14. WASTE MANAGEMENT

14.1 Principal Environmental Legislation

14.1.1 Dumping at Sea Ordinance

14.1.1.1 The DASO provides controls over the disposal of waste materials, including dredged marine sediments to sea. A permit from the Director of Environmental Protection (DEP) is required for the disposal of regulated substances within the waters of the Hong Kong. A permit is also required for materials loaded for disposal in waters outside Hong Kong. The permit may contain terms and conditions governing the type and quantity of substances to be dumped, the location of the disposal grounds and monitoring of disposal operations.

14.1.2 Environment, Transport and Works Bureau ETWB 34/2002

14.1.2.1 In considering disposal locations and dumping permit conditions, DEP will be guided by the requirements of ETWB 34/2002, Management of Dredged / Excavated Sediment. This circular sets down a sediment quality assessment and management framework. The assessment process is based on a tiered structure in which a desk top study is initially undertaken supplemented, if necessary, with field sampling and chemical analysis or biological effects testing. The framework is illustrated in Figure 14.1. Dredged sediment is ultimately classified as follows :

- Type 1 – suitable for open sea disposal
- Type 2 – requires confined marine disposal
- Type 3 – not suitable for marine disposal without special treatment

14.1.2.2 The Circular identifies 2 sets of chemical assessment criteria as follows:

- Lower Chemical Exceedance Criteria (LCEL)
- Upper Chemical Exceedance Criteria (UCEL)

14.1.2.3 The criteria were discussed in Section 6.1.4 and are presented in Table 6.2.

14.1.3 Waste Disposal Ordinance

14.1.3.1 The WDO prohibits the unauthorised disposal of waste material including trade waste such as waste from any trade, manufacturer or business, or any waste building or civil engineering materials. Such wastes can only be disposed of at a licensed site. The WDO also provides for licensing of waste collection and transport. However the EPD does not require licences to be obtained for the transport of non-hazardous trade waste.

14.1.4 Waste Disposal (Chemical Waste) (General) Regulation

14.1.4.1 The Chemical Waste Regulation establishes “cradle-to grave” responsibilities for handling and disposal of chemical waste. Chemical waste is defined to include any substance being scrap material, or unwanted substances specified under Schedule 1 of the Regulation, if such a substance or chemical occurs in such a form, quantity or

concentration so as to cause pollution or constitute a danger to health or risk of pollution to the environment.

14.1.4.2 The Regulation requires producers of chemical wastes to register with the EPD. Producers of chemical wastes must treat their wastes on-site under licence from the EPD or have a licensed collector take the wastes to a licensed facility. A computerised trip ticket is issued to track the production, collection and disposal of each individual consignment of chemical waste material. The Regulation also governs the storage and on-site handling of chemical waste including emergency planning and health and safety training for employees.

14.1.5 Land (Miscellaneous Provisions) Ordinance

14.1.5.1 Construction and demolition (C&D) materials which are wholly inert (e.g. soil, rock, concrete debris etc) may be taken to public filling areas. The Land (Miscellaneous Provisions) Ordinance requires that Dumping Licences are obtained by individuals or companies who deliver inert C&D material to the public filling areas. The licences are issued by the CED under delegated authority from the Director of Lands. The material should be free from marine mud, household refuse, plastic, metal, industrial and chemical wastes, animal and vegetable matter, although a small amount of timber is acceptable.

14.1.6 Public Health and Municipal Services Ordinance - Public Cleansing and Prevention of Nuisances By-laws

14.1.1.1 These by-laws are enforced by the Regional and Urban Councils and provide controls over fly-tipping of wastes at unauthorised sites.

14.2 Description of Existing Conditions

14.2.1 The Tuen Mun Area 38 site is already reclaimed but currently undeveloped. The site is vacant. Construction of the tank farm and associated facilities will therefore not require demolition of existing building or structures. No waste is generated from the site at present.

14.2.2 The marine approach channel to the existing AFRF at Sha Chau island must be maintained at a depth of not less than 10m. This channel is therefore routinely dredged at a typical frequency of every 3-4 years. The channel was previously dredged in 2000. On that occasion the dredged volume was 62,764m3. The spoil was categorised by EPD as “Class A – uncontaminated” and suitable for open marine disposal without any special handling precautions. The latest dredging event was in 2005 when both the channel and the turning basin were dredged. The volume dredged increased, therefore, to 180,471m^3. Based upon the new sediment classification system, described in Section 14.1.2 above, the material was classified as Type1 – suitable for open sea disposal (dedicated site).

14.2.3 The routine operation of the existing AFRF does not generate any significant quantity of waste. There is a zero discharge policy at the facility with no direct discharge of sewage and greywater. All waste waters are contained and routinely desludged to a barge at a frequency of once per week. Very little domestic waste is produced from this facility.

Arisings are of the order of 5m^3 per month. These are collected and disposed to Government landfill.

14.3 Key Issues

14.3.1 During the construction period, dredging for the pipeline trench will involve excavation of sizeable quantities of marine sediment which will require off-site marine disposal. The potential contamination of this material must therefore be carefully assessed in line with the requirements of Environment, Transport and Works Bureau ETWB TCW 34/2002, as discussed in more detail in Section 14.5.2 below.

14.3.2 Some chemical waste will be generated during construction mainly in connection with the maintenance of plant and equipment. With implementation of standard good management practices, its disposal would not be problematic. Similarly other trade waste generated during construction such as packaging materials etc does not present any particular difficulties.

