

Contents

6.	Waste Management Implications	1
6.1	Legislation, Standards and Guidelines	1
6.2	General Principles	3
6.3	Construction Phase	5
6.4	Operational Phase	20
6.5	Environmental Monitoring and Audit	24
6.6	Conclusion	25

Tables

Table 6.1	Other Relevant Documents and Guidelines	3
Table 6.2	Summary of Estimated Generation of C&D Materials during Construction Phase	6
Table 6.3	Breakdown of Yearly Generation of C&D Materials during Construction Phase	7
Table 6.4	Locations of Waste Facilities for Waste Handling	10
Table 6.5	Summary of Estimated Waste Generation and Recommended Waste Management Arrangements and Transportation Routing during Construction Phase	12
Table 6.6	Summary of Estimated Waste Generation and Recommended Waste Management Arrangements and Transportation Routing during Operational Phase	22

Figures

<u>Figure 6.1</u>	Facilities for Storage, Collection and Transpiration of Waste
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6. Waste Management Implications

6.1 Legislation, Standards and Guidelines

6.1.1 General

6.1.1.1 The relevant legislation, standards and guidelines applicable to the study for the assessment of waste management implications include:

- Criteria and guidelines for evaluating and assessing waste management implications as specified in Annexes 7 and 15 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM);
- Waste Disposal Ordinance (WDO) (Cap. 354) and subsidiary Regulations;
- Land (Miscellaneous Provisions) Ordinance (Cap. 28);
- Public Health and Municipal Services Ordinance (Cap. 132) – Public Cleansing and Prevention of Nuisances Regulation; and
- Works Bureau Technical Circular (WBTC) No. 12/2000 Fill Management.

6.1.1.2 Relevant regulations under the WDO include:

- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C); and
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N).

6.1.2 Criteria and Guidelines for Evaluating and Assessing Waste Management Implications as specified in Annexes 7 and 15 of the EIAO-TM

6.1.2.1 Annex 7 of the EIAO-TM describes the criteria for assessing waste management implication which include provision of adequate waste handling, storage, collection, transfer, treatment and disposal facilities during both construction and operational phases, provision of adequate facilities to facilitate waste reduction, exploration of beneficial use of waste generated as well as alternatives which generate minimal amount of waste.

6.1.2.2 Annex 15 of the EIAO-TM describes the approaches and methodologies for assessment of waste management implications arising from the Project.

6.1.3 Waste Disposal Ordinance

6.1.3.1 The WDO prohibits any unauthorised disposal of wastes. Construction waste, defined under Cap. 354N of the WDO, refers to a substance, matter or thing which is generated from construction works. It includes all abandoned materials, whether processed or stockpiled or not, before being abandoned, but does not include sludge, screenings or matter removed or generated from desludging, desilting or dredging works.

6.1.3.2 Under the WDO, wastes can only be disposed of at designated waste disposal facilities licensed by Environmental Protection Department (EPD). Breach of this Ordinance can

lead to a fine and/ or imprisonment. The WDO also stipulates the requirements for issuing licenses for the collection and transportation of wastes.

6.1.4 Waste Disposal (Chemical Waste) (General) Regulation

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

6.1.5 Waste Disposal (Charges for Disposal of Construction Waste) Regulation

6.1.5.1 Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a Public Fill Reception Facility for disposal must consist entirely of inert material.

6.1.6 Land (Miscellaneous Provisions) Ordinance

6.1.6.1 The inert portion of construction and demolition (C&D) materials may be taken to Public Fill Reception Facilities (PFRFs) operated by the Civil Engineering and Development Department (CEDD). The 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.

6.1.6.2 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. 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.

6.1.7 Public Cleansing and Prevention of Nuisances Regulation

6.1.7.1 The regulation provides control on illegal dumping of wastes on unauthorised (unlicensed) sites.

6.1.8 Works Bureau Technical Circular No. 12/2000 Fill Management

6.1.8.1 WBTC No. 12/2000 explains how fill resources, C&D material, and dredged/excavated sediment disposal are managed.

6.1.9 Other Relevant Guidelines

6.1.9.1 The documents and guidelines shown in **Table 6.1** are also related to waste management and disposal applicable to the Project.

Table 6.1 Other Relevant Documents and Guidelines

Bureau / Department	Documents / Guidelines / Technical Circulars
Development Bureau	<ul style="list-style-type: none"> • WBTC No. 2/93, Public Dumps • WBTC No 2/93B, Public Filling Facilities • WBTC No. 16/96, Wet Soil in Public Dumps • WBTC Nos. 4/98 and 4/98A, Use of Public Fill in Reclamation and Earth Filling Projects • WBTC No. 19/2001, Metallic Site Hoardings and Signboards • WBTC No. 12/2002, Specifications Facilitating the Use of Recycled Aggregates • ADV-19, Practice Note for Authorized Persons and Registered Structural Engineers on Construction and Demolition Waste • DEVB TCW No. 06/2010, Trip-ticket System for Disposal of Construction and Demolition Materials • DEVB TCW No. 08/2010, Enhanced Specification for Site Cleanliness and Tidiness • DEVB TCW No. 09/2011, Enhanced Control Measures for Management of Public Fill • ETWB TCW No. 19/2005, Environmental Management on Construction Sites
CEDD	<ul style="list-style-type: none"> • Project Administration Handbook (PAH) for Civil Engineering Works, Chapter 4, Section 4.1.3 • CEDD TC No. 11/2019, Management of Construction and Demolition Materials
Environment and Ecology Bureau	<ul style="list-style-type: none"> • A Guide to the Chemical Waste Control Scheme • A Guide to the Registration of Chemical Waste Producers • Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes • Monitoring of Solid Waste in Hong Kong 2021

6.2 General Principles

6.2.1 Waste Management Hierarchy

6.2.1.1 The waste management hierarchy has been applied in the assessment and development of mitigation measures for waste. The waste management hierarchy is a concept which shows the desirability of various waste management methods and comprises the following in order of preference:

- Avoidance;
- Minimization;

- Recycling/reuse;
- Treatment; and
- Disposal.

