maintenance telephone device with multi memories and one extension line for the guard house (GH 1041), each partition room of MPW Quality control center (Module 10: AB 1044) including new telemetry partition room and laboratory partition rooms, substation (SU 0241), substation (SU 0641) and existing effluent transfer pumping station (PS 0633), as approved by the Engineer. The Contractor shall be responsible in laying cables for this purpose and the cables shall be with at least 100% additional capacity. All works, specifications and materials shall be subject to the Engineer approval.

k. The Contractor shall disconnect, dismantle, remove and cart away to a tippers off the site all kitchen equipment completely. The Contractor shall renovate, supply, erect, install, test, commission and maintenance new kitchen room with other services such as plumbing, fittings and electrical works as directed by the Engineer. The extent of works shall include provide, install, commission and maintenance for new kitchen (but not limited to) assemble new quality standard fabricate cabinets, doors and frames of high pressure decorative laminate finished 19 mm thick MDF board unit kitchen for the MPW building to be aligned and secured adjoining cabinet units and counter tops with the following components but not limited to top counter granite surface, drawers and shelves of 12 mm thick hardboard or plywood, 1200 mm wide stainless steel sink unit with integral embossed drain board, faucets separate hot and cold, exhaust fan, water cooler, boiler, refrigerator 15 feet, electrical gas oven with gas cylinder, water filters, calling bell system connected to each partition room, curtains and other related kitchen services such as plumbing, ceramic tiles, fittings and all civil, mechanical, electrical and safety works. The extent of work shall include but not limited to provide all other required glass wares, gas cylinder, kitchen supplies and consumables per month for the duration of the contract period as directed by the Engineer. All works, specifications and materials of new kitchen equipment subject to the Engineer approval. The color of ceramic tiles and type of materials shall be subject to the Engineer Approval.

l. The Contractor shall provide, install, test, commission and maintenance new external lightings at least 500 W metal halide type fixtures (8 Nos.) with all related wires and electric installations outside the MPW Quality control center. The Contractor shall replace the entire existing power outlet and control switches with new identical or equivalent type with the approval of the

Engineer. All works, specifications and materials shall be subject to the Engineer approval.

E. Renovation works of the main Guard House (AB 1041) and other related works:

1. The Contractor shall demolish, dismantle mechanical and electrical equipments, cut pipes, remove, abandonment and cart away to a tippers off the site existing guard house toilet fixtures, equipments, plumbing system, pipes, sanitary fixtures, lightings, kitchen fixtures, tiles, A/C units, doors, windows, water storage tank, equipment and other related parts as required by the Engineer. The extent of works shall include but not limited to all required civil, mechanical, electrical and instrumental works as approved by the Engineer.

2. The Contractor shall renovate, provide, erect, install, test, commission and maintenance main guard house (AB 1041) of zone area (1) within two (2) years starting from the Date of Enterprise and shall include but not limited to provide, install, test, commission and maintenance new lightings, wooden doors with lockers, aluminum doors with lockers, glazing windows with mesh screens frames and curtains, louvers, vents, ceramic tiles, electric installations and other accessories, new interior lightings fixtures, switching devices, power outlets for all indoor and outdoor lightings and all required civil, mechanical, electrical and instrumental works as approved by the Engineer.

3. The Contractor shall renovate, provide, install, test, commission and maintenance new plumbing system, pipes, plumping specialties, sanitary sewer system and manholes connected to the nearest new sewer manhole within two (2) years starting from the Date of Enterprise, and shall include but not limited to sanitary fixtures (bidet, urinals, water closet, sink with faucets hot and cold, shower with faucets hot and cold, boiler and exhaust fan) for toilet including chrome fittings and connections, ceramic tiles and other services. The Contractor shall provide all required consumables (detergents, soap, paper tissues, toilet tissue, big roll tissue papers, etc.) per month for the duration of the contract period. The color of ceramic tiles and type of materials shall be subject to the Engineer approval. All works, materials and specifications shall be subject to the Engineer approval.

4. The extent of works shall include but not limited to renovate, provide, install, test, commission and maintenance new lightings, wooden doors with lockers, aluminum doors with lockers, glazing windows with mesh screens frames, louvers, vents, electric installations and other accessories and all required civil, mechanical, electrical, instruments works. All works, materials and specifications shall be subject to the Engineer approval.

5. The extent of works shall include but not limited to civil maintenance works of the guard house which includes repair of walls, roof, slab and other concrete surface, treatment and repair of cracks and joints leakages, cure of damaged concrete surface, making good irregularities and defects including expansion and other joints, corrective measures to ensure water tightness, replacing defective joints and water-stops. All works, materials and specifications shall be subject to the Engineer approval.

6. The Contractor shall disconnect, dismantle and remove existing fresh water pipelines and fittings from the main water source point to new guard house and cart away off the site. The Contractor shall renovate, provide, install, commission

and maintenance new UPVC pipelines connected from the main water source point to new guard house including all fittings and other related accessories. All works, materials and specifications shall be subject to the Engineer approval.

7. The Contractor shall dismantle, remove and cart away kitchen facilities from guard house off the site and renovate, provide, install, test, commission and maintenance new kitchen for guard house with other services such as plumbing, fittings, kitchen equipment and electrical works. Also, the works shall include install and assemble new quality standard fabricate cabinets, doors and frames of high pressure decorative laminate finished 19 mm thick MDF board unit kitchen to be aligned and secured adjoining cabinet units and counter tops with the following components but not limited to top counter granite surface, drawers and shelves (12 mm thick hardboard or plywood), 1200 mm wide stainless steel sink unit with integral embossed drain board, faucets separate hot and cold, exhaust fan, water cooler, boiler, large size insect killer lights (twin tubes, 16watts, and 30 cm length with transformer housed in PVC enclosure), refrigerator 15 feet, electrical / gas oven with gas cylinder, laundry washer/dryer (capacity 5 kg) with other fittings and connections, water filters, oil heater, curtains and other related kitchen services such as plumbing, ceramic tiles, fittings and all civil, mechanical, electrical and safety works. All specifications of new kitchen equipment and materials subject to the Engineer approval.

8. The Contractor shall disconnect, dismantle, remove and cart away existing interior lightings off the site. The Contractor shall renovate, provide, install, test, commission and maintenance new interior lightings fixtures having a minimum illumination level of 500 Lux in all the areas, accessories and control switching devices inside the new guard house. The lighting fixtures shall be 4 x 20 W tube fixtures fluorescent luminaries with mirror optical reflectors and electronic power saving ballast. All accessories shall include power outlets all indoor and outdoor lighting, telephone extension points, etc... The layout type and the numbers of fixtures shall be approved by the Engineer. All works, materials and specifications shall be subject to the Engineer approval.

9. The Contractor shall renovate, provide, install, test, commission and maintenance new external lightings at least 400 W (4 Nos.) metal halide type fixtures with all related wires and electric installations outside the new guard house.

10. The Contractor shall renovate, provide, paint, test, commission and maintenance interior and exterior walls and roof with emulsion paint. Painting shall be carefully executed with clean brushes and in the best manner and applied strictly in accordance with the manufacture's instructions. All paints, stains, varnishes shall be well stirred before use and thinned only in accordance with manufacturer's recommendations. Painting of exterior walls shall not be carried out in wet, dusty or foggy weather. Painting interior walls and roofs shall not proceed in dusty conditions. The extent of works shall include but not limited to scraping and sand blasting to remove dust out of exterior walls prior to painting works. All works, materials and specifications shall be subject to the Engineer approval.

11. The Contractor shall renovate, provide, install, commission and maintenance new water proofing roof insulation (75 mm thick) closed cell non absorbent rigid polystyrene insulation board. The insulation boards shall be placed immediately after the membrane has been laid. Flexible waterproofing membrane for roofing shall be bitumen based to accepted standards and approved by the Engineer. Surfaces to receive the membrane shall be smooth, dry and free from dust. Roof screed shall be laid to falls over the concrete roof slab and have a minimum

thickness of 35 mm. The screed shall be laid, compacted and shall be leveled and finished with steel trowel. Primer for concrete shall be suitable for use with the waterproofing membrane. All works, materials and specifications shall be subject to the Engineer approval.

12. The Contractor shall renovate, provide, install, maintenance and commission with the following new equipments and furniture and shall include but not limited to gas/electric cooker with oven and gas cylinder to be filled continuously, office desk "L" shape, cabinet with triple drawers, telephone instrument with multi memories, connection and one extension line shall be provided from the new EPBAX, swivel leather chair with arms , single bed (length 2 m x width 1 m x thickness at least 15 cm with base), mattress, pillow and blanket, sofa bed three seats (size 140 x 200 cm with cover, closet double doors and shelves, laundry washer/dryer, vacuum cleaner and carpeting all interior rooms with other fittings and connections, coffee table, sofa two seats, interior lightings, large insect killer lights (twin tubes, 16watts, and 30 cm length with transformer housed in PVC enclosure), aluminum doors with lockers, glazing windows with mesh screens frames, louvers and vents, carpet, curtain and other required furniture as directed by the Engineer. All works, materials and specifications shall be subject to the Engineer approval.

13. The Contractor shall disconnect, remove, abandonment and cart away off site of the existing electrical power supply system, telephone network installations and connections. The Contractor shall renovate, supply, install, test, commission and maintenance new electrical power supply system installations and connections from the existing modified substation No.1 (SU 0241). The new main power panel shall be housed in a separate room which shall house the telephone exchange, fire alarm, control panel and electrical power supply panel. All works, materials and specifications shall be subject to the Engineer approval.

14. The Contractor shall be responsible for the renovation of the electrical power system, telephone network and electrical lighting system. The Contractor shall disconnect, dismantle, remove all existing lighting system, carting off the site and reinstalling the entire lighting fixtures, control networks, ventilation fans, motor control etc. and all the cables of all pump motors which are in operation. The lighting fixture shall be 250 W pendent types - high bay type fixtures with HPMV lamps; all control devices like power outlets and switches, all wiring accessories, conducts, wires etc. All exhaust fans of identical size shall be replaced. The power supply cables shall be supplied and installed by the Contractor and shall be sufficient to operate an electrical load not less than 40 KW.

15. The Contractor shall renovate, provide, install, test, commission, operation and maintenance of a new motor control center, enunciator panel, control relay panel, motor starters, distribution boards, other auxiliary equipment, electrical power cables, instrumentation control cables, earthling and bonding, batteries, battery charger, light fittings, supporting brackets and all other associated necessary components connection to substation No. 1 (SU 0241) for the new loads.

16. All equipment shall be connected to the new Motor Control Center with new cables, and configured on the control board.

17. The Contractor shall renovate, provide, erect, install, test, commission, operation and maintenance of a new house for the new MCC in a separate room. The room for the MCC shall be provided with air conditioner split type in sufficient nos., so that the temperature of the panel room shall be maintained to $20^{o}C$ at any given time.

18. The Contractor shall be fully responsible for any civil works required for the panels foundation, seal all sleeves of the cables, wiring, cable trays, trunking, conduits and conduit boxes, cable trench and ducts shall be protected with waterproofing membrane. All works, materials and specifications shall be subject to the Engineer approval.

19. The Contractor shall disconnect, dismantle, remove existing A/C unit and cart away off site. The Contractor shall renovate, rehabilitate, provide, install, test, commission and maintenance new split air conditioning unit (3.5 tons) with compressor (2 Nos.) for the guard house. The Contractor shall be responsible to rehabilitate and erect wall section area to close the existing opening window area.

20. The Contractor shall renovate, provide, install, test, commission and maintenance sufficient numbers of fire extinguishers as minimum (2 Nos.). Out of the two extinguishers one shall be water type and one shall be CO_2 type and these shall be of Minimum of 10 Kg capacity. Better alternate shall be also provided as per recommendation of KFB regulations and shall be refilled or inspected by KFB yearly. Also, the Contractor shall consider the approval according to KFB regulations. The Contractor shall renovate, provide, install, test, commission and maintenance new fire protection system, and cabinet, fire hoses, racks and nozzles, fire detection, alarm system and lightning protection according to KFB regulations. All works and materials shall be subject to the Engineer approval.

21. The Contractor renovate, provide, install, test, commission and maintenance with sufficient smoke and heat detectors as per the KFB approved procedures and shall be connected to FCAP with sufficient numbers of fire alarms bells and shall be installed to alert (sound and light alarm) the shift operator during any fire condition.

22. The Contractor shall be fully responsible not to allow any unauthorized persons or vehicle entering the site without prior permission from the Ministry. The Contractor shall be fully responsible to protect his staff from escaped wild animals especially dogs. The Contractor shall provide safety officer to be available in the plant for 24 hours for the duration of the contract period. The extent of work shall include but not limited to interior and exterior telephone line and other related works.

23. The extent of work shall include but not limited to all required civil, mechanical, electrical and instrumental works as approved by the Engineer.

F. Renovation works of MPW Switchgear room of substation S/S.1 (SU 241) and other related works:

1. The work assigned by this item shall be carried out with a full co-ordination and supervision of MEW. It is the Contractor responsibility to obtain MEW approval of his design criteria and installation ideas on the shop drawings prior to start of any Electrical Works, and for the connection of the Electrical supply (or part of it) to the work of MPW (if required).

2. Upon completion of the Electrical Work the Contractor shall be responsible for obtaining MEW approval for the whole installation or modification (or any part thereof) including supervision of MEW representative on the final testing and energizing the panels, and setting to work.

3. The Contractor shall acquaint himself with the latest issue of the rules and regulations of Electrical installation work of the Ministry of Electricity and water (MEW) in Kuwait. It is the Contractor responsibility to obtain the latest copies of these regulations at his own expense and there will be no consideration for any such unawareness of these requirements.

4. The Contractor shall check and allow in the Contract prices for obtaining any permits, licenses, or paying rents and fees for any authorities necessary for starting, carrying out, completing, setting to work and handing over in an operating and useable condition, all equipment and materials called for in the Contract documents.

5. The work shall include the supply, manufacture, installation, erection, delivery, storage, testing, setting to work, commissioning and handing over in perfect operating condition all materials and equipment called for in the Contract Documents as well as carefully removal of the old existing materials and equipment, packing, transporting them safely to MPW store.

6. A complete installation shall include any sundry items or components may be necessary or as specified by the Engineer. Such items, whether mentioned or not, shall be included at no extra cost to the contract sum.

7. No claims will be admitted if the Engineer specifies additional requirements or any modification to achieve the system to his satisfaction; such work will be executed and carried out through the same contract price without any additional cost to the ministry.

8. All builder's works, such as chasing of walls, grouting of bolts, foundation, trenches with Chaucer plate covers, building of cable manholes, earthling pits and fitting laying of ducts, ceiling of ducts, excavation of trenches backfilling and consolidation, carting away of surplus spoil, etc. shall be executed by the Contractor and the full and entire cost of all such builder's works and materials shall be included in the total bid amount.

1. <u>Renovation works</u>:

1. Disconnect, Dismantle, remove and abandonment of the existing equipment at the existing L.T. Switchboard at substation S/S. 1 (Module SU 0241), includes incoming feeders, main switchboard, distribution board, MCC, Control panel, batteries and battery charger, power and control cables, lighting fittings etc., and all other electrical equipment and transport all of them safely to the ministry store.

2. Renovate, supply, manufacture, delivery, installation, erection, testing and setting to work, commissioning within two (2) years starting from the Date of Enterprise and handling over in perfect operating condition, the following L.T. switchgears and equipment complete with all required cables, wires, fittings and accessories, including necessary civil and builder works:

    a. L.T. Incoming Feeder Panels.
    b. Main L.T. switchboard.
    c. Distribution boards.
    d. Control board with mimic panel.
    e. Motor Control Center (MCC).

f. EAD (Environmental Affair Department) Feeder panel.
g. Automatic Transfer Switch.
h. Batteries and battery charger.
i. Lighting system.
j. A/C Package unit.
k. Ventilation system.
l. Fire Alarm System.
m. Auxiliary panels and cable works.
n. Spare equipped panel.

3. The new L.T. Switchboard (S/S.1 Module SU 0241) shall provide electric power supply to the following facilities (but not limited). Other facilities may add to the actual connected load during the design period as directed by the Engineer:

   a. MPW Quality control center and shall include but not limited to offices partition rooms, telemetry partition room, laboratory partition rooms and other partition rooms.
   b. Guard house
   c. Mosque
   d. Landscaping
   e. Lighting and Power system (Zone area 1)
   f. EAD (Environmental Affair Department)
   g. Redundancy (100% additional spare capacity)

4. The nominal connected load to the new switchboard (S/S.1) may be estimated as shown in the following table, the Contractor shall calculate the actual connected loads required for his design report, and submit single line diagram to the Engineer for approval:

Load Description	Estimated Load (KW)	Running Load (KW)
MPW quality control center AB 1044 (office equipments, laboratory equipments and devices, SCADA / Telemetry master stations), Wastewater Pumping Station (PS 0931).etc.	500	450
Guard House (GH 1041)	40	40
Mosque (AB 1043)	60	60
Lighting & Power System (zone area 1)	150	150
EAD (Environmental Affair Department)	1000	750
Spare equipped panels	500	450

5. The rehabilitation and renovation work shall include provision of the latest version of mosaic enunciator panel, PLC based control panel, electrical power and control cables, instrumentation, earthling system, supporting brackets, cable trays, trenches, trunking and conduits, cable ladders and all other associated necessary components for the proper and modern electrical installation.

6. The work shall also include replacement of entire lighting system, wiring, lighting fixtures, ventilation system, power outlets and other related accessories.

7. The Contractor shall Supply, install, testing, commissioning and setting to work Emergency lighting independent units self contained battery of 4 hrs. Back up time for the following areas as specified in the contract documents:

    - 5 Units for substation S/S.1
    - 10 Units for MPW Quality Control Centre
    - 4 units for Laboratory
    - 2 units for Mosque
    - 3 Units for Scada Control room
    - 3 Units for Telemetry Master Station
    - 2 Units for Guard house
    - 6 Nos. weather proof units for the outdoor areas

8. Supply, install, testing and commissioning of new lighting & Power system for zone area (1) and facilities complete with the following equipment.

    - Lighting and Power distribution boards.
    - Explosion proof and weather proof lighting fittings,
    - Lighting Switches, sockets outlets, junction boxes and accessories.
    - Lighting and power cables, conduits fittings and accessories.
    - Earthling System.

9. Supply, install, connection and setting to work a new earthling system for all electrical equipments and switchboards, as per the latest regulation of MEW and requirement of the contract specifications.

10. The Contractor shall include but limited to the preparation of concrete surfaces repairs shall include (but not limited to) clean and dry from all contamination, surface laitance and other loose materials according to approved manufacture requirements either grit or water blasting technique to be dumped out of the station building. In addition, the old contaminated sealant of existing joints shall be thoroughly cleaned out from all traces of previous sealant and primer using a suitable mechanical method such as grit blasting, water blasting or grinding. The extent of work shall include but not limited to civil maintenance and repair works of wall and ceiling plastering, replacement of all doors and door frames, stairs, tiles, false ceiling, etc. as directed by the Engineer.

11. The Contractor shall paint internal wall and roof with emulsion paint for substation. Painting shall be carefully executed with clean brushes and in the best manner and applied strictly in accordance with the manufacture's instructions. All paints, stains, varnishes shall be well stirred before use and thinned only in accordance with manufacturer's recommendations. Painting of interior walls shall not be carried out in wet, dusty or foggy weather and interior walls and roofs shall not proceed in dusty conditions. The extent of work shall include maintenance and painting metal door for each substation and provide new lockers.

12. The Contractor shall provide, install, test, commission and maintenance new water proofing roof insulation (75 mm thick) closed cell non absorbent rigid polystyrene insulation board. The insulation boards shall be placed immediately after the membrane has been laid. Flexible waterproofing membrane for roofing

shall be bitumen based to accepted standards and approved by the Engineer. Surfaces to receive the membrane shall be smooth, dry and free from dust. Roof screed shall be laid to falls over the concrete roof slab and have a minimum thickness of 35 mm. The screed shall be laid, compacted and shall be leveled and finished with steel trowel. Primer for concrete shall be suitable for use with the waterproofing membrane.

13. The Contractor shall disconnect, dismantle, remove and cart away existing interior lightings off the site. The Contractor shall provide, install, test, commission and maintenance new interior lightings fixtures, accessories and switching devices, power outlets, indoor and outdoor lighting, telephone extension points, etc.

14. The Contractor shall provide, install, test, commission and maintenance new external lighting fitting (4 Nos.) 500 Watt each, halogen type fixtures with all related wires and accessories outside substation.

15. The Contractor shall provide, install, commission and maintenance a local telephone line and instrument connected to the new EPBAX which is installed in the MPW Quality Control Center, interior lightings, new A/C split unit. The extent of work shall include but not limited to replacing damaged aluminum doors with lockers, glazing windows with mesh screens frames, louvers and vents and other required works as directed by the Engineer.

16. The Contractor shall provide, install, test, commission fire extinguishers not less than (1 No.) as per recommendation of KFB regulations and shall be refilled or inspected by KFB yearly. The Contractor shall provide, install, test, commission and maintenance new fire protection system, and cabinet, fire hoses, racks and nozzles, fire detection, alarm system and lightning protection according to KFB regulations. All works and materials shall be subject to the Engineer approval.

17. The Contractor provide, install, test, commission and maintenance sufficient smoke and heat detectors in each room as per the KFB approved procedures and shall be connected to FCAP with sufficient numbers of fire alarms bells and shall be installed to alert (sound and light alarm) the shift operator during any fire condition. The fire alarm indication panel shall be installed at the guard house near the main entrance gate of Ardiya sewage plant to alert the guard man in case of any fire hazard.

18. The extent of works shall include but not limited to all related civil and builder works as may be required for proper completion of the above mentioned works.

2. <u>EAD (Environmental Affair Department):</u>

1. The Contractor shall be responsible of electrical renovation works required to provide a powerful and protected electrical supply to the EAD (Environmental Affair Department), located adjacent to Ardiya sewage plant within two (2) years starting from the Date of Enterprise.

2. The Contractor shall investigate and check thoroughly the actual loads at the EAD (Environmental Affair Department) buildings and facilities, and estimate the actual supply power required for each division and service of EAD, in order

to select the proper equipment and cables of the electrical panel at (S/S. 1 Module No. 02: SU 0241).

3. The Contractor shall coordinate with the EAD (Environmental Affair Department) authorities to evaluate the electrical power needs for the offices, laboratory equipment and facilities, and their future need, as may be required by the department manager, as well as the connection points and proper routes of the new cables.

4. The Contractor shall replace the old existing supply cables laid between the substation (SU 0241) and the main LT panel of EAD (Environmental Affair Department), by a new higher capacity cables, and repair (or replace) any damaged part or component of the existing LT panel before commissioning of the works.

G. Renovation, Rehabilitation and Modification works of Effluent Transfer Pumping Station (PS 0633) and other related works:

1. The Contractor shall be responsible to carry out the modification works required for the existing effluent water transfer pumping station (PS 0633) within two (2) years starting from the Date of Enterprise to reduce the number of the existing pumps to (3 Nos.) only and allow installation of additional equipment as a combined " New Pumping Station " includes the following :

   - Effluent water transfer pumps (3 Nos.).
   - New Rabya pumps (3 Nos.)
   - New landscaping irrigation Pumps (2 Nos.).
   - New Dewatering Pumps (2 Nos.).
   - New Electrical supply Panel and control room equipment.

2. Before the modification works above to be conducted, The Contractor shall disconnect, dismantle, remove, abandonment and cart away to a tippers off site effluent transfer pumps (3 Nos.) with discharge pipe and all related accessories completely to make an adequate area for the installation of the new above mentioned equipment.

3. The Remaining effluent Pumps (3 Nos.) with discharge pipe and all related accessories shall be completely overhauled within the entire renovation work of all mechanical and electrical equipment of the station as detailed later.

4. The extent of works shall include but not limited to study and investigate thoroughly surge vessels (VS 0661) in surge protection system and the Contractor shall be responsible to carry out the modification and renovation works required to disconnect, dismantle, remove, abandonment and cart away to a tippers off site surge vessels VS 0661 (4 Nos.) with all related accessories.

5. The Contractor shall demolish Rabya pumping station (PS 0632) and discharge pipelines completely, disconnect electrical supplies, dismantle electrical and mechanical equipments completely, break concrete structure, remove, cart away to a tippers off the site. The extent of works shall include but not limited to demolish, dismantle existing hatch box and unlimited distances (lengths) of all existing related underground pressure pipelines completely (open cut method) which is connected to the header tank within the boundary area of the fence,

dewater, cut pipes, remove, abandonment and cart away to a tippers off the site as approved by the Engineer.

6. The Contractor shall provide, erect and maintain all temporary staging, scaffolding, rigging, shuttering, over pumping and flow diversions to carry out the works close to existing structures in order to prevent subsidence of the foundations of other structures without any hazard to persons or existing services and carried out with all necessary precaution needed.

7. As the existing Irrigation pumping station serving the farms in Rabya will be cancelled and abandonment, the irrigation process will be transferred to another location inside the New Pumping Station at Ardiya sewage plant. However, Rabya pumping station (PS 0632) shall not be demolished until the commissioning of the new irrigation pumps at the New Pumping Station completed.

8. The Contractor shall be responsible for all related mechanical, electrical and civil works require to the Renovation, Rehabilitation and modification works for effluent transfer pumping station (Module 06: PS 0633).

9. The Contractor shall be responsible for the controlling not to interrupt the operation of the continuous flow of effluent tertiary treated wastewater to DMC (Date Monitoring Center) and to Rabya Farms.

10. All usable (salvage items) shall be delivered to MPW stores outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

11. All non salvage ferrous metals surfaces shall be delivered to MPW stores without packing, but shall be covered with large plastic sheets as approved by the Engineer.

12. The extent of works shall include but not limited to trench excavation, termite control, groundwater pressure investigation, soil rehabilitation and treatment of polluted soil on site, backfill excavated area after treatment of polluted soil, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA.

13. The extent of works shall include but not limited to provide, earth fill, test and commission new imported borrow soil to fill excess unlimited depth areas, landscaping, grading (compacting 95% MDD) soil and to be reinstated and restored the site to a condition match its surroundings and to the satisfaction of the Engineer and EPA. The Contractor shall submit a certificate approved by the EPA after treatment of polluted soil prior to backfill on site.

14. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

1. Modification of Effluent Transfer Pumping Station:

1. The Contractor shall study and investigate thoroughly the existing equipment and conditions of the effluent transfer pumping station including the following items.

    - Suction and discharge valves.
    - Non-return valves condition.
    - Foundation and supports.
    - Coupling present conditions.
    - Casings and impellers of the pumps.
    - Present flow rate.
    - Electrical motor starters and supply cables.
    - Grease pumps and pump motors.
    - All other related equipment and utilities.

2. The Contractor shall disconnect electrical supplies, dismantle electrical and mechanical equipments, cut pipes, remove, abandonment and cart way to a tippers off the site effluent transfer pumps (3 Nos.) completely with all fittings, suction and discharge pipes, valves, header pipe, supports, gauges and drain pipes, pump foundations, electrical panel, cables, and all other related accessories and utilities as approved by the Engineer.

3. Removed equipment and fittings shall be cleaned thoroughly and overhauled by the Contractor, packed and transported away to MPW store, or as directed by the Engineer.

4. The extent of works shall include but not limited to disconnect, dismantle, remove, abandonment and cart away to a tippers off site surge vessels VS 0661 (4 Nos.) completely with all fittings, discharge pipes, valves, gauges, foundations, electrical panel, cables and all other related accessories and utilities as approved by the Engineer.

5. The Contractor shall close the open end of the remaining part of header pipe and any other pipe works by a steel gasket flange of the correct size and material reasonable to withstand the maximum pressure of the effluent water.

6. The Contractor shall carry out complete overhauling and maintenance work for the remaining effluent transfer pumps (3 Nos.) and remaining surge vessels (4 Nos.) with all related pipe works, pipelines and fittings, valves, pressure gauges, motor, panel and other civil, mechanical and electrical (The capacity of pump is 835 liter/sec at 978 rpm and 600 liter/sec at 733 rpm).

7. The Contractor shall make good the space area leftover after equipment removal and prepare it for the installation of the new equipment and accessories, without any obstruction from the existing fittings and structures.

8. The Contractor shall renovate, supply, installation, setting to the work, testing and commissioning a new L.T switchboard, control board and MCC panels, complete with the necessary upgrading and modified ratings and capacities in order to provide the proper and accurate electrical power supply and control operation to the new equipment.

9. The rehabilitation and renovation work shall include provision of the latest version of mosaic enunciator panel, PLC based control panel, electrical power and control cables, instrumentation, earthling system, supporting brackets, and all other associated necessary components for the proper and modern electrical installation.

10. The Contractor shall be responsible for any modification or replacement of any part of the pumping station (whether specified above or not) related to this item and to allow such work in the total price of this item, no any additional cost or claims comes to the ground, shall be allowed by MPW.

