

7. Waste IMPACT ASSESSMENT

7.1 Introduction

7.1.1 This chapter on waste examines the quality and disposal options for wastes generated during construction of the proposed golf course. Disposal options will be outlined for each type of waste, and the responsibilities for disposal or recycling broadly discussed. As a principle it has been established that there will be **no net import or export of material from earthworks operations and ground-shaping** i.e. all cut material will be used within the works site as fill material.

7.1.2 Types of solid wastes that arise during construction phase include chemically inert excavated material, a relatively small quantity of demolished material such as pipes and broken concrete, municipal waste generated by site staff during the construction phase, and a small quantity of chemical waste such as detergents, lubricants and engine oil for equipment maintenance.

7.2 Environmental Legislation, Policies, Standards and Criteria

7.2.1 The following legislation relates to the handling, treatment and disposal of wastes in the Hong Kong SAR and will be used in assessing potential impacts:

- Waste Disposal Ordinance (Cap 354)
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354)
- 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 (Cap. 466).

Waste Disposal Ordinance

7.2.2 The *Waste Disposal Ordinance* (WDO) prohibits the unauthorised disposal of wastes. Construction waste is not directly defined in the WDO but is considered to fall within the category of “trade waste”. Trade waste is defined as waste from any trade, manufacturer or business, or any waste building, or civil engineering materials, but does not include animal waste. Under the WDO, wastes can be disposed of at sites licensed by the Environmental Protection Department (EPD). Breach of these regulations can lead to a fine and/or imprisonment. The WDO also stipulates the requirements for issuing licenses for the collection and transportation of wastes. Licenses are however not required for the collection and transportation of C&D waste or trade waste.

Waste Disposal (Chemical Waste) (General) Regulation

7.2.3 Chemical waste includes any scrap materials, or unwanted substances specified under Schedule 1 of this Regulation, if such a substance or chemical occurs in such a form, quantity or concentration that causes pollution or constitutes a danger to health or risk of pollution to the environment.

7.2.4 A person shall not produce, or cause to be produced, chemical wastes unless he is registered with EPD. Any person who contravenes this requirement commits an offence and is liable to a fine and/or imprisonment. Chemical wastes must be treated, utilising on-site plant licensed by EPD or have a licensed collector to transport 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 trace wastes from

production to disposal.

7.2.5 This regulation also prescribes the storage facilities to be provided on site including labelling and warning sign. To minimise the risks of pollution and danger to human health or life, the waste producer is required to prepare and make available written emergency procedures for spillage, leakage or accidents arising from storage of chemical wastes. The waste producer must also provide employees with training for such procedures.

7.2.6 Under the regulation of WDO, the *Chemical Waste (General) Regulation 1992* provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. The EPD has also issued a 'guideline' document, the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992)*, which details how the Contractor should comply with the regulations on chemical wastes.

Land (Miscellaneous Provisions) Ordinance

7.2.7 The inert portion of Construction and Demolition (C&D) materials may be taken to public filling facilities including public filling area, public filling barging points and stockpiling areas. These facilities usually form part of land reclamation schemes and are operated by CEDD. This ordinance requires Dumping Licenses (to be issued by CEDD) to be obtained by individuals or companies, who deliver inert C&D materials to the public filling facilities.

7.2.8 Individual licenses and windscreen stickers are issued for each vehicle involved. Public filling areas will accept only inert building debris, soil, rock and broken concrete. There is no size limitation on the rock and broken concrete, and a small amount of timber mixed with inert material is permissible. The material should, however, be free from marine mud, household refuse, plastic, metal, individual and chemical wastes, animal and vegetable matters and any other materials considered unsuitable by the Filling Supervisor.

Public Cleansing and Prevention of Nuisances by Laws

7.2.9 These by-laws provide further control on illegal tipping of wastes on unauthorised (unlicensed) sites. Illegal dumping of wastes can lead to a fine and imprisonment.

Marine Sediment

7.2.10 The WBTC No. 34/2002 sets out the management framework for dredged / excavated sediment. This Technical Circular outlines the new procedures to be followed in assessing and classifying sediment and explains the marine disposal arrangement for the classified material. The sediment quality criteria for the classification of sediment are presented in Table 7.1. Dumping permits from EPD are required for marine disposal of dredged materials.