6.2.2 Avoiding, Reducing, Reusing and Recycling Opportunities

6.2.2.1 All opportunities for avoiding, reducing, reusing and recycling of waste have been explored based on the following factors:

- Avoiding or minimizing sediment and waste generation throughout design, construction and operational phases;
- Adopting better management practices to promote segregation materials;
- Reusing and recycling on site or under other projects as far as practicable; and
- Diverting any C&D materials to PFRFs.

6.2.3 Analysis of Activities and Waste Generation

6.2.3.1 The quantity, quality and timing of the waste generation as a result of the construction activities of the Project and its associated works have been estimated, based on the sequence and duration of these activities.

6.2.3.2 The design, general layout, construction methods and programme to minimize the generation of inert C&D materials for the construction works have been considered.

6.2.3.3 The potential waste management implications associated with the handling, transportation and disposal of non-inert C&D materials arising from the construction works have been assessed with reference to the following approach:

- Estimation of the types, timing and quantities of the non-inert C&D materials to be generated; and
- Assessment of the potential waste management implications on the collection, transfer and disposal of non-inert C&D materials.

6.2.4 Proposal for Waste Management

6.2.4.1 Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generation, on-site or off-site reuse and recycling have been evaluated. Measures which can be taken in the design phase (e.g., modifying the design approach) and in the construction phase for maximising waste reduction have been separately considered.

6.2.4.2 After considering the opportunities for reducing waste generation and maximizing reuse, the types and quantities of the remaining wastes required to be disposed of have been estimated and the disposal options for each type of wastes have been described. The disposal method recommended for each type of wastes has taken into account the result of the assessment.

6.2.4.3 The impacts caused by handling (including labelling, packaging and storage), collection, and reuse/disposal of waste have been addressed and appropriate mitigation measures have been proposed.

6.3 Construction Phase

6.3.1 Identification and Evaluation of Waste Management Implications

6.3.1.1 During the construction phase, the main activities that will potentially generate waste include site clearance, site formation, excavation, tunnelling (e.g., drill-and-blast / drill-and-break and TBM method), demolition and construction of construction of superstructures. Typical waste types associated with these activities include:

- C&D materials;
- Chemical waste; and
- General refuse.

6.3.1.2 The reclamation scheme at the northeast corner of Tuen Mun Typhoon Shelter is no longer required, floating refuse and / or marine sediment will not be generated under this Project.

6.3.2 C&D Materials

6.3.2.1 C&D materials would be generated from construction works of the Project, including site clearance, site formation, construction of superstructures such as ventilation buildings, excavation from tunnelling works, as well as construction of other associated facilities. The C&D materials would mainly consist of inert C&D materials (i.e., excavated soil, rock, broken concrete), as well as relatively small amount of non-inert C&D materials (i.e., vegetation, timber, steel, etc). The C&D materials generated on site will be sorted into inert portion (i.e., public fill comprising excavated soil, rock and broken concrete) and non-inert portion (i.e., construction waste comprising vegetation, wood, plastics, packaging materials, etc).

6.3.2.2 Considerations have been made in devising construction method and planning the overall construction programme so as to minimise the generation of inert C&D materials, as discussed in **Section 2**. For example, for the tunnel construction at mainline alignment, Tunnel Boring Machine (TBM) method and drill-and-blast / drill-and-break method will be adopted rather than the conventional cut-and-cover method in order to minimise the generation of inert C&D materials from the associated excavation works. Furthermore, the inert C&D materials generated from the construction works of the Project will be reused on site and/or in other construction projects as far as practicable to minimise the quantities requiring delivery to the PFRFs (i.e., Tuen Mun Area 38 Fill Bank or Tseung Kwan O Area 137 Fill Bank).

6.3.2.3 Based on the latest engineering design scheme, it is estimated that a total of 3,187,704m³ of C&D materials will be generated during the construction of the Project. However, it should be noted that these quantities are initial estimates only that need to be further reviewed and updated at a later stage as the design progresses. A summary of the estimated generation of C&D materials (inert and non-inert) and the quantity to be re-used is presented in **Table 6.2**. Breakdown of the estimated generation of C&D materials (inert and non-inert) by years are shown in **Table 6.3**.

Table 6.2 Summary of Estimated Generation of C&D Materials during Construction Phase

Construction Activities	Inert C&D Materials (m ³) ^{[1][4]}			Non-inert C&D Materials (m ³) ^[2]
	Total Generated	Re-use On Site	Delivered Off-site ^[3]	
Temporary re-provisioning works of basketball court and public toilet	200	0	200	60
Provision of public parking area at Fung On Street	12	0	12	171
Site formation for the Southern Portal	237,500	10,000	227,500	12,500
Site formation for Wah Fat playground and the temporary adit	169,400	0	169,400	11,000
Site formation for the Northern Portal	572,105	3,000	569,105	20
TBM Tunnel	850,600	0	850,600	0
Reduced drill-and-blast / drill-and-break tunnel under Sam Shing	177,800	0	177,800	0
Construction of the Middle Ventilation Building and associated works	121,117	0	121,117	0
Drill-and-blast Tunnel from Wah Fat playground worksite	406,400	8,750	397,650	0
Drill-and-blast / drill-and-break from Lam Tei Quarry worksite	609,600	8,750	600,850	0
Underground magazine at Lam Tei Quarry	14,220	0	14,220	0
Magazine at Siu Lam	250	0	250	70
Magazine at Pillar Point	250	0	250	70
System Installation for Mechanical, electrical and plumbing (MEP), Electrical & Mechanical (E&M) and Traffic Control Surveillance System (TCSS)	0	0	0	95
Set up of slurry treatment plant and barging point from pre-casted materials	0	0	0	0
Set up of the overhead conveyor belt	4,264	0	4,264	0
Total:	3,163,718	30,500	3,133,218	23,986