11. The Contractor shall restrictedly follow the specifications and technical conditions of the supply and installation of L.T switchboard, MCCs and control panel Specified in Sanitary Engineering General Specifications (August 2002).

Submittals and Approval:

1. The Contractor shall submit to the Engineer for review and approval the following documents within 2 months from the date of Enterprise:

   A. Full study report on the modification and development of the effluent transfer pump station "as mentioned above, complete with the proper recommendation and equipment selection to achieve such work.

   B. Shop drawing, and technical data for the new Pumping Station shows the modification required and new arrangement of the equipment.

      - Product specifications and performance
      - Pump materials details
      - Motor housing materials, winding material, ambient temperature and maximum elevation in which motor is designed to operate continuously, insulation class, design, factor, bearing life and dynamic balance.
      - Dimension and weight.
      - Provision of mounting on the pump.
      - Pump – Motor construction details.
      - Starting methods.
      - Speed torque curve.

   C. Submittals shall also contain workshop drawing, documents, manufacturer specification of the new switchboard, MCC, control panel and distribution, cables and accessories, and all other electrical equipment will be installed through the work , including

      - Single line diagram showing loads and short circuit calculation
      - Schematic diagram showing electrical arrangement of the panels
      - Cable lay out
      - Component list.

   D. Working program for executing the work includes, delivery time, installation time, testing and commissioning, setting into the work.

2. The Engineer shall review and supply the above mentioned submittal and forward his approval or rejection within one month of the submittal date. In the case of submittal rejection or not approved due to missing items or incomplete data, or improper design. The Contractor shall correct and resubmit his study within one month of the Engineer's letter.

2. Installations of New Equipments:

The Contractor shall renovate, supply, erect, install, commission, operate and maintain the following equipments at the effluent transfer pumping station, with all required civil works, fittings and accessories, and as directed by the Engineer:

a. Rabya Pumps:

1. The Contractor shall design, renovate, supply, Install, test, commission, operation and maintenance new Irrigation centrifugal Pumps (3 Nos. 90 m^3/hr each.) to be mounted in the pump area adjacent to the existing remaining effluent pumps (3 Nos.) at the location of the of the abandonment effluent transfer pumps and supplied by the effluent water from the existing contact tank (header tank) complete with motor, pipe works, suction and discharge valves, non-return valves, valves actuators, pressure gauges, drains.….etc, and all other fitting and accessories. The new irrigation centrifugal pumps shall be connected the header tank (Module 06: CT0612) and the existing discharge pipelines within the boundary area of the fence as approved by the Engineer. The New Pumps shall be selected in a higher capacity rate than the existing pumps, adequate for a continuous operation with an aggressive effluent water supply.

2. The works shall include but not limited to provide, erect, test, commission and maintenance reinforced concrete foundation to withstand pump and replacement of all related necessary spare parts during the contract period.

3. The Contractor shall maintain the proper operation of the existing irrigation pumping station (Rabya Pumps), not to be demolished until the commissioning of the new irrigation pumps at the New Pumping Station completed.

4. The Contractor shall design, renovate, modify, provide, install, pipes laying, pipes alignment and lining, commission and maintenance unlimited lengths and unlimited depths of new double pressure pipelines (type of pipe DI or as approved by the Engineer, DN 300 mm) to be connected with the discharge pipes of new Irrigation centrifugal pumps, the header tank which received effluent treated wastewater and the existing discharge pipelines to Rabya farms within the boundary area of the fence as approved by the Engineer. The extent of works shall include but not limited to design, renovate, construct, test, commission and maintenance a new hatch box with frames and metals covers within the boundary area of the fence as approved by the Engineer for the connection between the new internal double pressure pipelines and the external asbestos pressure pipelines of Rabya DN 300 mm. The extent of works shall include but not limited to flow diversion, excavation, backfilling trenches, trench preparation, handling and laying out pipes, laying and jointing pipes, pipes alignment and lining, water stops, supply and used of specified couplings or collars, cutting, turning and chamfering, specials and fittings where required and for trimming pipes where built in, disposal of wastage incurred for any reason whatsoever, beds, haunches and surrounds, cleaning and testing of pipes and pipelines on site before, during and after pipes

laying, pre-commissioning CCTV inspection or joint testing and other related works as approved by the EPA and the Engineer. All pipelines materials and size diameters specifications shall be approved by the Engineer.

5. The Contractor shall design, renovate, supply, installation, setting to the work, testing and commissioning a new L.T switchboard, control board and MCC panels, complete with the necessary upgrading and modified ratings and capacities in order to provide the proper and accurate electrical power supply and control operation to the new equipment.

6. The Contractor shall be responsible for any modification or replacement of any part of the pumping station (whether specified above or not) related to this item and to allow such work in the total price of this item, no any additional cost or claims comes to the ground, shall be allowed by MPW.

Submittals and Approval:

The Contractor shall submit to the Engineer for review and approval the following documents within 2 months from the date of enterprise:

1. Full study report on the installation of the new Rabya pumps "as mentioned above, complete with the proper recommendation and equipment selection to achieve such work.

2. Shop drawing, factory test reports, manufacturer certified reports and technical data for the new pump-motor sets (3 Nos.) required in this item, includes the following.

    - Manufacturer Catalogs
    - Product specifications and performance
    - Pump materials details
    - Motor housing materials, winding material, ambient temperature and maximum elevation in which motor is designed to operate continuously, insulation class, design, factor, bearing life and dynamic balance.
    - Dimension and weight.
    - Provision of mounting on the pump.
    - Pump – Motor construction details.
    - Starting methods.
    - Speed torque curve.

3. Submittals shall also contain workshop drawing, documents, manufacturer specification of the new switchboard, MCC, control panel and distribution, cables and accessories, and all other electrical equipment will be installed through the work , including but not limited to

    - Single line diagram showing loads and short circuit calculation
    - Schematic diagram showing electrical arrangement of the panels
    - Cable layout
    - Component list.

b. Dewatering Pumps:

1. The Contractor shall disconnect electrical supplies, dismantle electrical and mechanical equipments, cut pipes, remove, abandonment and cart way to a tippers off the site dewatering pumps (2 Nos.) completely with all fittings, suction and discharge pipes, valves, header pipe, supports, gauges and drain pipes, pump foundations, electrical panel, cables, and all other related accessories and utilities as approved by the Engineer.

2. The Contractor shall renovate, supply, install, test, commission, operation and maintenance effluent water Submersible (Dewatering) pumps (2 Nos.), in the ground floor of the effluent transfer pumping station, to control the water leakage occurs from the main pump's packing as directed by the Engineer.

3. The dewatering pumps shall be installed in a concrete Chamber constructed in a lowest level than the ground floor of the pump room.

4. The dewatering pump chamber shall be constructed to include two submersible pumps connected in parallel through a common header pipe, discharge pipe, complete with suction, and discharge valves, concrete foundation, float switch, control switch, cable and wiring connection.

5. The discharge pipe shall be connected to the sewer network of the pumping station through a new pipe extended to the nearest manhole of the sewage network.

6. The Contractor shall submit a full report for his design of the work required, with the attached proposed drawing for the pump assembly and location selected to the engineer for approval, before conducting the work.

7. The Technical data for the dewatering pumps shall be :

Discharge Size	: 4 inches
Capacity	: 18 -30 L/S.
Head	: 12 - 10 m.
Impeller type	: Vortex
Pump materials	: impeller stainless steel 9.4460
Body	: mehenaite cast iron GG 25.
Shaft	: stainless steel 1.4021.07+05
Electrical motor	: 415 volt, 3 phases, 50 Hz, insulation class F. protection type IP 68

c. Landscaping Irrigation System:

1. The Contractor shall disconnect electrical supplies, dismantle and demolish the existing irrigation network system completely, including pumps, pipes, pipelines, fittings and other related accessories, remove, cart away to a tippers off the site.

2. The Contractor shall study, design, renovate, supply, install, test, commission, operation and maintenance new two (2) complete sets of booster pumps, vertical, multistage centrifugal pumps, UVPC piping system, suction and discharge gate valves for each pump, bypass relief valve and bronze water type self closing check valve at discharge of each pump, as well as pressure vessel suitable for minimum 1600 kpa (232 psi) working pressure with capacity suitable for limiting the number of pump starts to 15 times per hour.

3. The Contractor shall study, design, renovate, supply, install, test, commission, operation and maintenance new irrigation network system to irrigate existing and new landscaping of zones areas (1 & 2). The water source shall be effluent treated wastewater from the header tank at Ardiya sewage plant and shall be mixed with fertilizers.

4. The extent of works shall include but not limited to study, design, renovate, supply, install, test, commission, operation and maintenance new main irrigation pipeline and new irrigation network system to provide an adequate sufficient water supply to EAD (Environmental Affair Department) zone area within the perimeter fence of EAD located outside the boundary fence and adjacent to Ardiya sewage plant as approved by the Engineer. The water source shall be effluent treated wastewater from the header tank at Ardiya sewage plant and shall be mixed with fertilizers.

5. The extent of works shall include but not limited to provide, erect, test, commission and maintenance reinforced concrete foundation to withstand pump and replacement of all related necessary spare parts during the contract period.

7. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new automatic self cleaning screen filter of 200 mesh filtration fineness.

8. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new a pilot operated diaphragm type pressure reducing / sustaining valve at the discharge side of the screen filter.

9. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new drip system for the existing and new landscaping area of zones areas (1 & 2) and EAD zone area as approved by the Engineer.

10. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new sprinkler system to irrigate existing and new lawn (grass) zones areas (1 & 2) area and EAD zone area as directed by the Engineer.

11. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new quick coupling valves all over the area of manual watering.

12. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new flush valves in each zone as appropriate.

13. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new PVC pipes and fittings shall be manufactured from virgin polyvinyl chloride compound to ASTM D 1784 type 12454-B (PVC 1120) or equal approved.

14. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new pipe joints:

- UPVC –Socket type: solvent cemented joints.
- PE: plastic inserts (compression) type joint.
- Joint shall be rested for 1034 kpa (150 psi) working water pressure at ambient temperature.

15. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new valves shall be rated for 1379 kpa (200 psi) working pressure at ambient temperature:

    - Gate valves
    - Check valves
    - Globe valves
    - Drain valves
    - Ball valves
    - Flush valves
    - Combination pressure reducing and pressure sustaining valves

16. The extent of works shall include but not limited to design, renovate, supply, install, test, commission, operation and maintenance new remote control valves for spray/drip zones areas.

17. The extent of works shall include but not limited to design, renovate, provide, install, test, commission, operation and maintenance new polyphone tubes and micro tubes, nozzles, heads, sub-lateral irrigation lines, drip emitters with single and multi outlets, rotary impact sprinklers, quick couplers and vacuum breakers, reducers, T-connection pipe, union connection, elbow, solenoid valve, screen filter, valve boxes, pop up spray sprinklers, fertilizer injector, station controllers, Y-strainers, spare parts and other related spare parts and materials that kept the system in good condition for the duration of the contract period.

18. The extent of works shall include but not limited to provide, test, commission new lawn mower (1 No.) and shall remain the property of MPW.

d. <u>Surge Tank Compressors and Compressors motors</u>:

The Contractor shall study, design, renovate, provide, install, test, commission operation and maintenance of a new surge tank compressors (2 Nos.) and a new compressor motors (2 Nos.) of a minimum capacity of 50% higher than the existing equipment, as per the approved design of new irrigation system.

e. <u>Pressure Vessels</u>:

The Contractor shall study, design, renovate, supply, install, test, commission operation and maintenance new pressure vessel with carbon steel construction, suitable internal protective coating and pressure gauges. The minimum capacity shall be 4.0 m^3 with the operating range set at 50% of the vessel height.

f. <u>Flow Meters</u>:

1. The Contractor shall disconnect electrical supplies, dismantle electrical and mechanical equipments, cut pipes, remove, abandonment and cart way to a tippers off the site existing flow meters (Module 06: FC 0651) as approved by the Engineer.

2. The Contractor shall study, design, renovate, supply, install, test, calibrate, commission, operation and maintenance new complete five (5) sets of magnetic flow meters and measuring equipments complete with monitor and remote display units or any other type reasonable for such applications with all other related civil, mechanical and electrical installations and connections specifications and shall have a high accuracy, linear analog outputs insensitivity to specific gravity viscosity pressure and ability to measure a wide range of difficult to measure fluids (such as corrosive, slurries) which differentiates this type of metering system from all other flow meters. The field sensors shall be suitable to operate at temperature 60℃. The locations of the n ew flow meters shall measure the inlets and outlets flow of header tank and shall include measure the inlet flow from Rekka treatment plant (∅ 1200 mm) to header tank, inlet flow from DMC (∅ 1200 mm) to header tank, the discharge outlet over flow from the header tank to DMC pipeline (∅ 1200 mm), discharge outlet flow from the header tank to Rabya pressure pipelines (2 ∅ 300 mm) and discharge outlet flow from the header tank to new irrigation system as per manufacturer.

3. All specifications of new flow meters and electrical installations subject to the Engineer approval.

g. <u>Fire Fighting / Alarm System</u>:

1. The Contractor shall renovate, supply, install, test, commission, operation and maintenance Fire Fighting system with an alarm facilities and sufficient number of smoke and heat detectors in each room of the effluent transfer pumping station, as per the KFB approved procedures and shall be connected to FCAP with sufficient numbers of fire alarms bells and shall be installed to alert (sound and light alarm) the shift operator during any emergency fire condition.

2. The Contractor shall renovate, provide, install, test, commission and maintenance of sufficient numbers of fire extinguishers not less than (6 Nos.) as per recommendation of KFB regulations and shall be refilled or inspected by KFB yearly. Also, the Contractor shall consider the approval according to KFB regulations.

3. The Contractor shall renovate, provide, install, test, commission , operation and maintenance new fire protection system, and cabinet, fire hoses, racks and nozzles, fire detection, alarm system and lightning protection according to KFB regulations. All works and materials shall be subject to the Engineer approval.

h. <u>Air Conditioning and Utilities</u>:

1. The Contractor shall disconnect electrical supplies, dismantle electrical and mechanical equipments, cut pipes, remove, abandonment and cart way to a tippers off the site old existing HVAC package units and its related ducting system completely from effluent transfer pumping station and cart away to the MPW store. The Contractor shall renovate, provide, install, test, commission and maintenance new HVAC system not less than (2 Nos. x 25 tons) with two compressors for effluent transfer pumping station**.** The Contractor shall renovate, provide, install, test, commission and maintenance the ducting system according to the system capacity for the cooling and the ventilation requirements.

2. The Contractor shall renovate, provide, install, test, commission and maintenance new telephone instrument (multi memories) with telephone connection network of the effluent transfer pumping station and shall be taken connection extension line from the new EPBAX which is installed in MPW Quality Control Center. All works and materials shall be subject to the Engineer approval.

3. The Contractor shall renovate, provide, install, test, commission and maintenance new emergency lights fixtures not less than (20 Nos.) sufficient to allow enough illuminators for the movement of operators during the power failure. The emergency light fixtures shall be twin bulb holder type with aluminum reflector, weather proof, industrial type 12 Volt with inbuilt battery 6 x 10 AH and battery charger shall be thorn make or equivalent. The capacity of Bulbs shall be 2 x 35 W. The layout type and the numbers of fixtures shall be approved by the Engineer.

4. The Contractor shall be responsible for the renovation and rehabilitation of the electrical power system, telephone network and electrical lighting system. The Contractor shall disconnect, dismantle, remove all existing lighting system, carting off site and reinstalling the entire lighting fixtures, control networks, ventilation fans, motor control etc. and all the cables of all pump motors which are in operation. The lighting fixture shall be 250 W pendent types - high bay type fixtures with HPMV lamps; all control devices like power outlets and switches, all wiring accessories, conducts, wires etc. All exhaust fans of identical size shall be replaced. The power supply cables shall be supplied and installed by the Contractor and shall be sufficient to operate an electrical load not less than 500 KW.

5. The Contractor shall renovate, provide, install, test, commission, operation and maintenance of a new motor control center, enunciator panel, control relay panel, motor starters, distribution boards, other auxiliary equipment, electrical power cables, instrumentation control cables, earthling and bonding, batteries, battery charger, light fittings, supporting brackets and all other associated necessary components connection to existing substation No. 6 (SU0641) for the new loads.

6. All equipment shall be connected to the new Motor Control Center with new cables, and configured on the control board.

7. The Contractor shall renovate, provide, erect, install, test, commission, operation and maintenance of a new house for the new MCC in a separate room constructed in the building. The newly constructed room for the MCC shall be provided with air conditioner split type in sufficient nos., so that the temperature of the panel room shall be maintained to 20^{o}C at any given time.

8. The Contractor shall be fully responsible for any civil works required for the panel foundation, seal all sleeves of the cables, wiring, cable trays, trunking, conduits and conduit boxes, cable trench and ducts shall be protected with waterproofing membrane. All works and materials shall be subject to the Engineer approval.

9. The Contractor shall prepare on his own a safety place as spare parts store to keep, store the new spare parts and materials which required for maintenance works during the contract period.

10. Any failure of equipment or a part of it shall be replaced with new tested without any extra cost to MPW.

11. The Contractor shall be responsible for related civil, mechanical, electrical and instrumental works required for the proper installation and operation.

12. Maintaining and rectification of all damaged utilities and other services affected during the works at no extra cost.

3. Renovation Works:

1. The Contractor shall be responsible to carry out complete overhauling maintenance, cleaning and adjusting of the existing equipment and facilities at the New Pumping Station, replacing all defective parts and materials as directed by the Engineer.

2. The extent of work shall include but not limited to disconnect, dismantle, remove, abandonment, clean & paint all the existing equipment, with all related pipelines and fittings, valves, pressure gauges, motor, panel and other civil, mechanical and electrical works, and carted away off site.

3. The following are (but not limited) the scope of the renovation work required to be conducted and executed in parallel with the new installation work states above

   a. Supply and replace all the pipe works of the station including all fitting, flanges, bolts, nuts, and accessories

   b. Replace all defective instruments, pressure gauges, and pressure monitors in effluent transfer pumping station and the surge vessel system.

   c. The Contractor shall overhaul completely all the main pumps, motors, blowers, ventilation fans, compressors, and all aux. equipment of the New Pumping station, including replacement of bearings, seals, damaged parts ….etc.

   d. The Contractor shall be responsible for rehabilitation and modification of the electrical power system, telephone network and electrical lighting system (but not limited to) the following

      - Replace the entire lighting fixtures 4 x 20 W fluorescent luminaries with mirror optical reflectors and electronic power saving ballast in the building with new ones having a minimum illumination level of 500 Lux in all the areas.

      - Dismantle, remove and cart away existing indoor lightings fittings. The Contractor shall provide, install, test, commission and maintenance new indoors lighting system inside the new pumping station and outdoors lightings at least 500 W metal halide type fixtures (4 Nos.) with all related wires and electric installations outside the new pumping station.

      - Supply, install, test, commission and maintenance new twin bulb, indoor weather proof emergency lighting units (20 Nos.) with all related wires inside the new pumping station. The emergency light fixtures shall be holder type with aluminum reflector, industrial type 12 Volt with 6 x 10 AH and battery charger shall be thorn make or equivalent. The capacity of Bulbs shall be 2 x 35 W.

- Replace all the existing and power distribution boards with new ones with the approval of the MEW Engineer.
- Replace all power outlets, lighting and power switches and sockets with new ones and with identical capacities
- Complete overhauling of the 3.3 KV panels and replace all protection replays and all defective relays and other accessories in the panel.
- Replace all the vacuum tubes of all the Vacuum circuit breakers.
- Replace all the power cables of the effluent transfer pumps 1200 KW/3.3 KV.
- Complete overhauling of the 415 V MCC of the pumping station, replace all defective parts and protection relays, auxiliary ….etc.
- Replace the batteries and battery charger of all panels.
- Complete overhauling of the instrumentation panel and replace all the gauges, controllers and indicators.

4. Civil Maintenance and Repair works:

1. The Contractor shall be responsible of the civil maintenance works for the whole building of the New Pumping station which includes repair of walls, roof, slab, ladder and other concrete surface, treatment and repair of cracks and joints leakages, cure of damaged concrete surface, making good irregularities and defects including expansion and other joints, corrective measures to ensure water tightness, replacing defective joints and water-stops.

2. The Contractor shall dismantle and remove the existing water proofing roof insulation and cart away off site. The Contractor shall provide, install, test, commission and maintenance new water proofing roof insulation (75 mm thick) closed cell non absorbent rigid polystyrene insulation board. The insulation boards shall be placed immediately after the membrane has been laid. Flexible waterproofing membrane for roofing shall be bitumen based to accepted standards and approved by the Engineer. Surfaces to receive the membrane shall be smooth, dry and free from dust. Roof screed shall be laid to falls over the concrete roof slab and have a minimum thickness of 35 mm. The screed shall be laid, compacted and shall be leveled and finished with steel trowel. Primer for concrete shall be suitable for use with the waterproofing membrane.

3. The Contractor shall dismantle, remove, abandonment of the existing pipelines, valves, fittings and other connections, cart away to a tippers off the site from the main water source point to effluent transfer pumping station. The Contractor shall renovate, supply, erect, install, test, commission and maintenance new UPVC pipelines connected from the main water source point to effluent transfer pumping station with all fittings and other related civil works. All works, specifications and materials shall be subject to the Engineer approval.

4. The Contractor shall renovate, provide, paint, test, commission and maintenance internal, exterior walls and roof with emulsion paint. Painting shall be carefully executed with clean brushes and in the best manner and applied strictly in accordance with the manufacture's instructions. All paints, stains, varnishes shall be well stirred before use and thinned only in accordance with manufacturer's recommendations. Painting of exterior walls shall not be carried out in wet, dusty or foggy weather and interior walls and roofs shall not proceed in dusty conditions.

5. The Contractor shall dismantle the existing damaged aluminum doors (single and double), glazed aluminum windows with mesh screens frames, lockers, stoppers, handles, louvers, wood doors, exhaust fans, floor tiles, handrails, shutter door and renovate, provide, install, test, commission and maintenance new aluminum doors (single and double) with lockers, glazed aluminum windows with mesh screens frames, lockers, stoppers, handles, louvers, wood doors with lockers, exhaust fans, floor tiles, handrails, shutter door with locker and other appurtenances. The shutter door shall be control by electric switch open/close buttons.

6. The Contractor shall be responsible to rehabilitate and modify the existing room nearby the control panels room shall include but not limited to provide, install, commission and maintenance office desk "L" shape, cabinet with triple drawers, three chairs with arms, two single tables with glass surface , closet with triple drawers and rolling glass double doors, curtains, interior plant and telephone instrument with multi memories, A/C split unit (3.5 Tons) with compressor and all related civil, mechanical and electrical works. All specifications of new furniture and equipment subject to the Engineer approval.

7. The extent of works shall include but not limited to all required civil works for the concrete reinforcement for the foundation base of the pumps.

8. The extent of work shall include painting all exposed piping valves, gates, joints, penstock , surge vessels tanks and other metal surfaces shall be painted, but not limited to the following:

   - All other ferrous metal piping, iron exposed to view, metal surfaces shall be thoroughly cleaned to remove grease and dirt and wire brushed and scraped to remove scale and rust, and coating should be according to international standard.

   - All exposed galvanized piping and fitting shall be cleaned thoroughly by swabbing with thinner or solvents and any rust removed as for ferrous metal above. Two casts of primer, which provide a bond for the paint, shall then be brushed on. Undercoating and finishing shall be as above ferrous metal.

   - All cast iron pipe and fittings exposed to view shall be thoroughly cleaned of all dirt, rust and grease given a coast of a composition of coal tar or black paint finish over factory applied coat.

H. Renovation works of MPW Switchgear room of substation S/S.6 (SU 0641) and other related works:

1. The work assigned by this item shall be carried out with a full co-ordination and supervision of MEW. It is the Contractor responsibility to obtain MEW approval to his design and installation ideas on the shop drawings prior to start of any Electrical Works, and for the connection of the Electrical supply (or part of it) to the work of MPW (if required).

2. Upon completion of the Electrical Work the Contractor shall be responsible for obtaining MEW approval for the whole installation or modification (or any part thereof) including testing and energizing and setting to work.

3. The Contractor shall acquaint himself with the latest issue of the rules and regulations of Electrical installation work of the Ministry of electricity and water in Kuwait MEW. It is the Contractor responsibility to obtain the latest copies of these regulations on his own expense and there will be no consideration for any such unawareness of these requirements.

4. The Contractor shall check and allow in the Contract prices for obtaining any permits, licenses, rents and fees necessary for starting, carrying out, completing, setting to work and handing over in an operating and useable condition, all electrical works and materials called for in the Contract documents.

5. The work shall include the supply, manufacture, installation, erection, delivery, storage, testing, setting to work, commissioning and handing over in perfect operating condition all materials and equipment called for in the Contract Documents as well as carefully removal of the existing materials and equipment, packing, transporting them safely to MPW store.

6. A complete installation shall include any sundry items or components may be necessary or as specified by the Engineer. Such items, whether mentioned or not, shall be included at no extra cost to the contract sum.

7. No claims will be admitted if the Engineer specifies additional requirements or any modification to achieve the system to his satisfaction; such work will be executed and carried out through the same contract price without any additional cost to the ministry.

8. All builder's works, such as chasing of walls, grouting of bolts, construction of foundation as necessary, trenches with Chaucer plate covers, building of cable manholes, earthling pits and fitting laying of ducts, ceiling of ducts, excavation of trenches backfilling and consolidation, carting away of surplus soil, etc. shall be executed by the Contractor and the full and entire cost of all such builder's works and materials shall be included in the total bid amount.

9. The works assign to this item shall include (but not limited) to disconnect, dismantle and remove of the existing switchboards, distribution boards, Motors Control Center (MCC), Control panels, batteries and battery chargers and all other electrical equipment in MPW Switchgear room at substation S/S.6 including transport all of them safely to the new MPW store on site.

10. The Contactor shall arrange for an adequate temporary power supply unit of an enough capacity for all utilities and services, zone area (2) facilities and all other running loads during the rehabilitation works of the S/S.6 to ensure the availability of the electric power.

a) Description of the works:

1. Disconnect, Dismantle, remove and abandonment of the existing equipment at the existing L.T. Switchboard at substation S/S. 6 (Module SU 0641), includes incoming feeders, main switchboard, distribution board, MCC, Control panel, batteries and battery charger, power and control cables, lighting fittings, etc., and all other electrical equipment and transport all of them safely to the ministry store.

2. Renovate, rehabilitate, supply, manufacture, delivery, installation, erection, testing and setting to work, commissioning within two (2) years starting from the Date of Enterprise and handling over in perfect operating condition, the following L.T. switchgears and equipment complete with all required cables, wires, fittings and accessories, including necessary civil and builder works:

   a. L.T. Incoming Feeder Panels.
   b. Main L.T. switchboard.
   c. Distribution boards.
   d. Control board with mimic panel.
   e. Motor Control Center (MCC).
   f. Automatic Transfer Switch.
   g. Batteries and battery charger.
   h. Lighting system.
   i. A/C Package unit.
   j. Ventilation system.
   k. Fire Alarm System.
   l. Auxiliary panels and cable works.
   m. Spare equipped panel.

3. The Contractor shall be responsible to rehabilitate, modify and maintenance of MPW switchgear room at Substation No. 6 (SU 0641) to provide electrical power for the New Pumping Station including effluent transfer pumps, new Rabya pumps, new landscaping irrigation pumps, new dewatering pumps, flow meters, guard house and all other services and utilities at zone area (2), as directed by the Engineer for the duration of the contract period.

4. The Contractor shall be responsible in laying cables for this purposes of sufficient capacity in accordance with the MPW regulations and shall be selected (at least) 50% additional capacity. The following load distribution shall be considered as per the Engineer recommendation.

Load Description	Estimated Load (KW)	Running Load (KW)
Effluent Transfer Pumps (3 Nos.)	4800	2400
New Rabya Pumps (3 Nos.)	450	450
New Dewatering Pumps (2 Nos.)	40	30
New Landscaping Irrigation Pumps (2 Nos.)	150	150
Back Guard House	40	40
Lighting & Power System (zone area 2)	150	150
Spare equipped panel	500	500

5. The rehabilitation and renovation work shall include provision of the latest version of mosaic enunciator panel, PLC based control panel, electrical power and control cables, instrumentation, earthling system, supporting brackets, cable trays, trenches, trunking and conduits, cable ladders and all other associated necessary components for the proper and modern electrical installation.

6. The work shall also include replacement of entire lighting system, wiring, lighting fixtures, ventilation system, power outlets and other related accessories.

7. Supply, install, testing and commissioning of new lighting & Power system for zone area (2) and facilities complete with the following equipment.

    - Lighting and Power distribution boards.
    - Explosion proof and weather proof lighting fittings,
    - Lighting Switches, sockets outlets, junction boxes and accessories.
    - Lighting and power cables, conduits fittings and accessories.
    - Earthling System.

