SECTION VII – I: PARTICULAR REQUIREMENTS FOR EXISTING SEA OUTFALLS

Table of Contents

I.1 SCOPE AND DESCRIPTION OF EXISTING GHADIR SEA OUTFALLS 1
I.2 OBJECTIVES OF INSPECTION AND ASSESSMENT 1
I.3 SCOPE OF SERVICES 2
I.3.1 External Marine Inspection 2
I.3.2 Internal Inspection 3
I.3.3 Hydraulic and Head Assessment 3
I.3.4 Corrosion and Cathodic Protection Assessment 3
I.3.5 Reporting and Analysis 3
I.4 METHODOLOGY REQUIREMENTS 4
I.5 CONSTRAINTS AND OPERATIONAL REQUIREMENTS 4
I.6 DELIVERABLES 4
I.7 LIMITATION OF SCOPE 5
I.8 SPECIFIC REQUIREMENTS 5
I.8.1 Local Conditions 5
I.8.2 Downtime and Non-Productive Time 5
I.8.3 Safety. Health and Environmental Regulations: 5
I.8.4 ROV-CCTV Inspection: 6
I.9 AVAILABLE DATA AND INFORMATION RELATED TO THE EXISTING OUTFALLS 7
I.9.1 Summary Pipes Data 7
I.9.2 Detailed Sea Outfalls Data 8
I.9.3 Location and Function of Ghadir Sea Outfalls 10

List of Figures:

Figure 1: Ghadir Station Layout 10

I.1 SCOPE AND DESCRIPTION OF EXISTING GHADIR SEA OUTFALLS

The Contractor shall carry out inspection, survey, condition assessment and rehabilitation recommendation services for the two (2) existing sea outfalls associated with the Ghadir Wastewater Treatment Plant.

The existing outfalls are:

(a) Ghadir Main Sea Outfall

This outfall is used for the discharge of preliminarily treated wastewater into the sea, by pumping, and has an approximate nominal diameter of **DN 1200** and an approximate length of **2,600 meters**.

(b) Ghadir Overflow Sea Outfall

This outfall is used for the discharge of treated and/or untreated wastewater under emergency conditions, and has an approximate nominal diameter of **DN 1500** and an approximate length of **500 meters**.

The above outfalls are existing assets forming part of the current Ghadir WWTP system and shall remain in operation during the execution of the Contract unless otherwise instructed by the Engineer.

The available information regarding the existing outfalls is limited (Refer to Section I.9) and may not accurately reflect the current physical, structural, or hydraulic condition of the assets.

The Contractor shall be deemed to have fully satisfied himself, prior to submission of the Tender, as to the nature, extent, and complexity of the required inspection and survey works, and shall make due allowance for all constraints associated with access restrictions, marine and environmental conditions, operational limitations, and unforeseen asset conditions.

The scope of services under this Section is primarily **investigative and assessment-based**, and shall include inspection, survey, analysis and reporting activities, together with all necessary permits, approvals, and site works required to carry out these activities, as described herein.

Unless expressly stated otherwise in the Contract, the Contractor shall **not undertake rehabilitation or replacement works** on the existing sea outfalls as part of the base scope of services, and any such works shall be carried out only upon separate instruction by the Employer's Representative.

I.2 OBJECTIVES OF INSPECTION AND ASSESSMENT

The objective of this Section is to determine the current condition of the existing Ghadir sea outfalls and to provide the Employer with reliable technical information to support future operational, rehabilitation, and investment decision-making.

The inspection and survey works shall be undertaken with the following objectives:

- Determine the structural condition of the sea outfalls and associated components.
- Assess the hydraulic performance of the sea outfalls and identify any potential operational limitations.
- Identify defects, damages, or deterioration affecting the pipelines, diffusers, and related elements.
- Assess seabed interaction, including burial depth, exposure scour, and overall stability of the outfalls.
- Verify the diffusers condition, alignment and functionality.

- Assess internal pipelines condition including deposits, sediment accumulation, corrosion and lining integrity.
- Evaluate the presence, condition, and effectiveness of cathodic protection systems, where installed
- Establish updated bathymetric data and longitudinal profiles of the outfalls and the surrounding seabed.
- Identify risks affecting the structural integrity, hydraulic and performance, or long-term serviceability of the outfalls
- Provide technically justified recommendations for rehabilitation, repair, and/or upgrade of the outfalls.
- Provide preliminary cost estimates for recommended intervention measures.