Notes:

[1] "Inert C&D Material", also known as public fill, includes excavated soil, debris, rubble, earth and concrete which is suitable for land reclamation and site formation. Inert C&D Materials also include gravels, sands and filter cake to be generated from the slurry treatment plant.

- [2] “Non-inert C&D Material” involved in the Project includes vegetation, timber and steel. In contrast to public fill, non-inert waste is not suitable for land reclamation and subject to recovery of reusable/ recyclable items, is disposed of at landfills.
- [3] Surplus inert C&D materials will be delivered to PFRFs or to other construction projects with potential fill demand
- [4] In-situ volume is used.

Table 6.3 Breakdown of Yearly Generation of C&D Materials during Construction Phase

C&D Materials		Estimated Quantity Generated (m ³) ^{[5][6]}						Total
		2025	2026	2027	2028	2029	2030	
Inert C&D Material ^[1]	Soft Inert Material ^[3]	20,480	126,314	40,684	0	0	0	187,478
	Rock	90,905	542,561	856,915	1,222,166	263,619	0	2,976,166
	AHM ^[4]	12	0	0	0	62	0	74
Non-inert C&D Material ^[2]	Top Soil	1,435	7,850	2,650	0	0	0	11,935
	Vegetation	1,421	7,840	2,640	0	0	0	11,901
	Timber	0	0	0	0	0	0	0
	Steel	0	0	0	0	55	0	55
	Packaging	0	15	15	15	25	25	95

Notes:

- [1] “Inert C&D Material”, also known as public fill, includes debris, rubble, earth and concrete which is suitable for land reclamation and site formation.
- [2] “Non-inert C&D Material” involved in the Project includes top soil, vegetation, timber, steel and packing waste (including plastic and paper etc.). In contrast to public fill, non-inert waste is not suitable for land reclamation and subject to recovery of reusable/ recyclable items, is disposed of at landfills.
- [3] “Soft Inert C&D Material” mainly refers to excavated soil, etc.
- [4] “AHM (Artificial hard materials)” includes, but not limited to, broken concrete, asphalt, bitumen, granular materials, debris, and rubble, etc.
- [5] In-situ volume is used.
- [6] Testing and commissioning works of E&M and TCSS will be carried out during Q4 of 2030 to Q3 of 2033 generation, of C&D waste is expected to be minimal.

6.3.2.4 The surplus inert C&D materials will be delivered to PFRFs for future reuse by other construction projects, or directly to other construction projects with potential fill demand for beneficial reuse. For non-inert C&D materials, the non-recyclables will be delivered to landfills (i.e., West New Territories (WENT) Landfill or the proposed WENT Landfill Extension) for disposal, while the recyclables will be sent to the recyclers for recycling.

6.3.2.5 Mitigation measures for C&D materials are detailed in **Section 6.3.7.1** to **Section 6.3.7.10**. Provided that the mitigation measures are adopted, no adverse environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) associated with C&D materials are expected.

6.3.3 Chemical Waste

6.3.3.1 Materials classified as chemical wastes are listed in the Waste Disposal (Chemical Waste) (General) Regulation. The major chemical waste types arising from the construction sites may include the followings:

- Scrap batteries;
- Spent hydraulic oil and waste fuel;
- Spent lubrication oil and cleaning fluids from mechanical machinery; and
- Spent solvent from equipment cleaning activities.

6.3.3.2 Chemical waste may pose the following potential environmental, health and safety hazards if not stored and disposed of appropriately:

- Toxic effects to workers;
- Adverse impacts on water quality from spills and associated adverse impacts on freshwater biota; and
- Fire hazards.

6.3.3.3 Chemical waste may be generated any time throughout the construction phase of the Project (i.e., 102 months). It is difficult to quantify the amount of chemical waste as it will be highly dependent on the Contractor's on-site maintenance practice and the quantities of plant and vehicle utilized. Nevertheless, it is anticipated that the quantity of chemical waste, such as lubricating oil and solvent produced from plant maintenance, will be in the order of few hundreds litres per month.

6.3.3.4 Storage, handling, transport and disposal of chemical waste should be arranged in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Waste published by the EPD. Chemical waste should be collected by a licensed collector and to be disposed of to the Chemical Waste Treatment Centre (CWTC) in Tsing Yi. Opportunities for the reuse and recycling of materials will be taken wherever possible. Mitigation measures for chemical wastes are detailed in **Section 6.3.7.11** to **Section 6.3.7.12**. Provided that the handling, storage and disposal of chemical waste are in accordance with these requirements, potential environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

6.3.4 General Refuse

6.3.4.1 The construction workforce would generate refuse comprising food wastes, waste paper, aluminium cans and plastic bottles during construction period.

6.3.4.2 The storage of general refuse may give rise to adverse environmental impacts. These would include water quality, odour and visual impact in the form of windblown litter. The construction site 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 the approved disposal facilities could also lead to similar adverse impacts to those sites.

