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Environmental Protection Department

Contract No. EP/SP/66/12
Integrated Waste Management Facilities, Phase 1

吉寶西格斯－振華聯營公司
KEPPEL SEGHERS - ZHEN HUA JOINT VENTURE

SILT CURTAIN DEPLOYMENT PLAN

(Clause 2.6, Further Environmental Permit No. FEP-01/429/2012/A)

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C	Response to IEC's comment dated 9 May 2018	9 May 2018
B	Response to IEC's comment dated 4 May 2018	5 May 2018
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1 INTRODUCTION

1.1 Background

The Government of Hong Kong SAR will develop the Integrated Waste Management Facilities (IWMF) Phase 1 (hereafter "the Project") with incineration to achieve substantial bulk reduction of unavoidable municipal solid waste (MSW) and to recover energy from the incineration process. The IWMF will be on an artificial island to be formed by reclamation at the south-western coast of Shek Kwu Chau. Keppel Seghers – Zhen Hua Joint Venture (KSZHJV) was awarded the contract under Contract No. EP/SP/66/12 Integrated Waste Management Facilities Phase 1 to construct and operate the Project.

An environmental impact assessment (EIA) study for the Project has been conducted and the EIA Report was approved under the Environmental Impact Assessment Ordinance on 17 January 2012. An Environmental Permit (EP) (EP No.: EP-429/2012) was granted to EPD on 19 January 2012 for the construction and operation of the Project. Subsequently, the EP was amended (EP No.: EP-429/2012/A) and a further EP (FEP) (EP No.: FEP-01/429/2012/A) was granted to the Keppel Seghers – Zhen Hua Joint Venture (KSZHJV) on 27 December 2017.

Pursuant to Clause 2.6 of the FEP, a silt curtain deployment plan shall be developed and deposited with the Director of Environmental Protection at least 1 month before the commencement of marine works of the Project.

1.2 Purpose & Scope

As specified in Condition 2.6 of the FEP:
"At least 1 month before the commencement of marine works of the Project, 3 hard copies and 1 electronic copy of a silt curtain deployment plan shall be deposited with the Director. The silt curtain deployment plan shall include the construction programme and details on the design, operation and maintenance of silt curtain(s) for marine works."

This Silt Curtain Deployment Plan (SCDP) has been prepared in accordance with the FEP requirements and details the requirements for implementation of silt curtains during the Project construction phase. The key items covered by this Plan include:

- Summary of marine works requiring deployment of silt curtains
- Key components and design specifications for floating and cage-type silt curtains

- Requirements for installation, operation, maintenance and removal / re-deployment of the silt curtains during construction
- Methodology for the pilot test on silt curtain efficiency

2 CONSTRUCTION PROGRAMME AND OVERALL SILT CURTAIN INSTALLATION ARRANGEMENT

In general, one double layers of floating type silt curtain will be deployed at the opening of the seawall at the western side of Artificial Island.

Marine filling works within reclamation area will be commenced when the installation of block work seawall near the shoreline have been completed for 310m. In other words, the installation of block work seawall between Vertical Seawall Chainage S_CH0 and Vertical Seawall Chainage S_CH310 shall be completed. In addition, the precast caissons at Seawall A between Chainage SB_CH250 and SB_CH580 and at Seawall B between Chainage Q_CH0 and Q_CH388 shall be completed. Therefore, as a temporary measure, one double layers of floating type silt curtain will be installed at the eastern side of Artificial Island after the installation of block work seawall and Caisson at Seawall A and Seawall B as mentioned above. The overall silt curtain installation arrangement can refer to **Figure 1** of **Appendix E**.

After completion of seawall construction (except the portion left for marine access at the western side of Artificial Island), the temporary silt curtain located at the eastern side of Artificial Island will be removed. The overall silt curtain removal arrangement can refer to **Figure 2** of **Appendix E**.

Two double layers of floating type silt curtain will be deployed in the vicinity of coral colonies when the site is carrying out marine works that can affect fine contents on marine water such as laying sand blanket, laying Grade 200 and Grade 400 rock, dredging works, filling work below +2.5mPD at the reclamation area prior to the complete installation of caissons at marine access and operating of deep cement mixing. Cage typed silt curtain will be deployed during laying sand blankets, dredging works, filling works during seawall construction and operating of deep cement mixing. Cage Type silt curtain is equivalent to frame type silt curtain as stated in Further Environmental Permit Clause 2.17 to 2.19.

A brief programme showing the tentative commencement and completion dates of the major marine works are enclosed in **Appendix A**.

3 SILT CURTAIN DESIGN

3.1 Floating Type Silt Curtain

All floating silt curtains shall comprise at least the following components:

- Silt Curtain fabric
- Flotation
- Ballast chain
- Seams and Joints
- Anchors
- Warning lights / marker buoys

Silt Curtain Fabric

For silt curtains, the fabric material shall comprise a geotextile such as woven polypropylene or reinforced polyvinyl chloride (PVC) membrane. Impermeable fabrics are not recommended due to the excessive pressure that would be induced on the curtain due to tidal conditions, hence the fabric shall have a suitably low permeability that allows water to pass through under pressure, but will retain suspended solids. The fabric including seams and connecting parts shall have adequate tensile strength to withstand the pressures induced by the wind, wave and sea current conditions at the location to be deployed.

Floatation

The floatation device shall comprise flexible and buoyant units contained within a floatation sleeve or collar that is attached to the silt curtain. The buoyancy of the floatation units shall be adequate to support the full weight of the curtain including the pressure weight induced by tidal currents acting on the silt curtain surface. A freeboard of at least 10cm shall be maintained above the water surface at all times.

Ballast Chain

The ballast chain (or load lines) shall comprise a steel chain that is incorporated into the bottom hem of the silt curtain. The chain shall be sufficiently weighted to hold the curtain in a vertical position. Connecting devices from the load lines to connecting joints of the silt curtain shall be able to develop the full breaking strength of the chain.

Seams and Joints

Seams of the silt curtain fabric shall be heat sealed and shall develop the full strength of the fabric. Jointing devices such as ropes, chains and shackles shall be made of materials with adequate

strength and shall not limit the full strength of the silt curtain fabric.

Anchors

Anchors shall comprise either dig type (e.g. stakes, grappling hook, plow or fluke-type) or weight type (e.g. concrete blocks) with adequate hold / weight to retain the silt curtain in the same position relative to the seabed without interfering with the action of the silt curtain. Lateral anchors (one on either side of the silt curtain) shall be attached to a floating anchor buoy via an anchor line, which connects to the top of the silt curtain. Anchor spacing should be between 15 to 30 m apart. For areas with faster current velocity, closer spacing shall be adopted as necessary to stabilize the silt curtain.

Warning Lights / Marker Buoys

To warn other marine vessels not to approach or run into the silt curtains, yellow marker buoys fitted with yellow flashing lights shall be used to indicate the position of the anchors and silt curtain system. The buoys and lights shall be located on both sides of the silt curtain at regular intervals (no more than 60m apart) along the entire length of silt curtain.

Silt Curtain Depth

The depth (vertical length from the water's surface to the bottom) of the silt curtain shall be sized to the water depth at the location of deployment. The base of the silt curtain skirt shall be anchored to within 30cm of the seabed even during high tides, hence adequate depth of silt curtain shall be allowed in the total silt curtain depth to cater for tidal changes. Given that the tidal range at the Project area can reach >2m, the base of the silt curtain may be affected by deposition of sediment during low tides. Design of the silt curtain shall take into account the potential additional drag pressure on the silt curtain due to sediment deposition at low tide.

Three sets of floating type silt curtain shall be installed.

1. One double layers of floating type silt curtain shall be installed at the opening of the marine access at the western side of Artificial Island;
2. Marine filling works within reclamation area will be commenced when the installation of block work seawall near the shoreline have been completed for 310m. In other words, the installation of block work seawall between Vertical Seawall Chainage S_CH0 and Vertical Seawall Chainage S_CH310 shall be completed. In addition, the precast caissons at Seawall A between Chainage SB_CH250 and SB_CH580 and at Seawall B between Chainage Q_CH0 and Q_CH388 shall be completed. Therefore, as a temporary measure, one double layers of floating type silt curtain will be installed at the eastern side of Artificial Island after the installation of block work seawall and Caisson at Seawall A and Seawall B as mentioned

above. The overall silt curtain installation arrangement can refer to **Figure 1** of **Appendix E**. After completion of seawall construction (except the portion left for marine access at the western side of Artificial Island), the temporary silt curtain located at the eastern side of Artificial Island will be removed. The overall silt curtain removal arrangement can refer to **Figure 2** of **Appendix E**; and

3. Two double layers of floating type silt curtain shall be installed in the vicinity of coral colonies when the site is carrying out marine works that can affect fine contents on marine water such as laying sand blanket, laying Grade 200 and Grade 400 rock, dredging works, filling work below +2.5mPD at the reclamation area prior to the complete installation of caissons at marine access and operating of deep cement mixing.

The typical section of the proposed floating type silt curtain is attached in **Appendix B**. Specification of the proposed geotextile for the silt curtain is attached in **Appendix C**.

3.2 Cage Type Silt Curtain – Type 1

Cage type silt curtain – Type 1 shall mainly comprise the geotextile fabric with ballast chain / weight, a metal frame and associated connectors to affix the silt curtain to the frame. The frame shall be made of non-corrosive metal and properly designed to achieve structural integrity of the silt curtain.

The geotextile fabric shall be mounted and/or affixed to all four sides of the frame using seamed joints with sufficient overlap to prevent leakage of suspended solids. The silt curtain shall contain a roll up mechanism to enable the geotextile fabric to be rolled up when not in use. The design of the mechanism must enable the geotextile fabric to remain attached to the sides of the frame during roll up and roll down (i.e. prevent billowing of the fabric away from the cage frame).

Both the length of the frame and the geotextile fabric shall be measured and cut to fit the water depths at the location of deployment. The exact length shall be flexible to cater for changes in tidal level.

Cage type silt curtain – Type 1 shall be used by vessels laying sand blanket, laying Grade 200 and Grade 400 rock and dredging by using a closed grab method. Laying of sand blanket shall be carried out by a bottom dumping method to prevent localized overloading of the seabed and potential instability as well as minimizing loss of fines when placing the sand. The proposed method would allow sand to be discharged to a point near the seabed where current dispersion would be low. In addition, dredging works shall be carried out by closed grab dredger, each of

grab size of not more than $2m^3$.

The typical section of the different cage type silt curtains are attached in **Appendix D**. Specification of the proposed geotextile is attached in **Appendix C**.

3.3 Cage Type Silt Curtain – Type 2

Cage type silt curtain – Type 2 shall mainly comprise the geotextile fabric with ballast chain / weight. Metal rods and associated connectors to affix the silt curtain to the electric winches installed at the boundary of DCM barge. The metal rods shall be made of non-corrosive metal and properly designed to achieve structural integrity of the silt curtain.

The geotextile fabric shall be mounted and/or affixed to all four sides of the DCM barges using seamed joints with sufficient overlap to prevent leakage of suspended solids. The silt curtain shall contain a roll up mechanism, by electric winch, to enable the geotextile fabric to be rolled up when not in use. The design of the mechanism must enable the geotextile fabric to remain attached to the sides of the DCM barge during roll up and roll down (i.e. prevent billowing of the fabric away from the DCM barge).

Both the length of the frame and the geotextile fabric shall be measured and cut to fit the water depths at the location of deployment. The exact length shall be flexible to cater for changes in tidal level.

Cage type silt curtain – Type 2 shall be used by DCM barge as a secondary layer of silt curtain while conducting DCM works.

The typical section of the different cage type silt curtains are attached in **Appendix D**. Specification of the proposed geotextile is attached in **Appendix C**.

3.4 Cage Type Silt Curtain – Type 3

Cage type silt curtain – Type 3 shall comprise of several layers of hollow boxes made up of metal plates. The total length of hollow box can be adjusted by using telescopic method. Electric winches shall be used to move the hollow box upward or downward so as to reach the seabed. The metal plates shall be made of non-corrosive metal and properly designed to achieve structural integrity of the silt curtain.

Cage type silt curtain – Type 3 shall be used by DCM barge in the vicinity of drilling rod as a primary layer of silt curtain while conducting DCM works.

The typical section of the different cage type silt curtains are attached in **Appendix D**.

3.5 Cage Type Silt Curtain – Type 4

Cage type silt curtain – Type 4 shall mainly comprise the geotextile fabric with ballast chain / weight, a metal frame and associated connectors to affix the silt curtain to the frame. The frame shall be made of non-corrosive metal and properly designed to achieve structural integrity of the silt curtain.

Double layers geotextile fabric shall be mounted and/or affixed to all four sides of the frame using seamed joints with sufficient overlap to prevent leakage of suspended solids. The silt curtain shall contain a roll up mechanism to enable the geotextile fabric to be rolled up when not in use. The design of the mechanism must enable the geotextile fabric to remain attached to the sides of the frame during roll up and roll down (i.e. prevent billowing of the fabric away from the cage frame). Both the length of the frame and the geotextile fabric shall be measured and cut to fit the water depths at the location of deployment. The exact length shall be flexible to cater for changes in tidal level.

Cage type silt curtain – Type 4 shall be used by spreader pontoon / pelican barge / sand pumping barge while conducting reclamation by using sand pumping pipe. Reclamation shall be carried out by a bottom dumping method to prevent localized overloading of the seabed and potential instability as well as minimizing loss of fines when placing the sand. The proposed method would allow sand to be discharged to a point near the seabed where current dispersion would be low.

The typical section of the different cage type silt curtains are attached in **Appendix D**. Specification of the proposed geotextile is attached in **Appendix C**.

3.6 Cage Type Silt Curtain – Type 5

Cage type silt curtain – Type 5 shall mainly comprise the geotextile fabric with ballast chain / weight, a metal chute with tremie pipes and associated connectors to affix the silt curtain to the metal chute. The metal chute with tremie pipes shall be made of non-corrosive metal and properly designed to achieve structural integrity of the silt curtain.

The geotextile fabric shall be mounted and/or affixed to all four sides of the metal chute with tremie pipes using seamed joints with sufficient overlap to prevent leakage of suspended solids. The silt curtain shall contain a roll up mechanism to enable the geotextile fabric to be rolled up when not in use. The design of the mechanism must enable the geotextile fabric to remain attached to the sides of the metal chute with tremie pipes during roll up and roll down (i.e. prevent billowing of the fabric away from the metal chute with tremie pipes).

Both the length of the metal chute with tremie pipes and the geotextile fabric shall be measured and cut to fit the water depths at the location of deployment. The exact length shall be flexible to cater for changes in tidal level.

Cage type silt curtain – Type 5 shall be used by spreader pontoon / pelican barge while conducting reclamation without using sand pumping pipe. Reclamation shall be carried out by a bottom dumping method to prevent localized overloading of the seabed and potential instability as well as minimizing loss of fines when placing the sand. The proposed method would allow sand to be discharged to a point near the seabed where current dispersion would be low.

The typical section of the different cage type silt curtains are attached in **Appendix D**. Specification of the proposed geotextile is attached in **Appendix C**.

3.7 Cage Type Silt Curtain – Type 6

Cage type silt curtain – Type 6 shall mainly comprise the geotextile fabric with ballast chain / weight and associated connectors to affix the silt curtain to the caissons.

The geotextile fabric shall be mounted and/or affixed to caissons with sufficient overlap to prevent leakage of suspended solids. The silt curtain shall contain a roll up mechanism to enable the geotextile fabric to be rolled up when not in use. The design of the mechanism must enable the geotextile fabric to remain attached to the sides of caissons during roll up and roll down.

Both the length of the caissons and the geotextile fabric shall be measured and cut to fit the water depths at the location of deployment. The exact length shall be flexible to cater for changes in tidal level.

Cage type silt curtain – Type 6 shall be used during seawall filling works. Reclamation shall be carried out by a bottom dumping method to prevent spraying out of fines out of the caissons.

The typical section of the different cage type silt curtains are attached in **Appendix D**. Specification of the proposed geotextile is attached in **Appendix C**.

4 SILT CURTAIN PILOT TEST

4.1 Pilot Test Arrangement

The pilot test is proposed to be carried out during the early stage of construction with highest current speed conditions, covering both flood and ebb tide for one - two week including 3 sampling days for silt curtain efficiency testing.

During the silt curtain efficiency testing, sand blanket laying or operating of deep cement mixing works shall be actively conducted within the works areas protected by the silt curtains to be tested, and shall be operating at close to the maximum productivity. The sand blanket laying or operating of deep cement mixing works shall be located as close to the silt curtain boundary as practicable.

During the whole pilot test, the surrounding environment should be controlled as far as practicable such that there would be no other major SS-generating construction activity operating concurrently, or marine vessel movements in the near vicinity.

4.2 In-situ Monitoring

4.2.1 Monitoring Locations

Floating Type Silt Curtain

The water monitoring of the pilot test will be conducted at a total of six monitoring stations, i.e. three within marine works area and three outside the silt curtain. The locations of the sampling stations are described in **Table 4.1, Table 4.2**, **Figure 3 and Figure 4**.