8. Supply, install, connection and settings to work the local push button station, with emergency stop button (red mushroom type) totally enclosed with protection IP 65 for each motors and substation room.

9. Supply, install, testing, commissioning and setting to work, emergency lighting system of (12 Nos.) independent units, self contained battery of 4 hours back up time to be mounted in substation No. 6 (4 Units) and the New Pumping Station (8 Units), complete with all fitting and accessories as specified in the contract documents.

10. Supply, install, connection and setting to work a new earthling system for all electrical equipment and switchboards, as per the latest regulation of MEW and requirement of the contract specifications.

11. The Contractor shall be responsible to get clearance approval from M EW at his own expense for the latest regulation and modifications required for substation No. 6. (Module 06: SU 0641).

12. The extent of work shall include but limited to the preparation of concrete surfaces repairs shall include (but not limited to) clean and dry from all contamination, surface laitance and other loose materials according to approved manufacture requirements either grit or water blasting technique to be dumped out of the station building. In addition, the old contaminated sealant of existing joints shall be thoroughly cleaned out from all traces of previous sealant and primer using a suitable mechanical method such as grit blasting, water blasting or grinding.

13. The Contractor shall disconnect, dismantle, remove and cart away existing interior lightings off the site. The Contractor shall provide, install, test, commission and maintenance new interior lightings fixtures, accessories and switching devices, power outlets , indoor and outdoor lighting, telephone extension points, etc.

14. The Contractor shall provide, install, test, commission and maintenance new external lighting fitting (4 Nos.) 500 Watt each, halogen type fixtures with all related wires and accessories outside substation.

15. The Contractor shall provide, install, test, commission and maintenance new emergency lights fixtures not less than 4 Nos. allowing enough illuminators for the movement of operators during the power failure. The emergency light fixtures shall be twin bulb holder type with aluminum reflector, weather proof, industrial type 12 Volt with inbuilt battery 6 x 10 AH and battery charger shall be thorn make or equivalent. The capacity of Bulbs shall be 2 x 35 W. The layout type and the numbers of fixtures shall be approved by the Engineer.

16. The Contractor shall paint internal wall and roof with emulsion paint for substation. Painting shall be carefully executed with clean brushes and in the best manner

and applied strictly in accordance with the manufacture's instructions. All paints, stains, varnishes shall be well stirred before use and thinned only in accordance with manufacturer's recommendations. Painting of interior walls shall not be carried out in wet, dusty or foggy weather and interior walls and roofs shall not proceed in dusty conditions. The extent of work shall include maintenance and painting metal door for each substation and provide new lockers.

17. The Contractor shall provide, install, test, commission and maintenance new water proofing roof insulation (75 mm thick) closed cell non absorbent rigid polystyrene insulation board. The insulation boards shall be placed immediately after the membrane has been laid. Flexible waterproofing membrane for roofing shall be bitumen based to accepted standards and approved by the Engineer. Surfaces to receive the membrane shall be smooth, dry and free from dust. Roof screed shall be laid to falls over the concrete roof slab and have a minimum thickness of 35 mm. The screed shall be laid, compacted and shall be leveled and finished with steel trowel. Primer for concrete shall be suitable for use with the waterproofing membrane.
18. The Contractor shall provide, install, commission and maintenance a local telephone line and instrument connected to the new EPBAX which is installed in the MPW Quality Control Center, interior lightings, new A/C split unit. The extent of work shall include but not limited to replacing damaged aluminum doors with lockers, glazing windows with mesh screens frames, louvers and vents and other required works as directed by the Engineer.

19. The Contractor shall design, provide, install, test, commission fire extinguishers not less than (1 No.) as per recommendation of KFB regulations and shall be refilled or inspected by KFB yearly. The Contractor shall provide, install, test, commission and maintenance new fire protection system, and cabinet, fire hoses, racks and nozzles, fire detection, alarm system and lightning protection according to KFB regulations. All works and materials shall be subject to the Engineer approval.

20. The Contractor provide, install, test, commission and maintenance sufficient smoke and heat detectors in each room as per the KFB approved procedures and shall be connected to FCAP with sufficient numbers of fire alarms bells and shall be installed to alert (sound and light alarm) the shift operator during any fire condition. The fire alarm indication panel shall be installed at the guard house near the main entrance gate of Ardiya sewage plant to alert the guard man in case of any fire hazard.

21. The extent of works shall include but not limited to all related civil and builder works as may be required for proper completion of the above mentioned works.

I. Renovation works of Mosque Building and other related works:

1. The Contractor shall demolish, dismantle mechanical and electrical equipments, cut pipes, remove, abandonment and cart away to a tippers off the site existing roof materials, toilet fixtures, ablution facilities, equipments, plumbing system, pipes, sanitary fixtures, lightings, tiles, A/C units, doors, windows, equipment and other related parts as required by the Engineer. The extent of works shall include but not limited to all required civil, mechanical, electrical and instrumental works as approved by the Engineer.

2. The Contractor shall renovate, rehabilitate and modify existing mosque building (AB 1043) and ablution toilet room structures completely within one (1) month starting from the Date of Enterprise and shall include but not limited to repair of walls, roof insulation and drain, slab and other concrete surface, treatment and repair of cracks and joints leakages, cure of damaged concrete surface, making good irregularities and defects including expansion and other joints, corrective measures to ensure water tightness, replacing defective joints and water-stops. All works and materials shall be subject to the Engineer approval.

3. The extent of works shall include but not limited to dismantle, remove water proofing roof insulation materials and cart away off site. The Contractor shall design, provide, install, test, commission and maintenance new water proofing roof and shall include but not limited to water proofing insulation (75 mm thick) closed cell non absorbent rigid polystyrene insulation board. The insulation boards shall be placed immediately after the membrane has been laid. Flexible waterproofing membrane for roofing shall be bitumen based to accepted standards and approved by the Engineer. Surfaces to receive the membrane shall be smooth, dry and free from dust. Roof screed shall be laid to falls over the concrete roof slab and have a minimum thickness of 35 mm. The screed shall be laid, compacted and shall be leveled and finished with steel trowel. Primer for concrete shall be suitable for use with the waterproofing membrane. All works and materials shall be subject to the Engineer approval.

4. The extent of works shall include but not limited to provide, paint, test, commission and maintenance interior and roof of mosque building and ablution toilet room with emulsion paint. Painting shall be carefully executed with clean brushes and in the best manner and applied strictly in accordance with the manufacture's instructions. All paints, stains, varnishes shall be well stirred before use and thinned only in accordance with manufacturer's recommendations. Painting interior walls and roofs shall not proceed in dusty conditions. The extent of works shall include but not limited to scraping and sand blasting to remove dust out of exterior walls prior to painting works. All works, materials and specifications shall be subject to the Engineer approval.

5. The extent of works shall include but not limited to provide, plaster, test, commission and maintenance exterior walls of mosque building and ablution toilet room with rocks panels and cladding in accordance with manufacturer's recommendations. All works, materials and specifications shall be subject to the Engineer approval.

6. The extent of works shall include but not limited to provide, install, test, commission and maintenance of both mosque building and ablution toilet room new interior lightings fixtures with mirror optic reflector with power saving electronic ballast. Also, the Contractor shall provide, install, test, commission and maintenance new external lightings (outdoors lightings) at least 500 W metal halide type fixtures (4 Nos.) with all related wires and electric installations outside the mosque. The Contractor shall replace the entire existing power outlet and control switches with new identical or equivalent type with the approval of the Engineer. All works, specifications and materials shall be subject to the Engineer approval.

7. The Contractor shall dismantle, remove, abandonment and cart away off site windows completely of mosque prayer room. The extent of works shall include but not limited to provide, install, test, commission and maintenance of mosque building new glazing windows with mesh screens frames and new curtains as

approved by the Engineer. All works and materials shall be subject to the Engineer approval.

8. The extent of works shall include but not limited to provide, erect, install, furnish, test, commission and maintenance new thick carpet of similar type used in mosque, half dozen books wood carriers, cabinets consists of three (3) shelves with glass rolling doors, large shoes closet, large insect killer lights with twin tubes (16watts, and 30 cm length with transformer housed in PVC enclosure), high sound speaker system to recall prayers, A/C (Air Conditioning) split unit (3.5 ton) with compressor (2 Nos.), oil heater, portable electric fans (2 Nos.) and all required electrical installations. All works and materials shall be subject to the Engineer approval.

9. The extent of works shall include but not limited to renovate, provide, install, test, commission and maintenance new ablution facilities and toilets rooms and shall include but not limited to new plumbing system, pipes, plumping specialties, sanitary sewer system and manholes connected to the nearest new sewer manhole, new sanitary fixtures (urinals, water closets, etc.), new faucets hot and cold (6 Nos.) with wide tub used for ablution purpose, soaping and soap holders, color ceramic tiles for the ground floor and interior walls, exhaust fans, large insect killer lights with twin tubes (16watts, and 30 cm length with transformer housed in PVC enclosure), interior lightings fixtures, ceramic tiles and walls, power outlets, electric installations and other accessories and services as approved by the Engineer. The color of ceramic tiles and walls type of materials shall be subject to the Engineer Approval. All works and materials shall be subject to the Engineer approval.

10. The Contractor shall dismantle, remove, abandonment and cart away off site main entrance door, inner doors and windows completely of toilet (bath room). The extent of works shall include but not limited to provide, install, test, commission and maintenance new aluminum doors with hang louver and lockers for main entrance door and inner toilets doors (2 Nos.), double glazed rolling windows with mesh screen plates, installation of neon lightings, chrome fittings, ceramic tiles for walls and ground floor, angle valves, hose bibs, traps and drainage fixtures to be connected to the nearest sewerage manhole, UPVC pipes, ferrous accessories used for the installation of sanitary fixtures shall be anti-rust given at the factory, chrome plated brass escutcheon plates on chrome fittings fixed on the wall, hand dryer, secure mirrors to walls in concealed with plywood packing, holders of toilet papers and rolling tissues, large exhaust fans, water heater and boiler and all related works. The color and type of materials shall be subject to the Engineer Approval. All works and materials shall be subject to the Engineer approval.

11. The extent of works shall include but not limited to dismantle, remove, abandonment pipeline, valves, fittings and other connections from the main water source point to mosque, cart away to a tippers off the site. The Contractor shall renovate, supply, erect, install, test, commission and maintenance new UPVC pipelines connected from the main water source point to mosque with all fittings and other related civil works. All works, specifications and materials shall be subject to the Engineer approval.

12. The extent of works shall include but not limited to provide, install, commission and maintenance new fire extinguishers not less than (1 No.) as per recommendation of KFB regulations and shall be refilled or inspected by KFB yearly. The Contractor shall provide, install, test, commission and maintenance

new fire protection system, and cabinet, fire hoses, racks and nozzles, fire detection, alarm system and lightning protection according to KFB regulations. All works and materials shall be subject to the Engineer approval.

13. The extent of works shall include but not limited to all required civil, mechanical and electrical works as required for proper completion works. All specifications, paints, equipments, furniture and other materials shall be subject to the Engineer approval. The Contractor shall provide all other required consumables for ablution (detergents, soaps, paper rolling tissues, toilet tissues, big roll tissue holder, etc.) per month for the duration of the contract period as directed by the Engineer. The color of ceramic tiles and type of materials shall be subject to the Engineer approval

14. The Contractor shall dismantle, remove concrete tiles around the mosque building area and cart away off the site. The extent of works shall include but not limited to renovate, modify, provide, erect, install, commission and maintenance new color painting precast curbstones, site paving, concrete tiles, interlocking of different colors bricks, street furniture, foot pathways for pedestrians and colour decorative tiles.

15. The extent of works shall include but not limited to provide, install, commission and maintenance new irrigation system, landscaping, planting ground covers, grown vines, grown shrubs and grown color yearly season flowers around the mosque building area as approved by the Engineer.

J. Provision of new Management System and other related accessories:

1. The Contractor shall design, provide, install, test, commission, operate and maintenance all elements of the office management system, the works shall be started within one (1) year starting from the Date of Enterprise and commissioned before the end of the first year of the contract duration. The Contractor shall prepare drawings for the approval of the Engineer. No extra will be admitted if the Engineer specifies additional requirements to achieve a system to his satisfaction. The Contractor shall be responsible for obtaining MPW approval to such design prior to the start the execution of the works.

2. The office management system shall be original software of latest version, fast document searches, easy to use program, customize templates with latest window XP (Professional edition) / window vista (business edition) with Office English version (Arabic enable) and productivity manifold and shall include but not limited to the following equipment for the sole use and disposal of the Ministry Engineer:

    - Smart information record system (SIRS) or equivalent as approved of the Engineer.
    - Network PC system.
    - Monitor SCADA (Supervisory Control and Data Acquisition).
    - Alarm implemented SCADA where Emails and text messages are sent along alarm activation.
    - Multiple data servers connected to multiple controllers. Each data server has its own configuration data base and is responsible for the handling of a sub-set of the process variable (acquisition, alarm handling, archiving, etc.).

- A network of all Sanitary Department data being monitored including Meter Mail messaging technology, internet enabled alarm feature instantly notifies personnel of potential areas of concern.
- SCADA server connected to local network server multiple accesses points and data can be viewed from office home, other plants wherever the network is available.

3. The Contractor shall submit the original catalogs of the latest version available in the local market and the warranty durations from the manufacturer.

4. The Contractor shall design, provide, install, test, commission, operate and maintenance all elements for a Plant Information Management System (PIMS) in sufficient detail to enable PIMS Technology Provider (Vendor), to develop a detailed functional specification. The Vendor is expected to propose a complete and fully operation solution, regardless of any inadvertent omissions in this document within one (1) year starting from the Date of Enterprise. No extra will be admitted if the Engineer specifies additional requirements to achieve a system to his satisfaction. The Contractor shall be responsible for obtaining the Engineer approval to such design prior to the start the execution of the works.

5. The scope of work of the PIMS Vendor shall include but not limited to procurement, engineering, configuration, design, testing out and commissioning of a state-of-the-art PIMS system consisting of Enterprise Server as long-term data historian and other MPW facilities servers, Process Book and graphical and reporting, client tools, Real time web parts for web based visualization, customized graphics and reports, on site user training, offsite system manager training, and all associated hardware and software required to establish an integrated PIMS system. Real time data to be collected from the following MPW facilities servers and historized in the Enterprise or main server at Ardiya sewage plant: Umm Al-Haiman sewage treatment plant, Wafra sewage treatment plant, Rikka sewage treatment plant, Khairan sewage treatment plant, Kubd sewage treatment plant and Data Monitoring Centre (DMC).

6. The PIMS is to be state of the art real time infrastructure which allow users to gather data from the SCADA System in MPW facilities and store it sufficiently for a very long period of time at its original resolution and distribute it to authorized users through the Ministry internet, the worldwide web and phone, or microwave technologies in a secure manner.

7. The PIMS system should be upgradeable to interface and bring operational data from: Programmable Logic Controllers (PLCs), Emergency shutdown system (ESD), Asset Management System, Laboratory Information Systems (LIMS), future Supervisory Control and Data Acquisition systems (SCADA), Weather Monitoring System, Manual Data entry, IT Infrastructure health data, relational data (SQL, Oracle), 3rd party historians, etc. to the Enterprise server.

8. The PIMS should be able to deliver information to users all levels of the Ministry through the company LAN/WAN from the plant floor to the enterprise level. It should keep all historical and real time critical operating data online and available for at least 10 years.

9. The PIMS server should the flexibility to connect to more data sources in the future (located in other plants) and must be upgradeable to monitor more than 150,000 data tags on a single server.

10. The PIMS client software will permit:

    - Viewing of the PIMS data in a graphical form.
    - Trending of PIMS data.
    - Generating automatically updated reports.
    - Manipulation of the stored data using a calculation engine supplied with the software.

11. The security scheme for the PIMS shall include system level password protection and PIMS password scheme containing several levels of user authentication.

12. The PIMS Technology for the PIMS should be able to send data via standard formats (OPC, OLEDB, ODBC) to support seamlessly "best of breed" applications / solutions from various solution providers.

13. The PIMS historian software should be capable of manually back entering data to an earlier time stamp.

14. The PIMS system should include capabilities to perform on - line backup and restore of the complete system.

15. The PIMS should be capable to establish totals, averages, or any other calculation to the time – ordered data entries.

16. The PIMS should have user friendly tools which are installed on MS Windows based client PCs allowing MPW users to access real-time and historical data residing in the PIMS server and other data sources to create interactive graphical displays and reports that can be saved and shared.

17. The PIMS should make available graphics in web based format via an integral web server and based on Microsoft Share Point Portal server. MPW users should be able to create and save their personalized graphic web pages without the requirement of programming. All historical and real time information shall be accessible.

18. The data collection sampling rate shall be configurable on point to point, or group of point's basis, allowing scan rates as fast as at least 1 second interval.

19. The PIMS Vendor shall provide a detailed PIMS architecture drawing including all networking and PIMS hardware.

20. The PIMS technology must have accumulated minimum 5 years online experience in Waste Water Treatment Plants (WWTP) and Irrigation Systems Environment. Field proven experience (references) shall support the claim of PIMS technology supplier. The Vendor must present a reference list with minimum 5 clients with core business in WWTP and Irrigation.

21. The PIMS Enterprise server should have the flexibility to connect to more data sources in the future and must be upgradeable to monitor more than 1,000,000 tags on a single server. PIMS Vendor must represent references with 1,000,000 tags in one server in minimum 10 sites.

22. The PIMS Vendor shall provide all necessary system and application software. The acceptable operating system software is latest industry standard latest Microsoft Operating System.

23. The PIMS Original Software Developer should provide 24/7/365 days remote world class global customer support for maintenance and troubleshooting.

24. The PIMS server shall be designed to acquire the PIMS based data from 10 SCADA based facilities, scattered geographically in different locations in Kuwait at the following scan rates:

    - Digital signals: 1 minute.
    - Flows and Pressures: 1 minute.
    - Levels and Others: 1 minute.

25. The PIMS shall provide 55 client software licenses. Out of that, twenty (20) are concurrent "smart" client access licenses, thirty five (35) are "thin" Web based format client access.

26. PIMS proposal shall be based on the following:

    1. 50 Process graphics
    2. 30 Excel reports
    3. 10 Calculated variables

27. PIMS Vendor shall provide off site training for four (4) PIMS system Administrators.

28. PIMS Vendor shall provide on site training for twenty (20) PIMS users to enable them to create and use process graphics, reports, trends, and Real Time Web part pages.

29. As a minimum requirement, all inputs, outputs, Digital tags (Open/Close) and motor run status must be aggregated.

30. The PIMS Vendor shall provide all training materials and in English.

31. PIMS responsibility during the commissioning phase shall include:
    1. Ensuring that the PIMS system is installed properly.
    2. Powering up the system.
    3. Ensuring that the server software is working correctly.
    4. Ensuring that the interface with PIMS servers is functioning properly.
    5. Ensuring that all other interfaces to the PIMS are working properly.
    6. Loading client software in all designated machines and verify PIMS functionality comprehensively.
    7. Implementing system back up strategy and maintaining the system through successful completion of the Sustained Performance Test.

32. The extent of work shall include but not limited to all required civil, mechanical, electrical and instrumental works as approved by the Engineer.

33. The extent of works shall include but not limited to the following works and subject to the Engineer approval:

a. The Contractor shall design, provide, install, test and commission colored developed model of existing Ardiya pumping station and Sulaibiya wastewater treatment & reclamation plant layout structures (1.5 m x 1.5 m) and shall include all process treatment stages facilities in details, but not limited to quantities of

structures, substructures, wastewater retaining structures, buildings, blower house, pipelines, by-pass lines, manholes, roads, landscaping irrigation areas, trees, substations, poles, workshop, screening, de-gritting, aeration tanks, clarifiers, chlorine, Reverse Osmosis, odour control facilities, sludge treatment, drying beds, surge vessels, pumps, channels, etc. (Appendix 3 - Drawings). The extent of works shall include but not limited to frame board quality materials, table stand covered with transparent glass or plastic, lightings installations and other related works as approved by the Engineer.

b. The Contractor shall provide, install, test and commission large colored posters (20 Nos.) and sizes (60 cm x 50 cm) with bronze frame and transparent plastic covers or as directed by the Engineer of different views or locations of existing Ardiya pumping station and Sulaibiya wastewater treatment & reclamation plant as directed by the Engineer.

c. The Contractor shall provide (500 copies) of new booklets with color pictures, drawings, tables and other related works of existing Ardiya pumping station and Sulaibiya wastewater treatment & reclamation plant as approved by the Engineer.

a) General:

1. K. Renovation works of laboratory Partition Rooms furniture, equipments and devices, reagents and solutions, miscellaneous, glasses and plastic wares, chemical supplies and other related accessories.

2. The Contractor shall submit and follow the approved laboratory methods in accordance to the latest new original editions of Standard Methods for the Examination of Water and Wastewater prepared and published jointly by the American Public Health Association, the American Water Works Association and the Water Pollution Control Federation.

3. The Contractor shall submit manufacturer instructions technical data, charts, catalogues, operation and maintenance manuals of all laboratory equipments and devices.

4. The Contractor shall design, provide, erect, install, furnish, commission and maintenance the following new laboratory partition rooms furniture, equipments and devices, reagents and solutions, miscellaneous, glasses and plastic wares, chemical supplies and other related accessories within one (1) year starting from the Date of Enterprise and shall include but not limited to all related mechanical, electrical, instrumental and civil works as approved by the Engineer.

5. The laboratory partition rooms are located in MPW Quality control center (AB 1044).

6. The cost of Management System shall be born by the Contractor and shall be allowed to include in the total price of this contract

b) Description of the works:

1. <u>Laboratory Partition Rooms Furniture and other accessories:</u>

1. The Contractor shall dismantle mechanical and electrical equipments and instruments and furniture of all laboratory partitions rooms completely of the MPW Quality control center, remove, abandonment, cart away to a tippers off the site and transport to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. The extent of works shall include but not limited to furniture, devices, plumbing system, pipes, plumping specialties, sanitary sewer system, sanitary fixtures, boiler, exhaust fan, electrical installations and other related utilities and services. The extent of works shall include but not limited to all related civil, mechanical, electrical and instrumentation works to the satisfaction of the Engineer.

2. The extent of works shall include but not limited to clean, paint re-usable laboratory mechanical and electrical equipments, instruments and devices, tools, pumps, etc., cart away to a tippers off the site and delivered to MPW stores in new fitting packages similar to original packages with new machine cards and tags numbers plates, so that to be easily identified without the necessity of unpacking them.

3. The extent of work shall include but not limited to all clean, dismantle, remove laboratory non usable ferrous metals, cart away to a tippers off the site and delivered to MPW stores without packing, but shall be covered with large plastic sheets as approved by the Engineer.

4. The extent of work shall include but not limited to clean, remove all laboratory non valid chemicals and solutions, abandonment cart away to a tippers off the site in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

5. The Contractor design, renovate, provide, install, erect, test, commission and maintenance the following accessories for the laboratory partition rooms within one (1) year starting from the Date of Enterprise but not limited to plumbing system, pipes, plumping specialties, sanitary sewer system and manholes connected to the nearest new sewer manhole, plumbing system, plumping specialties, sinks with faucets hot and cold, boiler, exhaust fan, plumbing, chrome fittings, connections and other services, UPVC pipelines, fittings and other connections which linked to the main water source, water proofing insulation, aluminum doors with hang louvers and lockers, glazing windows with mesh screens frames, louvers and vents, interior lights and fittings, equipment and wiring installations, PVC false ceiling sheets in aluminum framing and sealed with silicon and should be non toxic, chemical resistance and water repellent, cables and connection to existing substation No. 1 (SU 0241) and other related civil, mechanical, electrical and instrumentation works. The extent of works shall include but not limited to provide all required laboratory consumables (detergents, soap, paper tissues, cotton, cleaning solution and sponge, big roll tissue papers, etc.) per month for the duration of the contract period.

6. The Contractor shall be responsible to design, supply, install, test, commission and maintenance for the laboratory partition rooms lightings fixtures and network,

fire alarm system, telephone instrument (wall hanged) for each room, connection extension line shall be provided from the new EPBAX which is installed in the MPW Quality Control Center within one (1) year starting from the date of enterprise. Each partition lab room shall have separate extension telephone internal line.

7. The Contractor shall renovate, supply, erect, install, test, commission and maintenance new HVAC system unit not less than (25 tons) with compressor for all laboratory partition rooms only and its related ducting system completely. The HVAC package units shall have a cooling capacity not less than 1.5 times the existing systems. The Contractor shall renovate, supply, erect, install, test, commission and maintenance the ducting system according to the system capacity for the cooling and the ventilation requirements. The new HVAC system unit for the laboratory partition rooms shall be isolated completely from new HVAC system units (2 Nos. x 25 tons) with two (2 Nos.) compressors for MPW Quality control center (Module 10: AB 1044) and its related ducting system completely. All works, specifications and materials shall be subject to the Engineer approval.

8. The Contractor shall study, design, supply, install, test, commission and maintenance for the laboratory partition rooms power supply for new laboratory building from existing modified substation No. 1 (SU 0241) within one (1) year starting from the Date of Enterprise and shall include but not limited to utilities and services (cables, wires, earthling, rods, MCC, electrodes, sensors, etc.).

9. The Contractor shall design, provide, install, test, commission and maintenance for the laboratory partition rooms new emergency lights fixtures sufficient within one (1) year starting from the Date of Enterprise to allow enough illuminators for the movement of MPW staff during the power failure. The emergency light fixtures shall be twin bulb holder type with aluminum reflector, weather proof, industrial type 12 Volt with inbuilt battery 6 x 10 AH and battery charger shall be thorn make or equivalent. The capacity of Bulbs shall be 2 x 35 W. The layout type and the numbers of fixtures shall be approved by the Engineer.

10. The Contractor design, provide, install, test, commission and maintenance for the laboratory partition rooms sufficient smoke and heat detectors in each room as per the KFB approved procedures especially the laboratory rooms within one (1) year starting from the Date of Enterprise and shall be connected to FCAP and sufficient no. of fire alarms (sound & light alarms), bells and shall be installed to alert the guard man and shift operator during any fire condition.

11. The Contractor shall design, provide, install, test, commission and maintenance for the laboratory partition rooms sufficient numbers of fire extinguishers not less than (3 Nos.) as per recommendation of KFB regulations within one (1) year starting from the Date of Enterprise and shall be refilled or inspected by KFB yearly. Also, the Contractor shall consider the approval according to KFB regulations. The Contractor shall provide, install, test, commission and maintenance new fire protection system, cabinet, fire hoses, racks and nozzles, fire detection, alarm system and lightning protection according to KFB regulations. All works and materials shall be subject to the Engineer approval.

12. The Contractor shall design, provide, install, test, commission and maintenance for the laboratory partition rooms sufficient power points in each laboratory partition room.

13. The Contractor shall design, provide, furnish, install, erect, test, commission and maintenance new laboratory furniture to fit chemistry laboratory partition room completely within one (1) year starting from the Date of Enterprise and shall include but not limited to base units, work tops, sinks units (3 Nos.), service fixtures, laboratory chairs (6 Nos.) and laboratory stools as approved by the Engineer. The extent of work shall include but not limited to:

    - Instruments to measure temperature and humidity.
    - High chemical and corrosion resistant epoxy benches.
    - Suspended Cabinets for glass wares.
    - Safety storage cabinets (class 2) with UV light equipment.
    - Safety cabinets for acids and dangerous chemicals.
    - Safety shower and equipments.
    - Safety precaution facilities, tools, cloths and materials (shoes, gloves, rechargeable torch lights, white coats, large First Aid Kits, helmet and other safety materials).
    - Boiler.
    - Oil heater.
    - Burn kit.
    - Insect killer lights with twin tubes (16watts, and 30 cm length with transformer housed in PVC enclosure).
    - A/C split unit (3.5 Tons) with compressor.
    - Burn kit.

14. The Contractor shall design, provide, furnish, install, erect, test, commission and maintenance new laboratory furniture to fit microbiology laboratory partition room completely within one (1) year starting from the Date of Enterprise and shall include but not limited to base units, work tops, sinks units (3 Nos.), service fixtures, laboratory chairs (6 Nos.) and laboratory stools as approved by the Engineer. The extent of work shall include but not limited to:

    - Instruments to measure temperature and humidity.
    - High chemical and corrosion resistant epoxy benches.
    - Suspended Cabinets for glass wares.
    - Safety storage cabinets (class 2) with UV light equipment.
    - Safety cabinets for acids and dangerous chemicals.
    - Safety shower and equipments.
    - Safety precaution facilities, tools, cloths and materials (shoes, gloves, rechargeable torch lights, white coats, large First Aid Kits, helmet and other safety materials).
    - Boiler.
    - Oil heater.
    - Burn kit.
    - Insect killer lights with twin tubes (16watts, and 30 cm length with transformer housed in PVC enclosure).
    - A/C split unit (3.5 Tons) with compressor.

