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1 INTRODUCTION

1.1 Background

1.1.1 Drainage Services Department (DSD) appointed Binnies Hong Kong Limited (Binnies or the consultants) to undertake the consultancy "Agreement No. CE 50/2019 (DS) Upgrading of Tai Po Sewage Treatment Works - Investigation" on 31 March 2020.

1.1.2 The existing Tai Po Sewage Treatment Works (TPSTW) is located within Tai Po Industrial Estate and has undergone various stages of extension since it was first commissioned in 1979. Currently, the existing TPSTW is a secondary treatment works with a design capacity of 120,000 m^3/day in Average Dry weather Flow (ADWF) serving Tai Po Industrial Estate, Tai Po, Lam Tsuen and Ting Kok areas.

1.1.3 The objective of the Project is to upgrade the existing TPSTW to about 160,000 m^3/day in ADWF to be advised by the consultants, with a view to meeting the future needs of Tai Po District, and allowing provision to receive and digest sludge from the Sewage Treatment Works (STW) in eastern New Territories (e.g. the relocated Sha Tin STW) for co-digestion with organic or pre-treated food waste.

1.1.4 Based on the review of latest flow records, the ADWF of TPSTW is expected to reach the design capacity in coming years. Taking into account the latest planning data, housing development programme, industrial flow and the potential centrate flow from co-digestion of imported sewage sludge and pre-treated food waste, the required design ADWF for the TPSTW may reach 160,000 m^3/day by 2041.

1.2 Project Description

1.2.1 The Project mainly comprises the following works:

- Construction and operation of new treatment facilities, modification / demolition of existing treatment facilities of TPSTW;
- Providing effluent reuse facilities; and
- Providing co-digestion facilities for imported sewage sludge and organic waste / pre-treated food waste.

1.2.2 Owing to the space limitation within the existing TPSTW and in order to maintain the sewage treatment services of the existing TPSTW, which is almost fully utilized, a piece of government land to the south of the existing TPSTW (about 1.6 hectares) is identified as the proposed expansion site for the Project. The Project site is shown in **Figure 1.1**.

1.3 Environmental Impact Assessment Ordinance Requirements

1.3.1 The Project consists of the following Designated Projects (DPs) under Part I, Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO):

- Item F.1 - Sewage treatment works with an installed capacity of more than 15,000 m^3 per day; and
- Item F.4 - An activity for the reuse of treated sewage effluent from a treatment plant.

1.3.2 This Project would have a potential to supply surplus gas and electricity generated from co-digestion of sewage sludge and organic waste / pre-treated food waste to the Hong Kong China Gas Company Limited and CLP Power Hong Kong Limited respectively. Hence, the Project would also comprise the following potential DPs under Part I, Schedule 2 of the EIAO:

- Item D.1 – A public utility electricity power plant; and
- Item D.2 – A public utility gas generation plant.

1.3.3 The implementation of this Project requires an Environmental Permit (EP) from the Environmental Protection Department (EPD) under the EIAO. An application for an Environmental Impact Assessment (EIA) Study Brief (Application No. ESB-321/2019) for the Project was submitted by DSD on 5 September 2019. An EIA Study Brief No. 321/2019 (ESB-321/2019) was subsequently issued by EPD on 16 October 2019 to facilitate the EIA study.

1.4 Purpose of this Sediment Sampling and Testing Methodology Paper

1.4.1 The Project site (including the existing TPSTW site and the proposed expansion site) was formed via land reclamation during the 1970s. Based on the available geological records, there are land-based marine deposit within the Project site. Based on the latest Project design, the land-based sediment (marine deposit) layer could potentially be encountered during the proposed excavation works for construction of the Project.

1.4.2 In accordance with Appendix H of the EIA Study Brief, it is necessary to identify the quantity, quality and timing of wastes arising (including any dredged/excavated. sediment/mud) as a result of the construction and operation activities of the Project. The purpose of this Sediment Sampling and Testing Methodology Paper (SSTMP) is to seek EPD agreement on the sampling and testing procedures for assessing the quality of the sediment generated from the Project under the EIA Study.

1.4.3 This SSTP is prepared in accordance with the Environmental, Transport and Works Bureau Technical Circular (Works) No. 34/2002 Management of Dredged / Excavated Sediments (ETWB TC(W) No. 34/2002) and shall only serve the purpose of fulfilling the EIA Study for this Project under the EIAO, Technical Memorandum on Environmental Impact Assessment Process (TM) and EIA Study Brief. Findings from the sediment sampling and testing exercise would be used to assess the waste management implications associated with the sediment generated from the Project under the EIA Study. Any future sediment disposal works under the Project should follow management hierarchy of minimization and on-site reuse (after treatment) before off-site disposal, a separate Sediment Sampling and Testing Plan (SSTP) / Sediment Quality Report (SQR) should be prepared and submitted to EPD for approval for the application of the dumping permit under the Dumping at Sea Ordinance (DASO). A rationale for sediment removal/ disposal should also be provided for agreement with the Marine Fill Committee (MFC) of Civil Engineering and Development Department (CEDD) under ETWB TC(W) No. 34/2002.

1.5 Structure of this Sediment Sampling and Testing Methodology Paper

1.5.1 Apart from this introduction section, the remaining sections of this SSTMP are as follows:

- Section 2 – Information Review
- Section 3 – Proposed Sediment Sampling Plan
- Section 4 – Proposed Laboratory Analysis Requirements; and
- Section 5 – Assessment Criteria.

2 INFORMATION REVIEW

2.1 Tentative Excavation Extent

2.1.1 Based on the latest design information, the maximum extent of the proposed excavation works of this Project is shown in **Figure 1.2**. Based on the preliminary design information, the

tentative excavation depth of this Project would vary in different locations from 1m to 12.5m below ground level (bgl).

2.2 Ground Investigation Records

2.2.1 The Project site was reclaimed in the 1970s. It is comprised of general fill over-lying a layer of marine deposit or alluvium. The public fill was previously placed on top of the marine deposits during the 1970s as a result of the land reclamation activities.

2.2.2 Under the Ground Investigation (GI) works of this Project, vertical geological profiles were recorded in ten (10) boreholes within or close to the upgrading works boundary of the Project. The thickness of the general fill material was measured to be > 13m in all the ten boreholes.

2.2.3 The relevant past GI records from Geotechnical Information Infrastructure (GInfo) of Civil Engineering and Development Department (CEDD) and other previous investigations were also reviewed. Most of these past GI data indicated that the thickness of the general fill material were > 13m. Thinner layer of fill material of < 13m was only recorded in localized areas.

2.2.4 Underneath the general fill is marine deposits with thickness up to 12.3m or alluvium with thickness up to about 14m. Rocks of various degrees of decomposition present below the marine deposit layer or alluvium layer or immediately underneath the fill layer. Within the proposed upgrading works area of the Project, bedrock would be encountered at a depth ranging from about -30.81 mPD to about -61.54 mPD as compared to the ground surface of about +6 mPD. The relevant GI records are attached in **Appendix 2.1**.

2.3 Historic Surrounding Land Use Before the Formation of Land Reclamation

2.3.1 Before the land reclamation in early 1970s, the quality of marine sediment at the Project site should be subject to the discharge and surface run-off from the nearby coastal area. In or before the early 1970s, the land use surrounding the Project site was only rural in nature. No contaminative or industrial land uses were identified. After the land reclamation at the Project site, the sediments were covered by the general fill and should not be directly and significantly affected by the surface and wastewater discharge to the marine water.

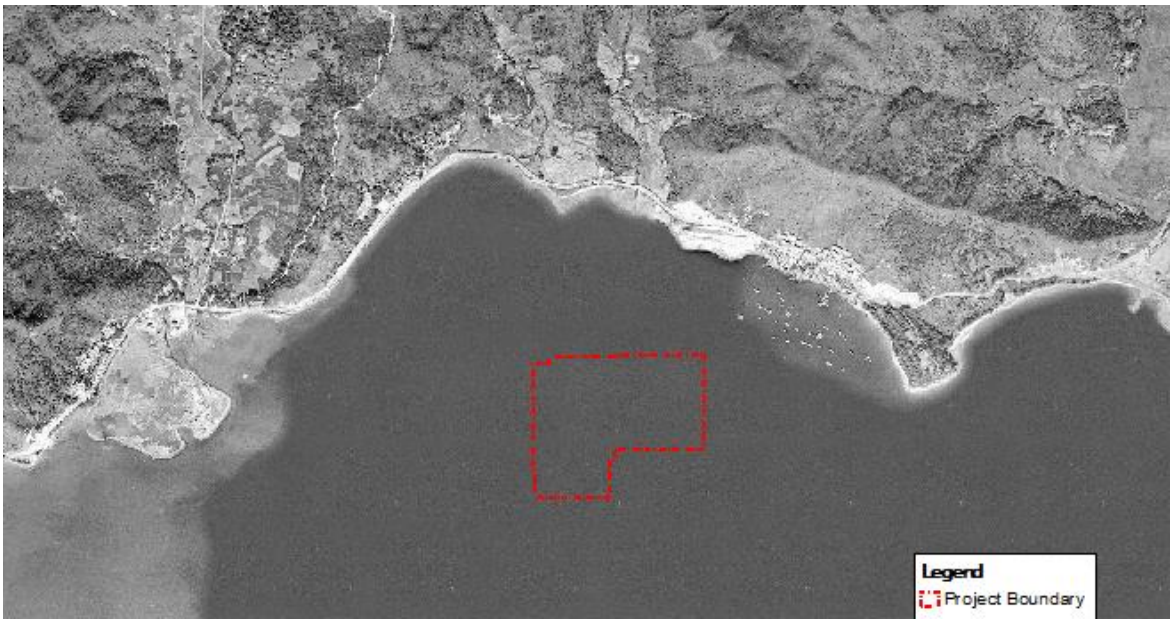


Exhibit 2.1 Historic Aerial Photo (1973)

2.4 Past Sediment Quality Monitoring Data

2.4.1 Sediment quality data were collected by EPD at TS3, which is located to the southeast of the existing Shuen Wan Restored Landfill (SWRL) and is the closest station to the Project site.

