

7. SOLID WASTE MANAGEMENT ASSESSMENT

7.1 Introduction

During the construction phase, quantities of excavated materials and other wastes will be generated which will require disposal in an appropriate and environmentally acceptable manner. This section of the EIA report involves an assessment of the potential environmental impacts from solid and construction waste streams generated by the proposed works and describes an appropriate disposal strategy. The disposal strategy is based upon the waste management principle of reducing the amount of waste requiring final disposal through the development of outline plans for waste avoidance, material re-use, and recycling.

Excavated materials and residual wastes may give rise to impacts during their handling, temporary stockpiling or storage on site, transportation and final disposal. A key task of this waste management assessment is to determine the types and where possible estimate the quantities of all solid waste arisings. Moreover, in order to determine the most appropriate methods of treatment, handling and disposal, it will also be important to understand the nature and composition of the waste, in particular whether the waste materials are inert or contaminated.

Wastes generated during the operational phase have also been considered within this assessment. Impacts on water quality from the generation of waste waters and proposed mitigation measures are discussed separately in Section 6 (Water Quality).

7.2 Objectives

The solid waste management assessment has been carried out in accordance with the agreed methodology presented in the Working Paper WP II – EIA Methodology and Assessment Report, the requirements of Clause 6.40.9 of the EIA Study Brief and Annex 7 and 15 of the TM-EIAO.

The overall objectives for the waste management assessment are summarised below:

- (i) to assess the construction activities involved for the proposed works and determine the type, nature and where possible, estimate the volume of waste to be generated;
- (ii) to identify any potential environmental impacts from the generation of waste associated with the works;
- (iii) to categorise waste materials where practical, i.e. suitability for re-use/recycling, disposal to public filling areas, disposal to landfill and any pre-treatment requirements prior to disposal;

- (iv) to recommend appropriate waste management options (including waste minimisation on-site, re-use or recycling opportunities and off-site disposal options);
- (v) to identify site management/mitigation measures that should be implemented to minimise any potential impacts from the generation, handling, storage and disposal measures/routings of waste, in accordance with the current legislative and administrative requirements; and
- (vi) to assess handling and disposal requirements of bentonite slurries in accordance with the Practice Note For Professional Persons ProPECC PN 1/94.

7.3 Nature and Type of Waste Materials

7.3.1 Construction Phase

Wastes which will be generated during the construction phase include the following:

- (i) vegetation and demolition waste from site clearance;
- (ii) excavated materials from earthworks (e.g. cuttings, pile foundations, regrading works);
- (iii) general construction waste (e.g. wood, scrap metal, concrete);
- (iv) bentonite slurries from pile construction;
- (v) chemical wastes generated by general site practices (e.g. vehicle and plant maintenance/servicing); and
- (vi) municipal wastes generated by site workers.

The construction works will also require the diversion of a number of water supply pipes. Historically, water supply pipework within Hong Kong has incorporated the use of asbestos containing materials. However, based on a review of available WSD records there is no evidence to suggest that asbestos containing materials will be encountered during the utility diversion works.

The generation of volumes of sediment requiring off site disposal is highly unlikely although small quantities may arise during viaduct construction (maximum estimate <math><100\text{m}^3</math>). No sediment quality testing was carried out as part of the geotechnical investigation since no dredging works are proposed and no significant generation of sediments requiring disposal are anticipated. In the unlikely event that sediment is excavated and requires off site disposal, sediment samples will be analysed to determine the appropriate disposal route. This will be in accordance with EPD's Technical Circular No 1-1-92, taking into consideration subsequent revisions to the quality criteria in light of the proposed New Sediment Management Framework.

Waste Generated from Site Clearance

During the ground preparatory works, areas of tree and shrub cover will need to be cleared (refer to Section 8, Ecology) and will require disposal. An estimated 12.64 Ha of vegetation will be cleared and will require disposal.

Along parts of the road alignment, existing structures will also need to be demolished to accommodate the proposed project works. Proposed demolition requirements are highlighted within Table 7.1 below. In addition, buildings resumed along the route may require demolition. These include buildings located with Tai Hang village (Chainage 6070-6310). Demolition

waste will likely comprise reinforced concrete, asphalt/concrete (from excavated road pavements), metal, electrical wiring, brick and tiles. Total volumes of waste generated are not expected to exceed 4000 m³.

