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7. WASTE MANAGEMENT IMPLICATIONS

7.1 Introduction

7.1.1.1 This section identifies the types of waste that are likely to be generated during the construction and operation phases of the Project and evaluates the potential waste management implications that may result from waste generated during these phases.

7.1.1.2 Mitigation measures and good site practices, including waste handling, storage and disposal, have been recommended with reference to relevant waste legislation and management guidelines.

7.1.1.3 The waste management implications have been assessed in accordance with the requirements outlined in Annex 7 and Annex 15 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) as well as the requirements set out under Clause 3.4.7 of the EIA Study Brief (No. ESB-340/2021).

7.2 Environmental Legislation, Standards and Guidelines

7.2.1 Overview

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

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

Waste Disposal Ordinance (Cap. 354)

7.2.1.2 The *Waste Disposal Ordinance (WDO) (Cap. 354)* prohibits any unauthorised disposal of waste. Construction waste defined under Cap. 354N of the *WDO*, refers to a substance, matter or thing that 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. Under the *WDO*, waste can be disposed of only at designated waste disposal facilities licenced by EPD.

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

7.2.1.3 Under the WDO, the *Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C)* provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. EPD has also issued three statutory guidelines:

- *A Guide to the Chemical Waste Control Scheme* (2016) to introduce and explain the legislative controls over the management of chemical waste in Hong Kong;
- *A Guide to the Registration of Chemical Waste Producers* (2016) to introduce the registration provisions of the Waste Disposal (Chemical Waste) (General) Regulation (the Regulation) and the procedure for identifying chemical waste generation; and
- the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* (1992), which details how the chemical waste producers should comply with the regulations on chemical waste.

Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)

7.2.1.4 Construction waste as defined under the *Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap.354N)* includes any substance, matter or thing that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned, but does not include any sludge, screening or matter removed in or generated from any desludging, desilting or dredging works. This Regulation stipulated that 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; whereas construction waste delivered to a public fill reception facility for disposal must consist entirely of inert material.

Land (Miscellaneous Provisions) Ordinance (Cap. 28)

7.2.1.5 The inert portion of construction and demolition (C&D) materials (including rocks, soil, broken concrete, building debris, etc.) may be taken to public filling facilities including public filling areas, public filling barging points and stockpiling areas. These facilities usually form part of land reclamation schemes and are operated by the Civil Engineering & Development Department (CEDD).

7.2.1.6 The *Land (Miscellaneous Provisions) Ordinance (Cap. 28)* requires that individuals or companies who deliver public fill to the public filling facilities to obtain Dumping Licences. The licences are issued by CEDD under delegated authority from the Director of Lands.

Public Health and Municipal Services Ordinance (Cap. 132)

7.2.1.7 The Public Cleansing and Prevention of Nuisances Regulation under the *Public Health and Municipal Services Ordinance (Cap. 132)* provides control on dumping of litter in public places.

7.2.2 Other Relevant Guidelines

7.2.2.1 The following guidelines are also relevant to waste management in Hong Kong:

7.2.2.2 Other relevant circulars / guidelines are applicable to waste management practices for the Project include:

- Environment, Transport and Works Bureau Technical Circular (Works) ETWB TC(W) No. 19/2005 “Environmental Management on Construction Sites”;
- Development Bureau Technical Circular (Works) DEVB TC(W) No.06/2010 “Trip Ticket System for Disposal of C&D Materials”;
- DEVB TC(W) No. 2/2011 “Encouraging the Use of Recycled and other Green Materials in Public Works Projects”;
- DEVB TC(W) No. 9/2011 “Enhanced Control Measures for Management of Public Fill”;
- DEVB TC(W) No. 08/2010 “Enhanced Specification for Site Cleanliness and Tidiness”;
- Works Branch Technical Circular WBTC No. 2/93 “Public Dumps”;
- WBTC No. 2/93B “Public Filling Facilities”;
- WBTC No. 16/96 “Wet Soil in Public Dumps”;
- WBTC No. 12/2000 “Fill Management”;
- WBTC Nos. 25/99, 25/99A and 25/99C, “Incorporation of Information on Construction and Demolition Material Management in Public Works Subcommittee Papers”;
- CEDD TC No. 11/2019 “Management of Construction and Demolition Materials”;
- Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste;
- ProPECC PN 2/97 Handling of Asbestos Containing Materials in Buildings; and

- Project Administration Handbook (PAH) for Civil Engineering Works, Section 4.1.3 of Chapter 4.

7.2.3 Construction & Demolition Materials

7.2.3.1 *ETWB TC(W) No. 19/2005* on *Environmental Management on Construction Site* includes procedures on waste management requiring contractors to reduce the C&D materials to be disposed of during the course of construction. The contractor is required to prepare and implement an Environmental Management Plan (EMP) and the Waste Management Plan (WMP) becomes part of the EMP.

7.2.3.2 *Project Administration Handbook for Civil Engineering Works, Section 4.1.3 Management of Construction and Demolition Material* Including *Rock* published by CEDD to enhance the management of C&D materials and to minimise their generation at source. The enhancement measures include drawing up a Construction and Demolition Material Management Plan (C&DMMP) at an early design stage to minimise C&D materials generation and encourage proper management of such materials.

7.2.3.3 Under *DEVB TCW No. 6/2010 Trip Ticket System for Disposal of Construction and Demolition Materials*, for all contracts that are expected to generate inert C&D materials requiring disposal from site, the project office should write to the Public Fill Committee (PFC) through Secretary of the PFC to request a designated disposal ground for incorporation into the tender documents. For contracts where the estimated amount of non-inert C&D materials requiring disposal at landfill facilities equals to or exceeds 50 m^3, the project office should seek confirmation from the DEP in terms of the availability of landfill facilities for disposal of such materials and the DEP would designate landfill facilities, if available, for the contracts. For contracts where the estimated amount of non-inert C&D materials to be generated from the contract is less than 50 m^3, the project office is not required to apply to DEP for designated landfill facilities but it should still specify in the tender documents of the appropriate landfill facilities for disposal.

7.3 Description of the Environment

7.3.1.1 The Project covers an area of about 611 ha and is predominantly rural in character. The existing population at the proposed location of the Project is approximately 2,900. The area has a mixed urban-rural character. South of San Tin Highway is predominantly occupied by brownfield operations with some village developments, whereas land to the north is mainly occupied by low-density residential and village developments with scattered brownfield and the San Tin wetland area.

7.3.1.2 The existing solid waste arising from the Project area includes domestic waste generated from village houses, commercial and industrial waste generated from open storage and industrial areas and chemical waste generated from vehicle maintenance workshop, open area storage, container storage and recycling facilities. The village type residential area in the middle of the Project area and south of San Tin Highway will be retained, while the rest of the Project area will be rezoned to other specified uses including innovation & technology, cultural, creative, convention to the north of San Tin Highway, logistic storage and workshop in the east, residential and commercial development south of San Tin Highway with some innovation & technology development. The contribution of waste generated from these areas is considered in the EIA.

7.3.1.3 Major existing waste facilities serving the assessment area are shown in **Table 7.1**.

Table 7.1 Summary of Existing Facilities Serving the Assessment Area

Waste Facilities	Location	Date of Commission	Design Capacity / Throughput
Strategic Landfill			
West New Territories (WENT) Landfill	Nim Wan, Tuen Mun	1993	61 Mm^3

Waste Facilities	Location	Date of Commission	Design Capacity / Throughput
North East New Territories (NENT) Landfill	Ta Kwu Ling	1995	35 Mm^3
Refuse Transfer Station			
North West New Territories Refuse Transfer Station (NWNTTS)	Shun Tat Street, Tuen Mun (near Lam Tei)	2001	1,260 tonnes per day
Special Waste Facilities			
Chemical Waste Treatment Centre (CWTC)	51 Tsing Yi Road South, Tsing Yi	1993	100,000 tonnes per year
Sludge Treatment Facility (STF)	Nim Wan, Tuen Mun	2015	2,000 tonnes per day

7.4 Assessment Methodology

7.4.1.1 The assessment of waste management implications during the construction and operation phases of the Project has been carried out in accordance with the EIA Study Brief and criteria given in Annexes 7 and 15 of the *EIAO-TM,* including the following tasks:

- Identification of the construction and operation activities of the Project which could give rise to waste arising;
- Estimation of types and quantities of waste generated;
- Examination of opportunities for waste reduction and re-use (both on-site and off-site) and the required disposal options for each type of waste; and
- Evaluation of potential impacts caused by improper handling, collection, transportation and re-use / disposal of wastes with respect to potential hazards, air and odour emissions, noise, wastewater discharges, ecology and public transport.