15. The Contractor shall design, provide, furnish, install, erect, test, commission and maintenance new laboratory furniture to fit storage laboratory partition room completely within one (1) year starting from the Date of Enterprise and shall include but not limited to:

    - Instruments to measure temperature and humidity.
    - High chemical and corrosion resistant epoxy benches.
    - Suspended Cabinets for glass wares.

- Safety storage cabinets (class 2) with UV light equipment.
- Safety storage cabinets for acids and dangerous chemicals
- Steel shelves.
- Safety precaution facilities, equipments, tools, cloths and materials (shoes, gloves, rechargeable torch lights, white coats, large First Aid Kits, helmet and other safety materials).
- Oil heater.
- Insect killer lights with twin tubes (16watts, and 30 cm length with transformer housed in PVC enclosure).
- A/C split unit (3.5 Tons) with compressor.

16. The extent of works shall include but not limited to all related civil, mechanical, electrical and instrument works as approved by the Engineer.

2. Laboratory Equipments and Devices:

1. The Contractor shall provide, test and commission new laboratory equipments and devices within one (1) year starting from the Date of Enterprise and shall include but not limited to the following minimum new laboratory equipments and devices requirements. The Contractor shall be obligated to submit operation and maintenance manuals in accordance to manufacturers and fulfill other requirements of new laboratory equipments and devices and shall not have the right to claim for compensation in time or cost. The extent of works shall include but not limited to all related civil, mechanical, electrical and instrument works. All new laboratory equipments and devices shall be subject to the Engineer approval:

Laboratory Equipments and Devices			
Item	**Description**	**Unit**	**Qty**
A	**Microbiology**		
1	Analytical Balance with calibration unit and special table for accurate weight	No	1
2	Top loading balance	No	1
3	Autoclave	No	1
4	Oven	No	1
5	Colony Counter	No	1
6	Distillation unit - water still	No	1
7	Filtration unit	No	1
8	Fume hood	No	1
9	Hot Plate	No	1
10	Incubator	No	1
11	Magnetic Stirrer	No	1
12	Microscope with digital camera	No	1
13	Microscope, Camera and Television	set	1

14	Stirrer with hot plate	No	1
15	Sieve Shaker	No	1
16	Vacuum pump	No	1
17	Gas Burner GAS PROF 1 - MICRO	No	1
18	Portable colony counter	No	1
19	Laboratory glassware washing machine	No	1
20	Water bath	No	1
21	pH meter with probe and all accessories, sensor, membrane, calibration kit, etc.	No	1
22	Lab-line environ shaker	No	1
B	**Chemistry**		
1	Atomic Absorption Spectrophotometer	No	1
2	Automatic sampler	No	1
3	Air pump	No	1
4	BOD Unit with Incubator	No	1
5	Analytical Balance with calibration unit and special table for accurate weight	No	1
6	Blender	No	1
7	COD Reactor , Hatch	No	1
8	Conductivity Meter with salinity measurement	No	1
9	De-ionizer	No	1
10	Desiccator's cabinet	No	1
11	Glassware drier	No	1
12	Heating mantles - 250 ml capacity	No	1
13	Heating mantles - 500 ml capacity	No	1
14	Safety cabinet	No	1
15	Kjeldahl Distillation Unit (Automatic Titration)	No	1
16	Kjeldahl Digestion Unit	No	1
17	Muffle furnace	No	1
18	Oven	No	1
19	Spectrophotometer - Hatch DR (complete test kit)	No	1
20	Orbital Shaker	No	1
C	**Portable Equipment**		
1	Ultra meter II instrument for temperature, pH, conductivity and TDS	No	1
2	Milwaukee Turbidity Meter for Turbidity test	No	1
3	HACH DR \890 colorimeter + Sulfur reagent set for sulfates test	No	1

4	HACH _HS-C#25378-00,Hydrogen sulfide test kit for H_2S test	No	1
5	HACH _DR\890 colorimeter + Amber Reagent set for Ammonia test	No	1
6	HACH _DR\890 colorimeter +Reactive phosphorus reagent set for phosphorus test	No	1
7	HACH Alkalinity test kit for Alkalinity test	No	1
8	HACH Chloride test kit for Chloride test	No	1
9	HACH DR \890 colorimeter +free chlorine reagent set for free chlorine test	No	1
10	HACH DR \890 colorimeter +total chlorine reagent set for free chlorine test	No	1
11	Reverse Osmosis System Complete with piping, all accessories, storage tank with level controller & online TDS monitoring System with accessories of mounting	No	1
12	Dissolved Oxygen meter with probe and all accessories, calibration kit, stand etc.	No	1
13	Residual Chlorine Photometer, complete with all accessories and DPD tablets, standards etc.	No	1
14	Conductivity meter with probe and all accessories, calibration kit etc.	No	1
15	Portable turbidity meter with all accessories, calibration kit etc.	No	1
16	Digital Burette	No	2
17	Ultrasonic cleaner	No	1
18	Hand Mask for Ammonia	No	4
D	**Accessories for Lab equipment**		
1	Gas Lighter (Gun Type)	No	10
2	Door Gasket	No	2
	Thermostat	No	1
3	Microscope		
a	Halogen Bulb	No	1
b	Conversion Filter	No	1
c	Objective (A=Plan), 10/0.25	No	1
d	Objective (A=Plan), 40/0.65	No	1
e	Objective (A=Plan), 100/1.25 oil	No	1
4	Thermostat for Incubator, Memmert	No	1
5	Thermostat for Autoclave	No	1
6	Kjeldhal Digestion Unit		
a	Digestion tubes	No	4
b	Heating Element	No	4
7	Electrode Probe		

a	Dissolved Oxygen	No	1
b	pH probe	No	1
c	Conductivity probe	No	1
d	Membrane Cap DO Probe	No	1
8	Deionizer -Barnstead , Filters part No. 1.8036 - 2.0803 - 3.5027- 4.5021		
a	Water Stirrer	No	1
b	Heating element	No	1
c	Condensers	No	1
9	Spectrophotometer		
a	Halogen Lamp	No	1
b	Area mat	No	1
c	Cold Trap Flask	No	1
d	9mm Pellet Cell	No	2
e	12 mm Pellet cell	No	2
10	Kjeldahl Distillation Unit		
a	Flasks - 500 ml Capacity	No	4
b	Bulb Steam	No	4
c	Distillate Collecting Bulb	No	4
11	AAS Cathode Lamps		
a	Fe, Mn, Ni, Cr, Zn, Ca, Hg, Cd, Pb, Na, B, Cu, Co, Mo, K and Mg	No	1
b	Ba, Be, Al, V, As, Se and Sr	No	1
12	Regulator , Pressure Gauge	No	1
13	Automatic Titrator Probe		
a	Ammonia	No	1
b	Chloride	No	1
c	Nitrate	No	1
d	Oxygen Dissolved	No	1
e	Silver Sulfide	No	1
f	pH	No	1
14	Settlometer Kit	Pack	1
15	Regular Glass Desiccators	No	1
16	Desiccators Plate	No	1
17	Ammonia Electrode	No	1
18	Hydrometer	No	1

Note:

Complete set of Microscope, Camera and Television (Microbiology equipment) shall include but not limited to the following requirements and subject to the Engineer approval:

- Solid state CCTV system and color monitor 21 inch, graduated mechanical, illumination system provides 6 volts, 20 W tungsten / halogen in base illuminator in both 120 V or 240 V, high quality glass optics to assure clear images and sharp resolution over entire field of view, separate On / Off switch, Rheostat intensity control and illumination indicator light, Achromatic and Panchromatic, engraved serial number, stable, C-shape stand and wide base.

- Accessories and connections: 35 mm camera and photographic accessories with a tri-ocular body, CCTV application a tri-ocular or separate adaptor mount, polarizing accessories, dark field accessories and phase contrast kit.

2. The Contractor shall include supply, test, commission and maintenance these items as minimum requirements and shall be subject to the Engineer approval:

   a. Oil content analyzer for grease and oil experiment.
   b. BÜCHI Scrubber for Organic Nitrogen experiment (4 scrubbers).
   c. Washing face shower as safety precaution including all related fittings and other accessories. (2 Nos.)
   d. Eye protection glasses (12 glasses).
   e. Class (A) of burettes and pipettes and all required glass wares (each 1 Dozen).
   f. Analytical Balance must come with calibration unit and especial table for accurate weight.
   g. Fuel Gas Distribution System.
   h. Laboratory Compressed Air System.
   i. Process Air and Gas Piping.
   j. Power Roof Ventilation.
   k. Laboratory Vacuum System.

3. The Contractor shall be responsible to arrange and conduct complete professional training programs of three (3) months to train MPW staff Microbiologist (5 persons) and Chemist (5 persons) concerning operation and maintenance of new laboratory equipments and devices in accordance to manufacturers and shall include but limited to tests experiments, safety precaution, first aid, reports, sampling and procedures of all lab experiments and analysis and use of laboratory devices and equipments as approved by the Engineer.

   a. The extent of works shall include but not limited to provide Chemist and Microbiologist to monitor and supervise on MPW staff either microbiologist or chemists for the duration of the contract period. MPW staff will run the lab experiments test after training course is completed under supervision of the Contract staff.

   b. The Contractor shall be responsible to provide assign a fully qualified professional staff of the Contractor as technical orientation supervisor during the orientation period.

   c. The Technical Orientation Supervision shall develop and effectively implement a well defined on-the-job orientation program to guide the

learning process of the trainee. The Technical Orientation supervisor shall allow the trainee to progressively practice what he or she has learned to the greatest possible extend and the Contractor shall assume fully responsibility for all work produced by the trainee.

d. Chemistry and microbiological tests shall include but not to the following lab tests and subject to the Engineer approval:

1. Chemical lab tests:

   Temperature, pH value, Transparency, Conductivity, Settleable matter, Total Suspended Solid, Volatile suspended Solid, Sludge Volume (30 min), Sludge Volume Index, Dissolved Oxygen, Chemical Oxygen Demand, Biological Oxygen Demand, Residual (F, and T) Chlorine, Oil and Grease, Sulfide (T & F), Ammonia, Nitrite – N, Nitrate – N, Organic – N, Total Nitrogen, Total Phosphate, Chloride, T.D.S., Sulphate, Chlorine Demand, Alkalinity and Bicarbonate, Heavy Metals, Heavy Metals dry solid, Total Nitrogen content reduce, Total Phosphate reduction.

2. Bacteriological lab tests:

   Total count M.P.N/100 ml (48 hr), Coliform M.P.N/100 ml (24 hr)**,** Fecal Coli M.P.N/100 ml (24 hr), Salmonella M.P.N /100ml (24hr), Fecal Staptcocci M.P.N/100ml (48 hr), Fungi M.P.N/100 ml (144 hr).

3. Microscopic life samples:
   Sarcondina, Pytoflagellates, Zoo flagellates, Free swimming ciliates, Stalked Ciliates, Suctoria, Rotifiers, Worms, Eggs of parasites (with cultivation), Filamentous growth of bacteria (type and category).

3. <u>Laboratory Reagents and Solutions:</u>

The Contractor shall provide, test and commission new laboratory reagents and solutions periodically as specified in below table for the duration of the contract period and shall include but not limited to the following minimum new laboratory reagents and solutions requirements. The Contractor shall be obligated to fulfill other requirements of new laboratory reagents and solutions in according to design specifications and shall not have the right to claim for compensation in time or cost. All new laboratory reagents and solutions shall be subject to the Engineer approval. The Contractor shall be responsible for obtaining MPW approval prior to the start the execution of the works:

Example:

1	S-diphenyl carbazone (diphenyl carbazone) (100gm)	1 Bottle	/ 4 months

Item 1 means:

The Contractor shall provide, test and commission one (1) Bottle of laboratory reagent and solution S-diphenyl carbazone (diphenyl carbazone) (100gm) periodically every 4 months for the duration of the contract period.

Item	Description	Unit	Quantity
	Laboratory Reagents and Solutions		
1	S-diphenyl carbazone (diphenyl carbazone) (100gm)	1 Bottle	/ 4 months
2	Xylene Cyanol ff (100gm)	1 Bottle	/ 4 months
3	Mercuric Nitrate (500 gm) or Mercuric Nitrate solution (1 N) (6 Amb/Box)	1 Bottle	/ 6 months
4	Sodium Nitroprusside (100 gm)	1 Bottle	/ 6 months
5	Tri Sodium Citrate (Alkaline Citrate) 500 g	1 Bottle	/ 6 months
6	Sulfamic acid (100 gm)	1 Bottle	/ 6 months
7	Acetic Acid (2.5 L)	1 Bottle	/ 4 months
8	Ethyl Alcohol (2.5 L)	1 Bottle	/ 2 months
9	Hydrochloric acid (2.5 L)	1 Bottle	/ 4 months
10	TTC(2,3,5 Triphenyl -Tetra zolium Chloride (25 g)	1 Bottle	/ 6 months
11	Media -M-Endo Agar (1 kg)	1 Bottle	/ 3 months
12	Media- MFC Agar (1 kg)	1 Bottle	/ 3 months
13	Media Nutrient Agar (500 g)	1 Bottle	/ 3 months
14	Media SS Agar (1 kg)	1 Bottle	/ 3 months
15	Media: Membrane Enterococuss Agar (1 kg)	1 Bottle	/ 3 months
16	K.F Agar (500 gm) Fecal Staptococci	1 Pack	/ 3 months
17	Wort Agar (1 kg)	1 Pack	/ 3 months
18	Di Potassium Hydrogen -O-Phosphate (AR) (500 g)	1 Bottle	/ 3 months
19	Glycerol AR (4 L)	1 Bottle	/ 6 months
20	Potassium Iodide AR (500 g)	1 Bottle	/ 6 months
21	Potassium Dihydrogen Orthophosphate (500 g)	1 Bottle	/ 4 months
22	Sodium Thiosulfate (500g)	1 Bottle	/ 4 months
23	Peptone (Bacteriological) (500 g)	1 Bottle	/ 3 months
24	Xylene solution (cleaning microscope) (1 L)	1 Pack	/ 6 months
25	Immersion oil for microscope	1 Pack	/ 6 months
26	Rosalic Acid (100 g)	1 Bottle	/ 3 months
27	Chloroform (500ml)	1 Bottle	/ 3 months
28	Acetone (4 L)	1 Bottle	/ 6 months
29	Cotton	2 Rolls	/ 3 months
30	Magnesium Chloride Hexa Hydrate (500 g)	1 Bottle	/ 3 months
31	Sodium Di-hydrogen phosphate monohydrate (500 g)	1 Bottle	/ 3 months
32	Tryptone (500 g)	1 Bottle	/ 6 months
33	Methyl red (100 g)	1 Bottle	/ 6 months
34	Ammonium Acetate (500 g)	1 Bottle	/ 12 months
35	Ammonium Hydroxide (2.5 L)	1 Bottle	/ 6 months
36	Ammonium Molybdate (500 g)	1 Bottle	/ 12 months

37	Boric Acid (500 g)	1 Bottle	/ 2 months
38	Calcium Chloride (500 g)	1 Bottle	/ 3 months
39	Carmine (500 ml)	1 Bottle	/ 6 months
40	Mercuric Sulfate (100 g)	1 Bottle	/ 4 months
41	Nitric Acid (2.5 L)	1 Bottle	/ 4 months
42	1, 10 Phenanthroline (5 g)	1 Bottle	/ 4 months
43	Sodium Hydroxide (500 g)	1 Bottle	/ 4 months
44	Sulfuric Acid (2.5 L)	1 Bottle	/ 4 months
45	Aluminum Chloride, 6-Hydrate Pure (500 g)	1 Bottle	/ 12 months
46	Ammonium Chloride (500 g)	1 Bottle	/ 3 months
47	Bromothymol Blue Water Soluble (5 g)	1 Bottle	/ 4 months
48	Bromocresol green Water Soluble (5 g)	1 Bottle	/ 4 months
49	Di Sodium Hydrogen - O- Phosphate AR (500 g)	1 Bottle	/ 3 months
50	Ferric Chloride 6 - Hydrate AR (500 g)	1 Bottle	/ 3 months
51	Ferric Sulfate 7- Hydrate AR (500 g)	1 Bottle	/ 3 months
52	Ferric Indicator Solution (100 Ml)	1 Bottle	/ 6 months
53	Ferric Ammonium Sulfate AR (500 g)	1 Bottle	/ 6 months
54	Iodine 0.I.N. Ampoule (6/Box)	1 Box	/ 12 months
55	Manganese Sulfate, 4 H_2O AR (500 g)	1 Bottle	/ 6 months
56	Mixed Indicator (500 ml)	1 Bottle	/ 12 months
57	Oxalic acid 2- Hydrate AR (2.5 L)	1 Bottle	/ 12 months
58	Phenolphthalein solution , 1% (250 ml)	1 Bottle	/ 6 months
59	Phenol Red 0.02 % Sol.(100 ml)	1 Bottle	/ 4 months
60	Phenol Red, Sodium Salt (25 g)	1 Bottle	/ 6 months
61	Potassium Bromide AR (500 g)	1 Bottle	/ 4 months
62	Potassium dichromate AR (500 g)	1 Bottle	/ 4 months
63	Potassium Chloride AR (500 g)	1 Bottle	/ 6 months
64	Sodium Carbonate Anhydrous (500g)	1 Bottle	/ 6 months
65	Sodium Chloride (500g)	1 Bottle	/ 6 months
66	Sodium Sulfate Anhydrous AR (500g)	1 Bottle	/ 4 months
67	Sodium Tetra Thionate (500 g)	1 Bottle	/ 6 months
68	1,1,1 Trichloro-Ethane (2.5 L)	1 Bottle	/ 4 months
69	Sodium Benzoate (500 g)	1 Bottle	/ 6 months
70	Phosphoric acid concentrated AR (2.5 L)	1 Bottle	/ 6 months
71	Benzene (1 L)	1 Bottle	/ 6 months
72	Bromophenol Blue (100 g)	1 Bottle	/ 6 months
73	Calcium carbonate (500 g)	1 Bottle	/ 6 months
74	calcium oxide (500 g)	1 Bottle	/ 6 months

75	Carbon Tetrachloride (0.5 L)	1 Bottle	/ 4 months
76	Copper Sulfate (500 g)	1 Bottle	/ 6 months
77	Eriochrome black 'T' Indicator (100 g)	1 Bottle	/ 6 months
78	Ethylene d-amine tetra acetic acid (EDTA) (500 g)	1 Bottle	/ 6 months
79	Hydrogen peroxide (0.5 L) AR (30%)	1 Bottle	/ 2 months
80	Magnesium Sulfate (500 g)	1 Bottle	/ 6 months
81	Methylene Blue (100 g)	1 Bottle	/ 6 months
82	Methyl Orange Indicator (25 g)	1 Bottle	/ 4 months
83	Perchloric acid (500 ml) (70%)	1 Bottle	/ 6 months
84	Potassium Carbonate (500 g)	1 Bottle	/ 6 months
85	Potassium hydroxide (500 g)	1 Bottle	/ 6 months
86	Potassium nitrate (500 g)	1 Bottle	/ 6 months
87	Potassium permanganate (500 g)	1 Bottle	/ 6 months
88	Silver Nitrate or $AgNO_3$ (1 N)	1 Bottle	/ 6 months
89	Sodium bicarbonate (500 g)	1 Bottle	/ 12 months
90	Sodium Sulfite (500 g)	1 Bottle	/ 12 months
91	Nitrogen gas	1 Cylinder	/ 4 months
92	Hydrogen gas	1 Cylinder	/ 4 months
93	Helium gas	1 Cylinder	/ 4 months
94	Acetylene gas	1 Cylinder	/ 4 months
95	Nitrous oxide gas	1 Cylinder	/ 4 months
96	Liquid Nitrogen gas (35L)	1 Cylinder	/ 4 months
97	Air cylinder	1 Cylinder	/ 4 months
98	Phenol	1 Kit	/ 6 months
99	Atomic Absorption Standard Solutions		
a	Aluminum Nitrate	1 L	/ 6 months
b	Arsenous Oxide	1 L	/ 6 months
c	Boron Standard	1 L	/ 6 months
d	Cadmium Nitrate	1 L	/ 6 months
e	Calcium Nitrate	1 L	/ 6 months
f	Chromic Nitrate	1 L	/ 6 months
g	Cobalt Nitrate	1 L	/ 6 months
h	Copper Nitrate	1 L	/ 6 months
i	Lead Nitrate	1 L	/ 6 months
j	Mercury Nitrate	1 L	/ 6 months
k	Magnesium Nitrate	1 L	/ 6 months
l	Manganese Nitrate	1 L	/ 6 months
100	Nickel Nitrate	1 L	/ 6 months

101	Potassium nitrate	1 L	/ 6 months
102	Sodium Nitrate	1 L	/ 6 months
103	Zinc Nitrate	1 L	/ 6 months
104	Electrode chemicals		
a	Sulfide antioxidant buffer (4/pkt)	1 L	/ 4 months
105	pH electrode chemicals		
a	pH buffer 4.01	1 L	/ 6 months
b	pH buffer 10.01	1 L	/ 6 months
106	Electrode filling sol.	1 L	/ 6 months
107	Electrode storage sol.,475 ml	1 No	/ 6 months
108	Bismuth Sulphite Agar (500 g)	1 Bottle	/ 6 months
109	Aluminum Standard Solution 100 mg/l	1 L	/ 12 months
110	ECR Reagent Powder (50 pillow / packet)	1 packet	/ 2 months
111	Hexa Methlene Powder (50 pillow / packet)	1 packet	/ 2 months
112	ECR-Masking Reagent	1 L	/ 2 months
113	Arsenic Standard Solution 1000 mg/l	1 L	/ 12 months
114	Lead Acetate 20 % Solution	1 L	/ 4 months
115	Pyridine	1 L	/ 4 months
116	Silver Di-ethyl Dithio-Carbomate	1 kg	/ 4 months
117	Stannous Chloride	1 L	/ 4 months
118	Zinc Mesh	1 Kg	/ month
119	Borover 3 Powder Pillow (50 pillow / packet)	1 packet	/ month
120	Boron Standard 1000 mg/l	1 L	/ 12 months
121	Buffer Pillow Citrate Type (50 pillow / packet)	1 packet	/ month
122	Di-thiver Metal Reagent (50 pillow / packet)	1 packet	/ month
123	Potassium Cyanide (100 g / packet)	1 packet	/ month
124	Cadmium Standard Solution 1000 mg/l	1 L	/ 12 months
125	Chloride Standard Solution 1000 mg/l	1 L	/ 12 months
126	Ferric Iron Solution	1 L	/ month
127	Mercuric Thiocyanate Solution	1 L	/ month
128	DPD-Free Chlorine Reagent Powder Pillow (50 pillow / packet)	1 packet	2/6 months
129	Chlorine Standard Solution	1 Ampoules	/ month
130	Color Standard 500 pt.-Co. Unit	1 L	/ 12 months
131	Acid Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
132	Chromaver-3 Chromium Reagent (50 pillow / packet)	1 packet	/ month
133	Chromium -1 Reagent (50 pillow / packet)	1 packet	/ month
134	Chromium -2 Reagent (50 pillow / packet)	1 packet	/ month

135	Chromium Trivalent Standard Solution	1 L	/ 12 months
136	EDTA Reagent (50 pillow / packet)	1 packet	/ month
137	Phthalate Phosphate Reagent (50 pillow / packet)	1 packet	/ month
138	PAN Indicator Solution 0.3 %	1 L	/ month
139	Cobalt Standard Solution (1000 mg/l)	1 L	/ 12 months
140	Cuver-1 Copper reagent Powder Pillow (50 pillow / packet)	1 Pillow	/ month
141	Copper Standard Solution 100 mg/l	1 L	/ 12 months
142	Free Copper Reagent Powder pillow (50 pillow / packet)	1 packet	/ month
143	Hydro Sulphite Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
144	Potassium I Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
145	Potassium II Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
146	Potassium III Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
147	Potassium Standard Solution 100 mg/l	1 L	/ 12 months
148	Acid Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
149	Citric Acid Powder Pillow (50 pillow / packet)	1 packet	/ month
150	Molybdate Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
151	Silica Standard (1000 mg/l)	1 L	/ 12 months
152	Sulfaver 4 reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
153	Sulphate Standard Solution	1 L	/ 12 months
154	Sulfide - I Reagent (100 ml)	1 packet	/ month
155	Sulfide - II Reagent (100 ml)	1 packet	/ month
156	Formaline Stock Solution (4000 mg/l)	1 L	/ month
157	Cyclohexane	1 L	/ month
158	Zincover 5 Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
159	Zinc Standard Solution (1000 mg/l)	1 L	/ 12 months
160	Nitraver-3 Nitrite Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
161	Nitraver-5 Nitrite Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
162	Buffer Solution, Hardness Type	1 L	/ month
163	Phenol Reagent 1 Powder Pillow (50 pillow / packet)	1 packet	/ month
164	Phenol Reagent 2 Powder Pillow (50 pillow / packet)	1 packet	/ month
165	Copper Sulfate Powder Pillow (50 pillow / packet)	1 packet	/ month
166	Sulfide Inhibitor Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
167	Potassium Per Sulfate Powder Pillow (50 pillow / packet)	1 packet	/ month
168	PhosVer-3 Phosphate Reagent pillows (50 pillow / packet)	1 packet	/ month

169	Molybdovanadate Reagent	1 L	/ month
170	Phosphate Standard Solution (100 mg/l)	1 L	/ 12 months
171	Ferrover Iron Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
172	Iron Standard Solution (1000 mg/l)	1 L	/ 12 months
173	Rover Rust Mover	1 Kg	/ month
174	Rust Suspension	1 L	/ month
175	Buffer Powder Pillow Citrate Type (50 pillow / packet)	1 packet	/ month
176	Dithiver Metal Reagent (50 pillow / packet)	1 packet	/ month
177	Potassium Cyanide	1 Kg	/ month
178	Lead Standard Solution ,100mg/l	1 L	/ 12 months
179	Alkaline Cyanide	1 L	/ month
180	Ascorbic Acid Powder Pillow (50 pillow / packet)	1 packet	/ month
181	Manganese Standard 1000 mg/l	1 L	/ 12 months
182	Rochelle Salt Solution	1 L	/ month
184	Phthalate Phosphate Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
185	Nickel Standard (1000 mg/l)	1 L	/ 12 months
186	Cyanide -3 Cyanide Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
187	Cyanide- 4 Cyanide Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
188	Cyanide -5 Cyanide Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
189	Buffer Solution PM 40	1 L	/ month
190	Hexanes	1 L	/ month
191	Hexaver Chelating Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
192	Lead Acetate Trihydrate	1 Kg	/ month
193	M-Nitrophenol Indicator	1 L	/ month
194	Sodium Cyanide	1 L	/ month
195	Buffer Sulfate Type Reagent	1 L	/ month
196	Detergent Reagent Powder Pillow (50 pillow / packet)	1 packet	/ month
197	Detergent Standard Solution	1 Ampoules	/ month
198	Alkaline Solution	1 L	/ month
199	Ca+ MG Indicator Solution	1 L	/ month
200	Calcium Standard (50 mg/l)	1 L	/ 6 months
201	Magnesium Standard Solution	1 L	/ 6 months
202	COD -Vials (0-1500 mg/l) (150 / packet)	1 packet	/ month
203	COD -Vials (0-150 mg/l) (150 / packet)	1 packet	/ month
204	1,1,2 trichloro - 1,2,2 trifluroethane (500 ml)	1 Bottle	/ month

205	Sodium bisulfite monohydrate (500 g)	1 Bottle	/ month
206	Silica Gel (500 g)	1 Bottle	/ month
207	p - Dimethyl amino benzaldehyde (100 g)	1 Bottle	/ month
208	Alpha Naphthol (25 g)	1 Bottle	/ month
209	Sodium BoroHydride (500 g / packet)	1 Bottle	/ month
210	Universal Indicator 100 ml	1 Bottle	/ month
211	1-Naphthylamine Hydrochloride	1 Bottle	/ month
212	$AgNO_3$ 0.0141N	1 pack	/ month
213	Al masking reagent sol -ECR	1 Bottle	/ month
214	Alkali sol .for Ca & Mg	1 Bottle	/ month
215	Aluminum chloride solution 6 N	1 Bottle	/ month
216	Aluminum reagent powder	1 Pack	/ month
217	Amino acid reagent powder pillows	1 Pack	/ month
218	Bleach household	1 Pack	/ month
219	Borover 3 powder	1 Pack	/ month
220	Bromocresol green	1 Pack	/ month
221	Bromo-phenol	1 Bottle	/ month
222	Buffer sol - sulfate type	1 Bottle	/ month
223	Clorox	1 Bottle	/ month
224	Chromium acid reagent powder	1 Pack	/ month
225	Cobalt EDTA reagent powder	1 Pack	/ month
226	COD standard solution 1000 mg\L	1 Bottle	/12 months
227	Copper sulfate powder $CuSO_4$	1 Pack	/ 4 months
228	CR(III) Standard solution	1 Bottle	/ month
229	Formaldehyde 37%	1 Bottle	/ month
230	Formazin stock solution	1 Bottle	/ month
231	Glutamic acid	1 Pack	/ month
232	Isopropyl alcohol	1 Bottle	/ month
233	Mn standard solution1000 mg/L	1 Bottle	/ 12 months
234	$NaC_2H_3O_2$	1 Bottle	/ 4 months
235	Nickel 1 reagent powder	1 Pack	/ month
236	Nickel 2 reagent powder	1 Pack	/ month
237	NITRAVER		
a	NitriVer 2 NITRITE REAGENT POWDER PILLOWS	1 pack	/ month
b	NitriVer 6 NITRATE REAGENT POWDER PILLOWS	1 pack	/ month
c	NITROGEN NITRATE REAGENT POWDER PILLOWS	1 pack	/ month
d	NITROGEN,NITRATE STANDARD SOLUTION	1 Bottle	/ month

238	PERTREATMENT KIT	1 Bottle	/ month
239	Petroleum ether	1 Bottle	/ month
240	Phenol ACS	1 Bottle	/ month
241	PHENOL SOLUTION	1 Bottle	/ month
242	Phosphate pre-treatment powder pillows	1 Pack	/ month
243	Potassium Chromate K_2CrO_4 (500 g)	1 Pack	/ 6 months
244	Potassium hydrogen phthalate.KHP	1 Pack	/ month
245	Potassium Sulfate	1 Pack	/ month
246	Sodium Arsenite	1 Pack	/ month
247	Sodium Hypochlorite	1 Pack	/ month
248	Sodium iodide	1 Pack	/ month
249	Sodium NITRITE ACS	1 Pack	/ month
250	Sodium sulfide	1 Pack	/ month
251	Sodium TETRABORATE $Na_2B_4O_7$	1 Pack	/ month
252	Starch indicator	1 Pack	/ month
253	SULFANILIC ACID	1 Pack	/ month
254	Drierite 8 Mesh indicating	1 Bottle	/ month
255	OD vials , High & Low range	1 Bottle	/ month
256	Cadmium Granules	1 Bottle	/ month
257	K_2SO_4	1 Bottle	/ 4 months

4. <u>Laboratory Miscellaneous, Glasses and Plastic Wares:</u>

The Contractor shall provide, test and commission new laboratory miscellaneous, glasses and plastic wares within one (1) year from the date of enterprise and shall include but not limited to the following minimum new laboratory miscellaneous, glasses and plastic wares requirements and specifications. The Contractor shall be obligated to fulfill other requirements of new laboratory reagents and solutions in according to design specifications and shall not have the right to claim for compensation in time or cost. All new laboratory miscellaneous, glasses and plastic wares shall be subject to the Engineer approval. The Contractor shall be responsible for obtaining MPW approval prior to the start the execution of the works:

Item	Description	Quantity
1	**Beakers, Borosilicate glass graduated**	
a	50 ml cap	12 Nos.
b	100 ml cap	5 Nos.
c	250 ml cap	5 Nos.
d	500 ml cap	5 Nos.
e	1000 ml cap	5 Nos.