Table 7.1 Activities Involving Generation of Demolition Materials

Chainage	Activity
400	Demolition of bridges – Banyan, Banyan West
3700	Demolition of existing slip road
4600	Demolition of existing retaining wall
6090	Demolition of footbridge at Tai Hang
7520	Demolition of footbridge at Kiu Tau
7990	Demolition of footbridge (N119, N119a)
8525	Demolition of footbridge (NF 82)

Excavated Materials

The greatest volume of excavated material will arise from the re-excavation/modification of existing cuttings and slope cutting for new retaining walls. Wherever possible, excavated material from the earthworks will be re-used on site as structural fill or for landscaping purposes. This will maximise the utilisation rate of materials on site and reduce the requirement for off site disposal.

Estimated volumes of material from Cut and Fill Activities are presented in Table 7.2

Table 7.2 Estimated Volumes of Material From Cut and Fill Activities

Chainage	Construction Activity	Volume of Material (m ³)	
		Fill	Cut
550-700	Widening of existing embankment	15050	
750-1080	Widening of existing embankment using retaining wall	26450	
1250-1400	Widening of existing embankment including short retaining wall	22500	
1400-1480	Modification of existing cutting		5500
1500-1750	Widening of existing embankment including short retaining wall	32500	
1990-2200	Re-excavation of the existing cutting on north side; modification of existing cutting using retaining on the south side.		16800
2200-2260	Widening of existing embankment	2600	
2260-2380	Modification of existing cutting, including use of a retaining wall		8800
2380-2450	Widening of existing embankment	900	
2450-2610	Modification of existing cutting, including use of a retaining wall		5200
2610-2750	Widening of existing embankment including retaining wall	800	
2820-3120	Re-excavation of the existing cutting using retaining wall		14750
3650-3705	New embankment	200	

Chainage	Construction Activity	Volume of Material (m ³)	
		Fill	Cut
3920-4010	Re-excavation of the existing cutting		875
4010-4170	Widening of existing embankment	22300	
4170-4350	Re-excavation of the existing cutting		12250
4350-4420	New embankment	2030	
4420-4730	Modification of existing cutting using retaining wall on each side of the carriageway		18515
4800-4940	Widening of existing embankment	2500	
5370-5570	New retaining wall for viaduct access road		425
8390-8600	Modification of existing cutting using retaining wall		2000
Total		127,830	85,115

Based on the results of the Geotechnical Ground Investigation, the volumes of excavated material which are acceptable or unacceptable for re-use within the Project are summarised in Table 7.3. The total volume of material from cut and fill activities which will need to be imported to site and which will require off site disposal, is illustrated in Table 7.4 (figures have been rounded up).

Table 7.3 Estimated Volumes of Material From “Cut” Activities which are Acceptable or Unacceptable for Re-use within the Project

Chainage	Volume of Material from “Cut” Activities (m ³)	Volume Acceptable for re-use within Project (m ³)	Volume Unacceptable for re-use within Project (m ³)
1400-1480	5500	3900	1600
1990-2200	16800	10800	6000
2260-2380	8800	7100	1700
2450-2610	5200	2100	3100
2820-3120	14750	10400	4350
3920-4010	875	700	175
4170-4350	12250	9800	2450
4420-4730	18515	14900	3615
5370-5570	425	100	325
8390-8600	2000	1000	1000
Total		60800	24315

Table 7.4 Volumes of Material from Cut and Fill Activities to be imported to site / requiring off-site disposal

Volume of fill material to be imported (m ³)	Volume of excavated material requiring off-site disposal (m ³)
67,000	24,500

For excavated soils to be re-usable, materials must be clean, inert and suitable for the proposed engineering or landscaping use. A desk based review of the current land use along the route was undertaken in order to assess the likelihood of encountering contaminated soil materials during the construction works. Layout plans for the alignment were reviewed to identify potential contaminating land uses. The desk top study was supported by on site observations where possible. The review focused on areas where significant excavation would take place, i.e. where cuttings are required. Where only superficial ground works are to be carried out, no significant potential for the generation of excavated materials are anticipated.