7.2.11 Two surface (grab) samples of marine sediment were collected on May 2005 for laboratory testing of contaminants to characterise the sediment quality within the proposed area of dredging for the purpose of the desalination intake and discharge locations. The location of the sampling point is presented in Figure 7.1.

Other Relevant Guidelines

7.2.12 The following documents and guidelines also relate to waste management and disposal:

Table 7.1 Others Relevant Documents and information

Bureau / Department	Documents / Guidelines / Technical Circulars
Planning, Environmental and Lands Branch	<ul style="list-style-type: none"> u Waste Disposal Plan for Hong Kong (December 1989) u Waste Reduction Framework Plan, 1998 to 2007
Environment, Transport and Works Bureau	<ul style="list-style-type: none"> u Works Branch Technical Circular (WBTC) No. 32/92, The Use of Tropical Hard Wood on Construction Site u WBTC No. 2/93, Public Dumps u Works Bureau TC No 2/93B, Public Filling Facilities u WBTC No. 16/96, Wet Soil in Public Dumps u Works Bureau TC Nos. 4/98 and 4/98A, Use of Public Fill in Reclamation and Earth Filling Project u Works Bureau TC Nos. 25/99, 25/99A and 25/99C, Incorporation of Information on Construction and Demolition Material Management in Public Works Sub-committee Papers u Works Bureau TC No. 12/2000, Fill Management u Works Bureau TC No. 19/2001, Metallic Site Hoardings and Signboards u Works Bureau TC No. 06/2002, Enhanced Specification for Site Cleanliness and Tidiness u Works Bureau TC No. 12/2002, Specification Facilitating the Use of Recycled Aggregates u Environment, Transport and Works Bureau Technical Circular (ETWBTC) (Works) No. 33/2002, Management of Construction and Demolition Material Including Rock u ETWBTC (Works) No. 34/2002, Management of Dredged / Excavated Sediment u ETWBTC (Works) No. 15/2003, Waste Management on Construction Sites u ETWBTC(Works) No. 31/2004, Trip-ticket System for Disposal of Construction and Demolition Material
EPD / CEDD	New Disposal Arrangements for Construction Waste (1992)
EPD	Code of Practice on the Packaging, Labeling and Storage of Chemical Wastes (1992)
PlanD	Environmental Guidelines for Planning In Hong Kong (1990), Hong Kong Planning Standards and Guidelines

7.2.13 ETWB TC No. 15/2003 sets out the policy and procedures requiring contractors to prepare and implement an enhanced Waste Management Plan to encourage on-site sorting of C&D materials and to reduce C&D waste generation during construction.

7.2.14 ETWB TCW No. 31/2004 promulgates the amended trip ticket system (TTS) for public works contracts including capital works contracts, term contracts and design and build contracts, where construction and demolition (C&D) materials including waste generated on site required disposal.

7.2.15 ETWB TCW No. 34/2002 stipulates the procedures for seeking approval to dredge / excavated sediment and the management framework for marine disposal of such sediment. Applications for approval of dredging / excavation proposal and allocation of marine disposal shall be made to the Secretary of Marine Fill Committee. Marine Dumping Permits are required from EPD for the disposal of dredged/ excavated sediment.

7.3 Baseline Condition

Existing Sediment Characteristics

7.3.1 The sediment sample was tested in the laboratory for the following parameters:

- (i) Metals concentrations including chromium (Cr), copper (Cu), mercury (Hg), lead (Pb), cadmium (Cd), nickel (Ni), zinc (Zn), silver (Ag) and arsenic (As).
- (ii) Concentrations of organic compounds: total polychlorinated biphenyls (PCBs) and polyaromatic hydrocarbons (PAHs).

Table 7.3 Sediment Quality Criteria for the Classification for Sediment

Contaminants	LCEL	UCEL
<i>Heavy Metal (mg/kg dry weight)</i>		
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
<i>Metalloid (mg/kg dry weight)</i>		
Arsenic	12	42
<i>Organic-PAHs ($\mu\text{g}/\text{kg}$ dry weight)</i>		
PAHs (Low Molecular Weight)	550	3160
PAHs (High Molecular Weight)	1700	9600
<i>Organic-non-PAHs ($\mu\text{g}/\text{kg}$ dry weight)</i>		
Total PCBs	23	180

Source: Appendix A of ETWB TCW No. 34/2002 Management of Dredged / Excavated Sediment

Note: LCEL – Lower Chemical Exceedance Level
UCEL – Upper Chemical Exceedance Level

7.3.2 Sediments are categorised with reference to the LCEL and UCEL, 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 minimises 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.