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

7.4.1.3 After considering all the opportunities for reducing waste generation and maximising re-use, the types and quantities of the waste required to be disposed of have been estimated and the disposal options for each type of waste have been described. The disposal method recommended for each type of waste has taken into account the result of the assessment. The impacts caused by handling (including stockpiling, labelling, packaging and storage), collection, transportation and reuse / disposal of waste have been addressed and appropriate mitigation measures have been proposed.

7.5 Identification and Evaluation of Waste Management Implications

7.5.1 Construction Phase

7.5.1.1 There are a number of Schedule 2 Designated Projects (DPs) under this Project. The following activities, including the DPs under Schedule 2 and Schedule 3 and some non-DP elements in the Revised RODP (**Sections 1.5 and 2.4**), have been included in the waste management implication assessment for the construction phase:

- Construction of new primary distributor and new district distributor roads (DP1);
- Construction of new San Tin Lok Ma Chau Effluent Polishing Plant (STLMC EPP) (DP2);
- Construction of new San Tin Lok Ma Chau Water Reclamation Plant (STLMC WRP) (DP3);

- Construction of new refuse transfer station (DP4);
- Construction of two 400kV electricity substations (DP5);
- Revitalization works along San Tin East Main Drainage Channel (DP6);
- Recreational development for proposed Sites O.1.1, O.1.2, and O.1.3 (DP7);
- Construction of new district cooling systems (DCS);
- "Residential" ("R") development, "Government, Institution or Community" ("G/IC"), "Education" ("E"), "Green Belt" ("GB"), open space, "Amenity" ("A"), and other specified uses; and
- Other miscellaneous construction works, e.g. buildings, roads, utilities, etc.

7.5.1.2 Typical waste types arising from the proposed works are identified in this section, together with an evaluation of the potential waste management impacts associated with the handling and disposal of waste. **Table 7.2** lists out the sources and examples of the identified waste types.

Table 7.2 Identification of Waste Types during the Construction Phase of the Project

Waste Type	Source of Waste	Example of Waste
Construction and Demolition (C&D) Materials	• Materials generated from site clearance and site formation works • Materials generated from construction of new buildings and infrastructures	Non-inert C&D materials • Top soil, vegetation and wood waste, etc. • Bamboo, timber, paper and plastic,etc. Inert C&D materials • Soft materials • Artificial hard materials • All grade granite
Chemical Waste	• Building demolition • Plant operation and maintenance • Maintenance of mechanical equipment	• Asbestos containing materials • Oil and grease, scrap batteries, usedpaint, fuel, etc. • Cleansing fluids and solvents from construction plant and equipment
General Refuse	• Refuse generated from construction works and site-based staff and workers	• Food waste, containers, cans and wastepaper, etc.
Excavated Sediment	• Excavated sediment generated from the pond excavation works	• Pond sediment
Floating Refuse	• Construction activities along river channels or water bodies	• Litter and debris

Notes:
1. Non-inert C&D material includes, but not limited to, bamboo, timber, paper and plastic, etc.
2. Soft material includes, but not limited to, excavated soil, fill, etc.
3. Artificial hard material includes, but not limited to, broken concrete, asphalt, bitumen and granular materials, etc.
4. Granite includes, but not limited to, all grades and types of rock.

Construction and Demolition Materials

7.5.1.3 The construction phase of the Project will be implemented in a number of development stages through a number of construction activities. The anticipated timing for major construction activities in each development stage is summarised in **Table 7.3**.

Table 7.3 Anticipated Timing for Major Construction Activities in Each Development Stage

Construction Activities	Development Stage	Anticipated Timing
Site Clearance and Site Formation Works	Initial Phase	2024 – 2028
	Main Phase	2026 – 2033
	Remaining Phase	2032 – 2034
Construction of New Buildings and Infrastructures	Initial Phase	2026 – 2033
	Main Phase	2028 – 2038
	Remaining Phase	2034 – 2039

7.5.1.4 C&D materials will be generated from site clearance and site formation works and construction of new buildings and infrastructure. These C&D materials will comprise both non-inert and inert components.

Site Clearance and Site Formation Works

7.5.1.5 Site clearance waste will mainly come from the demolition of existing structures, tree felling and preparation of the existing ground surface and will comprise top soil, vegetation, broken concrete and asphalt. Site formation waste will mainly come from the excavation works and will comprise excavated soil and granite. To minimise the generation of site clearance and site formation waste, the phasing plan and general layout of the Project are considered holistically and thoroughly. For road alignments, the options of district distributor roads are considered as alternative alignments of at-grade levels, thus would have minimal implication to the generation of C&D materials. For site formation works, it is discussed under **Section 2.8.7.14**. For alternative locations of STLMC Effluent Polishing Plant (EPP) and STLMC Water Reclamation Plant (WRP), they are preferred to locate within the main Project area to the cavern area to avoid generation of excessive C&D materials to be disposed of. The alternative locations of STLMC EPP and STLMC WRP are discussed under **Section 2.8.4** and **2.8.9** respectively. For construction methods, the potential methods for construction of viaduct are mentioned in **Section 2.4.2.4**. The minimisation of cast in-place concrete construction method would be beneficial to reduce generation of public fill/inert C&D materials.

7.5.1.6 The estimated volumes of C&D materials generated from site formation works are illustrated in **Table 7.4**.

Table 7.4 Estimated Volumes of C&D Materials Generated from Site Clearance and Site Formation Works

Development Stage	Volume of Non-Inert C&D Material (m^3)	Volume of Inert C&D Material (m^3)		
		Soft Material	Artificial Hard Material	Rock
Initial Phase	7,800	4,514,800	6,200	1,001,800
Main Phase	11,700	2,066,200	9,400	1,157,300
Remaining Phase	3,300	567,400	2,700	22,700
Total [1]	**22,800**	**7,148,500**	**18,300**	**2,181,800**

Note:
[1] Total may not add up due to rounding.

7.5.1.7 It is estimated that around 22,800 m^3 of non-inert C&D materials, and inert C&D materials including 7,148,500 m^3 of soft materials, 18,300 m^3 of artificial hard materials, and 2,181,800 m^3 of rock materials will be generated from site clearance and site formation works. 8,250,300 m^3 of inert C&D materials generated from the Project are assumed to be suitable for reuse on-site as backfilling materials and only 1,098,300 m^3 of inert C&D materials will be transported to other concurrent projects for reuse. Potential concurrent projects such as Remaining Phase of Site

Formation and Engineering Infrastructure Works at Kwu Tung North and Fanling North New Development Area shall be sourced for reuse of inert C&D materials. Delivery to the Public Fill Reception Facilities (PFRFs) should only be considered as the last resort. The non-inert C&D materials should be reused on-site as much as possible before disposing at the NENT or WENT Landfill. With proper implementation of good construction site practice and mitigation measures, the on-site handling and reuse of site clearance waste would not cause adverse environmental impacts.

7.5.1.8 It is estimated that around 2,568,000 m^3 of fill materials will need to be imported during the site clearance and site formation works of the Project. The imported fill materials are sourced from suitable inert C&D materials generated from the construction of new buildings and infrastructure as well as other concurrent projects. The reusable portion of the inert C&D materials generated from the site clearance and site formation works will be reused on-site as backfilling materials. The Contractor should review the programme during early construction stage to maximise the quantity of on-site reuse of surplus fill materials. The estimated cut and fill volumes for the development by year are shown in **Table 7.5**.