I.3 SCOPE OF SERVICES

The Contractor shall carry out all necessary works to achieve the above objectives, including but not limited to the following:

I.3.1 External Marine Inspection

The Contractor shall perform a detailed external marine inspection of both outfalls along their full length. The inspection scope shall include, but not be limited to, the following activities:

- Verification of the pipeline alignment and assessment of overall structural condition
- Identification of exposed, buried and partially buried sections of the pipeline
- Assessment of seabed conditions around the pipeline
- Identification of scour, sedimentation and instability zones
- Inspection of diffuser sections, risers and outlets
- Verification of diffuser orientation and verticality
- Identification of physical damage, cracking, deformation or displacement
- Identification of corrosion, abrasion or deterioration of exposed components
- Inspection of connections, joints and terminal structures
- Identification and documentation of anomalies or irregular conditions
- Excavation of trial pits to assess the condition of buried pipe sections.

The inspection shall include:

- Deployment of an underwater ROV (Remotely operated vehicle) inspection system
- High-resolution continuous video recording
- Photographic documentation
- Side-scan sonar and/or equivalent seabed survey techniques
- Bathymetric survey and seabed profiling
- Preparation of updated longitudinal profiles of the outfalls

I.3.2 Internal Inspection

The Contractor shall perform a comprehensive internal inspection of both outfalls. The scope of work shall include, but not be limited to, the following:

- Inspection of internal pipe surfaces using CCTV systems, advanced robotic crawler inspection equipment, or equivalent approved technologies.
- Identification characterization and mapping of internal deposits, sediments build-up or obstructions.
- Assessment of the internal lining condition, including corrosion, abrasion and general deterioration.
- Identification of defects such as cracks, deformation, joint irregularities or blockages.
- identification of potential hydraulic restrictions affecting flow performance.

The Contractor shall propose appropriate access and inspection methodologies, subject to the Engineer's approval, taking into consideration operational constraints, system availability and all applicable health and safety requirements.

I.3.3 Hydraulic and Head Assessment

The Contractor shall carry out hydraulic and head assessments of the outfalls, including but not limited to, the following activities:

- Measurement and monitoring of water levels and/or internal pressures, where feasible
- Evaluation of hydraulic performance under operating conditions
- Assessment of head losses, flow capacity and potential hydraulic restrictions within the system.

All assessment activities shall be executed in accordance with approved operational procedures and applicable health, safety and environmental requirements.

I.3.4 Corrosion and Cathodic Protection Assessment

The Contractor shall perform an assessment of corrosion conditions affecting the outfalls and associated components. The scope of the assessment shall include, but not be limited to, the following:

- Identification of existing cathodic protection (CP) systems, if present.
- Evaluation of the condition, configuration and effectiveness of the cathodic protection system
- Assessment of corrosion levels, deterioration mechanism and associated risks
- Localized wall thickness measurements where feasible and subject to prior approval.

I.3.5 Reporting and Analysis

The Contractor shall prepare detailed comprehensive reports documenting the findings of the inspections and assessments. The reports shall include, at a minimum, the following:

- Condition assessment report of each outfall
- Identification, classification and description of observed defects and anomalies
- Updated drawings and longitudinal profiles
- Photographic and video records
- Analysis of the structural, hydraulic and operational condition of the outfalls
- Identification of critical areas requiring intervention
- Recommendations for rehabilitation, repair or upgrade measures

- Preliminary cost estimates of proposed intervention measures
- Prioritization of recommended actions

I.4 METHODOLOGY REQUIREMENTS

The Contractor shall submit a detailed methodology for review and approval prior to commencement of the works.

The methodology shall include, as a minimum, the following:

- Proposed inspection and survey techniques (ROV, divers, sonar, CCTV, etc.)
- Internal and external inspection procedures
- Marine and seabed survey methodology, including data acquisition and processing
- Access arrangements, temporary works and any enabling works
- Health and safety procedures, including hazards identification and risk mitigation measures
- Environmental protection and mitigation measures to be implemented during the works
- proposed sequence of activities and detailed execution schedule.

All inspection and survey activities shall be subject to review and approval by the Employer's Representative prior to execution.

I.5 CONSTRAINTS AND OPERATIONAL REQUIREMENTS

The existing outfalls form an integral part of an operational wastewater treatment system and shall remain in continuous service throughout the execution of the Works.