7.3.3 For projects with disposal requirements of less than 50,000 m³ Category L sediment, the allocation of sediment disposal space had been delegated to DEP in accordance with ETWB TCW No.34/2002.

7.3.4 The marine sediment quality analysis results of chemical testing, as compared with the sediment quality criteria for the classification of sediment, are presented in Table 7.3.

7.3.5 The chemical testing results (Table 7.3) indicate that Category L sediments were found at the proposed dredging area and therefore the sediments are suitable for open sea disposal.

Table 7.3 Results of Sediment Quality Analysis

Contaminant	Unit	ETWB TCW No. 34/2002		LOR	S1	S2
		LCEL	UCEL	-	Seabed	Seabed
Metals						
Arsenic	mg/kg	12	42	1	3.2	3.1
Cadmium	mg/kg	1.5	4	0.1	<0.2	<0.2
Chromium	mg/kg	80	160	8	<8	<8
Copper	mg/kg	65	110	3	<7	<7
Mercury	mg/kg	0.5	1	0.05	<0.05	<0.05
Nickel	mg/kg	40	40	1	<4	<4
Lead	mg/kg	75	110	3	24	25
Silver	mg/kg	1	2	0.1	0.1	<0.1
Zinc	mg/kg	200	270	6	<20	<20
PAHs						
Acenaphthene (ANA)	µg/kg	550	3160	55	<55	<55
Acenaphthylene (ANY)	µg/kg	550	3160	55	<55	<55
Anthracene (ANT)	µg/kg	550	3160	55	<55	<55
Benzo(a)anthracene (BaA)	µg/kg	1700	9600	170	<170	<170
Benzo(a)pyrene (BaP)	µg/kg	1700	9600	170	<170	<170
Benzo(b)fluoranthene (BbF)	µg/kg	1700	9600	170	<170	<170
Benzo(ghi)perylene (BPE)	µg/kg	1700	9600	170	<170	<170
Benzo(k)fluoranthene (BkF)	µg/kg	1700	9600	170	<170	<170
Chrysene (CHR)	µg/kg	1700	9600	170	<170	<170
Dibenz(ah)anthracene (DBA)	µg/kg	1700	9600	170	<170	<170
Fluoranthene (FLT)	µg/kg	1700	9600	170	<170	<170
Fluorene (FLU)	µg/kg	550	3160	55	<55	<55
Indeno(1,2,3-cd)pyrene (IPY)	µg/kg	1700	9600	170	<170	<170
Naphthalene (NAP)	µg/kg	550	3160	55	<55	<55
Phenanthrene (PHE)	µg/kg	550	3160	55	<55	<55
Pyrene (PYR)	µg/kg	1700	9600	170	<170	<170
Total PCBs	µg/kg	23	180	2	<2	<2

Notes:

Normal indicates Category L

Bold and Italic indicates Category M

Bold, Italic and Highlighted indicates Category H

Notes:

1. LMW = Low molecular weight PAHs, that is, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene and phenanthrene.

2. HMW = High molecular weight PAHs, that is, 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.

Construction and Demolition (C&D) Materials

7.3.6 The current policy related to the dumping of C&D material is documented in the *Works Branch Technical Circular No. 2/93, 'Public Dump'*. Construction and demolition materials that are wholly inert, namely public fill, should not be disposed of to landfill, but taken to public filling areas which usually form part of reclamation schemes.

7.3.7 In addition to the Works Branch Technical Circular (WBTC), EPD and CEDD have produced a leaflet titled *'New Disposal Arrangements for Construction Waste' (1992)* which states that C&D material with less than 30% by weight of inert material (that is, public fill) will be accepted at landfill. If the material contains more than 30% inert material, the waste must be sorted with suitable material and sent to public filling area and the non-inert material (that is, C&D waste) sent to landfill for final disposal.