Along the route alignment a number of light commercial/industrial uses (including open storage areas) were identified, although in the majority of cases these are not directly affected by the proposed works. In view of the minimal excavation and low potential for contamination from current uses, no significant volume of contaminated excavated materials is considered likely. Within areas of cutting no potential contaminating uses were identified.

A petrol filling station is located at Wo Hop Shek (Grid reference 833490 838565). Only minor works i.e. provision of cycle track/ footpath, are proposed adjacent to the site. As a result, no significant potential for the generation of contaminated excavated materials is considered likely.

In the unlikely event that contaminated materials are encountered, the appropriate measures as outlined under Section 7.4.1 should be followed.

Construction Waste Material

Construction waste likely to be generated during the site formation works include the following:

- waste wood from concrete form work;
- spent concrete;
- waste steel rebars from concrete reinforcement activities; and
- material and equipment wrappings.

The project works incorporate the construction of retaining walls, abutments and viaducts which may have piled foundations that may require the use of bentonite slurries. It is common practice among contractors to reuse these slurries during construction, thus reducing the volume requiring final disposal.

The total volume of construction waste to be generated is not expected to exceed 5000 m³. Volumes of bentonite slurries requiring final disposal will depend on site practices.

Chemical Waste Material

Plant and vehicle maintenance will likely be the primary source of chemical wastes during the construction period. The majority of chemical waste produced is therefore expected to consist of waste oils and solvents. Typical wastes may include the following:

- solid wastes (empty fuel/lubricant drums, used oil/air filters, scrap batteries, vehicle parts); and
- liquid wastes (waste oils/grease, spent solvents/detergents and possibly spent acid/alkali from batteries maintenance).

The volume of chemical waste will depend upon the total number of plant / vehicles and how much maintenance is actually carried out on site. However it is unlikely that volumes will exceed 450 litres / month.

Municipal Waste

Site construction workers will generate municipal wastes which will comprise food wastes,

packaging and waste paper.

No accurate figures are available on the likely volumes to be generated although EPD have predicted that on average, 1.07kg/employee/day of municipal waste may be expected (Monitoring of Municipal Solid Waste 1996, EPD (1997) Hong Kong Government). The total quantity of waste generated will thus be dependent on the number of site workers that the contractor proposes to use. For estimation purposes, we have assumed a maximum of 600 site staff.

7.3.2 *Operational Phase*

Wastes may be generated from specific maintenance operations (e.g. road re-surfacing, upkeep of landscaped areas) and may include asphalt, concrete and organic wastes (vegetation). The total volumes and types of waste materials will be dependent upon the nature and frequency of the maintenance works undertaken and cannot be accurately estimated at this stage.

7.3.3 *Summary and Estimated Volumes of Generated Waste*

Broad estimates for the volumes of generated waste have been assigned for each waste type although total amounts will be determined by the contractor's working practices / site procedures. Estimated volumes of materials to be generated are presented in Table 7.5.

The construction programme (refer to Appendix 1.1) will extend over a 3.5 year period (June 2002 to November 2005), with site clearance, earthworks and construction activities phased according to the following highway sections :

- (i) Section between Island House and Tat Wan Road (Chainage 0100-1900)
- (ii) Section between Tat Wan Road and Tai Po Tai Wo Road (Chainage 1900-4000)
- (iii) Section between Tai Po Tai Wo Road and Hong Lok Yuen Road (Chainage 4000-5300)
- (iv) Section between Hong Lok Yuen Road and Pak Wo Road (Chainage 5300-8700)

Table 7.5 Summary of Wastes to be Generated

Activity	Material Type	Likely time of arising	Estimated total volumes generated
Construction Phase			
Ground preparatory works	Site clearance	Jun 02 – Jul 02 ^{Sections i, ii, iii} Feb 03 – May 03 ^{Section iv}	Coverage 12.64 Ha
	Demolition materials	May 03 – Oct 03 ^{Section i} Nov 03 – May 04 ^{Section iv} Aug 04 - Mar 05 ^{Section I} Oct 04 – Feb 05 ^{Section iii} Oct 04 – Mar 05 ^{Section iv} Apr 05 – Mar 05 ^{Section ii}	4000m ³
Earthworks	Excavated materials	Feb 02 - Apr 03 ^{Section i} Nov 02 – Dec 03 ^{Section ii} Oct 02 – Jun 03 ^{Section iii} Feb 03 – Jan 05 ^{Section iv} May 03 – Dec 03 ^{Section iv}	24,500m ³
General works	Construction waste	Throughout construction period	5,000m ³
	Chemical waste	Throughout construction period	450 litre/month
	Bentonite slurries	Upon completion of construction works	Dependent upon site practices
	General refuse (generated by site staff)	Throughout construction period	3852 kg/week (assumes max of 600 staff and a 6 day week)
Operational Phase			
Maintenance works	Construction Wastes	Intermittent	Dependent upon extent of works.