Table 4.1 Locations of Monitoring Stations for Pilot Test (for one double layers of floating type silt curtain)

Monitoring Stations	Location	Description
A1	Within Marine Works Area	The floating type silt curtain is 50m wide only. The distance between the inside stations (A1 to A3) will be adjusted according to the actual dimension of the floating type silt curtain on the day of the test.
A2		
A3		
B1	Outside Silt Curtain	The floating type silt curtain is 50m wide only. The distance between the outside stations (B1 to B3) will be adjusted according to the actual dimension of the floating type silt curtain on the day of the test and located within approximately 50m from the silt curtain boundary.
B2		
B3		

Figure 3 Indicative locations of Monitoring Stations for Pilot Test (One double layer of floating Type Silt Curtain)

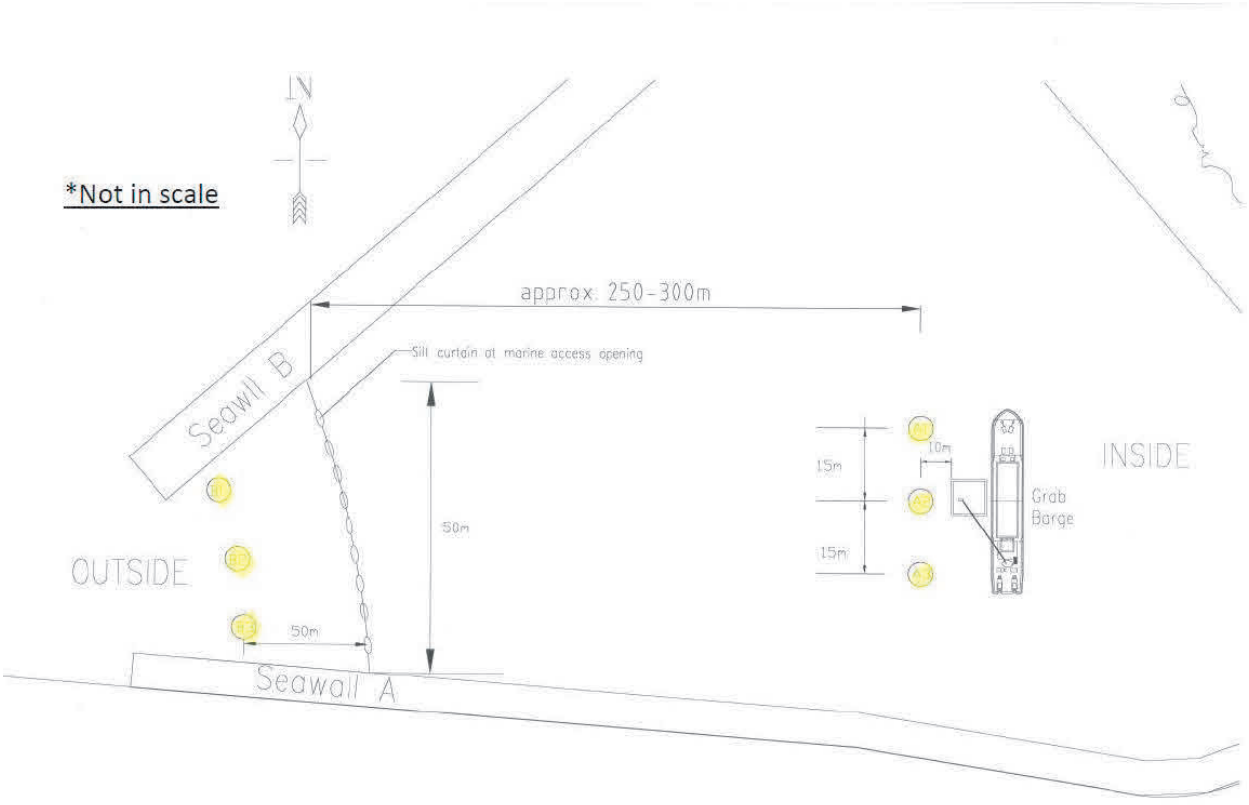
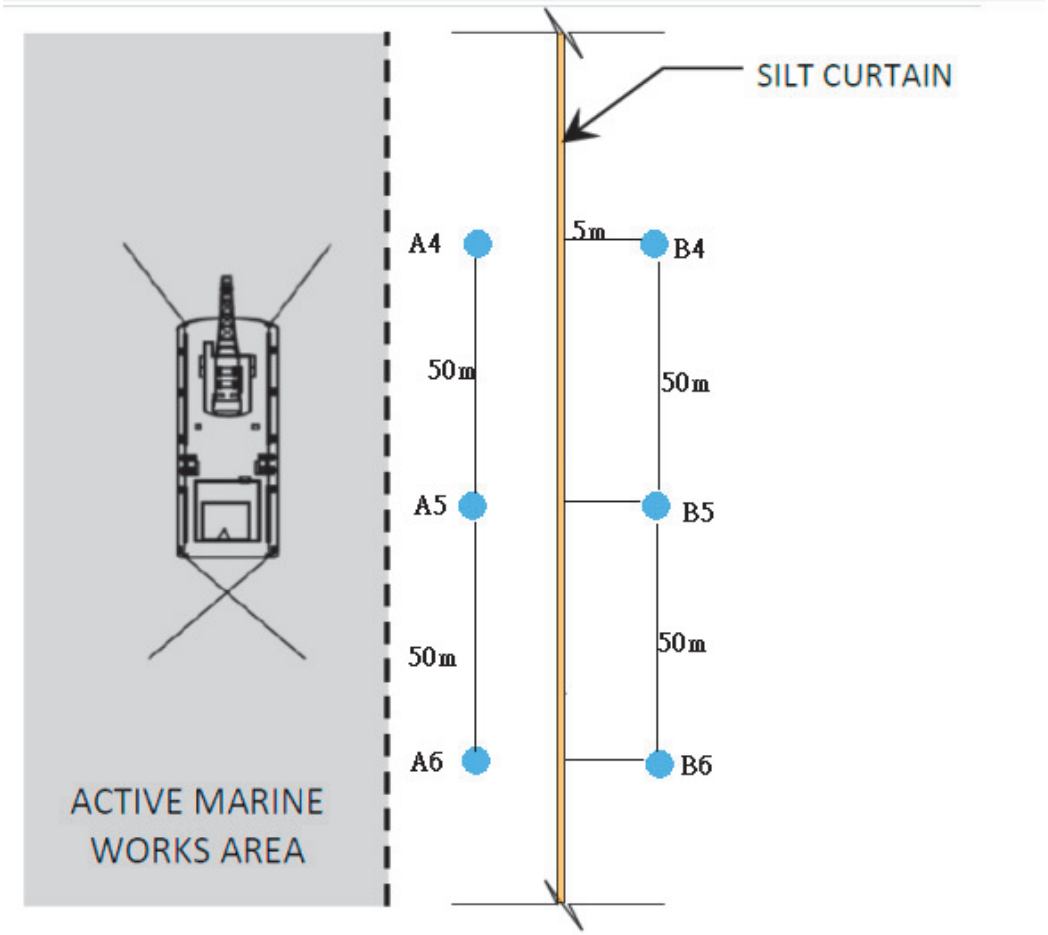


Table 4.2 Locations of Monitoring Stations for Pilot Test (for two double layers of Floating type silt curtain)

Monitoring Stations	Location	Description
A4	Within Marine Works Area	Three monitoring stations spaced at approximately 50m from each other and located between the marine works and the silt curtain boundary
A5		
A6		
B4	Outside Silt Curtain	Three monitoring stations spaced at approximately 50m from each other and located within approximately 5m from the silt curtain boundary
B5		
B6		

Figure 4 Indicative locations of Monitoring Stations for Pilot Test (Two double layer of Floating Type Silt Curtain)



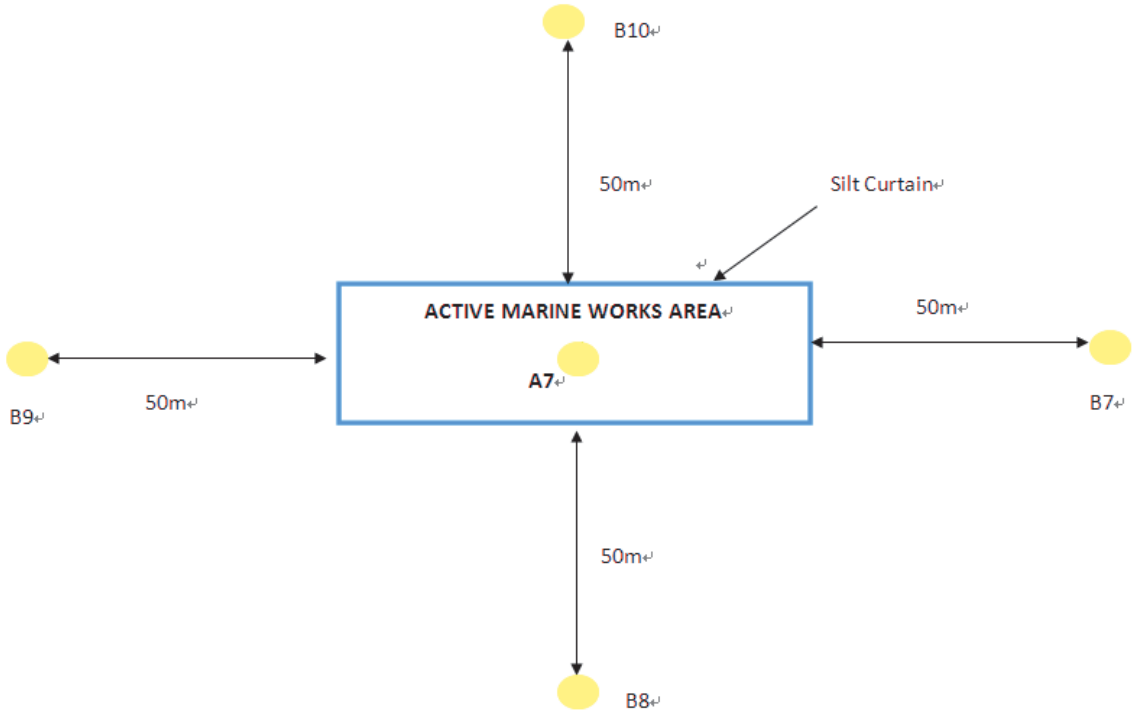
Cage Type Silt Curtain

The water monitoring of the pilot test will be conducted at a total of five monitoring stations, i.e. one inside the cage and four outside the silt curtain. The locations of the sampling locations are described in **Table 4.3** and **Figure 5**.

Table 4.3 Locations of Monitoring Stations for Pilot Test (for cage type silt curtain)

Monitoring Stations	Location	Description
A7	Within Marine Works Area	One monitoring station will be located inside the cage
B7	Outside Silt Curtain	Four monitoring stations located at four sides of silt curtain and within approximately 50m from the silt curtain boundary
B8		
B9		
B10		

Figure 5 Indicative locations of Monitoring Stations for Pilot Test (Cage Type Silt Curtain)



4.2.2 Water Sampling Equipment

For in-situ monitoring, a turbidimeter (HACH 2100Q or equivalent) will be used to measure turbidity. A sampler will be used to collect water samples for laboratory analysis of suspended solids.

4.2.3 Turbidity

Turbidity will be measured in-situ by the nephelometric method. The instrument will be portable and weatherproof using a DC power source complete with cable, sensor and comprehensive

operation manuals. The equipment will be capable of measuring turbidity between 0-1000 NTU. The probe cable will not be less than 25m in length.

4.2.4 Water Depth Detector

A portable, battery-operated echo sounder will be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the underside of the survey boat, if the same vessel is to be used throughout the monitoring programme.

4.2.5 Position System

A hand held Global Positioning System (GPS) will be used to ensure that the correction location has been selected prior to sample collection.

4.2.6 Current Velocity and Direction

A Valeport 106 or equivalent current meter will be used for measuring current velocity and direction to verify the exact location of the impact monitoring stations and control stations.

4.2.7 Suspended Solids

A water sampler, consisting of PVC or glass cylinder of a capacity of not less than two litres which can be effectively sealed with cups at both ends will be used. The water sampler will have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is the selected water depth.

4.2.8 Sample Container and Storage

Following collection, water samples for laboratory analysis will be stored in high density polythene bottles with no preservatives added, packed in ice (cooled to 4°C without being frozen), delivered to the laboratory and analyzed as soon as possible.

4.2.9 Calibration of In-Situ Instruments

The turbidimeter should be checked and calibrated before use. Turbidimeter should also be certified by a laboratory accredited under Hong Kong Laboratory Accreditation Scheme (HOKLAS) or other international accreditation scheme, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the pilot test. Responses of turbidimeter will be checked with certified standard solutions before each use.

For the in-situ calibration of field equipment, the BS 1427:2009, “Guide to on-site test methods for the analysis of waters” will be observed.

Sufficient stocks of spare parts will be maintained for replacements when necessary. Backup monitoring equipment will also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc.

Table 4.4 summarizes the equipment used in the water quality monitoring program of pilot tests.

Table 4.4 Water Quality Monitoring Equipment

Equipment	Model	Monitoring Parameters / Use	Quantity
Water Sampler	Kahlsico Water – Bottle Model 135DW 150 or equivalent	Collection of water sample	2
Turbidimeter	HACH 2100Q or equivalent	Measurement of turbidity	2
Monitoring Position Equipment	"Magellan" handheld GPS Model Triton 400/Garmin Model eTrex 10 or equivalent	Determination of water quality monitoring stations	1
Sonar Water Depth Detector	Garmin Fishfinder 140 or equivalent	Determination of water depth	1
Current Meter	Valeport 106 or equivalent	Measurement of current velocity and direction	1

4.2.10 Monitoring Methodology

The monitoring stations will be accessed by the guide of a hand held digital Global Positioning System (GPS) during water quality monitoring of pilot test. The depth of the monitoring location will be measured using depth meter in order to determine the sampling depths. Afterwards, the water sampler will be lowered to the predetermined depths (1m below water surface, mid-depth and 1m above seabed) and the collected water samples shall be decanted into the sample cells of the turbidimeter for analysis of turbidity. At each measurement, two consecutive measurements of in-situ parameters will be taken. Where the difference in the value between the first and second readings of each set was more than 25% of the value of the first reading, the reading will be discarded and further readings will be taken.

Water samples for SS (mg/L) measurements will be collected at the same depths.

Water sampler will be lowered into the water to the required depths of sampling. Upon reaching the pre-determined depth, a messenger to activate the sampler will then be released to travel down the wire. The water sample will be sealed within the sampler before retrieving. At each station, water samplers at three depths (1m below the water surface, mid depth and 1m above the seabed) will be collected accordingly. Water samples will be stored in a cool box and kept at less than 4°C but without frozen and sent to the laboratory as soon as possible. In addition, field information

will also be recorded. Adequate water samples (about 1L) for laboratory measurements will be collected.

The water quality parameters to be monitored are tabulated below in **Table 4.5**.

Table 4.5 Water Quality Parameters to be tested during Pilot Test

Water Quality Parameters	Pilot Test
Turbidity	x
Suspended Solids (SS)	x
Water depth	x
Current Velocity and direction	x

4.3 Laboratory Analytical Methods

Analysis of suspended solids (SS) will be conducted by laboratory accredited under HOKLAS or other international accredited laboratory, and comprehensive quality assurance and control procedures in place will be carried out in order to ensure quality and consistency in results. The testing method and limit of reporting are provided in **Table 4.6**.

Table 4.6 Laboratory Analysis for Water Samples

Parameter	Proposed Method	Reporting Limit
Suspended Solids	APHA 2540D	1.0 mg/L

4.4 Quality Assurance / Quality Control Requirements

4.4.1 Decontamination Procedures

Water sampling equipment used during the course of the monitoring programme will be decontaminated by manual washing and rinsed clean seawater / distilled water after each sampling event. All disposal equipment will be discarded after sampling.

4.4.2 Sampling Management and Supervision

Water samples will be dispatched to the testing laboratory for analysis as soon as possible after the sampling. All samples will be stored in a cool box and kept at less than 4°C but without freezing. All water samples will be handled under a chain of custody protocols and relinquished to the laboratory representatives at locations specified by the laboratory.

4.5 Review and Report

The effectiveness of the proposed silt curtain system can be calculated based following equation:

$(SS_{inside} - SS_{outside}) / SS_{inside} \times 100\% \geq 80\%$

The results of the pilot test and the recommendations and modifications for the silt curtain system will be submitted to the Supervising Officer (SO), Independent Environmental Checker (IEC) and Environmental Team Leader (ETL) for review.

5 SILT CURTAIN INSTALLATION

Silt curtains shall be installed completely before commencement of any marine works requiring silt curtains. Prior to installation of silt curtains, the KSZHJV shall undertake a thorough check for defects and / or damages particularly in the silt curtain fabric, at the seams, and at the jointing / connector locations. Any defects and / or damages shall be rectified before commencing installation. In addition, trained Marine Mammal Observer(s) (MMO(s)) shall check whether silt curtains are ready, well prepared and operated without any obvious damage. MMO(s) shall confirm the presence of the relevant frontline staff of KSZHJV and its sub-contractors and engineers on board to ensure the effective communication, coordination and implementation so as to response to any incidents involving marine mammals within the waters surrounded by the cage type / floating type silt curtain and the work areas. Also there are lookout points at an elevated level of each barge, clear and safe access at the edges of the barge for inspection during dredging / sand blanket laying, DCM works, seawall filling and reclamation works, provision of sufficient lighting is required if working at night.

5.1 Training of Marine Mammal Observers

Training sessions for MMO(s) shall be conducted by marine mammal specialist, Dr. Samuel Hung, Dr. Lindsay Porter, Ms. Julia Chan or someone with equivalent qualifications, with briefing materials provided as guidelines, instructing adequate knowledge of all requirements for observing marine mammal and appropriate actions to be taken. Competence checking by ET shall be provided to the trained MMO(s) and the training frequency shall follow the approved Marine Mammal Watching Plan.

As the frontline staff of KSZHJV or its sub-contractors, i.e. foremen, site agent, superintendents and engineers would involve in the installation of silt curtain, briefings for these personnel will be

provided by the trained MMO(s) during induction trainings to get familiar with the requirements and duties of MMO(s) so as to assist on marine mammal observations within waters surrounded by silt curtains and taking necessary action when there is marine mammal trapped by silt curtain. Refresh briefings will be provided to all frontline staff once every 6 months. The briefing and training records will be provided to ETL, IEC and SO for audit and record.

5.2 Floating Silt Curtains

The furled floating silt curtains shall be launched into the sea by derrick / crane boats / seawalls and floated into position. Anchors shall be carefully lowered to the seabed at the specified intervals. Care shall be taken to ensure that lateral anchor points are in the correct positions prior to attaching the anchor lines / anchor buoy to the silt curtain. After attaching the silt curtain to the anchors and before unfurling the silt curtains, a check shall be conducted on the 'lay' of the curtain to confirm the positioning and slack allowances are correct. Where necessary, final adjustments should be made to the anchors, before the furling lines are released to allow the silt curtain skirt to drop. Where base anchors are also required, connection of the anchor lines to the silt curtain shall be done by divers after unfurling the silt curtain.

In order to avoid the entrance of marine mammals into the works area through the opening at silt curtains for vessel access, and the subsequent potential impacts including increase in stress level in marine mammals due to underwater noise and chance of collision with working vessels, the openings for vessel access at the silt curtains should be restricted to about 50m to minimize the risk of accidental entrance by marine mammal. The silt curtain installed in the vicinity of coral colonies is mainly served to reduce the impact of suspended solids generated from construction activities to the adjacent coral colonies. The location of installation of floating type silt curtain is attached in **Appendix E**.

During the installation process of floating type silt curtains, in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains, a monitored exclusion zone of 250m radius from silt curtain should be implemented. The exclusion zone should be closely monitored by an experienced marine mammal observer (MMO) for at least 30 minutes before the start of installation process. If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals. The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone from an elevated platform with unobstructed visibility. The marine mammal observer(s) shall be independent of the KSZHJV and shall form part of the Environmental Team and have the power to call-off

construction activities.

In addition, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works requiring the exclusion zone monitoring, should be avoided under weather conditions with low visibility as much as possible. For the night-time marine mammal monitoring, spotlight will be used to provide sufficient brightness to assist the inspection in dark condition. In case of inadequate of brightness, night vision device will be used. For the marine mammal monitoring during adverse weather, the contractor shall also confirm the visibility of lookout point for effective implementation of the exclusion zone monitoring, safety of MMO(s) and practicability of deployment of silt curtain, otherwise marine works requiring the exclusion zone monitoring shall be ceased.

5.3 Cage Type Silt Curtains

The assembled cage frame shall be securely attached to the section of the construction vessel involved in the marine works (e.g. around the grab of the grab dredger). The rolled up silt curtains attached to the cage frame should be lowered to seabed level after the frame position has been fixed and the vessel is in the correct location for the marine works.