7.3.8 Measures have been introduced under *Environment, Transport and Works Bureau (ETWB) TCW No. 33/2002* to enhance the management of C&D material including rock, and to minimise its generation at source. The enhancement measures include: (i) drawing up a Construction and Demolition Material Management Plan (C&DMMP) at an early design stage to minimise C&D material generation; (ii) vetting of the C&DMMP prior to upgrading of the project to Category A in the Public Works Programme; and (iii) providing the contractor with information from the C&DMMP in order to facilitate him in the preparation of the Waste Management Plan (WMP) and to minimise C&D material generation during construction. Projects generating less than 50,000m³ C&D material or importing less than 50,000m³ fill material are exempt from the C&DMMP. A new technical circular ETWB TCW 15/2003 was recently issued to introduce additional measures to enhance waste management on construction sites. The circular sets out the policy and procedures requiring contractors to prepare and implement an enhanced WMP to encourage on-site sorting of C&D material and to minimise their generation during the course of construction.

7.4 Assessment Methodology

7.4.1 The methodology follows the criteria laid out in the *Technical Memorandum on EIA Process* (Annexes 7 and 15). The principal legislation regulating waste is the *Waste Disposal Ordinance*.

7.4.2 The main objectives of the waste assessment are to:

- (i) identify the sources, volumes, quality and timing of wastes arising from the construction activities;
- (ii) recommend construction waste management requirements in terms of minimisation through project design, construction method, and site location, identification of re-use and recycling opportunities and the responsible party for each step of the waste management process; and
- (iii) recommend disposal sites and routes for different types of wastes unsuitable for re-use or recycling.

7.4.3 Mitigation measures and good site practices have been recommended with reference to the applicable waste legislation and guidelines.

7.5 Identification of Potential Sources of Wastes

Construction Phase

7.5.1 Types of construction and demolition material generated from the activities will be:

- (i) *Site clearance materials*: variable quantities of vegetative matter;
- (ii) *Excavated material*: inert material removed from the ground and sub-surface. Variable quantities of excavated material will be produced during cutting operations - but all will be reused on site for fill;
- (iii) *Concrete waste*: there will inevitably be a small excess of concrete and other damaged, used and surplus construction materials arising from construction activities throughout the project;
- (iv) *General works waste*: including the generation of limited quantities of wooden material waste, chemical waste, aqueous waste, and domestic, municipal waste and sewage from day to day activities.

7.5.2 Handling and disposal of these wastes may cause environmental impacts and nuisance during the construction phase if potential impacts are not properly managed and mitigated.

7.5.3 The HKSAR Government's construction and demolition waste management strategy is the same as for other wastes, i.e. in order of desirability: avoidance; minimisation; recycling; and safe disposal of construction materials. During the detailed design stage, the engineers and environmental assessors should work closely together with a view to reducing the volumes of materials requiring removal and final disposal.

7.5.4 The various types of waste arising from the Project are described in this section, and the favoured disposal option (according to the government's strategy) outlined for each waste material. Responsibilities for disposal and, where possible, recycling, are discussed.

7.6 Prediction and Evaluation of Environmental Impacts

Construction Phase

Construction and Demolition (C&D) Materials

7.6.1 Construction and demolition material (C&DM) arises from construction activities such as site clearance and demolition works. C&DM may include the following:

- inert portion of C&D material (public fill) such as rock, concrete, etc.;
- non-inert portion (C&D waste) such as timber, etc.

7.6.2 The Contractor is responsible for sorting C&DM into inert and non-inert portions. Inert portion of C&DM is fill material and hence, should be reused on site. Surplus inert C&DM may be disposed of at public filling areas depending on the percentage of inert content. Non-inert portion of C&DM should be reused whichever possible and be disposed of at landfills as the last resort.

7.6.3 Site formation to the required level shall be undertaken by cut and fill method. Based on the proposed design of the third golf course, the total excavated volumes during the construction from the Project will be 530,000 m³. Based on the preliminary estimation, the excavated material would be mostly general backfilling material. All excavated materials could be re-used on site and off-site disposal of inert portion would not be expected. No significant impacts would be anticipated.

7.6.4 Minimal amount of C&D material will be generated from the extension of the administration and maintenance buildings at the existing golf course. The volume of C&D material is estimated by the Project Engineer to be approximately 275m³ and would comprise mostly broken concrete, brick and cement plaster/mortar. Such materials cannot be reused on-site and will require disposal. It is considered that the handling and disposal of site clearance waste would not be a key issue and the potential environmental impact arising from

handling and disposal of such waste would be negligible.