7.4 Potential Impacts & Mitigation Measures

Waste materials have the potential to cause adverse environmental impacts during generation, storage, transport and disposal. The principal adverse effects relate to dust, water quality, general health and safety and visual impacts. For each anticipated waste category, the potential environmental impacts are highlighted and appropriate mitigation measures/disposal options recommended below. These recommendations form the basis of the Waste Management Plan (WMP).

The Traffic Impact Assessment, carried out separately from the EIA, considers the overall impacts from all traffic associated with the construction works, including the movement of haulage vehicles disposing of waste materials off-site. The TIA recommends temporary traffic measures and phasing of the construction works. Other mitigation measures associated with potential impacts from construction haulage vehicles are discussed within Section 4 (Air) and Section 5 (Noise).

Waste management procedures should be implemented to minimise potential impacts to the environment. This may be achieved by consideration and application of the following protocols :

- (i) avoiding and/or minimising waste generation where practical by improvements or changes in the project design or site procedures;
- (ii) reusing/recycling/recovering materials where possible and thereby negating / minimising disposal requirements (e.g. by waste segregation according to type, separation of recyclable materials such as metal, reuse of wood from site hoarding/concrete formwork, utilisation of excavated material for filling or landscaping)
- (iii) ensuring that all treatment and disposal options comply with best practice and all relevant guidelines and legislation.

The following specific measures should therefore be adopted during the detailed design and construction stages of the project to minimise waste generation:

Detailed Design :

- Minimising excavation requirements as far as possible.
- Balancing cut and fill requirements.
- Evaluating the potential for maximising the re-use of excavated materials for example, within landscape mounds.
- Considering treatments for unsuitable excavated materials e.g. upgrading of subsoils to top soils by mixing with compost.
- Providing an area within the construction site to allow for sorting and segregation of materials.

Construction :

- Segregating waste materials according to type to facilitate re-use and recycling.
- Separation of inert construction and demolition materials for either re-use on-site or use as public fill.

- During demolition works, segregating materials at source as far as practical.
- Co-ordinate material deliveries to site in order to minimise storage times on site and the likelihood of causing damage.
- Consider on site mulching of vegetation to reduce bulk and review opportunities for possible use within landscaping areas.
- Training site staff in waste minimisation practices.

In accordance with good practice, accurate site records should be maintained throughout the construction works detailing the quantities of materials; a) generated on site; b) reused on site; and c) disposed off site, together with disposal routes/locations. The burning of wastes on-site will not be permitted.

Reference should be made to the WBTC No. 5/98 “On Site Sorting of Construction Waste on Demolition Sites”, WBTC No. 5/99 “Trip-ticket System for Disposal of Construction and Demolition Material” and WBTC No. 25/99 “Incorporation of Information on Construction and Demolition Material Management. WBTC NO. 5/98 refers to contracts which comprise solely demolition works although the measures proposed for mandatory on-site sorting of construction and demolition (C&D) material represents good site practice. The separation of inert C&D material (suitable for public filling) from C&D waste (considered unsuitable for use as public fill) is required to minimise the volumes requiring landfill disposal as far as practical.

WBTC No. 5/99 refers to the implementation of a trip ticket system for the proper disposal of C&D material to either public filling areas or landfills. WBTC No. 25/99 refers to the management of construction and demolition material (C&DM), i.e. inert material suitable for use as public fill or in earth filling projects.

Full reference should be made to the relevant WBTC for further details.

7.4.1 Wastes Generated from Site Clearance and Excavated Materials

All materials should be re-used or transported off site as soon as possible to minimise the potential for adverse environmental impacts. It is recognised that some stockpiling of materials will be required in some instances although these should be segregated in terms of material type as far as practical to facilitate material re-use (i.e. top soil for landscaping, suitable fill for engineering works).