Accordingly, the Contractor shall:

- Ensure uninterrupted operation of the WWTP and associated sea outfalls.
- Coordinate all inspection and survey activities with the operation of existing facilities
- Prevent any uncontrolled discharge, system upset or operational disruption attributable to the works
- Obtain prior approval before undertaking any intrusive, high-risk or potentially disruptive activities
- Comply at all times with all health and safety regulations, marine operational rules and statutory requirements
- Implement all necessary measures to protect the personnel, environment and existing infrastructure during the execution of the works.

I.6 DELIVERABLES

The Contractor shall provide, as a minimum, the following deliverables:

- Methodology report
- Inspection and survey records
- bathymetric, marine and seabed survey data
- High resolution video and photographic documentation
- Defect register, identifying defect type, chainage, location and description

- Updated longitudinal profiles and drawings
- Condition assessment reports for each outfall
- Rehabilitation, repair and upgrade recommendation reports
- Preliminary cost estimates for recommended works
- Prioritized list of proposed interventions

All deliverables shall be submitted in formats, media, and levels of detail approved by the Employer.

I.7 LIMITATION OF SCOPE

The scope under this Section is limited to inspection, survey and assessment activities.

Rehabilitation, repair or replacement works are not included in the base scope of the Contract and shall only be carried out if specifically instructed by the Employer's Representative in accordance with the Contract provisions.

I.8 SPECIFIC REQUIREMENTS

I.8.1 Local Conditions

The Contractor shall have the sole responsibility for, and shall investigate and satisfy himself as to the nature and location of all places where the Works shall be performed and the general and local conditions in Lebanon, and particularly, but without limitation, with respect to the following : conditions affecting shipping and transportation, disposal, handling and storage of materials; permission required from the Lebanese armed forces to carry out the works in the designated areas; customs regulations regarding the bringing into and removing from Lebanon of equipment and plant to carry out the works; availability and quality of labor, climatic and marine conditions and seasons; physical conditions, subsurface geology and nature of subsurface conditions to be encountered; equipment and facilities needed preliminary to and during performance of the Contract; local laws, regulations and customs; and all other matters which can in any way affect the performance of the Works or the cost associated with such performance. The Contractor shall have full responsibility for properly estimating either the difficulties or the cost of successfully performing the Works. No claim resulting from want to knowledge of any local conditions will be entertained.

The Contractor shall comply with all rules and regulations of Lebanese Ports including, but not limited to, rules and regulations for vessels in port and for navigation.

I.8.2 Downtime and Non-Productive Time

The Contractor shall include in his tender for all costs in respect of any delay, downtime or non-productive time resulting from inclement weather or any of the conditions or events referred to in clause 4 above, or any other events or conditions that are his responsibility under the terms of the contract.

I.8.3 Safety. Health and Environmental Regulations:

In addition to contractual Safety, Health and Environmental requirements, included in the Conditions of Contract, the Contractor shall comply with the following regulations and guidelines, or other equal and internationally approved regulations and guidelines regarding his diving operations:

i. The Diving Operations at Work Regulations 1981, Health and Safety, S.I 1981 No 399, UK
ii. The Diving Operations at Work (Amendment) Regulations 1990, Health and Safety, S.I. 1990 No 996, UK.
iii. CIRIA URP 83 SEA OUTFALLS 'Construction, Modification, Inspection and Repair' an Engineering Guide, Section 6 'Inspection and Diver Safety'.

The Contractor shall submit with his tender a copy of the diving safety procedures which will be followed by his divers during underwater operations.

I.8.4 ROV-CCTV Inspection:

1. General:

ROV-CCTV inspection works, for both the overflow and the emergency sea outfalls, shall include, but is not limited to, the provision of digital video recordings, inspection logs, records, and still color photographs of the following:

- Internal inspection of the sea outfall pipes, including assessment of structural condition, joints, connections, sediment build-up, debris, and any internal obstructions.
- External inspection of the sea outfall pipes including diffusers, diffuser ports, nozzles, and associated fittings.
- Inspection of concrete mattress, anti-buoyancy measures, anchoring systems, and all pipe protection systems, including assessment of stability and condition.
- Assessment of pipe alignment, support conditions, exposure, and continuity along the outfall route.
- Assessment of seabed conditions, including evidence of scour, erosion, sediment displacement, or loss of support.
- Inspection of external pipe coatings, wraps, and protective systems for damage or deterioration.
- Identification and recording of defects, including cracks, deformation, corrosion, mechanical damage, leakage indications, and excessive marine growth or biofouling.