During the installation process of cage type silt curtains, in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains, a monitored exclusion zone of 250m radius from silt curtain should be implemented. The exclusion zone should be closely monitored by an experienced marine mammal observer (MMO) for at least 30 minutes before the start of installation process. If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals. The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone from an elevated platform with unobstructed visibility. The marine mammal observer(s) shall be independent of the KSZHJV and shall form part of the Environmental Team and have the power to call-off construction activities.

In addition, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works requiring the exclusion zone monitoring, should be avoided under weather conditions with low visibility as much as possible. For the night-time marine mammal monitoring, spotlight will be used to provide sufficient brightness to assist the

inspection in dark condition. In case of inadequate of brightness, night vision device will be used. For the marine mammal monitoring during adverse weather, the contractor shall also confirm the visibility of lookout point for effective implementation of the exclusion zone monitoring, safety of MMO(s) and practicability of deployment of silt curtain, otherwise marine works requiring the exclusion zone monitoring shall be ceased.

6 SILT CURTAIN OPERATION AND MAINTENANCE

On board supervisors will be assigned to check the condition of the silt curtain before commencement of works every day. An inspection checklist will be prepared and filled in by the site supervisors. All checklists will be kept on site for record purpose. The sample of Silt Curtain Daily Inspection Checklist and Diver Inspection Checklist for Silt Curtain are attached in **Appendix F**.

For the tentative arrangement of silt curtain under adverse weather, the silt curtain will not be temporary removed. However, related works will be suspended immediately if silt curtain is found any damage. The damaged silt curtain shall be lifted up from water by grab dredger / derrick barge. Double line sew a new piece of geotextile to the existing geotextile to cover the damaged area. The overlapping length shall be at least 300mm. The marine works involving the requirement for using of silt curtain shall only be commenced after the damaged silt curtain is repaired.

Refuse around the silt curtains will be collected at regular intervals on a daily basis so that water behind the silt curtains will be kept free from floating debris.

Sufficient spare geotextiles will be kept on site for replacing of damaged silt curtains. The spare geotextiles shall be covered with tarpaulin sheets to avoid direct contact with water and sunlight.

Underwater silt curtain inspection will be conducted by diver after installation / re-installation / relocation of silt curtains / suspected sediment release due to ineffectiveness of silt curtain (e.g. from the results of environmental monitoring of suspended solids by the ET). Diver inspections shall cover at least a 10m length of silt curtain or one whole silt curtain panel (whichever is greater) at each diving location, and at intervals of at least every 200m along the length of silt curtains deployed. The diver inspections shall check that the silt curtain fabric is intact, the silt curtain depths and anchor positions are correct, and there is no damage / breakage in anchor and load lines. Photographic records shall be taken during each underwater inspection. All identified defects / damage shall be photographed and the position recorded on GPS to enable the affected areas to be subsequently located for in-situ repair where appropriate.

6.1 Approach for Marine Mammal Watching Works

Detailed marine mammal watching works shall refer to the approved Marine Mammal Watching Plan and Detailed Monitoring Programme on Finless Porpoise under FEP – 01/420/2012/A. The key components of marine mammal watching works are summarized as below.

Marine Mammal Exclusion Zone for continuous MMO monitoring
A monitored exclusion zone of 250m radius from silt curtain or from the boundary of a work area should be implemented under the following situations (where applicable, Marine Mammal Watching Plan shall be conducted at the meantime):

1. 30 minutes before commencement of and during silt curtain installation / re-installation / relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.27); or
2. During implementation of Marine Mammal Exclusion Zone plan with 3 or more construction vessels requiring MMO's duty operating simultaneously in close proximity.

Marine Mammal Exclusion Zone for non-continuous MMO monitoring at marine access opening
For the construction activities requiring non-continuous MMO monitoring (i.e. opening of floating type silt curtain at marine access for reclamation works), MMO(s) will be arranged for:

1. 30 minutes before the commencement of installation / re-installation / relocation works of floating type silt curtain at marine access;
2. MMEZ monitoring during installation / re-installation / relocation of floating types silt curtain when opening and closing at marine access area; and
3. After the enclosure of floating type silt curtain at marine access area for reclamation works to implement visual inspection as detailed in Marine Mammal Watching Plan.

The marine mammal exclusion zone (MMEZ) will be carried out in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains or works area and minimize underwater acoustic disturbance, so as for precautionary purpose for DCM works. If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals. The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone from an elevated platform with unobstructed visibility. The marine mammal observer(s) shall be independent of the construction contractor and shall form part of the Environmental Team and have the power to call-off construction activities.

In addition, as marine mammals cannot be effectively monitored within the proposed monitored

exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works requiring the exclusion zone monitoring, should be avoided under weather conditions with low visibility as much as possible. For the night-time marine mammal monitoring, spotlight will be used to provide sufficient brightness to assist the inspection in dark condition. In case of inadequate of brightness, night vision devise will be used. For the marine mammal monitoring during adverse weather, the MMO shall confirm the visibility of lookout point for effective implementation of the exclusion zone monitoring, whilst contractor shall confirm safety of MMO and practicability of deployment of silt curtain, otherwise marine works requiring the exclusion zone monitoring shall be ceased.

Upon the completion of silt curtain installation / re-installation / relocation, the marine works would be conducted within an enclosed environment within the silt curtain. Subsequently, Visual Inspection of the Waters Surrounded by Silt Curtains (Section 6.2) and Regular Inspection of Deployed Silt Curtain inspection (Section 6.3) under Marine Mammal Watching Plan would be implemented (where applicable, Marine Mammal Exclusion Zone shall be conducted at the meantime).

As per EP requirement from Clause 2.13 of the VEP, a Marine Mammal Watching Plan has been prepared and submitted separately to EPD, where the plan has included details of marine mammal watching actions such as regular inspection of silt curtains and visual inspection of the waters surrounded by the curtains. All measures recommended in the Marine Mammal Watching Plan shall be fully and properly implemented for the Project.

Special attention would be paid to Phase 2 (reclamation) where the floating type silt curtain would be opened occasionally for vessel access, leaving a temporary opening. An action plan has been devised to cope with any unpredicted incidents such as the case when marine mammals are found within the waters surrounded by the silt curtains as below **Figure 6**.

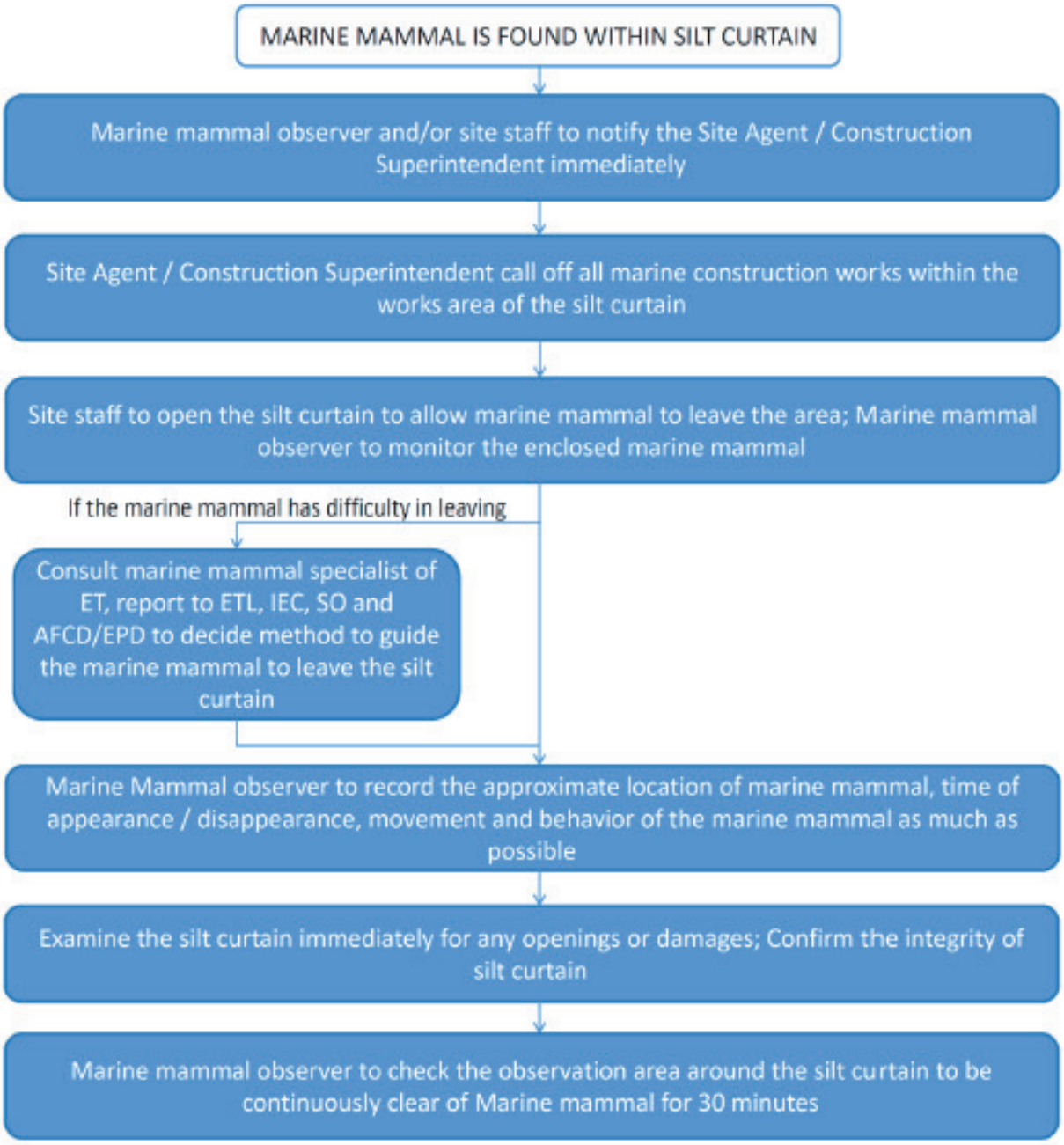


Figure 6: Response Procedures for Occurrence of Marine Mammal within Silt Curtain

6.2 Visual Inspection of the Waters Surrounded by Silt Curtains

Detailed marine mammal watching works shall refer to the approved Marine Mammal Watching Plan under FEP – 01 /429/2012/A. Key components of visual inspection of the waters surrounded by silt curtains are summarized as below.

Two shifts of marine mammal observer team will be arranged for this Contract. Each shift of MMO team will be responsible for maximum 12 hours of monitoring work per day. At least two MMO(s) would be assigned as one team to work in shift to avoid / minimize fatigue of observers.

Visual inspection will be conducted by a trained MMO with naked eyes and the aid of binoculars to check for any presence of marine mammal inside the works area surrounded by silt curtains prior to commencement of works on each day. The models of the proposed marine binoculars to be used are Marine Binoculars Steiner Navigator 7X50C with Compass and Bushnell 7x50 Marine Binocular with Compass. For the night-time marine mammal monitoring, spotlight will be used to provide sufficient brightness to assist the inspection in dark condition. In case of inadequate of brightness, night vision device (NVD) will be used. The proposed model of NVD are from ATN, model PS15-CGTI Night Vision Goggles with 3x lens or equivalent which had proved practicable for night-time monitoring. In the event of marine mammal being sighted, the trained MMO(s) will notify the construction superintendent immediately for response actions as stated in **Figure 6** and communicate with relevant parties to stop and then resume work after the discovered marine mammal leaves.

For the re-deployment of the localized silt curtains (frame-type, cage-type or enclosed floating-type silt curtains), MMO will conduct visual inspection to confirm that there is no presence of marine mammal within the localized silt curtains (frame-type, cage-type or enclosed floating-type silt curtains). Visual inspection will be conducted every an hour by MMO for confirming that there is no any marine mammal observed in the surrounding area of the deployed silt curtain during re-deployment of localized silt curtains (frame-type, cage-type or enclosed floating-type silt curtains).

In case there is any marine mammal being found, the MMO(s) should carry out the response actions as stated **Figure 6** and communicate with relevant parties to stop and then resume work after the discovered marine mammal leaves.

6.3 Regular Inspection of Deployed Silt Curtains

Detailed marine mammal watching works shall refer to the approved Marine Mammal Watching Plan under FEP – 01 /429/2012/A. Key components of regular inspection of deployed silt curtains are summarized as below.

Before commencement of dredging / sand blanket laying / DCM work at each designated area, a trained MMO shall check whether silt curtains are ready, well prepared and operated without any obvious damage.

Also, the MMO shall confirm the presence of the relevant frontline staff of the main contractor or its sub-contractors and engineers on board to ensure the effective communication, coordination and implementation of the response plan in relation to any incidents involving marine mammals within the waters surrounded by the deployed silt curtains and the work areas.

During the operation, the inspection will be conducted daily. The MMO(s) will walk along the edge of the barge along the cage type silt curtain or proper location without obstacles where appropriate to inspect the cage type silt curtain with naked eyes, the MMO(s) will check that the cage type silt curtains are maintained in the correct positions with no obvious defects / entanglement and there is no observable muddy water passing through the cage type silt curtain. Any floating refuse trapped by the silt curtain shall be removed as part of the regular inspection. For inspection at night time, spotlight will be used to provide sufficient brightness to assist the inspection in dark condition.

6.4 Regular Inspection of Floating Type Silt Curtain during Opening of Vessel Access

Detailed marine mammal watching works shall refer to the approved Marine Mammal Watching Plan under FEP – 01 /429/2012/A. Key components of regular inspection of floating type silt curtain during opening of vessel access are summarized as below.

One trained MMO shall be on site to perform non-continuous MMO monitoring. Each shift of MMO will be responsible for maximum 12 hours of monitoring work per day and two shifts of MMO shall be arranged at the duty vessel to perform non-continuous MMO monitoring per day.

For the opening of access area of the floating type silt curtain in the reclamation area, MMO will conduct visual inspection to check for any presence of marine mammal near the opening of access areas surrounded by the floating type silt curtain every 30 minutes until the floating type silt curtain was enclosed. If the floating type silt curtains are enclosed during the reclamation work, MMO will conduct visual inspection to check for any presence of marine mammal inside the area surrounded by the floating type silt curtain daily. The duration will be subject to various conditions, e.g. weather or angle of observation. The works can only commence after confirming that the surrounding waters of the floating type silt curtains have not contain any marine mammal. Thereafter, frontline staff, i.e. foremen, site agent, superintendents and engineers will assist our MMO in implementing the plan from the active work fronts within the waters surrounded by the silt curtains throughout the work period. The MMO will conduct visual inspection daily to observe the presence of any marine mammal around the floating type silt curtains or being trapped by the

localized silt curtains. The MMOs will also check if the floating type silt curtains are in correct positions.

The model of the proposed marine binoculars to be used is Marine Binoculars Steiner Navigator 7X50C with Compass and Bushnell 7x50 Marine Binoculars with Compass. For the night-time marine mammal monitoring, spotlight will be used to provide sufficient brightness to assist the inspection in dark condition. In case of inadequate of brightness, night vision device (NVD) will be used. The proposed model of NVD are from ATN, model PS15-CGTI Night Vision Goggles with 3x lens or equivalent which had proved practicable for night-time monitoring. In the event of marine mammal being sighted, the trained MMO(s) will notify the construction superintendent immediately for response actions as stated in **Figure 6** and communicate with relevant parties to stop and then resume work after the discovered marine mammal leaves.

7 SILT CURTAIN REMOVAL / REPOSITIONING

Prior to removal of silt curtains, all marine works for which the silt curtains are deployed shall be stopped and visual inspection of the water quality within the area protected by silt curtains shall be conducted to confirm no sediment plume remaining within the works area before commencing silt curtain removal.

7.1 Floating Silt Curtains

Floating silt curtains shall be removed by detaching the chain connecting the silt curtain to the anchors, before rolling up and lifting the silt curtains and marker buoys / lights onto derrick / crane boats. Care should be taken to protect the silt curtain skirt from damage as it is dragged from the water. The remaining anchors shall be individually connected to the crane by divers and carefully lifted off the seabed for recovery onto the boats to minimize disturbance to the seabed.

During the re-positioning / re-deployment process of floating type silt curtains, in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains, a monitored exclusion zone of 250m radius from silt curtain should be implemented. The exclusion zone should be closely monitored by an experienced marine mammal observer (MMO) for at least 30 minutes before the start of re-positioning / re-deployment process. If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals. The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone from an elevated platform with unobstructed visibility. The marine

mammal observer(s) shall be independent of the KSZHJV and shall form part of the Environmental Team and have the power to call-off construction activities.

In order to avoid the entrance of marine mammals into the works area through the opening at silt curtains for vessel access, and the subsequent potential impacts including increase in stress level in marine mammals due to underwater noise and chance of collision with working vessels, the openings for vessel access at the silt curtains should be restricted to about 50m to minimize the risk of accidental entrance by marine mammal. The silt curtain installed in the vicinity of coral colonies is mainly served to reduce the impact of suspended solids generated from construction activities to the adjacent coral colonies. The location of installation of floating type silt curtain is attached in **Appendix E**.

In addition, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works requiring the exclusion zone monitoring, should be avoided under weather conditions with low visibility as much as possible. For the night-time marine mammal monitoring, spotlight will be used to provide sufficient brightness to assist the inspection in dark condition. In case of inadequate of brightness, night vision device will be used. For the marine mammal monitoring during adverse weather, the KSZHJV shall also confirm the visibility of lookout point for effective implementation of the exclusion zone monitoring, safety of MMO(s) and practicability of deployment of silt curtain, otherwise marine works requiring the exclusion zone monitoring shall be ceased.

7.2 Cage Type Silt Curtains

For cage type silt curtains, the silt curtains shall be rolled up and either securely wrapped to the top of the frame or detached from the frame completely before the cage frame is lifted and removed or re-positioned as required. Re-installation where required, shall follow the procedures specified in Section 5.

8 IMPLEMENTATION SCHEDULE

The implementation schedule as tabulated in **Table 8.1** summarizes the recommended mitigation measures, the implementation parties and timing to take action while implementing the Silt Curtain Deployment Plan.