All excavated material should be handled in a manner that minimises the release of fugitive dust (especially during hot and dry weather) and where possible the movement of material should be kept to a minimum. Mitigation measures for the handling of excavated materials

on-site have been addressed in detail within Section 4 (Air Quality). Within the stockpile area, the following measures should be in place to control potential impacts :

- covering material during heavy rainfall;
- using dust suppression techniques (such as dampening with fine water spray and covering with tarpaulin);
- controlling the excessive use of water during spraying to prevent the generation of runoff contaminated with elevated levels of suspended solids;
- segregation of the surface water system for the stockpile area and the fitting of silt traps where appropriate;
- locating stockpiles to minimise potential visual impacts;
- minimising land intake of stockpile areas as far as possible;
- provide fencing within designated areas to separate sensitive habitats and prevent stockpiling in unsuitable locations; and
- designate appropriate haulage roads.

A reduction in the total volume of excavated materials requiring off site disposal will be achieved as far as possible by optimising the re-use of suitable material on-site.

Both excavated material which cannot be re-used on site and inert construction and demolition materials will require disposal at public filling areas. The public filling area at Pak Shek Kok and the public filling barging point at Kwai Chung have been identified by Secretary, Public Filling Sub-Committee (PFSC) as possible available sites during the construction works programme.

The capacity for the public filling areas to accept inert construction and demolition material will however be dependent upon current and future demands on disposal sites. Accurate predictions on the likely disposal site for excavated materials derived from the project works can therefore not be made at this stage. Any material which is not suitable for re-use on site will be removed during the initial 16 months of the construction works programme. The majority of demolition wastes will be generated from the dismantling of existing bridges, which will commence 18 months into the construction programme.

A petrol filling station is located at Wo Hop Shek (Grid reference 833490 838565) and special disposal and handling procedures may be required in the unlikely event that contaminated soils are excavated. These should include segregation of all excavated contaminated soils within a designated area, which is bunded to prevent the discharge of potentially contaminated surface water runoff. The stockpiles should be covered and removed for off-site disposal by a licensed waste collector as soon as practical. Final disposal should be to a licensed landfill site, upon approval from EPD. During the handling and excavation of any contaminated materials,

appropriate health and safety precautions will be required to minimise any potential risks to site workers. Implementation of “standard” civil engineering techniques (e.g. provision of overalls, gloves etc., no smoking or eating on site) and the minimisation of dust generated during construction will serve to ensure that direct contact by site workers is avoided.

Cleared vegetation derived from the ground preparatory works should be segregated from any soil materials where practical and sent to a suitable disposal site such as the WENT Landfill. WENT Landfill will only accept a maximum of 30% by weight of inert construction waste. It is therefore important that soil / vegetation are kept segregated. Mulching of vegetation on site would also reduce the bulk of material requiring disposal. Moreover, where possible opportunities for the use of the mulch within landscaping areas either on site, or as part of other landscaping projects, should be identified by the contractor prior to landfill disposal.

7.4.2 *Inert Construction and Demolition Material*

In view of the inert nature of such material, its disposal is unlikely to cause long-term environmental concern. Stockpiling of all construction material prior to disposal should comply with the control measures outlined earlier in order to minimise any potential impacts related to dust, visual impact, water quality and general health and safety.

The excessive generation of inert construction and demolition material increases disposal costs and may take up valuable landfill space. With the implementation of good site management and careful planning, the over-ordering of materials and generation of inert construction and demolition material should be minimised. In accordance with WBTC No. 19/99 (Metallic Site Hoardings and Signboards), re-useable metal hoarding and signboards should also be utilised on site to reduce the volumes of inert construction and demolition material wood generated.

Where possible, inert construction and demolition materials such as wood and metal should be separated out from other materials for recycling. All recyclable material should be clearly segregated and stored in appropriate skips/containers or stockpiled. Segregation of material will aid in the potential for re-use of material and in final disposal, if necessary. Material recycling or re-use reduces both the need for new construction materials and subsequent collection, transportation and disposal costs. Only when materials cannot be reused should they be disposed of to a public filling area or, as a last resort, landfilled. All construction and demolition material disposed at public filling sites must comply with the public dumping licensing requirements (e.g. the material should be inert and contain <5% by volume of timber). As far as possible, materials should be sorted to minimise the requirement for off site disposal.