6.3.4.3 The number of workforce to be employed for the Project is not available at this stage, but it anticipated to be about 2,500 workforce at peak time for the Project. Based on the generation rate of 0.65 kg/person/day, the total refuse generated per day would be about 1,625 kg/day. General refuse will be produced any time throughout the construction phase of the Project (i.e., 102 months).

6.3.4.4 The non-recyclable refuse will be placed in bags and stored in enclosed containers and disposed of at the landfills (i.e., WENT Landfill or proposed WENT Landfill Extension) on a daily basis. The recyclables collected will be sent to the recyclers regularly for off-site recycling.

6.3.4.5 Mitigation measures for general refuse are detailed in **Section 6.3.7.13** to **Section 6.3.7.14**. Provided that the mitigation measures are adopted, the potential environmental impacts caused by the storage, handling, transport and disposal of general refuse the associated adverse environmental impact is not anticipated.

6.3.5 General Mitigation Measures

6.3.5.1 The mitigation measures for construction phase are recommended based on the waste management hierarchy principles. Recommendations of good site practices, waste reduction measures as well as the waste storage, collection and transportation are described in the following sub-sections.

Good Site Practices

6.3.5.2 Adverse waste management implications are not expected, provided that good site practices are strictly implemented. The following good site practices are recommended throughout the construction activities:

- Nomination of an approved personnel, such as a site manager, to be responsible for the implementation of 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 site cleanliness, appropriate waste management procedures and concepts of waste reduction, reuse and recycling;
- Provision of sufficient waste disposal points and regular collection for disposal;
- Appropriate measures to minimize 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;
- Provision of wheel washing facilities at site exit before the trucks leave the works areas to minimize dust disturbance due to the trucks transportation to the public road network; and
- The Contractor should prepare a Waste Management Plan (WMP) as part of the Environmental Management Plan (EMP) in accordance with the ETWB TC(W) No. 19/2005. The WMP should be submitted to the Project Manager or Project Manager's Representative (PMR) for approval.

Waste Reduction Measures

6.3.5.3 Amount of waste generation can be significantly reduced through good management and control. Waste reduction is best achieved at the planning and design phase, as well as by ensuring the implementation of good site practices. The following recommendations are proposed to achieve reduction:

- Segregate and store different types of waste in different containers, skip or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Proper storage and good site practices to minimize the potential for damage and contamination of construction materials;
- Plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste;
- Sort out demolition debris and excavated materials from demolition works to recover reusable/ recyclable portions (i.e., soil, broken concrete, metal etc.); and
- Provide training to workforce on the importance of appropriate waste management procedures, including waste reduction, reuse and recycling.

Storage, Collection and Transportation of Waste

- 6.3.5.4 Three spoil storage area would be set up at the Wah Fat Playground Works Area, near the slurry treatment plant at southern portal work front and at the barging facilities at TM-CLKT Northern Landfall for temporary storage of inert C&D materials generated from drill-and-blast / drill-and-break tunnelling, TBM tunnelling and other construction works.
- 6.3.5.5 Slurry acts a transportation medium and for excavation face support during TBM tunnelling. A temporary Slurry Treatment Plant (STP) would be set up at the southern portal work front to treat, dewater and process the excavated material. Gravels, sands and filter cake will be generated from the STP and are considered as inert C&D waste. For the delivery method/route of the slurry generated from the TBM to the STP, slurry pipes will be adopted and it will all fall within the project area.
- 6.3.5.6 The spoils from STP will be either transported via trucks or an overhead conveyor belt to the barging point for disposal. The conveyor belt will be put in place, installed across Lung Mun Road, along Ho Fuk Street, Ho Yeung Street, front section of TMB-CLK Northern Landfall and connecting to the proposed barging points. The conveyors will be operating during the construction working hours transporting spoils. The proposed volume to be transported is 6,000 tonnes a day.
- 6.3.5.7 Locations of the mentioned waste facilities are summarized in **Table 6.4** and presented in **Figure 6.1**.

Table 6.4 Locations of Waste Facilities for Waste Handling

Site Location	Type of Waste Handling/ Waste Facilities
Works area at Wat Fat Playground, works area at Southern Portal and TM-CLKT Northern Landfall.	Spoil storage area
Southern portal work front (at the former TM-CLKT site office)	Slurry treatment plant and slurry pipe
Across Lung Mun Road, along Ho Fuk Street, Ho Yeung Street, front section of TMB-CLKT Northern Landfall connecting to the proposed barging points.	Conveyor belt
TM-CLKT Northern Landfall	Barging points

6.3.5.8 Storage of waste on site may induce adverse environmental implications if not properly managed. The following recommendations should be implemented to minimize the impacts:

- Maintain and clean storage areas routinely;
- Non-inert C&D materials such as top soil should be handled and stored well to ensure secure containment of the materials;
- Spoil storage area should be provided with covers and water spraying system to prevent materials from wind-blown or being washed away;
- Different locations should be designated to stockpile each material to enhance reuse; and
- Conveyor belt systems should be fully enclosed and equipped with water spray to suppress dust generation.
- Slurry treatment plant will be fully enclosed by a noise enclosure, which would help in alleviating the dust impact.

6.3.5.9 The collection and transportation of waste from works areas to respective disposal sites may also induce adverse environmental impacts if not properly managed. The following recommendations should be implemented to minimize the impacts:

- Remove waste in timely manner;
- Employ the trucks with cover or enclosed containers for waste transportation;
- Obtain relevant waste disposal permits from the appropriate authorities; and
- Disposal of waste should be done at licensed waste disposal facilities.

6.3.5.10 All dump trucks and vessels engaged on site should be equipped with Global Positioning System (GPS) or equivalent automatic system for real time tracking and monitoring of their travel routings and parking locations to prohibit illegal dumping and landfilling of C&D materials.

