5. WASTE DISPOSAL AND MANAGEMENT

5.1 Introduction

This Section identifies the potential wastes arising from the construction of the Project and assesses the potential environmental impacts of their handling and disposal. Options for reuse, minimisation, recycling, treatment, storage, collection, transport and disposal of waste arising from construction are examined. Where appropriate, procedures for waste reduction and management are considered and environmental control measures for avoiding or minimising impacts are recommended.

During the operation of Route 10 (NLYLH), the types of waste generated will be largely restricted to Construction and Demolition (C&D) material (such as asphaltic concrete) from road maintenance works and refuse from the administration building at the toll plaza. The quality of C&D material to be generated will depend on the maintenance programme proposed by the operator which cannot be determined at this stage. However, it is expected that it will be in the order of a few hundred cubic metre per year. The asphaltic material should be recycled as far as possible and any surplus material should be disposed of at public filling areas (PFAs) or other reclamation sites. The amount of general refuse to be generated will be in the order of 200 to 300 kg per day or about 1 cubic metre per day. The disposal of this small quantity of general refuse to waste transfer station or landfill will have negligible impact on the operation of these facilities.

5.2 Environmental Legislation and Standards

The criteria for evaluating potential construction waste management implications are set out in *Annex 7* of the TMEIA.

The following legislation covers, or has some bearing upon, the handling, treatment and disposal of waste in Hong Kong, and has been used as the assessment criteria:

- *Waste Disposal Ordinance* (Cap 354);
- *Waste Disposal (Chemical Waste) (General) Regulation* (Cap 354);
- *Land (Miscellaneous Provision) Ordinance* (Cap 28);
- *Public Health and Municipal Services Ordinance* (Cap 132) - *Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws*; and
- *Dumping at Sea Ordinance.*

The following documents, guidelines and circulars relate to waste management in Hong Kong:

- *Annex 15* of the TMEIA;

- *Waste Reduction Framework Plan, 1998 - 2007*, Planning, Environment and Lands Branch, Government Secretariat (5 November 1998);
- *Hong Kong Planning Standards and Guidelines* (HKPSG);
- *New Disposal Arrangements for Construction Waste*, Environmental Protection Department & Civil Engineering Department (1992);
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*, Environmental Protection Department (1992);
- *Works Branch Technical Circular No 2/93, Public Dumps*;
- *Works Branch Technical Circular No 16/96, Wet Soil in Public Dumps;*
- *Practice Note for Professional Persons - Construction Site Drainage* (ProPECC PN 1/94), Professional Persons Consultative Committee (1994).
- *Environmental Protection Department Technical Circular (TC) No. 1-1-92, Classification of Dredged Sediments for Marine Disposal*; and
- *Works Branch Technical Circular No. 6/92, Fill Management*; and
- *Works Branch Technical Circular (WBTC) No. 22/92, Marine Disposal of Dredged Mud.*

5.3 Construction Waste Impact

5.3.1 Potential Sources of Impact

Construction activities will result in the generation of a variety of waste which may include:

- site clearance waste;
- excavated materials;
- marine dredged materials;
- construction and demolition (C&D) waste;
- chemical waste; and
- general refuse.

If not properly managed, the handling and disposal of this waste may cause environmental impact and nuisance. The nature these waste types are discussed below.

Site Clearance Waste

The Project will be predominantly constructed on hillsides and in rural areas. Site clearance waste generated will therefore mainly consist of low-graded natural vegetation such as scrub and grass.

Excavated Materials

As indicated in the preliminary construction programme in *Figure 2.1*, the main sources of excavated material will be:

- North Lantau: Sam Chuen cutting;
- Tsing Lung Bridge: excavation of tower base at Kwai Shek, rock overburden at Kwai Shek Anchorage;
- Tsing Lung Tau to So Kwun Wat: Tai Lam Chung Tunnel, Siu Lam cutting; and
- So Kwun Wat Section: general cutting.

The majority of this material will be rock, although some soil will be generated, in particular at the tunnel portals. Excavated materials are inert and can normally be reused on site or in Public Fill areas.

Marine Dredged Materials

The preliminary design has adopted drained reclamation wherever possible and the dredging of marine deposits has been minimised. However, dredged material will be generated at the Toll Plaza on North Lantau where soft marine sediment must be removed prior to forming the seawalls. The total amount of marine sediment dredged will be less than $0.5Mm^3$.