Table 8.1 Implementation Schedule

EIA Ref.	Supporting Document of VEP Ref.	Supporting Document for Reviewing Dredging Rate and Filling Rate (Rev. E) Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location (Breakwater (B) / Seawall (S) / Coral (C) / Reclamation Area (R)	Works Period	Implementation Agent	Implementation Stages*			
								Des	C	O	Dec
S5b.8.1.9	3.3 & 8.1.1.6	4.3	2	Reclamation and Construction of Breakwaters / Seawalls			KSZHJV		√		
				• The proposed dredging and reclamation should be commenced in phases. The reclamation should be started within the enclosed seawalls after the substantial completion of the seawall as mentioned in Section 2 of Silt Curtain Deployment Plan. Silt curtain should be applied around caissons during the filling of the cell to prevent the loss of fine in the filling material.	B, S, R	During dredging, reclamation and infilling of Caissons.					
				• Marine access shall be located at the western side of Artificial Island, away from the identified coral communities and will be shielded by silt curtains systems to control sediment plume dispersion.	S, R	From upon completion of block work seawall (S_CH0 and S_CH310) and Caissons (SB_CH250 and SB_CH580 at Seawall A, Q_CH0 and CH388 at Seawall B) to completion of installation of Caissons at marine access.					
				• The silt curtain system at marine access opening should be closed as soon as the barges passes through the marine access opening in order to minimize the period of curtain opening. Filling should only be carried out behind the silt curtain when the silt curtain is completely closed.	S, R	From upon completion of block work seawall (S_CH0 and S_CH310) and Caissons (SB_CH250 and SB_CH580 at Seawall A, Q_CH0 and CH388 at Seawall B) to completion of installation of Caissons at marine access.					
				• Deployed silt curtains should be regularly checked and maintained to ensure proper functioning.	B, S, C, R	Throughout the marine works construction period					
				• Frame-type silt curtains should be deployed around the dredging, Grade 200 and Grade 400 rock laying and sand blanket laying operations.	B, S, R	During dredging and, Grade 200 and Grade 400 rock laying, sand blanket laying					
				• Silt curtains should be employed to enclose DCM field trial and any full scale DCM work to minimize the potential impacts on water aspect.	B, S	During DCM works					
				• Two Double layers silt curtain should be installed to embrace the coral colonies in the indirect impact site.	C	For construction activities that can affect the fine content of marine water such as sand blanket laying, Grade 200 and Grade 400 rock laying, dredging works, filling work below +2.5mPD					

EIA Ref.	Supporting Document of VEP Ref.	Supporting Document for Reviewing Dredging Rate and Filling Rate (Rev. E) Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location (Breakwater (B) / Seawall (S) / Coral (C) / Reclamation Area (R)	Works Period	Implementation Agent	Implementation Stages*			
								Des	C	O	Dec
						at the reclamation area prior to the complete installation of caissons at marine access and operating of deep cement mixing.					
				• As a temporary measure, one double layer silt curtain should be installed at the eastern side of Artificial Island after substantial completion of installation of block work seawall and Caisson at Seawall A and B as stated in Section 2 and Figure 1 of Appendix E.	S, R	From upon completion of block work seawall (S_CH0 and S_CH310) and Caissons (SB_CH250 and SB_CH580 at Seawall A, Q_CH0 and CH388 at Seawall B) to completion of seawall construction.					
7b.8.3.20 – 7b.8.3.24	4.3.3		6.1 - 6.4	Monitored exclusion zones For Continuous MMO monitoring • A monitored exclusion zone of 250m radius from silt curtain or from the boundary of a work area should be implemented under the following situations (where applicable, Marine Mammal Watching Plan shall be conducted at the meantime): 1. 30 minutes before commencement of and during silt curtain installation / re-installation / relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.27); or 2. During implementation of MMEZ cluster plan with multiple construction vessels requiring MMO's duty operating simultaneously in close proximity. For non-continuous MMO monitoring at marine access opening • A monitored exclusion zone of 250m radius from silt curtain installed at marine access opening: 1. 30 minutes before commencement of installation / re-installation / relocation works of floating type silt curtain at marine access; 2. MMEZ monitoring during installation / re-installation / relocation of floating types silt curtain when opening and closing at marine access area; and 3. After the enclosure of floating type silt curtain at marine access area for	B, S, C R	Throughout the whole marine works construction period when carrying out silt curtain installation / re-installation / relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.27) and during implementation of MMEZ cluster plan with multiple construction vessels requiring MMO's duty operating simultaneously in close proximity. Throughout the whole marine works reclamation period prior to completion of installation of caissons at marine access opening.	KSZHJV		√		

EIA Ref.	Supporting Document of VEP Ref.	Supporting Document for Reviewing Dredging Rate and Filling Rate (Rev. E) Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location (Breakwater (B) / Seawall (S) / Coral (C) / Reclamation Area (R)	Works Period	Implementation Agent	Implementation Stages*			
								Des	C	O	Dec
				reclamation works to implement visual inspection as detailed in Marine Mammal Watching Plan.							
				• The marine mammal exclusion zone (MMEZ) will be carried out in order to avoid the accidental entrance and entrapment of marine mammals within the silt curtains or works area and minimize underwater acoustic disturbance, so as for precautionary purpose for DCM works. If a marine mammal is noted within the exclusion zone, all marine works should stop immediately and remain idle for 30 minutes, or until the exclusion zone is free from marine mammals. The experienced marine mammal observer should be well trained to detect marine mammals. Binoculars should be used to search the exclusion zone form an elevated platform with unobstructed visibility. The marine mammal observer(s) shall be independent of the construction contractor and shall form part of the Environmental Team and have the power to call-off construction activities.	B, S, C, R	Throughout the whole marine works construction period when carrying out silt curtain installation / re-installation / relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.27) and during implementation of MMEZ cluster plan with multiple construction vessels requiring MMO's duty operating simultaneously in close proximity.					
				• In addition, as marine mammals cannot be effectively monitored within the proposed monitored exclusion zone at night, or during adverse weather conditions (i.e. Beaufort 5 or above, visibility of 300 meters or below), marine works should be avoided under weather conditions with low visibility as much as possible.	B, S, C, R	Throughout the whole marine works construction period when carrying out silt curtain installation / re-installation / relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.27) and during implementation of MMEZ cluster plan with multiple construction vessels requiring MMO's duty operating simultaneously in close proximity.					
				• Marine Mammal Exclusion Zone (MMEZ) Plan shall be properly implemented.	B, S, C, R	Throughout the whole marine works construction period when carrying out silt curtain installation / re-installation / relocation, deep cement mixing injection works or noisy construction works (as stipulated in FEP Clause 2.27) and during implementation of MMEZ cluster plan with multiple construction vessels requiring MMO's duty operating					

EIA Ref.	Supporting Document of VEP Ref.	Supporting Document for Reviewing Dredging Rate and Filling Rate (Rev. E) Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location (Breakwater (B) / Seawall (S) / Coral (C) / Reclamation Area (R)	Works Period	Implementation Agent	Implementation Stages*			
								Des	C	O	Dec
						simultaneously in close proximity.					
				<u>Marine mammal watching plan</u>							
				• Upon the completion of the installation / re-installation / relocation of floating type silt curtain, the marine works would be conducted within a full enclosed environment within the silt curtain. Subsequently, Visual Inspection of the Waters Surrounded by Silt Curtains (Section 2.1, MMWP) and Regular Inspection of Deployed Silt Curtain (Section 2.2, MMWP) would be implemented (where applicable, Marine Mammal Exclusion Zone shall be conducted at the meantime).	B, S, R	Throughout the whole marine works construction period for deployed silt curtains formed enclosed environment and to carry out marine works inside an enclosed environment.					
				• All measures recommended in the Marine Mammal Watching Plan shall be fully and properly implemented for the Project.	B, S, R	Throughout the whole marine works construction period for deployed silt curtains formed enclosed environment and to carry out marine works inside an enclosed environment.					
				• Special attention should be paid to Phase 2 (reclamation) where the floating type silt curtain would be opened occasionally for vessel access, leaving a temporary 50m opening. An action plan devised in the Marine Mammal Watching Plan shall be properly implemented to cope with any unpredicted incidents such as the case when marine mammals are found within the waters surrounded by the silt curtains.	S, R	Throughout the whole marine works construction period.					
				<u>Small openings at silt curtains</u>							
				• In order to avoid the entrance of marine mammals into the works area through the opening at silt curtains for vessel access, and the subsequent potential impacts including increase in stress level in marine mammals due to underwater noise and chance of collision with working vessels, the openings for vessel access at the silt curtains should be restricted to be from 50m – 100m to minimize the risk of accidental entrance by marine mammal.	S, R	From upon completion of block work seawall (S_CH0 and S_CH310) and Caissons (SB_CH250 and SB_CH580 at Seawall A, Q_CH0 and CH388 at Seawall B) to completion of installation of Caissons at marine access.					

EIA Ref.	Supporting Document of VEP Ref.	Supporting Document for Reviewing Dredging Rate and Filling Rate (Rev. E) Ref.	Current Plan Ref.	Environmental Protection Measures / Mitigation Measures	Location (Breakwater (B) / Seawall (S) / Coral (C) / Reclamation Area (R)	Works Period	Implementation Agent	Implementation Stages*			
								Des	C	O	Dec
7b.8.3.30			5.1	<u>Training of staff</u> • For the implementation of Marine Mammal Watching Plan and Marine Mammal Exclusion Zone Plan, training sessions shall be conducted for MMO by marine mammal specialist, Dr. Samuel Hung, Dr. Lindsay Porter, Ms. Julia Chan or someone with equivalent qualification, with briefing materials provided as guidelines, instructing adequate knowledge of all requirements for observing marine mammal and appropriate actions to be taken according to this plan. Competence checking by ET shall be provided at least once every 6 months to the trained MMO involved in implementation of this plan. • As frontline staff of the main contractor or its sub-contractors, i.e. foremen, site agent, superintendents and engineers would involve in the implementation of this plan, briefings for these personnel will be provided by the trained MMO during induction trainings to get familiar with the plans for assisting on marine mammal observations within waters surrounded by silt curtains and taking necessary action according to the plans when there is marine mammal trapped by the silt curtain or appearance of marine mammal within the MMEZ. Refresh briefings will be provided to all frontline staff once every 6 months. The briefing and training records will be provided to ETL, IEC and SO for audit and record.		Throughout the whole marine works construction period. Throughout the whole marine works construction period.	KSZHJV		√		

Note: * - Des – Design; C – Construction; O – Operation; Dec - Decommissioning

Appendix A

Construction Programme

Activity ID	Activity Name	Remaining Duration	Start	Finish
EP_SP_66_12-WP-2-M0	Programme for Design and Construction Works	2835	22-Nov-17 A	26-Aug-25
EP_SP_66_12-WP-2-M0.01	Key Dates	2496	22-Nov-17	21-Sep-24
EP_SP_66_12-WP-2-M0.02	Contract Preliminaries	2807	19-Dec-17	26-Aug-25
EP_SP_66_12-WP-2-M0.03	Licence/Permit Applications	2252	15-Dec-17	13-Feb-24
EP_SP_66_12-WP-2-M0.04	General Submissions	1320	22-Nov-17	03-Jul-21
EP_SP_66_12-WP-2-M0.05	Design Submissions	1724	22-Nov-17 A	11-Aug-22
EP_SP_66_12-WP-2-M0.06	Procurement of Major Equipment	1903	13-Sep-18	28-Nov-23
EP_SP_66_12-WP-2-M0.07	Environmental Works	1708	05-Jan-18	09-Sep-22
EP_SP_66_12-WP-2-M0.08	Maritime Works	1277	29-Dec-17	27-Jun-21
EP_SP_66_12-WP-2-M0.08.3	Submissions	196	29-Dec-17	12-Jul-18
EP_SP_66_12-WP-2-M0.08.1	Marine Construction	1265	10-Jan-18	27-Jun-21
EP_SP_66_12-WP-2-M0.08.1.1	Phase I - Construction of Perimeter Seawalls	740	10-Jan-18	19-Jan-20
EP_SP_66_12-WP-2-M0.08.1.1.3	Marine Works Preparations	274	10-Jan-18	10-Oct-18
08-0900	Carry out hydrographic survey	14	10-Jan-18	23-Jan-18
08-1005	Ground Investigation for DCM Design	180	13-Feb-18	11-Aug-18
08-1010	Mobilization of DCM Barge for Load Test	30	14-May-18	12-Jun-18
08-1020	Mobilization of Remaining DCM Barge for Construction	30	11-Sep-18	10-Oct-18
08-1340(2)	Sediment Sample collection and testing Dumping Permit Application	21	05-Sep-18*	25-Sep-18
EP_SP_66_12-WP-2-M0.08.1.1.1	Seawal and Berth at DCM Area	676	15-Mar-18	19-Jan-20
08-1030	DCM Mix Tiial (incl. Bench-scale testing and Lab Tests)	106	15-Mar-18	28-Jun-18
08-1040	DCM Pre-construction Site Trial and testing	43	29-Jun-18	10-Aug-18
08-1050	Static Load Test Preparation	31	11-Aug-18	10-Sep-18
08-1060	Carry out static loading test	22	11-Sep-18	02-Oct-18
08-1065(2)	Static load test report submission	8	03-Oct-18	10-Oct-18
08-1070	Geotextile Laying	60	11-Aug-18	09-Oct-18
08-1075(2)	Sand Blanket Laying	60	11-Aug-18	09-Oct-18
08-1080	DCM Injection Works (575,000m3, approx 6300 nr.)	120	11-Oct-18	07-Feb-19
08-1090	DCM Final Completion Tests	180	10-Nov-18	08-May-19
08-1100	Rubble Mound Laying (100,000m3 approx, @550m3/d)	180	09-Jan-19	07-Jul-19
08-1105(1)	Prefabrication for Caission	282	24-Nov-18	01-Sep-19
08-1110	Caisson Laying (Total 50nrs, @2 nrs/week)	182	24-Mar-19	21-Sep-19
08-1120	Wave Wall Construction	120	22-Sep-19	19-Jan-20
EP_SP_66_12-WP-2-M0.08.1.1.2	Seawal at Dredging Area	295	25-Dec-18	15-Oct-19
08-1130	Dredging Works (26,000m3 @ 285m3/d avg. to comply EP Conditions 2.18)	110	25-Dec-18	13-Apr-19
08-1140	Lay Rock & Sand Fill	50	15-Mar-19	03-May-19
08-1150	Place Rubble Mound (35,000m3 approx., @550m3/d)	88	30-Mar-19	25-Jun-19
08-1155(2)	Fabrication and delivery of Precast Seawall Blocks (12,000nr. approx)	90	15-Mar-19	12-Jun-19
08-1160	Lay Concrete Block Wals (300m length approx. @4m/d)	80	29-Apr-19	17-Jul-19
08-1170	Insitu Concrete Wall Construction	90	18-Jul-19	15-Oct-19
EP_SP_66_12-WP-2-M0.08.1.2	Phase II - Reclamation, Breakwater and Berth Construction	999	03-Oct-18	27-Jun-21
EP_SP_66_12-WP-2-M0.08.1.2.1	Reclamation	999	03-Oct-18	27-Jun-21
08-1180	Geotextile Laying	100	03-Oct-18	10-Jan-19
08-1185(2)	Sand Blanket Laying	100	03-Oct-18	10-Jan-19
08-1190	Install Vertical Band Drain by Barge	160	10-Feb-19	19-Jul-19
08-1200	Reclamation fill up to +2.5mPD	375	22-Sep-19	30-Sep-20
08-1210	Reclamation fill from +2.5 to Formation Level	120	03-Jul-20	30-Oct-20
08-1220	Lay Surcharge	80	11-Sep-20	29-Nov-20
08-1230	Surcharge Period	180	30-Nov-20	28-May-21
08-1240	Remove Surcharge	85	04-Apr-21	27-Jun-21
EP_SP_66_12-WP-2-M0.08.1.2.2	Breakwater	583	02-Sep-19	06-Apr-21
08-1250	Geotextile and Sand Blanket Laying	45	22-Sep-19	05-Nov-19
08-1260	DCM Injection Works (290,000m3, approx 3200 nr.)	65	06-Nov-19	09-Jan-20
08-1270	DCM Final Completion Test	71	05-Jan-20	15-Mar-20
08-1280	Rubble Mound Laying (100,000m3 approx, @550m3/d)	188	05-Mar-20	08-Sep-20
08-1285(1)	Prefabrication for Caission	411	02-Sep-19	16-Oct-20
08-1290	Caisson Laying (Total 43nrs, @2 nrs/week)	150	11-Jul-20	07-Dec-20
08-1300	Wave Wall Construction	120	08-Dec-20	06-Apr-21
EP_SP_66_12-WP-2-M0.08.1.2.3	Seawal and Berth at Marine Access	150	03-Jul-20	29-Nov-20
08-1310(2)	Prefabrication for Caission (4nrs)	90	03-Jul-20	30-Sep-20
08-1320(2)	Caisson Laying (4nrs)	30	01-Oct-20	30-Oct-20
08-1330(2)	Wave Wall Construction	30	31-Oct-20	29-Nov-20
EP_SP_66_12-WP-2-M0.09	Foundation Works	397	12-Apr-21	13-May-22
EP_SP_66_12-WP-2-M0.09.0	Site Investigation and Preliminary Pile	46	12-Apr-21	27-May-21
EP_SP_66_12-WP-2-M0.09.1	Administration Bld Foundation	138	25-Nov-21	11-Apr-22
EP_SP_66_12-WP-2-M0.09.2	Waste Bunker & Tipping Hall Bld Foundation	203	13-May-21	01-Dec-21
EP_SP_66_12-WP-2-M0.09.3	Boiler & Flue Gas Bld Foundation	331	12-Apr-21	08-Mar-22
EP_SP_66_12-WP-2-M0.09.4	ACC Area Foundation	129	20-Sep-21	26-Jan-22
EP_SP_66_12-WP-2-M0.09.5	Turbine Hall Bld Foundation	142	28-Jun-21	16-Nov-21
EP_SP_66_12-WP-2-M0.09.6	Air Compressor Bld Foundation	28	17-Nov-21	14-Dec-21