Location of TS3 is shown in **Exhibit 2.2** below. The earliest sediment quality data collected by the EPD from 1987 to 1990 are presented in **Table 2.1** below and these data are presentative of the historic or earlier conditions of the harbour sediment.

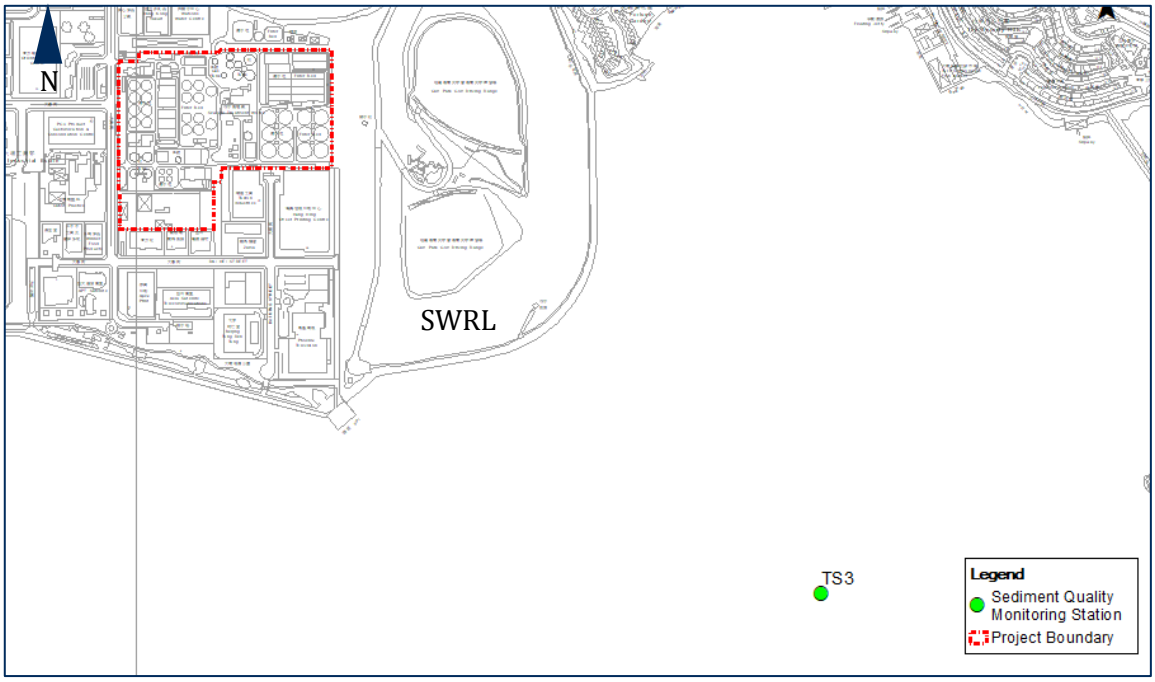


Exhibit 2.2 Locations of Sediment Quality Monitoring Station TS3

Table 2-1 EPD Sediment Monitoring data between 1987 to 1990 at TS3

Contaminants [5]	**TS3**	**LCEL** [1]	**UCEL** [2]
Metals (mg/kg dry weight)			
Cadmium (Cd)	0.4 – 1.3	1.5	4
Chromium (Cr)	23 – 32	80	160
Copper (Cu)	32 – 58	65	110
Mercury (Hg)	0.04 – 0.26	0.5	1
Nickel (Ni)	3 – 23	40	40
Lead (Pb)	47 – 87	75	110
Silver (Ag)	<1 - <1	1	2
Zinc (Zn)	28 – 140	200	270
Metalloid (mg/kg dry weight)			
Arsenic (As)	3.8 – 7.9	12	42
Organic PAHs [3] **(ug/kg dry weight)**			
Low Molecular Weight PAHs	Data not available	550	3160
High Molecular Weight PAHs	Data not available	1700	9600
Organic-non-PAHs (ug/kg dry weight)			
Total PCBs [4]	Data not available	23	180

Source: Environmental Protection Department's website: Environmental Protection Interactive Centre (https://cd.epic.epd.gov.hk/EPICRIVER/marine/history/sediment/)

Notes:

(1) Low Chemical Exceedance Level (LCEL)

(2) High Chemical Exceedance Level (HCEL)

(3) Polycyclic aromatic hydrocarbons

(4) Polychlorinated biphenyls

(5) Tributyltin data are not available.

2.4.2 Over the period between 1987 and 1990, the measured sediment quality at TS3 exceeded the LCEL (for lead only) at two sampling occasions (on 3 November 1988 and 2 June 1989). The levels of contaminants measured in all the remaining sampling occasions were below the LCEL.

The sediment contamination level at inner Tolo Harbour was not very high in the late 80s. It is not expected that the contamination level of sediments deposited in the Project site during the 70s before the land reclamation and prior to the rapid development of Tolo Harbour would be higher than those recorded in the inner Tolo Harbour during the 80s.

2.5 Past Relevant EIA Report

2.5.1 The previous TPSTW Stage V upgrading works involved the construction of new facilities in available space within TPSTW and modification of some existing facilities. Excavation was proposed in open areas of TPSTW for construction of new treatment units. According to Section 5.4.4 of the approved EIA Report for "TPSTW Stage V" published in 2004 (EIAO Register No.: AEIAR-081/2004), land contamination assessment was carried out in TPSTW, and the assessment showed that there was no exceedance in the Dutch B levels (i.e. soil clean-up targets) for all soil samples the excavation works areas of TPSTW Stage V, which concluded that the area was not contaminated [1]. Thus, there is no evidence of contamination influencing from the off-site surrounding environment such as the Tai Po industrial Estate and marine water. The approved EIA Report also stated that the materials excavated under the TPSTW Stage V would be mostly fill materials. No sediment issue was reported in the approved EIA.

3 PROPOSED SEDIMENT SAMPLING PLAN

3.1 Tentative Schedule of Sediment Sampling and Testing

3.1.1 The tentative schedules for carrying out the sampling and testing of the sediment are shown in **Table 3.1** below.

Table 3-1 Tentative Schedule of Sediment Sampling and Testing Works

Activities	Tentative Schedule
Sediment sampling	September 2021
Tier II chemical screening	September 2021
Tier III biological screening (if required)	October 2021

3.2 Proposed Sampling Locations and Depth of Sampling

3.2.1 Based on the information review, the expected contaminant level is not very high. The sediment sampling would generally follow the 100 x 100m grid arrangement. The proposed sediment sampling depth is 13m bgl to cover the maximum excavation depth.

3.2.2 Based on the GI records and the latest Project design, majority of the marine deposits in the proposed excavation works area of this Project would be deeper than the excavation depths as discussed in Section 2.2 and shown in **Figure 3.1**. Sediment would be encountered only in isolated locations of the works area.

[1] Details of the land contamination Site Investigation (SI) results are however not reported in the EIA. The relevant SI records are also not available from DSD.

3.2.3 Based on the 100 x 100m grid arrangement, a total of 11 grids (namely G1 to G11) are required to cover the possible excavation area as shown in **Figure 3.1**. The available GI records in G1, G2, G6 and G10 indicated that the fill material layers would extend to >13 m bgl. The excavation depth of maximum 12.5 bgl or sampling to 13 m bgl would unlikely encounter the sediment layer in G1, G2, G6 and G10 with reference to the GI data as shown in **Figure 3.1**. Sediment sampling is not proposed in G1, G2, G6 and G10.

3.2.4 In G3, G4, G5 and G11, sediments were recorded within the maximum excavation depth in isolated areas. These isolated areas are located (1) near the northern and eastern boundaries of the G3, (2) close to the southern boundary of G4, (3) at the southwest corner of G5 and (4) at the northeast corner of G11 (see **Figure 3.1**), The relevant GI data in these 4 grids were previously collected before the site development. These isolated locations (with a potential to encounter sediment within the excavation depth) are currently occupied by existing facilities or utilities in the existing TPSTW (in G3, G4 and G5) and the existing waste recycler (Lau Choi Kee Papers Company Limited) in the proposed expansion site (in G11).

3.2.5 This Project will be constructed in two phases. Phase 1 works will mainly involve construction of a new sewage treatment plant within the proposed expansion site to the south of the existing TPSTW (see **Figure 1.1**). Phase 2 works will mainly include the redevelopment of the western area of the existing TPSTW including the demolition of existing facilities of TPSTW. The Phase 1 works are scheduled to commence in 2025 for completion in 2029. The Phase 2 work would commence in 2029 for completion in 2033.

3.2.6 Sediment sampling at the north-eastern area of G11 (where there would be a potential to encounter sediment) is not feasible and not allowed by the existing tenant (Lau Choi Kee Papers Company Limited) at the EIA stage. Sampling in G11 can only be done after the waste recycling facilities in the proposed expansion site are decommissioned after the EIA stage (in mid-2022 the earliest) and before the Project construction in 2025. The existing facilities in TPSTW are in operation and therefore sediment sampling in the relevant locations of G3, G4 and G5 as mentioned in Section 3.2.4 is not feasible. The sampling can only be done after decommissioning of these facilities in 2029.

3.2.7 Taking into consideration of the existing facilities and the depth of the sediment occurrence from the GI records, sampling of sediment is possible in G7, G8 and G9 only. Based on the 100m x 100m grid sampling arrangement, one sampling location is proposed in each grid. The sampling locations are selected at the past GI locations, which showed the highest potential to encounter sediment at a shallow depth and also have no conflict with the existing facilities and utilities. Details of the sampling locations are shown in **Table 3.2** and illustrated in **Figure 3.1**.

Table 3-2 Details of Proposed Sampling Locations

Sampling Location	Coordinates *	
	Easting	Northing
BH1	837485.37	835180.32
BH2	837560.49	835184.02
BH3	837684.82	835192.68

Note:
* Actual locations subject to fine adjustments on-site.

3.2.8 In addition to the above and if biological screening is required, a grab sample will be collected at the routine sediment monitoring station PS6 at Port Shelter (E850234, N820057) as the reference sediment sample.