2	**Bottles with cap, screw neck with cap and clear glass autoclave plastic**	
a	100 ml cap	12 Nos.
b	250 ml cap	5 Nos.
c	500 ml cap	5 Nos.
3	**Burettes**	
a	50 Ml clear glass straight bore, Class A	6 Nos.
4	**Brushes for cleaning glassware's, different sizes**	
a	Flask Brush	12 Nos.
b	Burette Brush	12 Nos.
c	Graduate Brush	12 Nos.
d	Beaker Brush	12 Nos.
e	Rubber Stopper Assortment	12 Nos.
5	Latex rubber tubing ,8 mm 0 x 1.5 mm wall	12 Nos.
6	Vacuum tubing ,6 mm 0 x 5 mm wall	12 Nos.
7	**Automatic Burettes**	
a	50 ml, capacity with 1000 ml reservoir amber bottle	2 Nos.
b	50 ml, capacity with 1000 ml reservoir bottle. clear glass	2 Nos.
c	50 ml, capacity with 2000 ml reservoir amber bottle	1 No.
d	50 ml, capacity with 2000 ml reservoir bottle. clear glass	1 No.
e	25 ml, capacity with 2000 ml reservoir bottle. clear glass	1 No.
8	**Graduated Cylinders with spout, glass BS 604**	
a	25 ml cap	6 Nos.
b	50 ml cap	6 Nos.
c	100 ml cap	6 Nos.
d	500 ml cap	12 Nos.
9	Membrane filter holder, to hold 47 mm diameter filter membrane	4 Nos.
10	**Flasks, conical wide mouth Borosilicate glass**	
a	250 ml cap	12 Nos.
b	500 ml cap	5 Nos.
c	1000 ml cap	4 Nos.
d	2000 ml cap	4 Nos.
11	**Funnels, glass Pyrex**	
a	30 mm diameter, 30 mm stem	5 Nos.

b	50 mm diameter, 50 mm stem	5 Nos.
c	100 mm diameter, 100 mm stem	5 Nos.
12	**Pipettes graduated**	
a	1 ml cap	12 Nos.
b	2 ml cap	12 Nos.
c	5 ml cap	12 Nos.
c	20 ml cap	5 Nos.
d	10 ml cap	5 Nos.
e	25 ml cap	2 Nos.
13	Pipettes container	2 Packs
14	Diluting screw glass caps	12 Packs
15	Small plastic pumps	12 Packs
16	Tissue for microscopic lances (Roth) 21x21 cm	12 Packs
17	**Wash bottles, polyethylene**	
a	250 ml cap	5 Nos.
b	500 ml cap	5 Nos.
c	1,000 ml cap	5 Nos.
18	**Flasks culture media ,Auto cleavable with screw caps, graduated, marking area**	
a	100 ml cap	20 Nos.
b	250 ml cap	20 Nos.
19	Bottles for media 100 ml auto cleavable	20 Nos.
20	Burette stand 33x 18 cm	5 Nos.
21	Filter funnel, s-steel, diff size	5 Nos.
22	Autoclave tape 'sterile 1.9 cm x 55.4 m Roll	5 Rolls
23	**Disposable, Auto cleavable, Bio-hazard bags**	
a	14" x 19" size – (100 / packet)	24 packets
24	**Membrane filters 47mm diameter, 0.45 micron**	
a	pore size, WHATMAN Cat No. - 7184004 – (100 / packet)	12 packets
25	Petridishes, disposable 100 mm sterile (100 / packet)	12 packet
26	Petridishes, disposable 50 mm sterile (100 / packet)	12 packets
27	Gas Cylinders	2 Nos.
28	Forceps, stainless steel, 10 mm	5 Nos.
29	Gloves, Latex, (S) ,(M) ,(L) size – (100 / packet)	12 packets
30	Safety goggles	12 packets
31	Lamp, "National (EFT15E67C.2V)	12 packets

32	Permanent markers, black, red, blue	6 Nos.
33	Pipette filler bulbs	12 packets
34	Natural gas flame burner, 16 cm height	6 Nos.
35	sampling bottles, polyethylene, auto-cleavable	20 Nos.
36	Spatula spoon/ flat	6 Nos.
37	Aluminum foil, "HEAVY DUTY"	12 Nos.
38	**Filter papers WHATMAN QUALITATIVE No. 1**	
a	47 mm (100 / packet)	12 packets
b	90 mm (100 / packet)	12 packets
39	Heavy duty wall mounted paper towel	
a	22.5 cm wide	50 packet
40	Tissue paper, laboratory wipers, 14 "x 19"	50 Rolls
41	KIMWIPES BRAND EX-L -140/box	50 Boxes
42	Liquid soaps	10 Dozen
43	Dettol soaps	10 Dozen
44	Roll Holder	1 Dozen
45	**Cleaning cloth**	
a	76 x 51 cm	2 Dozens
b	56 x 61	2 Dozens
c	51x 51	2 Dozens
d	54 x 46	2 Dozens
46	Cotton wool – (5 kg / packet)	50 packets
47	Safety Station - Shower , Eye \ Face	6 Nos.
48	Face mask disposable – (100 / packet)	36 packets
49	Face shield	6 Nos.
50	FIRST AID KIT (50 persons)	10 Nos.
51	FIRE BLANKET	10 Nos.
52	**Gloves (pairs)**	
a	Non Asbestos	30 Nos.
b	acrylonitrile	30 Nos.
c	P.V.C	30 Nos.
53	Insulated containers 1 L X 6	6 Nos.
54	LABELS	12 packets
55	Self adhesive blank – 600 / pkt	12 pkts

56	Warning labels – 120 /pkt	12 pkts
57	Lab coat (different sizes)	12 Nos.
58	**Loops disposable**	
a	1 micro L	5 Nos.
b	10 micro L	5 Nos.
59	**Microscope slides**	
a	Frosted slides - 100/pkt	12 pkts
b	Hanging slides - 100/pkt	12 pkts
60	Cover slips - 100/pkt	12 pkts
61	Slide marker - 10/pkt	12 pkts
62	Automatic slide dispenser	50 Nos.
63	Optic cleaning kit	50 Nos.
64	micro slide container	50 Nos.
65	Inoculation needle with loop and holder	12 Nos.
66	Forceps 100 mm	12 Nos.
67	Pipette stand with 18 small and 10 large holes	2 Nos.
68	Stirring rode glass -2 15/pkt	12 pkts
69	Safety eye wash bottle 500 ml	12 Nos.
70	Rubber Gloves	12 Nos.
71	Zetex Gloves	12 Nos.
72	Thermometer	5 Nos.
73	Weighing dishes 8/pkt 67/46	12 pkts

74	Weighing paper 76 x 76 mm - 500/pkt	12 pkts
75	Micro pipette Tips (1ml disposable 100/pk)	12 pkts
76	**Bottles, clear Glass, Borosilicate reagent bottle with "Polly stop" stopper**	
a	50 ml cap	5 Nos.
b	100 ml cap	12 Nos.
c	250 ml cap	12 Nos.
d	500 ml cap	5 Nos.
e	1000 ml cap	12 Nos.
77	**Bottles, amber glass, Borosilicate reagent bottle with "Polystop" stopper**	
a	250 ml cap	5 Nos.
b	500 ml cap	5 Nos.
c	1000 ml cap	5 Nos.
78	**Bottles dispensing with top dispensers mounted on bottle with screw necks, amber glass**	
a	Range of dispenser up to 10 ml with 500 ml cap. Bottle	5 Nos.
b	Range of dispenser up to 50 ml with 1000 ml cap. Bottle	3 Nos.
79	Bottles for BOD's 300 ml	20 Nos.
80	Bottles, dropping with polypropylene bulb, 30 ml cap.	5 Nos.
81	Bottle carrier to carry 300 ml bottles for 8 bottles	5 Nos.
82	Buckets plastic 10 litter capacity	5 Nos.
83	Clamps - three prong	5 Nos.
84	Condenser, coil type	5 Nos.
85	**Crucible**	

a	Glass can withstand up to 1200 deg. C, 20 ml cap.	12 Nos.
b	Porcelain, 12 ml cap.	12 Nos.
86	**Cylinder with spout, Polypropylene**	
a	50 ml cap	5 Nos.
b	100 ml Cap	5 Nos.
c	250 ml Cap	5 Nos.
87	Evaporating dishes 150 Ml capacity , pyrex.	12 Nos.
88	Evaporating dishes 320 ml capacity ,	5 Nos.
89	**Filter flask with side arm**	
a	500 ml cap	5 Nos.
b	1000 ml cap	12 Nos.
c	2000 ml cap	5 Nos.
90	**Flasks, conical with ground neck, neck size 24/29**	
a	250 ml cap	12 Nos.
91	**Flasks, volumetric, class A glass**	
a	25 ml cap "Trapezoidal shape	12 Nos.
b	50 ml cap "Trapezoidal shape"	12 Nos.
c	100 ml cap	12 Nos.
d	250 ml cap	12 Nos.
e	500 ml cap	5 Nos.
f	1000 ml cap	12 Nos.
g	2000 ml cap	5 Nos.

92	Buckner funnel	12 Nos.
93	**Funnel polypropylene**	
a	100 mm diameter, 100 mm stem	12 Nos.
94	**Separator funnel**	
a	500 ml cap	12 Nos.
b	1000 ml cap	12 Nos.
95	**Pipettes, " ONE MARK"**	
a	1 ml cap	12 Nos.
b	2 ml cap	12 Nos.
c	5 ml cap	12 Nos.
d	10 ml cap	5 Nos.
e	20 ml cap	5 Nos.
f	25 ml cap	5 Nos.
g	50 ml cap	5 Nos.
96	Test tubes -100/pkt	12 pkts
97	**Watch glass**	
a	75 mm diameter	5 Nos.
b	100 mm diameter	5 Nos.
c	150 mm	5 Nos.
98	Gas washing bottle, Pyrex 125 ml cap.	5 Nos.
99	Quartz curette for U.V. spectra - 2/pkt	20 pkts
100	Storage bottle, polyethylene	12 pkts

101	(HDPE) 50 litter cap	5 Nos.
102	Filters, glass fiber, WHATMAN GF/C -100/pkt	12 pkts
103	Grease tube silicone. 50 gm	12 Nos.
104	Rubber tubing 8 mm int. thick wall (50' coil)	12 Nos.
105	Anti-bumping glass beads - 250/ grams	5 pkts.
106	M-Torque , A -Torque paper	60 Rolls
107	Carts, chemicals & glass ware	12 Nos.
108	Clamps, different types	24 Nos.
109	Sterile pads - 50/pkt	12 pkts
110	Glass cutting knife for Borosilicate glass	12 Nos.
111	Glass cutting knife diamond mount	12 Nos.
112	Lubricating grease	12 Nos.
113	rubber grease soft	12 Nos.
114	Rubber grease medium	12 Nos.
115	Silicone grease	12 Nos.
116	Apiezon grease for glass	12 Nos.
125	Mortar & pestle	12 Nos.
126	Stands, base diff. size	12 Nos.
127	Stop Clock	12 Nos.
128	Test-tube stand- steel	12 Nos.
129	Tongs	12 Nos.
130	Tripod stand, 200 mm	5 Nos.

131	Tubing diff. diameter - 5m/pkt	12 pkts
132	Wall charts	12 Nos.
133	Erlenmeyer Flask, 1,000 ml	12 Nos.
134	Graduated Cylinders ,Plastic : 1L	5 Nos.
135	Graduated Cylinder for SVI, 1L	5 Nos.
136	**Stirring Bars**	
a	12mm x 8 mm	5 Nos.
b	25mm x 8 mm	5 Nos.
c	50mm x 8 mm	5 Nos.
137	Funnels, Top Diameter 80 mm	5 Nos.
138	**Beakers, Polypropylene**	
a	500 ml	5 Nos.
b	1000 ml	5 Nos.
139	Carboy , Polypropylene , w \ Spigot	5 Nos.
140	**Erlenmeyer Flask**	
a	125 ml	12 Nos.
141	Aluminum weigh dishes	5 pkts
142	Weigh bottles	12 Nos.
143	Acid bottles	12 Bottles
144	Acid dispensing burette	12 Nos.
145	Glass burette funnels	5 Nos.
146	Glass wool	5 Nos.

147	Cadmium reduction column	12 Nos.
148	Oven Lighter	12 Nos.
149	Ice Bucket	12 Nos.
150	Eppendorf Pipette	5 Nos.
151	VWR Marco automatic adjustable pipette 0-5 ml	5 Nos.
152	VWR Marco automatic adjustable pipette tips	5 Nos.
153	T.T. Racks	12 Nos.
154	Tubing stretcher	12 Nos.
155	DI cartridge holder	12 Nos.
156	DI cartridge	12 Nos.
157	Apron	12 Nos.
158	Oven size- baker‘s secret	5 Nos.
159	Blue Ice Packs	5 Nos.
160	Whirl - Pac Bags 5 - 1/2 x 9	12 Nos.

5. <u>Laboratory Chemicals Supplies:</u>

The Contractor shall supply, test and commission the following other laboratory chemicals supplies listed below within the last six (6) months of the contract period as approved by the Engineer:

Description	Quantity
ACETONE	2.5 L
ALKALI SOLUTION FOR HARDNESS HACH CAT No.22417 – 32	5 BOTTLES
AMMONIUM CHLORIDE	1 Kg
ARGON GAS CYLINDER	4 NOS
AMINO ACID REAGENT FOR PHOSPHATE HACH CAT NO. 1934 -32	5 BOTTLES
BORIC ACID	1 Kg
CALCIUM CHLORIDE	250 gm

CALCIUM AND MAGNESIUM SOLUTION FOR HARDNESS HACH CAT NO. 22418 – 32	5 BOTTLES
DI – POTASSIUM HYDROGEN ORTHO – PHOSPHATE	1.5 Kg
DI – SODIUM HYDROGEN ORTHO – PHOSPHATE	500 gm
EGTA SOLUTION FOR HARDNESS HACH CAT NO -22297 – 26	5 BOT
EDTA SOLUTION FOR HARDNESS HACH CAT NO -22419 – 26	5 BOT
FERROUS AMMONIUM SULPHATE	1.5 Kg
FERRION INDICATOR	1 LIT
FERRIC CHLORIDE	250 gm
FREE CL_2 POWDER PILLOWS HACH CAT NO .14077 – 99	600 PIL
GLASS MF FILTER PAPER 47 DIA MM NO. 934 – AH	3500 CIR
DPD FREE CHLORINE REAGENT FOR 10mL SAMPLE	36 box (50 ampule packet)
DPD TOTAL CHLORINE REAGENT FOR 10mL SAMPLE	20 packet
GLUCOSE (BOD 5. STD) REAGENT GRADE	500 gm
GRAPHITE TUBE FOR ATOMIC APSORPTION VARIAN PART NO. 63 -100011 -00	6 NOS
ISOPROPYLE ALCHOHOL	1.5 L
MERCURY SULPHATE	750 gm
METHYL ORANGE INDICATOR	25 gm
MOLYBDATE REAGENT	5 BOT
FOR PHOSPHATE HACH CAT NO. 2236 -32	5 BOT
CHLORINE STANDARD SOLUTION	1000 mg/l
MAGNESIUM SULPHATE	250 gm
NITROGEN INHIBITOR REAGENT GRADE 2 (CHLORO 6. TRICHLORO MEITRYL PYRIDINE) (HACH) AVAILABLE FROM HACH CAT NO. 2533	5 gm
NITRAVER 5 NITRATE REAGENT POWDER PILLOWS HACH CAT NO. 14034 -99	500 PIL
NITRAVER 3 NITRATE REAGENT POWDER PILLOWS HACH CAT NO. 14065 -99	500 PIL
POTASSIUM DICHROMATE	500 ml
POTASSIUM HYDROGEN ORTHO PHOSPHATE	1.5 kg
PH BUFFER 7	1 L
PH BUFFER 4	300 ml
PH BUFFER 10	600 ml
POTASSIUM CHROMATE	250 gm
PHENOLPTHELIN INDICATOR POWDER	250 gm
POTASSIUM NITRITE	250 gm
POTASSIUM SULFATE	250 gm
POTASSIUM HYDROGEN PALTALATE COD. STD CERTIFIED A. C. S. ($HOCOC_6H_4COOK$)	250 gm
POTASSIUM CHLORIDE	250 gm
ROUND FILTER PAPER 18.5 CM MEDIUM	2000

FLOW	CIRCLES
SILVER SULFATE	250 gm
SODIUM HYDROXIDE	1.5 kg
SILVER NITRATE AMPOULES 0.0282 N	22 AMPULES
SULFAVER 4 SULFATE REAGENT POWDER PILLOWS HACH CAT NO 12065 – 99	500 PILLOWS
SULFIDE 1 REAGENT HACH CAT NO .1816 – 37	5 BOT
SULFIDE 2REAGENT HACH CAT NO .1817- 32	5 BOT
SODIUM NITRITE	250 gm
SODIUM SULFIDE	250 gm
TOTAL CL_2 REAGEN POWDER PILLOWS	600 PIL
1-1-1- TRICHLORO ETHANE	15 L
ACETIC ACID	2.5 L
AMMONIUM ACETATE	500 g
AMMONIUM HYDROXIDE	2.5 L
AMMONIUM MOLYBDATE	500 g
HYDROCHLORIC ACID (HCL)	2 BOTTLE
ETHYL ALCOHOL	2.5 L
SODIUM SULFITE Na_2SO_3	1 BOTTLE
NITRIC ACID	2 BOTTLE
SODIUM HYDROXIDE	1000 g
SODIUM THIOSULFATE	500 g
POTASSIUM SULFATE	1 BOTTLE
Copper (II) Sulfate	1 BOTTLE
BARIUM CHLORIDE	500 g
SULFURIC ACID STANDARD SOLUTION 19.2N CAT	2 BOTTLES
ERIOCHROM BLACK	100 g
POTASSIUM IODIDE	500 g
CHLOREX	1 BOTTLE
MAGNESIUM CHLORIDE HEXA HYDRATE	500 g
SODIUM ETHANOATE	1 BOTTLE
MAGNESIUM CHLORIDE	1 BOTTLE
TRICHLORO FLUORO ETHANE	2.5 L
N-HEXANE	1L
ETHANOL	2 BOTTLE
NUTRIENT AGAR	1.0 kg
S.S. AGAR	1.0 kg
M.F.C BROTH	1.0 kg
WORT AGAR	1.0 kg
BRAIN HEART INFUSION AGAR	1.0 kg
ENDO AGAR	1.0 kg
KF STREPTOCOCCUS AGAR	1.0 kg
COVER SLIPS	2000 NOS.
SLIDES	2000 PCS
MEMBRANE FILTER PAPER	600 PCS
PETRIDISHES	600 PCS
S.P.DISCARDING BAGS	25 PCS
ALUMINIUM FOIL	1 PKT
LENSE PAPER	1 PKT
COTTON	12 ROLLS

Index
Document 2- III
Part C - Particular Requirements

Section D: <u>Partial Operation and Maintenance works at Ardiya Sewage plant</u>

Clause 1: Partial Operation works at Ardiya Sewage plant.

Clause 2: Partial Maintenance works at Ardiya Sewage plant:

A. Maintenance works of mechanical and electrical equipments, Instrumentation, air conditioning units, office equipments, laboratory equipments, exterior and outdoor lightings poles and networks, furniture, utilities, services and other related works.

B. Civil Maintenance works.

C. Landscaping, Plantation and Irrigation works.

Clause 1: Partial Operation works at Ardiya Sewage plant

The price fixed for this item is lump sum and shall include all personnel engineers, supervisors, drivers, manpower and labors, machineries, equipments, pumps, materials, supplies, fuels, grease, oil, consumables, transportation, tools or implements, temporary accommodations and furnishings, and generally for all means used for the fulfillment of the contract requirements which he undertakes to provide on site to carry out the works completely within the contract period. The Contractor shall minimize nuisances and work in a safe manner but not limited to all the following works and subject to Engineer approval:

i) <u>General:</u>

1. The Contractor shall be fully responsible for controlling not to interrupt the continuous flow through the header tank which received the tertiary treated effluent water from Rikka sewage treatment plant, then pump treated effluent from Ardiya treatment plant to DMC (Data Monitoring Center), Rabya farms and irrigation network on site. The Contractor must make all necessary arrangements to ensure flows are maintained in a safe manner.

1. The Contractor shall provide operators (4 Nos.) with skill labours (4 Nos.) to partial operation of Ardiya sewage treatment plant in three (3) shifts per day for the duration of one (1) year period after renovation works are completed.

2. The Contractor shall provide all necessary safety personnel materials and equipments, lightings, precaution against fire, excavation support and protection, safety signs, and temporary power supply for proper completion of the work.

3. The Contractor shall be responsible for maintaining and rectification of all damaged utilities and other services affected during the works at no extra cost.

4. The Contractor shall provide all necessary material, lightings, safety signs and temporary power supply for proper completion of the works.

5. The Contractor shall be responsible to register readings from the flow meters hourly and prepare records of operation period for all existing and new pumps.

6. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

ii) **Description of the works:**

1. The Contractor shall be fully responsible for the operation of remaining existing effluent transfer pumps (3 Nos.) and remaining existing surge vessels (4 Nos.) in the new pumping station of zone area (2) with all related mechanical and electrical equipments for the duration of one (1) year period after renovation works at Ardiya sewage plant are completed to pump tertiary treated effluent wastewater from the header tank to DMC (Data Monitoring Center) as approved by the Engineer.

2. The Contractor shall be fully responsible for the operation of new Rabya Pumps (3 Nos.) in the new pumping station of zone area (2) with all related mechanical and electrical equipments for the duration of one (1) year period after renovation works at Ardiya sewage plant are completed to pump tertiary treated effluent wastewater from the header tank to Rabya farms as approved by the Engineer.
3. The Contractor shall be fully responsible for the operation of the new landscaping irrigation system in the new pumping station of zone area (2) with all related mechanical and electrical equipments for the duration of one (1) year period after renovation works at Ardiya sewage plant are completed to irrigate the existing landscaping area, new landscaping zone area (1) and EAD (Environmental Affair Department) located outside and adjacent to Ardiya sewage plant as approved by the Engineer. The water source shall be effluent treated wastewater from the header tank at Ardiya sewage plant and shall be mixed with fertilizers.

4. The extent of works shall include but not limited to proper operation of other related facilities, mechanical and electrical equipments, instruments and shall include but not limited to new dewatering pumps (2 Nos.), electrical supply panel and control room equipment, surge tanks compressors and compressors motors, pressure vessels, readings of flow meters, alarm system, fire protection system and all other related parts.

Clause 2: Partial Maintenance works at Ardiya Sewage plant

The price fixed for this item is lump sum and shall include all personnel engineers, supervisors, drivers, manpower and labors, machineries, equipments, pumps, materials, supplies, fuels, grease, oil, consumables, transportation, tools or implements, temporary accommodations and furnishings, and generally for all means used for the fulfillment of the contract requirements which he undertakes to provide on site to carry out the works completely within the contract period. The Contractor shall minimize nuisances and work in a safe manner but not limited to all the following works and subject to Engineer approval:

i) <u>General:</u>

1. The Contractor shall execute all the works as specified in the contract requirements in conformance with the Sanitary Engineering General Specifications (2002), General Specifications for Buildings and Engineering Works (1990), Roads administration, General specifications for Kuwait Motorway (2004) and other latest editions of the codes, ordinances, rules and regulations of Ministry of Public Works, EPA (Environment Public Authority) regulations and other Governmental authorities.

2. The Contract shall submit request of inspection of all required activities works in according to contract requirements for approval by the EPA and the Engineer.

3. The Contractor shall be responsible for maintenance and rectification of all damaged utilities and other services affected during the works at no extra cost.

4. The Contractor shall require work concurrently in different locations to execute all contract requirements on time.

5. The Contractor shall consider all information of appendices as a part of contract requirements. However, these appendices are considered as guidance only and do not covers all requirement of the works. it is the Contractor responsibility to visit all the sites and conduct full survey during the period of tendering to determine all the components of works calls by the contract and as directed by the Engineer. The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

6. The Contract shall submit request of inspection of all required activities works in according to contract requirements for approval by the EPA and the Engineer.

7. The Contractor shall provide all necessary safety personnel materials and equipments, lightings, safety precaution against fire, fencing, signs for proper completion of the work.

8. The Contractor shall co-operate, co-ordinate and not interfere his operations with all other parties or Contractor's executing works on sites / or adjacent to his sites.

9. The Contractor shall be responsible to provide adequate mobile diesel generators to be available on demand for electricity loading required to execute the works without any interruption for the works.

10. The cost of the above mentioned requirements will be borne by the Contractor and shall deem to have allowed for the same in the total price of this contract**.** The Contractor shall not have the right to claim for compensation in time or cost.

ii) <u>Description of Works:</u>

A. <u>Maintenance works of mechanical and electrical equipments, Instrumentation, air conditioning units, office equipments, laboratory equipments, exterior and outdoor lightings poles and networks, furniture, utilities, services and other related works:</u>

1. The Contractor shall be fully responsible for the proper maintenance and repair or if required replace of the existing and new mechanical and electrical equipments, instruments, air conditioning units and lightings fixtures and networks of zone area

(1) facilities starting from the Date of Enterprise for the duration of the contract period as approved by the Engineer and shall include but not limited to MPW Quality control centre furniture and equipments, laboratory furniture, equipments and devices, guard house furniture and equipments, substation (SU 0241), mosque, office equipments, street lightings, safety equipments, outdoors lightings, main entrance gate, conveyor rod nearby main gate, EPABX central telephone system and extension lines, fire protection system, fire detection, alarm system, lightings and power system, electrical renovation works required to EAD (Environmental Affair Department), motors, pipe works, water pipelines, drains, etc. and all other fitting and accessories, utilities and services (cables, wires, earthling, rods, MCC, electrodes, sensors, etc.), lightings fixtures and networks, emergency lightings, doors with lockers, windows with mesh screens, power roof ventilation system, mechanical and electrical installations, fire alarm system, HVAC system, smoke and heat detectors, fuel gas distribution system, laboratory compressed air system, process air and gas piping, laboratory vacuum system and all related mechanical, electrical and instrumental works as approved by the Engineer.

