

## 6. Waste Management Implications

### 6.1 Introduction

This section identifies the types of wastes that are likely to be generated when carrying out of the Project and evaluates the potential environmental impacts that may result from these wastes in accordance with Section 3.4.6 of the EIA Study Brief as well as the criteria and guidelines outlined in Annex 7 and Annex 15 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM), respectively.

With reference to **Chapter 2**, there are three different Re-provisioning Options for the undertaking of the proposed Project works, namely Option A, Option B, and Option C, that are being considered for the Project. An assessment of potential waste management implication of the three Re-provisioning Options will be discussed in this Section.

Wastes arising from the Project are mainly from activities in the site clearance and ground decontamination process. The options for waste minimisation, recycling, treatment, storage, collection, transport and disposal of waste have been examined. Environmental mitigation measures and good site practices are recommended with reference to the applicable waste legislations and guidelines.

### 6.2 Environmental Legislation, Standards and Guidelines

The criteria and guidelines for assessing waste management implications are outlined in Annex 7 and Annex 15 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM), respectively.

The following legislation which relates to the handling, treatment and disposal of wastes in the Hong Kong SAR are applied in the assessment of waste management implication:

- Waste Disposal Ordinance (Cap. 354)
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354)
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354)
- Public Health and Municipal Services Ordinance (Cap. 132) – Public Cleansing and Prevention of Nuisances Regulation
- Land (Miscellaneous Provisions) Ordinance (Cap. 28)
- Dumping at Sea Ordinance (Cap. 466)

#### 6.2.1 Waste Management

The Waste Disposal Ordinance (WDO) prohibits the unauthorised disposal of wastes. Construction waste is defined as any substance, matter or thing that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before abandoned, but does not include any sludge, screenings or matter removed in or generated from any desludging, desilting or dredging works. Under the WDO, wastes can be disposed of only at designated waste disposal facilities.

Under the WDO, the Chemical Waste (General) Regulation provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes.

The Environmental Protection Department (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.

The Public Cleansing and Prevention of Nuisances Regulation provides regulatory control for illegal tipping of wastes on unauthorised (unlicensed) sites.

### **6.2.2 Construction and Demolition (C&D) Materials**

The current policy related to dumping of Construction and Demolition (C&D) material is documented in the Works Branch Technical Circular No. 2/93, 'Public Dumps'. C&D materials that are wholly inert, i.e. public fill, should not be disposed of to landfill, but taken to public filling areas, which usually form part of reclamation schemes. The Land (Miscellaneous Provisions) Ordinance requires that dumping licenses be obtained by individuals or companies who deliver public fill to public filling areas. The Civil Engineering and Development Department (CEDD) issues the licences under delegated powers from the Director of Lands.

Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, enacted in January 2006, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert C&D material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert C&D material, and construction waste delivered to a public fill reception facility for disposal must consist entirely of inert material.

Measures have been introduced under Environment, Transport and Works Bureau (ETWB) TCW No. 33/2002, "Management of Construction and Demolition Material Including Rock" to enhance the management of construction and demolition material, and to minimise its generation at source. The enhancement measures include: (i) drawing up a Construction and Demolition Material Management Plan (C&DMMP) at the feasibility study or preliminary design stage to minimise C&D material generation and encourage proper management of such material; and (ii) 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 C&D material less than 50,000 m<sup>3</sup> or importing fill material less than 50,000 m<sup>3</sup> are exempt from the C&DMMP. The ETWB TCW No. 19/2005 "Environmental Management on Construction Sites" includes procedures on waste management requiring contractors to reduce the C&D material to be disposed of during the course of construction. Under ETWB TCW No. 19/2005, the contractor is required to prepare and implement an Environmental Management Plan (EMP) and the WMP becomes part of the EMP.

## **6.3 Assessment Methodology**

In accordance with Section 3.4.6.1 of the EIA Study Brief, the criteria for evaluating and assessing the waste management implications follows Annexes 7 and 15 of the EIAO-TM and the assessment covers the scope outlined in Appendix D1 of the EIA Study Brief which includes the following:

### **6.3.1 Analysis of Activities and Waste Generation**

- Identify the quantity, quality and timing of waste arising as a result of the land decontamination activities of the Project, and based on the sequence and duration of these activities to evaluate the potential environmental impacts that may result from these wastes.

- Adopt appropriate decontamination methods to ensure no contaminated wastes from the Project would be disposed of prior to proper decontamination.