Progarmme for Design and Construction Works
Summary Progarmme

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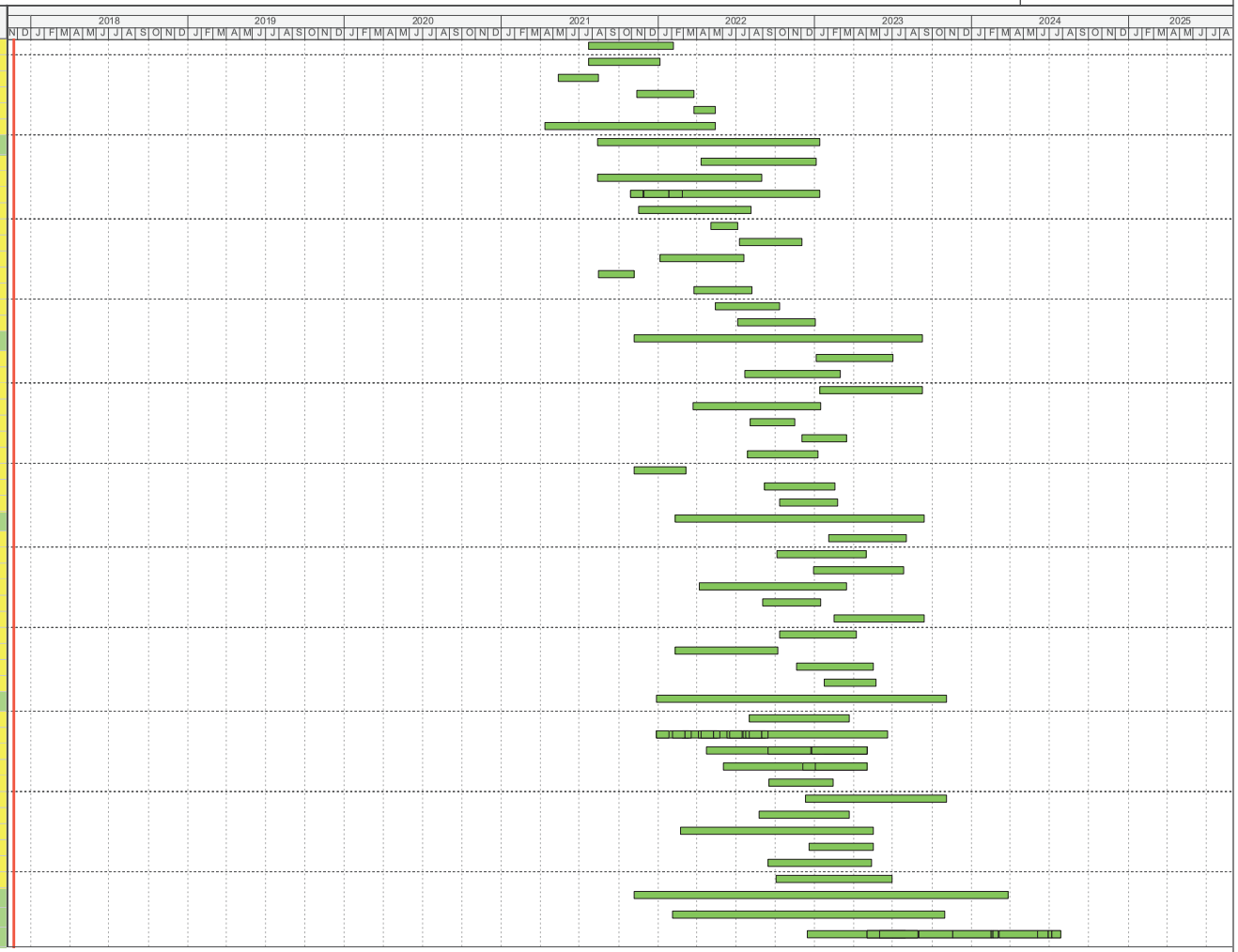
04-Dec-17	Rev.0 - 1st Issue		
16-Jul-18	Rev.1 - Revised to SO's comments		
03-Sep-18	Rev.2 - Revised to SO's comments		

Activity ID	Activity Name	Remaining Duration	Start	Finish
EP_SP_66_12-WP-2-M0.09.7	Chimney Foundation	198	23-Jul-21	05-Feb-22
EP_SP_66_12-WP-2-M0.09.8	MT Plant & Desalination Bld Foundation	168	22-Jul-21	05-Jan-22
EP_SP_66_12-WP-2-M0.09.9	IWMF Substation Building Foundation	94	13-May-21	14-Aug-21
EP_SP_66_12-WP-2-M0.09.10	Access Ramp Bld Foundation	133	13-Nov-21	25-Mar-22
EP_SP_66_12-WP-2-M0.09.11	Reception Bld Foundation	49	26-Mar-22	13-May-22
EP_SP_66_12-WP-2-M0.09.12	Pipe Bridge Foundation	397	12-Apr-21	13-May-22
EP_SP_66_12-WP-2-M0.10	**Superstructural Works**	519	12-Aug-21	12-Jan-23
EP_SP_66_12-WP-2-M0.10.1	Administration Bld Structure	267	12-Apr-22	03-Jan-23
EP_SP_66_12-WP-2-M0.10.2	Waste Bunker & Tipping Hall Bld Stucture	384	12-Aug-21	30-Aug-22
EP_SP_66_12-WP-2-M0.10.3	Boiler & Flue Gas Treatment Bld Structure	441	29-Oct-21	12-Jan-23
EP_SP_66_12-WP-2-M0.10.5	Turbine Hall Bld Structure	262	17-Nov-21	05-Aug-22
EP_SP_66_12-WP-2-M0.10.6	Air Compressor Bld Structure	63	04-May-22	05-Jul-22
EP_SP_66_12-WP-2-M0.10.7	Chimney Structure	145	10-Jul-22	01-Dec-22
EP_SP_66_12-WP-2-M0.10.8	MT Plant & Desalination Bld Structure	196	06-Jan-22	20-Jul-22
EP_SP_66_12-WP-2-M0.10.9	IWMF Substation Structure	84	15-Aug-21	06-Nov-21
EP_SP_66_12-WP-2-M0.10.10	Access Ramp Bld Structure	135	26-Mar-22	07-Aug-22
EP_SP_66_12-WP-2-M0.10.11	Reception Bld Structure	150	14-May-22	10-Oct-22
EP_SP_66_12-WP-2-M0.10.13	Pipe Bridge Structure	180	06-Jul-22	01-Jan-23
EP_SP_66_12-WP-2-M0.11	**Architectual Builders Works & Finishes**	672	07-Nov-21	09-Sep-23
EP_SP_66_12-WP-2-M0.11.1	Administration Bld ABWF Works	180	04-Jan-23	02-Jul-23
EP_SP_66_12-WP-2-M0.11.2	Weste Bunker & Tipping Hall Bld ABWF Works	225	21-Jul-22	02-Mar-23
EP_SP_66_12-WP-2-M0.11.3	Boiler & Flue Gas Bld ABWF Works	240	13-Jan-23	09-Sep-23
EP_SP_66_12-WP-2-M0.11.5	Turbine Hall Bld ABWF Works	299	23-Mar-22	15-Jan-23
EP_SP_66_12-WP-2-M0.11.6	Air Compress Bld ABWF Works	105	03-Aug-22	15-Nov-22
EP_SP_66_12-WP-2-M0.11.7	Chimney ABWF Works	105	02-Dec-22	16-Mar-23
EP_SP_66_12-WP-2-M0.11.8	MT Plant & Desalination Bld ABWF Works	165	28-Jul-22	08-Jan-23
EP_SP_66_12-WP-2-M0.11.9	IWMF Substation ABWF Works	120	07-Nov-21	06-Mar-22
EP_SP_66_12-WP-2-M0.11.10	Access Ramp Bld ABWF Works	165	05-Sep-22	16-Feb-23
EP_SP_66_12-WP-2-M0.11.11	Reception Bld ABWF Works	135	11-Oct-22	22-Feb-23
EP_SP_66_12-WP-2-M0.12	**Building Services Installation**	581	09-Feb-22	12-Sep-23
EP_SP_66_12-WP-2-M0.12.1	Administration Bld BS Works	180	03-Feb-23	01-Aug-23
EP_SP_66_12-WP-2-M0.12.2	Weste Bunker & Tipping Hall Bld BS Works	210	04-Oct-22	01-May-23
EP_SP_66_12-WP-2-M0.12.3	Boiler & Flue Gas Bld BS Works	210	29-Dec-22	26-Jul-23
EP_SP_66_12-WP-2-M0.12.5	Turbine Hall Bld BS Works	344	07-Apr-22	16-Mar-23
EP_SP_66_12-WP-2-M0.12.6	Air Compressor Bld BS Works	135	02-Sep-22	14-Jan-23
EP_SP_66_12-WP-2-M0.12.4	Chimney BS Works	210	15-Feb-23	12-Sep-23
EP_SP_66_12-WP-2-M0.12.8	MT Plant & Desalination Bld BS Works	180	11-Oct-22	08-Apr-23
EP_SP_66_12-WP-2-M0.12.9	IWMF Substation BS Works	241	09-Feb-22	07-Oct-22
EP_SP_66_12-WP-2-M0.12.10	Access Ramp Bld BS Works	180	19-Nov-22	17-May-23
EP_SP_66_12-WP-2-M0.12.11	Reception Bld BS Works	120	24-Jan-23	23-May-23
EP_SP_66_12-WP-2-M0.13	**Process Equipment Installation**	677	28-Dec-21	04-Nov-23
EP_SP_66_12-WP-2-M0.13.2	Waste Bunker & Tipping Hall Bld Process Equipment Installation	233	01-Aug-22	21-Mar-23
EP_SP_66_12-WP-2-M0.13.3	Boiler House & Flue Gas Treatment Bld Process Equipment Installation	539	28-Dec-21	19-Jun-23
EP_SP_66_12-WP-2-M0.13.4	ACC Area Equipment Installation	375	23-Apr-22	02-May-23
EP_SP_66_12-WP-2-M0.13.5	Turbine Hall Bld Equipment Installation	335	02-Jun-22	02-May-23
EP_SP_66_12-WP-2-M0.13.6	Air Compressor Bld Equipment Installation	150	17-Sep-22	13-Feb-23
EP_SP_66_12-WP-2-M0.13.8a	MT Process Bld Process Equipment Installation	330	10-Dec-22	04-Nov-23
EP_SP_66_12-WP-2-M0.13.8b	Desalination Bld Process Equipment Installation	210	24-Aug-22	21-Mar-23
EP_SP_66_12-WP-2-M0.13.09	IWMF Substation Bld Equipment Installation	450	22-Feb-22	17-May-23
EP_SP_66_12-WP-2-M0.13.10	Ramp & Storage Bld Process Equipment Installation	150	19-Dec-22	17-May-23
EP_SP_66_12-WP-2-M0.13.12	Equipment Installaion at External Area	240	15-Sep-22	12-May-23
EP_SP_66_12-WP-2-M0.13.13	External Process Pipe Works	271	03-Oct-22	30-Jun-23
EP_SP_66_12-WP-2-M0.14	**Landscape, External Road and Drains Works**	872	07-Nov-21	27-Mar-24
EP_SP_66_12-WP-2-M0.15	**Works By CLP**	633	04-Feb-22	30-Oct-23
EP_SP_66_12-WP-2-M0.16	**Testing & Commissioning**	591	15-Dec-22	27-Jul-24



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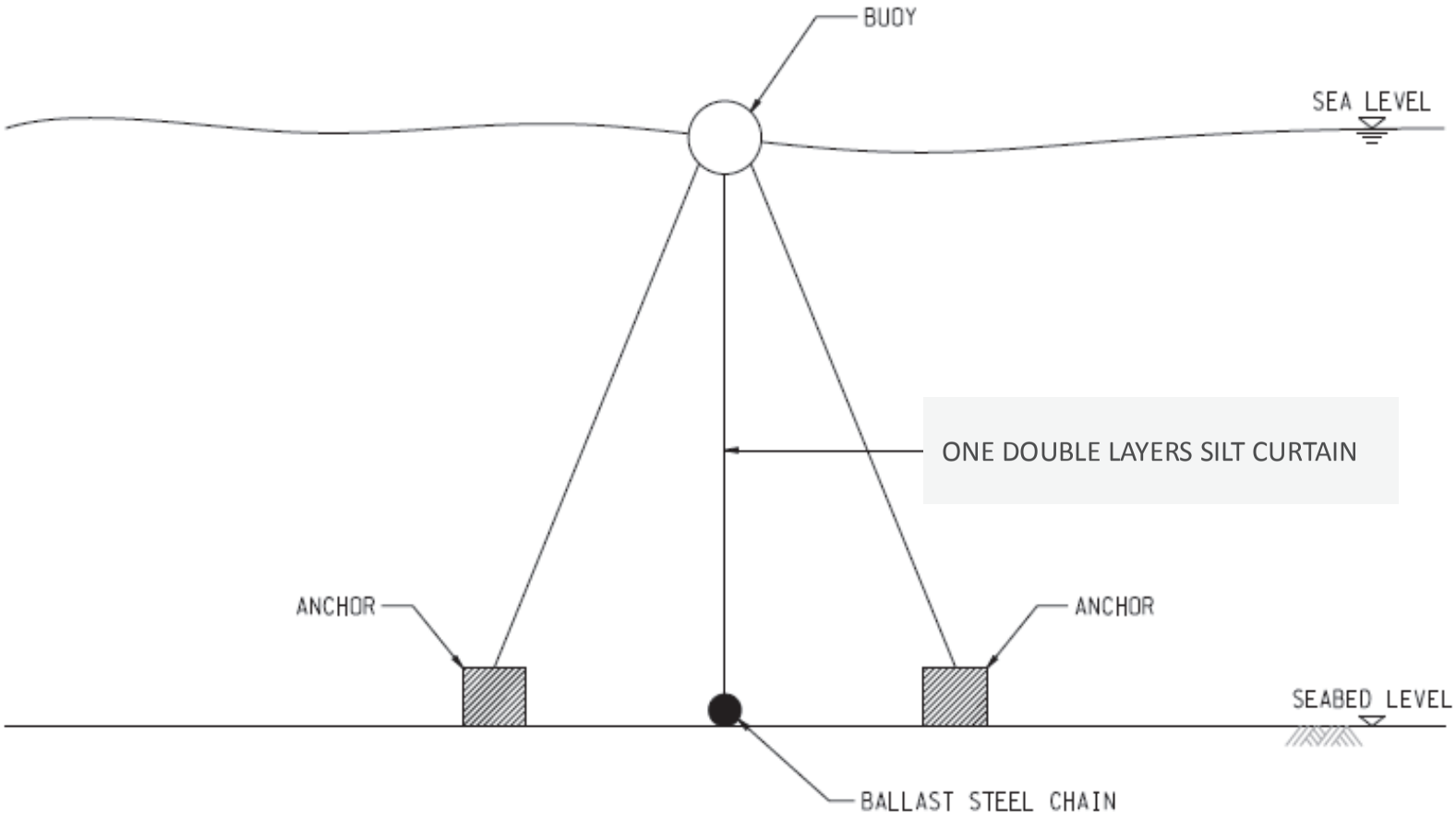
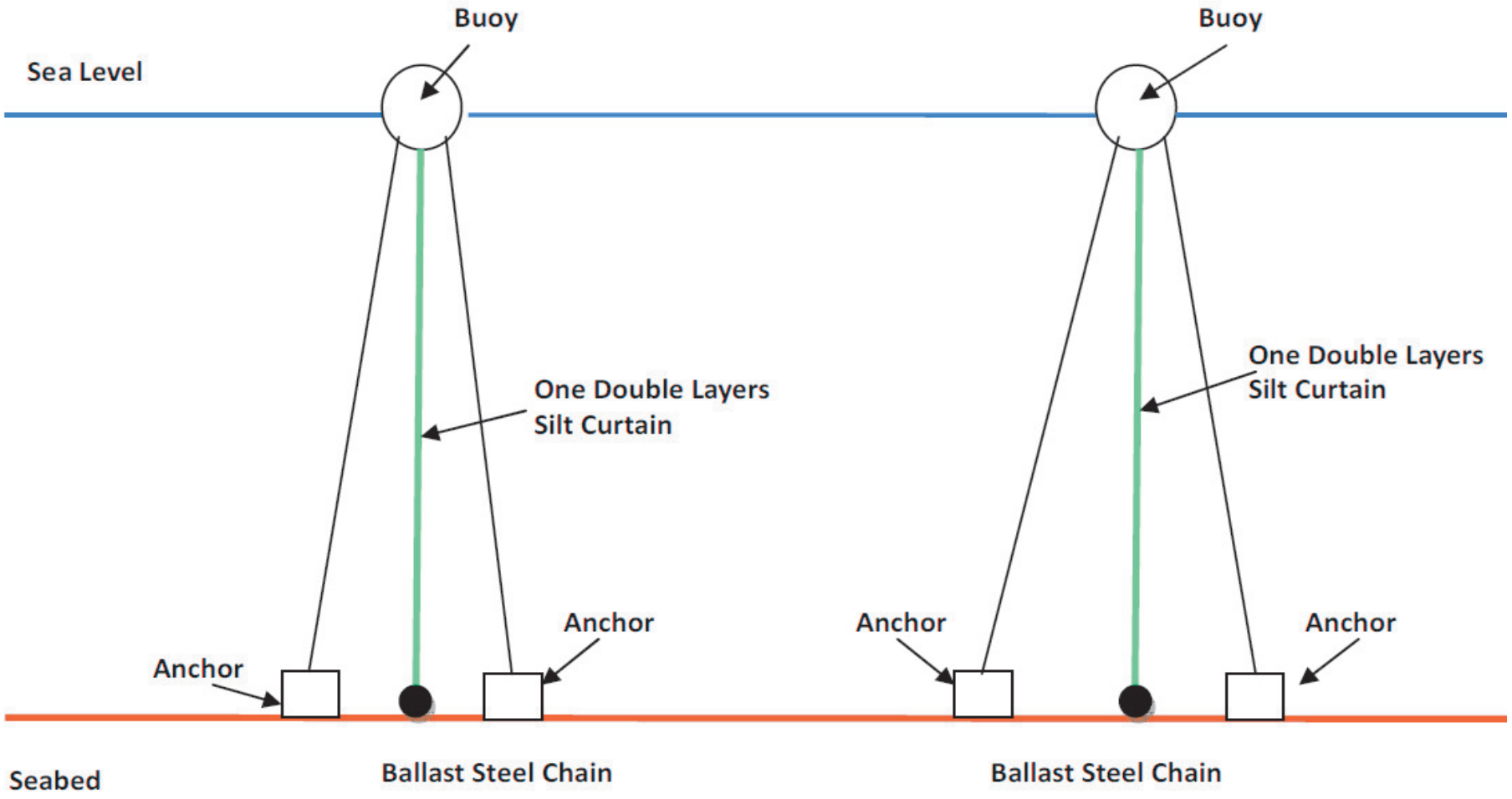
Appendix B

Typical Section of Floating Type Silt Curtain



Typical Section of One double layers of Floating Type Silt Curtain



Typical Section of Two double layers of Floating Type Silt Curtain

Appendix C

Specification of the Proposed Geotextile

SG WOVEN GEOTEXTILES

we under^{cover} the world

A TOTAL RANGE OF GEOTEXTILES

Headquarters:
BONAR TECHNICAL FABRICS NV/SA
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T.: +32 (0) 52 457 487
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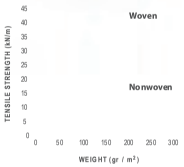
F.: +44 (0)1382 229238
E-MAIL: geotextiles@bonaryarns.com

website: www.bonartf.com

bontec
woven and nonwoven geotextiles



SEPARATION

REINFORCEMENT

Other geotextiles available within the Bontec range include Highflow, High strength Wovens and Thermally Bonded & Needlepunched Nonwovens

Visit us at our website:
www.bonartf.com

SG Woven Geotextiles

PRODUCT PROFILE

"An exciting range of Standard Grade geotextiles that offer the perfect solution to your Separation requirements. With tensile strengths ranging from 10 to 300 kN/m you can be certain that an SG fabric will be available with the performance that you are looking for."

DAILY SEPARATION, SOIL STRENGTHENING
OR GROUND REINFORCEMENT?

Bontec SG woven geotextiles are manufactured from polypropylene tapes & yarns, and exhibit an excellent chemical resistance to commonly encountered acids and alkalis at ambient temperatures. Available in a lightweight range with products from 80 to 200g/m2, and a heavyweight range from 200 to 800g/m2.