3.2.9 The exact sampling locations will be determined on site and subject to fine adjustment due to site specific conditions (e.g. locations, presence of foundations, underground utilities, delivery pipes and services). Details of the adjustments, if any, will be reflected in the EIA Report.

3.2.10 At the detailed design or construction stage when the more detailed design information including the detailed configuration of the excavation extent is available, a separate Sediment Sampling and Testing Plan (SSTP) / Sediment Quality Report (SQR) should be prepared and submitted to EPD for approval for the application of the dumping permit under the Dumping at Sea Ordinance (DASO).

3.3 Sampling Procedure

3.3.1 Upon determination of the exact sampling locations, a survey will be undertaken to measure the Hong Kong Grid Coordinates and metres above the Principal Datum (mPD) of the sampling locations.

3.3.2 All sediment samples will be collected using borehole drilling method. The borehole will be undertaken by means of dry rotary drilling method (i.e. without the use of flushing medium) as much as possible. For safety reasons, an inspection pit will be excavated down to 1.5m below ground level (m bgl) to inspect for underground utilities at the proposed borehole locations.

3.3.3 Soil boring using drill rigs should then be performed at depth 1.5m below ground. Undisturbed samples using U100 sampler (made of stainless steel or other appropriate materials) will be collected at depth where marine sediments are firstly encountered and samples will be taken at that particular depth (i.e. immediately above the top of marine deposit), 0.9m down, 1.9m down, 2.9m down and then every 3m down to the borehole termination depth. The depth of sediment sampling will be terminated at least 1m below the base of marine sediment or base of excavation (i.e. 13 m bgl), whichever is shallower. Sufficient amount of sediment sample will be taken for both chemical and biological testing. The undisturbed samples will be sealed up with tightly fitting rubber caps and duct-taped in place. Each sample will be clearly labeled sampling date and time, together with full description of the sample).

3.3.4 The samples will be stored, transported and maintained at 4°C or lower without being frozen in the dark prior to any laboratory testing. All samples will be packed and transported in such a manner as to avoid shock, vibration or any other disturbance of the samples. Samples will be delivered to laboratory within 24 hours after collection and analyzed within 14 days of delivery for chemical testing. The chain-of-custody procedure will be followed to record the flow of sample handling, from collection of samples to delivery of samples to the designated laboratory.

3.4 Strata Logging

3.4.1 Strata logging for boreholes should be undertaken during the course of drilling/digging and sampling by a qualified geologist. The logs should include the general stratigraphic description, depth of soil sampling, sample notation and level of groundwater (if encountered). The presence of rocks/boulders/cobbles and foreign materials such as metals, wood and plastics should also be recorded.

3.5 Sediment Sampling at Port Shelter

3.5.1 Prior to sampling, the laboratory responsible for analysis will be consulted for the sample size for both chemical and biological testing as well as the required preservation procedures.

3.5.2 Prior to sampling, the sampling location should also be set out with the aid of a differential global positioning system (DGPS) or equivalent device. After the setting out, the depth of water or the seabed surface level, in metres below the Principal Datum (mPD), should be measured.

3.5.3 Surface sediment will be taken by a closed grab sampler at the EPD's routine marine sediment monitoring station PS6 at Port Shelter (E850234, N820057) as the reference sample. The grab sampler will be thoroughly washed with seawater prior to each sampling attempt.

3.5.4 The surface sediment samples will be recovered on site and placed in laboratory provided clean high density polyethylene containers, wide mouth borosilicate glass bottles with Teflon lined lids or other appropriate containers and sealed to prevent leakage. Only new or pre-cleaned sample containers will be used to hold the sediment samples. The containers will be labeled with station number, sample depth, sampling date and time, together with full description of the sample.

3.5.5 The samples will be stored, transported and maintained at 4°C or lower without being frozen in the dark prior to any laboratory testing. All samples will be packed and transported in such a manner as to avoid shock, vibration or any other disturbance of the samples. Samples will be delivered to laboratory within 24 hours after collection and analyzed within 14 days of delivery for chemical testing. The chain-of-custody procedure will be followed to record the flow of sample handling, from collection of samples to delivery of samples to the designated laboratory.

3.6 Sample Size and Decontamination Procedures

3.6.1 All equipment in contact with the sediment should be thoroughly decontaminated between each excavation, drilling and sampling event to minimize the potential for cross contamination. The equipment (including drilling equipment and sediment samplers) should be decontaminated by steam cleaning or high-pressure hot water jet, then washed by phosphate-free detergent and finally rinsed by distilled water.

3.6.2 Prior to sampling, the laboratory responsible for analysis should be consulted for the particular sample size for chemical / biological testing. According to ETWB TC(W) No. 34/2002, the recommended sample sizes for each parameter and test are as shown in **Table 3-3**.

Table 3-3 Recommended Sampling Size

Parameters to be tested	Sampling Size
Metal and Metalloid	0.5L
Organic	0.5L
Biological testing	6L

3.6.3 The types of sampling bottle to be used and pretreatment methods for the collected samples are as shown in **Table 3-4**.

Table 3-4 Types of Sampling Bottle and Pretreatment Methods

Parameters to be tested	Sampling bottle	Pre-treatment Procedure#
Metal and Metalloid	High density polyethylene bottles*	USEPA SW-846^ Chapter 3
Organic	Wide mouth Borosilicate glass bottles with Teflon lined lid	USEPA SW-846 Chapter 4
Biological testing	Wide mouth Borosilicate glass bottles with Teflon lined lid or high-density polyethylene bottles*	USEPA SW-846 Chapter 3 or Chapter 4 as appropriate

Notes:
* Heavy duty plastic bags may be used for the storage of sediment sample for testing metals, metalloid and biological response.
# Other equivalent methods may be used subject to the approval of DEP.
^ Test methods for evaluating solid waste: physical/chemical methods, SW-846, United States Environmental Protection Agency

4 PROPOSED LABORATORY ANALYSIS REQUIREMENTS

4.1 Tier II Chemical Screening

4.1.1 All sediment samples will be tested for all target parameters with analytical methods given in **Table 4.1**. In the event that alternative analytical methods and/or reporting limits are proposed by Hong Kong Laboratory Accreditation Scheme (HOKLAS) accredited laboratory, prior approval shall be sought from EPD before the sediment sampling and testing.

Table 4-1 Analytical Methods

Parameters	Preparation Method US EPA Method	Determination Method US EPA Method	Reporting Limit
Metals (mg/kg dry wt.)			
Cadmium (Cd)	3050B	6020A or 7000A or 7131A	0.2
Chromium (Cr)	3050B	6010C or 7000A or 7190	8
Copper (Cu)	3050B	6010C or 7000A or 7210	7
Mercury (Hg)	7471A	7471A	0.05
Nickel (Ni)	3050B	6010C or 7000A or 7520	4
Lead (Pb)	3050B	6010C or 7000A or 7420	8
Silver (Ag)	3050B	6020A or 7000A or 7761	0.1
Zinc (Zn)	3050B	6010C or 7000A or 7950	20
Metalloid (mg/kg dry wt.)			
Arsenic (As)	3050B	6020A or 7000A or 7061A	1
Organic-PAHs (µg/kg dry wt.)			
Low Molecular Weight PAHs+	3550B or 3540C and 3630C	8260B or 8270C	55
High Molecular Weight PAHs++	3550B or 3540C and 3630C	8260B or 8270C	170
Organic-non-PAHs (µg/kg dry wt.)			
Total PCBs+++	3550B or 3540C and 3665A	8082	3
Organometallics (µgTBT/L in interstitial water)			
Tributyltin	Krone et al. (1989)* – GC/MS UNEP/IOC/IAEA**	Krone et al. (1989)* – GC/MS UNEP/IOC/IAEA**	0.015

Notes:

\+ Low molecular weight PAHs include acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene

++ High molecular weight PAHs include benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene

+++ The reporting limit is for individual PCB congeners. Total PCBs include 2,4' diCB, 2,2',5 triCB, 2,4,4' triCB, 2,2',3,5' tetraCB, 2,2',5,5' tetraCB, 2,3',4,4' tetraCB, 3,3',4,4' tetraCB, 2,2',4,5,5' pentaCB, 2,3,3',4,4' pentaCB, 2,3',4,4',5 pentaCB, 3,3',4,4',5 pentaCB, 2,2',3,3',4,4' hexaCB, 2,2',3,4,4',5' hexaCB, 2,2',4,4',5,5' hexaCB, 3,3'4,4',5,5' hexaCB, 2,2',3,3',4,4',5 heptaCB, 2,2',3,4,4',5,5' heptaCB, 2,2',3,4',5,5',6 heptaCB (ref: the "summation" column of Table 9.3 of Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual (The Inland Testing Manual) published by USEPA).

* Krone et al. (1989), A method for analysis of butyltin species and measurement of butyltins in sediment and English Sole livers from Puget Sound, Marine Environmental Research 27 (1989) 1-18. Interstitial water to obtained by centrifuging the sediment and collecting the overlying water.

** UNEP/ICO/IAEA refers to IAEA's Marine Environment Laboratory reference methods. These methods are available free of charge from UNEP/Water or Marine Environmental Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

4.1.2 The laboratory testing works will be conducted by a HOKLAS accredited laboratory.

4.2 Tier III Biological Screening

4.2.1 In accordance with the guidelines of ETWB TCW No. 34/2002, Tier III biological screening will be necessary for all Category M and certain Category H sediment samples in which one or more contaminants exceed 10 times of Lower Chemical Exceedance Level (LCEL) as identified in the Tier II chemical screening. The methods will follow the guidelines of ETWB TCW No. 34/2002.

4.2.2 The biological screening will either be conducted on the composite samples or individual samples, depending on the category and distribution profile. If composite samples are to be tested, they should be prepared by mixing up to 5 samples of the same category (M or H) which are continuous in vertical or horizontal profile.

