

6. WASTE MANAGEMENT IMPLICATIONS

6.1 Introduction

This *Section* presents the potential waste management implications arising from the construction and operation of the Project and the potential environmental impacts associated with the storage, handling, transportation and disposal of the wastes.

6.2 Legislative Requirements and Evaluation Criteria

The criteria for evaluating waste management implications are stated in *Annex 7* of the *EIAO-TM*. *Annex 15* of the *EIAO-TM* prescribes the general approach and methodology for assessing the waste management implications caused by a project or proposal.

The following legislation covers the handling, treatment and disposal of wastes in Hong Kong which are relevant to the types of waste to be generated from the Project, and has been considered in the assessment.

- *Waste Disposal Ordinance (WDO) (Cap 354)*;
- *Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C)*;
- *Land (Miscellaneous Provisions) Ordinance (Cap 28)*;
- *Public Health and Municipal Services Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisances Regulation*;
- *Dumping at Sea Ordinance (DASO) (Cap. 466)*; and
- *Merchant Shipping (Prevention and Control of Pollution) Ordinance (Cap 413)*.

6.2.1 Waste Disposal Ordinance (WDO) (Cap 354)

The WDO prohibits the unauthorised disposal of wastes, with waste defined as any substance or article which is abandoned. Under the WDO, wastes can only be disposed of at licensed waste disposal sites. A breach of these regulations can lead to the imposition of a fine and/or a prison sentence. The WDO also provides for the issuing of licences for the collection and transport of wastes. Licences for the collection and transport of construction waste or trade waste, however, are not issued currently.

The *Waste Disposal (Charges for Disposal of Construction Waste) Regulation* defined construction waste as any substance, matters or things that are generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned, but does not include any sludge, screening, or matter removed in or generated from any desludging, desilting or dredging works.

The *Construction Waste Disposal Charging Scheme* came into operation on 1 December 2005. Processing of account applications by the EPD started on the same day. A Contractor who undertakes construction work with value of HK\$1 million or above is required to open a billing account solely for the contract. Charging for the disposal of construction waste started on 20 January 2006.

Depending on the percentage of inert materials in the material, construction waste can be disposed of at public fill reception facilities, construction waste sorting facilities, landfills and outlying islands transfer facilities, where differing disposal costs would be applied. This scheme encourages waste reduction and hence minimise the costs of the Contractor or the Project Proponent.

Table 6.1 summarises the Government waste disposal facilities for construction waste and various charge levels.

Table 6.1 Government Waste Disposal Facilities for Construction Waste

Government Waste Disposal Facilities	Type of Construction Waste Accepted	Charge per Tonne ^(a)
Public fill reception facilities	Consisting entirely of inert construction waste ^(b)	HK\$71
Sorting facilities	Containing more than 50% by weight of inert construction waste ^(b)	HK\$175
Landfills ^(c)	Containing not more than 50% by weight of inert construction waste ^(b)	HK\$200
Outlying Islands Transfer Facilities ^(c)	Containing any percentage of inert construction waste ^(b)	HK\$200

Notes:

- Except for the Outlying Islands Transfer Facilities, the minimum charge load is 1 tonne, i.e. if a load of waste weighs 1 tonne or less, it will be charged as 1 tonne. A load of waste weighing more than 1 tonne will be charged at 0.1 tonne increment. For Outlying Islands Transfer Facilities, the charge is \$20 per 0.1 tonne and the minimum charge load is 0.1 tonne.
- Inert construction waste means rock, rubble, boulder, earth, soil, sand, concrete, asphalt, brick, tile, masonry or used bentonite.
- If a load of waste contains construction waste and other wastes, that load will be regarded as consisting entirely of construction waste for the purpose of calculating the applicable charge.

6.2.2 Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C)

Chemical waste as defined under the *Waste Disposal (Chemical Waste) (General) Regulation* includes any substance being scrap material, or unwanted substances specified under *Schedule 1* of the *Regulation*, if such a substance or chemical occurs in such a form, quantity or concentration so as to cause pollution or constitute a danger to health or risk of pollution to the environment.

Chemical waste producers shall register with the EPD. Any person who contravenes this requirement commits an offence and is liable to a fine and imprisonment. Producers of chemical wastes must treat their wastes, utilizing on-site plants licensed by the EPD or have a licensed collector take the wastes to a licensed facility. For each consignment of wastes, the waste producer, collector and disposer of the wastes must sign all relevant parts of a computerised trip ticket. The system is designed to allow the transfer of wastes to be traced from cradle-to-grave.

The *Regulation* prescribes the storage facilities to be provided on site including labelling and warning signs. To minimise the risks of pollution and danger to human health or life, the waste producer is required to prepare and make available written procedures to be observed in the case of emergencies due to spillage, leakage or accidents arising from the storage of chemical wastes. He/she must also provide employees with training in such procedures.

6.2.3 Land (Miscellaneous Provisions) Ordinance (Cap 28)

The inert portion of construction waste ⁽¹⁾ (also called public fill) may be taken to public fill reception facilities. Public fill reception facilities are operated by CEDD. The Land (Miscellaneous Provisions) Ordinance requires that individuals or companies who deliver public fill to the public fill reception facilities need to obtain Dumping Licences. The licences are issued by the CEDD under delegated authority from the Director of Lands.