Table 7.5 Estimated Cut and Fill Volumes for the Site Clearance and Site Formation Works by Year

Year [1]	Cut Volume (m^3) (A)	Fill Volume (m^3) (B)	Net Export / Import of C&D Material (m^3) (A) – (B) [2]	Import Volume of Fill Material (m^3) [2]	Cumulative Stockpiling Volume (m^3) [2]
2025	2,059,200	596,000	1,463,200	0	1,463,200
2026	2,606,200	1,290,800	1,315,300	0	2,778,500
2027	1,069,200	3,664,000	-2,594,800	0	183,800
2028	1,050,400	3,493,900	-2,443,400	2,259,700	0
2029	675,900	835,200	-159,300	159,300	0
2030	233,400	382,400	-149,000	149,000	0
2031	439,500	204,000	235,500	0	235,500
2032	566,100	172,100	394,000	0	629,500
2033	430,300	110,000	320,300	0	949,800
2034	218,400	69,900	148,500	0	1,098,300
Total [2]	**9,348,600**	**10,818,300**	**-1,469,700**	**2,568,000**	**1,098,300** [to be reused in other concurrent projects]

Note:
[1] The site clearance and site formation works shall commence in end 2024. It is therefore assumed that no cut and fill volumes is anticipated in 2024.
[2] Total may not add up due to rounding.

Construction of New Buildings and Infrastructure

7.5.1.9 C&D materials will also be generated from construction of new buildings and infrastructures including the construction of primary and district distributor roads, SPS and associated rising mains, EPP, WRP and other miscellaneous infrastructure works and will comprise non-inert C&D materials, brick and concrete. The estimated volumes of C&D materials generated from construction of new buildings and infrastructures are shown in **Table 7.6**. As the anticipated timing for construction of new buildings and infrastructure overlaps with the site clearance and site formation works, most inert C&D materials generated from the Project at the early stage of construction of new buildings and infrastructure (i.e. from 2026 to 2030), which are considered suitable, will be reused on-site as backfilling materials in the site clearance and site formation works, reducing the need to import fill material from other projects. It is estimated that 646,400

m^3 of inert C&D materials generated from the construction of new buildings and infrastructures will be reused on-site, and approximately 1,921,600 m^3 of imported fill will be acquired from other concurrent projects. However, as the construction of new buildings is carried out by different entities based on land use, the reuse of construction and demolition materials on-site is subject to further coordination with the respective parties involved.

Table 7.6 Estimated Volumes of C&D Materials Generated from Construction of New Buildings and Infrastructures

Development Stage	Gross Floor Area(m^2)	Total C&D Material Generated (m^3)	Volume of Non-Inert C&D Material (m^3)	Volume of Inert C&D Material (m^3)
Initial Phase	3,400,500	340,000	23,800	316,200
Main Phase	5,353,200	535,300	37,500	497,800
Remaining Phase	1,879,200	187,900	13,200	174,800
Total [1]	**10,632,900**	**1,063,300**	**74,400**	**988,900**

Note:
[1] Total may not add up due to rounding.

7.5.1.10 In accordance with the Reduction of Construction Waste Final Report published by the Hong Kong Polytechnic University in March 1993, a C&D materials generation rate of 0.1 m^3 per 1 m^2 of gross floor area (GFA) is adopted. The total estimated GFA of the proposed development in the assessment area is around 10,632,900 m^2. Therefore, it is estimated that around 1,063,300 m^3 of C&D materials would be generated from construction of the buildings and structures for the proposed development.

7.5.1.11 In addition, based on Monitoring of Solid Waste in Hong Kong (2021) published by EPD, 93% of the C&D materials would be inert C&D materials. The inert C&D materials is assumed to be all artificial hard materials in the estimation. It is estimated that around 74,400 m^3 of non-inert C&D materials and 988,900 m^3 of artificial hard materials will be generated from construction of new buildings and infrastructure. The non-inert and inert C&D materials generated from construction of new buildings and infrastructure will be reused and recycled within the sites as much as possible before disposal to the NENT or WENT Landfill and delivery to the PFRFs subject to the designation from the Public Fill Committee (PFC), respectively. The generation of C&D materials can be minimised through careful planning during the detailed design stage and with good site practice during construction. This includes the use of non-timber formwork and temporary works and on-site sorting of the C&D materials for reuse and recycling as far as practicable. With proper implementation of good construction site practice and mitigation measures, the on-site handling and reuse of C&D materials would not cause adverse environmental impacts.

Temporary Stockpiling Areas

7.5.1.12 As shown in **Table 7.5**, the inert C&D materials generated from site clearance and site formation works shall be temporarily stored within the Project site as much as possible during Initial Phase, Main Phase and Remaining Phase of the Project. Since the Project will be implemented in stages, temporary stockpiling areas have been identified and shown in **Figure 7.1** to store the C&D materials for reuse under the Project.

7.5.1.13 The estimated volume of stockpiling in 2025 is about 1,463,200 m^3. The total size and holding capacity of the temporary stockpiling area located at Site OU(RAF).1.2, OU(LSW).1.1 and OU.1.9 are approximately 10.7 ha and 422,400 m^3 respectively. As the sites are insufficient for storing the inert C&D materials generated, nearby concurrent projects such as Advance Site Formation and Engineering Infrastructure Works at Kwu Tung North and Fanling North New Development Areas and Remaining Phase of Site Formation and Engineering Infrastructure Works at Kwu Tung North and Fanling North New Development Area shall be sourced to temporarily store the C&D materials subject to further coordination with the respective parties

involved. Where available, some C&D materials shall be stored within the developing sites of the Project to minimise the need of external storage.

7.5.1.14 The estimated volume of stockpiling in 2026 is about 2,778,500 m^3. The total size and holding capacity of the temporary stockpiling area located at Site O.2.1, RSc.2.4 and RSc.2.5 are approximately 12.4 ha and 774,700 m^3 respectively. As the sites are insufficient for storing the inert C&D materials generated, nearby concurrent projects such as Remaining Phase of Site Formation and Engineering Infrastructure Works at Kwu Tung North and Fanling North New Development Area shall be sourced to temporarily store the C&D materials subject to further coordination with the respective parties involved. Where available, some C&D materials shall be stored within the developing sites of the Project to minimise the need of external storage.

7.5.1.15 The estimated volume of stockpiling in 2027 is about 183,800 m^3. The size and holding capacity of the temporary stockpiling area located at Site OU(MU)2.1.1 are approximately 7.5 ha and 460,500 m^3 respectively, which is sufficient for storing the inert C&D materials generated.

7.5.1.16 In 2028-2030, as the estimated total fill volume is greater than the cut volume, the C&D materials will be reused on-site and there are no materials to be stockpiled.

7.5.1.17 The surplus C&D materials generated from the site clearance and site formation works in 2031-2034 would be arranged according to **Section 7.5.1.7**.

7.5.1.18 The storage and stockpiling of C&D materials prior to utilisation on-site may contribute to the generation of dust, visual impacts from unsightliness and water quality impacts from runoff. The disposal of C&D materials also has the potential to result in noise and dust impacts from loading and unloading and emissions from haul vehicles. Mitigation and control requirements for C&D materials are detailed in **Sections 7.6.2.1 to 7.6.2.4**. Provided that the handling, storage and disposal of C&D materials are in accordance with these requirements, adverse waste management implications, including potential hazards, air and odour emissions, noise and wastewater discharge, ecology and public transport, associated with handling, storage and disposal of C&D waste during the construction phase of the Project are not expected.

Chemical Waste

7.5.1.19 Asbestos containing materials (ACM) can be found in buildings built before the mid-1980s. If the buildings or structures containing ACM need to be demolished, the ACM should be removed in accordance with the requirements of the Air Pollution Control Ordinance and disposed of in accordance with the requirements of Waste Disposal Ordinance. A Registered Asbestos Consultant and Registered Asbestos Laboratory shall be engaged to conduct investigation for the presence of ACM. An Asbestos Investigation Report, an Asbestos Abatement Plan (if required) and a notification of commencement ofasbestos abatement works shall be submitted to EPD at least 28 days before the asbestos abatement works commences. Also, the removal of ACM should be carried out by a Registered Asbestos Contractor according to the approved Asbestos Abatement Plan under the supervision of a Registered Asbestos Consultant. The asbestos waste generated should be disposed of by a licensed chemical waste collector in compliance with the Waste Disposal Ordinance.

7.5.1.20 The maintenance and servicing of plant, equipment and vehicles will also generate a small amount of chemical waste during the construction phase of the Project. The possible chemical waste includes:

- Scrap batteries from vehicle maintenance;
- Spent hydraulic fluids and waste fuel from plant operation;
- Spent lubrication oils and cleaning fluids from plant maintenance; and
- Spent paint and solvents from equipment maintenance.