### **6.3.2 Proposal for Waste Management**

- Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generation, on-site or off-site re-use and recycling shall be fully evaluated.
- Estimate the types and quantities of the wastes required to be disposed of.
- Identify the disposal methods / options for each type of waste.
- Identify the transportation routings and the frequency of the trucks involved.
- Identify the stockpiling areas and the disposal outlets for the wastes.
- Assess the potential impacts from the management of solid waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges, ecology and public transport.

### **6.3.3 Excavation, Filling and Dumping**

- Identify and quantify excavation, fill extraction, filling, sediment / mud transportation and disposal activities and requirements.
- Identify potential fill source and dumping ground to be involved.
- Identify and evaluate the best practicable excavation methods, treatment methods, reuse / recycling options and work programme to minimise excavation and dumping requirements and demand for fill sources.

## **6.4 Identification, Prediction and Evaluation of Environmental Impact**

The ground decontamination works to be carried out for the Project would generate a variety of wastes that can be divided into distinct categories based on their composition and ultimate method of disposal. The identified waste types include:

- C&D materials
- Chemical waste
- General refuse

The Project will not involve any excavation or dredging of marine sediment.

Each type of waste arising is described below, together with an evaluation of the potential environmental impacts associated with the handling, storage and transport of the waste. This Section assesses the waste management impact that may arise from the Project under the three different Re-provisioning Options. It is anticipated that the total amount of waste generated from the Project under the three Re-provisioning Options will be the same.

## 6.4.1 Construction and Demolition (C&D) Materials

### 6.4.1.1 Site Clearance

Demolition materials (Artificial Hard Material (AHM)), such as broken concrete and building debris if any, are to be generated from the site clearance works within the site area, including the concrete slab. A total of about 18,367 m<sup>3</sup> of AHM would be generated during these works. To maximise reuse of C&D materials, on-site sorting to recover inert C&D materials would be performed as far as practicable before offsite disposal. Non-inert C&D materials would be separated from AHM, after which non-inert C&D materials would be disposed of at landfill while AHM would be disposed of at the Government Public Fill Reception Facilities (PFRFs) at Tseung Kwan O (TKO) Area 137.

The following non-inert C&D materials would also be generated during the site clearance works:

- Trees and Vegetation within the site area
- Steel reinforcement from site clearance of existing features and pavement
- Papers and plastics

About 58 m<sup>3</sup> of non-inert C&D materials would be generated and 196 trees would be felled. The trees and vegetative materials are regarded as non-inert C&D waste and are considered not suitable to be transplanted as they grow in contaminated soil (Details of the landscape impact assessment will be presented in **Section 10**). However, other suitable materials such as the steel reinforcement which separates from the broken AHM will be recycled as far as possible, and the amount would be estimated in the WMP to be prepared by the Contractor. The remaining will be disposed of at the South East New Territories (SENT) landfill as the last resort.

The strategy for handling and disposal of the substantial amount of C&D material off-site from the works area is essential as it would impose road traffic impact and environmental impacts along the haul route to the nearby community and even affect the programme of the construction works.

### 6.4.1.2 Decontamination Phase

No AHM will be generated during the decontamination works. As a major part of the Project, all the contaminated soil within the site area should be treated on-site. The ground decontamination method for excavated soil is proposed in the Contamination Assessment Report / Remediation Action Plan (see **Appendix 7.2**). About 65,479 m<sup>3</sup> of soil not requiring decontamination would be generated during excavation works of which the Contractor should maximise the re-use during the decontamination works. Surplus soil not requiring decontamination should be designated for off-site disposal at the PFRFs and should meet the most stringent Risk-Based Remediation Goals (RBRGs) (i.e. Rural Residential / Urban Residential). It is estimated that about a maximum of 14,000 m<sup>3</sup> soil not requiring decontamination may need to be disposed of at the PFRFs.

## 6.4.2 Chemical Waste

The operation, maintenance and servicing of plant and equipment may generate some chemical wastes such as cleansing fluids, solvents, lubrication oil, fuel, used carbon filters, and silt removed from surface runoff by desiltation. It is difficult to quantify the amount of chemical waste that will arise from the

decontamination activities since it will be dependent on the Contractor's on-site maintenance requirements and the amount of plant utilised. However, it is anticipated that the quantity of chemical waste, such as lubricating oil and solvent produced from plant maintenance, and used activated carbon filters would be small and in the order of few cubic meters per month. The amount of chemical waste to be generated will be quantified in the WMP to be prepared by the Contractor.