(1) "Construction waste" refers to materials arising from any land excavation or formation, civil/building construction, road works, building renovation or demolition activities. It includes various types of reusable materials, building debris, rubble, earth, concrete, timber and mixed site clearance materials. When sorted properly, materials suitable for land reclamation and site formation (known as public fill) should be re-used at public fill reception facilities. The rock and concrete can be crushed and processed to produce aggregates for various civil and building engineering applications. The remaining construction waste (comprising timber, paper, plastics, and general refuse) are to be disposed of at landfills.

Under the licence conditions, public fill reception facilities will only accept inert earth, soil, sand, rock, boulder, rubble, brick, tile, concrete, asphalt, masonry or used bentonite. In addition, in accordance with paragraph 11 of *Development Bureau (DevB) Technical Circular (Works) (DevB TC(W)) No. 6/2010*, the Public Fill Committee will advise on the acceptance criteria (e.g. no mixing of construction waste, nominal size of the materials less than 200 mm, etc). The material should, however, be free from marine mud, household refuse, plastic, metal, industrial and chemical wastes, animal and vegetable matter and any other materials considered unsuitable to the public fill reception facility.

6.2.4 Public Cleansing and Prevention of Nuisances Regulation (Cap 132)

This *Regulation* provides further control on the illegal dumping of wastes on unauthorised (unlicensed) sites. The illegal dumping of wastes can lead to a fine and/or imprisonment.

6.2.5 Dumping at Sea Ordinance (DASO) (Cap 466)

Under the *DASO*, a permit from the Director of Environmental Protection is required if anyone intends to dispose and dump from vessels in the sea. The permit is valid for specific periods of time and stipulates the (1) type and quantity of substances to be dumped; (2) location of the disposal grounds; (3) requirement of equipment for monitoring the disposal operations; and (4) environmental monitoring requirements.

ETWB TC(W) No. 34/2002 – Management of Dredged/ Excavated Sediment, sets out the procedures for seeking approval to dredge/ excavate sediment and the management framework for marine disposal of such sediment. This circular outlines the requirements to be followed in assessing and classifying the sediment and explains the marine disposal arrangement for the classified material.

Table 6.2 summarises the HKSAR Government charging system for proponents of private projects to dispose of dredged sediment.

Table 6.2 HKSAR Government Charging System for Disposal of Dredged Sediment

Sediment Type	Charge Rate per Cubic Metre (measured in situ at dredging/ excavation site)
Type 1 - Open Sea Disposal of Category L Sediment	HK\$1.92
Others	HK\$96.00

6.2.6 Merchant Shipping (Prevention and Control of Pollution) Ordinance (Cap 413)

The *Merchant Shipping (Prevention and Control of Pollution) Ordinance* and its subsidiary regulations prohibit the discharge of wastewater and garbage from vessels.

Hong Kong has implemented the International Convention for the Prevention of Pollution from Ships 1973 as amended by the 1978 Protocol (universally known as MARPOL) and the MARPOL related requirements are mainly implemented under the *Merchant Shipping (Prevention and Control of Pollution) Ordinance*. Under the requirements, liquid oil waste or any other mixtures which contain oil and noxious liquid substances or any such residues shall not be discharged into the sea. In Hong Kong, the Chemical Waste Treatment Centre (CWTC) is the reception facility for oily waste discharged from vessels.

6.2.7 Other Relevant Guidelines

Other relevant guidance documents, which detail how the Project Proponent or the Contractor should comply with the local regulations, are as follows:

- *Waste Disposal Plan for Hong Kong* (December 1989), Planning, Environment and Lands Branch Government Secretariat, HKSAR Government;
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* (1992), EPD, HKSAR Government;
- *Hong Kong Planning Standards and Guidelines Planning* (2014), Planning Department, HKSAR Government;
- *WBTC No. 2/93 - Public Dumps*, Works Branch, HKSAR Government;
- *WBTC No. 2/93B - Public Filling Facilities*, Works Branch, HKSAR Government;
- *WBTC No. 16/96 - Wet Soil in Public Dumps*, Works Branch, HKSAR Government;
- *Waste Reduction Framework Plan, 1998 to 2007*, Planning, Environment and Lands Bureau, Government Secretariat, 5 November 1998;
- *WBTC No. 4/98 and 4/98A - Use of Public Fill in Reclamation and Earth Filling Projects*, Works Bureau, HKSAR Government;
- *WBTC No. 12/2000 - Fill Management*, Works Bureau, HKSAR Government;
- *WBTC No. 19/2001 - Metallic Site Hoardings and Signboards*; Works Bureau, HKSAR Government;
- *Project Administration Handbook for Civil Engineering Works, Section 21.25 of Chapter 7 and Section 9.12 of Chapter 5 - Control of Site Crushers*, HKSAR Government;
- *WBTC No. 12/2002 - Specifications Facilitating the Use of Recycled Aggregates*, Works Bureau, HKSAR Government;
- *Project Administration Handbook for Civil Engineering Works, Section 4.1.3 of Chapter 4 - Management of Construction and Demolition Material Including Rock*, HKSAR Government;
- *ETWB TC(W) No. 19/2005 - Environmental Management on Construction Sites*, Environment, Transport and Works Bureau, HKSAR Government; and
- *DevB TC(W) No. 6/2010 - Trip Ticket System for Disposal of Construction & Demolition Materials*, Development Bureau, HKSAR Government.