7.5.1.21 Chemical waste arising during the construction phase of the Project may pose environmental, health and safety hazards if not stored and disposed of. The potential environmental, health and safety hazards include:

- Toxic effects to workers;
- Adverse impacts on water quality and aquatic biota from spills; and
- Fire hazard.

7.5.1.22 It is difficult to quantify the amount of chemical waste that will arise during the construction phase of the Project since it will be highly dependent on the Contractor's on-site construction activities and maintenance practices. Nevertheless, it is anticipated that the quantity of chemical waste, such as lubrication oil and solvent produced from plant and equipment maintenance, would be small and in the order of a few cubic metres per month. The amount of chemical waste to be generated would be quantified in the WMP to be prepared by the Contractor.

7.5.1.23 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. Wherever possible opportunities should be taken to reuse and recycle materials. Mitigation and control requirements for chemical waste are detailed in **Section 7.6.2.5 to 7.6.2.10**. Provided that the handling, storage and disposal of chemical waste are in accordance with these requirements, adverse waste management implications, including potential hazards, air and odour emissions, noise, wastewater discharge, ecology and public transport, associated with handling, storage and disposal of chemical waste during the construction phase of the Project are not expected.

General Refuse

7.5.1.24 During the construction phase of the Project, the workforce will generate general refuse comprising food waste, waste paper, empty containers, etc. Storage of general refuse may give rise to adverse environmental impacts, such as windblown litter, odour, water and visual impacts, if not properly managed. The site may also attract vermin and pests if the waste containers are not cleaned or maintained properly and frequently. In addition, disposal of waste at sites other than the approved waste disposal facilities may lead to similar adverse environmental impacts to those sites.

7.5.1.25 The number of construction workers is not available at this stage but it is anticipated that there will be not more than 3,000 staff to be presented on-site at any one time during each year of the construction phase of the Project. Based on a generation rate of 0.65 kg per worker per day, around 1,950 kg of general refuse would be generated daily during the construction phase of the Project. Therefore, it is estimated that around 8,400 m^3, 13,200 m^3 and 4,200 m^3 general refuse[1] would be generated during the Initial, Main and Remaining Phase respectively.

7.5.1.26 In order to minimise the final disposal quantities of general refuse, provision of sufficient number of recycling bins for the collection of different types of recyclable waste (including paper, aluminium cans, plastic bottles and glass bottles) and sufficient number of general refuse bins for the collection of non-recyclable waste is recommended. The Contractor should implement an education programme for workers relating to avoiding, reducing, reusing and recycling of general refuse. A reputable licensed collector should be employed to collect the general refuse on a daily basis for disposal at the North West New Territories Refuse Transfer Station (NWNTTS) or the NENT or WENT Landfill.

7.5.1.27 Mitigation and control requirements for general refuse are detailed in **Section 7.6.2.11 to 7.6.2.12**. Provided that the handling, storage and disposal of general refuse are in accordance with these requirements, adverse waste management implications, including potential hazards, air and odour emissions, noise and wastewater discharge, ecology and public transport, associated with handling, storage and disposal of general refuse during the construction phase of the Project are not expected.

Excavated Sediment

7.5.1.28 Some existing ponds and agricultural wet areas will be removed due to the new developments recommended for the Project. Construction works at the existing ponds / wet areas within the

[1] Assuming bulk density of 311.73kg/m^3 and works are 48 weeks a year and 6 days a week.

Project area may result in excavated sediment. The excavated sediment to be generated from the construction will consist of soil and pond sediment.

7.5.1.29 Information on the quantity and quality of excavated sediment in the area is not currently available but it is preliminarily estimated that there will be 2,029,000 m^3 of excavated sediment. The estimation however shall be further reviewed and updated when sufficient geotechnical information is available. Metal-based algaecides including copper-based algaecides are not commonly used for fresh water fish farming in Hong Kong due to the high cost and toxicity to fish. Calcium oxide, which is cheaper, non-toxic to fish and a more readily available chemical, is more commonly used to control algae and suspended solids in fishponds. It is therefore considered unlikely that the excavated sediment will be contaminated. The excavated sediment, however, is expected to have high water content and high organic content. The excavated sediment is proposed to be stabilised / solidified by mixing with cement so that the mixture is suitable for reuse on-site. It is estimated that the process shall take less than 1.5-months-time inclusive of testing subject to further liaison with relevant parties. In view of short processing period, the sediment is proposed to be reused directly at its original location, and all excavated sediment is anticipated to be suitable for reuse. Transportation arrangement for the excavated sediment is therefore not required.

7.5.1.30 All excavated sediment generated from the pond excavation works should be collected and handled in compliance with the Waste Disposal Ordinance. Soil mixing or cement mixing work is suggested to improve the physical properties of the excavated sediment such that the grading and plasticity of the mixture will be suitable for reuse on-site as backfilling materials in the Project. Mitigation and control requirements for excavated sediment are detailed in **Section 7.6.2.13**. Provided that the handling of excavated sediment are in accordance with these requirements, adverse waste management implications, including potential hazards, air and odour emissions, noise, wastewater discharge, ecology and public transport, associated with handling of excavated sediment during the construction phase of the Project are not expected.

Floating Refuse

7.5.1.31 Floating refuse in the Project area might be generated from construction workforce (e.g. waste paper and empty containers) while working along the river channels or water bodies. The quantity is expected to be insignificant. Proper waste management and training to workers, such as avoiding placing waste collection bins close to any river channels water bodies and ensuring construction materials are well covered to prevent occurrence of wind-blown light materials should be considered. Mitigation and control requirements for floating refuse are detailed in **Section 7.6.2.14**. Adverse waste management implications, including potential hazards, air and odour emissions, noise, wastewater discharge, ecology and public transport, associated with handling of floating refuse during the construction phase of the Project are not expected.

7.5.2 Transportation Arrangement for Waste Disposal during Construction Phase

7.5.2.1 Land transport should be used to deliver and dispose of the waste generated from the Project area to the designated disposal outlets. It is anticipated that there would be around 200 vehicles per day for transporting waste during the construction phase of the Project. The tentative transportation routings for the disposal of various types of wastes generated during the construction phase of the Project are shown in **Table 7.7**. No barging points or conveyor systems will be established in the Project area. The transportation routings may change subject to the actual traffic conditions of the roads. Nevertheless, with the implementation of appropriate mitigation measures (e.g. using water-tight containers and covered trucks), no adverse environmental impacts are expected due to the transportation of waste.

Table 7.7 Tentative Transportation Routings for Waste Disposal During Construction Phase

Disposal Outlet	Type of Waste	Tentative Transportation Routing
Potential concurrent projects listed in **Section 7.5.1.7** and PFRFs subject to the designation from the PFC	Inert C&D Materials	Concurrent projects: Via San Tin Highway, Fanling Highway and Po Shek Wu Road PFRF: Via San Tin Highway, Yuen Long Highway, Tuen Mun Road, Wong Chu Road, Lung Fu Road and Lung Mun Road (example for Tuen Mun Area 38 Fill Bank) (196 vehicles per day)
NENT Landfill or WENT Landfill	Non-inert C&D Materials and ACM	NENT Landfill: Via San Tin Highway, Fanling Highway, So Kwun Po Road, Ma Sik Road, Sha Tau Kok Road, Wo Keng Shan Road. WENT Landfill: Via San Tin Highway, Yuen Long Highway, Tuen Mun Road, Wong Chu Road, Lung Mun Road, Lung Kwu Tan Road, Nim Wan Road (2 vehicles per day)
NWNTTS or NENT Landfill or WENT Landfill	General Refuse and Floating Refuse (if any)	NWNTTS: Via San Tin Highway, Yuen Long Highway, Long Tin Road, Castle Peak Road, Shun Tat Street NENT or WENT Landfill: same as non-inert materials (2 vehicles per day)
CWTC	Chemical Waste	Via San Tin Highway, Tsing Long Highway, Tsing Sha Highway and Tsing Yi Road (1 vehicle per day)

Remark:
It is assumed that each vehicle has a capacity of 7m^3 and operates 6 days a week and 48 weeks a year.

7.5.3 Construction Phase Waste Summary

7.5.3.1 **Table 7.8** provides a summary of the waste types likely to be generated during the construction phase of the Project, together with the recommended handling and disposal methods.