Chemical waste arising during the decommissioning works may pose environmental, health and safety hazards if not stored and disposed of in an appropriate manner as stipulated in the Waste Disposal (Chemical Waste) (General) Regulations. The potential hazards include:

- Toxic effects to workers
- Adverse impact on water quality from spills
- Fire hazards

Materials classified as chemical waste will require special handling and storage arrangements before removal for appropriate treatment at the Chemical Waste Treatment Facility (CWTF) or other licensed facility. Wherever possible, opportunities should be taken to reuse and recycle materials. Mitigation and control requirements for chemical waste are detailed in **Section 6.6.4**. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts are not expected.

### **6.4.3 General Refuse**

The Project's workforce will generate general refuse comprising food scraps, waste paper, empty containers, etc. Such refuse should be properly managed so intentional or accidental release to the surrounding environment does not occur. Disposal of refuse at sites other than approved waste transfer or disposal facilities shall be prohibited. Effective collection of site wastes will be required to prevent waste materials being blown around by wind, flushed or leached into the marine environment, or creating odour nuisance or pest and vermin problem. Waste storage areas shall be well maintained and cleaned regularly. With the implementation of good waste management practices at the site, adverse environmental impacts are not expected to arise from the storage, handling and transportation of workforce wastes.

The maximum number of workers to be employed is estimated to be 100. Based on a generation rate of 0.65 kg per worker per day, the maximum daily arising of general refuse during the construction period would be approximately 65 kg and this waste can be effectively controlled by normal measures.

## **6.5 Opportunities for Reducing Waste Generation, Maximise Reuse and Recycling**

Opportunities to minimise C&D material generation and maximise use of material generated as mentioned under Appendix D (2)(i) of EIA Study Brief were considered and reviewed during decontamination works are presented in the **Sections 6.5.1** and **6.5.2** below.

### **6.5.1 Site Clearance**

#### Ways to minimise the generation of C&D material

- Carefully planned programme to avoid generation of additional C&D material
- Provision of good practice training and adoption of site management to minimise waste generation

Ways to maximise the reuse of C&D materials on site

- Use of steel or aluminium formworks and falseworks for temporary works
- Adoption of repetitive design to maximise the reuse of formwork for temporary works

Ways to maximise the use of recycled inert C&D materials

- Use of recycled inert C&D material or products with recycled aggregates for temporary or permanent works, such as concrete paving blocks, where appropriate.

Ways to maximise the recovery rate of materials

- Provision and utilisation of on-site sorting facilities as far as practicable to maximise the recovery of inert C&D material, which can then be delivered to the PFRFs for beneficial use by other projects
- Provision and utilising of on-site sorting facilities as far as practicable to maximise the recovery of recyclable materials (such as, steel), which can then be collected by recyclers for recycling.

## **6.5.2 Decontamination Phase**

Ways to minimise the generation of C&D material

- Adoption of most adequate decontamination method to maximise the treatment efficiency, thus quantity of contaminated soil can be minimised.

Ways to maximise the reuse of treated inert C&D material on site

- Maximise the use of treated inert C&D materials for backfilling after the completion of decontamination process.

Ways to maximise the reuse of C&D material and/or rock on site

- Use of steel or aluminium formworks and falseworks for temporary works
- Adoption of repetitive design to allow the reuse of formwork for temporary works

Ways to maximise the recovery rate

Provision and utilisation of on-site sorting facilities as far as practicable to maximise the recovery of recyclable materials (such as, steel), which can then be collected by recyclers for recycling.

The Contractor will be required under the Contract to minimise the generation and maximise the reuse of C&D material. Some of the requirements are summarised below:

- (a) to plan for minimising the generation of C&D material in any temporary design, contractor's design, decontamination sequence and methodologies;



- (b) to submit and implement an EMP in accordance with Environment Transport and Works Bureau Technical Circular (ETWBTC) No. 19/2005 or any succeeding circular(s), and establish a mechanism to record the quantities of C&D materials generated and required each month and estimate the quantities of C&D materials that will be generated and required each year, and report to the Project Office;
- (c) to establish a Trip-Ticket System as stipulated in DEVB TC(W) No. 6/2010 or any superseding circular(s), for proper disposal of C&D waste to the designated outlets;
- (d) to properly sort C&D materials into inert C&D materials, metals, timber and other non-inert C&D waste in the workplace to prevent cross-contamination. Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, construction waste delivered to landfill for disposal must not contain more than 50% by weight of inert construction waste and construction waste delivered to a public fill reception facility for disposal must consist entirely of inert construction waste.