7.6.5 C&D material also would be generated during site clearance and the estimated volume is approximately 40,000m³ of which 70% is assumed to be vegetation (28,000m³) and 30% to be top soil (12,000m³). Most of the top soil and vegetation (70%) is expected to be reused on site. Only when the excavated soil cannot comply with specification for use in backfilling would be delivered to designated public filling facilities. Small amount of surplus vegetation that cannot be reused as mulch/compost would need to be disposed to landfill.

7.6.6 Depending on the nature of the construction waste generated, these surplus wastes that are not suitable for reuse on-site should be collected by a waste collector under arrangement with the Contractor and deposited at a designated public filling facilities and/or landfills. The Contractor should ensure that the necessary waste disposal permits are obtained prior to the collection of waste.

7.6.7 A summary of the estimated volumes of excavated material generated from earthworks for the proposed third golf course, as well as C&D material generated from the demolition of administration and maintenance and from site clearance is presented in Table 7.4 below.

Table 7.4 Summary of Estimated Excavated Material in Bulk Volume (2006-2008)

Construction activities	Volume of C&D Material (m ³)	Volume of C&D Material to be re-used (m ³)	Surplus inert C&D Material (m ³) ¹	Surplus non-inert material (m ³) ²
Site clearance	40,000	28,000	3,600	8,400
Excavation	530,000	530,000	0	0
Extension of administration and maintenance building	275	0	275	0
Total	570,275	558,000	3,875	8,400

Notes:

- 1) The proposed public filling facility is likely to be the fill bank at Tseung Kwan O Area 137 (subject to confirmation by CEDD)
- 2) The proposed landfill site is likely to be South East New Territories (SENT) Landfill (subject to confirmation by EPD)

Chemical Waste

7.6.8 It is difficult to quantify the amount of chemical waste that will arise from the construction activities since it would be highly dependent on the Contractor's on-site maintenance requirements and the number of plant utilised. However, it is anticipated that the quantity of chemical waste, such as lubricating oil and solvent produced from plant maintenance, would be small and in the order of a few hundred litres per month. The amount of chemical waste expected to be generated would be quantified in the site Waste Management Plan to be prepared by the Contractor.

7.6.9 The potential hazards if chemical wastes arising during the construction phase include:

- (i) Toxic effects to workers;
- (ii) Adverse impacts on water quality from spills (impacts on fresh water biota); and
- (iii) Fire hazards

7.6.10 Materials classified as chemical wastes will require special handling and storage arrangements. Such

waste should be collected by licenced chemical waste collector for subsequent disposal at licenced waste disposal facilities, such as Chemical Waste Treatment Facility at Tsing Yi. Wherever possible opportunities should be taken to reuse and recycle materials. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts are not expected to result.

Sewage from Construction Workforce

7.6.11 Sewage arising will be generated from:

- (i) Construction workforce; and
- (ii) Site office's sanitary facilities.

7.6.12 If not properly managed, the untreated sewage could cause odour and potential health risks to the workforce by attracting pests and other disease vectors. The exact number of construction workers to be employed on-site is unavailable at this stage. It is expected to be approximately 500 workers during peak construction period for 6 months.

7.6.13 As the workers will be scattered along the proposed third golf course, the most cost-effective solution will be to provide adequate number of portable toilets at sub-divided construction areas to ensure that sewage from site staff is properly collected. Depending on site conditions and site activities, the locations and number of portable toilets will be determined in the Waste Management Plan (WMP) to be submitted by the Contractor. No adverse waste impact is envisaged provided that maintenance by licensed contractors is conducted regularly.

General Refuse

7.6.14 The Project would generate general refuse including paper and food waste. The amount that may be produced is dependent on the size of the workforce at site. Potential environmental impacts of general refuse include odour (if waste is not collected frequently), windblown litter, water quality impacts (if waste enters water bodies), and visual impacts. The refuse may also attract pests and vermin if the storage areas are not well maintained and cleaned regularly. In addition, disposal of waste at sites other than approved waste transfer or disposal facilities can also lead to environmental impacts.