Table 7.8 Summary of Waste Arising, Waste Handling Procedures and Disposal Routes during the Construction Phase of the Project

Waste Type	Generated from	Materials to be Generated	Total Amount to be Generated	Handling Procedures	Handling/Disposal Routes
Construction and Demolition (C&D) Materials	• Materials generated from site clearance and site formation works	• Non-inert C&D materials ➢ Top soil, vegetation and wood waste, etc. ➢ Bamboo, timber, paper and plastic, etc.	• 22,800 m^3	• Reusable materials should be separated and recycled as far as practicable	• Reused on-site as much as possible. Materials that cannot be reused nor recycled will be disposed of at the NENT or WENT Landfill
		• Inert C&D materials ➢ Soft materials ➢ Artificial hard materials ➢ Rock	• 9,348,600 m^3	• Reusable materials should be separated and recycled as far as practicable	• Sorted materials will be stored at the temporary stockpiling areas and reused as much as possible before being used for construction by other concurrent projects or delivered to PFRFs subject to the designation from the PFC for beneficial use
	• Materials generated from construction of new buildings and infrastructures	• Non-inert C&D materials ➢ Top soil, vegetation and wood waste, etc. ➢ Bamboo, timber, paper and plastic, etc.	• 74,400 m^3	• Reusable materials should be separated and recycled as far as practicable	• Reused on-site as much as possible. Materials that cannot be reused nor recycled will be disposed of at the NENT or WENT Landfill
		• Inert C&D materials ➢ Soft materials ➢ Artificial hard materials ➢ All grade granite	• 988,900 m^3	• Reusable materials should be separated and recycled as far as practicable	• Sorted materials will be reused on-site as much as possible. The remainder to be delivered to PFRFs subject to the designation from the PFC for beneficial use

Chemical Waste	• Building demolition • Plant operation and maintenance • Maintenance of mechanicalequipment	• Asbestos containing materials (ACM) • Oil and grease, scrap batteries, used paint, fuel, etc. • Cleansing fluids and solvents from construction plant and equipment	• ACM: To be verified prior to construction stage • Other chemical waste: A few cubic metres per month	• Other chemical waste: Stored in compatible containers in designated area on-site • ACM and other chemical waste: Collected by licensed collectors	• ACM: disposed of at the NENT or WENT Landfill • Other chemical waste: Recycled by licensed facility and/or disposal of at the CWTC
General Refuse	• Refuse generated from construction works and site-based staff and workers.	• Food waste, containers, cans and waste paper, etc.	• Around 1,950 kg per day	• Provide on-site collection points together with recycling bins • Collected by a licensed collector	• Recycled at recycling facilities and/or disposed of at the NWNTTS and/or the NENT or WENT Landfill
Excavated Sediment	• Excavated sediment generated from pond excavation works	• Pond sediment	• Around 2,029,000 m^3	• All excavated sediment generated from pond excavation works should be collected and handled in compliance with the Waste Disposal Ordinance	• The excavated sediment should be stabilized and solidified for reuse on site
Floating Refuse	• Construction activities along river channels or water bodies	• Litter and debris	• Insignificant	• Dispose together with general refuse, after separating the recyclables for recycling • Collected by a licensed collector	• Recycled at recycling facilities and/or disposed of at the NWNTTS and/or the NENT or WENT Landfill

7.5.4 Operation Phase

7.5.4.1 In accordance with Annex 7 and Annex 15 of the EIAO-TM as well as the requirements set out under Clause 3.4.8 of the EIA Study Brief (No. ESB-340/2021), an application for an EP will be submitted for a number of Schedule 2 DPs under this Project. Activities identified in S7.5.1.1, including the DPs identified under Schedule 2 and Schedule 3 and some non-DP elements in the Revised RODP (**Section 2.4**), have been included in the waste management implication assessment for the operation phase:

7.5.4.2 The operation phase activities to be carried out for the Project will generate a variety of waste types. Typical waste types arising from the proposed works are identified in this section, together with an evaluation of the potential waste management impacts associated with the handling and disposal of waste. **Table 7.9** lists out the sources and examples of the identified waste types.

Table 7.9 Identification of Waste Types during the Operation Phase of the Project

Waste Type	Source of Waste	Example of Waste
Municipal Solid Waste (MSW)	• Domestic waste generated from future residences of public and private housing • Commercial and industrial (C&I) waste generated from enterprise and technology parks, offices and recreation sites	• Food waste, containers, cans and waste paper, etc. • Scrap materials, e.g. metals, etc.
Chemical Waste	• Chemical waste generated from ➢ Public facilities operation (e.g. EPP) ➢ Maintenance activities (e.g. buildings, infrastructure, roads, etc.)	• Paint, lubricants and used batteries, etc.
Screenings, Grits and Sewage Sludge	• Screenings and grits generated from sewage treatment process • Dewatered sludge generated from sewage treatment process	• Screenings and grits • Dewatered sludge

Municipal Solid Waste

7.5.4.3 The generation of MSW will be of most concern during the operation stage, which comprise domestic waste and C&I waste. **Table 7.10** shows the historical geographical variation in waste arising between 2017 and 2021.

Table 7.10 Historical Geographical Variation in Waste Arising (2017 – 2021)

	Average Domestic Waste (kg/person/day)					Average Commercial & Industrial Waste (kg/employee/day)				
District	**2017**	**2018**	**2019**	**2020**	**2021**	**2017**	**2018**	**2019**	**2020**	**2021**
Yuen Long	0.99	1.17	1.06	1.14	1.16	0.93	1.11	1.00	0.97	1.13
New Territories	0.78	0.84	0.95	0.86	0.88	0.70	0.80	0.76	0.71	0.80
Hong Kong	0.87	0.90	0.87	0.91	0.94	0.59	0.63	0.60	0.53	0.59

Sources:
1. Monitoring of Solid Waste in Hong Kong 2017-2021 (EPD, 2018-2022).
2. Population Census Summary Results, 2011, 2016, 2021 (CSD, 2012, 2017, 2022).

7.5.4.4 For a worst case assumption on future MSW generation[2], the per capita generation rates of domestic and C&I waste during the development period (2031 – 2039) have been calculated based on the average annual change of MSW generation at Yuen Long District using linear regression model. This model is applied uniformly to the year of completion for each development stage, without regard to variation within socio- economic groups.

Domestic waste $Yt = 0.031(t – 16) + 1.0101$

C&I waste $Yt = 0.0259(t – 16) + 0.9522$

Where: Yt = waste generation rate at year t (in kg/person/day for domestic waste and in kg/employee/day for C&I waste)

t = year in last two figures of the year (e.g. “17” in 2017).

7.5.4.5 **Table 7.11** shows the calculated per capita domestic and C&I waste generation rates for each development stage (2031 – 2039) based on the average annual change of MSW generation at Yuen Long District using linear regression model.

Table 7.11 Calculated Per Capita Domestic and C&I Waste Generation Rates for Each Development Stage (2031 – 2039)

Year of Population Intake	Domestic Waste Generation Rates (kg/person/day)	C&I Waste Generation Rates (kg/employee/day)
2031	1.48	1.34
2032	1.51	1.37
2033	1.54	1.39
2034	1.57	1.42
2035	1.60	1.44
2036	1.63	1.47
2037	1.66	1.50
2038	1.69	1.52
2039 [1]	1.72	1.55

Note:
[1] The timeline of development after 2039 is uncertain. It is assumed to be included in 2039.

7.5.4.6 The Project targets to accommodate approximately 147,000 to 159,000 residents and 165,000 employees upon development completion. Based on the calculated domestic and C&I waste generation rates for each development stage as shown in **Table 7.11**, the estimated domestic waste, C&I waste and total MSW generated in the development stages are provided in **Table 7.12**.

[2] The *Waste Blueprint for Hong Kong 2035* published in 2021 laid out plans and actions to reduce per capita MSW disposal and to utilize waste-to-energy facilities for disposal of MSW in the long run. For the purpose of this assessment, these targets have not been taken into account for a worst case assumption.