6.3 Expected Waste Arisings during Construction and Operation

During construction and operation of the Project, the main activities that generate wastes will be the marine dredging of the seabed for the formation of the proposed CMPs. The typical waste types associated with the construction and operation activities include:

- Dredged marine sediment from the formation of the proposed CMPs;
- Chemical waste from maintenance of plant and equipment (e.g. dredgers); and
- General refuse from marine-based workforce.

Construction and demolition (C&D) materials are not expected to be generated from the Project as all the construction and operation activities are marine-based works. In addition, sediments from disposal and capping works during operation of the Project are generated from other projects and they are not categorised as waste arising from this Project.

6.3.1 Dredged Marine Sediment

Marine sediment will be dredged to form CMPs for the Project. It is unavoidable to undertake dredging to form CMPs for receiving sediments from other projects. In planning the operational area of the CMPs within the Study Area, sediment quality data have been reviewed and areas with low contamination levels have been selected for CMP development to avoid generating contaminated sediments during formation of CMPs as discussed in **Section 2.6.2**. The extent of dredging required is the footprint of the proposed CMPs as shown in **Figure 2.8**.

Dredging will be conducted by grab dredgers or trailing suction hopper dredger (TSHD). Each CMP will be formed one by one and it is expected that dredging works for each CMP will last for about 1 - 2 years. The estimated *in situ* volume of marine sediment to be dredged for each CMP ranges from 2-5 Mm³ depending on the pit capacity. The total estimated *in situ* volume of dredged marine sediment for the seven CMPs of the Project is about 24 Mm³.

Depending on the sediment quality based on the chemical and biological test results, the dredged sediments will be disposed at open sea or confined marine disposal sites. Based on the available sediment quality data from the ground investigation works, it is expected the dredged sediments would require Type 1 open sea disposal and the sediments could be disposed of at South of Cheung Chau, South of Tsing Yi, East of Ninepin and East of Tung Lung Chau, or East of Sha Chau as capping materials. Possible on-site reuse will also be explored to dispose of the dredged sediments within WL Facility as capping materials when the CMP of the WL Facility reaches its capacity in receiving contaminated sediments.

For a conservative assessment in this EIA Study, it is assumed there would not be any on-site reuse of the uncontaminated sediment generated from dredging of the CMPs as the capping materials. The dredged materials are assumed to be delivered to the other existing disposal facilities, mainly to the open sea disposal area to the South of Cheung Chau, South of Tsing Yi and to East of Sha Chau as capping materials. The dredged materials will be transported to the disposal site using TSHD or hopper barges with tug boats depending on the type of dredging plant to be used at the time of construction works.

6.3.1.1 Marine Sediment Quality

Marine sediment sampling and testing has been undertaken under EPD Routine Marine Sediment Quality Monitoring, and marine sediment quality information relevant to the Project from the initial site investigation for the Project in May and June 2020 within and in the vicinity of the proposed dredging areas was reviewed. Details of the previous sampling and testing results are contained in the *Proposal for Field Investigation for Assessment of Waste Management Implications* prepared for this EIA Study in **Annex 6A**. The previous testing results suggested that the contamination level of the marine sediments within the Key Area identified for potential CMP development under the Project is likely to be low.

Further sediment sampling programme was agreed with EPD and undertaken as part of this EIA Study to provide supplementary information on sediment quality along the vertical profile for the design of CMP and assessment under the EIA, including identification and estimation of dredging / excavation, dredged / excavated sediment / mud transportation and disposal activities and requirements (see **Annex 6A**). The sediment samples at a total of six (6) locations have been collected per plan (see **Figure 6.1** for sampling locations). At each sampling location, vibrocore drilling was undertaken by continuous vibrocore method from 0 – 0.9 m below seabed, 0.9 m down, 1.9 m down, 2.9 m down and then every 3 m to the bottom of the proposed dredging extent. A 100 mm diameter rigid plastic (PVC) sample tube was used to collect the sample cores at the top of the sediment layer and then at 0.9 m, 1.9 m, and 2.9 m, each 1 m thick (starting at the specified sampling depth level to -1.0 m below the specified depth), except for the first sub-sample from the seabed which was 0.9 m long. Sufficient sediment samples for further biological testing were also collected at the same time.