The Contractor shall submit full details of the proposed ROV-CCTV inspection methodology, for each aspect of the works, to the Engineer for review and approval prior to commencement.

2. Equipment:

All equipment used on site for ROV-CCTV inspection shall be suitable for operation under water operation and for the environmental and depth conditions expected during the works. Full details of the Contractor's proposed equipment shall be submitted to the Engineer for approval prior to use.

The camera unit shall be capable of capturing clear, close-range images in all directions through integrated pan-and-tilt or equivalent movement, without reliance on external mirror attachments.

The video recording system shall provide permanent recording of all camera transmissions as digital video files of approved quality, stored on suitable electronic media.

Camera lighting shall be designed and adjusted to minimize reflective glare. The lighting and camera system shall be capable of producing clear, stable, well-illuminated, and in-focus images of the underwater subject under all conditions encountered during the works. Light intensity, exposure, and aperture settings shall be selected to provide the best possible image quality.

3. Video recording:

The Contractor shall record the whole of the survey in digital video format conforming to the recording equipment manufacturer's specification. The recording shall provide a continuous record of the inspection, with survey data either displayed on screen or embedded as synchronized digital metadata. Such data shall include the following information:

- Automatic update of the camera's meterage (m)
- Date - day, month and year
- Direction of survey

- Nominal diameter of sewer (mm)

The recording shall permit continuous recording during stationary periods and shall include manual override capability.

Proper identification shall be provided on both the video storage container and the digital video recording, and shall include project and location information, the date of recording, and other relevant descriptive information.

4. ROV-CCTV Inspection requirements:

The rate of travel of the camera shall permit full and accurate assessment of all inspected features and shall not normally exceed **0.2 m/s**. The camera shall be paused or its speed reduced as necessary to ensure proper documentation of the condition of the pipe or other inspected items.

For internal inspection of the sea outfalls pipes, the camera shall be aligned with the **centerline of the pipe.**

The video image produced by the ROV-CCTV system shall be stable, in focus, correctly illuminated, free from distortion or interference, and of sufficient resolution and clarity to allow identification and assessment of defects.

Where visibility is impaired due to fouling of the lens, lighting malfunction, obstruction to camera movement, or equipment instability, the cause shall be rectified and the affected inspection section **re-inspected and re-recorded.**

Any portions of recorded video that are unclear, incomplete, or otherwise unacceptable shall be replaced with new digital recordings of the affected sections. The Engineer shall determine the acceptability of all submitted recordings.

Digital still color images shall be captured from the video recordings or by an integrated imaging system to provide clear, sharp, high-quality documentary records of the inspected assets.

Precautions shall be taken to prevent deterioration of image quality due to camera vibration, instability, or optical interference during recording.

For all surveys, the Contractor shall submit to the Engineer original digital video files and digital still images, together with soft and hard copies as specified, which shall become the property of the Employer.

I.9 AVAILABLE DATA AND INFORMATION RELATED TO THE EXISTING OUTFALLS

The below information regarding the Pipes Data has been extracted from the Annex A of: "TENDER DOCUMENTS FOR OUTFALL PIPE REHABILITATION FOR SOUTH BEIRUT SEA OUTFALL AT GHADIR" prepared for CDR on behalf of The Ministry of Environment on May 1996 implementation of the sea outfalls:

I.9.1 Summary Pipes Data

Ghadir Sea Outfall Pipe		
1.	Length	2570m
2.	Nominal diameter	1200mm
3.	Maximum pumped flow	2600 L/sec
4.	Material being pumped	primary treated sewage
Ghadir Overflow Sea Outfall Pipe		
1.	Length	470m
2.	Nominal diameter	1500mm
3.	Maximum flow in overflow outfall	2600 L/sec
4.	Material in overflow outfall	raw sewage

I.9.2 Detailed Sea Outfalls Data

The following information has been requested for the implementation of the sea outfalls:

Ghadir Sea Outfall Pipe		
1	Chainage	+35m to + 2605m
2	Steel Pipeline	
	Outside diameter	1219.2 mm
	Wall thickness	
	chainage + 35 to 1405	12.7mm
	chainage + 1405 to + 2605	15.88mm
	Manufacturing specification	API 5LS
	Steel grade	Grade B
	Minimum specified yield stress	24.6 kgf/mm^2
	Welding specification	API Std. 1104
3	Pipe Coating	
	External coating, coal tar enamel	
	wrap with glass fiber reinforcement,	
	Average thickness	6.0mm
	Assumed density of coating	1400 kg/m^3
4	Pipe lining	
	Coal tar epoxy, average thickness	0.5mm
	Assumed density of lining	1300 kg/m^3
5	Reinforced Concrete Weight Coating	
	Concrete compressive strength	30 N/mm^2
	Chainage +35 to + 1405m	
	Thickness	150 mm
	Average density	2400 kg/m^3
	Reinforcement main bars	
	Circumferential	6mm ø100 mm crs
	Reinforcement tie-bars	
	Longitudinal	5 mm ø 400 mm crs
	Reinforcement standard BS. 4483	C283 ref.
	Chainage + 1405m to 2605m	
	Thickness	150mm
	Average density	2400 kg/m^3
	Reinforcement main bars circumferential	8mm ø100mm crs
	Reinforcement tie-bars	
	Longitudinal	5mm ø400mm crs
	Reinforcement standard BS. 4483	C503 ref.
6	Outfall Weights	
	Chainage + 35 to 1405m	
	In air empty	1974.75 kgf/m
	Submerged empty	87.29 kgf/m
	Submerged full of sewage	1203.61 kgf/m
	Specific gravity empty	1.046
	Specific gravity full	1.638
	Chainage + 1405 to + 2605m	
	In air empty	2068.10 kgf/m
	Submerged empty	180.64 kgf/m
	Submerged full of sewage	1285.09 kgf/m
	Specific gravity empty	1.096
	Specific gravity full	1.681

SECTION VII – I: PARTICULAR REQUIREMENTS FOR EXISTING SEA OUTFALLS

Ghadir Overflow Outfall		
1	Chainage	+35m to + 505m
2	Steel Pipeline	
	Outside diameter	1524.0 mm
	Wall thickness	12.7mm
	Manufacturing specification	API 5LS
	Steel grade	Grade B
	Minimum specified yield stress	24.6 kgf/mm^2
	Welding specification	API Std. 1104
3	Pipe Coating	
	External coating, coal tar enamel	
	wrap with glass fiber reinforcement,	
	Average thickness	6.0mm
	Assumed density of coating	1400 kg/m^3
4	Pipe lining	
	Coal tar epoxy, average thickness	0.5mm
	Assumed density of lining	1300 kg/m^3
5	Reinforced Concrete Weight Coating	
	Concrete compressive strength	30 N/mm^2
	Thickness	200 mm
	Average density	2400 kg/m^3
	Reinforcement main bars	
	Circumferential	6mm ø 100 mm crs
	Reinforcement tie-bars	
	Longitudinal	5 mm ø 400 mm crs
	Reinforcement standard BS. 4483	C283 ref.
6	Weights	
	In air empty	3134.58 kgf/m
	Submerged empty	117.24 kgf/m
	Submerged full of sewage	1876.97 kgf/m
	Specific gravity empty	1.039
	Specific gravity full	1.622

I.9.3 Location and Function of Ghadir Sea Outfalls

The below information is based on the "Final Report" prepared for CDR on 24-11-1997, related to: "Ghadir Outfall Pre-treatment Plant, Operation and Maintenance, Contract No. 1742 2nd & 3rd years". Consultant: ACE, Contractor Subal Engineering.

The intakes of the existing Ghadir sea outfall and the overflow sea outfall are located as shown in the below figure.