Table 7.12 Projected Quantities of Domestic and C&I Waste Arising for Each Development Stage (2031 – 2039) [1]

Year of Population Intake	Strategic Residents (Population)	Projected Domestic Waste (tonnes/day)	Strategic Employees (Population)	ProjectedC&I Waste (tonnes/day)	Total Projected Municipal Solid Waste (tonnes/day)
2031	16,400	24	18,400	25	49
2032	-	-	10,300	14	14
2033	13,300	20	23,900	33	54
2034	56,700	89	67,200	95	184
2035	7,500	12	1,700	2	14
2036	-		8,400	12	12
2037	7,600	13	16,000	24	37
2038	-	-	200	0.3	0.3
2039 [2]	57,800	100	19,300	30	130
Total [3]	**159,000**	**258**	**165,000**	**235.3**	**494.3**

Note:
[1] This projection covers the first intake in 2031 to mass intake in 2039, and thereafter covering the targeted population in the operation phase of the Project.
[2] The timeline of development after 2039 is uncertain. It is assumed to be included in 2039.
[3] Total may not add up due to rounding.

7.5.4.7 As shown in **Table 7.12**, the projected domestic waste requiring disposal is 258 tonnes per day and the projected C&I waste requiring disposal is 253 tonnes per day. As such, the total MSW requiring disposal would be more than 500 tonnes per day.

7.5.4.8 An effective and efficient waste handling system is essential in order to minimise potential adverse environmental impacts during waste storage, collection and transport. Such impacts may include odour if waste is not collected frequently; water quality if waste enters storm water drains; aesthetics and vermin problems if the waste storage area is not well maintained and cleaned regularly. The waste handling system may also facilitate materials recovery and recycling.

7.5.4.9 Opportunities to reduce disposal of food waste at landfill has been provided at the proposed EPP equipped with co-digestion function. Based on the latest design information, about 100 tonnes of food waste would be received at the food waste pre-treatment facility daily. This would help divert food waste disposal at landfill.

7.5.4.10 In accordance with Chapter 9 of the Hong Kong Planning Standards and Guidelines, a refuse collection point (RCP) is required to serve the needs of each population of 20,000 persons or areas within a distance of 500 metres, whereas a refuse transfer station (RTS) is required to provide a handling capacity between 100 and 1,000 tonnes in New Town Areas, which is equivalent to between 100,000 and 1,000,000 population. To cope with the new population waste generation and to support the existing NWNTTS, Sites OU(RCP).1.8 and OU(RCP).5.5 have been allocated for construction of a new RCPs and Site OU(RTS/RRF).1.9 have been allocated for construction of a new RTS and resource recovery facilities (RRF). Based on the Revised RODP, the planned capacity of the RTS would be at 3,000 tpd, which is sufficient to handle the MSW disposed as detailed in **Table 7.12**.

7.5.4.11 Based on the latest construction programme for the development of the new RCPs and RTS as shown in the Revised RODP, one of the RCPs and is scheduled to commission under Initial Phase in 2032. On the other hand, the new RTS and the other RCP will be scheduled to commission under Initial Phase in 2033. A RRF is co-located with the RTS. Waste recycling facilities / containers are recommended to be included in the RCPs. It is expected that there will

be sufficient refuse transfer capacity to handle the general refuse arising during the operation phase of the Project. The MSW will be transported to the RCPs or RTS then to the NENT Landfill for disposal.

7.5.4.12 The waste should be sorted to recover materials (such as paper, aluminium cans, plastic bottles and glass bottles, etc.) as far as possible before disposal at the landfill. Different containers should be provided for the storage of different recyclable materials (e.g. fluorescent lamps, toner cartridges, rechargeable batteries, scrap electrical and electronic appliances, etc.). To avoid potential odour nuisance to the residents during transport of waste, enclosed waste collection trucks should be used and the collection route and time should be properly planned. The new RCPs and RTS should contain compactors and/or related equipment to provide adequate waste handling services within the Project area and odour treatment units to remove odourous gas in the air before discharging to the environment. At least daily collection should be arranged by the waste collectors.

7.5.4.13 Mitigation and control requirements for MSW are detailed in **Sections 7.6.3.1 and 7.6.3.2**. Provided that the handling, storage and disposal of MSW are in accordance with these requirements, adverse waste management implications, including potential hazards, air and odour emissions, noise, wastewater discharge, ecology and public transport, associated with handling, storage and disposal of MSW during the operation phase of the Project are not expected.

Chemical Waste

7.5.4.14 Chemical waste such as paints, lubricants and used batteries may be generated during maintenance activities and operation from public facilities. This waste may pose environmental, health and safety hazards. Measures as stipulated in the Waste Disposal (Chemical Waste) (General) Regulation and the Code of Practice on the Packaging, Labelling and Storage of Chemical Waste should be strictly followed for the handling and disposal of chemical waste. The quantity of chemical waste to be generated during the operation is expected to be small and in the order of a few cubic metres per month.

7.5.4.15 Should any chemical waste be generated, the operator should register with EPD as a chemical waste producer. The chemical waste would be readily accepted for disposal of at the CWTC in Tsing Yi. This chemical waste should be collected periodically in drum- type containers by licensed chemical waste collectors. Mitigation and control requirements for chemical waste are detailed in **Section 7.6.3.3**. Provided that the handling, storage and disposal of chemical waste are in accordance with these requirements, adverse waste management implications, including the potential hazards, air and odour emissions, noise, wastewater discharge, ecology and public transport, associated with handling, storage and disposal of chemical waste during the operation phase of the Project are not expected.

Screenings, Grits and Sewage Sludge

7.5.4.16 The proposed STLMC EPP is designed to handle the sewage arising from the Project. Tertiary treatment and secondary plus treatment are assumed for the proposed STLMC EPP subject to detailed design. The design capacity of STLMC EPP is 125,000 m^3 per day and the major solid waste types produced from the operation are screenings and grits collected from the inlet works and dewatered sludge associated with the sewage treatment process. It is estimated that around 22 m^3 per day of screenings and grits would be generated from the proposed new STLMC EPP during the operation phase of the Project. Screenings and grits should be properly stored in a covered container and disposed of daily to the NENT Landfill. The transportation and disposal of the screeningsand grits would be managed and controlled by a reputable waste collector employed by the operator to reduce any potential pest odour and litter impacts.

7.5.4.17 Sludge thickening tank is suggested to reduce the volume of primary sludge generated from primary sedimentation tank in the new STLMC EPP. Anaerobic co-digestion of sewage sludge and pre-treated food waste from the food waste pre-treatment facility is designed to generate biogas for utilization onsite. The food waste co-digestion is considered for the sludge estimation. The co-digestion for food waste and sewage sludge is assumed to be 1:1 in the digesters, the estimated amount of sludge contributed by food waste is roughly 50%. Centrifuge or filter press are suggested for digested sludge dewatering. Approximately 160 m^3/day dewatered sludge

cake at 30% w/w dry solids content would be generated for disposal during operation phase of the project. Dewatered sludge should be properly stored in a covered container after the sludge dewatering process and disposed of daily to the Sludge Treatment Facility (STF) in Tuen Mun (subject to detailed design) . The dewatered sludge would be delivered by road transport in water tight containers or skips to avoid odour emission during transportation to the STF. Mitigation and control requirements for screenings, grits and sewage sludge are detailed in **Section 7.6.3.4**. Provided that the handling, storage and disposal of screenings, grits and sewage sludge are in accordance with these requirements, adverse waste management implications, including potential hazards, air and odour emissions, noise, wastewater discharge, ecology and public transportation, associated with handling, storage and disposal of screenings, grits and sewage sludge during the operation phase of the Project are not expected.

7.5.5 Transportation Arrangement for Waste Disposal During Operation Phase

7.5.5.1 Land transport should be used to deliver and dispose of the waste generated from the Project area to the designated disposal outlets. It is expected there will be around 50 vehicles per day for transporting waste during the operation phase of the Project. The transportation routings for the disposal of various types of waste generated during the operation phase of the Project are shown in **Table 7.13**. The transportation routings may change subject to the actual traffic conditions of the roads. Nevertheless, with the implementation of appropriate mitigation measures (e.g. using water-tight containers and covered trucks), no adverse environmental impacts are expected due to the transportation of waste.