Bontec SG facts include:

Tensile strengths up to 300 kN per metre (kN/m) width
CBR Puncture Strengths ranging from 1.800 N to 12.500 N
SG Mechanical Properties that offer maximum strength at minimal cost and ensure the products survivability both against installation damage and in the longer term.

Lightweight woven geotextiles typically offer greater mechanical strengths per unit weight than comparable nonwoven grades. This makes lightweight woven geotextiles the ideal choice for separation

Waterflows normal to the plane that are generally several times more than that required by design

A range of consistent opening sizes suited for use in soils ranging from clay to coarse granular fill.

SG hydraulic properties that are suited to the demands of everyday separators.

Available ex-stock in 4.5m and 5.25m wide rolls or other widths to order

Typical applications for SG woven geotextiles include:

As a general purpose separator for use under site access roads and areas of hardstanding.
As a separation and strengthening layer under new roadways, car parks, industrial units etc.
As an erosion control layer under heavy rock armour in coastal defence projects.
For any separation application where there exists a need to prevent the intermixing of soft foundation soils with good clean granular fill.

SG Woven Geotextiles have been manufactured as a cost effective solution to your soil separation and stabilisation applications. They are manufactured from highly durable polypropylene polymer and have a long life expectancy when used in permanent structures.

For further product information, be it a technical data sheet or to discuss your project with one of our in-house geotextile experts please do not hesitate to contact one of our offices listed below.

For UK and Ireland: BONAR YARNS & FABRICS Ltd
St. Salvador Street | Dundee | Scotland | DD3 7EU
T.: +44 (0)1382 346102 | F.: +44 (0)1382 229238
E-MAIL: geotextiles@bonaryarns.com

Headquarters: BONAR TECHNICAL FABRICS NV/SA
Industriestraat 39 | B-9240 Zele | BELGIUM
T.: +32 (0) 52 457 487 | F.: + 32 (0) 52 457 495
E-MAIL: geotextiles@bonartf.com

bontec
woven and nonwoven geotextiles

Bontec® SG 110/110

Standard Grade Woven Geotextiles

Technical data sheet

Product description

Polymer	Density	Melting Point	Construction
100% Polypropylene	0,91 kg/dm³	165 °C	Tapes

Properties

Mechanical Properties	Standard	Performance	Tolerance
Tensile strength - MD	EN ISO 10319	110 kN/m	-9,9 kN/m
Tensile strength - XD	EN ISO 10319	110 kN/m	-9,9 kN/m
Elongation at break - MD	EN ISO 10319	10 %	+/-2,3 %
Elongation at break - XD	EN ISO 10319	7 %	+/-1,6 %
Static puncture resistance (CBR)	EN ISO 12236	12,5 kN	-2,5 kN
Dynamic perforation resistance (cone drop)	EN ISO 13433	10 mm	+2,0 mm

Hydraulic Properties	Standard	Performance	Tolerance
Water permeability normal to the plane (VIh50)	EN ISO 11058	25x10-3 m/s	-8x10-3 m/s
Waterflow in the plane @20 kPa	EN ISO 12958	-	-
Characteristic Opening Size (O90)	EN ISO 12956	230 µm	+/-69,0 µm

Physical Properties	Standard	Performance	Tolerance
Thickness under 2 kPa	EN ISO 9863-1	1,53 mm	+/-0,31 mm
Weight	EN ISO 9864	464 g/m²	+/-46,4 g/m²
Length x width		100 x 525 m	
Roll Diameter		-	

Durability	Standard	Performance	
Predicted minimal durability in years in natural soils with 4 < pH < 9 and soil temperatures < 25°C	Annex B	25,0	

Version date : 1/07/2013

Version n° 1

The Quality Management System of Bonar has been approved to the ISO 9001 Quality Management System Standard. Certificates are available on request.

CE

Bonar
partners in performance

Bontec®
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info@bonar.com / www.bonar.com

SILT PROTECTOR (오탁방지막)

SILT PROTECTOR의 용도

- 매립 공사시 해수중에 발생하는 토사, 세립토(SILT)의 확산방지
- 해상 공사의 주변 양식장, 청정수역, 해수욕장 피해 방지
- 항로 준설, 해상 정비 지역 주위의 오탁 확산 방지
- 항만, 호안 공사시 인근지역의 오탁 방지

SILT PROTECTOR의 특징 및 효과

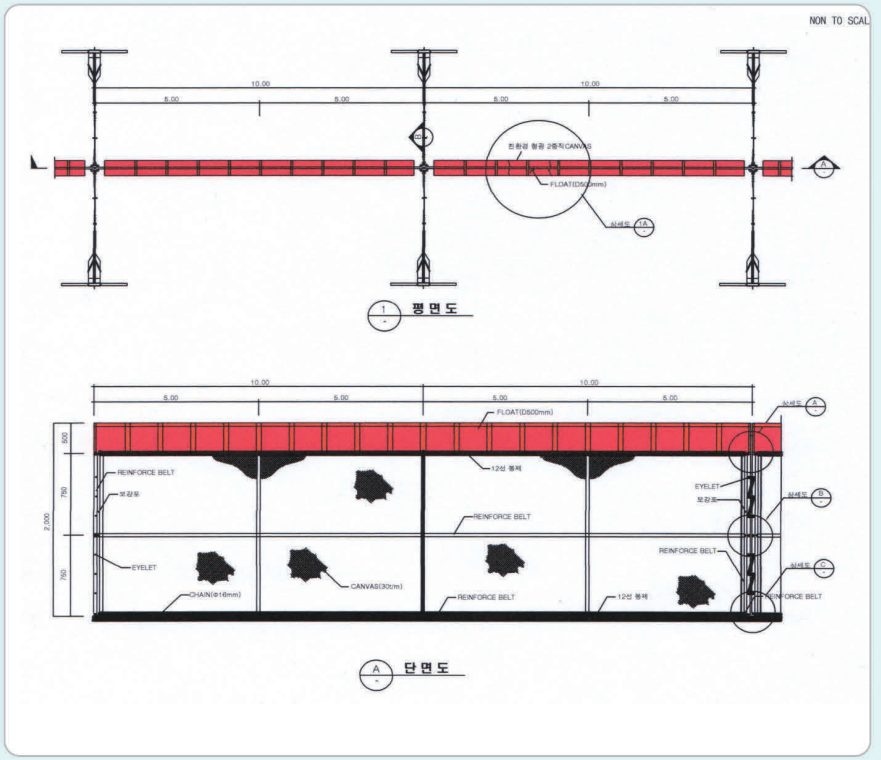
- 조립, 설치, 철거가 용이하고 취급이 간편하다.
- 고강도의 다양한 막체를 생산하여 해상 조건에 따른 막체 선정이 자유롭다.
- 파랑에 대한 순응성이 양호하며 FLOAT 파손시 부분 교체, 보수가 용이하다.
- 오탁수의 침강 촉진과 확산 방지가 탁월하다.
- 현장의 해상 및 기상 조건 등에 따라 CANVAS부의 강도와 FLOAT부의 부력에 맞춰 다양한 제품의 공급이 가능하다.

SILT PROTECTOR의 물성 및 상세도

SILT PROTECTOR

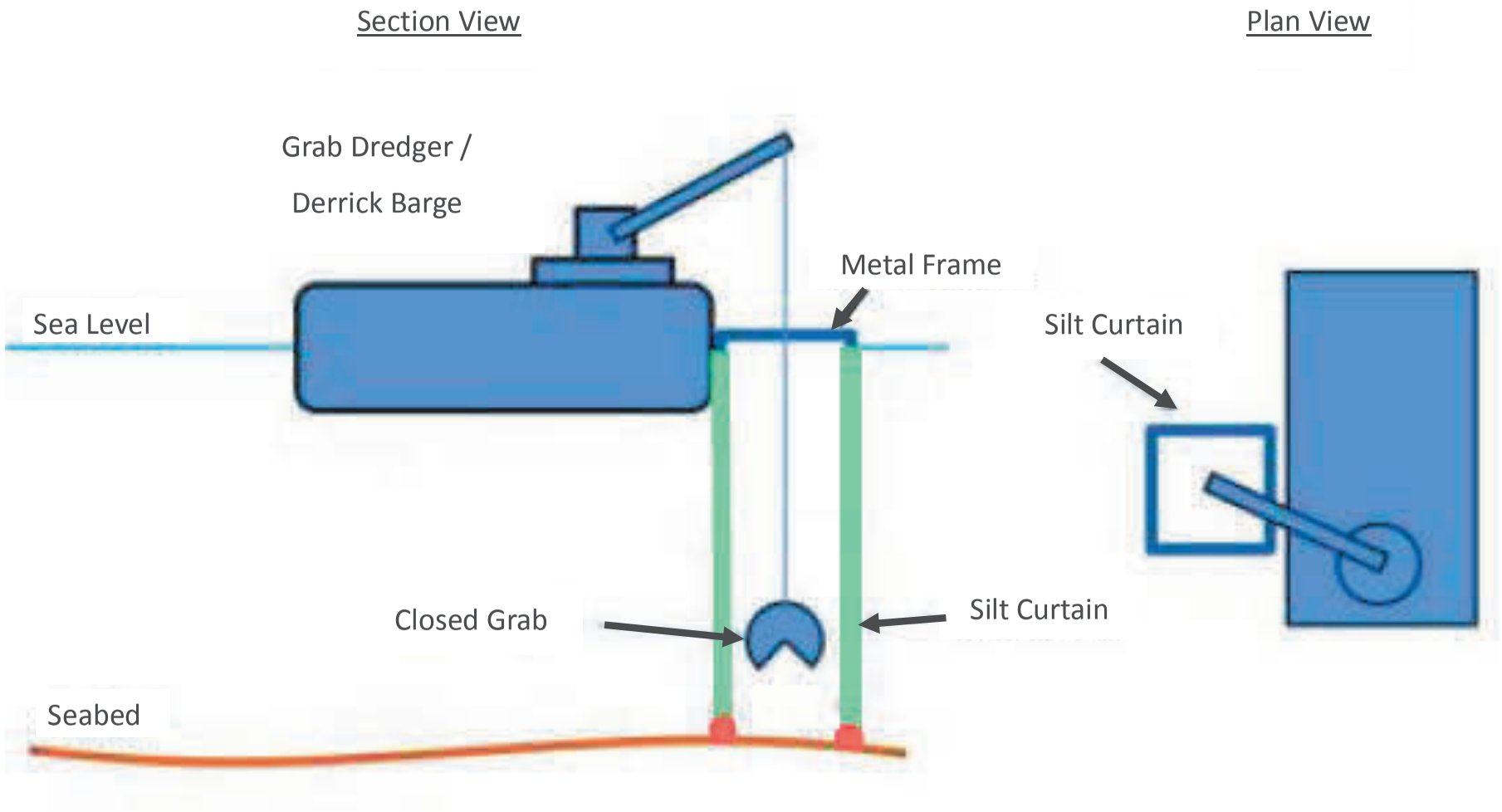
구 분	단 위	JYS 10	JYS 15	JYS 20	JYS 25	JYS 30	JYS 32	시험방법
재 질	–	폴리에스터						KS K 0210-1
중 량	g/m²	300	400	600	700	900	1000	KS K ISO 9864
인장 강도	kN/m이상	100	150	200	250	300	320	KS K ISO 10319 광폭스트립법
인장 신도	%	10~30					10~40	KS K ISO 10319 광폭스트립법
인열 강도	N, 이상/ (Kgf 이상)	1000 (100)	1500 (150)	2000 (200)	2500 (250)	3000 (300)	3200 (320)	KS K 0796
투수 계수	cm/sec	$\alpha \times 10^{-2}$~10^{-4} (α : 1.0~9.9)						KS K ISO 11058
치수변화율	%	±0.2% 이하						KS K ISO 7771

SILT PROTECTOR 상세도

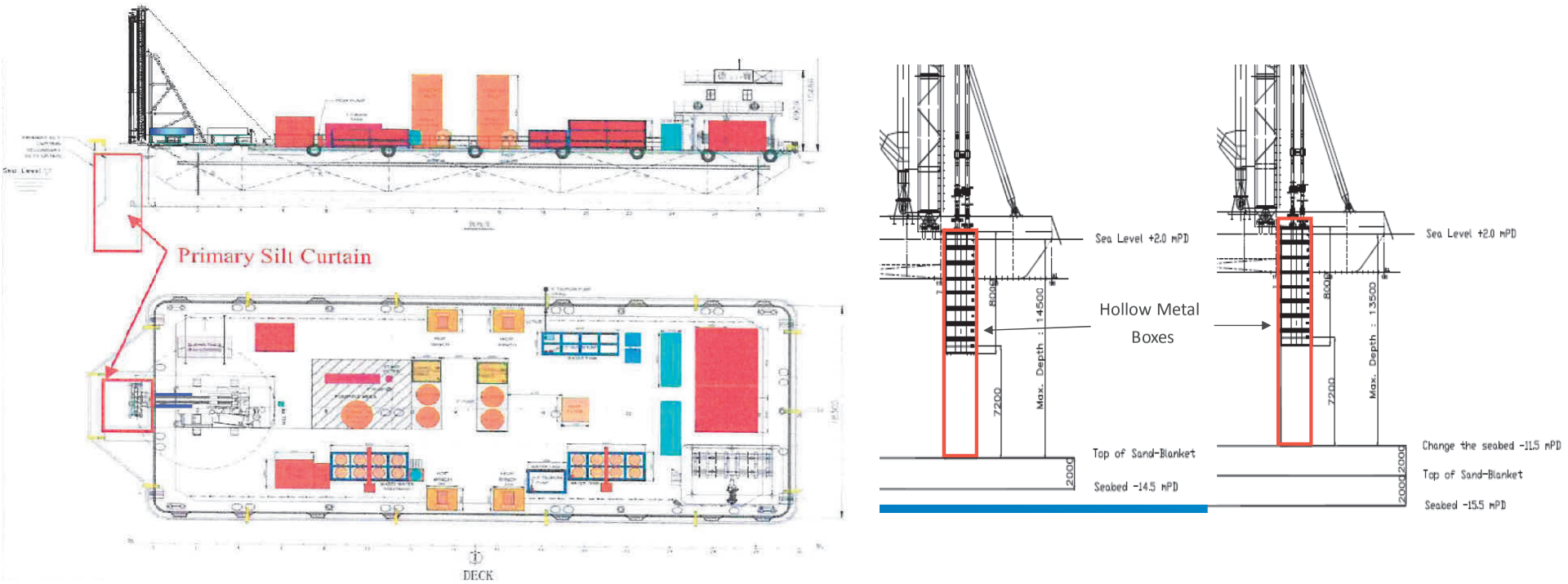


Appendix D

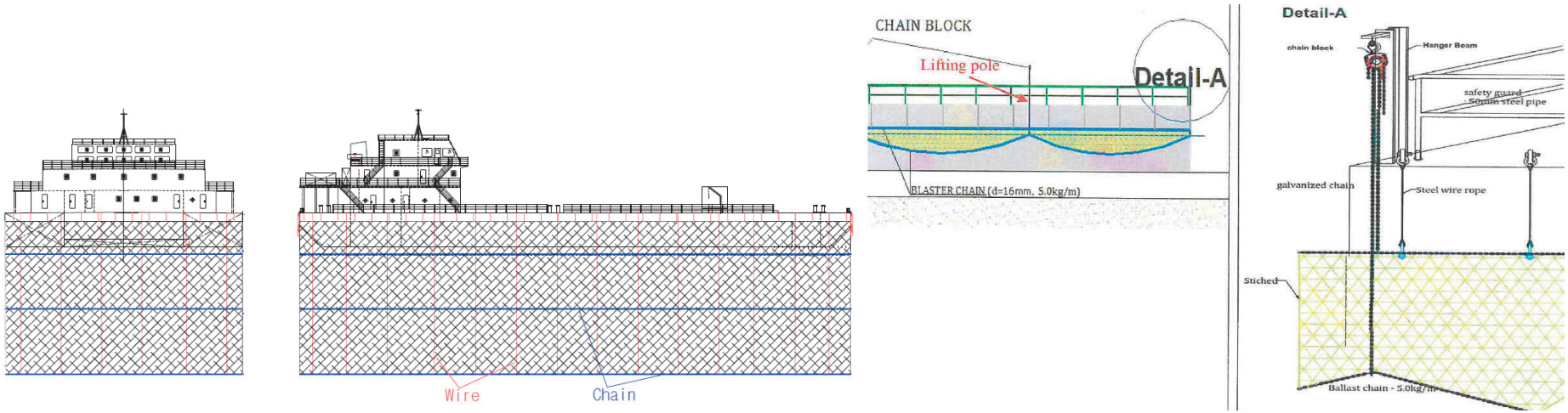
Typical Section of Cage Type Silt Curtains



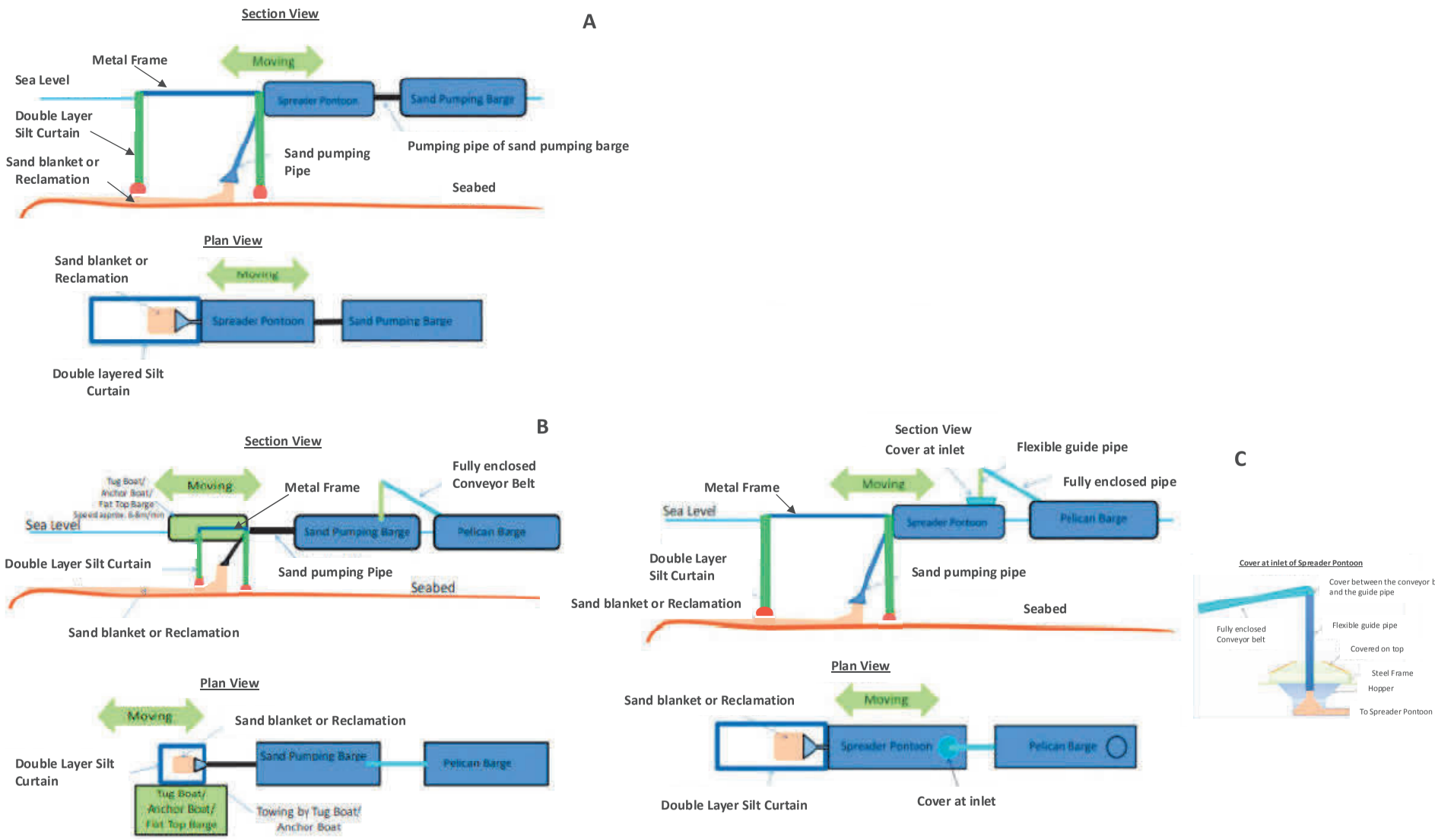
Typical Section of Cage Type Silt Curtain – Type 1 (for Close Grab)