Dredged material is currently classified according to the level of contamination under the *EPD Technical Circular (EPDTC) No. 1-1-92, Classification of Dredged Sediments for Marine Disposal.* It must be disposed of according to the level of contamination. The criteria for determination of the quality of the dredged material is discussed in Section 5.4. Marine disposal of dredged materials is controlled under the *Dumping at Sea Ordinance 1995.*

Construction and Demolition Waste

Construction and demolition (C&D) material[1] will mainly arise from the construction of the administrative buildings, tunnel portals, viaducts and the toll plaza, and the demolition of existing structures such as village houses. It includes unwanted materials generated during construction, rejected structures and materials, materials that have been over-ordered and materials which have been used and discarded. C&D material may include:

- wood from formwork and falsework;
- material and equipment wrapping;
- unusable/surplus concrete/grouting mixes; and

[1] "C&D material" contains a mixture of inert and non-inert material. The inert portion is the "public fill" and the non-inert portion is the "C&D waste".

- damaged/contaminated/surplus construction materials.

The adopted alignment avoids the removal of both the Tso Wan and Fa Peng villages. However, a number of village houses and existing structures in other areas may need to be demolished (eg villages houses along Siu Lam Link). This may result in the generation of demolition waste.

Chemical Waste

The *Waste Disposal (Chemical Waste)(General) Regulation* defines chemical waste as any substance being scrap material or unwanted substances specified in its *Schedule 1* and provides a complete list of such substances. However, substances likely to be generated by construction activities will mainly arise from the maintenance of equipment. These may include, but need not be limited to, the following:

- scrap batteries or spent acid/alkali;
- used engine oils, hydraulic fluids and waste fuel;
- spent mineral oils/cleaning fluids from mechanical machinery; and
- spent solvents/solutions, some of which may be halogenated, from equipment cleaning activities.

Chemical waste may pose serious environmental, health and safety hazards if it is not properly managed. These hazards may include:

- toxic effects to workers;
- adverse effects on water quality from spills;
- fire hazards; and
- disruption of sewage treatment works where the chemical waste is allowed to enter the sewerage system.

General Refuse

Each worksite will generate general refuse including paper and food waste. There is likely to be a concentration of such waste at batching plants on major worksites and at the Tai Lam Chung Tunnel portals. The storage of general refuse has the potential to give rise to high environmental impacts. These include odour (if waste is not collected frequently), windblown litter, water quality impacts (if waste enters water bodies), and visual impacts. The refuse may also attract pests and vermin if the storage areas are not well maintained and cleaned regularly. In addition, disposal of waste at sites other than approved waste transfer or disposal facilities, can also lead to environmental impacts.

5.4 Assessment Methodology

5.4.1 General

The method for assessing potential waste management impacts during construction follow that presented in *Annexes 7* and *15* of the TMEIA and include the following:

- estimation of the types and quantities of waste generated;
- assessment of potential impacts from the management of solid waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges and transport; and
- assessment of potential impacts on the capacity of waste collection, transfer and disposal facilities.

5.4.2 Marine Dredged Material

Dredged sediments destined for marine disposal are classified according to their level of contamination by seven toxic metals as stipulated in the *EPDTC No. 1-1-92, Classification of Dredged Sediments for Marine Disposal.* The seven metals are cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), and zinc (Zn). The contamination levels presented in the *EPDTC 1-1-92* serve as criteria for determining the disposal requirements of marine dredged sediments. Definitions of the classifications are as follows:

Class A Uncontaminated material, for which no special dredging, transport or disposal methods are required beyond those which would normally be applied for the purpose of ensuring compliance with EPD's Water Quality Objectives (WQO), or for protection of sensitive receivers near the dredging or disposal areas.

Class B Moderately contaminated material, which requires special care during dredging and transport, and which must be disposed of in a manner which minimizes the loss of pollutants, either into solution or by resuspension.

Class C Seriously contaminated material, which must be dredged and transported with great care, which cannot be dumped in the gazetted marine disposal grounds and which must be effectively isolated from the environment upon final disposal.

It should be noted that for sediments to be identified within a particular class, the concentration of only one of the metallic types needs to be exceeded. For Class B and Class C, the final determination of appropriate disposal options and routing, and the allocation of a permit to dispose of material at the designated disposal site will be made by the EPD and Fill Management Committee (FMC) in accordance with *WBTC 22/92* and *6/92*.

EPD's criteria for the classification of dredged sediments destined for marine disposal are shown below in *Table 5.1*. Permits from the EPD are required for marine disposal of such materials.