Table 7.13 Tentative Transportation Routings for Waste Disposal During Operation Phase

Disposal Outlet	Type of Waste	Tentative Transportation Routing
NENT Landfill	MSW from RTS, Screenings and Grits from STLMC EPP	Via San Tin Highway, Fanling Highway, So Kwun Po Road, Ma Sik Road, Sha Tau Kok Road, Wo Keng Shan Road (23 vehicles per day)
CWTC	Chemical Waste	Via San Tin Highway, Tsing Long Highway, Tsing Sha Highway and Tsing Yi Road (1 vehicle per day)
STF (subject to detailed design)	Dewatered Sludge from STLMC EPP	Via San Tin Highway, Yuen Long Highway, Tuen Mun Road, Wong Chu Road, Lung Fu Road, Lung Mun Road, Lung Kwu Tan Road and Nim Wan Road (23 vehicles per day)

Remark:
It is assumed that each vehicle has a capacity of 7m^3 and operates 6 days a week and 48 weeks a year.

7.5.6 Operation Phase Waste Summary

7.5.6.1 **Table 7.14** provides a summary of the waste types likely to be generated during the operation phase of the Project, together with the recommended handling and disposal methods.

Table 7.14 Summary of Waste Arising, Waste Handling Procedures and Disposal Routes during the Operation Phase of the Project

Waste Type	Generated from	Materials to be Generated	Total Amount to be Generated	Handling Procedures	Handling/Disposal Routes
Municipal Solid Waste (MSW)	• Domestic waste generated from future residences of public and private housing • Commercial and industrial (C&I) waste generated from enterprise and technology parks, offices and recreation sites	• Food waste, containers, cansand waste paper, etc. • Scrap materials, e.g. metals,etc.	• Domestic and C&I waste: More than 500 tonnes per day	• Provided on-site collection points together with recycling bins • Collected by a licensed collector	• Recycled at recycling facilities and/or disposed of at the new RCPs, RTS and/or the NENT Landfill • For source-separated food waste, pre-treated at food-waste pre-treatment facilities and co-digested at proposed STLMC EPP.
Chemical Waste	• Chemical waste generated from ➢ Public facilities operation (e.g. STW, liquefied petroleum gas filling stations, petrol filling stations, etc.) ➢ Maintenance activities (e.g. buildings, infrastructures, roads, etc.)	• Paint, lubricants and used batteries, etc.	• A few cubic metres per month	• Stored in compatible containers in designated area on-site • Collected by licensed collectors	• Recycled by licensed facility or disposed of at the CWTC
Screenings, Grits and Sewage Sludge	• Screenings, grits and dewatered sludge generatedfrom STW	• Screenings and grits • Dewatered sludge	• Screening and grits: 22 m^3 per day • Dewatered sludge: Around 160 m^3 per day	• Stored in bins or other containers in designated area on-site • Collected by licensed collectors	• Screenings and grits are disposed of at the NENT Landfill • Dewatered sludge are disposed of at the STF (subject to detailed design)

7.6 Mitigation of Adverse Waste Management Implications

7.6.1 General

Waste Management Hierarchy

7.6.1.1 The waste management hierarchy has been applied in the assessment and development of mitigation measures for waste which aims at evaluating the desirability of waste management methods and includes the following in descending preference:

- Avoidance and minimisation of waste generation;
- Reuse of materials as far as practicable;
- Recovery and recycling of residual materials where possible; and
- Treatment and disposal of waste according to relevant laws, guidelines and good practices.

7.6.1.2 Recommendations of good site practices and waste reduction measures should be stated in order to achieve avoidance and minimisation of waste generation in the waste management hierarchy. To minimize C&D materials generation and encourage proper management of such materials, a C&DMMP should be prepared. An EMP and trip-ticket system are recommended for monitoring management of waste. Specific measures targeting the mitigation of impacts in works areas and the transportation of waste off-site should be provided to minimise the potential impacts to the surrounding environment.

Good Site Practices

7.6.1.3 Good site practices should be included as part of the contract requirements to be addressed during the detailed design stage of the development by the Contractor. Adverse waste management implications are not expected provided that good site practices are strictly implemented. The following good site practices are recommended during the construction phase:

- Nomination of an approved personnel, such as a site manager, to be responsible for the implementation of good site practices;
- Training of site personnel in site cleanliness, proper waste management and chemical handling procedures;
- Provision of sufficient waste disposal points and regular collection of waste for disposal;
- Adoption of appropriate measures to minimise windblown litter and dust during handling, transportation and disposal of waste; and
- Preparation of a WMP in accordance with the ETWB TCW No. 19/2005 Environmental Management on Construction Sites and submitted it to the Engineer for approval.

Waste Reduction Measures

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

- Segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Adopt proper storage and site practices to minimise the potential for damage to, and contamination of, construction materials;
- Plan the delivery and stock of construction materials carefully to minimise the amount of waste generated;

- Sort out demolition debris and excavated materials from demolition works to recover reusable / recyclable portions (i.e. soil, rock, broken concrete, etc.);
- Maximise the use of reusable steel formwork to reduce the amount of C&D materials;
- Minimise over ordering of concrete, mortars and cement grout by doing careful check before ordering; and
- Adopt pre-cast construction method instead of cast-in-situ method for construction of concrete structures as far as possible.

Storage, Collection and Transportation of Waste

7.6.1.5 Storage of materials on-site may induce adverse environmental impacts if not properly managed. The following recommendations should be implemented to minimise the impacts:

- Waste, such as soil, should be handled and stored well to ensure secure containment, thus minimising the potential of pollution;
- Maintain and clean storage areas routinely;
- Stockpiling area should be provided with covers and water spraying system to prevent materials from being wind-blown or washed away; and
- Different locations should be designated to stockpile each material to enhance reuse.

7.6.1.6 Waste hauler with appropriate permits should be employed by the Contractor for the collection and transportation of waste from works areas to respective disposal outlets. The following recommendation should be implemented to minimise 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
- Dispose of waste at licensed waste disposal facilities.

7.6.2 Construction Phase

Construction and Demolition Materials

7.6.2.1 Careful design, planning together with good site management can reduce over-ordering and generation of C&D materials such as concrete, mortar and cement grouts. Formwork should be designed to minimise the use of standard wooden panels, so that high reuse levels can be achieved. Alternatives such as steel formwork or plastic facing should be considered to increase the potential for reuse.

7.6.2.2 A total generation of 10,337,500 m^3 of inert C&D materials is estimated from site clearance and site formation works as well as construction of new buildings and infrastructures. The inert C&D materials with suitable characteristics / size should be reused on-site as fill or recycled as aggregate for other projects as far as practicable. When disposing C&D material at a public filling reception facility for beneficial reuse, the material should only consist of soil, rock, concrete, brick, cement plaster / mortar, inert building debris, aggregates and asphalt. The material should be free from household refuse, plastic, metals, industrial and chemical waste, animal and vegetable matter, and other material considered to be unsuitable by the Filling Supervisor. Prior to disposal of non-inert C&D materials, wood, steel and other metals should also be separated for reuse and / or recycling where practicable so as to minimise the quantity of waste to be disposed of at landfill.

7.6.2.3 Suitable areas should be designated within the site boundaries for sorting and providing temporary stockpiling of C&D materials. Within stockpile areas, the following measures should be taken to control potential environmental impacts or nuisance:

- Surface of stockpiled soil should be regularly wetted with water especially during dry season;
- Disturbance of stockpile soil should be minimised;
- Stockpiled soil should be properly covered with tarpaulin especially during heavy storms are predicted; and
- Stockpiling areas should be enclosed where space is available.

7.6.2.4 In order to monitor the delivery of C&D materials at the designated public fill reception facility and landfill and to control fly-tipping, a trip-ticket system should be included. A recording system for the amount of waste generated, recycled and disposed, including the disposal sites, should also be set up. Warning signs should be put up to remind the designated disposal sites. CCTV should also be installed at the vehicular entrance and exit of the site to monitor handling of C&D materials disposal. To prohibit illegal dumping and landfilling of C&D materials, as well as proper delivery to concurrent project sites for re-use, the dump trucks engaged on site should be equipped with GPS or equivalent automatic system for real time tracking and monitoring of their travel routings, parking locations and disposal activities.

Chemical Waste

7.6.2.5 Due to the potential large amount of ACM during the site clearance stage, asbestos investigation is required. However, as asbestos investigation will involve a large number of buildings and most premises will involve private access, which cannot be obtained at this stage, it is considered that an asbestos specialist shall be employed by the responsible parties during the construction stage to investigate this issue.