It will be the contractor's responsibility to ensure that inert construction and demolition material is collected by approved licensed waste collectors and that appropriate measures are taken to

minimise adverse impacts such as dust generation. The contractor must also ensure that all necessary disposal permits are obtained.

Bentonite slurries should be reused as far as possible and final residues disposed of in accordance with the Practice Note For Professional Persons ProPECC PN 1/94. Slurries may either be disposed of at the marine disposal grounds (subject to obtaining a licence from EPD) or to the public drainage system following treatment to satisfy relevant effluent discharge standards (as set out in the WPCO Technical Memorandum on Effluent Standards).

7.4.3 *Chemical Wastes*

Chemical waste, as defined in the Waste Disposal (Chemical Waste) (General) Regulation, will require disposal by appropriate and approved means. Potential hazards associated with the inappropriate handling of these materials include:

- effects on human health (i.e. dermal and toxic effects with respect to site workers);
- phytotoxic effects to vegetation;
- contamination of the soil, groundwaters and surface water following spillage;
- risk of fire or explosions; and
- discharge of chemical wastes to sewer and potential disruption of the sewage treatment works.

Chemical wastes should be stored in a locked, fully bunded area which is impermeable to both water and the waste being stored. The waste storage area should also be covered to prevent rainfall from accumulating within the bunded areas. The bunded area must have a volume of either 110% of the largest container or 20% by volume of the chemical waste stored in that area. Appropriate spill absorption material should be stored near the storage area in order to clean up any minor spill events. The risks associated with chemical waste storage and handling can be further minimised by :

- designation of an appropriate, well ventilated storage area;
- minimisation of waste production and recycling/reprocessing for certain waste liquids where appropriate (e.g. oils, solvents);
- careful handling of waste fuel and oil residues;
- use of appropriate and labelled (Chinese and English) storage containers;
- storage of wastes remote from sensitive receivers (e.g. drains, residential properties and water bodies); and
- education of workers on the concepts of site cleanliness and appropriate waste management procedures.

An appropriate disposal facility is the Chemical Waste Treatment Centre (CWTC) at Tsing Yi. If chemical wastes are to be generated, the contractor will need to register with EPD as a chemical waste producer and observe the requirements for chemical waste storage, labelling, transportation and disposal. The contractor will also need to consider the guidance in "A Guide to Chemical Waste Control Scheme: A Guide to the Registration of Chemical Waste Producers" and the "Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes". All chemical wastes should be collected from site by a licensed chemical waste collector.

Material that is not acceptable at the CWTC (such as spent batteries) should be sent to a co-

disposal landfill such as the SENT Landfill.

7.4.4 *Municipal Waste*

If not appropriately managed, municipal wastes generated by site workers have a potential to cause impacts in terms of nuisance, insects and vermin. This may give rise to adverse environmental impacts for both site workers and site neighbours which could include:

- odour nuisance if putrescible material is not collected on a frequent basis;
- wind-blown material causing litter problems;
- vermin and pests in the waste storage area if it is not well maintained and cleaned regularly;
and
- adverse visual impacts.

A temporary refuse collection facility should be set-up by the contractor and wastes should be stored in appropriate containers prior to collection and disposal. A private waste collection firm may be commissioned by the site contractor to remove the waste regularly (daily basis), to the satisfaction of the Engineer.

7.4.5 *Operational Phase Wastes*

Waste generated from the operational phase of the road widening project is likely to be restricted to small volumes associated with maintenance works and the upkeep of landscaped areas. Provided that appropriate waste handling, storage and disposal procedures are adopted no significant impacts are considered likely. The procedures outlined within sections 7.3.1 to 7.3.4 should be followed, where appropriate.

7.5 Summary of Waste Management Plan (WMP)

A summary of the proposed mitigation measures and proposed disposal options are presented in Table 7.6 and form the Waste Management Plan for the proposed project works.