Legend

- Vibrocoreing Location
- Indicative Study Area for the WL Facility
- Key Area Identified for Potential CMP Development

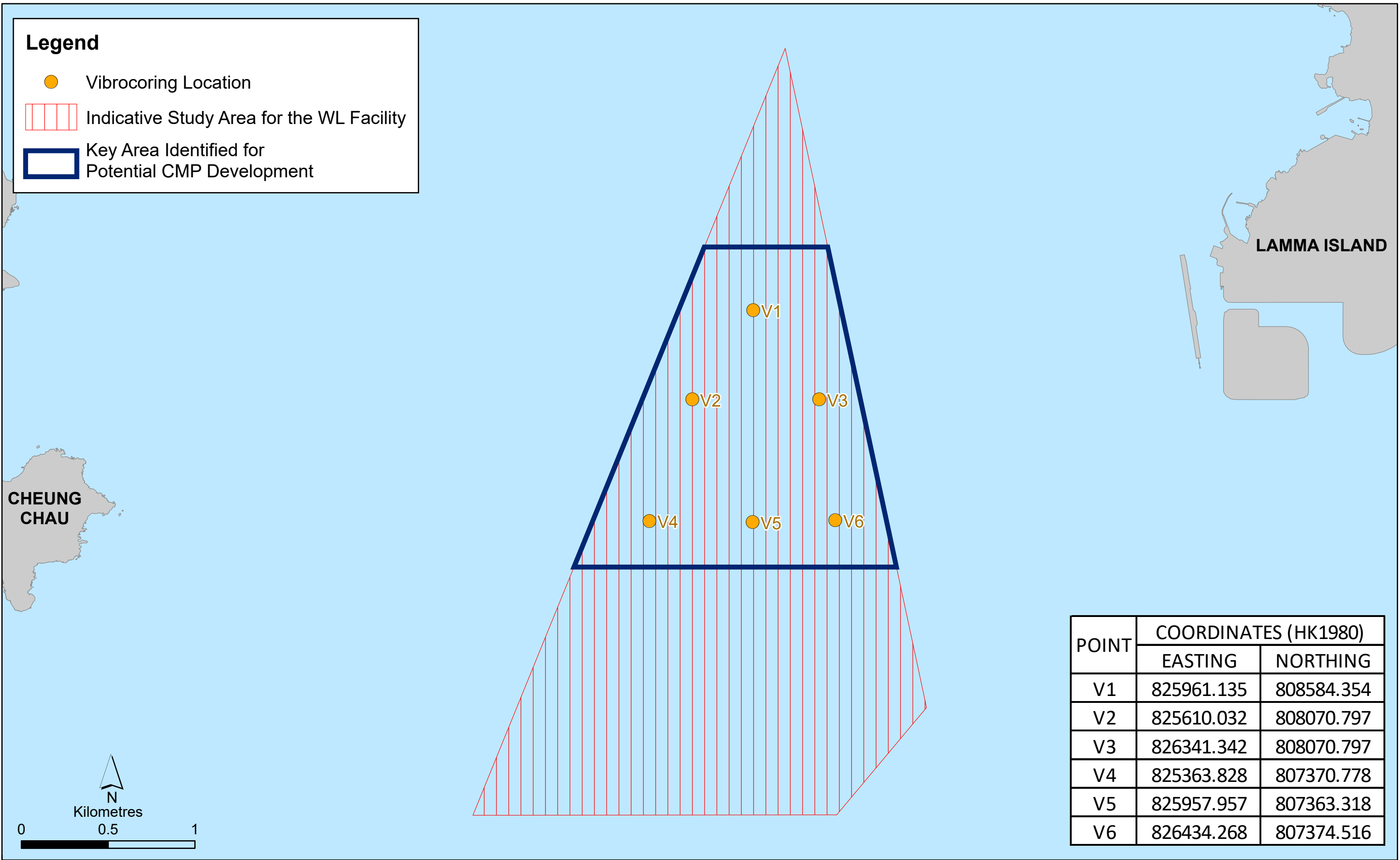


Figure 6.1

Locations for Sediment Sampling and Testing

The marine sediment analytical results for the six locations within the Key Area are presented in **Table 6.3**. The full laboratory analytical results of the relevant sampling locations are contained in **Annex 6B**. The testing results are compared against the Lower Chemical Exceedance Level (LCEL) and Upper Chemical Exceedance Level (UCEL) of respective parameters in **Table 6.3**.