Table 5.1 Classification of Sediments by Metal Content (mg.kg dry weight^{-1})

	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Class A	0.0-0.9	0-49	0-54	0.0-0.7	0-34	0-64	0-149
Class B	1.0-1.4	50-79	55-64	0.8-0.9	35-39	65-74	150-199
Class C	1.5 or more	80 or more	65 or more	1.0 or more	40 or more	75 or more	200 or more

5.5 Evaluation of Impacts

The amount of waste arising from construction and the potential environmental impacts associated with its handling, storage, transport and disposal are discussed below.

Site Clearance Waste

The majority of the alignment is either in tunnel or on viaducts or bridges. The need for site clearance will be limited and will consist of small amounts of low graded vegetation, mainly consisting of scrub and grass. It is considered that the handling and disposal of the site clearance waste will not be a key issue and the potential environmental impact arising from handling and disposal of such waste will be negligible.

Surplus Excavated Material

Initial estimates are that there will be a total of approximately 6.7 Mm^3 of excavated materials and a total of 3.6 Mm^3 of general fill will be required. Assuming the general fill materials required can be fully supplied by the excavated materials, a total of about 3.1 Mm^3 of surplus excavated materials will be generated from the construction.

Table 5.2 presents the cut and fill balance and *Figures 5.1- 5.4* present the timing and volume of surplus excavated materials generated from the construction.

Table 5.2 Cut and Fill Balance for Construction of Route 10 (NLYLH) (Southern Section)

Section	Items included	Cut Volume (m3)	Fill Volume (m3)	Balance
North Lantau	• Fa Peng • Toll Plaza • Sam Chuen • Yi Chuen • San Po Tsui	2,258,000	3,483,000	-1,225,000

Section	Items included	Cut Volume (m3)	Fill Volume (m3)	Balance
Tsing Lung Bridge	• Kwai Shek • Tsing Lung Tau • Towers	2,499,000	0	2,499,000
Tai Lam Chung	• Tunnel Portals • Tunnel • Tai Lam Chung Viaduct • Siu Lam • Siu Lam Viaduct • Siu Lam Quarry • So Kwun Wat Mainline	2,775,000	566,000	2,209,000
So Kwun Wat Interchange	• So Kwun Wat Link Road • Siu Lam Link Road	485,000	83,000	402,000
Total Southern Section		8,017,000	4,132,000	3,885,000

Notes:
1. Quantities based on measurement from Preliminary Design Drawings and MOSS program output.
2. Negative balance shows net import of fill required.
3. Bulking factor 1.2 **NOT** included on volumes.

The majority of the excavated material will be reused on-site as fill in the construction of seawalls (if required), reclamation of the toll plaza and road embankments. The transportation of the surplus excavated material will be conducted in an environmental friendly manner using conveyor belts and marine barges, which will significantly reduce the use of vehicular transportation.

The surplus excavated material will be re-used as public fill at PFAs or reclamation sites for reclamation projects. Should no suitable PFAs or reclamation sites be identified during the time surplus material is generated, this will have to be disposed of to landfill, which is undesirable. Projects registered in the Fill Management Committee (FMC) database (reference: FMC Database of Fill Requirements & Surpluses. October 1998 FMC Secretariat. Geotechnical Engineering Office, Civil Engineering Department, Hong Kong) which have a similar time horizon for construction as Route 10 (NLYLH) include Container Terminal No 9, North Lantau Development - Tung Chung & Tai Ho: Remaining Development, Southeast Kowloon Reclamation and Tuen Mun Area 38 Special Industries Area Reclamation and require over 15 million cubic metres of fill. This is approximately four times the surplus excavated material generated for the project.

It is recommended that if the transportation constraints can be resolved, the surplus excavated material generated in Kwai Shek (North Lantau) be re-used as general fill for the reclamation the toll plaza. The surplus excavated material generated from Tsing Lung Tau to So Kwun Wat can be re-used as general fill for the So Kwun Wat Interchange. The Contractor should liaise with the Fill Management Committee (FMC) to identify other reclamation projects that will require fill material during the construction period.

It is envisaged that a length of about 200m of the Tai Lam Chung Tunnel will be excavated from the Southern Portal. This will result in approximately 100,000 m^3 of material for disposal. This material will be transported via the southern portal area to barging points at Tsing Lung Tau by means of an enclosed conveyor belt. Environmental impacts associated with the transportation of excavated materials will be minimal.