6.3.6 Summary of Waste Generation, Proposed Waste Management Arrangements and Transportation Routing during Construction Phase

6.3.6.1 The estimated waste generation, proposed waste management arrangements, the tentative transportation route and estimated truck/vessel trips for different identified waste types during the construction phase is summarized in **Table 6.5**. The Contractor will be requested to use the suitable route to transport waste generated from the Project (e.g. inert and non-inert C&D materials, chemical waste and general refuse etc.) to the dedicated treatment facilities/ disposal sites (i.e. PFRFs, WENT Landfill/ proposed WENT Landfill Extension and CWTC) for beneficial reuse or disposal.

Table 6.5 Summary of Estimated Waste Generation and Recommended Waste Management Arrangements and Transportation Routing during Construction Phase

Type of Waste	Waste Generated	Approx. Quantity and Timing of Generation	Waste Management Arrangements	Tentative Transportation Routings to Disposal Sites	Peak Frequency of trips
C&D materials	Inert C&D materials (e.g., excavated soil, rock, broken concrete)	3,163,718m ³ (2025 to 2029)	<p><u>Re-provisional works / site formation</u></p> <ul style="list-style-type: none"> On-site reuse: 13,000m³ Sent to Tuen Mun Area 38 Fill Bank: 966,217m³ <p><u>Works for Magazine Sites</u></p> <ul style="list-style-type: none"> On-site reuse: 0m³ Sent to Tuen Mun Area 38 Fill Bank: 14,720m³ <p><u>Shallow Foundation of the Overhead Conveyor Belt</u></p> <ul style="list-style-type: none"> On-site reuse: 0m³ Sent to Tuen Mun Area 38 Fill Bank: 4,264m³ 	<p><u>Southern Portal Area:</u></p> <ul style="list-style-type: none"> Via Lung Fu Road, Lung Mun Road <p><u>Northern Portal Area:</u></p> <ul style="list-style-type: none"> Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Wong Chu Road, Lung Fu Road, Lung Mun Road <p><u>Excavation / slopes works at Wah Fat Playground Works Area and adit excavation:</u></p> <ul style="list-style-type: none"> Via Hoi Wing Road, Hoi Wong Road, Wu Shan Road, Lung Mun Road <p><u>Lam Tei Quarry Magazine Site</u></p> <ul style="list-style-type: none"> Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Wong Chu Road, Lung Fu Road, Lung Mun Road <p><u>Siu Lam Magazine Site</u></p> <ul style="list-style-type: none"> Via rural roads, Kwun Fung Street, Castle Peak Road-Tai Lam, Hoi Wing Road, Wu Shan Road, Lung Mun Road <p><u>Pillar Point Magazine Site</u></p> <ul style="list-style-type: none"> Via rural roads, Mong Wing Street, Wong Tat Street, Lung Mun Road 	~116 trucks/day

Type of Waste	Waste Generated	Approx. Quantity and Timing of Generation	Waste Management Arrangements	Tentative Transportation Routings to Disposal Sites	Peak Frequency of trips
				<u>Overhead conveyor belt at Ho Fuk, Ho Yeung Street and Ho Yat Street</u> <ul style="list-style-type: none"> Via Ho Fuk Street / Ho Yeung Street, Ho Wan Street, Lung Mun Road 	
			<u>Tunnel and building construction</u> <ul style="list-style-type: none"> On-site reuse: 17,500m³ Sent to barging points at TM-CLKT Northern Landfall and then to PFRFs (i.e., Tseung Kwan O Area 137 Fill Bank): 2,148,017m³ 	<u>TBM Tunnels and building works:</u> <ul style="list-style-type: none"> Via Ho Yat Street, Ho Wo Street Via conveyor belt for C&D materials generated from TBM tunnels (alternative) <u>Construction of tunnels and building works (Lam Tei Workfront):</u> <ul style="list-style-type: none"> Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Wong Chu Road, Lung Fu Road, Lung Mun Road, Ho Suen Street, Ho Yeung Street, Ho Yat Street, Ho Wo Street <u>Construction of tunnels and building works (Wah Fat Workfront):</u> <ul style="list-style-type: none"> Via Hoi Wing Road, Hoi Wong Road, Wu Shan Road, Lung Mun Road, Ho Suen Street, Ho Yeung Street, Ho Yat Street, Ho Wo Street <u>Barging Points at TM-CLKT Northern Landfall to PFRFs (i.e. Tseung Kwan O Area 137 Fill Bank):</u> <ul style="list-style-type: none"> Via Castle Peak Fairway, Ha Pang Fairway, Ma Wan Fairway, Western 	<p>~500 trucks/day (to barging points)</p> <p>Transporting volume via conveyor belt is 6,000 tonnes / day</p> <p>~6 barges/day (tentatively proposed to be delivered to PFRFs operated by CEDD, such as Tseung Kwan O Area 137 Fill Bank, for later use by other projects, subjected to the consideration</p>