Table 6.3 Marine Sediment Analytical Results

Sampling Location	Sampling Depth	Metals and Metalloids								Low M.Wt PAHs	High M.Wt PAHs	Total PCBs	TBT in interstitial water (f)	Overall Sediment Class (L, M, H) (c),(d),(e)	Requires Biological Testing? (Yes / No)	
		Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver							Zinc
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg							mg/kg
Reporting Limits		1	0.2	1	1	1	0.05	1	0.1	20	55	75	23 ^(b)	0.015		
LCEL		<u>12</u>	<u>1.5</u>	<u>80</u>	<u>65</u>	<u>75</u>	<u>0.5</u>	<u>40</u>	<u>1</u>	<u>200</u>	<u>550</u>	<u>1,700</u>	<u>23</u>	<u>0.15</u>		
UCEL		42	4	160	110	110	1	40	2	270	3,160	9,600	180	0.15		
V1	0.00-0.90m	8.9	0.06	25	25	34	0.13	16	0.2	72	<50	<100	<18	N/A	L	No
V1	0.90-1.90m	10.4	<0.05	24	15	30	0.15	17	<0.1	66	<50	<100	<18	N/A	L	No
V1	1.90-2.90m	5.7	<0.05	22	8.6	16	<0.05	16	<0.1	57	<50	<100	<18	N/A	L	No
V1	2.90-3.90m	7.2	<0.05	23	11	31	<0.05	16	<0.1	61	<50	<100	<18	N/A	L	No
V1	5.90-6.90m	6.0	0.05	24	11	19	<0.05	17	<0.1	60	<50	<100	<18	N/A	L	No
V1	8.90-9.90m	5.7	0.06	26	10	20	<0.05	18	<0.1	63	<50	<100	<18	N/A	L	No
V1	11.90-12.90m	7.1	<0.05	27	9.3	21	<0.05	20	<0.1	60	<50	<100	<18	N/A	L	No
V1	14.90-15.90m	9.7	<0.05	28	14	23	<0.05	19	<0.1	60	<50	<100	<18	N/A	L	No
V1	17.90-18.90m	10.3	0.09	31	17	33	<0.05	21	<0.1	76	<50	<100	<18	N/A	L	No
V2	0.00-0.90 m	11.6	0.20	25	20	40	0.30	17	0.1	115	<50	<100	<18	N/A	L	No
V2	0.90-1.90 m	7.1	<0.05	21	8.6	19	<0.05	16	<0.1	55	<50	<100	<18	N/A	L	No
V2	1.90-2.90 m	5.6	<0.05	23	9.0	17	<0.05	16	<0.1	60	<50	<100	<18	N/A	L	No
V2	2.90-3.90 m	5.5	0.06	25	10	19	<0.05	17	<0.1	62	<50	<100	<18	N/A	L	No
V2	5.90-6.90 m	6.5	0.06	23	14	22	0.06	16	<0.1	63	<50	<100	<18	N/A	L	No
V2	8.90-9.90 m	5.9	0.07	23	10	18	<0.05	16	<0.1	58	<50	<100	<18	N/A	L	No
V2	11.90-12.90 m	4.5	0.07	26	11	17	<0.05	18	<0.1	58	<50	<100	<18	N/A	L	No
V2	14.90-15.90 m	10.8	0.06	26	14	23	<0.05	18	<0.1	58	<50	187	<18	N/A	L	No
V2	17.90-18.90 m	11.9	0.10	30	19	30	<0.05	19	0.1	71	<50	183	<18	N/A	L	No
V3	0.00-0.90 m	9.0	0.07	27	18	30	0.17	18	0.15	77	<50	<100	<18	N/A	L	No
V3	0.90-1.90 m	8.4	0.05	23	12	26	0.13	17	<0.1	63	<50	<100	<18	N/A	L	No
V3	1.90-2.90 m	6.2	<0.05	21	7.6	15	<0.05	16	<0.1	54	<50	<100	<18	N/A	L	No
V3	2.90-3.90 m	5.3	<0.05	22	8.1	16	<0.05	16	<0.1	56	<50	<100	<18	N/A	L	No
V3	5.90-6.90 m	6.1	0.05	22	9.8	19	<0.05	16	<0.1	60	<50	<100	<18	N/A	L	No
V3	8.90-9.90 m	5.1	0.07	26	12	19	<0.05	18	<0.1	66	<50	<100	<18	N/A	L	No
V3	11.90-12.90 m	5.6	<0.05	22	8.2	14	<0.05	16	<0.1	48	<50	<100	<18	N/A	L	No
V3	14.90-15.90 m	10.8	<0.05	27	13	21	<0.05	18	<0.1	61	<50	<100	<18	N/A	L	No
V3	17.90-18.90 m	8.1	<0.05	22	11	16	0.06	7.8	<0.1	28	<50	<100	<18	N/A	L	No
V4	0.00-0.90 m	6.8	0.05	24	11	20	0.06	18	<0.1	64	<50	<100	<18	N/A	L	No
V4	0.90-1.90 m	5.5	0.05	23	10	17	<0.05	17	<0.1	60	<50	<100	<18	N/A	L	No
V4	1.90-2.90 m	5.6	0.06	24	10	18	<0.05	18	<0.1	64	<50	<100	<18	N/A	L	No