The principal means of disposal will be via marine transport. It is proposed that barges with a capacity of 800 m^3 be used for the excavated materials produced at Kwai Shek and Tsing Lung Tau.

It is estimated that 20 barges per day over 9 months, or 15 barges per day over 12 months, will be required for the transportation of excavated materials from Kwai Shek. This level of marine traffic is low and will have no significant impact on shipping routes. Nevertheless, every opportunity should be taken to re-use surplus material at nearby reclamation sites (eg potential reclamation possibilities at North Shore Lantau and Tuen Mun Area 38, etc) in order to minimise travel distances and thus the impact on marine traffic.

Excavation activities are programmed to start in April 2002 and be completed in September 2003 as shown in *Figures 5.1-5.4*. Filling and reclamation activities will commence in April 2002 and be completed by November 2002.

The total construction period for the Tai Lam Chung Tunnel is estimated at 115 weeks. The construction programme for Tsing Lung Bridge is 5 years. Two years will be required for the construction of the viaducts at So Kwun Wat and North Lantau.

Marine Dredged Material

Results from the I&PD site investigation, as presented in *Table 5.3*, show that the sediment in the proposed toll plaza area and at Tsing Lung Tau are generally uncontaminated. The exception is Zn level at G1 and the Cu level at G2 (sampling locations are shown in *Figures 5.5 and 5.6*). Open sea disposal of the dredged material will therefore be appropriate.

Table 5.3 Results of Site Investigation Study

Sampling Locations	Cd	Cr	Cu	Hg	Ni	Pb	Zn
G1	0.36	31	40	0.23	8.9	44	150[a]
G2	0.39	30	56[a]	0.16	8.9	Not detected	120
G3	0.28	21	33	0.05	6.3	31	74
G4	<0.1	<8	<6	<0.05	-[b]	<7	<20
G5	0.39	30	52	0.18	8.4	60	79
G6	0.34	30	42	0.14	8.5	56	84
G7	0.12	<8	6.5	<0.05	<4	15	28
G8	0.30	20	37	0.11	5.5	63	79
G9	0.82	19	39	0.13	7.0	32	77

Sampling Locations	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Classification system according to TC 1-1-92							
Class A	0.0-0.9	0-49	0-54	0.0-0.7	0-34	0-64	0-149
Class B	1.0-1.4	50-79	55-64	0.8-0.9	35-39	65-74	150-199
Class C	1.5 or more	80 or more	65 or more	1.0 or more	40 or more	75 or more	200 or More

Notes
(a) Samples showing Class B results but would still acceptable for open sea disposal according to generalised TC 1-1-92.
(b) Sample G4 is mainly shell fragments. No soil remaining for re-analysis.

A new technical circular for the management of dredged or excavated sediment, titled: *Management of Dredged/Excavated Sediment* is currently being drafted jointly by Planning, Environment and Land Bureau (PELB) and Works Bureau (WB). It will be applied to projects that involve the marine disposal of dredged/excavated sediment commencing after 1 January 2002, and hence will probably apply to this Project. The Site Investigation Study has been conducted after consultation with EPD to take into account the criteria of the new technical circular. In accordance with the requirements of the existing technical circulars, the results show that the dredged sediments could be disposed of at gazetted marine dumping grounds. However, with the implementation and finalisation of the new proposed technical circular, it is understood that more tests on the dredged material will be required. These tests would likely include tests on the levels of Silver, Arsenic, PAHs and Tributyltin.

It is estimated that the construction of the seawall for the toll plaza will require the dredging of approximately 0.45Mm^3 of marine sediment. The FMC has been notified about the Project, although the routes and locations of final disposal sites for the dredged materials cannot be determined until the Detailed Design phases.

Construction and Demolition Waste Arising from New Building Construction

The quantity of C&D material produced from the construction of the administration building will be about 1,000 m^3. This is not expected to have any major impact.

C&D material should be removed from site as soon as practicable to avoid adverse environmental impacts due to on-site storage of the material. Because of the scale of the Project, it is likely that space will be available for sorting and separating inert and non-inert materials on site before disposal. Inert materials (public fill) should be taken to public filling areas and non-inert or putrescible materials (waste) to landfills

To conserve space at landfill sites, C&D waste with more than 20% (by volume) inert material (dust, dirt, soil, brick, ceramic tile, concrete, etc) should not be disposed of at landfills.

C & D Waste Arising from Demolition of Buildings

On Lantau the alignment avoids encroachment on both the Tso Wan and Fa Peng villages and hence the number of structures requiring removal will be minimal. Although a small number of structures along the Siu Lam Link Road may need to be demolished, the total quantity of demolition waste will be small.