4.2.3 According to ETWB TCW No. 34/2002, the following three toxicity tests (to be considered as one set) will be conducted on Category M and certain Category H sediments:

- a 10-day burrowing amphipod toxicity test;
- a 20-day burrowing polychaete toxicity test; and
- a 48-96 hour larvae (bivalve or echinoderm) toxicity test.

4.2.4 The species to be used for each type of biological test and the test conditions are listed in **Table 4.2** below.

Table 4-2 Testing Species for Biological Screening

Test Type	Species	Reference Test Condition[1][2]
10-day burrowing amphipod toxicity test	*Ampelisca abdita*	USEPA (1994) / PSEP (1995)
	Leptocheirus plumulosus	USEPA (1994)
	Eohaustorius estuaries	USEPA (1994) / PSEP (1995)
20-day burrowing polychaete toxicity test	*Neanthes arenaceodentata*	PSEP (1995)
48-96 hour larvae (bivalve or echinoderm) toxicity test	Bivalve: *Mytilus spp.* *Crassostrea gigas*	PSEP (1995)
	Echinoderm: *Dendraster excentricus* *Strongylocentrotus spp.*	

Notes:

(1) U.S.EPA (U.S. Environmental Protection Agency) 1994. Methods for assessing the toxicity ofsediment-associated contaminants with estuarine and marine amphipods. Office of Research and Development. U.S. Environmental Protection Agency, Cincinnati, OH. EPA/600/R94/025.

(2) PSEP (Puget Sound Estuary Program) 1995. Recommended guidelines for conducting laboratory bioassays on Puget Sound sediments.

4.2.5 Category H sediment with one or more contaminant levels exceeding 10 times LCEL should also be subjected to the above three toxicity tests but in a diluted manner (dilution test). The samples shall be prepared as method shown in **Table 4-3** prior to toxicity testing. All biological tests should be conducted by accredited laboratories and include appropriate quality assurance / quality control such as negative control and positive control. Samples of reference

sediment will also be tested.

Table 4-3 Sample Preparation

Sediment Characteristics	Preparation Method
Category H sediment (> 10 × LCEL)	Sample to be mixed with 9 portions of reference sediment
Category M sediment or Category H sediment (> 10 × LCEL) suspected of ammonia contamination	Additional set of sample (after dilution for Cat. H sediment) to be purged* for ammonia removal (for amphipod test only).

Notes:
* If the ammonia concentration in the overlying water of the test system is ≥ 20 mg/L, purging of sediment is required. This is performed by replacing the overlying water at a rate of 6 volume replacements/24 h for 24 hours, and repeated once only if the ammonia level still exceeds 20 mg/L

4.2.6 Additional ancillary parameters including moisture content, grain size, total organic content (TOC), ammonia and salinity of pore water should also be tested on the composite and reference samples. The ancillary test will provide necessary information on the general characteristic of the sediment. Test organisms will be selected based on their application limits for sediment grain size and porewater salinity. When ammonia level is found to be higher than the tolerance limit (i.e. > 20mg/l), sediment samples will be flushed (purged) by frequent renewal of the overlying water after test set-up, until the ammonia level drops below the tolerance limit.

4.2.7 Sediment samples will be thoroughly homogenized prior to initiation of any tests to minimize variance among test replicates. Debris and indigenous organisms present in the sediment will be removed beforehand so that neither false positive results (due to presence of predatory species) nor false negative results (from indigenous species that are taxonomically similar to the test species) will be generated.

4.2.8 The samples should be promptly analyzed with maximum holding time of 2 weeks for chemical test and 8 weeks for biological test.

4.3 Quality Assurance / Quality Control Requirements

4.3.1 All tests will be conducted by laboratories accredited by HOKLAS or, in case of overseas laboratories, by equivalent accreditation for these tests.

4.3.2 For chemical screening, the following Quality Control (QC) plan will be implemented for the laboratory testing:

- Method Blank;
- Duplicate (at 5% level i.e. one for every 20 samples); and
- Matrix Spike (at 5% level i.e. one for every 20 samples).

4.3.3 The proposed data quality objectives are shown in **Table 4.3**.

Table 4-4 Data Quality Objectives for Chemical Screening

Quality Controls	Acceptance Criteria
Method Blank	Less than method detection limit (MDL)
Duplicate	Agree within ±25% of the mean of duplicate results
Matrix Spike	Agree within ±25% of the recovery of spike concentration

4.3.3 For biological screening, negative and positive control should be included as appropriate quality assurance / quality control.

5 ASSESSMENT CRITERIA

5.1.1 For Tier II chemical screening, the sediment quality will be assessed according to sediment quality criteria in Appendix A of ETWB TCW No. 34/2002. As specified in the ETWB TCW No. 34/2002, sediments will be classified into three categories based on their contaminant levels. The classification is as follows:

Category L: Sediment with all contaminant levels not exceeding the LCEL. The material must be dredged, transported and disposed of in a manner that minimizes the loss of contaminants either into solution or by suspension.

Category M: Sediment with any one or more contaminant levels exceeding the LCEL and none exceeding the UCEL. The material must be dredged and transported with care, and must be effectively isolated from the environment upon final disposal unless appropriate biological tests demonstrate that the material will not adversely affect the marine environment.

Category H: Sediment with any one or more contaminant levels exceeding the UCEL. The material must be dredged and transported with great care, and must be effectively isolated from the environment upon final disposal.

5.1.2 The sediment quality criteria for the classification of sediment are shown in **Table 5.1** below.

Table 5-1 Sediment Quality Criteria for the Classification of Sediment

Contaminants	Lower Chemical Exceedance Level (LCEL)	Upper Chemical Exceedance Level (UCEL)
Metals (mg/kg dry wt.)		
Cadmium (Cd)	1.5	4
Chromium (Cr)	80	160
Copper (Cu)	65	110
Mercury (Hg)	0.5	1
Nickel (Ni)*	40	40
Lead (Pb)	75	110
Silver (Ag)	1	2
Zinc (Zn)	200	270
Metalloid (mg/kg dry wt.)		
Arsenic	12	42
Organic-PAHs (µg/kg dry wt.)		
Low Molecular Weight PAHs	550	3160
High Molecular Weight PAHs	1700	9600
Organic-non-PAHs (µg/kg dry wt.)		
Total PCBs	23	180
Organometallics (µg TBT/L in Interstitial water)		
Tributyltin*	0.15	0.15

Note:

* The contaminant level is considered to have exceeded the UCEL if it is greater than the value shown.

5.1.3 Upon completion of the Tier II chemical screening, Tier III biological screening will be conducted for sediment samples that were classified as either Category M or Category H sediment with one or more contaminant levels exceeding 10 times the LCEL. The test endpoints and decision criteria for biological screening are summarized in **Table 5.2**. The sediment is deemed to have failed the biological test if it fails in any one of the three toxicity tests.

Table 5.2 Test Endpoints and Decision Criteria for Tier III Biological Screening

Toxicity Test	Endpoints Measured	Failure Criteria
10-day amphipod	Survival	Mean survival in test sediment is significantly different ($p \leq 0.05$)[1] from mean survival in reference sediment and mean survival in test sediment <80% of mean survival in reference sediment.
20-day polychaete worm	Dry Weight[2]	Mean dry weight in test sediment is significantly different ($p \leq 0.05$)[1] from mean dry weight in reference sediment and mean dry weight in test sediment <90% of mean dry weight in reference sediment.
48–96 hour larvae (bivalve or echinoderm)	Normality Survival[3]	Mean normality survival in test sediment is significantly different ($p \leq 0.05$)[1] from mean normality survival in reference sediment and mean normality survival in test sediment <80% of mean normality survival in reference sediment.

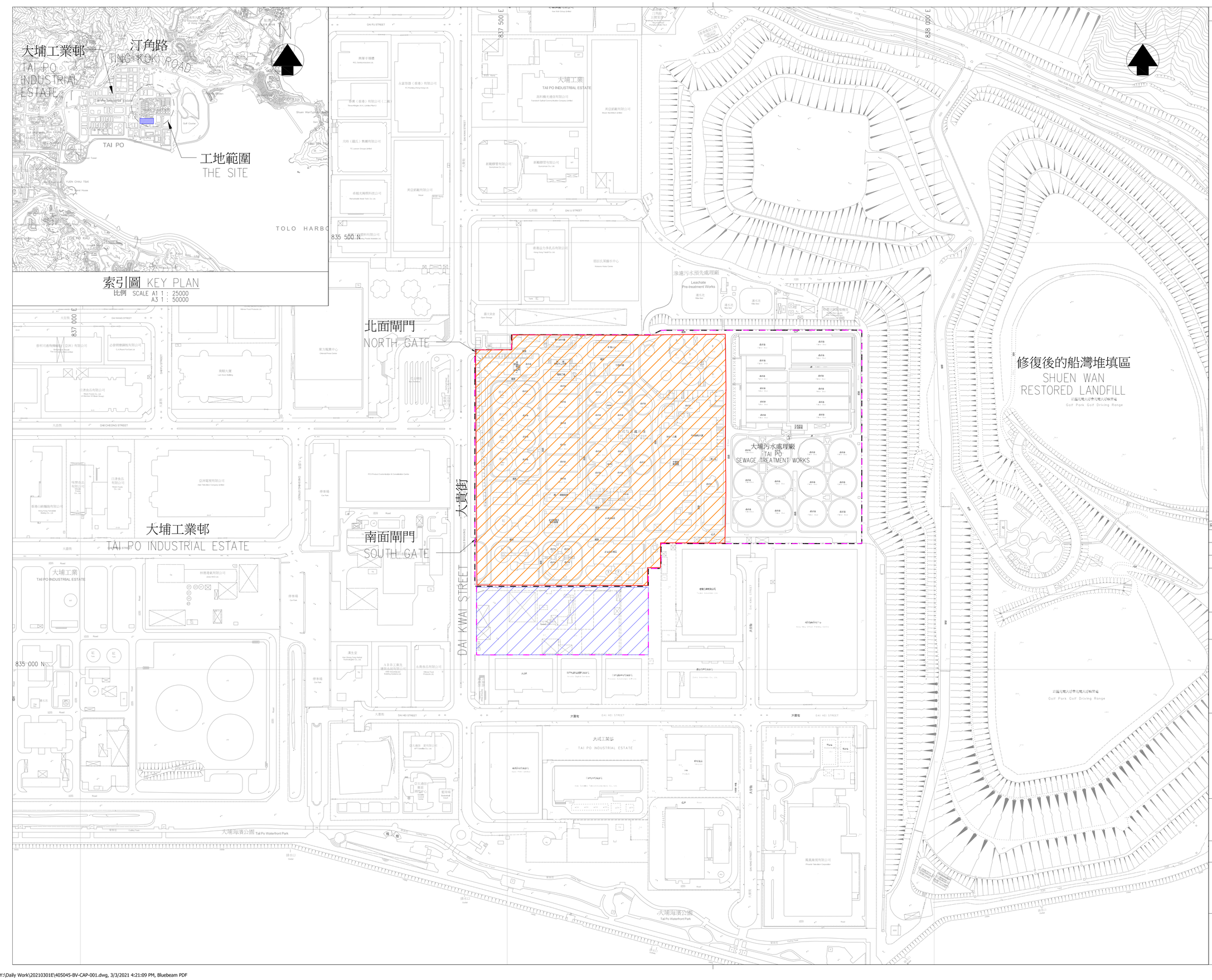
Notes
1. Statistically significant differences should be determined using appropriate two-sample comparisons (e.g., t-tests) at a probability of $p \leq 0.05$.
2. Dry weight means total dry weight after deducting dead and missing worms.
3. Normality survival integrates the normality and survival end points, and measures survival of only the normal larvae relative to the starting number.