Type of Waste	Waste Generated	Approx. Quantity and Timing of Generation	Waste Management Arrangements	Tentative Transportation Routings to Disposal Sites	Peak Frequency of trips
				Fairway, Northern Fairway, Central Fairway, Hung Hum Fairway, Eastern Fairway, Tathong Channel	of the contractor in construction stage)
	Non-inert C&D materials (e.g. vegetation, wood, plastics, cardboard)	23,986m ³ (2025 to 2027, 2029 to 2030)	<ul style="list-style-type: none"> On-site segregation and off-site recycling for recyclables Disposed of at landfill sites for non-recyclables (i.e. WENT Landfill or proposed WENT Landfill Extension) 	<p><u>Southern Portal Area:</u></p> <ul style="list-style-type: none"> Via Lung Fu Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road <p><u>Northern Portal Area:</u></p> <ul style="list-style-type: none"> Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Wong Chu Road, Lung Fu Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road <p><u>Site formation at Wah Fat Playground and adit excavation:</u></p> <ul style="list-style-type: none"> Via Hoi Wing Road, Hoi Wong Road, Wu Shan Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road 	~8 trucks/day
Chemical waste	Scrap batteries, spent hydraulic oil, waste fuel, spent lubrication oil, cleaning fluids, spent solvent from cleaning activities	Few hundred litres per month (2025 to 2033)	<ul style="list-style-type: none"> Disposed of at CWTC or other licensed chemical waste treatment facilities 	<p><u>Southern Portal Area:</u></p> <ul style="list-style-type: none"> Via Lung Fu Road, Wong Chu Road, Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road <p><u>Northern Portal Area:</u></p> <ul style="list-style-type: none"> Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road 	~1 truck/day

Type of Waste	Waste Generated	Approx. Quantity and Timing of Generation	Waste Management Arrangements	Tentative Transportation Routings to Disposal Sites	Peak Frequency of trips
				<p><u>Site formation at Wah Fat Playground and adit excavation:</u></p> <ul style="list-style-type: none"> • Via Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road <p><u>TBM Tunnels and building works:</u></p> <ul style="list-style-type: none"> • Via Ho Wo Street, Ho Yat Street, Ho Yeung Street, Ho Suen Street, Lung Mun Road, Lung Fu Road, Wong Chu Road, Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road <p><u>Construction of tunnels and building works (Lam Tei Workfront):</u></p> <ul style="list-style-type: none"> • Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road <p><u>Construction of tunnels and building works (Wah Fat Workfront):</u></p> <ul style="list-style-type: none"> • Via Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road 	

Type of Waste	Waste Generated	Approx. Quantity and Timing of Generation	Waste Management Arrangements	Tentative Transportation Routings to Disposal Sites	Peak Frequency of trips
General refuse	Food waste, plastic bottles, aluminium cans and waste papers from construction workers	1,625kg/day (2025 to 2033)	<ul style="list-style-type: none"> On-site segregation and off-site recycling for recyclables Disposed of at landfill sites for non-recyclables (i.e. WENT Landfill or proposed WENT Landfill Extension) 	<p><u>Southern Portal Area:</u></p> <ul style="list-style-type: none"> Via Lung Fu Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road <p><u>Northern Portal Area:</u></p> <ul style="list-style-type: none"> Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Wong Chu Road, Lung Fu Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road <p><u>Wah Fat Playground Works Area and adit excavation:</u></p> <ul style="list-style-type: none"> Via Hoi Wing Road, Hoi Wong Road, Wu Shan Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road <p><u>TBM Tunnels and building works:</u></p> <ul style="list-style-type: none"> Via Ho Wo Street, Ho Yat Street, Ho Yeung Street, Ho Suen Street, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road <p><u>Construction of tunnels and building works (Lam Tei Workfront):</u></p> <ul style="list-style-type: none"> Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Wong Chu Road, Lung Fu Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road 	~1 truck/day

Type of Waste	Waste Generated	Approx. Quantity and Timing of Generation	Waste Management Arrangements	Tentative Transportation Routings to Disposal Sites	Peak Frequency of trips
				<u>Construction of tunnels and building works (Wah Fat Workfront):</u> <ul style="list-style-type: none"> • Via Hoi Wing Road, Hoi Wong Road, Wu Shan Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road 	

6.3.6.2 In addition to the above measures, other specific mitigation measures on handling the C&D materials, chemical waste and general refuse generated from construction phase are recommended in the following sub-sections.

6.3.7 Mitigation Measures for Waste Identified

Mitigation Measures for C&D Materials

6.3.7.1 During design phase, a Construction and Demolition Material Management Plan (C&DMMP) will be prepared in accordance with Section 4.1.3 “Construction and Demolition Materials” of the Project Administration Handbook for Civil Engineering Works and will be submitted together with the EIA Report to the department Vetting Committee for endorsement and then to Public Fill Committee (PFC) for approval.

6.3.7.2 Wherever practicable, C&D materials should be segregated from other wastes to avoid contamination and ensure acceptability at PFRFs or reclamation sites. The following mitigation measures should be implemented in handling the excavated and C&D materials:

- Carry out on-site sorting;
- Make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate; and
- Implement a trip-ticket system for each works contract in accordance with DEVB TC(W) No. 6/2010 to ensure that the disposal / handling of C&D materials is properly documented and verified, so as to avoid the illegal dumping and landfilling of C&D materials.

6.3.7.3 Details of the recommended on-site sorting and reuse of C&D materials is given below:

On-site Sorting of C&D Materials

6.3.7.4 Spoil storage area would be located within the site during construction phase for temporary storage of inert C&D materials.

6.3.7.5 All C&D materials arising from the construction would be sorted on-site to recover the inert C&D materials, and reusable and recyclable materials prior to disposal off-site as far as practicable. Non-inert portion of C&D materials should also be reused whenever possible and be disposed of at landfills as a last resort.

6.3.7.6 The Contractor would be responsible for devising a system to work for on-site sorting of C&D materials and promptly remove all sorted and processed material arising from the construction activities to minimise temporary stocking on-site. It is recommended that the system should include the identification of the source of generation, estimated quantity, arrangement for on-site sorting and/ or collection, temporary storage areas, and frequency of collection by recycling contractor or frequency of removal off-site.