Given the nature of the inert C&D material it can be delivered to public filling areas where it is unlikely to raise any long term concerns. The potential environmental impacts arising from the handling and disposal of inert C&D material will be negligible.

Chemical Waste

The amount of chemical waste that will arise from the construction activities will be dependent on the contractor's on-site maintenance and the amount of plant and number of vehicles utilised. It is anticipated that the quantity of chemical waste, such as lubricating oil and solvent, produced from plant maintenance will be relatively small. These types of waste will be readily accepted at the Chemical Waste Treatment Facility at Tsing Yi.

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. Provided that this occurs, and the chemical waste is disposed of at a licensed chemical waste treatment and disposal facility, the potential environmental impacts arising from the storage, handling and disposal of a small amount of chemical waste generated from the construction activities will be negligible.

General Refuse

It is estimated that the size of the construction workforce will peak at about 1,600. The quantity of general refuse to be generated at the peak of construction is therefore estimated to be about 1,600 kg day^{-1}. Provided the refuse is stored and transported in accordance with good practice and disposed at licensed landfills, the potential environmental impacts will be minimal.

5.6 Mitigation Measures

5.6.1 Introduction

This section sets out measures which should be taken to avoid or minimise potential adverse impacts from waste arising from the construction. The contractor should incorporate these recommendations into a comprehensive on-site waste management plan. Such a management plan should incorporate site specific factors, such as the designation of areas for the segregation and temporary storage of reusable and recyclable materials.

Waste Management Hierarchy

The various waste management options can be categorised in terms of preference from an environmental viewpoint. The preferred options have the least impact and are more sustainable in the longer term. Hence, the hierarchy is as follows:

- avoidance and minimisation, ie not generating waste through improving practices and design;

- reuse of materials, thus avoiding disposal (generally with only limited reprocessing);
- recovery and recycling, thus avoiding disposal (although reprocessing may be required); and
- treatment and disposal, according to relevant laws, guidelines and good practice.

The contractor should consult the EPD on the final disposal of waste.

This hierarchy should be used to evaluate waste management options, thus allowing maximum waste reduction and often reducing costs. Waste reduction measures should be introduced at the design stage and carried through the construction activities, wherever possible, by careful purchasing control, reuse of formwork and good site management. By reducing or eliminating over-ordering of construction materials, waste is avoided and costs are reduced both in terms of purchasing of raw materials and in disposing of waste.

Training and instruction of construction staff should be given at the site to increase awareness and draw attention to waste management issues and the need to minimise waste generation. The training requirement should be included in the site waste management plan.

Storage, Collection and Transport of Waste

Permitted waste hauliers should be used to collect and transport waste to the appropriate disposal points. The following measures to minimise adverse impacts should be instigated:

- handle and store waste in a manner which ensures that it is held securely without loss or leakage, thereby minimising the potential for pollution;
- use waste hauliers authorised or licenced to collect specific categories of waste;
- remove waste in a timely manner;
- maintain and clean waste storage areas regularly;
- minimise windblown litter and dust during transportation by either covering trucks or transporting waste in enclosed containers;
- obtain the necessary waste disposal permits from the appropriate authorities, if they are required, in accordance with the *Waste Disposal Ordinance* (Cap 354), *Waste Disposal (Chemical Waste) (General) Regulation* (Cap 354), the *Land (Miscellaneous Provision) Ordinance* (Cap 28);
- dispose of waste at licensed waste disposal facilities;

- develop procedures such as a ticketing system to facilitate tracking of loads, particularly for chemical waste, and to ensure that illegal disposal of waste does not occur; and

- maintain records of the quantities of waste generated, recycled and disposed.

Surplus Excavated Material

The excavated material may have to be temporarily stockpiled on-site for subsequent re-use. Control measures should be taken at the stockpiling area to prevent the generation of dust and pollution of stormwater channels. Details of environmental control measures for dust and water pollution are discussed in Sections 4 and 5 of this Report. Key control measures are highlighted below:

Dust:

- wetting the surface of the stockpiled soil with water when necessary especially during the dry season;

- covering stockpiled soil with sheets;

- minimising disturbance of stockpiled soil; and

- enclosure of stockpiling areas.

Water Quality:

- separating surface water drainage system for stockpiling areas;

- installation of silt traps for the surface water drainage system; and

- covering stockpiled material with tarpaulins during heavy rainstorms.