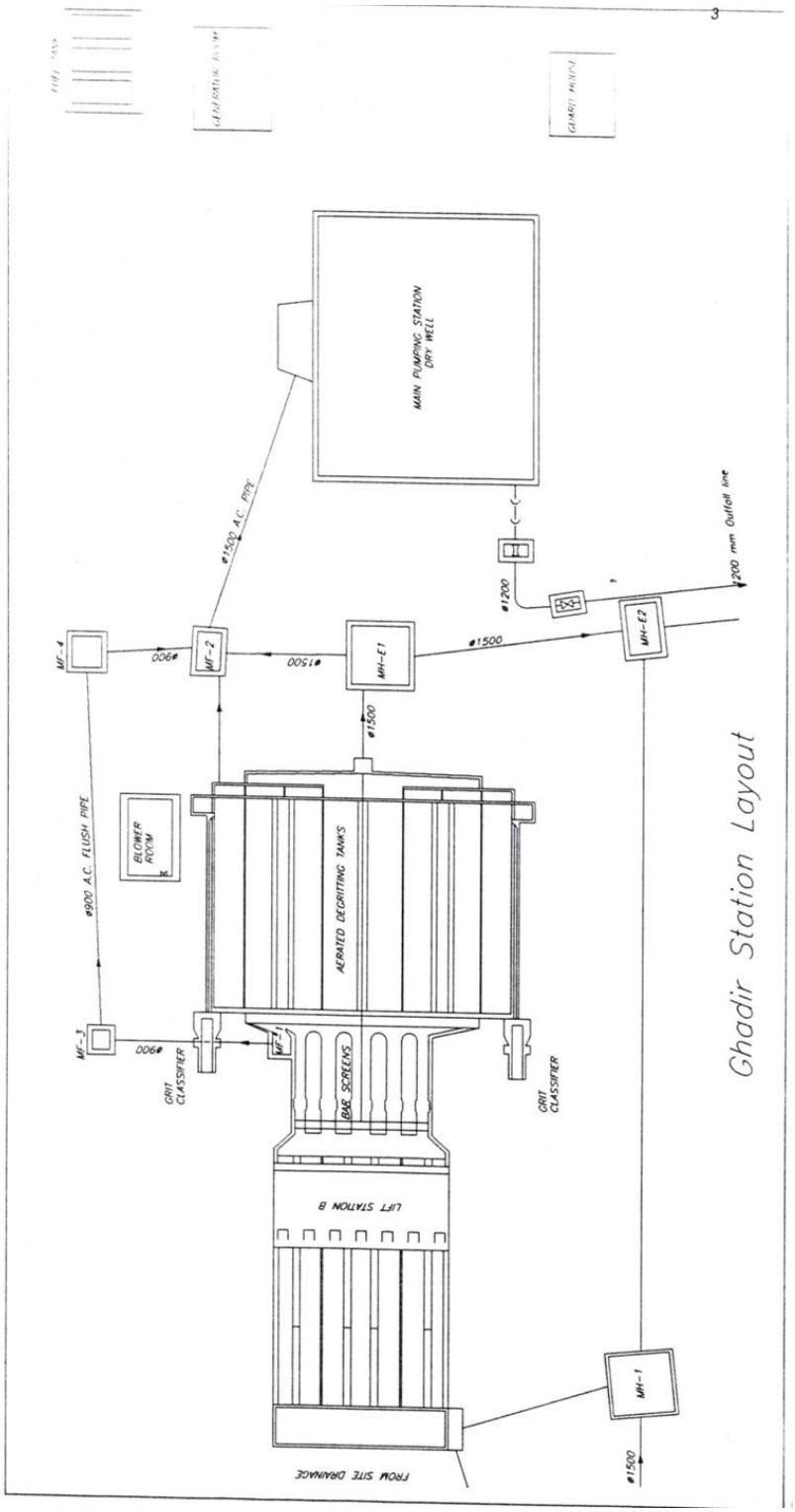


Figure 1: Ghadir Station Layout

SECTION VII – I: PARTICULAR REQUIREMENTS FOR EXISTING SEA OUTFALLS

Ghadir Sea Outfall, the longest sea outfall, is the main sea outfall that is discharging the treated sewage flow, downstream the main pumping station of the Ghadir WWTP, away from the cost.

Ghadir Overflow Sea Outfall, the shortest, is used in an emergency case when the pumping station is partially or totally out of operation, or when the inlet untreated flow is higher than the capacity of pumping station, or the capacity of the treatment system, as described below:

Manholes MH-1A, MH1B & MHE-2.

In case lift station B cannot cope with the influent flow or penstocks are closed, the liquid level in manhole MH-1A Will rise above the dividing baffle wall built in this manhole and the sewage will flow through the 1500mm connecting pipe to manhole MH-1B, which has also a dividing baffle wall, after which the influent will be directed to manhole MH-E2 through a 1500mm line from where it will dump into the sea through the 1500mm overflow line.

Manholes MHE-1 & MHE-2.

Overflow function

In case the main pump station cannot cope with the incoming flow or penstocks PSPG-1 &2 are closed, the water level in manhole MHE-1 will rise above the dividing baffle wall built into this manhole and sewage will flow through the 1500mm line to manhole MHE-2 from where it will dump into the sea through the 1500mm overflow line.

By Pass Function

If the main pumping station is to be by-passed partially or completely, one or more of the 3x 600mm by-pass penstocks installed on the baffle wall of MHE-1 can be opened to route the flow directly to sea through MHE-2 and the 1500mm overflow line.