Reuse of C&D Materials

6.3.7.7 The following potential measures should be explored to maximize the reuse/ recycle of C&D materials generated from the Project:

- Reuse suitable inert C&D materials on-site as far as practicable;
- Reuse suitable excavated rock by reworking at approved quarries (e.g., crushed as aggregates);
- Sorting of demolition debris and excavated materials from demolition works to recover reusable/ recyclable portions (e.g., soil, broken concrete, metal); and
- Protect recyclable material to keep it in usable condition.

Specification of Inert C&D Materials to be Delivered Off-site

6.3.7.8 In case there are surplus inert C&D materials generated in the Project and are required to be delivered to the PFRFs, the inert C&D materials should fulfil the following requirements:

- Reclaimed asphalt pavement should not be mixed with other materials when delivered to the PFRFs;
- Moisture content of inert C&D materials should be lowered to 25% max. when delivered to the PFRFs;
- Inert C&D materials delivered to the PFRFs should be of a size less than 200mm; and
- Inert construction waste should not be in liquid form such that it can be contained and delivered by dump truck instead of tanker truck. Inert C&D materials in liquid form should be solidified before delivering to the PFRFs.

6.3.7.9 Nevertheless, the acceptance criteria of inert C&D materials to PFRFs are subject to the advice by the Public Fill Committee.

Use of Standard Formwork and Planning of Construction Materials Purchasing

6.3.7.10 Standard formwork should also be used as far as practicable in order to minimise the arising of non-inert C&D waste. The use of more durable formwork (e.g. metal hoarding) or plastic facing should be encouraged in order to enhance the possibility of recycling. The purchasing of construction materials should be carefully planned in order to avoid over ordering and wastage.

Mitigation Measures for Chemical Waste

6.3.7.11 For those processes which generate chemical waste, it may be possible to find alternatives to eliminate the use of chemicals, to reduce the generation quantities or to select a chemical type of less impact on environment, health and safety as far as possible. Wherever possible, opportunities for the reuse and recycling of materials will be taken.

6.3.7.12 If chemical wastes are produced at the construction site, the Contractor should register with EPD as chemical waste producers. Storage, handling, transport and disposal of chemical waste should be arranged in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published by the EPD. Chemical waste should be stored in appropriate containers and collected by a licensed chemical waste collector. Chemical wastes (e.g. spent lubricant oil) should be recycled at an appropriate facility as far as possible, while the chemical waste that cannot be recycled

should be disposed of at either the CWTC, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

Mitigation Measures for General Refuse

- 6.3.7.13 General refuse should be stored in enclosed bins separately from construction and chemical wastes. Recycling bins should also be placed to encourage recycling. Preferably enclosed and covered areas should be provided for general refuse collection and routine cleaning for these areas should also be implemented to keep areas clean. A reputable waste collector should be employed to remove general refuse on a daily basis. Arrangements should be made with the recycling companies to collect the recycle waste as required. It is expected that such arrangements would minimize potential environmental impacts.
- 6.3.7.14 The Contractor should implement an education programme for workforce relating to avoiding, reducing, reusing and recycling general refuse. Participation in a local collection scheme should be considered by the Contractor to facilitate waste reduction.

6.3.8 Residual Waste Management Implications

- 6.3.8.1 With the implementation of recommended mitigation measures, adverse residual waste management implications and impacts on potential hazard, air and odour emissions, noise, wastewater discharge and public transport caused by handling (including stockpiling, labelling, packaging & storage), collection, transportation and reuse/ disposal of different types of waste are not anticipated for the construction phase.

6.4 Operational Phase

6.4.1 Identification and Evaluation of Waste Management Implications

- 6.4.1.1 During the operational phase, the tunnel ventilation buildings and administration buildings will generate the following wastes:
- Chemical waste; and
 - General refuse.

6.4.2 Chemical Waste

- 6.4.2.1 Lubricants, paints, used batteries, mineral oil, coolants, solvents, cleansing materials (such as wiping cloth), scrap metals and discarded maintenance parts will be generated during the operational phase within the administration buildings and ventilation buildings as well as maintenance of the tunnel. The amount of chemical waste that will arise from the maintenance activities is expected to be small (i.e. a few hundred litres per month). Used fluorescent tubes in a large quantity would be handled as chemical waste in accordance with "A Guide to Waste Producers for Handling and Disposing Spent Mercury-Containing Lamps". These wastes may pose significant environmental, health and safety hazard if they are not properly managed.
- 6.4.2.2 The requirements given in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes should be followed in handling of these chemical wastes. A trip-ticket system should be operated in accordance with the Waste Disposal (Chemical Waste) (General) Regulation to monitor all movements of chemical wastes which will be

collected by a licensed collector to a licensed facility (i.e. CWTC) for final treatment and disposal.

6.4.3 General Refuse

6.4.3.1 General refuse will arise from the employees within mainly the administration buildings, and partly from the tunnel ventilation buildings. General refuse would include food, paper, wood, plastic, metal containers, etc. The storage and handling of these wastes may give rise to environmental impacts. As a worst case scenario, assuming staff of all shifts are present on site at the same time, the total number of personnel is estimated to be no more than 200. With a general refuse generation rate of 0.65kg per worker per day, the maximum amount of general refuse to be generated during the operational phase will be about 130 kg per day.

6.4.3.2 Recyclable materials (e.g. paper, plastic bottles, glass bottles, and aluminium cans) will be segregated on site as far as practicable for off-site recycling, while the remaining non-recyclable refuse will be delivered to the landfills (i.e. WENT Landfill or proposed WENT Landfill Extension) for disposal on a daily basis.