7.6.15 Release of general refuse into rivers/streams and marine waters should not be permitted as introduction of these wastes is likely to have detrimental effects on water quality in the area. Effective collection of site wastes would be required to prevent waste materials being blown around by wind, flushed or leached into the freshwater and marine environment, and odour nuisance. Disposal of refuse at sites other than approved waste transfer or disposal facilities can also result in similar impacts.

7.6.16 The exact number of workers to be employed for the project is not available at this stage. It is expected to be approximately 500 workers during peak construction period for 6 months. Assuming a generation rate of

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1.11 kg per person per day (EPD, 2002), approximately 0.55 tonnes per day of general refuse will be generated during the peak construction period. Provided that the mitigation measures recommended in Section 7.7 are adopted, the environmental impacts caused by the storage, handling, transport and disposal of general refuse are expected to be minimal. It is recommended that the general refuse be collected daily by reputable waste collectors.

Marine Dredged Sediment

7.6.17 It is proposed that dredging will be carried out for the intake and outfall pipelines for the proposed desalination plant near to the existing pier. The total volume of dredged sediment for the Project is estimated to

be approximately 1,500 m³. The potential environmental effects of the removal of these sediments on water quality have been assessed and presented in Chapter 6 of this Report.

7.6.18 In order to minimize any potential adverse impacts arising from the dredged marine sediment, the sediment should be dredged, transported and disposed of in a manner that minimises the loss of contaminants either into solution or by resuspension. Mitigation measures to minimise potential environmental impacts are recommended in Section 7.7. It is anticipated that, with the implementation of mitigation measures, no unacceptable impacts will result from the transportation and disposal of the dredged sediment.

7.6.19 A Sediment Quality Report was prepared as per the requirements given in the ETWB TCW No. 34/2002 "Management of Dredged / Excavated Sediment". The Final Sediment Quality Report has been approved by EPD in 2005. Based on the Final Sediment Quality Report, field sampling work involving 2 surface grab samples at the proposed desalination plant's intake and discharge pipeline location was carried out during the May 2005 which had been collected and tested. Results indicate that the contaminants in all samples are registered in Category L (Material < Lower Chemical Exceedance Level). Since all samples are Category L, these marine deposits would be assigned at Type 1 open sea disposal according to the requirements given in the ETWB TCW No. 34/2002.

Operational Phase

7.6.20 The operational phase of the Project, on the other hand, is not expected to generate significant quantities of waste. The volume of waste generated by the golfer will be minimal and will only cause marginally increase to the current volume generated by the existing golf courses. The current waste management and disposal arrangement of the existing golf course are adequate to cater for the increase.

7.7 Proposed Mitigation Measures for Construction Waste

Good site practices

7.7.1 Appropriate waste handling, transportation and disposal methods for all waste arisings generated during the construction works at the proposed project should be implemented to ensure that construction wastes do not enter the nearby fresh coastal waters of Port Shelter.

7.7.2 It is expected that adverse impacts from waste management would not arise, provided that good site practices are strictly followed. Recommendations for good site practices during construction include:

- nomination of approved personnel, such as a site manager, to be responsible for good site practices, and making arrangements for collection of all wastes generated at the site and effective disposal to an appropriate facility;
- training of site personnel in proper waste management and chemical waste handling procedures;
- provision of sufficient waste disposal points and regular collection for disposal;
- appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
- regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- a Waste Management Plan should be prepared and should be submitted to the Engineer for approval. One may make reference to ETWB TCW No. 15/2003 for details; and
- a recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be proposed.

7.7.3 Appropriate waste handling, transportation and disposal methods for all waste arisings generated during the construction works should be implemented to ensure that construction wastes do not enter the marine waters.

Waste Reduction Measures

7.7.4 Good management and control can prevent the generation of significant amounts of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:

- segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- separate labelled bins shall be provided to segregate aluminium cans from other general refuse generated by the work force, and to encourage collection of by individual collectors;
- any unused chemicals or those with remaining functional capacity shall be recycled;
- maximising the use of reusable steel formwork to reduce the amount of C&D material;
- prior to disposal of C&D waste, it is recommended that wood, steel and other metals shall be separated for re-use and / or recycling to minimise the quantity of waste to be disposed of to landfill;
- proper storage and site practices to minimise the potential for damage or contamination of construction materials;
- plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste; and
- minimize over ordering of concrete, mortars and cement grout by doing careful check before ordering.