5.1.4 The sediment quality results would be presented in the EIA Report and used in the assessment of waste management implications of the Project. The sediment disposal shall be arranged according to the sediment category in accordance with Appendix C of ETWB TC(W) No. 34/2002 enclosed in **Appendix 5.1**.

END OF TEXT

FIGURES

A3



LEGEND:

- PROJECT BOUNDARY
- EXISTING SITE BOUNDARY OF TAI PO SEWAGE TREATMENT WORKS
- PROPOSED UPGRADING WORKS WITHIN EXISTING TAI PO SEWAGE TREATMENT WORKS
- PROPOSED EXPANSION SITE

Revision	Date	Description		Initial
	Designed	Checked	Drawn	Checked
Initial	–	–	–	–
Date	05/20	05/20	05/20	05/20

Approved

Agreement no.
CE 50/2019 (DS)

Project title
UPGRADING OF TAI PO SEWAGE TREATMENT WORKS – INVESTIGATION

Drawing title
PROJECT LOCATION PLAN

Drawing no.
FIGURE 1.1

Revision
–

Scale
A1 1 : 2000
A3 1 : 4000

香港特別行政區政府渠務署
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION DRAINAGE SERVICES DEPARTMENT

BLACK & VEATCH HONG KONG LIMITED
博威工程顧問有限公司

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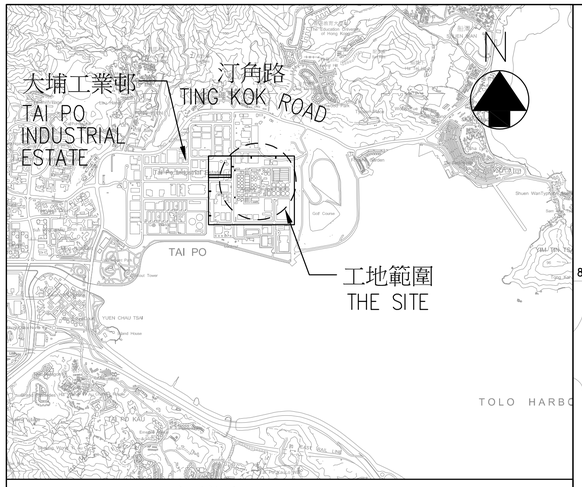
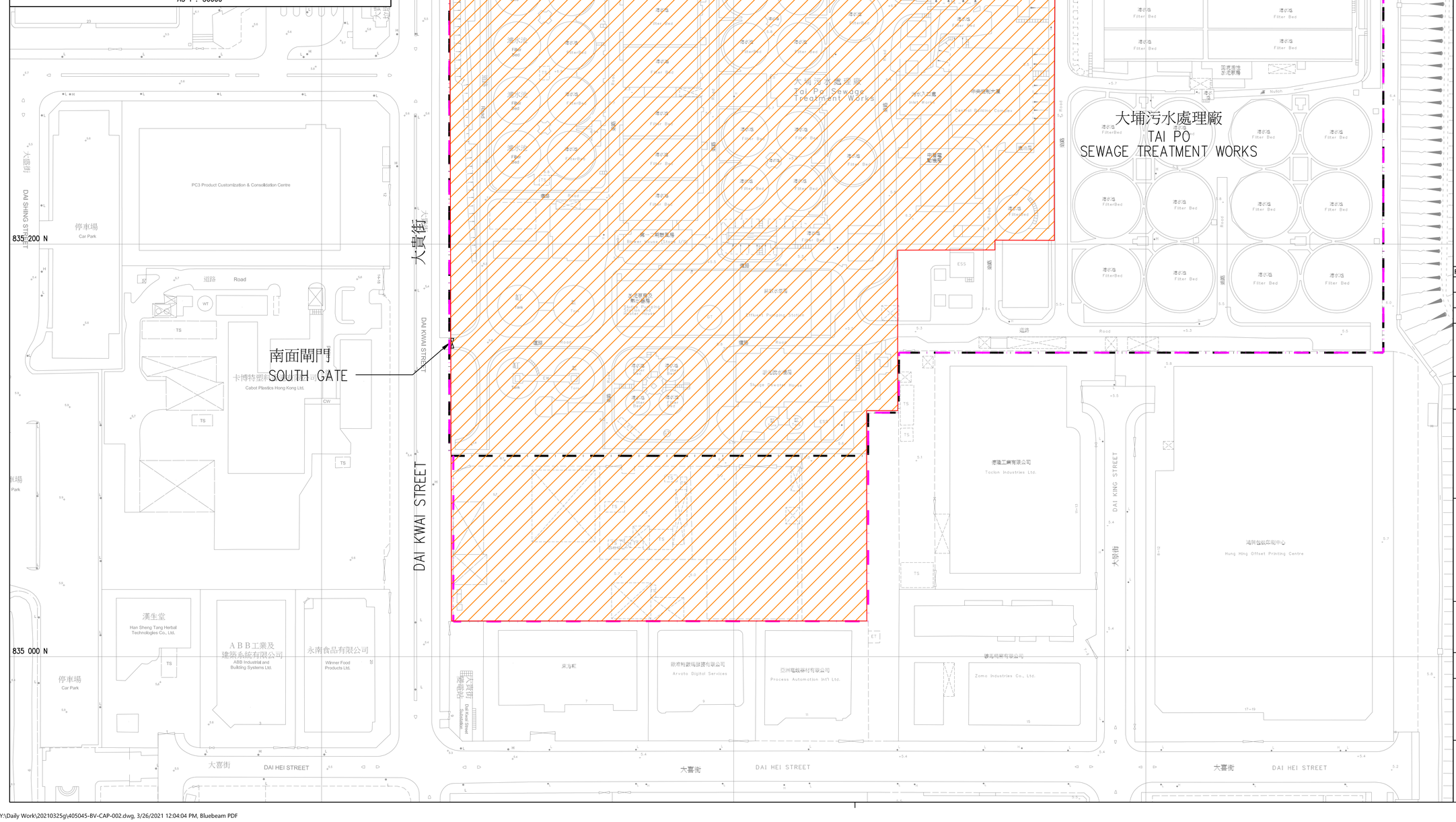
A3



索引圖 KEY PLAN
比例 SCALE A1 1 : 25000
A3 1 : 50000



LEGEND:

- PROJECT BOUNDARY
- EXISTING SITE BOUNDARY OF TAI PO SEWAGE TREATMENT WORKS
- PROPOSED EXCAVATION WORKS BOUNDARY

Revision	Date	Description			Initial
	Designed	Checked	Drawn		Checked
Initial	–	–	–		–
Date	05/20	05/20	05/20		05/20

Approved

Agreement no.
CE 50/2019 (DS)