## **6.6 Mitigation of Adverse Environmental Impacts**

### **6.6.1 Good Site Practices**

Adverse impacts related to waste management such as potential hazard, air, odour, noise wastewater discharge, ecology and public transport as mentioned in Appendix D (2)(iv) of the Study Brief are not expected to arise, provided that good site practices are strictly followed. Recommendations for good site practices during the decommissioning works include:

- Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site;
- Training of site personnel in proper waste management and chemical waste handling procedures;
- Provision of sufficient waste disposal points and regular collection for disposal;
- Dust suppression measures as required under the Air Pollution Control (Construction Dust) Regulation should be followed as far as practicable. Appropriate measures to minimise windblown litter and dust / odour during transportation of waste by covering trucks or in enclosed containers;
- Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- Separation of chemical wastes for special handling and appropriate treatment;
- A recording system for amount of wastes generated, recycled and disposed of (including the disposal sites);
- General refuse shall be removed as soon as possible. As such, odour is not anticipated to be an issue to distant sensitive receivers;
- Provision of wheel washing facilities before the trucks leaving the works area so as to minimise dust introduction from public road;
- Covers and water spraying system should be provided for the stockpiled C&D material to prevent dust impact;

- Provision of cover for the stockpile material, sand bag or earth bund as barrier to prevent material from washing away and entering the drains;
- Designate different locations for storage of C&D material to enhance reuse;
- A well-planned programme for transportation of C&D material should be implemented to lessen the off-site traffic impact; and
- A well-planned delivery programme for offsite disposal and imported filling material such that adverse noise impact from transporting of C&D material is not anticipated.

### 6.6.2 Waste Reduction Measures

Good management and control can prevent the generation of a significant amount 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:

- Sorting of debris from site clearance to recover reusable/ recyclable portions (i.e. soil, broken concrete, metals etc.);
- 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;
- Encourage collection of aluminium cans, PET bottles and paper by providing separate labelled bins to enable these wastes to be segregated from other general refuse generated by the workforce;
- Any unused chemicals or those with remaining functional capacity shall be recycled;
- Proper storage and site practices to minimise the potential for damage or contamination of materials;
- Plan and stock materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste; and
- Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycle.

In addition to the above measures, specific mitigation measures are recommended below for the identified waste arising to minimise environmental impacts during handling, transportation and disposal of these wastes.

### 6.6.3 C&D Material

The C&D material should be sorted on-site into inert C&D material (that is, public fill) and C&D waste. The surplus inert C&D material (e.g. surplus excavated soil not requiring decontamination as assessed in CAR/RAP in **Appendix 7.2**) would require disposal at the Government PFRFs in TKO Area 137 and should meet the most stringent RBRGs (i.e. Rural Residential / Urban Residential).

The C&D waste, such as steel and other metals should be reused or recycled and, as a last resort, disposed of to landfill. It is recommended that a suitable area be designated on-site to facilitate the sorting process and a temporary stockpiling area will be required for the separated materials.



As discussed in **Section 6.4.1.2** of this report, the ground decontamination methods to be adopted will be proposed in the Contamination Assessment Report / Remediation Action Plan in **Section 7**. It is proposed that all treated soil be backfilled or re-used on-site.

In order to monitor the disposal of public fill and C&D waste at PFRFs and landfills, respectively, and to control fly tipping, a trip-ticket system as promulgated under DEVB TC(W) No. 6/2010 should be included as one of the contractual requirements and implemented by an Environmental Team undertaking the Environmental Monitoring and Audit work. An Independent Environmental Checker should be responsible for auditing the results of the system.

#### **6.6.4 Chemical Waste**

If chemical wastes are produced at the site, the Contractor will be required to register with the EPD as a chemical waste producer and to follow the guidelines stated in the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes, to the licensed Chemical Waste Treatment Centre, or other licensed facilities, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

#### **6.6.5 General Refuse**

General refuse should be stored in enclosed bins or compaction units separate from C&D material. A licensed waste collector should be employed by the contractor to remove general refuse from the site separately. Effective collection and storage methods (including enclosed and covered area) of site wastes should be provided to reduce the occurrence of wind-blown light material.

### **6.7 Impacts Caused by Handling, Collection and Disposal of C&D Materials**

With careful planning for handling, collection and disposal of the C&D materials and with implementation of good waste management practices, recommended mitigation measures as stated in **Section 6.6** and recommended handling and disposal methods as described in **Table 6.1**, potential hazard, air and odour emission, noise, wastewater discharge and ecological impacts caused by handling, collection and disposal of waste is expected to be minimal.