7.7.5 In addition to the above good site practices and waste reduction measures, specific mitigation measures are recommended below for the identified waste arisings to minimise environmental impacts during handling, transportation and disposal of these wastes.

Site Clearance Waste

7.7.6 Scrub and other vegetation will be stripped for the tees, fairways, greens and access roads. The normal route for disposal for such material is landfill but in this case it is proposed that vegetation is passed through a "chipper" to break down the material into a medium that can be used as mulch / compost and provide a seed-bank for natural hydroseeding of exposed areas.

7.7.7 Non-inert materials should be kept separate and reused on-site as fill in preference to disposal at public filling areas which are operated by CEDD or disposal at landfill.

Excavated Materials

7.7.8 Material generated during open cut works, and access route formation will comprise rock and soil and all this material will be reused in the site shaping process. It is anticipated that there will be no material requiring disposal off-site in public filling areas.

Construction and Demolition (C&D) Material

7.7.9 The C&D material generated from the site formation and demolition works should be sorted on-site into inert C&D material and C&D waste. In order to minimise the impact resulting from collection and transportation of C&D material for off-site disposal, the excavated material comprising fill material should be reused on-site as backfilling material. C&D waste, such as wood, plastic, steel and other metals should be reused or recycled and, as a last resort, disposed of to landfill. A suitable area(s) should be designated within the site for temporary stockpiling of C&D material and to facilitate the sorting process. The stockpiling/sorting area should be located far away from the identified sensitive receivers (such as water bodies).

Site fencing

7.7.10 Some site fencing may be required during construction phase of the Project. Attention should be paid to WBTC No. 19/2001 which introduce a new policy requiring the use of metallic site hoardings and signboards in order to reduce the amount of timber used on construction sites. Metallic alternatives to timber (softwood, softwood veneered plywood, composite boards etc.) are now readily available in the market and have been widely used for site hoarding and signboards. These metallic alternatives are more sustainable and environmentally friendly than timber and can be re-used many times and thereafter recycled for other uses. Furthermore, the wider use of these re-usable and recyclable materials can help to reduce the amount of construction and demolition (C&D) waste generated from construction sites and in turn preserve the valuable capacity of the landfills.

7.7.11 A summary of the construction and demolition materials arising as a result of the likely construction works is presented in Table 7.5.

Table 7.5 Construction Waste Arising as a Result of Construction Works

Major Activities	Waste Type(s)	Disposal
Site Clearance	Vegetation Topsoil	Reuse as mulch / Compost Used for landscaping
Demolition (limited to small portion at the administration building located at the existing golf courses)	Concrete Bricks/Tiles Ferrous Metal	Public Filling Area Public Filling Area Recycle
Site Formation / Ground shaping	Fill Materials	To be reused onsite
General Site Activities	Sewage wastes Municipal wastes Chemical waste oil	Sewage treatment works Recycle or landfill CWTC / Licensed Contractor

Remarks:

CWTC - Chemical Waste Treatment Centre, Tsing Yi

The inert materials should be reused on-site before disposal of at public filling areas or landfills.

Chemical Waste

7.7.12 Where the construction processes produce chemical waste, the Contractor must register with EPD as a Chemical Waste Producer. Wastes classified as chemical wastes are listed in the *Waste Disposal (Chemical Waste) (General) Regulation*. These wastes are subject to stringent disposal routes. EPD requires information on the particulars of the waste generation processes including the types of waste produced, their location, quantities and generation rates. A nominated contact person must be provided.

7.7.13 The major chemical waste types arising from the construction sites are likely to be oils, lubricants, paints and solvents. Oil waste may be in the form of raw waste, or as sundries such as spent oil filters, or materials used to absorb oil leaks. Storage and disposal of these wastes are discussed below.

7.7.14 Hard standing surfaces draining via oil interceptors shall be provided in works area compounds. Interceptors will be regularly emptied to prevent release of oils and grease into the surface water drainage system after accidental spillages. The interceptor should have a bypass to prevent flushing during periods of heavy rain.

Oil and fuel bunkers should be banded to prevent discharge due to accidental spillages or breaches of tanks. Waste collected from any grease traps should be collected and disposed of by a licensed contractor.