Project title
UPGRADING OF TAI PO SEWAGE TREATMENT WORKS – INVESTIGATION

Drawing title
PROPOSED EXCAVATION WORKS BOUNDARY

Drawing no.
FIGURE 1.2

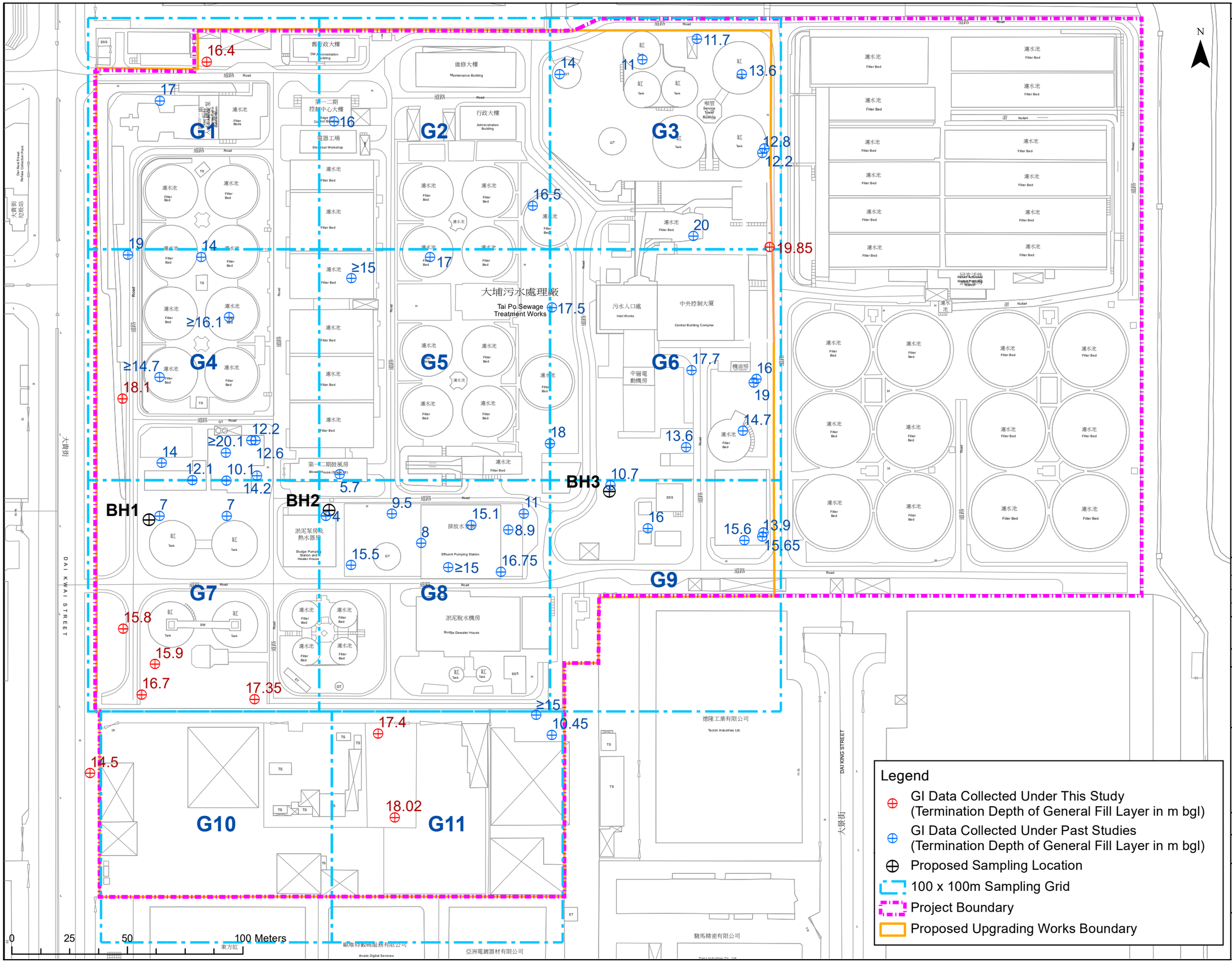
Revision
–

Scale
A1 1 : 1000
A3 1 : 2000

香港特別行政區政府渠務署
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION
DRAINAGE SERVICES DEPARTMENT

BLACK & VEATCH HONG KONG LIMITED
博威工程顧問有限公司

A3



Legend

- GI Data Collected Under This Study (Termination Depth of General Fill Layer in m bgl)
- GI Data Collected Under Past Studies (Termination Depth of General Fill Layer in m bgl)
- Proposed Sampling Location
- 100 x 100m Sampling Grid
- Project Boundary
- Proposed Upgrading Works Boundary

Revision	Description			
	Designed	Reviewed	Drawn	Checked
Initial	PSY	Amy	PSY	Amy
Date	8/21	8/21	8/21	8/21

Approved: -

Agreement No.: CE 50/2019 (DS)

Project Title: Upgrading of Tai Po Sewage Treatment Works - Investigation

Figure Title: Proposed Sampling Location Plan

Drawing No.: Figure 3.1

Revision: -

Scale: A3: 1:1,500

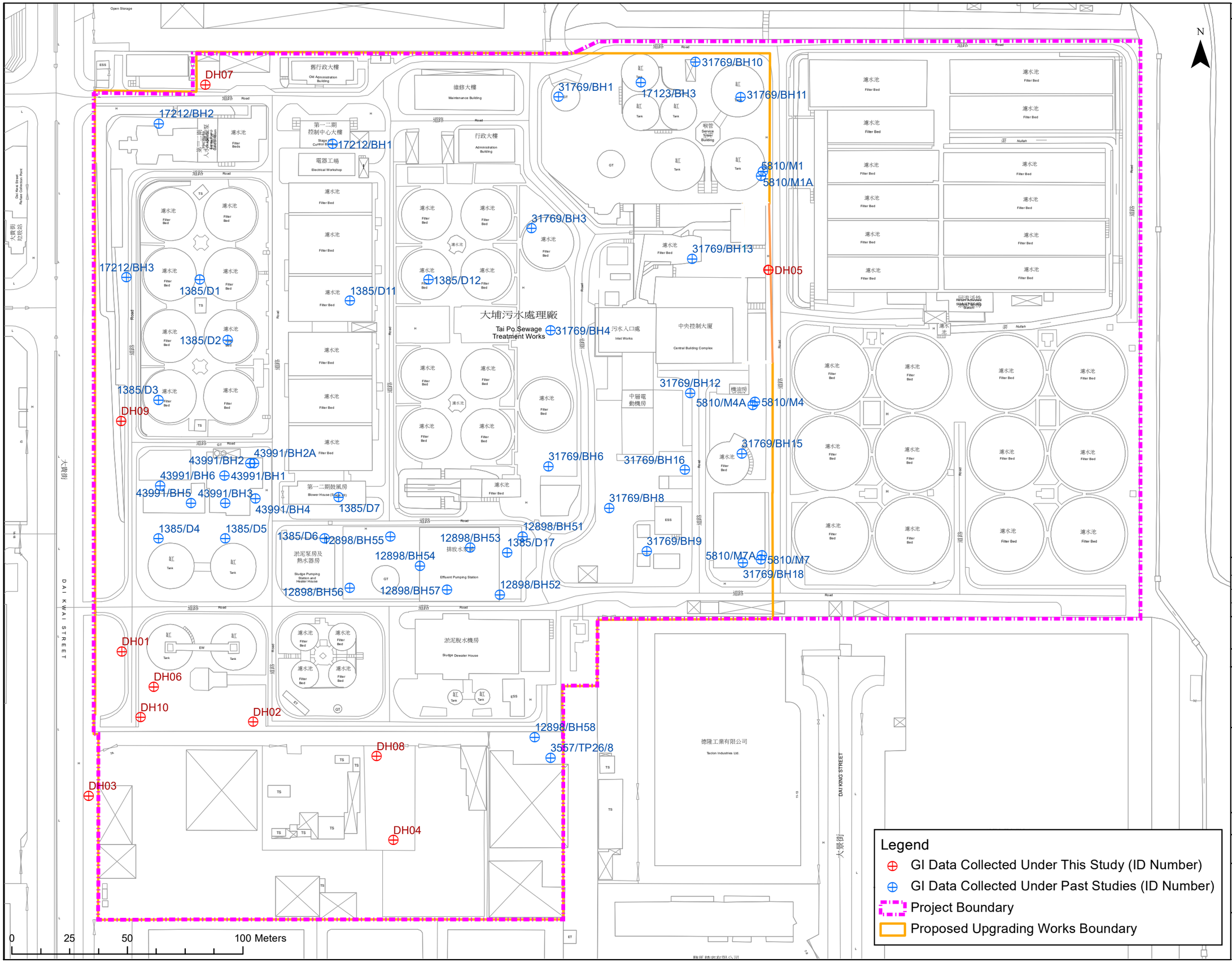
Client: 渠務署 Drainage Services Department

Consultant: binnies

APPENDIX 2.1

GROUND INVESTIGATION RECORDS

A3



Revision	Description			
	Designed	Reviewed	Drawn	Checked
Initial	PSY	Amy	PSY	Amy
Date	8/21	8/21	8/21	8/21

Approved
-

Agreement No.
CE 50/2019 (DS)