### **6.8 Waste Handling Procedures and Disposal Routes**

**Table 6.1** provides a summary of the various waste types likely to be generated during the Project together with the recommended handling and disposal methods. On-site stockpiling area will be provided throughout the project, and the location of the stockpiling area may be varying within the site at different stages of land decontamination works. In case where wastes are arranged for disposal by trucks, the trucks will be running through the major trunk roads in Route 4 from Kennedy Town to Quarry Bay, followed by the Eastern Harbour Crossing, Tseung Kwan O Road and Wan Po Road before reaching the PFRFs, sorting facilities or SENT landfill located in Tseung Kwan O Area 137 for disposal. No barging

point or conveyor system will be used in the Project. The frequency of trucks for waste disposal will not be more than 8 trucks per hour.

## **6.9 Evaluation of Residual Impacts**

With the implementation of the recommend mitigation measures for the handling, transportation and disposal of the identified waste arising, residual impacts are not expected for land decontamination works.

## **6.10 Environmental Monitoring and Audit**

It will be the contractor's responsibility to ensure that all waste produced during site clearance and decontamination works 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 WMP to be developed by the Contractor throughout the Project period. The WMP shall be prepared and implemented in accordance with ETWB TC (W) No. 19/2005 Environmental Management on Construction Site.

Throughout the project period, regular site inspection as part of the EM&A procedures should be carried out to determine if wastes are being managed in accordance with approved procedures and the WMP. Different aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal would be included in the programme.

## **6.11 Conclusion**

Wastes generated by the Project are likely to include C&D material from site clearance within the Project boundary, chemical waste from the maintenance of plant and equipment and from the decontamination process, as well as general refuse from the workforce. Provided that these identified waste arisings are handled, transported and disposed of using approved methods, and that the recommended good site practices are strictly followed, significant adverse environmental impacts would not be expected during the Project works.

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Table 6.1: Summary of Waste Handling Procedures & Disposal Routes

Waste Material Type	Generated from Works Item	Timing to be Generated for Each Re provisioning Option (Approximate)			Quantity Generated	Quantity Reused On-site	Quantity Disposed Off-site	Handling	Disposal
		A	B	C					
C&D material produced (Artificial Hard Materials)	Site clearance works and Excavation works, including the concrete slab	From 2015 to 2022, and from 2024 to 2028	From 2015 to 2022	From 2015 to 2019	18,367m <sup>3</sup>	-	18,367m <sup>3</sup>	Temporary stockpile on a designated area before disposal	To be disposed of at PFRFs for beneficial uses as last resort
C&D material produced (excavated soil not requiring treatment)	Excavation works	From 2015 to 2022, and from 2024 to 2028	From 2015 to 2022	From 2015 to 2019	65,479m <sup>3</sup>	51,479m <sup>3</sup> (Estimated volume only, subject to review by Contractor's WMP)	14,000m <sup>3</sup> (Estimated volume only, subject to review by Contractor's WMP)	Temporary stockpile on a designated area on-site before backfilling.	All excavated soil to be reused on-site as far as possible. (see Note below) Any surplus soil to be disposed of at PFRFs as last resort and should meet the most stringent RBRGs (i.e. Rural Residential / Urban Residential)
Non-inert C&D waste produced	Site clearance works	From 2015 to 2022, and from 2024 to 2028	From 2015 to 2022	From 2015 to 2019	58 m <sup>3</sup> and 196 trees	-	58 m <sup>3</sup> and 196 trees	Temporary stockpile on a designated area before disposal	To be disposed of at a licensed landfill.
Chemical waste	Lubrication oil, fuel etc. from operation, maintenance and servicing plant and equipment	From 2015 to 2022, and from 2024 to 2028	From 2015 to 2022	From 2015 to 2019	A few litres / month (preliminary estimate)	-	A few litres / month (preliminary estimate)	Recycle on-site or by licensed companies. Stored on-site within suitably designed containers	Chemical Waste Treatment Facility or other licensed facility
General refuse	Waste paper, food scraps, discarded containers, etc. generated from workforce	From 2015 to 2022, and from 2024 to 2028	From 2015 to 2022	From 2015 to 2019	65kg / day (preliminary estimate based on maximum workforce of 100)	-	65kg / day (preliminary estimate based on maximum workforce of 100)	Provide on-site refuse collection points	Refuse Transfer Station for compaction and containerisation to landfill

Note: Excavated soil not requiring decontamination from the area designated for "Public Parks/ Industrial" should only be backfilled at the area designated for "Public Parks/ Industrial" within the Project site.