Sampling Location	Sampling Depth	Metals and Metalloids									Low M.Wt PAHs	High M.Wt PAHs	Total PCBs	TBT in interstitial water (f)	Overall Sediment Class (L, M, H) (c),(d),(e)	Requires Biological Testing? (Yes / No)
		Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc						
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg						
Reporting Limits		1	0.2	1	1	1	0.05	1	0.1	20	55	75	23 ^(b)	0.015		
LCEL		<u>12</u>	<u>1.5</u>	<u>80</u>	<u>65</u>	<u>75</u>	<u>0.5</u>	<u>40</u>	<u>1</u>	<u>200</u>	<u>550</u>	<u>1,700</u>	<u>23</u>	<u>0.15</u>		
UCEL		42	4	160	110	110	1	40	2	270	3,160	9,600	180	0.15		
V4	2.90-3.90 m	5.2	0.06	27	12	20	<0.05	19	<0.1	68	<50	<100	<18	N/A	L	No
V4	5.90-6.90 m	5.6	0.05	25	10	18	<0.05	19	<0.1	64	<50	<100	<18	N/A	L	No
V4	8.90-9.90 m	5.0	0.06	28	12	19	<0.05	20	<0.1	69	<50	<100	<18	N/A	L	No
V4	11.90-12.90 m	8.7	0.05	23	11	18	<0.05	16	<0.1	52	<50	<100	<18	N/A	L	No
V4	14.90-15.90 m	11.9	0.09	35	21	36	<0.05	23	<0.1	85	<50	923	<18	N/A	L	No
V4	17.90-18.90 m	11.7	0.12	35	21	33	0.07	23	<0.1	84	<50	927	<18	N/A	L	No
V5	0.00-0.90 m	5.9	<0.05	18	9.8	18	0.05	12	<0.1	48	<50	<100	<18	N/A	L	No
V5	0.90-1.90 m	9.6	0.06	24	13	26	0.08	18	<0.1	65	<50	<100	<18	N/A	L	No
V5	1.90-2.90 m	5.6	0.05	21	7.1	14	<0.05	16	<0.1	54	<50	<100	<18	N/A	L	No
V5	2.90-3.90 m	7.2	0.06	24	10	19	<0.05	18	<0.1	63	<50	<100	<18	N/A	L	No
V5	5.90-6.90 m	6.0	0.07	26	11	20	<0.05	19	<0.1	65	<50	<100	<18	N/A	L	No
V5	8.90-9.90 m	4.9	<0.05	28	11	20	<0.05	20	<0.1	64	<50	<100	<18	N/A	L	No
V5	11.90-12.90 m	6.9	0.05	22	10	17	<0.05	16	<0.1	51	<50	<100	<18	N/A	L	No
V5	14.90-15.90 m	10.7	0.07	27	13	23	<0.05	18	<0.1	59	<50	<100	<18	N/A	L	No
V5	17.90-18.90 m	10.1	0.10	31	19	34	<0.05	20	<0.1	75	<50	<100	<18	N/A	L	No
V6	0.00-0.90 m	6.3	0.09	20	13	20	0.06	13	<0.1	56	<50	<100	<18	N/A	L	No
V6	0.90-1.90 m	5.3	<0.05	21	8.0	16	<0.05	15	<0.1	54	<50	<100	<18	N/A	L	No
V6	1.90-2.90 m	5.0	<0.05	20	6.4	14	<0.05	15	<0.1	51	<50	<100	<18	N/A	L	No
V6	2.90-3.90 m	6.4	0.06	25	9.3	18	0.06	18	<0.1	64	<50	<100	<18	N/A	L	No
V6	5.90-6.90 m	5.1	0.08	27	12	20	<0.05	20	<0.1	67	<50	<100	<18	N/A	L	No
V6	8.90-9.90 m	5.2	0.08	29	12	18	<0.05	21	<0.1	65	<50	<100	<18	N/A	L	No
V6	11.90-12.90 m	7.5	<0.05	20	8.5	16	<0.05	14	<0.1	46	<50	<100	<18	N/A	L	No

Notes:

- (a) **Underlined results** = Samples with contaminant concentrations exceeding LCEL; **Bold results** = Samples with contaminant concentrations exceeding UCEL; **Shaded results** = Samples with contaminant concentrations 10 times more than UCEL
- (b) Although the reporting limit for individual PCB congeners is 3 µg/kg dry weight as stated in *ETWB TC(W) No. 34/2002*, the testing laboratory could achieve a lower practical quantitation limit for each PCB congener and the reporting limit for total PCBs is 23 µg/kg dry weight.
- (c) Category L = Sediment with all contaminant levels not exceeding the LCEL. The material must be dredged, transported and disposed of in a manner which minimizes the loss of contaminants either into solution or by re-suspension.
- (d) 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.
- (e) 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.
- (f) Analysis of Tributyltin in interstitial water was not conducted due to insufficient volume of interstitial water in the collected samples
- (g) The depths of marine deposit below seabed levels for Locations V1-V6 were 20.90m, 21.60m, 18.90m, 20.45m, 18.90m and 12.90m, respectively.

As shown in **Table 6.3**, all the marine sediments to be dredged within the Key Area were found to be uncontaminated and would be disposed to Type 1 open sea disposal sites (i.e. South of Cheung Chau, South of Tsing Yi, East of Ninepin and East of Tung Lung Chau), or East of Sha Chau as capping materials. These findings of the marine sediment testing are consistent with the information from the review of the previous marine sediment quality information within and in the vicinity of the Key Area in **Annex 6A**.

The estimated *in situ* volumes of uncontaminated sediment to be dredged under the Project for each CMP are presented in **Table 6.4**. The allocation of disposal space will be subject to further review and approval by MFC/ CEDD.

Table 6.4 Estimated Volumes of Sediments for each CMP

CMP	Sediment Type	Estimated <i>In-situ</i> Volumes of Sediments to be Dredged (Mm ³)
Pit A	Category L (Type 1 Open Sea Disposal)	2.28
Pit B	Category L (Type 1 Open Sea Disposal)	4.37
Pit C	Category L (Type 1 Open Sea Disposal)	2.88
Pit D	Category L (Type 1 Open Sea Disposal)	2.37
Pit E	Category L (Type 1 Open Sea Disposal)	4.88
Pit F	Category L (Type 1 Open Sea Disposal)	3.78
Pit G	Category L (Type 1 Open Sea Disposal)	3.56
Total	-	24.12

Note: The estimated quantities of sediments are estimated based on the preliminary design of the Project for the EIA. CEDD will plan to conduct another sediment sampling and testing upon confirming the design and layout of CMPs prior to the construction works (i.e. dredging) of the Project in accordance with *ETWB TC(W) No. 34/2002* to confirm the quantities and quality the sediment / mud to be disposed of in accordance with the *Dumping at Sea Ordinance (DASO) (Cap 466)*.