Table 7.6 Waste Management Plan

	Control Measures	Proposed Disposal method / area
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	Control Measures	Proposed Disposal method / area
General requirements	<p><i>Detailed Design Stage</i></p> <ul style="list-style-type: none"> • minimising excavation requirements as far as possible • balancing cut and fill requirements • evaluating the potential for maximising the re-use of excavated materials for example, within landscape mounds • considering treatments for unsuitable excavated materials e.g. upgrading of subsoils to top soils by mixing with compost • providing an area within the construction site to allow for sorting and segregation of materials <p><i>Construction Stage</i></p> <ul style="list-style-type: none"> • minimisation of waste generation for disposal (via reduction/recycling/re-use) • segregating waste materials according to type to facilitate re-use and recycling • separation of inert construction and demolition materials for either re-use on-site or use as public fill • during demolition works, segregating materials at source as far as practical • co-ordinate material deliveries to site in order to minimise storage times on site and the likelihood of causing damage • training site staff in waste minimisation practices • transport of wastes off site as soon as possible • maintenance of accurate waste records • use of re-useable metal hoardings / signboards • no on-site burning will be permitted 	-
Vegetation from preparatory works	<ul style="list-style-type: none"> • segregation of materials to facilitate disposal • on site mulching by contractor to reduce bulk and review of opportunities for possible use within landscaping areas 	Re-use / landfill
Demolition waste	<ul style="list-style-type: none"> • segregation of materials to facilitate disposal • appropriate stockpile management 	Public fill for inert wastes
Excavated materials	<ul style="list-style-type: none"> • segregation of materials to facilitate disposal / reuse • appropriate stockpile management • re-use of excavated material on or off site (where possible) • special handling and disposal procedures in the event that contaminated materials are excavated 	Re-use on site for suitable material. Disposal to public fill areas for unsuitable materials.
Construction waste	<ul style="list-style-type: none"> • segregation of materials to facilitate recycling/reuse (within designated area and in appropriate containers/stockpiles) • appropriate stockpile management • planning and design considerations to reduce over ordering and waste generation • recycling and re-use of materials where possible (e.g. metal, wood from hoardings, formwork) • for material which cannot be re-used/recycled, collection should be carried out by an approved waste contractor for landfill disposal 	Public fill for inert wastes. Disposal to landfill for materials unsuitable for public filling
Bentonite slurries	<ul style="list-style-type: none"> • bentonite slurries should be reused as far as possible • disposal in accordance with Practice Note For Professional Persons ProPECC PN 1/94 	Marine disposal (upon EPD approval) or disposal to drainage system satisfying WPCO requirements.

	Control Measures	Proposed Disposal method / area
Chemical waste	<ul style="list-style-type: none"> • storage within locked, covered and bunded area • the storage area should <i>not</i> be located adjacent to sensitive receivers e.g. drains • minimise waste production and recycle oils/solvents where possible • a spill response procedure should be in place and absorption material available for minor spillages • use appropriate and labelled containers • educate site workers on site cleanliness/waste management procedures • if chemical wastes are to be generated, the contractor must register with EPD as a chemical waste producer • collection by a licensed chemical waste collector 	CWTC or SENT
Municipal waste	<ul style="list-style-type: none"> • waste should be stored within a temporary refuse collection facility, in appropriate containers prior to collection and disposal • regular, daily collections are required by an approved waste collector 	Landfill
Operational waste	<ul style="list-style-type: none"> • wastes should be stored within a designated storage area • waste should be segregated into recyclable, non recyclable and putrescible wastes, where possible to facilitate disposal 	Dependent upon material type – refer to the waste categories above.

7.6 Conclusions

The proposed construction activities associated with the proposed works will generate a number of waste materials. These include:

- vegetation and demolition wastes from site clearance
- excavated materials
- construction waste
- chemical waste
- municipal waste

Waste generated from the operational phase of the road widening project is likely to be restricted to small volumes associated with intermittent maintenance works (e.g. asphalt from resurfacing works) and landscape upkeep (vegetation).

The potential impacts of wastes arising from the construction and operational phases of the road widening project have been assessed. Provided that the mitigation measures outlined above are in place, potential impacts to the environment associated with waste generated by the construction and operational phases of the project will be controlled. With the recommended procedures/measures in place, the construction and operational wastes generated / disposed as part of this project, will not lead to any significant adverse environmental impacts.

Further to this assessment, these waste management measures should be included in the contractors Environmental Pollution and Control Requirements as well as the Environmental Monitoring and Audit Manual.