Project Title
Upgrading of Tai Po Sewage Treatment Works - Investigation

Figure Title
Existing Ground Investgation Record

Drawing No. Appendix 2.1

Revision -

Scale
A3: 1:1,500

Client
渠務署 Drainage Services Department

Consultant
binnies

Appendix 2.1 - Summary of Existing Ground Investigation Records

Report No.	GI Station No.	Easting	Northing	Ground Level (mPD)	Max Depth of GI Stations (mPD)	Depth of Strata Encountered (mPD)																																				Depth of Piezometer Tip/Standpipe Tip(mPD)	Highest Groundwater Level (mPD)
						FILL			FILL Thickness	Marine Deposit			MD Thickness	Estuarine Deposit			ED Thickness	COLL			COLL Thickness	ALL			ALL Thickness	Residual Soil			RS Thickness	Debris Flow			DF Thickness	CDG			CDG Thickness	CDV			CDV Thickness	HDG			HDG Thickness	HDV			HDV Thickness	MDG or above			MDV or above				
5810	M1	837750.98	835339.07	5.78	-32.90	5.78	-	-7.02	12.80	-7.02	-	-9.02	2.00		-			-			0.00	-9.02	-	-15.22	6.20	-				-				-				-15.22	-	-31.30	16.08	-				-				-		-31.30	-	-32.90		
	M1A	837751.84	835340.92	5.80	-8.40	5.80	-	-6.40	12.20	-6.40	-	-8.40	2.00		-			-					-			-				-				-				-				-				-				-8.25 (P)	4.63
	M4	837748.42	835241.24	5.90	-34.07	5.90	-	-10.10	16.00	-10.10	-	-11.10	1.00		-			-			0.00	-11.10	-	-14.50	3.40	-				-				-				-14.50	-	-31.60	17.10	-				-	-31.60	-	-32.48	0.88	-	-32.48	-	-34.07	-	-
	M4A	837747.31	835239.74	5.85	-13.80	5.85	-	-13.15	19.00		-				-			-			0.00	-13.15	-	-13.80	0.65	-				-				-					-				-				-				-13.65(P)	-
	M7	837750.90	835173.04	5.90	-32.71	5.90	-	-8.00	13.90	-8.00	-	-11.00	3.00		-			-			0.00	-11.00	-	-13.63	2.63	-				-				-				-13.63	-	-23.59	9.96	-				-	-23.59	-	-31.08	7.49	-	-31.08	-	-32.71		
	M7A	837751.47	835174.77	6.04	-10.96	6.04	-	-9.61	15.65	-9.61	-	-10.09	0.48		-			-			0.00	-10.09	-	-10.96	0.87	-				-				-					-				-				-				-10.81(P)	3.02
1385	D1	837508.00	835294.00	5.30	-12.70	5.30	-	-8.70	14.00	-8.70	-	-10.20	1.50					-					-																													-	-
				-10.20		-10.20	-	-12.70	2.50		-							-					-																													-	-
	D2	837520.00	835268.00	5.20	-10.90	5.20	-	-10.90	16.10		-							-					-																													-	-
	D3	837490.00	835242.00	4.90	-9.80	4.90	-	-9.80	14.70		-							-					-																													-	-
	D4	837490.00	835182.00	5.70	-15.30	5.70	-	-1.30	7.00	-1.30	-	-11.30	10.00					-			0.00	-11.30	-	-14.30	3.00					-				-				-14.30	-	-15.30	1.00					-				-				-	-
	D5	837519.00	835182.00	5.50	-15.50	5.50	-	-1.50	7.00	-1.50	-	-11.50	10.00					-			0.00	-11.50	-	-14.50	3.00					-				-				-14.50	-	-15.50	1.00					-				-				-	-
	D6	837562.00	835182.00	5.60	-15.40	5.60	-	1.60	4.00	1.60	-	-10.40	12.00					-			0.00	-10.40	-	-14.40	4.00					-				-				-14.40	-	-15.40	1.00					-				-				-	-
	D7	837568.00	835200.00	5.40	-12.60	5.40	-	-0.30	5.70	-0.30	-	-12.60	12.30					-					-																													-	-
	D11	837573.00	835285.00	5.70	-9.30	5.70	-	-9.30	15.00		-							-					-																													-	-
	D12	837607.00	835294.00	5.70	-12.30	5.70	-	-11.30	17.00									-			0.00	-11.30	-	-12.30	1.00					-				-					-				-				-				-	-
	D17	837641.00	835176.00	5.50	-15.50	5.50	-	-3.40	8.90	-3.40	-	-14.50	11.10					-					-																-14.50	-	-15.50	1.00														
12898	BH51	837647.74	835182.94	5.62	-52.93	5.62	-	-5.38	11.00	-5.38	-	-16.38	11.00					-			0.00	-16.38	-	-23.88	7.50								-23.88	-	-47.58	23.70		-				-47.58	-	-52.93	5.35		-							-	-
	BH52	837637.81	835157.78	5.85	-57.11	5.85	-	-10.90	16.75	-10.90	-	-15.90	5.00					-			0.00	-15.90	-	-27.15	11.25								-27.15	-	-52.08	24.93		-													-52.08	-	-57.11		-
	BH53	837625.00	835178.07	6.04	-66.64	6.04	-	-9.06	15.10	-9.06	-	-11.46	2.40					-			0.00	-11.46	-	-14.96	3.50								-14.96	-	-61.54	46.58		-													-61.54	-	-66.64		-	-6.26(P)	2.74
	BH54	837603.29	835170.13	6.02	-56.50	6.02	-	-1.98	8.00	-1.98	-	-5.98	4.00					-			0.00	-5.98	-	-19.98	14.00								-19.98	-	-51.18	31.20		-				-51.18	-	-51.58	0.40		-				-51.58	-	-56.50		-	-	-
	BH55	837590.50	835182.80	5.85	-55.99	5.85	-	-3.65	9.50	-3.65	-	-12.65	9.00					-			0.00	-12.65	-	-15.65	3.00								-15.65	-	-50.75	35.10		-				-50.75	-	-51.96	1.21		-				-51.96	-	-55.99		-	-	-
	BH56	837572.87	835160.62	6.26	-48.86	6.26	-	-9.24	15.50	-9.24	-	-14.19	4.95					-					-																-14.19	-	-43.79	29.60		-										-43.79	-	-48.86		-	-	-
	BH57	837614.97	835159.79	5.89	-9.11	5.89	-	-9.11	15.00									-					-																													-	-
	BH58	837652.99	835095.92	5.56	-9.44	5.56	-	-9.44	15.00									-					-																													-	-
3557	TP26/8	837659.80	835087.20	5.50	-20.45	5.50	-	-4.95	10.45	-4.95	-	-7.20	2.25					-			0.00	-7.20	-	-17.20	10.00	-17.20	-	-20.45	3.25																							-	-
43991	BH1	837518.64	835209.34	6.53	-48.40	6.53	-	-13.57	20.10									-					-																-13.57	-	-40.47	26.90		-				-40.47	-	-43.27	2.80		-	-43.27	-	-48.40	-	-
	BH2	837529.76	835214.60	6.29	-52.62	6.29	-	-5.91	12.20		-			-5.91	-	-11.61	5.70	-			0.00	-11.61	-	-19.01	7.40	-					-			-				-19.01	-	-38.91	19.90		-				-38.91	-	-46.21	7.30		-	-46.21	-	-52.62	-	-
	BH2A	837531.48	835214.62	6.27	-11.43	6.27	-	-6.33	12.60		-			-6.33	-	-11.43	5.10	-					-			-				-				-					-				-								-	-
	BH3	837518.94	835197.25	6.50	-47.73	6.50	-	-3.60	10.10		-			-3.60	-	-11.20	7.60	-			0.00	-11.20	-	-14.20	3.00	-					-			-				-14.20	-	-40.20	26.00		-				-40.20	-	-42.33	2.13		-	-42.33	-	-47.73	-	-
	BH4	837532.12	835199.34	6.25	-49.25	6.25	-	-7.95	14.20		-			-7.95	-	-9.55	1.60	-			0.00	-9.55	-	-13.65	4.10	-					-			-				-13.65	-	-42.55	28.90		-				-42.55	-	-43.30	0.75		-	-43.30	-	-49.25	-	-
	BH5	837504.14	835197.36	6.54	-47.08	6.54	-	-5.56	12.10		-			-5.56	-	-12.66	7.10	-			0.00	-12.66	-	-13.26	0.60	-					-			-				-13.26	-	-39.96	26.70		-				-39.96	-	-40.86	0.90		-	-40.86	-	-47.08	-	-
	BH6	837490.84	835204.91	6.92	-56.18	6.92	-	-7.08	14.00		-			-7.08	-	-11.63	4.55	-			0.00	-11.63	-	-14.63	3.00	-					-			-14.63	-	-43.73	29.10		-				-43.73	-	-48.42	4.69		-				-48.42	-	-56.18		-	-	-
31769	BH1	837663.26	835373.20	5.78	-54.01	5.78	-	-8.22	14.00	-8.22	-	-8.72	0.50		-			-			0.00	-8.72	-	-13.22	4.50	-					-			-				-13.22	-	-48.64	35.42		-										-48.64	-	-54.01	-	-
	BH3	837651.54	835316.22	5.60	-48.53	5.60	-	-10.90	16.50		-				-			-			0.00	-10.90	-	-13.90	3.00	-					-			-				-13.90	-	-42.55	28.65		-				-42.55	-	-43.05	0.50		-	-43.05	-	-48.53	-	-
	BH4	837659.88	835272.20	5.92	-44.02	5.92	-	-11.58	17.50		-				-			-			0.00	-11.58	-	-15.08	3.50	-					-			-				-15.08	-	-36.98	21.90		-				-36.98	-	-38.83	1.85		-	-38.83	-	-44.02	-	-
	BH6	837659.00	835213.23	5.73	-48.30	5.73	-	-12.27	18.00	-12.27	-	-12.77	0.50		-			-			0.00	-12.77	-	-15.77	3.00	-					-			-				-15.77	-	-39.72	23.95		-				-39.72	-	-40.92	1.20		-	-40.92	-	-48.30	-	-
	BH8	837685.22	835195.20	6.36	-44.14	6.36	-	-4.34	10.70	-4.34	-	-13.34	9.00		-			-			0.00	-13.34	-	-14.44	1.10	-					-			-				-14.44	-	-38.84	24.40		-										-38.84	-	-44.14	-	-
	BH9	837701.48	835176.51	6.41	-46.23	6.41	-	-9.59	16.00		-				-			-			0.00	-9.59	-	-15.59	6.00	-					-			-				-15.59	-	-41.06	25.47		-										-41.06	-	-46.23	-	-
	BH10	837722.58	835388.36	5.84	-36.06	5.84	-	-5.86	11.70	-5.86	-	-9.96	4.10		-			-			0.00	-9.96	-	-12.96	3.00	-					-			-				-12.96	-	-30.81	17.85		-										-30.81	-	-36.06	-	-
	BH11	837742.11	835373.06	5.83	-38.80	5.83	-	-7.77	13.60	-7.77	-	-9.87	2.10		-			-			0.00	-9.87	-	-12.97	3.10	-					-			-				-12.97	-	-30.55	17.58		-				-30.55	-	-33.22	2.67		-	-33.22	-	-38.80	-	-
	BH12	837720.35	835245.00	7.61	-47.99	7.61	-	-10.09	17.70	-10.09	-	-13.09	3.00		-			-			0.00	-13.09	-	-16.09	3.00	-					-			-				-16.09	-	-42.49	26.40		-										-42.49	-	-47.99	-	-
	BH13	837721.13	835303.11	9.65	-48.94	9.65	-	-10.35	20.00		-				-			-			0.00	-10.35	-	-14.45	4.10	-					-			-				-14.45	-	-43.56	29.11		-										-43.56	-	-48.94	-	-
	BH15	837742.62	835218.76	6.29	-43.21	6.29	-	-8.41	14.70	-8.41	-	-11.41	3.00		-			-			0.00	-11.41	-	-15.51	4.10	-					-			-				-15.51	-	-33.51	18.00		-				-33.51	-	-36.11	2.60		-	-36.11	-	-43.21	-	-
	BH16	837717.99	835211.73	6.39	-39.96	6.39	-	-7.21	13.60	-7.21	-	-11.21	4.00		-			-			0.00	-11.21	-	-14.21	3.00	-					-			-				-14.21	-	-32.11	17.90		-				-32.11	-	-34.44	2.33		-	-34.44	-	-39.96	-	-
	BH18	837743.21	835171.48	6.56	-39.35	6.56	-	-9.04	15.60	-9.04	-	-10.44	1.40		-			-			0.00	-10.44	-	-14.54	4.10	-					-			-				-14.54	-	-33.15	18.61		-										-33.15	-	-39.35	-	-
17212	BH1	837565.51	835352.80	5.78	-54.29	5.78	-	-10.22	16.00	-10.22	-	-11.22	1.00					-			0.00	-11.22	-	-14.22	3.00								-14.22	-	-49.22	35.00		-										-49.22	-	-54.29		-	-	-
	BH2	837490.10	835361.55	8.14	-54.33	8.14	-	-8.86	17.00	-8.86	-	-9.86	1.00					-			0.00	-9.86	-	-13.86	4.00								-13.86	-	-47.32	33.46		-										-47.32	-	-54.33		-	-	-
	BH3	837476.21	835295.01	8.27	-52.85	8.27	-	-10.73	19.00		-							-			0.00	-10.73	-	-11.73	1.00								-11.73	-	-47.73	36.00		-										-47.73	-	-52.85		-	-	-
17123	BH3	837698.96	835379.46	5.69	-44.01	5.69	-	-5.31	11.00	-5.31	-	-8.31	3.00					-			0.00	-8.31	-	-10.11	1.80					-10.11	-	-15.31	5.20		-			-15.31	-	-36.51	21.20												-36.51	-	-44.01	-	-
Site Specific	DH01	837474.18	835133.09	5.67	-47.32	5.67	-	-10.13	15.80	-10.13	-	-11.33	1.20				-13.33	-	-14.43	1.10	-11.33	-	-13.33	2.00												-14.43	-	-38.43	24.00						-38.43	-	-42.18	3.75					-42.18	-	-47.32	-1.83(S) -10.23(P)	1.99
	DH02	837531.05	835102.60	6.18	-48.29	6.18	-	-11.17	17.35												-11.17	-	-13.17	2.00												-13.17	-	-42.18	29.01						-42.18	-	-42.25	0.07					-42.25	-	-48.29	-2.12(S) -12.32(P)	3.39
	DH03	837459.84	835070.64	5.65	-52.95	5.65	-	-8.85	14.50												-8.85	-	-14.35	5.50												-14.35	-	-46.23	31.88						-46.23	-	-47.76	1.53					-47.76	-	-52.95	-0.05(S)	1.63
	DH04	837591.77	835051.57	6.84	-41.82	6.84	-	-11.18	18.02	-11.18	-	-14.26	3.08								-14.26	-	-16.46	2.20												-16.46	-	-35.16	18.70						-35.16	-	-35.38	0.22					-35.38	-	-41.82	-2.16(S)	2.52
	DH05	837754.18	835298.29	5.68	-50.01	5.68	-	-14.17	19.85	-9.22	-	-11.32	2.10																								-14.17	-	-38.17	24.00						-38.17	-	-44.55	6.38					-44.55	-	-50.01	-3.32(S) -10.32(P)	5.45
	DH06	837487.96	835117.79	6.36	-48.98	6.36	-	-9.54	15.90	-9.54	-	-10.85	1.31																								-10.85	-	-43.57	32.72												-43.57	-	-48.98	-2.04(S) -10.04(P)	2.12
	DH07	837510.35	835378.53	5.43	-47.62	5.43	-	-10.97	16.40												-10.97	-	-12.97	2.00								-12.97	-	-35.17	22.20						-35.17	-	-41.14	5.97					-41.14	-	-47.62			-3.57(S)	3.15
	DH08	837584.55	835087.77	6.83	-45.85	6.83	-	-10.57	17.40	-10.57	-	-11.67	1.10								-11.67	-	-18.67	7.00												-18.67	-	-39.47	20.80						-39.47	-	-39.67	0.20					-39.67	-	-45.85	-2.17(S) -11.57(P)	2.66
	DH09	837473.90	835232.83	7.30	-62.89	7.30	-	-10.80	18.10												-10.80	-	-14.25	3.45												-14.25	-	-57.30	43.05						-57.30	-	-57.80	0.50					-57.80	-	-62.86	-2.40(S)	2.09
	DH10	837482.26	835104.66	5.79	-49.16	5.79	-	-10.91	16.70												-10.91	-	-13.81	2.90												-13.81	-	-38.91	25.10						-38.91	-	-43.72	4.81					-43.72	-	-49.16	-1.71(S) -10.71(P)	2.52