The testing results and the disposal options presented in this EIA Report are for EIA purposes only. To confirm the marine sediment disposal quantity and location, a separate Marine Sediment Sampling and Testing Plan (MSSTP) and Sediment Quality Report (SQR) will be prepared in accordance with the requirement stated in *ETWB TC(W) No. 34/2002* for EPD approval as required under the *Dumping at Sea Ordinance (DASO) (Cap 466)*. The actual quantity and allocation of the disposal site(s) will be based on the results of the SQR to be approved by MFC/ CEDD and a dumping permit will be obtained from EPD prior to the commencement of the dredging works.

The dredged marine sediments will be loaded on to the barge immediately. With the assumption of typical barge capacity of 800m³, a maximum of 18 barge trips per day are anticipated to transfer the marine sediments to the disposal sites at South of Cheung Chau, South of Tsing Yi or East of Sha Chau as capping materials during the construction of the CMPs. The barges to be used will be fitted with seals to prevent leakage of marine sediment, and no overloading of marine sediment and marine sediment laden water will be allowed during loading or transportation. As such no adverse impact on water quality and marine ecology associated with the barge transport of marine sediments and their disposal is expected.

6.3.2 Chemical Waste

Chemical waste, as defined under the *Waste Disposal (Chemical Waste) (General) Regulation*, includes any unwanted substances specified under *Schedule 1 of the Regulation*. Substances likely to be generated from the construction and operation activities will include:

- Used paint, engine oils, hydraulic fluids and waste fuel;
- Spent mineral oils/cleaning fluids from mechanical machinery; and

- Spent solvents/ solutions from equipment cleaning activities.

Chemical wastes may pose environmental, health and safety hazards if not stored and disposed of in an appropriate manner as outlined in the *Waste Disposal (Chemical Waste) (General) Regulation* and the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*. These hazards may include:

- Toxic effects to workers;
- Adverse effects on air and water quality from spills; and
- Fire hazards.

The maintenance and servicing of plants and equipment (e.g. dredgers) may generate some chemical wastes such as used solvents and waste lubricating oil. It is difficult to quantify the amount of chemical waste that will arise from the construction activities since it will be dependent on the on-site maintenance requirements by the dredging contractor(s). However, it is anticipated that the quantity of chemical waste, such as waste lubricating oil and solvents produced from plant maintenance, will be small and in the order of a few litres per month. The chemical waste will be collected by a licensed chemical waste collector and delivered to the licensed chemical waste treatment facilities for disposal (at the Chemical Waste Treatment Centre (CWTC) at Tsing Yi).

With the incorporation of suitable arrangements for the storage, handling, collection, transportation and disposal of chemical wastes under the requirements stated in the *Waste Disposal (Chemical Waste) (General) Regulation* and the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* and the mitigation measures recommended in **Section 6.4**, no adverse environmental (including air and odour emissions and wastewater discharge) impacts, and hazards are anticipated.

6.3.3 General Refuse

During the construction and operation of the Project, it is expected workers on the marine work barges and associated site office, if any, will produce general refuse (mainly consists of food waste, aluminium cans, plastic bottles, waste paper and glass bottles) which requires off-site disposal. The storage of general refuse has the potential to give rise to adverse environmental impacts, if not properly managed. These include odour if the general refuse is not collected frequently, floating/windblown litter and visual impact.

It is conservatively estimated that a maximum of about 50 workers will be working on the construction and operation of the Project at any one time. With a general refuse generation rate of 0.65 kg per worker per day, the maximum amount of general refuse to be generated by the workforce will be about 32.5 kg per day.

To reduce the quantity of general refuse to be disposed of at landfill, recyclable materials (i.e. paper, plastic bottles, aluminium cans and glass bottles) will be segregated on-site (e.g. at marine vessels used for the construction and operation activities) for off-site recycling, as far as practicable. Adequate number of enclosed waste containers and recycling bins will be provided to avoid over-spillage of waste and/ or recyclable materials.

The non-recyclable general refuse on marine vessels will be collected for disposal on shore. The non-recyclable refuse will be placed in bags/bins and disposed of at the Outlying Island Transfer Facilities by barge/marine vessel on a regular basis. Given that the quantity of general refuse to be disposed of at landfill is small, no adverse impact on the operation of the landfill is anticipated.

With the implementation of the mitigation measures recommended in **Section 6.4**, no adverse environmental impacts (including potential hazard, air and odour emissions, noise and wastewater discharge) caused by storage, handling, transport and disposal of general refuse are expected.

6.4 Mitigation Measures

The assessment indicates that with the implementation of the waste management practices at the marine-based work sites and marine vessels, no adverse environmental impacts are envisaged for the handling, collection and disposal of waste arising during the construction and operation activities of the Project.

This *Section* further describes the good construction site practices to avoid or further reduce the potential environmental impacts associated with the handling, collection and disposal of marine sediment, chemical waste and general refuse arising from the works.