7.6.2.6 Sufficient and reasonable lead time shall be allowed for preparation, vetting and implementation of Asbestos Investigation Report and Asbestos Abatement Plan in accordance with Air Pollution Control Ordinance before commencement of any demolition or site clearance work.

7.6.2.7 Some key precautionary measures related to the handling and disposal of asbestos are listed as following:

- Adoption of protection, such as full containment, mini containment, or segregation of work area;
- Provision of decontamination facilities for cleaning of workings, equipment and bagged waste before leaving the work area;
- Adoption of engineering control techniques to prevent fibre release from work area, such as use of negative pressure equipment with high efficiency particulate air (HEPA) filters to control air flow between the work area and the outside environment;
- Wetting of asbestos containing materials before and during disturbance, minimising the breakage and dropping of asbestos containing materials, and packing of debris and waste immediately after it is produced;
- Cleaning of work area by wet wiping and vacuuming with HEPA-filtered vacuum cleaner;
- Coating on any surfaces previously in contact with or contained by asbestos with a sealant;
- Proper bagging, safe storage and disposal of asbestos and asbestos-contaminated waste;
- Pre-treatment of all effluent from the work area before discharged; and
- Air monitoring strategy to check the leakage and clearance of the work area during and after the asbestos work.

7.6.2.8 The handling and disposal of ACM will be carried out in accordance with the EPD's Code of Practice on Handling, Transportation and Disposal of Asbestos Waste and ProPECC PN 2/97 Handling of Asbestos Containing Materials in Buildings.

7.6.2.9 For those processes which generated 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.

7.6.2.10 If chemical waste is produced at the construction 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 Waste. Chemical waste should be stored in appropriate containers and collected by a licensed chemical waste contractor. Chemical waste (e.g. spent lubricant oil) should be recycled at an appropriate facility as far as possible, while 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.

General Refuse

7.6.2.11 General refuse should be stored in enclosed bins or compaction units separate from C&D materials and chemical wastes. A reputable waste collector should be employed by the contractor to remove general from the site, separately from C&D materials and chemical wastes, on a daily basis to minimise odour, pest and litter impacts. The collected general refuse would be disposed of at designated landfill. Clearly labelled recycling bins should be provided on site in order to encourage segregation and recycling of aluminium and plastic wastes, and wastepaper in order to reduce general refuse production.

7.6.2.12 The contractor should carry out an education programme for workers in avoiding, reducing, reusing and recycling of materials generation. Posters and leaflets advising on the use of the bins should also be provided onsite as reminders. The recyclable waste materials should then be collected by reliable waste recycling agents on a daily basis.

Excavated Sediment

7.6.2.13 Since the amount of excavated sediment generated from the pond excavation works is expected to be small, all excavated sediment will be treated and reused on-site as backfilling materials for the Project. This approach avoids the need for off-site disposal that may result in impacts on the marine environment. In addition, all construction works near the watercourses should be undertaken within a dry zone and during dry season to avoid adverse impacts to the environment. The excavated sediment, if stockpiled on site, should be stored in enclosed containers and transported to the on-site treatment facilities as soon as practicable to minimise any potential odour impacts.

Floating Refuse

7.6.2.14 In case of floating refuse is identified, the floating materials should be removed and eventually stored and disposed of together with the general refuse, after separating the recyclables for recycling. Any floating refuse trapped within the Project area will be collected by the Contractor and disposed together with other general refuse. Apart from collecting and storing waste with good waste management practice on site to avoid having waste transported to river channels or water bodies under extreme weather conditions, the contractor should be responsible for the collection of refuse, if any, within the works area. Contractor shall collect and remove floating refuse at regular intervals on a daily basis to keep river channels or water bodies within the Project area and the neighbouring water free from rubbish during the construction phase.

7.6.3 Operation Phase

Municipal Solid Waste

7.6.3.1 Implementation of a waste prevention programme as well as materials recovery and recycling programme are recommended in order to minimise the production of waste. The programmes should consist of the following components:

- Recycling bins such as paper, aluminium cans, plastic bottles, glass bottles, etc. should be placed at prominent locations to encourage recycling;
- Banner should be erected at the recycling bins area;
- Operator should make arrangements with the recycler to collect and recycle used fluorescent lamps, toner cartridges as well as the scrap electronic equipment, such as computers to avoid disposal at landfills as far as practicable;
- Staff awareness training should be provided on waste management procedures, including waste reduction and recycling;
- Operator should set up waste reduction and recycled targets; and
- Operator should participate in the Wastewi$e Label scheme to facilitate waste reduction.

7.6.3.2 MSW generated from residential, commercial and industrial buildings should be collected with lidded bins, delivered to the refuse collection room and stored in enclosed containers installed in each building at the ground floor to prevent windblown, vermin, water pollution and visual impact. At least daily collection should be arranged by the waste collector to transport the waste to the RCPs or RTS within the STLMDC DN. Odour removal installations are recommended to be installed at the RCPs and RTS to treat the exhaust air. Such arrangements will minimise potential environmental impacts. The above recommendations are proposed as technical guidelines for the operator's consideration and will be subject to detailed design.

Chemical Waste

7.6.3.3 The proposed mitigation measures for operation phase are the same as that proposed for the construction phase. The operator should register with EPD as a chemical waste producer and follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Chemical waste should be stored in appropriate containers and collected by a licensed chemical waste contractor. Chemical waste (e.g. spent lubricant oil) should be recycled at an appropriate facility as far as possible, while 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.

Screenings, Grits and Sewage Sludge

7.6.3.4 The new STLMC EPP is designed to handle the sewage generated from the new development areas under this Project. The major solid waste types produced from the EPP would be the screenings and grits collected from the inlet works and the dewatered sludge collected from the sewage treatment process. Screenings and grits generated from the EPP is suggested to be disposed of at the NENT Landfill whereas the dewatered sludge generated from the EPP is suggested to be treated at the STF, subject to detailed design. The screenings, grits and dewatered sludge will be delivered by road transport in water tight containers or skips to avoid odour emission during transportation. Unloading process will be operated in the designated room inside STF which should be enclosed and served by negative pressure by extracting odorous gas to deodorising unit.

7.7 Evaluation of Residual Environmental Impacts

7.7.1.1 With the implementation of recommended mitigation measures for the handling, transportation and disposal of the identified waste, no residual waste management implications would be anticipated during both the construction and operation phases.

7.8 Environmental Acceptability of the Schedule 2 Designated Projects

7.8.1.1 Waste management implication assessment for the construction and operation phases of the Project was carried out taking into account the DPs under Schedule 2 and Schedule 3. It is noted that the DPs under Schedule 2 would mostly contributed to the generation of C&D materials during the construction phase of the Project. The majority of the non-inert C&D materials would be generated from construction of new buildings and infrastructures, while the majority of the inert C&D materials would be generated from refinement of site formation level and the proposed construction activities. Since most of the inert C&D materials generated from the Project would be reused as backfilling materials, the DPs under Schedule 2 are not anticipated to result in any adverse environmental impacts.

7.9 Conclusion

7.9.1.1 The main waste types to be generated during the construction phase of the Project will include C&D materials, chemical waste, general refuse, excavated sediment, and floating refuse. It is estimated that a total of 10,337,500 m^3 of inert C&D materials will be generated from site clearance and site formation works as well as construction of new buildings and infrastructures. Reduction measures have been recommended to minimise the amount of materials generated by the Project by reusing C&D materials as far as practicable before off-site disposal. Provided that the waste is handled, transported and disposed of using approved methods, adverse waste management implications, including potential hazards, air and odour emissions, noise, wastewater discharge, ecology and public transport, associated with handling, storage and disposal of wastes during the construction phase of the Project are not expected.

7.9.1.2 The main waste types to be generated during the operation phase of the Project will include MSW, chemical waste, screenings, grits and sewage sludge. New RCPs and a new RTS will be included in the Revised RODP in preparation for the increased quantity of waste in the district. The proposed waste infrastructure will provide convenient collection of recyclables from the local community, and to provide synergy to achieve better operational efficiency and environmental sustainability. Provided that the waste is handled, transported and disposed of using approved methods, adverse waste management implications, including potential hazards, air and odour emissions, noise, wastewater discharge, ecology and public transport, associated with handling, storage and disposal of wastes during the operation phase of the Project are not expected.