7.7.15 Any construction plant which is likely to leak oil, should have absorbent inert material e.g. sand, placed beneath it. This material should be replaced on a regular basis and the contaminated material should be stored in a designated, secure place. Any sand used for soaking oil waste is classified as chemical waste and should be disposed of in accordance with the *Waste Disposal (Chemical Waste) (General) Regulations*.

7.7.16 Lubricants and waste oils are likely to be generated during the maintenance of vehicles and mechanical equipment. Used lubricants will be collected and stored in individual containers which are fully labelled. The containers should be stored in a designated secure place. If possible such waste should be sent to oil recycling companies; there are also companies which collect empty oil drums for reuse or refill.

7.7.17 Oil and lubricant wastes are classified as chemical wastes, and if not recycled, should be collected by licensed collector and should be treated at the Chemical Waste Treatment Centre, Tsing Yi, or other sites licensed for disposal of waste oil. A trip ticket system operates to control the movement of such chemical waste and tickets have to be produced upon the request of EPD.

7.7.18 Some paints and solvents are classified as chemical waste and, if used on site, will be subject to the stringent requirements of the *Waste Disposal (Chemical Waste) (General) Regulation*. Empty paint cans should be recycled or collected as waste. Any dry paint waste should be swept up and collected in containers for disposal.

7.7.19 No lubricants, oils, solvents or paint products should be allowed to discharge into water courses, either by direct discharge, or as contaminants carried in surface water runoff from the construction site.

Sewage

7.7.20 An adequate number of portable toilets should be provided for the on-site construction workforce. The portable toilets shall be maintained in a state that will not deter the workers from using them.

General Refuse

7.7.21 General refuse should be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. An enclosed and covered area is preferred to reduce the occurrence of 'wind blown' light material.

7.7.22 Solid and liquid wastes will be generated by the construction workers during the clearance/construction period. The refuse (mainly non-recyclable materials) will be collected regularly in black refuse bags and delivered to the existing solid waste disposal system and transferred to landfill for disposal.

Marine Sediments

7.7.23 The basic requirements and procedures for dredged mud disposal are specified under the ETWB TCW No. 34/2002. The management of the dredging, use and disposal of marine mud is monitored by the Marine Fill Committee (MFC), while the licensing of marine dumping is the responsibility of the Director of Environmental Protection (DEP).

7.7.24 The dredged marine sediments will be loaded onto barges and transported to the designated disposal site. Category L sediments were found at the proposed dredging area and therefore the sediments are suitable for open sea disposal. At this stage in the engineering design, it is estimated that 1,500 m³ of sediments will require open sea disposal. In accordance with the ETWB TCW No. 34/2002, the material must be dredged, transported and disposed in a manner which minimizes the loss of contaminants either into solution or by resuspension.

7.7.25 During transportation and disposal of the dredged marine sediments, the following measures should be taken to minimise potential impacts on water quality:

- Bottom opening of barges shall be fitted with tight fitting seals to prevent leakage of material. Excess material shall be cleaned from the decks and exposed fittings of barges and hopper dredgers before the vessel is moved.
- Monitoring of the barge loading shall be conducted to ensure that loss of material does not take place during transportation. Transport barges or vessels shall be equipped with automatic self-monitoring devices as specified by the DEP.

7.8 Evaluation of Residual Impact

7.8.1 With the implementation of the recommended mitigation measures for the handling, transportation and disposal of the identified waste arisings, residual impacts would not be expected during the construction of the proposed works.

7.9 Environmental Monitoring and Auditing

7.9.1 Waste management would be the contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and EPD's regulations and requirements. The recommended mitigation measures should form the basis of the site Waste Management Plan to be developed by the Contractor at the construction stage.

7.10 Conclusion

7.10.1 An assessment of potential environmental impacts from wastes of the proposed project has been conducted. Key issues are the requirements for effective waste management planning during the construction phase. The operational phase is not expected to generate any significant amount of wastes.

7.10.2 Waste management methods and practices and other environmental control measures for the construction phase have been recommended to ensure that potential impacts are avoided or mitigated to acceptable levels. Provided all the suggested mitigation measures are properly implemented, potential environmental impacts associated with wastes from the Project would be insignificant.

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http://www.epd.gov.hk/epd/english/environmentinhk/waste/waste_maincontent.html