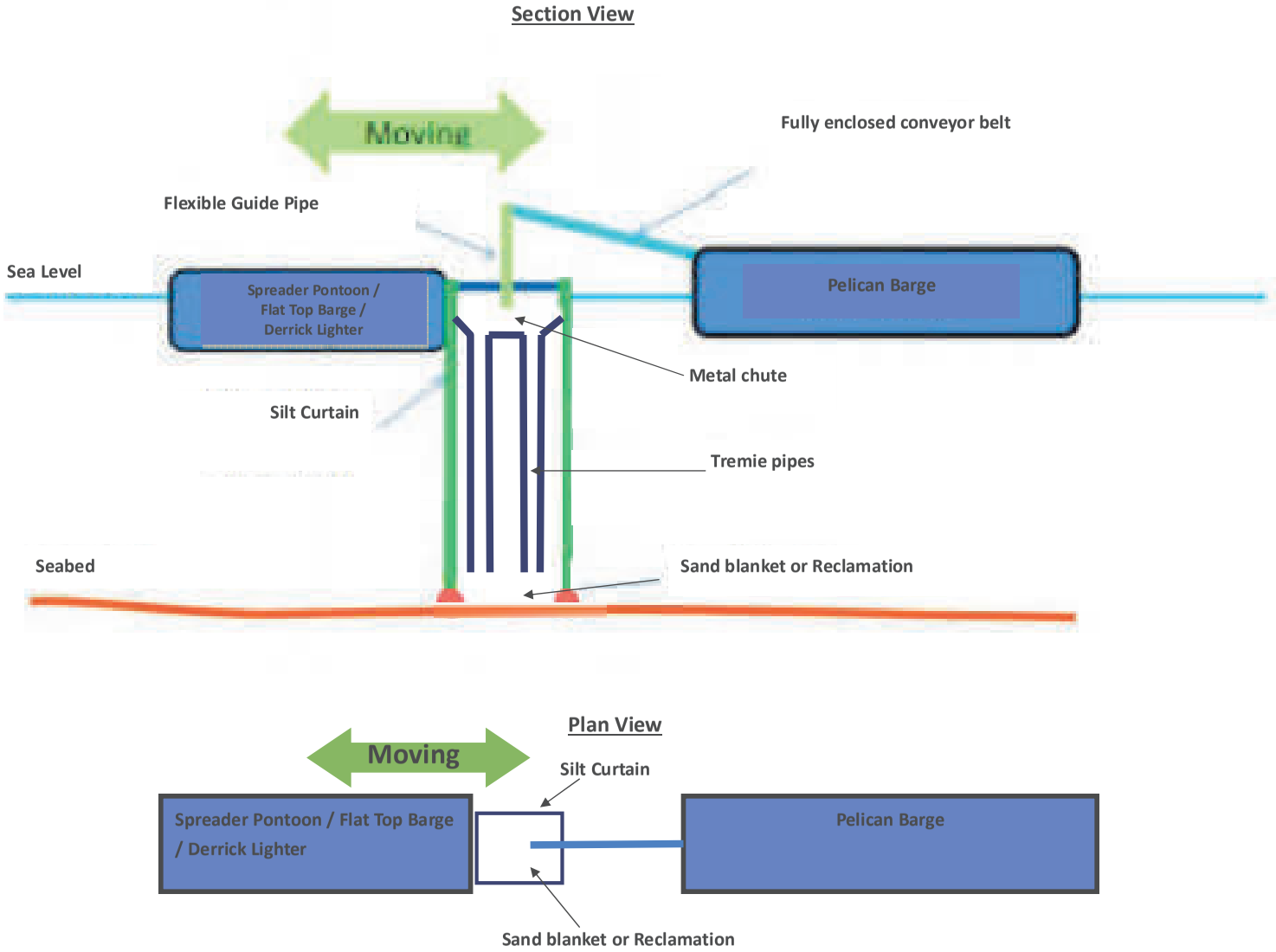
Typical Section of Cage Type Silt Curtain – Type 3 (for DCM Operation – Primary Layer Silt Curtain)



Typical Section of Cage Type Silt Curtain – Type 2 (for DCM Operation – Secondary Layer Silt Curtain)



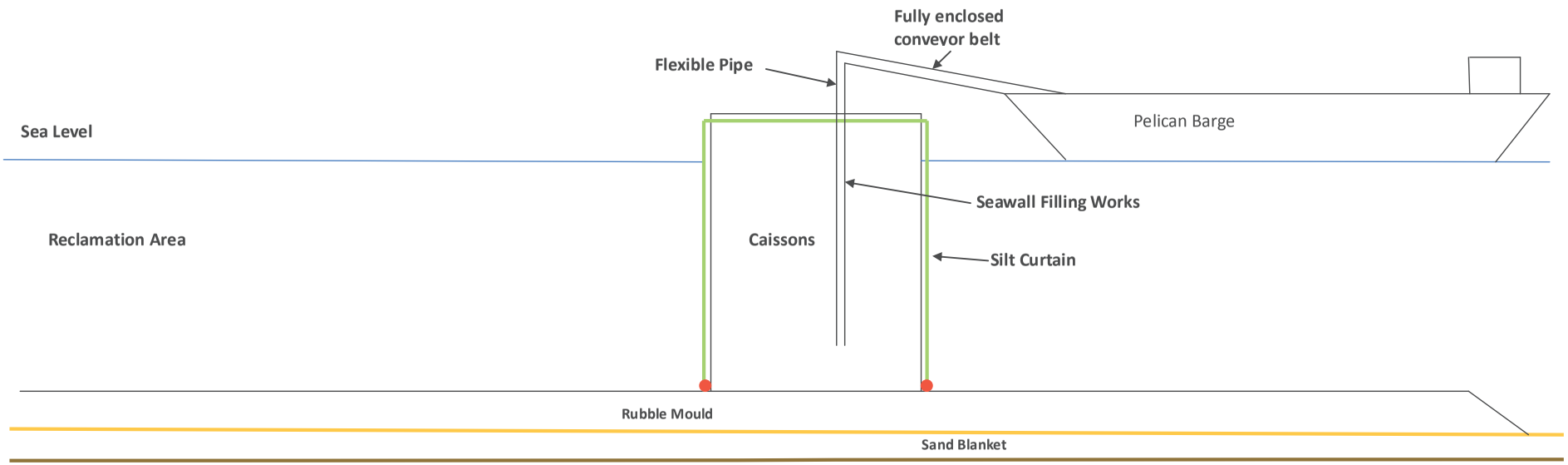
Typical Section of Cage Type Silt Curtain – Type 4 (for Spreader Pontoon and sand pumping barge using sand pumping pipe)



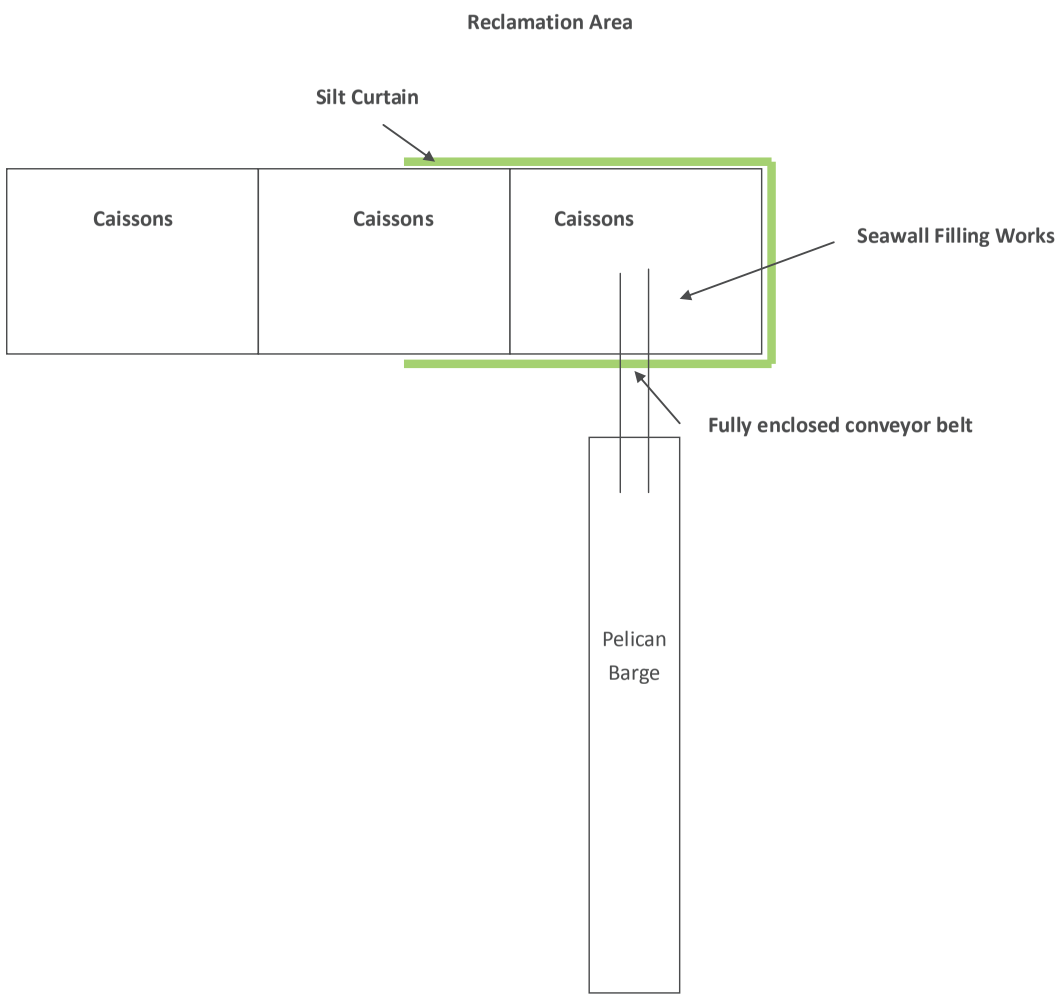
Typical Section of Cage Type Silt Curtain – Type 5

A

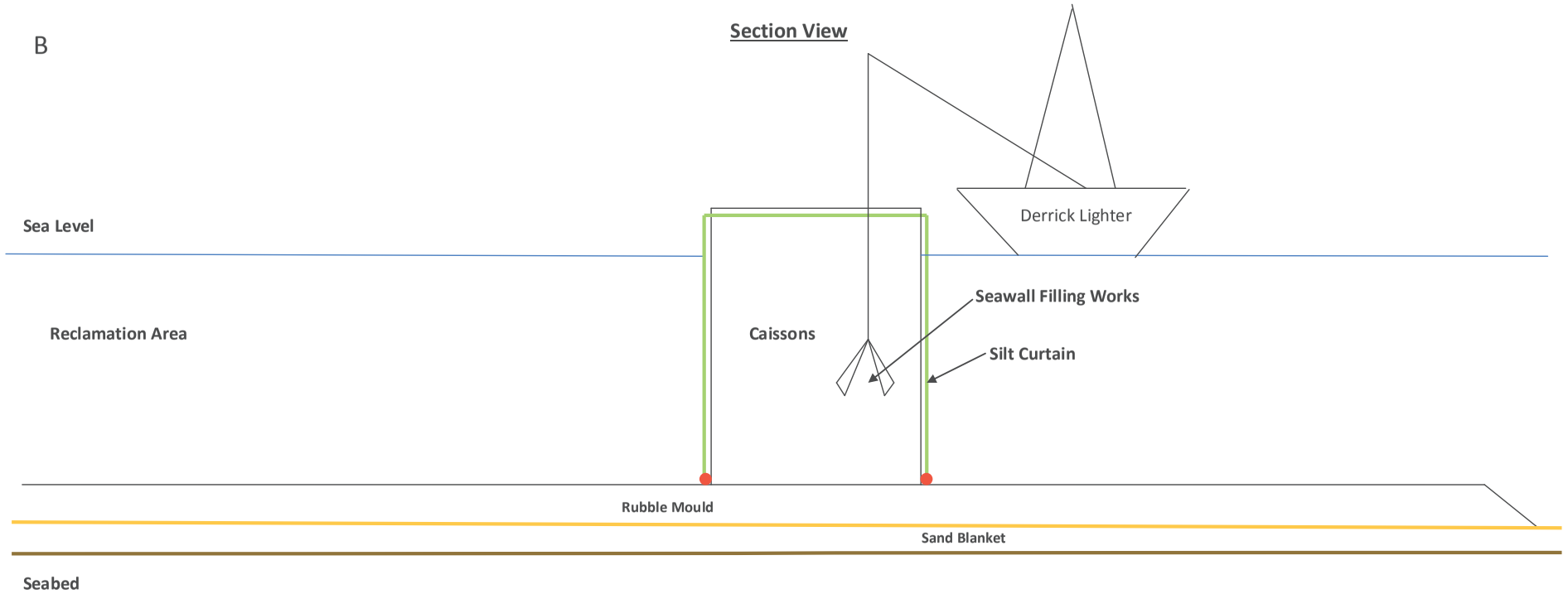
Section View



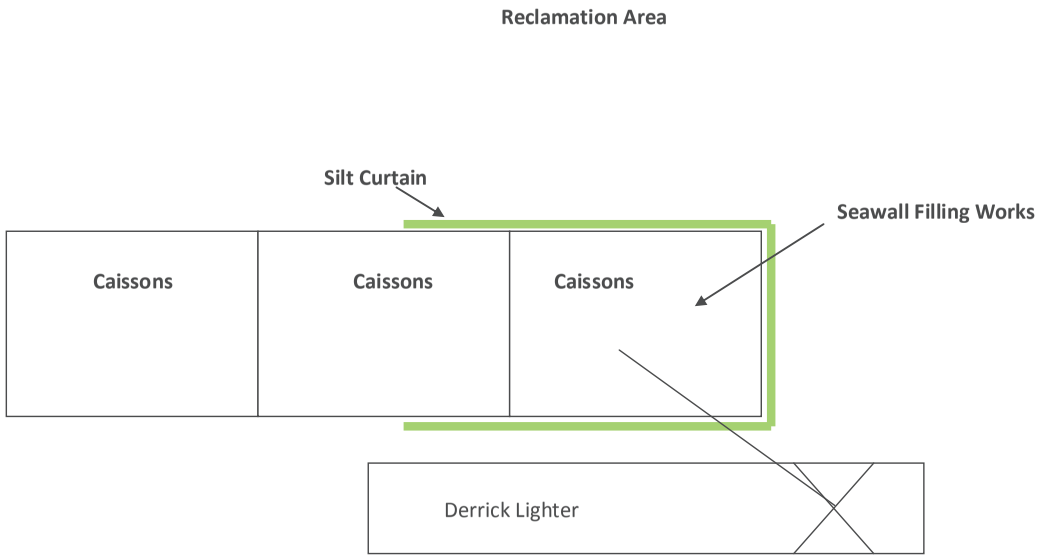
Plan View


Reclamation Area
Silt Curtain
Caissons
Caissons
Caissons
Seawall Filling Works
Fully enclosed conveyor belt
Pelican
Barge

B


Section View
Derrick Lighter
Sea Level
Reclamation Area
Caissons
Seawall Filling Works
Silt Curtain
Rubble Mould
Sand Blanket
Seabed