The Contractor(s) must ensure that all the necessary waste disposal and marine dumping permits or licences are obtained prior to the commencement of the construction works.

6.4.1 General Waste Disposal Practice

The Contractor(s) will open a billing account with the EPD in accordance with the Waste Disposal (Charges for Disposal of Construction Waste) Regulation. Every construction waste or public fill load to be transferred to Government waste disposal facilities (e.g. public fill reception facilities, sorting facilities and landfills) will be provided with a valid “chit” which contains the information of the account holder to facilitate waste transaction recording and billing to the waste producer. A trip-ticket system will also be established in accordance with *DevB TC(W) No. 6/2010* to monitor the disposal of construction waste at landfill and to control fly-tipping. The trip-ticket system will be included as one of the contractual requirements and implemented by the Contractor(s).

At the commencement of the construction works, training will be provided to workers on the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, re-use and recycling. In particular, the training will emphasize no dumping of waste into the sea is allowed, particularly at marine-based work sites and on marine vessels.

6.4.2 Disposal of Dredged Marine Sediment

The management of dredged marine sediment requirement *ETWB TC(W) No. 34/2002* will be incorporated in the Contract for the construction of the Project, including:

- Disposal vessels will be fitted with tight bottom seals in order to prevent leakage of material during transport.
- Barges will be filled to a level, which ensures that of marine sediment and marine sediment laden water does not spill over during loading or transport to the disposal site and that adequate freeboard is maintained to ensure that the decks are not washed by wave action.
- After dredging, any excess materials will be cleaned from decks and exposed fittings before the vessel is moved from the dredging area.
- When the dredged material has been unloaded at the disposal areas, any material that has accumulated on the deck or other exposed parts of the vessel will be removed and placed in the hold or a hopper. Under no circumstances will decks be washed clean in a way that permits material to be released overboard.
- Dredgers will maintain adequate clearance between vessels and the seabed at all states of the tide and reduce operations speed to ensure that excessive turbidity is not generated by turbulence from vessel movement or propeller wash.

6.4.3 Chemical Waste Management

The Contractor(s) will register as a chemical waste producer with the EPD. Chemical waste will be handled in accordance with the *Code of Practice on the Packaging, Handling and Storage of Chemical Wastes* as listed below.

Containers used for storage of chemical wastes will:

- be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed;
- have a capacity of less than 450L unless the specifications have been approved by the EPD; and
- display a label in English and Chinese in accordance with instructions prescribed in *Schedule 2 of the Regulations*.

The storage area for chemical wastes will:

- be clearly labelled and used solely for the storage of chemical waste;
- be enclosed on at least 3 sides;
- have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;
- have adequate ventilation;
- be covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and
- be arranged so that incompatible materials are appropriately separated.

Chemical waste will be disposed of:

- via a licensed waste collector; and
- to a facility licensed to receive chemical waste, such as the CWTC which also offers a chemical waste collection service, and can supply the necessary chemical waste storage containers.

6.4.4 General Refuse Management

General refuse will be stored in enclosed bins separately from chemical wastes. Floating refuse will be collected on an 'as needed' basis for disposal as general refuse. Workers will be prohibited from throwing rubbish into the sea and adequate bins will be provided on marine vessels and site office, if any. General refuse will be delivered separately from chemical wastes for offsite disposal on a regular basis to reduce odour, pest and litter impacts. General refuse from the marine vessels will be collected and disposed on shore.

Recycling bins will be provided at strategic locations on marine vessels to facilitate recovery of recyclable materials (including aluminium can, waste paper, glass bottles and plastic bottles) from the Project. Materials recovered will be sold for recycling.

6.5 Residual Environmental Impacts

With the implementation of the recommended mitigation measures, no adverse residual waste management impact is anticipated during the construction and operation activities of the Project.

6.6 Environmental Monitoring and Audit

During dredging works of the Project, site audits will be undertaken by the Project Proponent and the Contractor on a monthly basis to determine if wastes are being managed in accordance with the recommended good site practices in this EIA Report. The audits will investigate all aspects of waste management, including waste generation, storage, handling, recycling, transportation and disposal, to prevent any dumping of waste into the sea or malpractice of waste disposal.

As the operation activities of the Project (i.e. disposal of contaminated sediments and capping by uncontaminated sediments) will generate minimal quantity of waste and no adverse environmental

impacts will arise with the implementation of standard waste management practices, waste monitoring and audit programme for the operation activities of the Project will not be required.

6.7 Conclusions

Based on the findings of this EIA Study, it is estimated that about 24 Mm³ *in situ* volumes of uncontaminated sediment will be dredged under the Project and the sediments will be disposed of at Type 1 open sea disposal sites (i.e. South of Cheung Chau, South of Tsing Yi, East of Ninepin, East of Tung Lung Chau, East of Sha Chau as capping materials). Possible on-site reuse will also be explored to dispose the dredged sediments within WL Facility as capping materials when any CMP of the WL Facility reached its capacity in receiving contaminated sediments.

With the implementation of good site practices, adverse environmental impacts (including potential hazards, air and odour emissions, noise, wastewater discharge and public transport) arising from the management and disposal of waste during the construction and operation activities of the Project are not anticipated.