2. The extent of works shall include but not limited to calibration of existing and new equipments and devices of zone area (1) facilities and shall include but not limited to laboratory equipments and devices, safety equipments, gas detectors devices, alarms, pumps in automatic modes, pressure gauges, fire and smoke detectors and other instruments on daily basis to get accurate data readings.

3. The Contractor shall be fully responsible for the proper maintenance and repair or if required replace of the new mechanical and electrical equipments, instruments, air conditioning units and street and outdoor lightings poles and networks of zone area (2) facilities for the duration of one (1) year period after renovation works are completed as approved by the Engineer and shall include but not limited to substation (SU 0641), effluent transfer pumping station (PS 0633), remaining effluent transfer pumps (3 Nos.) and remaining surge vessels (4 Nos.), irrigation pumps (Rabya Pumps (3 Nos.), landscaping irrigation Pumps (2 Nos.), dewatering Pumps (2 Nos.), electrical supply Panel and control room equipment, surge tanks compressors and compressors motors, pressure vessels, flow meters, alarm system, fire protection system, fire detection, telephone extension lines, HVAC system, smoke and heat detectors, lightings and power system, emergency lightings, back entrance gate, utilities and services, safety equipments, motors, pipe works, suction and discharge valves, non-return valves, valves actuators, pressure gauges, drains, etc. and all other fitting and accessories.

4. The extent of works shall include but not limited to calibration of new equipments and devices of zone area (2) and shall include but not limited to flow meters, safety equipments, gas detectors devices, alarms, pumps in automatic modes, pressure gauges, fire and smoke detectors and other instruments on daily basis to get accurate data readings.

5. The Contractor shall provide, install, test, commission new original spare parts for the prompt repair and maintenance of the mechanical and electrical equipments, instruments, air conditioning units and lightings fixtures and networks, instruments, air conditioning units and other related required spare parts. All replacement spare parts shall be original parts from the original equipment supplier or manufacturer.

6. The Contractor shall make all necessary arrangements to ensure the continuous supply of spare parts and materials and the rate of supply of these materials shall be in such quantities and accounts as would ensure uninterrupted operation.

7. Where spare parts, materials or equipment are manufactured under license, the Contractor shall submit an assurance obtained from the Company that owns the original design (principle manufacturer) addressed to the Employer, confirming the safety of the design. At the same time, the owners of such designs shall confirm that the produced equipment is in good condition and in accordance with said designs.

8. All equipment or parts, thereof, instruments or materials shall be delivered to the site in their original packages and shall be easily identified without the necessity of unpacking them. All packages shall bear the name and brand of the manufacturer.

9. The Contractor shall obtain and submit to the Engineer the Guarantee, Certificate or Warranty furnished by the manufacturers and suppliers and such Guarantees or Certificates shall be supplementary to, and not in lieu of the Contractor's own Guarantee and shall in no way invalidate the latter. If any defects or faults are not made good by the Contractor within a reasonable time, the Employer may proceed to do the work at the Contractor's risk and expense.

10. If any defects or faults shall appear in any items of equipment which necessitates complete replacement of such item, the Guarantee period in respect of the item so replaced shall be extended for a further period of one year from the date of satisfactory replacement thereof. If any defect appears to be a systematic defect, all equipment of the same make shall be replaced by the Contractor at his own cost.

11. The Contractor shall not install any parts or materials before receiving the written approval of the Employer.

12. The Contractor shall guarantee in writing to the Employer that all mechanical and electrical parts will be suitable for their intended use. The Contractor shall extend warranty for all materials, as per contract document.

13. The Contractor shall provide oil, grease and other lubricants of the specific quality required for each separate piece of equipment. Follow manufacturer's recommendations regarding the selection of lubricants.

14. The Contractor shall provide gas, diesel, and other fuels necessary for the maintenance services.

15. The Contractor shall replace all filters at intervals recommended by the equipment manufacturers and shall clean filters at monthly intervals.

16. The Contractor shall provide all solvents, cleaning agents, brushes, paint and similar items as necessary for the care of equipment in accordance with the manufacturer's preventive maintenance and routine maintenance instructions.
17. The Contractor shall provide and install adequate and ample storage facilities and shall safeguard all spare parts and other maintenance items.

18. The Contractor shall provide all tools and equipment necessary to perform the maintenance services. These shall be returned to the Employer at the end of the contract period and shall be returned in good condition. In addition, should the Contractor require additional or replacement tools or equipment for the performance of maintenance services, he shall procure and perform the maintenance services at his own expense.

The minimum list of tools, test equipment and accessories to be provided by the Contractor for electrical work is as follows:

a. Relay tester for current relays 0 - 30 Amps.
b. Relay tester for voltage relays 0 - 220 volts
c. Megger 500V/1000V
d. Digital Avometer 0-600 1-10A
e. Digital Clamp meter 0-600V, 0-1000 Amp (Multi range type)
f. Electric Blower / Drier
g. Electric Vacuum Cleaners
h. Complete set of hand tools
i. Battery Voltage tester
j. Hydrometers
k. Earth Tester
l. Portable battery charger 12V/24V
m. Neon Tester 6.6KV
n. Multi gases detector
o. H_2S gas detector

19. The maintenance service and repair works to be conducted and provided by the Contractor involves preventive maintenance, corrective maintenance and troubleshooting works comprising of general maintenance, overhaul, repair and emergency maintenance and calibration of entire equipments, instrumentation, air Conditioning units, lightings networks and other related parts. All electrical materials, spare parts, maintenance and repairs works must comply with the latest edition of MEW regulations for installation in buildings. The Contactor must submit for approval samples, specifications, catalogues, maintenance program and technical details for repairs to Engineer.

20. The extent of work shall include but not limited to lubrication, calibration, checking fuel and distilled water, recharging gas, cleaning from dust, testing, inspecting all fans, compressors, motors wiring, switches, controls and protection devices, calibrating, adjusting, lubricating, checking of tightness of all connections, cleaning the body and casing, charging, cleaning filters. Replace worn-out drain lines, replace fuses, bulbs, fittings and make the necessary modifications if required. Maintenance of various types of electrical circuit breakers, contact switches, rectifiers, inverters, relays, motor control panels, electrical protection devices, batteries, lighting system etc.

21. The Contractor shall be responsible to submit to the Engineer and execute the preventive maintenance program works that occur at continuous frequencies for the duration of the contract period according to manufacturer recommendation of the existing and new mechanical and electrical equipments of zone area (1) facilities starting from the Date of Enterprise and new mechanical and electrical equipments of zone area (2) facilities for the duration of one (1) year after renovation works are completed as approved by the Engineer. However, the Engineer shall have the right to revise the said preventive maintenance program works at any time during the contract period and make any changes to the program.

22. The extent of works shall include but not limited to the following maintenance and repair works:

a. Routine and preventive maintenance of various type of electrical panels and switchboard including circuit breakers, contactors switches, rectifier, relays, motor control panel, protection device, batteries, battery chargers, lighting network and fitting and emergency lighting system , etc.

b. Overhauling calibration, testing of electrical protection devices such as, (but not limited to) over current relays, under voltage relays, earth fault relays, flash over relays, phase sequence relays combined safety switches, etc.

c. Maintenance and repair works required to HVAC package units, A/C split units, window A/C including replacement of damaged parts, ducts equipment and fittings as well as charge of refrigerant gases etc., and all other works deemed to be necessary to maintain the A/C systems and units in good working orders as instructed by MPW Engineer. The A/C systems in operation the Contractor shall carry on the maintenance program (but not by limitation) as follows.

1. Seasonal checking preparation of the equipment for operation with sufficient period before the operation of the equipment. This shall be done once before summer season.

2. Preventive maintenance as per approved schedule including cleaning of filters, charging gas, checking belts etc.

3. Starting and operation of the equipment whenever required by the Engineer during the period of the Contract. However, the Contractor shall check periodically the unit to ensure their operation. The Contractor should ensure that the equipment after starting will continue to run without interruption from faults or defect resulting from bad maintenance.

4. Maintenance and service of the equipment shall include all the necessary repairs and replacement of all the defective parts whether mechanical or electrical. The Contractor shall also look after the air distribution system related to the equipment and the electrical installation components starting from and including the switch fuse controlling the unit.

5. The Contractor shall supply all necessary spare parts and material he may find required to the proper maintenance procedures of the A/C systems and units, such material shall include (but not by the way of limitation), instruments, tools, cleaning chemical, refrigerants, oil, greases, rags and all other necessary items to carry out the work.

d. Maintenance of street Lights works shall include but not limited to chokes, capacitors, holders, capacity wiring, lamps, covers, connectors, distribution boards, photo cell for auto operation as per existing numbers of poles, etc.

23. The Contractor shall provide all supplies which shall include all consumables, perishable, dispensable and miscellaneous items including office supplies, spare parts, lubricants, fuel, safety supplies, cleaning supplies, canteen supplies, and similar items required for completion of the maintenance services on monthly basis as approved by the Engineer for the duration of the contract period. The extent of works shall include but not limited to provide all required

consumables (office equipments, laboratory, safety materials, toilets and ablution, kitchen, cleaners, etc.) for the duration of the contract period as directed by the Engineer. The extent of works shall include but not limited to supply and store of on site the following consumables first aid medicines, oil, grease, lubricants, gas, fuses, diesel, cotton waste cleaners, refill gas for AC (Freon gas), gas pipes related to laboratory, gas cylinders, distilled water, paints, oil seals, packing, washers, bolts, sleeves, O-rings, nuts, dry batteries, rust removals, filters, fans, screws bolts, drill bits silicones, rubbers, sanitary materials, welding electrodes, fasteners and all wearable parts such as gland packing, packing pushers, gaskets rubber parts, bulbs, safety consumables (gloves, gas masks, etc.) required for the proper maintenance and repair works for the duration of the contract period.

24. The Contractor shall provide, install, test, commission and maintenance all required spare parts and materials to maintain and repair office equipment or furniture as approved by the Engineer for the duration of the contract period.

25. The Contractor shall maintain and repair all new guard house equipments and furniture, mosque equipments, carpet and high sound speaker system to recall prayers, main gates, rod conveyor and shall include but not limited to provide all necessary spare parts and materials to maintain and repair damaged and defected equipments or furniture without any delay for the contract duration.

B. <u>Civil Maintenance works</u>:

1. The Contractor shall be fully responsible for the proper civil maintenance works of zone area (1) facilities for the duration of the contract period and shall include but not limited to main front entrance gates, main guard house (AB 1041), mosque (AB 1043), MPW Quality Control Center including laboratory partition rooms (AB 1044), substation (SU 0241), main roadways, internal roadways and parking areas as approved by the Engineer.

2. The Contractor shall be fully responsible for the proper civil maintenance works of zone area (2) facilities for the duration of one (1) year period after renovation works are completed and shall include but not limited to substation No. 6 (SU 0641), second stage contact tank (Module 06: CT 0612) or header tank, inlet and outlet channels of header tank, by-pass channel to sea which is connected to outlet channel of header tank, effluent transfer pumping station (Module 06: PS 0633) or new pumping station.

3. The Contractor shall be fully responsible for the proper civil maintenance works of wastewater pumping station (PS 0931) concrete structure, valves , pumps and equipments, main sewer pipelines and manholes within the boundary area of the perimeter fence, main storm water drainage system within the boundary area of the perimeter fence, Internal sewer pipelines and manholes of zones areas (1 & 2) connected to main sewer pipeline or wastewater pumping station (PS 0931), Internal storm water drainage system of zones areas (1 & 2) connected to main storm water drainage system and other related facilities starting from the Date of Enterprise for the duration of the contract period as approved by the Engineer.

4. The extent of works shall include but not limited to clean and flush unlimited depth of manholes, sewers and pipelines completely, remove wastewater, sludge, sand, gravels and other contaminants completely of zones areas (1 & 2), cart away to a tippers off the site, transport and dispose to dumping area outside the site to

unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval. Metals and frames covers of manholes and hatch boxes shall be cleaned and sand blast to remove any corrosion product and paint with two coats of coal tar paints.

5. The Contractor shall be fully responsible for the proper civil maintenance works of the perimeter chain link fence (800 m + 440 m + 800 m + 440 m) with barbed wires completely and other related facilities for the duration of the contract period as approved by the Engineer.

6. The Contractor shall be fully responsible to clean all buildings (MPW Quality Control Center centre, substations SU 0241 and SU 0641, mosque, guard house, new pumping station) and shall include but not limited to scraping, sand blasting and removal of dust out of exterior walls of buildings, cleaning with detergents and power sweeper all buildings floors daily, cleaning office equipment daily, cleaning with detergents toilets, ablution facilities and kitchens daily, cleaning windows, doors and furniture daily, vacuum clean mosque carpet daily and all other areas on site as directed by the Engineer.

7. The Contractor shall include but not limited to clean and remove sand accumulated on the roadways and internal roadways of zones areas (1 & 2) using sand power sweeper, clean and remove cutting grass, dust, rubbish and debris daily accumulated on site including foot pathways, parking shelters, interlocking tiles, inner and outer sides areas accumulated nearby the perimeter fence and cart away to a tippers off the site to approved areas by legal authorities and municipality. The extent of work shall include but not limited to provide mobile containers to remove debris, garbage, cutting grass, dust, pruning trees and disposed off site to approved areas by the Municipality.

8. The extent of works shall include maintenance of all buildings (MPW Quality Control Center centre, substations SU 0241 and SU 0641, mosque, guard house, new pumping station) civil structures but not limited to repair of walls, roofs, slabs and other concrete surfaces, treatment and repair of cracks and joints leakages, cure of damaged concrete surfaces, making good irregularities and defects including expansion and other joints, corrective measures to ensure water tightness, replacing defective joints and water-stops.

9. The extent of works shall include maintenance of all buildings (MPW Quality Control Center centre, laboratory partition rooms, mosque, guard house, new pumping station) waste drainage sewer system, plumbing system, kitchen and toilets fixture, but not limited to sanitary fittings, joints and other related connections, valves, pipes, sanitary pipelines and manholes.

10. The extent of works shall include but not limited to repair or if required replace wood doors, lockers, stoppers, handles, louvers, frames, aluminum doors (single and double), roller shutter doors, glazed aluminum windows with mesh screens, all types of floor ceramic tiles, all exposed piping and other surfaces, exterior brick, exhaust fans, boilers, gas ovens, curtains, toilets and kitchen plumbing, sanitary fixtures and fittings, ventilation system, toilets fixtures, ceiling roof, roof insulation, drainage system and other related works of zones areas (1 & 2).

11. The extent of works shall include but not limited to painting of all buildings of zones areas (1 & 2) including parking areas to be carefully executed with clean

brushes and in the best manner and applied strictly in accordance with the manufacture's instructions. All paints, stains, varnishes shall be well stirred before use and thinned only in accordance with manufacturer's recommendations. Painting of exterior work shall not be carried out in wet, dusty or foggy weather and interior work shall not proceed in dusty conditions. The paint finish to internal walls shall be emulsion paint. The Contractor shall paint buildings (inside and if applicable outside) once in a year during the Contract period and repaint all equipment and piping once during the Contract. All woodwork and gypsum board assemblies shall be prepared to a fine clean finish by scraping or sanding all made dust free immediately before painting and coating. Plaster shall be clean, dry and free from loose to materials. All fixed ironmonger except hinges shall be removed before painting fixed on completion. Holes and cracks shall be cut back and solidly filled, allowed to dry and rubbed down smooth.

12. The extent of work shall include but not limited to repair or if required replace all defective or damaged pipelines completely due to collapse, deflection and failure of pipelines, junction fitting among pipelines, intersection joints connection among pipelines and manholes. The Contractor shall be responsible to carry out a CCTV (Closed Circuit Television) survey to inspect all pipelines sections and identify the damaged, collapse, deflection and failure of pipelines.

13. The extent of works shall include but not limited to maintenance of all buildings (MPW Quality Control Center centre, substations SU 0241 and SU 0641, laboratory partition rooms, mosque, guard house, new pumping station) smoke and heat detectors especially the laboratory partition rooms, fire alarms (sound & light alarms), fire protection system, cabinet, fire hoses, racks and nozzles, fire detection, fire extinguishers as per recommendation of KFB regulations. Fire extinguishers shall be refilled or inspected by KFB yearly.

14. The Contractor shall be responsible for the maintenance of asphalt and internal roadways and other related finishing civil works of zones areas (1 & 2). The works shall be executed in conformance with the requirements of the latest editions of the codes and regulations of "Roads administration, General specifications for Kuwait Motorway".

C. <u>Landscaping, Plantation and Irrigation maintenance works</u>:

1. The Contractor shall be responsible for the preventive and maintenance of the existing and new landscaping areas of zones areas (1 & 2) starting from the Date of Enterprise for the duration of contract period and shall include but not limited watering, gardening, mowing and trimming grass, pruning trees, paving, cultivating, seeding and replanting dried trees. The extent of works shall include but not limited to remove dried trees off the site and replant grown trees in different locations as approved by the Engineer.

2. The extent of works shall include but not limited to provide, irrigate and commission adequate irrigation water manually for trees, vines, shrubs, flowers, grass, plants, etc. of existing zones areas (1 & 2) using water tankers and hoses starting from the Date of Enterprise for the duration the contract period until the commissioning of the new landscape network irrigation system to provide an adequate irrigation water for the existing and new landscaping zones areas (1 & 2) and EAD zone area after renovation works are completed and shall include but not limited to trees, vines, shrubs, flowers, grass, plants, etc.

3. The extent of works shall include but not limited to cut and remove dried trees off the site within the boundary area of the fence perimeter (800 m + 440 m + 800 m + 440 m) as approved by the Engineer starting from the Date of Enterprise for the duration of the contract period, transport and dispose to dumping area outside the site to unlimited distances locations areas in the state of Kuwait in a legal manner and in accordance to the regulations of the authorities, municipality, EPA and Engineer approval.

4. The extent of works shall include but not limited to cut, remove, replant and commission of the existing grown trees within the boundary area of the fence perimeter (800 m + 440 m + 800 m + 440 m) into different locations as approved by the Engineer and shall include but not limited to watering, gardening, mowing and trimming grass, pruning trees, paving, cultivating, seeding, etc..

5. The extent of works shall include but not limited to preventive and maintenance of new irrigation network system for the duration of one (1) year period after renovation works are completed and shall include repair or if required replace all required defective spare parts and pumps but not limited to PVC main irrigation pressure pipelines and fitting for water distribution, polyphone tubes and micro tubes, nozzles, heads, sub-lateral irrigation lines, drip emitters with single and multi outlets, rotary impact sprinklers, gate valves, quick couplers and vacuum breakers, reducers, T-connection pipe, union connection, elbow, solenoid valve, screen filter, valve boxes, pop up spray sprinklers, fertilizer injector, station controllers, Y-strainers and other related spare parts and materials that kept the system in good condition.

SPECIAL SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Project Information Management Software System (PIMSS)

B. Project Web site

C. Project Web Cameras and Video Servers

D. Local Area Network and Devices

E. Software(s)

F. Engineering Workstations, Laptop computers, Servers, Printers, Plotters, Scanners and Un-interruptible Power System(s)

G ADSL - Internet Connectivity

1.02 REFERENCE STANDARDS

A. ISO 82045-5..... Document management -- Part 5: Application of metadata for the construction and facility management sector

B. BS ISO 12006-2…. Building construction. Organization of information about construction works. Framework for classification of information

C. ISO/TR 19033.. Technical product documentation -- Metadata for construction documentation

D. ISO/IEC 24762… Information technology -- Security techniques -- Guidelines for information and communications technology disaster recovery services

E. IEEE 1062..... Recommended Practice for Software Acquisition

1.03 QUALITY ASSURANCE

A. Requirements of the following organisations shall be conformed to, as appropriate:

1. Codes, ordinances, rules and regulations of the State of Kuwait and its lawful enforcement agencies.
   a. Ministry of Communications, Kuwait
   b. Ministry of Electricity and Water
   c. Ministry of Information

2. International Standards Organisation

B. Works covered by this Section shall be executed by a PIMSS specialist, engaged in the installation and maintenance of PIMSS as primary business for at least three (3) years immediately preceding years in Kuwait and approved for the purpose by relevant governmental agencies.

C. Descriptions of the software and hardware components stated in the tender documents are intended to define functional requirements of an acceptable system, integral with the whole of the Contract. These shall not be interpreted

outside that context and the Contractor shall, in his tender, highlight and allow for alterations / modifications to the system or the system components; which in his opinion are necessary to accomplish the intended purpose.

D. PIMMS supplied shall have local agent(s) certified by manufacturer(s) to maintain the equipment during its Period of Operation.

E. Materials and fieldwork required to complement PIMSS are included in this Section. Additional software and hardware shall be provided as appropriate; subsequent to system commissioning.

F. PIMSS shall be installed by competent installers trained by software vendor and under the supervision and guidance of a PIMSS specialist as appropriate.

G. Computer equipment / system components shall conform to the requirements of FCC regulation Part 15 Section 15 governing radio frequency, electromagnetic interference and be so labelled.

H. Where it is intended to integrate PIMSS with external systems software and hardware used shall be compatible with such systems. Alternatively compatibility shall be ensured by using appropriate adapters and the like, at no additional cost.

I. Products are listed in specifications for the purpose of defining the requirements and shall be construed to mean or approved equal. Alternatives submitted for approval shall be identical in function and performance.

1.04 SUBMITTALS

Three (3) copies of the following shall be submitted under provisions of the General Conditions of Contract. These, being a critical part of the job, shall be prepared in a professional manner and submitted in one or more file(s) / book(s) each (A4 size open flat files or hardbound volumes), if single volume will limit it's use.

A. Project Documentation (Stage I - Preliminary); to be submitted within ONE (1) month from the date of enterprise: Job specific volume containing the following in separate sections with indexes. Sections not submitted shall be marked with the date by which that section will be supplied. One set of these documents shall be maintained at site at all times.

1. Functional Description: Overall system tasks and functioning. Separate sheet for each PIMSS.

2. Similarly, overview of the Project Website and listing of the different areas on a site map and their functions.

3. Web cameras specifications and descriptions of all salient features associated with the systems and how still photo and video data is interfaced with the PIMSS and/or the website in an easy to understand format

4. Drawings: Supplied in plastic drawing covers and clipped into the volume, containing:
   a. Schematic diagrams of the location of all hardware and system components.
   b. Network layout showing how all equipment in a. is connected by wired network and specific names and IP address of all equipment in a.
   c. Backup schedule of all system data.
   d. Website sitemap

5. A customized bi-lingual user manual containing all common PIMSS functions and usage procedure for the designated personnel is to be

submitted to for Engineer's / Engineer's Representative's (Supervising Consultant) for approval and distribution to all users.

B. PIMSS Manual (Stage II - Final); to be submitted prior to the completion of implementation of PIMSS and the website. This volume shall contain the latest revisions of sections of Stage I, along with the following; approval of which by the Engineer shall be a pre-condition for approval of PIMSS installation.

1. Workflow Charts: A complete set of flow charts, describing the agreed upon routing workflows for all document types.
2. Protocol for deciding the routing of previously undecided Project Information Items.
3. File and folder naming schema for all each Project Information Item and its revision and each Electronic Document Format shall be enumerated.
4. A hardcopy of training manual for all classes of users.
5. Hardcopy of the Project Web site and Web camera user manual in English/Arabic.
6. User list and their system access levels

1.05 SYSTEM DESCRIPTION: The system shall be designed in compliance with relevant ISO guidelines in respect of system protocol. It shall generally include and perform; but not limited to the following.

A. Project Information Management Software System (PIMSS) shall be Internet enabled/based . Related hardware shall be microprocessor based, complete in all respects and capable of executing functions called for in respect of the various systems listed in this specification.

1. Capable of ensuring that all Project Information Items (see Glossary 1.06) is mediated through, centrally organized, stored, tracked, and is accessible online / electronically 24 hours a day and 7 days a week with a 99% uptime.

2. Collaboration and document movement between Stakeholders made possible by configurable routing of all Project Information Items. Once an agreed upon workflow for a particular document type like RFIs, is configured PIMSS shall automate the routing of these and other related construction documents and drawings.

3. The exact workflows for each of the standard construction documents shall be decided in consultation with the Engineer and Engineer's Representative and approved workflows are to be available online. Changes to approved document routing workflow can only be made on approval of Engineer and Engineer's Representative.

4. Summary status of all project information items in any of the document routing workflows shall also be available online for example the number of pending RFIs. Security of approvals given to documents shall be ensured in PIMSS by tracking and logging of documents. For example when an RFI was sent through PIMSS the computer IP address and user details must be tracked and logged for review.

5. Reporting of project progress parameters such as budgeted and actual costs and time, change orders, project resource tracking and locations and other key performance indicators in agreement with the Engineer and Engineer's Representative in an executive summary dashboard from which further details can be obtained.

6. Start of implementation of PIMSS shall be within two weeks of the Date of Enterprise and shall be completed within two months from Date of Enterprise. PIMSS and related hardware such as servers **(minimum 400 users or in accordance with the size and nature of the contract and subjected to the approval of the engineer)**, workstations, laptops computers, fiber optical networking, ADSL internet service etc.. subject to the approval of Engineer's Representatiove shall be provided and maintained in functional condition during the period of construction, operation and handing over the project site. If the system be needed beyond this time; instructions will be issued by the Engineer and fair recompose awarded to the Contractor.

7. Implementation and use of PIMSS does not entitle the Contractor to disregard legal contractual obligations and responsibilities in the Contract Documents. Hard copies of all documents and drawings that have legal content / import shall be made and delivered against receipt from recipients.

8. PIMSS, required hardware (**Minimum 300 users or in accordance with the size and nature of the contract and subjected to the approval of the engineer**) and redundant ADSL internet access shall be supplied, installed, maintained and training shall be given in the use of PIMSS:
   a. For all designated staff of the Engineer whether located at site or at the MPW Head Office.
   b. For all designated staff of the Engineer's Representative whether located at site or at the GC Head Office.
   c. For all project staff of the Contractor whether located at site or at their Head Office.
   d. 50-users will be reserved and assigned for item "a" and "b" for their use.

9. The system must be capable of storing, indexing and viewing all Electronic Document Formats. Any other project information item / contract related documents shall be capable of being stored, transmitted, backed up and managed through this system.

10. Project information items and linked information entered into the PIMSS shall be updated at least once every 4 hours.

11. The access security to PIMSS hardware and software must be permission based and shall be controlled by the Contractor. It is his responsibility to ensure that it is secure from internal or external unauthorized access. PIMSS shall also maintain accountability through auditing, and detailed tracking of document history in log files which shall be accessible to the Engineer and Engineer's Representative.

12. Access to the servers, workstations and laptop computers supplied for use with the PIMSS system must be secured either by fingerprint or other biometric scanning to ensure that the system is being used only by the designated user.

13. Access to signature used for electronic approval must be via biometric access or digital signatures. The system administrator must have no direct access to Engineer's and Engineer's Representative digital signature / biometric fingerprint.

14. PIMSS shall include a version control function that preserves a record of all document revisions. Users can track and manage multiple document versions, add comments, and send notifications when new versions are created.

15. The system configuration shall be such that the user is able to work with documents and drawings without being unreasonably slow. All supplies (DVD, CD, printing cartridges, toner**,** ink, paper etc.) and accessories required to use the equipment on the project shall be supplied by the contractor. Maintenance of these in working condition is also part of the Contractors responsibility.

16. Backup of all data in PIMSS and the public website in section 1.03 must be done on a daily basis and shall be a full backup or a differential backup daily for 6 days of the week and a full backup every 7th day. Two copies of the full weekly backup must be maintained. One copy of the backup shall be stored in a 4 hour fire-proof safe on site and the other copy of all the data must be deposited as specified by the Engineer or Engineer's Representative. Training in restoring this backup must be given to the Engineer and Engineer's Representative to allow for examination of contents and logs that have been stored in the backup.

17. At the end of the Period of Operation, DVD(s) containing all the information at project closure shall be supplied. This DVD shall also contain an offline viewer. The system shall be password secured. It shall replicate the same permissions as the PIMSS. Two copies of this DVD(s) shall be supplied one each for the Engineer and the Engineer's Representative. No further copies of this DVD(s) are to be given to anyone else.

B. Web server and Database software(s), data, programming and updating as appropriate to establish a publicly accessible web site on the internet. Site will contain essential project information as decided by the Engineer.

C. Web cameras and Digital video Server system containing at least four (4) numbers installed at designated site locations and capable of the following functions.

1. Capable of monitoring the site in real time day and night,
2. Location movable to allow remote inspection of all critical construction operations.
3. Capable of being moved to new locations and connected to the PIMSS.
4. Video server capable of High Speed Recording and Playback of all web cameras 30fps per camera.
5. Can be operated and viewed remotely over the Internet from designated Workstations and Laptops provided to the Engineer / Engineer's Representative.