6.4.3.3 A reputable waste collector should be employed to remove general refuse from the associated facilities, separately from chemical wastes, on a daily basis to minimise odour, pest and litter impacts.

6.4.4 Summary of Waste Generation, Proposed Waste Management Arrangements and Transportation Routing during Operational Phase

6.4.4.1 The estimated waste generation, proposed waste management arrangements, the tentative transportation route and estimated truck trips for different identified waste types during the operational phase is summarized in **Table 6.6**.

Table 6.6 Summary of Estimated Waste Generation and Recommended Waste Management Arrangements and Transportation Routing during Operational Phase

Type of Waste	Waste Generated	Approx. Quantity and Timing of Generation	Waste Management Arrangements	Tentative Transportation Routings to Disposal Sites	Peak Frequency of trips
Chemical waste	Lubricants, paints, used batteries, mineral oil, coolants, solvents, cleansing materials (such as wiping cloth), scrap metals and discarded maintenance parts from operational and maintenance activities. Used fluorescent tubes in a large quantity.	Few hundred litres per month (throughout operational phase)	<ul style="list-style-type: none"> Disposed of at CWTC or other licensed chemical waste treatment facilities 	<ul style="list-style-type: none"> Via Lung Fu Road, Wong Chu Road, Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road Via Ho Wo Street, Ho Yat Street, Ho Yeung Street, Ho Suen Street, Lung Mun Road, Lung Fu Road, Wong Chu Road, Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road Via Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Tsing Long Highway, Tsing Sha Highway, Tsing Yi Road 	~1 truck/day
General refuse	Food waste, plastic bottles, aluminium cans and waste papers from highway / tunnel operational and maintenance facilities and ventilation buildings	Daily generation of ~130 kg (throughout operational phase)	<ul style="list-style-type: none"> On-site segregation and off-site recycling for recyclables Disposed of at landfill sites for non-recyclables (i.e. WENT Landfill or proposed WENT Landfill Extension) 	<p><u>Southern highway / tunnel operational and maintenance facilities (i.e. administration building and southern ventilation building etc.):</u></p> <ul style="list-style-type: none"> Via Lung Fu Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road 	~1 trucks/day

Type of Waste	Waste Generated	Approx. Quantity and Timing of Generation	Waste Management Arrangements	Tentative Transportation Routings to Disposal Sites	Peak Frequency of trips
				<p><u>Northern highway / tunnel operational and maintenance facilities (i.e. administration building, northern ventilation building satellite building etc.):</u></p> <ul style="list-style-type: none"> • Via To Lai Road, Castle Peak Road-Lam Tei, Tuen Mun Road, Wong Chu Road, Lung Fu Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road <p><u>Middle Ventilation Building:</u></p> <ul style="list-style-type: none"> • Via Hoi Wing Road, Hoi Wong Road, Wu Shan Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road 	

6.4.5 Mitigation Measures for Waste Identified

Mitigation Measures for Chemical Waste

- 6.4.5.1 The requirements given in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes should be followed, where applicable, in handling of these chemical wastes. A trip-ticket system should be operated in accordance with the Waste Disposal (Chemical Waste) (General) Regulation to monitor all movements of chemical wastes which would be collected by a licensed collector to a licensed facility for final treatment and disposal.
- 6.4.5.2 If chemical wastes are produced at the operating sites, the Contractor should register with EPD as chemical waste producers. Storage, handling, transport and disposal of chemical waste should be arranged in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published by the EPD. Chemical waste should be stored in appropriate containers and collected by a licensed chemical waste collector. Chemical wastes (e.g., spent lubricant oil) should be recycled at an appropriate facility as far as possible, while the chemical waste that cannot be recycled should be disposed of at either the CWTC, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

Mitigation Measures for General Refuse

- 6.4.5.3 A reputable waste collector should be employed to remove general refuse generated from administration buildings and ventilation buildings on a daily basis to minimise odour, pest and litter impacts. Arrangements should be made with the recycling companies to collect the recycle waste as required. It is expected that such arrangements would minimize potential environmental impacts.

6.4.6 Residual Waste Management Implications

- 6.4.6.1 With the implementation of recommended mitigation measures, adverse residual waste management implications and impacts on potential hazard, air and odour emissions, noise, wastewater discharge and public transport caused by handling (including stockpiling, labelling, packaging & storage), collection, transportation and reuse/ disposal of different types of waste are not anticipated for the operational phase.

6.5 Environmental Monitoring and Audit

- 6.5.1.1 It is recommended that regular site inspections and audits (i.e., on a weekly basis) of the waste management practices would be carried out during the construction phase to determine if wastes are being managed in accordance with the recommended good site practices and WMP. The audits will investigate all aspects of waste management including waste generation, storage, handling, recycling, transportation and disposal. Monitoring of the implementation of the trip ticket system for disposal of C&D materials in accordance with DEVB TC(W) No. 6/2010 is also recommended.
- 6.5.1.2 Environmental monitoring and audit related to waste management is not required during the operational phase of the Project.

6.6 Conclusion

6.6.1 Construction Phase

6.6.1.1 Potential waste management implications from the generation of waste during the construction phase have been evaluated. General mitigation measures of good site practices, waste management measures and strategic mitigation measures, including the opportunity for on-site sorting, reusing C&D materials, etc., are devised to minimise the surplus materials to be disposed. Recommendations have been made for implementation by the Contractor during the construction period to minimise waste generation and off-site disposal.

6.6.2 Operational Phase

6.6.2.1 The types of waste that would be generated during the operational phase have also been assessed. Recommendations have been made to ensure proper treatment and disposal of these wastes. Appropriate waste collector would be employed to handle general refuse, chemical waste generated during operational phase respectively.