*Type of Rock

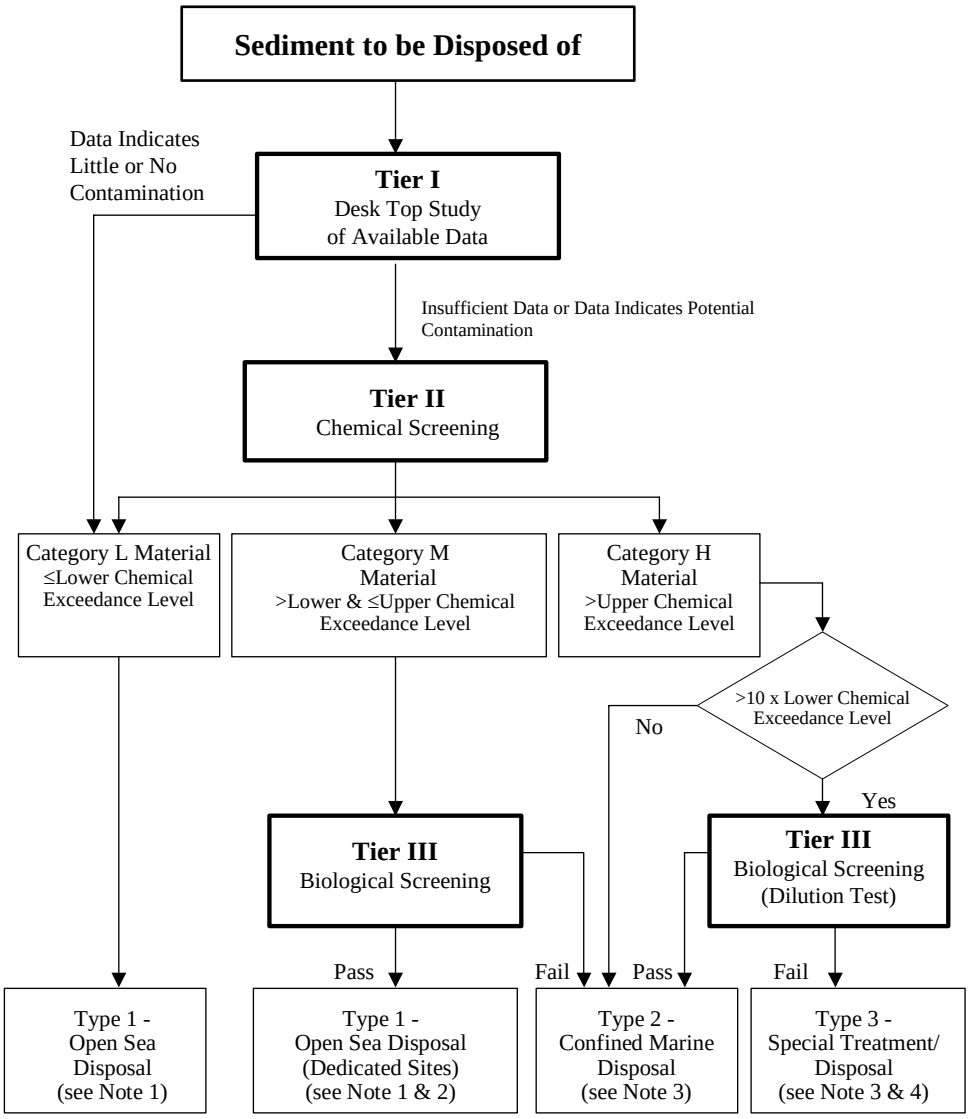
CD Rock	COMPLETELY DECOMPOSED ROCK
HD Rock	HIGHLY DECOMPOSED ROCK
MD Rock	MODERATELY DECOMPOSED ROCK
SD Rock	SLIGHTLY DECOMPOSED ROCK
ALL	ALLUVIUM
COL	COLLUVIUM
MD	MARINE DEPOSIT
FILL	FILL

APPENDIX 5.1

MANAGEMENT FRAMEWORK FOR DREDGED/EXCAVATED SEDIMENT

(EXTRACTED FROM ETWB TC(W) NO. 34/2002)

Management Framework for Dredged/Excavated Sediment



Notes

(1) Most open sea disposal sites are multi-user facilities and as a consequence their management involves a flexibility to accommodate varying and unpredictable circumstances. Contract documents should include provisions to allow the same degree of flexibility should it be necessary to divert from one disposal site to another during the construction period of a contract.

(2) Dedicated Sites will be monitored to confirm that there is no adverse impact.

(3) For sediment requiring Type 2 or Type 3 disposal, contract documents should state the allocation conditions of MFC and DEP. At present, East Sha Chau mud pits are designated for confined marine disposal.

(4) If any sediment suitable for Type 3 disposal (Category H sediment failing the biological dilution test) is identified, it is the responsibility of the project proponent, in consultation with DEP, to identify and agree with him/her, the most appropriate treatment and/or disposal arrangement. Such a proposal is likely to be very site and project specific and therefore cannot be prescribed. This will not preclude treatment of this sediment to render it suitable for confined marine disposal.

(5) The allocation of disposal space may carry a requirement for the project proponent to arrange for chemical analysis of the sediment sampled from 5% of the vessels en-route to the disposal site. For Category M and certain Category H sediment, the chemical tests will be augmented by biological tests. Vessel sampling will normally entail mixing five samples to form a composite sample from the vessel and undertaking laboratory tests on this composite sample. All marine disposal sites will be monitored under the general direction of the Civil Engineering Department. However, exceptionally large allocations might require some additional disposal site monitoring. These will be stipulated at the time of allocation.

(6) Trailer suction hopper dredgers disposing of sediment at East Sha Chau must use a down-a-pipe disposal method, the design of which must be approved in advance by DCE. The dredging contractor must provide equipment for such disposal.