D. The network setup must be based on a domain model with appropriate security access to users based on the requirements of the Engineer and Engineer's Representative. Any change in any user's system security access must be approved by the Engineer and/or Engineer's Representative..

E. Licensed software to edit, view and print all Project Information Items and all Electronic Document Formats are to be provided for the workstations supplied to the Engineer and Engineer's Representative.

F. A Broadband internet data link with redundancy with 24 hour and 7 days connectivity and a guaranteed uptime of 99% must be provided exclusively for the Engineer and Engineer's Representative and other PIMSS designated users at the site offices of the Engineer and Engineer's representative and MPW and GC offices.

1.06 GLOSSARY OF TERMS USED

Broadband	High data capacity, two-way link between an end user and access network suppliers capable of supporting voice, data and full-motion, interactive video applications and shall be minimum 10 Mbps.
Electronic Document Formats	PDF, DWG, DWF, DOC, DOCX, XLS, XLSX, PPT, DGN, MPP, JPG, TIFF, PNG, P3, PSD, TXT, RTF and other Microsoft and Adobe formats.
DRAM	Dynamic Random Access Memory
DWF	Drawing Web Format, which is a compressed DWG output format suitable for printing, redlining and mark-up and display on websites
DWG	AutoCAD binary drawing format
DXF	Drawing Exchange format for AutoCAD which is a human readable version of DWG
Data	Drawings, Documents, RFI, transmittals and all other contract related information managed by PIMSS.
I / O	Input / Output
IP	Internet Protocol version 4
On Line	State when a data on a network is available for I/O.
Engineering Workstation	Computer hardware and software combination that can be connected to the PIMSS via a wired and wireless network to I/O data.
PIMSS	Project Information Management Software System
Project Information Items	Comprises all contact drawings, revised and/or additional design drawings, all shop drawings, materials and equipment listings, submittals, transmittals, RFIs, meeting minutes, change orders, correspondence between Stakeholders and all other standard reporting items prescribed in the contract documents.
RAM	Random Access Memory
PDF	Portable Document Format from Adobe systems is used to view documents from many software programs without having those programs installed.
Period of Operation	Starting from the Date of Enterprise till the Date of Substantial completion plus three months as certified by the Engineer.
Stakeholders	Comprises Engineer and his project personnel, Engineer's Representative (Supervising Consultant) and his personnel and Contractor and his project personnel.

Software Licence	Include any form of document or agreement, which may limit the client's use of the software resident in the PIMSS
UPS	Un-interruptible Power System
Uptime	Amount of time within a 24 hour period a system is active or available for servicing requests

PART 2 - PRODUCTS

2.01 GENERAL

A. Acceptable Manufacturers for PIMSS
1. Autodesk, USA
2. Primavera Systems, Inc., USA
3. Newforma, USA
4. Meridian Systems, USA
5. Approved alternatives / substitutions under provisions of the General Conditions of Contract

B. Acceptable Manufacturers for Web camera
1. Earthcam Inc., USA
2. Axis Communications, Sweden
3. Lumenera Corporation, USA
4. Approved alternatives / substitutions under provisions of the General Conditions of Contract

2.02 ENGINEERING WORKSTATION / LAPTOP

A. Hardware: This shall be the minimum configuration for a desktop (tower case) and Laptop computer.

1.	Processor…….	Intel Core2 Duo / or AMD Turion
2.	RAM……..	2 GB RAM
3.	Hard Drive…….	1 # 250 GB
4.	Floppy Drive…….	3½ Inch, 1.44 MB
5.	CD ROM / DVD…….	48 X CDRW-DVD Combos, 32 Bit Sound
6.	Backup Device……..	DVD Writer
7.	Sound Card……..	32 Bit with 25 W Speakers
8.	Display Card …….	256 MB Onboard DRAM
9.	Network card …….	100/1000Mb Half/Full Duplex Auto-Negotiation
10.	Wireless network card….	802.11G compatible with 128bit encryption
11.	Communication Ports……	2 # Serial, 1 # Parallel, 6 # USB 2
12.	Video Display…….	17 Inch LCD
13.	Keyboard…….	103 Key Enhanced, Programmable
14.	Pointing Device…….	Microsoft Serial /USB Mouse
15.	Accessories……..	Mouse Pad, 7 # Rewritable DVDs, 2GB USB removable drive, Transparent Dust Covers, Power / Printer Cables

B. When an engineering workstation/laptop is being used for drawing mark-up / document / spread-sheet creation purposes and other similar functions, which may not be directly related to the PIMSS aspects of the system, it shall continue to monitor, display and enunciate warnings / pop ups upon their occurrence.

C. Wide-format colour scanners (A0 size) and Engineering workstations and laptops with Windows XP/Vista dual boot operating system are to be provided to the designated staff of the Engineer and the designated staff of the Engineer's Representative at convenient locations.

D. Originals of software used in the PIMSS, Engineering Workstations, Laptops, Website and Web camera shall be furnished to the Engineer in a Compact Disk, along with operating Keys like license number and CD key.

E. Each engineering workstation/laptop shall have a clock, which shall not be affected by power failure and which shall be synchronised with real time clocks in other engineering workstation/laptops.

F. Server for **400 users (or in accordance with the size and nature of the contract and subjected to the approval of the engineer)** to be provided subject to the approval of Engineer's Representative.

2.03 WEB CAMERA

A. Wide Angle outdoor web camera with the following capability:

1. Focal length of at least 30 to 250mm (equivalent in 35mm camera) and light sensitivity of 0.5 lux
2. At least 10x optical zoom capable of at least 6 Megapixel images
3. Capable of operating in temperatures of at least - 2 to 60 degrees Celsius.
4. Capable of Time lapse photography
5. Capable of General Streaming Video
6. Remote controllable with Pan, Tilt and Zoom.

B. Camera to be housed in IP 65 rated camera enclosure.

C. 4 web linked cameras in 4 locations to be specified by Engineer's Representative. Web cameras output will be of 2 types - photos and live stream video.

D. Live stream video shall be viewable via password protected web interface. Capable of simultaneous viewing by **20** users**(or in accordance with the size and nature of the contract and subjected to the approval of the engineer**). Video data to be linked to Digital Video Recording Server or other mechanism to allow Engineer's and Engineer's representative designated personnel to monitor site activity and review activity on any given day.

E. Photo output to Project website updated everyday.

2.04 WEB SITE

A Contractor is to setup a Project website for public to access via Internet and containing essential project data, perspectives, drawings and site photos. Content on site will be subject to the approval of the Engineer.

B Website must have redundant hardware backup to maintain an uptime of 99%.

2.05 PRINTERS, SCANNER and DISPLAY ACCESSORIES

A. Laser printer with the following characteristics.

1. Capable of printing A3 size documents in colour or black and white
2. Duplex printing capable.

3. Resolution of 600 dots per inch (dpi)
4. Paper tray capable of holding at least 250 sheets
5. Manual paper feed with provision for feeding smaller than A4 items of stationery e.g. envelopes
6. Minimum printing speed of 12 full pages of text per minute
7. Cartridge toner system which shall be simple to remove and replace
8. Compatible with printer drivers supplied with the PIMSS engineering workstation/laptop.
9. Capable of supporting all functions available on all software installed on the PIMSS engineering workstation/laptop.

B. SCANNER

Flat bed scanner with latest model selected and approved by an Engineer's Representative.

C. PROJECTOR AND SCREEN:

Latest Model of Projector and its fixed screen selected and approved by an Engineer's Representative.

D. Flat Screen TV- 42"

Latest Model of Flat Screen TV- 42" selected and approved by an Engineer's Representative. (to be located in Meeting room or Reception area decided by Engineer's representative)

The Engineer will select the item A,B,C and D for the project and contractor will make the necessary payment and carryout all work described above. The total cost of these four items will not exceed KD 3,000 (Kuwaiti Dinars three thousand only)

2.06 UN-INTERRUPTIBLE POWER SYSTEM

A. Packaged, floor mounted type capable of maintaining the following equipment, for a period of 20 minutes. Supported equipment shall not power down and reboot, in the event of mains power failure.
1. Engineering workstations / Laptops including Printers
2. Web server and other servers network switches / routers.

B. UPS shall be provided for all Engineering workstations, laptop docking stations and all other devices and shall be activated automatically.

2.07 PASSWORD ACCESS

A. PIMSS users shall gain access to the system by logging on which shall be achieved by entry of a unique PIMSS user name and password combination.

B. Each PIMSS user shall be assigned a system access level which shall enable that PIMSS user, once logged on, to access only those commands, monitoring and program functions which have an equal or lower access level.

C. Only the highest access level shall enable assignment or reading of PIMSS user passwords. This level access is to be assigned to the Project Specialist and System Administrator. Designated staff member of the Engineer and Engineer's Representative teams shall be assigned this level for auditing all actions fo the System Administrator

D. The system shall record logging on / off activity. Terminals shall automatically log-off after a pre-set time if no keyboard activity has occurred. In addition, PIMSS users shall be able to manually log-off when leaving the terminal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Contractor shall install a fully functional system (not detailed in Contract Documents) in compliance with reference standards, local / international codes and project electrical specifications.

B. Wiring shall be installed in such a way that minimises coupling of electromagnetic and electrostatic interference on low voltage signals and data wiring.

3.02 TESTING OF SOFTWARE

A. PIMSS Specialist shall demonstrate the hardware and software(s) to the Engineer and Engineer's representative; by in-house simulation prior to implementing software on site.

B. System demonstrations shall be conducted within one month of Date of Enterprise. A minimum of one week's written notice shall be given and the Engineer's written consent obtained, prior to such demonstrations.

3.03 TRAINING OF ENGINEER'S PERSONNEL

A. During the Period of Operation of PIMSS, the PIMSS Specialist shall instruct the Engineer's and Engineer's representative and designated personnel in all aspects of the operation of PIMSS

B. In addition, a Document Control Engineer cum System Administrator with at least 5 years of experience in electronic Document management in construction sites and at least 2 years experience with a recognized online Construction Project Information System shall be employed full-time the Period of Operation of PIMSS to train new users, design, maintain, operate and archive PIMSS data.

C. PIMSS training for all personnel shall include three (3) eight-hour sessions encompassing all aspects of operation, maintenance and trouble shooting techniques associated with the system, including but not limited to:

1. Common System I/O functions
2. System data backup and restoration
3. Use of all peripherals like Printers, Web Camera and scanners

D. Advanced training for designated advanced users shall include five (5) additional eight-hour sessions encompassing all aspects of Software programming and to undertake software customization and maintenance associated with the system, including but not limited to:

1. Workflow creation and troubleshooting
2. Customization of Forms
3. Installation of software for new users
4. Server setup and operation
5. Trouble shooting and System maintenance procedures

6. Web site details and modification

3.04MAINTENANCE

A. Requirements of General Conditions of Contract shall be referred to and complied with as appropriate, without prejudice to the requirements stated herein.

B. Initial configuration, training and operation of PIMSS for a period of 6 months from the Date of Enterprise and at least 4 months after completion of PIMSS implementation, must be done through qualified personnel from the PIMSS specialist stationed full time on site.

C. Corrective actions / modifications made on the PIMSS during Period of Operation shall be updated on user documentation and on user and manufacturer archive software media.

D. Any updates or changes to PIMSS shall be informed and agreed to with the Engineer and Engineer's Representative in advance and supplementary training shall be provided in modified or new product functions. Software updating shall be done outside of regular working hours.

E The hardware and software provided by the contractor remain the property of the contractor and must be maintained by the contractor and shall be in working condition during Contractor's working hours.

F Replacements for all hardware and software systems are to be provided on the same day of failure from spares to be kept by the contractor.

G. If any part of the system is not able to function for longer than 24 hours the contractor shall replace the malfunctioning component or provide a temporary equivalent substitute system. Failure to correct the malfunction within 48 hours from receipt of the Engineer's representative written notice shall be cause for a penalty of KD 200 per day of delay to be deducted from the Contract amount.

4 . The contractor has to be adjusted **THE SPECIAL SYSTEMS** in accordance with size and nature of the contract and subjected to the approval of the engineer.

5 .COST OF THE SPECIAL SYSTEMS

The cost of SPECIAL SYSTEMS shall be borne by the contractor and shall Be allowed to include in the total price of this contract.

Document 2- III

Part C – Appendixes

Index
Document 2- III
Part C - **Appendixes**

Note: Attached Drawings

Appendix 1

Demolish, Disconnect, Dismantle and Abandonment
Ardiya Sewage Plant (Modules 1 – 10)

Demolish all types of structure facilities, disconnect electrical supplies, dismantle electrical and mechanical equipments, cut pipes, break concrete structure, remove, abandonment and cart away off the site are divided into 10 modules and attached drawings. These modules shall include but not limited to the following structures, mechanical and electrical equipments:

The Contractor shall include the following information of the appendix as guidance only to the Contractor and does not cover all required works. Therefore, it is obligated that the Contractor to visit all the sites and conduct joint survey with MPW staff to determine by himself the plant facilities structures, substructures or underground tanks, underground pipelines, manholes, wells, pits, buildings and all other works of the contract requirements during the period of tendering as directed by the Engineer. The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

Modules Facilities	Structures, Mechanical and Electrical Equipments
Module 01	**Module 1 shall include but not limited to the following structures, mechanical and electrical equipments:**
Inlet Chambers IS 0151, IS 0152	• Concrete structure. • 12 force mains from pumping stations terminating in each chamber. Dimensions of pipelines : 7 x DN 1000, 2 x DN 700, 2 x DN 300, 1 x DN 150 • Air injection pipes installed in ends of force mains. • Two 9 kW, DN 1500 agitators (mixers) installed in each chamber. • Dosing piping installed in each chamber. Dosing pumps are located in Odour control building. • Bio-enchancing solution dosing FRP tanks and piping installed on inlet chambers. • Foul air sucking pipes DN 450 FRP installed in each chamber. Sucking fan, capacity 8500 Nm^3/hr located in odour control building. • Main channel inlets.
Coarse (Manual) Bar Screens SC 0101, SC 0102	• Concrete structure. • Screen SC 0101, wide 3000 mm, 50 mm spacing, in the main channel branch leading to Modules 02 & 03. • Screen SC 0102, wide 3000 mm, 50mm spacing, in the main channel branch leading to Modules 04 & 05.
Fine (Mechanical) Bar Screens SF 0101, SF 0102	• Concrete structure. • Screen SF 0101, wide 3000 mm, 20 mm spacing in the main channel branch leading to Modules 02 & 03.

	• Screen SF 0102, wide 3000mm, 20mm spacing, in the main channel branch leading to Modules 04 & 05. • Belt conveyer for screenings at each fine screen. • Skip for screenings at each fine screen.
Degritter DG 0101	• Concrete structure. • One unit with four chambers, each long 44 m and wide 2.8 m. • One traveling bridge equipped with two diaphragm grit pumps and tipper flushing tank. • Two inlets and two outlets slide gates. • Electrical panel. • Collecting container.
Degritter DG 0102	• Concrete structure. • One unit with two chambers, each long 27 m, wide 3 m. • Equipped with one electric traveling bridge with two scrapers drive. • Two air lifts and two (screw) classifiers DN 300 mm. • Three air blowers. • Two inlets and two outlet slide gates 1400 x 1000. • Electrical panel in steel, weather proof cabinet. • Collecting container.
Degritter DG 0103	• Concrete structure. • One unit with two chambers, each long 27m, wide 3m. • Equipped with one electric traveling bridge with two scrappers. Drive 0.75 kW, scraper 0.75 kW. • One grit pump in each chamber. Pump has auto priming system. • One grit classifier DN 228.6 mm with vortex type DN 150 grit concentrator and separation tank capacity 4.54 m^3/h of grit. • Two inlets and two outlet slide gates 1400 x 1000. • Electrical panel in steel, weather proof cabinet.
Sewage Channels	• Concrete gravity channels, covered with FRP elements connected by FRP pipes DN 150 to the odour control system. • Two flow meters in the sewage channels. • Two pH-meters.
Caustic Soda NaOH Storage Tank SV 0181	• One storage tank (volume 100 m^3) located near odour. control building inside the shallow concrete basin. • One peristaltic pump for feeding above storage tank.
Foul Air Trestle Bridge FD 0171	• Steel bridge 4 m high, 73 m long. (OCF) to inlet chambers. • Caustic soda pipes from OCF building to inlet chambers.
Odour Control Building SH 0141	• Concrete structure. • Air injection system: One air compressor capacity 600 m^3/h and pipes for transferring compressed air to inlet chambers. • Foul air from inlet structures transferred to scrubbers by FRP duct DN 600 mm 73 m long on trestle bridge FD 0171. • Three stage scrubbing. • Four scrubbing towers.

	• Four circulation pumps located on each scrubbing tower. • Three Dosing pumps to scrubbers. • One exhaust fan and foul air FRP piping DN 600 mm. • Storage tank (10 m^3 capacity) and storage tank (5 m^3 capacity). • Two peristaltic pumps. Pumps are located at odour control building. • Platform scale room. • One chlorinator. • One Cl_2 injector to Cl_2-tower. • One fresh water softening station with one booster pump, one softener container (0.2 m^3) and two solenoid valves. • Two submersible dewatering pumps for draining water transferred to two pits. • Four dosing pumps to inlet chambers. • Instruments installation control panel monitoring system. • Electrical and lighting installation.
KISR Test Area	• Concrete substructure. • Chamber with Inlet channel. • Electrical installation. • Valves • Basins • Gravity underground pipelines • Other accessories • Panels • Steel Bridges • Storage Tank
Module 02	**Module 2 shall include but not limited to the following structures, mechanical and electrical equipments:**
Bioreactor BR 0211	• Concrete substructure. • Inlet channel with one slide gate 1050 x 800. • One basin 48 x 21 x 4.6 m^3. • Fine pore membrane duplex air diffusers: 328 units formed in four grids membrane active area of one diffuser: 0.472 m^2. • Process air piping with four butterfly valves DN 250. Air blowers located in machine house. • Pipe DN 400 from four pumps located in machine house. Guardrails around the basin.
Bioreactor BR 0212	• Concrete substructure. • One basin with 6 separate chambers. Each chamber size: 35 x 8.4 x 4.39 m^3. • Inlet open channel with two slide gates. • Flow meter in the inlet channel. • Distribution channel with 12 slide gates. • Fine pore membrane duplex air diffusers: 648 units in basin. Membrane active area of one diffuser: 0.472 m^2. • Process air piping with twelve butterfly valves DN 300. Air from blowers located in machine house. • Distribution chamber supplied by two pipelines DN 500 located in machine house.

	• Distribution channel with 12 discharge gate valves DN 200.
Bioreactor BR 0213	• Concrete substructure. • One basin 64 x 32 x 2.74 m^3. • Two inlet slide gates 1500 x 1000 and two outlet motorized slide gates 1000 x 800 and two manual slide gates 400 x 800. • Eight surface turbine aerators 55 kW each. • Pipe DN 600 with one butterfly valve DN 600 & distribution channel with two gate valves DN 500 pumps common for all bioreactors of module 02 are located in the machine house.
Clarifiers ST 0221 – ST 0226 (six units)	• Circular concrete substructure tanks or clarifiers (ST 0221, ST 0222, ST 0223, ST 0224, ST 0225, ST 0226) with conical bottom. Internal DN 37.5 m., V- notch length: 338.6 m. • Equipped with rotating bridge with bottom scraper. Bridge is rotated by two drive units. • Distribution chamber equipped with slide gate supplying pipe DN 700. • Bottom pipe DN 400, controlled by weir gate in overflow chamber. Discharged is directed to pumps in the machine house. • Reception launder fixed to the bridge, air lift piping and air blower and scum-sewage concentrating tank with discharging gate valve DN 150 on each bridge. • Submersible pump operates in each clarifier.
Scum Network	• Chambers, underground pipelines and manholes. • Pits at machine house.
Electrical Panel EP 0201	• Panel for six clarifiers of Module 02
Process air pipelines	• Pipeline DN 500 to bioreactor BR 0211. • Pipeline DN 550 to bioreactor BR 0212.
Sewage Mixed Liquor & Effluent Channels	• Concrete, gravity, open channels for sewage terminated in distribution channels to bioreactors mixed liquor channels and two distribution chambers to clarifiers. Inlet to above units is controlled by slide gates.
Sludge Discharge & Return Networks	• Gravity underground pipelines discharging sludge four clarifiers to pit at the machine house, common pipe at the pit : DN 1000. • Four pipelines from pumps in machine house to bioreactors. To bioreactor BR 0211 one pipeline DN 400. To bioreactor BR 0212 two pipelines DN 500 each. To bioreactor BR 0203 one pipe line DN 600 with 2 branches DN 600 to BR 0203 and BR 0402.
Excess sludge Pipeline	• One force underground pipeline DN 200 from machine house to thickeners at Module 07.
Sludge Flow meter Chamber FC 0254	• One magnetic flow meter.

Sludge Flow meter Chamber FC 0255	• Two magnetic flow meters located between Machine House and grease & oil shelter. • Six gate valves DN 200 for interconnections of two sludge pipelines.
Machine House MH 0231	• Concrete structure • Fifteen process air blowers for Modules 02 & 03. Each blower: capacity 9552 Nm^3/h at 55 ^0C Discharge pressure 55 kPa. Rotation speed 1450 min^{-1}. Absorbed power 177 kW. Motor rated 200kW. Blower equipped with: pressure unloading valve, solenoid control valve, safety valve check and butterfly valves DN 300 and flexible connection. • Four pumps for module 02 each pump. • Four pumps for Module 03 Horizontal shaft. Each pump: horizontal shaft, nominal capacity 900 m3/h, head 11.2 m, rotation speed 1450 min^{-1}, motor rated 55 kW. • One pump for Module 02. Horizontal shaft, nominal capacity 180 m^3/h, head 15 m, motor 18.5 kW. • One pump for Module 02. Horizontal shaft, nominal capacity 90 m^3/h, head 4.7 m, motor 3 kW. • Air and sludge piping with valves, diameters from DN 350 up to DN 1000. • Two drain pumps • One ventilation fan • MCC for all above equipment. • Control room for Module 02 & 03 • Shutter door, doors, upper floor, windows, ground floors, and remove of underground pipelines other building components.
Electrical Substation SU 0243	• MCC for aerators in bioreactors BR 0213 & BR 0411.
Module 03	**Module 3 shall include but not limited to the following structures, mechanical and electrical equipments:**
Bioreactor BR 0311	• Concrete substructure. • One basin with 9 separate chambers. Each chamber size: 50x8.4x38 m^3. • Inlet channel with two slide gates. • Distribution channel with 18 slide gates. • Internal channel in each chamber with four slide gates. • Fine pore membrane duplex air diffusers: 1512 units in basin. Membrane active area of one diffuser: 0.472 m^2. • Process air piping with eighteen butterfly valves DN 300. Air from blowers located in machine house. • Distribution chamber supplied by two pipelines DN 500 from pumps located in machine house. • Distribution channel with 18 discharge gate valves DN 200.
Clarifiers ST 0321 – ST 0326 (Six Units)	• Circular concrete substructure tanks or clarifiers (ST 0321, ST 0322, ST 0323, ST 0324, ST 0325, ST 0326) with hitched conical bottom. Internal diameter: 37.5 m. Total V-notches length at each clarifier: 432.0 m. • Equipped with rotating bridge with bottom scraper.

	Bridge is driven by 2 motors and gearbox units. • Distribution chamber equipped with slide gate & by intake pipe DN 700. • Bottom draw-off pipe DN 400, controlled by telescopic weir valve in overflow chamber. Discharged is directed to the pumps in the machine house. • Submersible pump on floats fixed to the bridge, discharge pipe and channel around clarifier, connected to the drainage system.
Scum Network	• Reception chambers at clarifiers, pipes and joint manholes. • Scum/liquid separator (tank). • Liquid pipeline connected to the turbid water system of Module 07.
Electrical Panel EP 0301	• Panel for six clarifiers of Module 03
Process air Pipeline	• Pipeline DN 1000 to bioreactor BR 0311
Sewage Mixed Liquor & Effluent Pipeline & Channels	• Concrete, gravity open channel covered with concrete slabs. • Underground gravity pipeline DN 1000 from degritter DG 0101 to bioreactor BR 0311 with sluice gates and manholes. • Concrete, gravity open channels and two distribution chambers to clarifiers. • Gravity open channels leading to Module 06. • Two flow meters in the effluent channels.
Sludge Discharge & Return Networks	• Gravity underground pipelines discharging to pit at the machine house common pipe at the pit : DN 1000 • Two force pipelines DN 500 from pumps in machine house to bioreactor.
Excess sludge Pumping Station PS 0331	• Concrete structure • Two submersible pumps in the pit at machine house. • One magnetic flow meter DN 150.
Excess Sludge Pipeline	• One underground force pipeline DN 150 from pumping station PS 0331 to thickeners at Module 07.
Module 04	**Module 4 shall include but not limited to the following structures, mechanical and electrical equipments:**
Raw Sewage Distribution Chamber	• Concrete chamber with weir gate 3000 mm long. Above weir gate controls flow to Modules 04 & 05 & indirectly to bioreactors BR 0213 & BR 0411.
Bioreactor BR 0411	• Concrete substructure • One basin 64 x 32 x 2.74 m. mixed liquor depth: 2.2 m. Effective volume of mixed liquor: 4150 m^3. • Two sewage inlet slide gates 1550 x 1000, two outlet motorized slide gates 1000 x 800 and two hand operated slide gates 1000 x 800. • Eight surface turbine aerators 55 kW each. • Return sludge supplied by the pipeline DN 800 with one gate valve DN 600 and open distribution channel with two gate valves DN 300. Return sludge pumps sump types are located in the pumping station PS 0423.
Bioreactor BR 0412	• Concrete structure.