Marine Dredged Material

All vessels for marine transportation of dredged sediment should be fitted with tight fitting seals to their bottom openings to prevent leakage of materials. In addition, loading of barges and hoppers should be controlled to prevent splashing of dredged material into the surrounding water, and barges or hoppers should under no circumstances be filled to a level which will cause the overflowing of materials or polluted water during loading or transportation.

C&D Waste

In order to minimise waste arisings and to keep environmental impacts within acceptable levels, the environmental control measures described below should be adopted.

Careful design, planning and good site management can minimise over-ordering and generation of waste materials such as concrete, mortar and cement grouts. The design of formwork should maximise 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.

The contractor should recycle as much of the C&D material as possible on-site. Proper segregation of waste types on site will increase the feasibility of certain components of the waste stream by recycling contractors. For example, concrete and masonry can be used as general fill and reinforcement can be taken to steel mills. Different areas of the worksite should be designated for such segregation and storage wherever site conditions permit.

The handling and disposal of bentonite slurries, if any, should be undertaken in accordance with ProPECC PN 1/94 on construction site drainage.

Construction and demolition wastes currently comprise approximately 35% of waste input to landfills. To maximise landfill life, Government policy discourages the disposal of C&D wastes with more than 20% inert material (by volume) at landfills. Inert C&D materials are directed to reclamation areas, where they have the added benefit of offsetting the need for removal of materials from borrow areas for reclamation purposes.

Government has established a charging scheme for the disposal of waste to landfill. When it is implemented, this will provide an additional incentive to reduce the volume of waste generated and to ensure proper segregation of types of waste to allow free disposal of inert material to public filling areas.

Chemical Waste

For those processes which generate chemical waste, it may be possible to find alternatives which generate reduced quantities or even no chemical waste, or less dangerous types of chemical waste.

Chemical waste that is produced, as defined by *Schedule 1* of the *Waste Disposal (Chemical Waste) (General) Regulation,* should be handled in accordance with the *Code of Practice on the Packaging, Handling and Storage of Chemical Wastes* as follows.

Containers used for the storage of chemical waste should:

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

The storage area for chemical waste should:

- be clearly labelled and used solely for the storage of chemical waste;
- be enclosed on at least 3 sides;
- have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;
- have adequate ventilation;
- be covered to prevent rainfall entering (water collected within the bund must be tested and disposed as chemical waste if necessary); and
- be arranged so that incompatible materials are adequately separated.
- Disposal of chemical waste should:
- be via a licensed waste collector; and
- be a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Facility which also offers a chemical waste collection service and can supply the necessary storage containers; or
- be to a reuser of the waste, under approval from the EPD.

The Centre for Environmental Technology operates a Waste Exchange Scheme which can assist in finding receivers or buyers for the small quantity of chemical waste to be generated from the Project.

General Refuse

General refuse should be stored in enclosed bins or compaction units separate from C&D and chemical wastes. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D and chemical wastes, on a daily or every second day basis to minimise odour, pest and litter impacts. The burning of refuse on construction sites is prohibited by law.

General refuse is generated largely by food service activities on site, so reusable rather than disposable dishware should be used if feasible. Aluminum cans are often recovered from the waste stream by individual collectors if they are segregated or easily accessible, so separate labelled bins for their deposit should be provided if feasible.

Office waste can be reduced through recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered if one is available.

5.7 Environmental Monitoring and Audit Requirements

It is recommended that auditing of each waste stream be carried out periodically to determine if waste is being managed in accordance with approved procedures and the site waste management plan. The audits should look at all aspects of waste management including waste generation, storage, recycling, treatment, transport, and disposal. An appropriate audit programme would be to undertake a first audit at the commencement of the construction works, and then to audit quarterly thereafter.

5.8 Conclusions

An assessment of the potential environmental impacts of waste arising from the construction of the Project has been conducted. Operational impacts on the proposed route are expected to be minimal. Key issues include the need for effective waste management planning during the construction phase. Waste management methods and practices and other environmental control measures are recommended to ensure that potential impacts are avoided or controlled to acceptable levels. Provided all the suggested mitigation measures such as proper handling a disposal of wastes are successfully implemented, the potential environmental impacts associated with the management of waste will be insignificant. A comprehensive on-site Waste Management Plan will be formulated and submitted to EPD for review prior to construction of the Project. The recommendations of the Waste Management Plan shall be fully implemented. No residual impact has been identified.