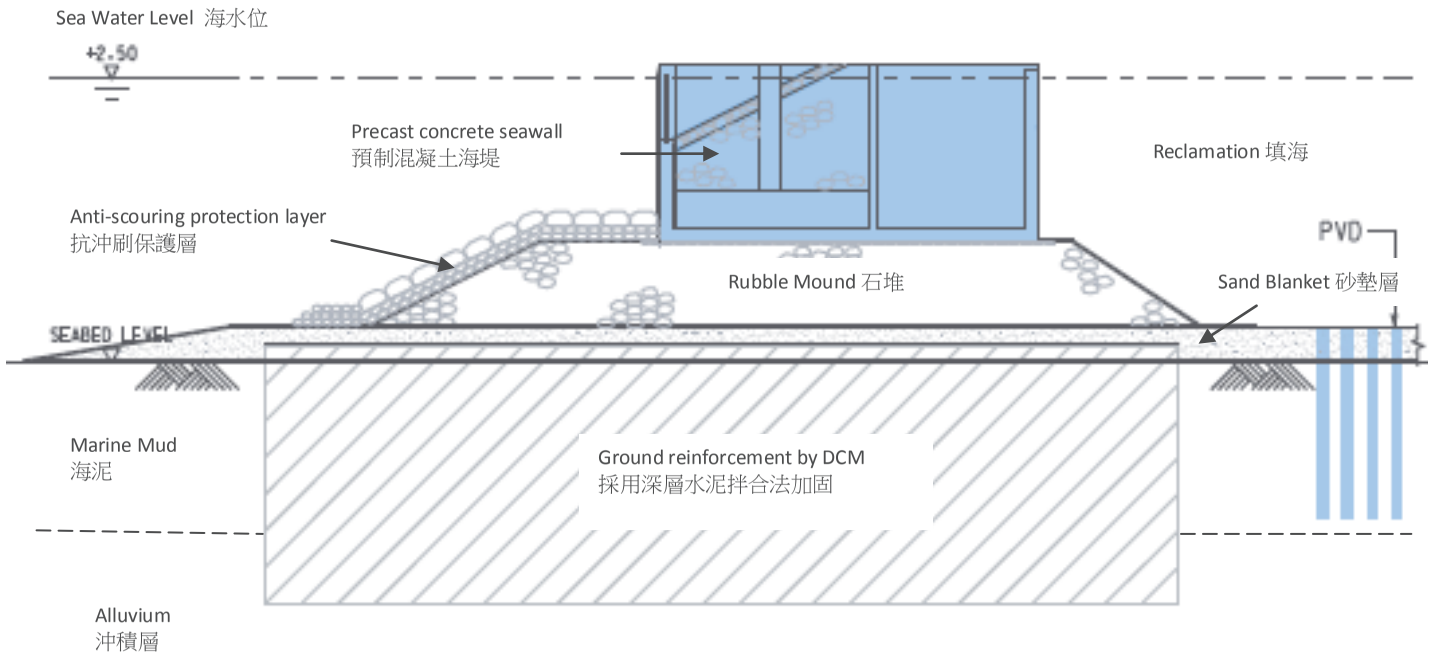
Plan View



Typical Section of Cage Type Silt Curtain – Type 6

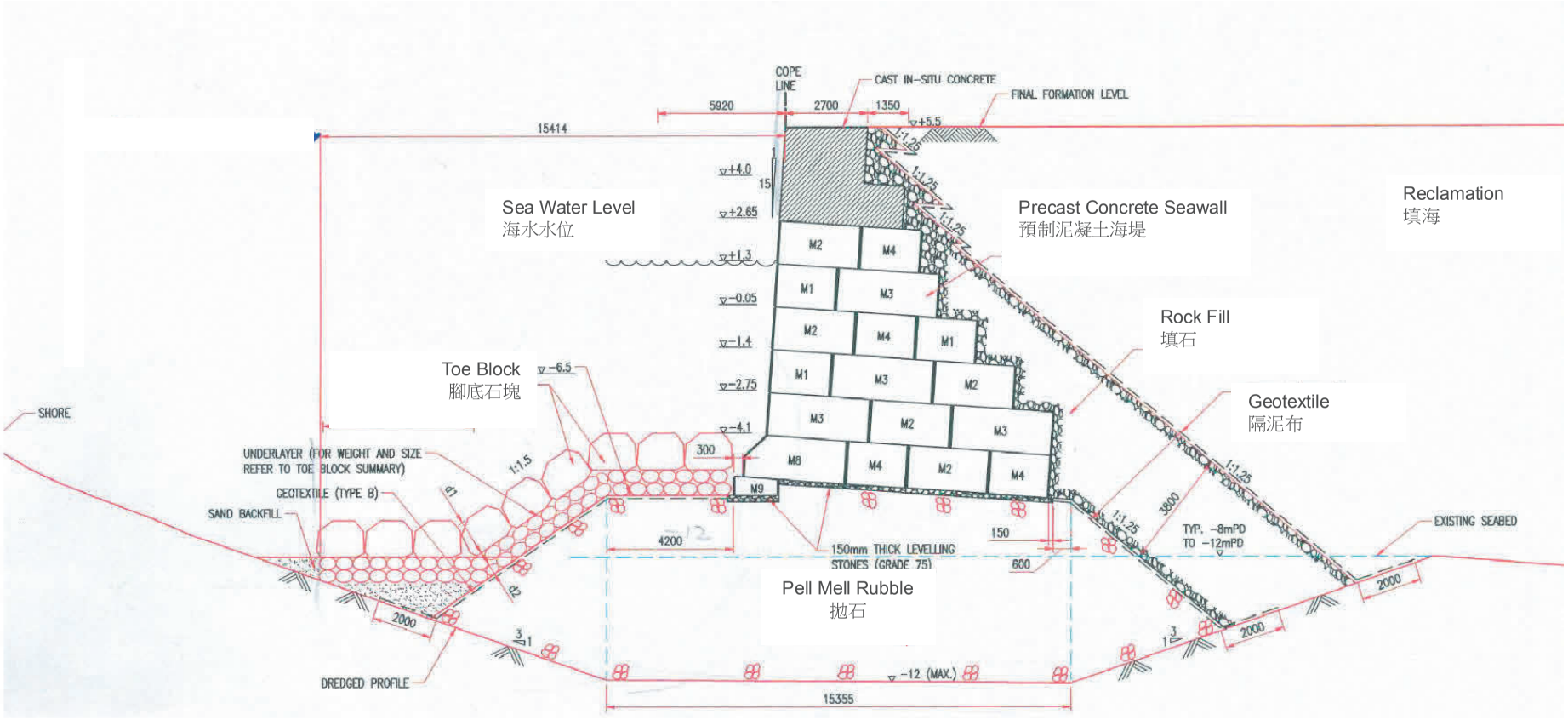
Appendix E

Location of Installation of Floating Type Silt Curtain



With Deep Cement Mixing (DCM) Ground Reinforcement

採用深層水泥拌合法加固



Without Deep Cement Mixing (DCM) Ground Reinforcement

未有採用深層水泥拌合法加固

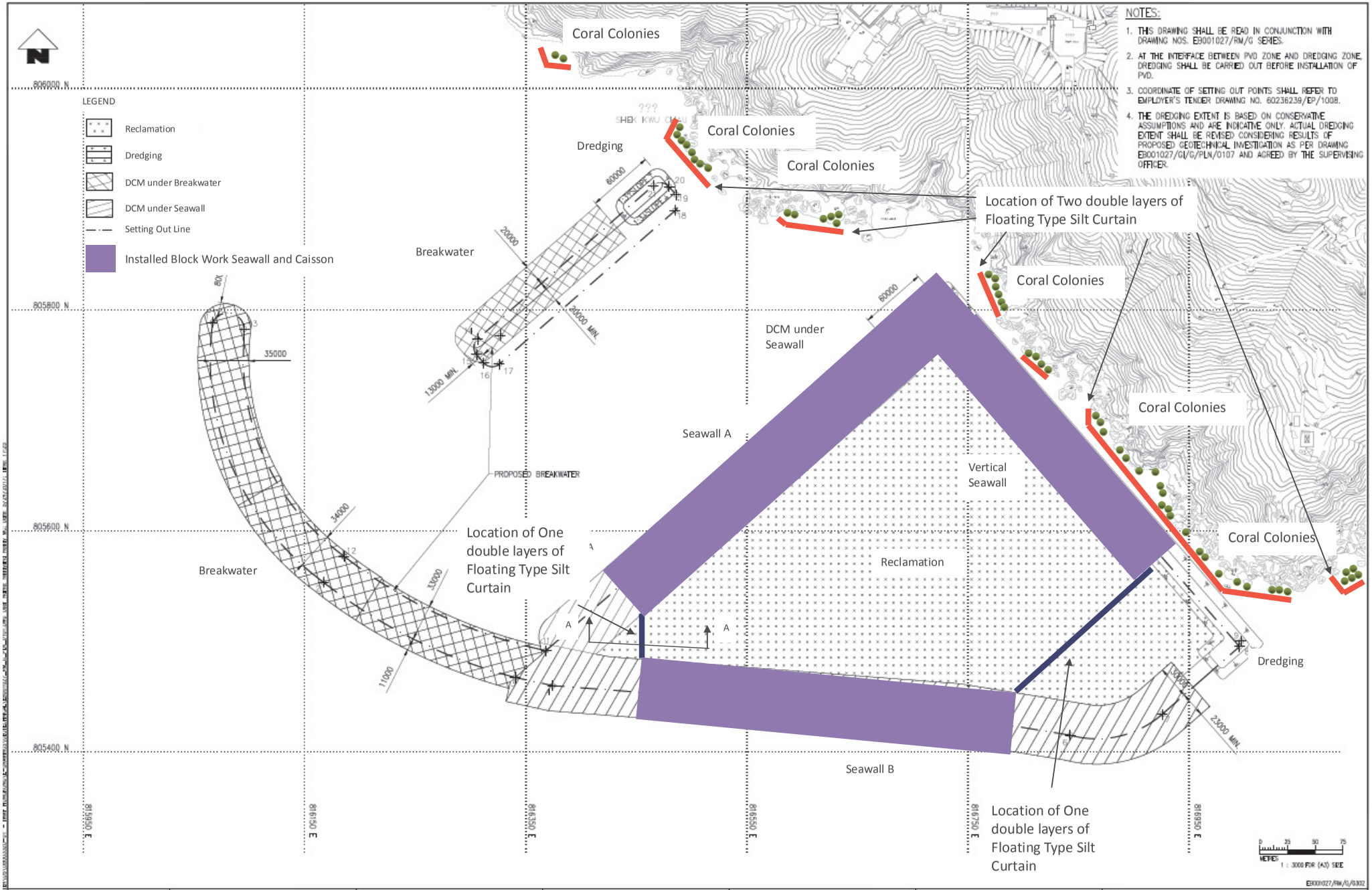


Figure 1

CLIENT: 環境保護署 Environmental Protection Department

ORIGINATOR: Keppel Seghers – Zhen Hua Joint Venture

DESIGNER: ARCADIS, DLN

DESIGN CHECKER: SMEC, Member of the Surbana Jurong Group

PROJECT: Contract EP/SP/66/12 Integrated Waste Management Facilities Phase 1

Location of Floating Type Silt Curtain (Before completion of Caisson and Block work Seawall Installation)

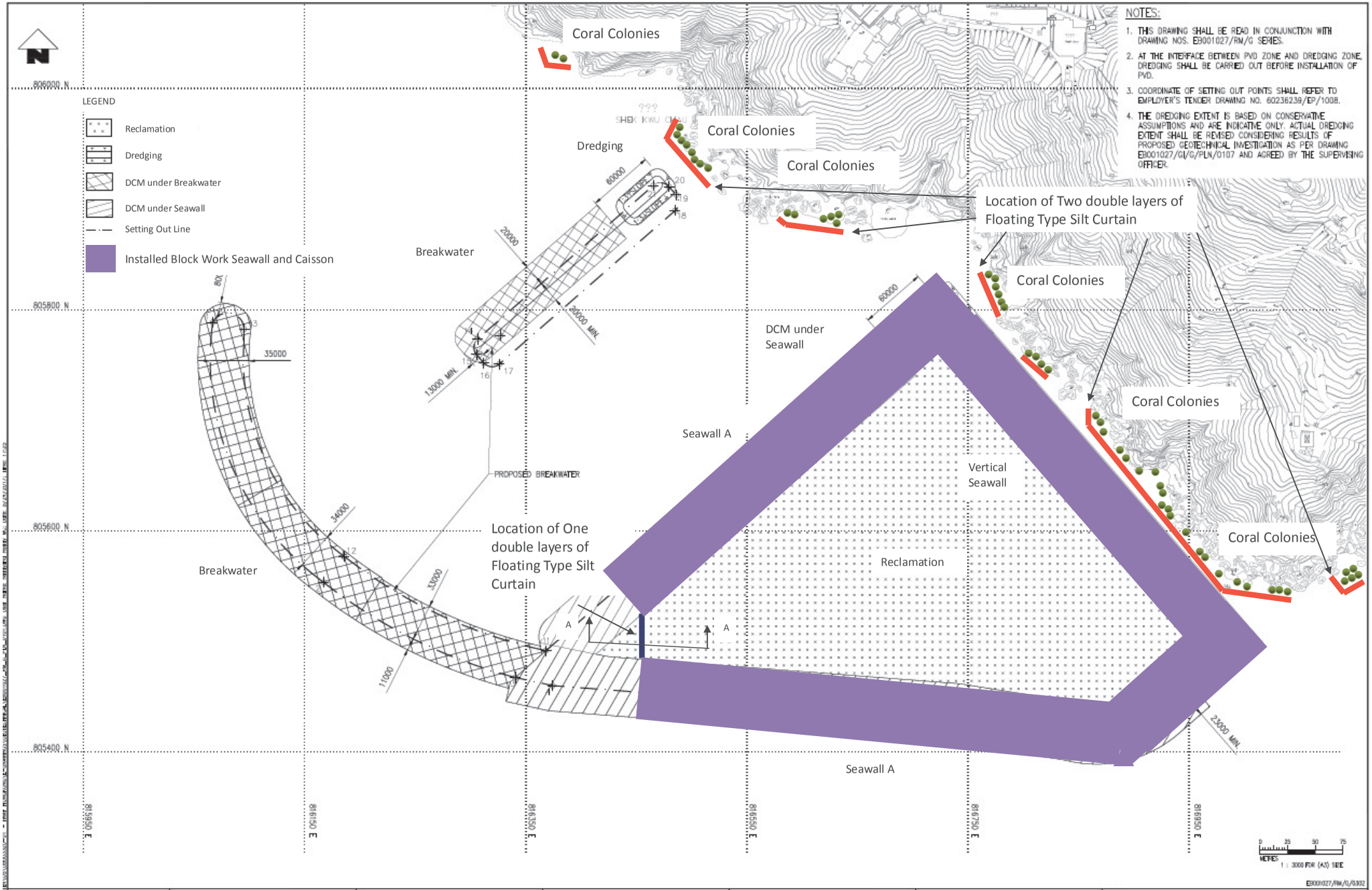


Figure 2

CLIENT: 環境保護署 Environmental Protection Department

ORIGINATOR: Keppel Seghers – Zhen Hua Joint Venture

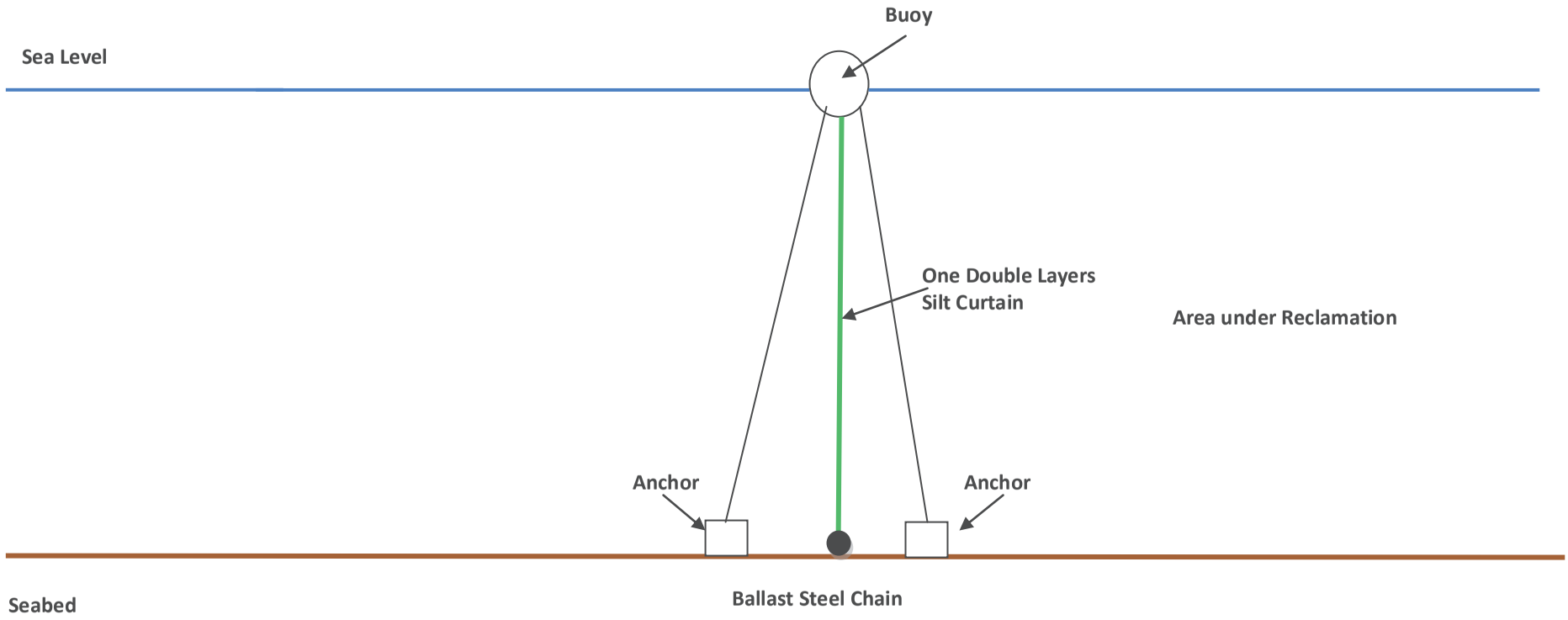
DESIGNER: ARCADIS, DLN

DESIGN CHECKER: SMEC

PROJECT: Contract EP/SP/66/12 Integrated Waste Management Facilities Phase 1

Location of Floating Type Silt Curtain (After completion of Caisson and Block work Seawall Installation)

Section view of floating type silt Curtain



Section A – A (N.T.S.)

Appendix F

Silt Curtain Inspection Checklist and Diver Inspection Checklist for Silt Curtain

Contract No.: EP/SP/66/12

Project Title: Integrated Waste Management Facilities, Phase 1

Client: Environmental Protection Department

Consultant: AECOM

Main Contractor: Keppel Seghers – Zhen Hua Joint Venture

Silt Curtain Daily Inspection Checklist

Silt Curtain ID: _____

Location: _____

Inspection Date and Time: _____

Item	Description	Condition		Immediate Action Required?*		Target Rectification Date	Remarks
		Yes	No	Yes	No		
1	No any floating debris / refuse within silt screen / curtain?						
2	Supporting frame / buoys in good condition?						
3	Tying rope in good condition?						
4	Geotextile intact and in good condition?						
5	Sinkers in good condition?						
6	No any obstruction to water flow between geotextile?						

Checked by: _____

On behalf of KSZHJV

Noted by: _____

On behalf of AECOM

*Note: For silt curtain with defects which need to be rectified immediately, related marine works have to be stopped until rectification works are completed to the satisfaction of the Supervising Officer

Contract No.: EP/SP/66/12
Project Title: Integrated Waste Management Facilities, Phase 1

Client: Environmental Protection Department
Consultant: AECOM
Main Contractor: Keppel Seghers – Zhen Hua Joint Venture

Diver Inspection Checklist for Silt Curtain

Silt Curtain ID: _____
Location: _____
Inspection Date and Time: _____

Item	Description	Condition		Immediate Action Required?*		Target Rectification Date	Remarks
		Yes	No	Yes	No		
Part A - Geotextile							
1	Curtain remains intact and without gap						
2	Curtain in upright position						
3	Curtain has no loose / flapping parts						
4	Curtain is securely attached at joints						
5	Curtain fittings (e.g. chains, bands, plates, joint connectors etc.) are intact and in position						
6	Curtain extends to within 30cm from seabed level (for floating type)						
7	Curtain hem is not weighted down by sediment deposition						

Item	Description	Condition		Immediate Action Required?*		Target Rectification Date	Remarks
		Yes	No	Yes	No		
Part B - Ancillary Components							
1	Anchors are undamaged and positions are correct						
2	Anchor lines are properly attached to the buoys / connectors of the silt curtain						
3	No parts are detached from the silt curtain						

Checked by: _____
On behalf of KSZHJV

Noted by: _____
On behalf of AECOM

*Note: For silt curtain with defects which need to be rectified immediately, related marine works have to be stopped until rectification works are completed to the satisfaction of the Supervising Officer