	• One basin with two separate chambers. Each chamber size 36mx12mx5.55m. mixed liquor depth: 4.8m. Effective volume of mixed liquor in basin: 3900 m^3. • Six surface turbine aerators with draft tube. • Return sludge supplied by open channel with weir gates. One by pass slide gat. • Six submersible pumps. • Two automatic weirs electrically operated, in each chamber. • One oxygen meter in each chamber.
Clarifiers ST 0421 – ST 0423 (Three Units)	• Concrete structure. • Circular tank with circular bottom. Internal diameter 37.5 m. Side wall sewage depth: 2.55 m. Sewage depth at the hopper edge: 4.7 m. Hopper upper DN: 4.5m, hopper bottom diameter 0.7m, hopper depth: 3.6m. Sewage surface: 1100 m^2. V-notch length: 117.8m. • Equipped with rotating bridge with sludge bottom scraper. Bridge is driven by two motors and gearbox unit. • Mixed liquor supplied from distribution chamber equipped with slide gate 1050 x 800 and by intake pipe DN 1000. • Sludge removed by under bottom draw-off pipe DN 700, controlled b telescopic weir valve and Drain valve in overflow chamber. • Scum removal facility consists of: scum skimming board fixed to the bridge, scum box fixed to the walls of effluent channel, discharge underground pipe DN 200 to scum/liquid separator with pumping PS 0432.
Return Sludge Lifting Station PS 0431	• Concrete structure. • Three screw pumps for returning sludge to bioreactor BR 0412, helix diameter 1400 with supporting pipe (shaft) DN 711, helix length: 10.460, Helix rotation speed 44.4 min^{-1}. Inclination 30 degree. • Three sump pumps for returning sludge to bioreactor BR 0411. Capacity 700 m^3/h each, head 7m. Three gates and three check valves DN 500. • Two excess sludge pumps to thickeners at Module 08. • Two gates and two check valves DN 150. • One magnetic flow meter DN 125. • Two monorails with electrical driven hoists, fixed to the ceiling.
Scum Pumping Station PS 0432	• Scum pumping combined with scum/liquid separation. Liquid is pumped to mixed liquor distribution chamber before clarifiers. Scum is removed manually onto dewatering concrete pad. • Two submersible pumps. • Two gates and two check valves DN 125.
Scum Network	• Underground pipelines DN 200 from three scum box in clarifiers to the scum / liquid separator PS 0432.
Sewage Channels and Pipeline, Mixed Liquor & Effluent	• Raw sewage gravity channel from degitters DG 0102 & DG 0103 to bioreactor BR 0411. • Raw sewage gravity underground pipeline DN 1000 from

Channels	distribution chamber DC 0151 to open channel leading to bioreactor 0412. • One slide gate 1050x800 electrically operated. • Mixed liquor channels from bioreactor BR 0411 and BR 0412 to clarifiers ST 401 – ST 0403. Three slide gates 1050 x 800 to above clarifiers. • Effluent from Module 02. Two slide gates 1050x 800 electrically operated. • Flow meter in effluent channel.
Electrical Panel BR 0401	• Steel cabinet panel for six submersible pumps in bioreactor BR 0412.
Electrical Substation SU 0441	• Concrete structure. • Control room with mimic panel for Modules 04. • MCC'S for process, facilities of Modules 04 & 05. • Transformers for Modules 04 & 05. • Roof A/C unit.
Lighting Network	• Mast lamps near bioreactors and clarifiers of Module 04.
Electrical and Control Cables	• Power and control cables for process facilities and lighting network in Module 04.
Module 05	**Module 5 shall include but not limited to the following structures, mechanical and electrical equipments:**
Raw sewage supplying channel	• Concrete channel 1.05 wide, 170m long, one slide gate 1050 x 800 electrically operated. Leads from BR 0511 & BR 0512.
Bioreactor BR 0511	• Concrete structure. • One basin 48x21x4.6 m, mixed liquor depth 3.8 m. Effective volume of mixed liquor: 3740 m^3. • Sewage inlet channel with one slide gate 1050x800. • Fine pore membrane duplex air diffusers : 328 units formed in four grids. • Process air piping with four butterfly valves DN 250. Air from blowers located in machine house. • Return sludge supplied by gravity pipeline DN 600 from two screw pumps located in PS 0531: pumps common for BR 0512. • Guard rails around the basin.
Bioreactor BR 0512	• Concrete structure. • One basin with two separate chambers. Each chamber size: 42x14x8 m. Mixed liquor depth: 7.2 m. Effective volume of mixed liquor in basin 8180 m^3. • Six surface turbine aerators with draft tube, 55 kW each. • Return sludge supplied by open channel with weir gates. One by pass slide gate. • Six submersible pumps, air pumping 80 Nm^3/h. • Two automatic weirs electrically operated, in each chamber. • One oxygen meter in each chamber.
Clarifiers ST 0521 – ST 0523 (Three Units)	• Concrete structure. • Circular tank with circular bottom. Internal diameter 37.5 m. Side wall sewage depth: 2.55 m Sewage depth at the hopper edge : 5.33 m. Hopper upper diameter : 4.5 m,

	hopper bottom DN 0.7 m, hopper depth : 3.6 m. Sewage surface: 1100 m^2 V-notch length : 3.15 m. • Equipped with rotating bridge with sludge bottom scraper. Bridge is driven by two motors and gearbox unit. • Mixed liquor supplied from distribution chambers, controlled by slide gate 1050 x 800 and by intake pipe DN 800. • Sludge removed by under bottom draw-off pipe DN 500, controlled by telescopic weir valve and drain valve in overflow chamber. • Scum removal facility consists of: scum skimming board fixed to the bridge.
Return Sludge Lifting Station PS 0531	• Concrete structure. • Two screw pumps, helix diameter 1400 with supporting pipe (shaft) DN 711, helix length: 10.460, Helix rotation speed 44.4 min^{-1}. Inclination 30 deg. • Two excess sludge pumps to thickeners at Module 08 • Two gates and two check valves DN 100. • One magnetic flow meter DN 125. • One monorail with electrical driven hoist, fixed to the ceiling.
Sewage Channels and Pipeline, Mixed Liquor & Effluent Channels	• Concrete structure. • Raw sewage gravity channel brand: 1050 wide with one slide gate 150 x 800. • Mixed liquor channel from bioreactor BR 0511 and BR 0412 to clarifiers ST 0501 – ST 0503. Three slide gates 1050 x 800 to above clarifiers. • Effluent channels from clarifiers to effluent channel from Module 03.
Electrical and Control Cables	• Power and control cables for process facilities and lighting network in Module 04.
Module 06	**Module 6 shall include but not limited to the following structures, mechanical and electrical equipments:**
Screw Lifting Station PS 0631	• Three screw pumps. • Provided with bypass to sea. • Overhead crane.
First Stage Contact Tank CT 0611	• Concrete structure. • Three tanks (20x13x5.2 m deep) with total volume = 3 x 1352 = 4056 m^3. • Provided with chlorine injection at influent channel.
Measuring Flume	• Automatic flow measurement recording. • Controls chlorine dosage.
Rapid sand filters Complex RD 0621	• Concrete structure. • Chlorine residual measurements. • Twelve units (10 x 10) m each. • Beds of (5) layers of gravel and coarse sand. • Three pneumatic sluice gates in each filter. • Pneumatic butterfly valves DN 150 on scour air in each filter. • Pneumatic butterfly valve DN 500 on backwash water in each filter.

	• Pneumatic butterfly valve DN 500 on filtrate in each filter. • Backwash pump (3 Nos.). • Backwash return pumps (4 Nos.). • Air scouring blower GMB 14.9, (3 Nos.). • Air control compressor (2 Nos.). • Booster pumps (3 Nos.). • Booster compressor (2 Nos.). • Backwash system is provided with holding tank and balancing tank. • Slug chlorination (operates for short duration to prevent algae growth). • Motive water pumps (2 Nos.) for chlorine injection • Dewatering pump (1 No.). • Overhead crane. • Control room • Bath room & two roof A/C units.
Chlorination Buildings CH 0642	• Concrete structure. • 64 sets x 0.65 ton drums. • Six sets platform scale 5000 kg capacity. • One set drum beam balance. • Three chlorine evaporators. • Three 1st stage chlorinators. • Two 2nd stage chlorinators. • Three chlorine fume detectors with acoustical and optical alarms. • One chlorination control equipment board. • One chlorination control panel with automatic dosing system - 1st stage 0-15 mg/dm^3 - 2nd stage 0-6 mg/dm^3 • Two emergency high speed fans. • Two injectors for 1st and 2nd stages chlorination. • Chlorine Cylinder Storage Building (1 No.), Chlorinators Building (1 No.), Electric Control Panel Building.(1 No.) • Over head Crane. • Two emergency high speed fans. • Lighting Installation • Ventilation
Rabya Pumping Station (PS 0632**)**	• Concrete structure. • Irrigation pumps 3 Nos. • Vertical filter 2 Nos. • FRP vessel with mixer, 2 Nos. • Fertilizer injector 2 Nos. • Pressure tank 2 Nos. 15 m^3. • Hosing & washing pumps 3 Nos. • Old irrigation pumps 3 Nos. • Inlet and Outlet channels.
Effluent Pumping Station (PS 0633) pumps	• Three pumps with 2 speed each. • Two dewatering pumps with discharge pipeline.
Surge Protection	• Surge vessels (4 Nos.) and connected installations.

System Tanks (VS 0661)	
Module 07	**Module 7 shall include but not limited to the following structures, mechanical and electrical equipments:**
Sludge Thickeners Complex TH 0721 – TH 0726 (Six Units)	• Concrete structure. • Three concrete circular tanks (TH 0721- TH 0722 - TH 0723), diameter 10 m. side wall high 4 m, side wall sludge depth 3 m, cone depth 2.7 m. Hopper diameters: upper 1.6 m, bottom 0.4 m, hopper depth: 1.1 m Effective vol.8 m^3, Flocculate/scrapper, central drive 1.5 KW. • Three concrete circular tanks (TH 0724-TH 0726), diameter 13 m, side wall high 3.7 m, cone depth 2.85 m. Hopper diameter: upper 1.6 m, bottom 0.4 m, hopper depth: 1.1 m. Effective volume 518 m^3. Flocculate/scraper 1.5 kW. • Piping DN 200 for raw sewage supply. Thickened sludge removal, turbid water removal with total 18 isolating gate valves for above six thickeners. • Electrical and instrumentation installations for the above thickeners including sludge level sensors in each.
Thickened Sludge Pumping Station PS 0732	• Concrete structure. • Two centrifugal pumps for thickeners TH 0721- TH 0723. • One magnetic flow meter DN 150. • Two sucking and two discharge gate valves DN 150, two check valves DN 150, and piping. • Electrical and instrumentation installation connected to mimic panel in the control room at digestion boilers.
Thickened Sludge Pumping Station PS 0733	• Concrete structure. • Two positive displacement pumps, capacity 120 m^3/h each, head 31 m, rotation speed 273 min^{-1} motor 18.5 kW with 1460 min^{-1}, for thickeners TH 0724 - TH 0726. • One magnetic flow meter DN 150. • Two sucking and two discharge gate valves DN 200, two check valves DN 200, and piping. • Electrical and instrumentation installation connected to mimic panel in the control room at digestion boilers.
Turbid Water Pumping Station PS 0731	• Concrete structure. • Two centrifugal pumps, capacity 252 m^3/h each, head 16 m, rotation speed 1480 min^{-1}, motor 22 KW. • Two sucking and two discharge gate valves DN 250, two check valves DN 250 and piping. • Electrical and instrumentation installations.
Sludge Filling Station FI 0761	• Road tankers filling station (near drying beds) including gate valve DN 150, raise pipe DN 150 and filling hose. • Two electrical control boxes for operation of thickened sludge pumps in PS 0732 & PS 0733. • Electrical installation for above boxes.
Sludge	• Road tankers filling station (beside the perimeter fence)

Filling Station FI 0762	including two gate valves DN 150, two raise pipes DN 150, two filling hoses. • Operation by the same control boxes as for FI 0761.
Sludge Digestion Complex DR0711 – DR0713 (Three Units)	• Three digesters DR 0711, DR 0712 & DR 0713 internal diameter of degritter 17.5 m, effective sludge volume 2800 m^3 each. • Flame arrests and vacuum/releasing valve on each digester. • One propeller mixer in each digester with motor 7.5 kW. • Sludge level sensor in each digester, 12 gate valves DN 250 in piping feeding one digester, removing digested sludge and turbid water, connecting digester with heat exchanger, and for biogas piping. • One biogas flowmeter on each digester. • One spiral heat exchanger 15 m^2 of heat transfer. • Two sludge circulation pumps capacity 108 m^3/h, head 6 m, rotation 945 min^{-1}, motor 705 kW. • Two water boilers, average heat capacity 1450 kW each, with diesel fuel burner/pump in boiler room. • Electrical control panel for boilers. • Two hot water circulation pumps DN 100 each. • One diesel fuel auxiliary tank in Boiler room. • One drain submersible pump capacity 28.8 m^3/h, head 6 m, rotation 1395 min^{-1}, motor 4 kW. • Control room with mimic panel and MCC. • Window A/C unit in control room. • Bath room with W.C., shower, two sinks and boiler. • Water tank FRP on the boiler room roof. • Flame arrested vessel combined with water drain located in separate room.
Diesel Fuel Tank FS 0764	• Underground tank 20 m^3 for storage of diesel fuel, for digestion boilers. • One diesel fuel pump 1.1 kW. • Pipeline DN 25 connecting fuel pump with auxiliary tank in boiler room. • Filling manhole FI 0751. • Fire extinguisher kiosk.
Gas Holder GT 0763	• One steel tank in water steel basin, maximum biogas volume 500 m^3, maxi. Gas pressure 2 kPa. • Flame arrested and vacuum/pressure releasing valve on the gas holder. • Valve house at gas holder with gas inlet and outlet valves DN 150, and with water supply valve. • Tank dome level control sensor and indicators. • Gas flow control valve DN 150 to flare with pneumatic actuator.
Air compressor Station AB 0721	• Air compressor for gas flow pneumatic actuator. • Control box for compressor and power cabling. • Piping DN 15 from compressor to actuator.
Waste Gas Flare WG 0761	• Steel stack 15 m high for biogas burring.

	• Flare ignition panel. • Gas gate valves DN 40 & DN 150 for pilot burners and main gas burner, duty pressure 100 kPa.
Air Compressor Station AB 0722	• Air compressor for supplying air to flare ignition system at WG 0761. • Control box for compressor and power cabling. • Piping DN 25 from compressor to the ignition panel.
Sludge Dewatering Building DH 0708	• Six belt filter presses, thickened sludge intermediate tank. • Twelve positive displacement sludge pumps for feeding presses, including valves. • Polymer storage. • Polymer dissolving, mixing and dosing tanks and pumps, including valves and posing pipes to presses. • Dried sludge shed DZ 0742 with dewatered sludge cake belt conveyor. • Washing water pumps. • Belt cleaning air compressor. • Electrical/instrumentation panel. • Electrical installation • Pipes DN 150 connecting thickened sludge pumps with feeding pumps. • Ventilation fans. • Service water plumbing.
Sludge Drying Kilns DK 0744	• Two horizontal rotary (ovens) for drying dewatered sludge. • System of feeding and unloading belt conveyors. • Electrical driving units. • Electrical panel.
Sludge Drying Bed Complex DB 0711	• Concrete structure • Twelve beds 30 x 0.6 m each, with filtration sand, grain Φ 0.6 mm on supporting gravel. • Under bed drainage DN 150. • One drainage manhole at each bed. • Sludge feeding gate valve DN 150 at each bed. • Filtrate pipeline between above manholes, connected to turbid water PS 0731. • Pipeline DN 200 supplying 12 drying beds with sludge by digested sludge pumps.
Sludge Emergency Holding Tank HT 0721	• Concrete structure • One rectangular underground open tank 29 x 12 x 3.6 m. • One sludge supplying valve DN 150. • Guard rails around the tank.
Electrical Substation SU 0741	• Concrete structure • MCC for Module 07 • Supporting battery for instruments of Module 07. • Switch gears for Module 07.
Dried Sludge Shed DZ 0742	
Fuel Fill FI 0751	

Module 08	Module 8 shall include but not limited to the following structures, mechanical and electrical equipments:
Sludge Thickeners Complex (2 Units) TH 0821 – TH 0822	• Concrete structure • Two concrete circular tanks internal diameter 12 m, side wall high 3.1 m, side wall sludge depth : 2.047, cone depth 0.55 + 0.40 m hopper dimensions : upper DN 1.2 m, bottom DN 0.5 m, depth : 0.65 m. Effective volume of one tank 305 m^3, rotation bridge with flocculator /scraper-peripheral drive. • One thickened sludge grinder. • Two thickened sludge positive displacement pumps. • One magnetic flow meter DN 125 for thickened sludge. • Raw and thickened sludge piping with 12 gate valves DN 150. • Two turbid water submersible pumps, capacity 108 m^3/h each, head 10 m, pump rotation speed 1450 min^{-1}, motor rated 5.5 kW connected to turbid water pumping sump. • Two magnetic flow meters DN 150 for turbid water. • Turbid water piping with 4 gate valves and 2 check valves DN 150. • Electrical control boxes for the above thickener bridges, thickened sludge pumps and turbid water pumps. • Transmitter boxes for above sludge and turbid water flow meters.
Sludge Filling Stations FI 0861, FI 0864	• Load tankers filling station near thickening complex TH 0821- TH 0864 near drying beds including one filling pipe and hose DN 150 each. • Operation by control box for thickened sludge pumps.
Sludge Digesters Complex DR 0811 – DR 0812 (Two units)	• Concrete structure. • Two digester circular DR 0811 & DR 0812, hermetic tanks, internal diameter of tank 20 m, effective sludge volume 4700 m^3 glass hatch with wiper on top of tank. • Flame arresters and vacuum/pressure releasing valves on each digester. • One gas compressor on each digester • Gas filtration vessel with ceramic cartridges on compressor sucking pipe on each digester and one near boiler house with gas flow meter. • Control box for compressor. • Sixteen gas injectors (lances) in each digester. • Piping system with valves connecting compressor with injectors. • Gas vessel with gate valve DN 150 for gas produced, leading to gas holder.
Boiler House BH 0831	• Two water boilers with diesel fuel burner / pump, and hot water pump. • Electrical control panel for boilers. • Two tube type heat exchangers. • Three sludge circulation pumps. • Three hot water circulation pumps. • Phosphate dosing unit, volume 100 dm^3. • Control boxes for sludge and water pumps. • One drain submersible pump.

	• One diesel fuel pump including pipe connection to boilers. • One auxiliary fuel tank. • Sludge piping DN 125 connecting circulation pumps with heat exchangers, including 12 gate valves. • Hot water piping DN 80 including 8 gate valves. • Bathroom with W.C., shower, three sinks and electric boiler. • Water tank FRP on the roof. • Control room for Module 08, mimic panel, switches for all equipment, two window A/C units.
Secondary Digested Sludge Holding Balancing Tank DR 0813	• Concrete structure. • One circular open tank, diameter 14 m, side wall high 6.58 m. sludge side wall depth 5.6 m, cone depth 6.8 m, cone bottom DN 0.4 m, effective sludge volume 1200 m^3. • Swinging overflow double pipes with floats for turbid water removal. • Two digested sludge centrifugal pumps. • Digested sludge. • Flow meter DN 150. • Control box for sludge pumps. • Transmitter box for flow meter.
Diesel fuel tank FS 0861	• Underground tank 20 m^3 for storage of diesel fuel for digestion boilers. • Two pipelines DN 25 connecting fuel tank with fuel pump in boiler house. • Filling manhole. • Fire extinguisher kiosk.
Gas Holder GT 0863	• One steel tank in concrete water basin, maximum biogas volume 1000 m^3, maximum gas pressure 3 kpa. • Flame arrester and vacuum/pressure releasing valve on the gas holder. • One gas inlet gate valve and drain valve in the underground manhole near the tank. • One gas flow meter on the inlet pipe to the tank. • Tank dome level control sensor and indicators. • Gas flow control valve DN 150 to waste gas burner.
Waste Gas Burner WG 0862	• Tower stack 4 m high, made of bricks. • 10 nozzles gas burner with temperature sensors. • Control valve DN 150. • Control panel for automatic ignition of gas.
Sludge Drying Beds Complex DB 0812	• Concrete structure. • Eleven beds 30 x 12 x 0.6 m each, with filtration sand, top layer grain Φ 0.6 mm, on layers of supporting gravel. • Under beds drainage DN 150. • One drainage manhole at each bed. • Sludge feeding butterfly valve DN 150 at each bed. • Filtrate pipeline between above manholes connected to turbid water PS 0731. • Pipeline DN 200 supplying 11 drying beds with sludge by digested sludge pumps.

Sludge Drying Beds Complex DB 0813	• Concrete structure. • Nine beds same like in complex DB 0812. • Manhole, pipelines, valves etc., similar to one in complex DB 0813.
Electrical Substation SU 0841	• Transformers for Module 08. • MCC for Module 08.
Module 09	**Module 9 shall include but not limited to the following structures, mechanical and electrical equipments:**
Hydrogen Sulfide Monitoring System MM 0901	• Fifteen H_2S sensors located around the perimeter fence. • Cable network connecting transmitter with computer located in administration building. AB 1042.
Potable & Brackish Water Complex WS 0921	• Concrete structure. • Two water holding underground tanks. For potable water 350 m^3, for brackish 700 m^3. • One booster set for potable water with two pumps and pneumatic (surge) vessel pump. • One booster set brackish water with two valves and check valves for portable and brackish water systems. • Two electrical panels for above.
Module 10	**Module 10 shall include but not limited to the following structures, mechanical and electrical equipments:**
Administration Building AB 1042	• Building structure. • Plumping. • A/C units. • Lighting installation. • Roof water tank.

List of Equipments
Module 1
Mechanical Screen No. 1
Mechanical Screen No. 2
Degritter Bridge Unit
Hydraulic Pump – Bridge Unit
Diaphragm Pump No.1
Diaphragm Pump No.2
Sand Scrapper Driving Unit – 1
Sand Scrapper Driving Unit – 2
Screw Conveyor No.1
Screw Conveyor No.2
Screw Conveyor No.3
Screw Conveyor No.4
Blower No.1
Blower No.2
Blower No.3

Pista Grit Pump.1
Pista Grit Pump No.2
Dosing Pump DP – 100
Dosing Pump DP – 400
Dosing Pump DP – 201
Dosing Pump DP – 400
Dosing Pump DP – 600
Dosing Pump DP – 610
Dosing Pump DP – 620
Dosing Pump DP – 630
Ventilator V400
Blower B – 700
Recirculation Pump P – 100
Recirculation Pump P – 200
Recirculation Pump P – 300
Recirculation Pump P – 400
Agitator A 700
Agitator A 701
Agitator A 702
Agitator A 703
Module 2
No.1 Settling Tank Drive Unit
No.2 Settling Tank Drive Unit
No.3 Settling Tank Drive Unit
No.4 Settling Tank Drive Unit
No.5 Settling Tank Drive Unit
No.6 Settling Tank Drive Unit
Scum Blower No. 1
Scum Blower No. 2
Scum Blower No. 3
Scum Blower No. 4
Scum Blower No. 5
Scum Blower No. 6
Aerator No. 1
Aerator No. 2
Aerator No. 3
Aerator No. 4
Aerator No. 5
Aerator No. 6
Aerator No. 7
Aerator No. 8
Electric Air Compressor
Diesel Air Compressor
Fuel Pump
Blower Rotary Lobe No.1
Blower Rotary Lobe No.2
Blower Rotary Lobe No.3
Blower Rotary Lobe No.4
Blower Rotary Lobe No.5
Blower Rotary Lobe No.6
Blower Rotary Lobe No.7
Blower Rotary Lobe No.8

Blower Rotary Lobe No.9
Blower Rotary Lobe No.10
Blower Rotary Lobe No.11
Blower Rotary Lobe No.12
Blower Rotary Lobe No.13
Blower Rotary Lobe No.14
Blower Rotary Lobe No.15
Return Sludge Pump No.1
Return Sludge Pump No.2
Return Sludge Pump No.3
Return Sludge Pump No.4
Return Sludge Pump No.5
Return Sludge Pump No.6
Return Sludge Pump No.7
Return Sludge Pump No.8
Scum Pump
Surplus Sludge Pump
Dewatering Pump No.1
Dewatering Pump No.2
Excess Sludge Pump No.1
Excess Sludge Pump No.2
Overhead Crane
Module 3
No. 1 Settling Tank Drive Unit
No. 2 Settling Tank Drive Unit
No. 3 Settling Tank Drive Unit
No. 4 Settling Tank Drive Unit
No. 5 Settling Tank Drive Unit
No. 6 Settling Tank Drive Unit
Scum Skimming Pump No.1
Scum Skimming Pump No.2
Scum Skimming Pump No.3
Scum Skimming Pump No.4
Scum Skimming Pump No.5
Scum Skimming Pump No.6
Module 4
No. 1 Settling Tank Drive Unit
No. 2 Settling Tank Drive Unit
No. 3 Settling Tank Drive Unit
Aerator No.9
Aerator No.10
Aerator No.11
Aerator No.12
Aerator No.13
Aerator No.14
Aerator No.15
Aerator No. 16
Sludge Recirculation Pump No.1
Sludge Recirculation Pump No.2
Sludge Recirculation Pump No.3
Sum Pump No.3
Scum Pump No.4

Over Head Chain Block 1
Over Head Chain Block 2
Return Sludge Screw Pump No.1
Return Sludge Screw Pump No.2
Return Sludge Screw Pump No.3
Aerator No.1
Aerator No.2
Aerator No.3
Aerator No.4
Aerator No.5
Aerator No.6
Submersible Ejector Pump No.1
Submersible Ejector Pump No.2
Submersible Ejector Pump No.3
Submersible Ejector Pump No.4
Submersible Ejector Pump No.5
Submersible Ejector Pump No.6
Module 5
No.4 Settling Tank Drive Unit
No.5 Settling Tank Drive Unit
No.6 Settling Tank Drive Unit
Aerator No.7
Aerator No.8
Aerator No.9
Aerator No.10
Aerator No.11
Aerator No.12
Return Sludge Screw Pump No.4
Return Sludge Screw Pump No.5
Module 6
Screw Pump No.1
Screw Pump No.2
Screw Pump No.3
Oil Circulation Pump No.1
Oil Circulation Pump No.2
Oil Circulation Pump No.3
Air Compressor No.1
Air Compressor No. 2
Booster Compressor No.1
Booster Compressor No. 2
Back Wash Return Pump No.1
Back Wash Return Pump No.2
Back Wash Return Pump No.3
Back Wash Return Pump No.4
Booster Pump No.1
Booster Pump No.2
Booster Pump No.3
Chlorine Motive Water Pump No.1
Chlorine Motive Water Pump No.2
Air Scour Blower No. 1
Air Scour Blower No. 2
Air Scour Blower No. 3

Dewatering Pump
Backwash Pump No.1
Backwash Pump No.2
Backwash Pump No.3
Over Head Chain Block
Effluent Transfer Pump No.1
Effluent Transfer Pump No.2
Effluent Transfer Pump No.3
Emergency Dewatering Pump No.1
Emergency Dewatering Pump No.2
Chlorine residual Pump No.1
Chlorine residual Pump No.2
Chlorine residual Pump No.3
Chlorine residual Pump No.4
Over Head Crane
Over Head Crane Block
Chlorinator No.1
Chlorinator No.2
Chlorinator No.3
Chlorinator No.4
Chlorinator No.5
Over Head Crane
Farm Pump No.1
Farm Pump No.2
Farm Pump No.3
Air Compressor No.1
Air Compressor No.2
Irrigation Pump No.1
Irrigation Pump No.2
Irrigation Pump No.3
Washing and Hosing Pump No.1
Washing and Hosing Pump No.2
Washing and Hosing Pump No.3
Dosing Pump
Drainage Pump No.1
Drainage Pump No.2
Mixer
Surge Vessel Tank No.1
Surge Vessel Tank No.2
Surge Vessel Tank No.3
Surge Vessel Tank No.4
Module 7
Thickener Bridge Drive Unit No.1
Thickener Bridge Drive Unit No.2
Thickener Bridge Drive Unit No.3
Thickener Bridge Drive Unit No.4
Thickener Bridge Drive Unit No.5
Thickener Bridge Drive Unit No.6
Fresh Sludge Pump No.1
Fresh Sludge Pump No.2
Dewatering Pump
Turbid Water Pump No.1

Turbid Water Pump No.1
Dewatering Pump
Digested Sludge Pump No.1
Digested Sludge Pump No.2
Boiler No. 1
Boiler No. 2
Sludge Pump No.9
Sludge Pump No. 10
Sludge Recirculation Pump No.1
Sludge Recirculation Pump No.2
Sludge Recirculation Pump No.3
Module 8
Sludge Settling Tank Driving Unit No.1
Sludge Settling Tank Driving Unit No.2
Crusher Device No.1
Crusher Device No.2
Sludge Pump No.7
Sludge Pump No.8
Digested Sludge Pump No.1
Digested Sludge Pump No.2
Turbid Water Pump No.1
Turbid Water Pump No.2
Sludge Pump No.1
Sludge Pump No.2
Module 9
Portable Water Pump No.1
Portable Water PumpNo.2
Brackish Water Pump No.1
Brackish Water Pump No.2
Waste Water Pump No.1
Waste Water Pump No.2

Appendix 2

Demolish, Disconnect, Dismantle and Abandonment
Screw Conveyor Stations S20 & S21

Demolish all types of structure facilities, disconnect electrical supplies, dismantle electrical and mechanical equipments, cut pipes, break concrete structure, remove, abandonment and cart away off the site.

The Contractor shall include the following information of the appendix as guidance only to the Contractor and does not cover all required works. Therefore, it is obligated that the Contractor to visit all the sites and conduct joint survey with MPW staff to determine by himself the plant facilities structures, substructures or underground tanks, underground pipelines, manholes, wells, pits, buildings and all other works of the contract requirements during the period of tendering as directed by the Engineer. The Contractor shall not have the right to make any future claims or any extra cost or delay in time on the basis for proper completion of the works required in the contract.

Lifting Stations	Location of the Stations
S20	COASTAL ROAD (FAHAHEL AREA)
S21	COASTAL ROAD (MANGAF AREA)

1. Details of screws:

STN No.	Nos. of Screws	Manufacture	Q (l/s)	Speed (rpm)	DN (mm)	Length (m)	Angle (o)	Inlet (mm)	Outlet (mm)	End - Point
S20	2	RITZ	80	55.49	700	7.58	30	400	400	A14
S21	2	VANDE-ZANDE	330	47.92	1,200	12.46	30	700	700	A14

2. Details of Grease pumps:

Lifting Stations	Qty	Driven type	Manufacturer	Type	Speed ratio
S20	2	ELECT GR PUMP	WOERNER	GMF	625:1
S21	2	ELECT GR PUMP	WOERNER	GMF	625:1

3. Details of Gear Boxes:

Lifting Stations	Qty	Manufacturer	Type	Speed ratio	Power (kW)
S20	2	WGW	SCN 200	1450:54	27
S21	2	WGW	SCN 200	1485:48	48

4. Screw Conveyor Motors:

Lifting Stations	Qty	Manufacturer	Type	IEC Spec.	kW	Vol. TS	Amp	Speed	P.F
S20	2	GEC	D132MEC	132M44	5.5	415	12.5	1,425	0.77
S21	2	GEC	D	225M4	45	415	55	1,480	0.77

5. Grease Pump Motors:

Lifting Stations	Qty	Manuf.	Type	kW	Volt	Conn.	Amp.	Speed (RPM)	P.F.
S20	2	BROOK-M	DE 63C	0.18	415	-	0.66	1,400	0.74
S21	2	BROOK-M	DE 63C	0.18	415	-	0.66	1,400	0.74

6. Ventilators & Exhaust Fan

Lifting Stations	Type of Existing Fan	Quantity
S20	E	ONE
S21	E	ONE

V = Ventilator fan

E = Exhaust fan

7. Diesel Generator:

Lifting Stations	Qty	KVA
S20	1	225
S21	1	225

8. Odour Control Equipment and related facilities:

Lifting Stations	Qty
S20	1
S21	1