14.3.3 In the operational phase there would be a small quantity of general refuse from the offices and workshops including some low level generation of chemical waste from the workshops. Handling, transport and disposal of this material can be controlled in accordance with the requirements of the Waste Disposal Ordinance and the Chemical Waste Regulations without difficulty.

14.4 Assessment Methodology

14.4.1 The assessment of the environmental impacts from the handling, storage, collection, transportation and disposal of waste material generated by the project has been undertaken in accordance with Annex 7 and Annex 15 of the EIAO Technical Memorandum.

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

- avoidance;
- minimisation;
- recycling / reuse;
- treatment; and
- disposal.

14.4.3 All opportunities for reducing waste generation have been assessed based upon the following factors :

- avoiding or minimising waste generation through changes in design;
- adopting better management practices to promote segregation of waste materials;
- reuse and recycling; and
- diverting waste to public dumps or other construction sites.

14.4.4 The types and quantities of major waste arisings have been estimated and disposal options for each category of waste identified, taking into account the existing or future spare capacities of the waste disposal facilities and the environmental implications of the handling, collection and disposal of waste material.

14.5 Construction Phase Waste Management Assessment

14.5.1 Background

14.5.1.1 Activities during the construction phase that will result in the generation of wastes can be broadly be classified into distinct categories based on their nature and the options for disposal. These include :

- dredged marine mud;
- excavated materials suitable for reclamation and public fill;
- construction and demolition waste, including cleared vegetation, some of which may be suitable for reclamation and fill;
- chemical waste; and
- sewage.

14.5.2 Dredged Marine Mud

14.5.2.1 The marine pipelines connecting the on-shore PAFF facility with the receiving jetty with and the airport would require the excavation and disposal of an estimated 340,000m^3 of marine sediment.

14.5.2.2 As discussed at length in Section 6.2 there is an abundance of data on sediment quality in the study area from sources including :

- EPD routine monitoring programme;
- Sediment quality assessment for the AFRF at Sha Cha
- East Sha Chau Contaminated Mud Pit monitoring programme;
- Airport Authority Hong Kong environmental monitoring at Chek Lap Kok;
- Shiu Wing Steel Co. maintenance dredging at Tap Shek Kok; and
- Sediment quality testing along the proposed PAFF pipeline alignment.

14.5.2.3 In Section 6.2.5.16 of this report, it was concluded that there is already a clear weight of evidence to indicate that the sediments to be dredged for this project are generally not contaminated to an extent that they would pose a threat to marine life if disturbed during dredging and put into suspension in the water column assuming the WQO for suspended sediments is satisfied and this has been assumed for the purposes of the EIA. The Sediment Quality Report for the PAFF pipeline is included in Appendix K for reference. However, in terms of applying for a licence under the statutory controls required by the Dumping at Sea Ordinance (DASO) and following the process prescribed by ETWB TCW 34/2002, it is noted that the results of the sediment testing along the pipeline alignment (Section 6.2.5.14) indicated that about 70% of the sediment samples were Category L material and could be disposed of at an open sea disposal site such as South Cheung Chau or the East of Ninepins. However, 30% of the sediment samples could be classified as Category M material based on ETWB TCW 34/2002 and special disposal

arrangement will also be necessary. The actual disposal location will be determined in due course by DEP in conjunction with the Marine Fill Committee during the application for a DASO permit.

14.5.3 Excavated Materials

14.5.3.1 The tank farm and associated offices and workshops will be constructed on existing undeveloped reclaimed land. The site formation works will not be particularly extensive and as such large quantities of this type of waste material are not predicted. The total quantity of excavated material is estimated to be about 95,000m^3. A breakdown of the origin of this material is provided in Table 14.1. It is envisaged that about 15,000m^3 of this material will be reused on site for purposes such as landscaping or to form bund walls. As such, about 80,000m^3 will be surplus and require disposal off-site. Notwithstanding, this excavated material will be suitable for subsequent use as public fill in another reclamation and the closest facility for receiving public fill material is Tuen Mun Area 38 C&D stockpile on an adjacent site.

Table 14.1 Estimate of Excavated Material to be Generated on Site

Source	Volume / m^3
Site Clearance	15,000
Excavation to form Tank Farm (bunded area)	80,000
Total	**95,000**

14.5.4 Construction and Demolition Waste

14.5.4.1 Construction and demolition (C&D) waste will arise from a number of site activities throughout the construction period and may include:

- cleared vegetation;
- wood from formwork;
- building demolition waste;
- equipment and vehicle maintenance;
- materials and equipment wrappings;
- unusable cement / grouting mixes; and
- damaged or contaminated construction materials.

14.5.4.2 Because the site is already clear and not previously developed, quantities of demolition waste will be minor and will comprise material such as shuttering or falsework from the construction of the buildings and bund walls. While steel shuttering will be recommended to be used as much as possible, wood will still need to be used in certain area. Similarly the vegetative covering to be cleared will not be very substantial. The volume of other more general C&D material generated by the project will depend on the specific operating procedures and site practices and it is estimated that about 700m^3 will be generated on site. With careful management, waste arisings can be greatly reduced. This can be achieved through the specification of various mitigatory measures in the construction contracts. Mitigatory measures that can help to keep waste generation to a practical minimum are identified below:

- temporary structures should be proprietary Portakabin type units sited on permanent hard paving;
- falsework should be formed from proprietary steel system rather than wood to minimise waste wood arisings;
- vegetation should be stripped / uprooted before any topsoil is removed to enable earth to be separated and retained on-site; and
- all C&D waste arising on site should be carefully sorted to extract recyclables and public fill material.

14.5.4.3 Of the 700m^3 of C&D material predicted to generated on the PAFF site, the nature of the material will be that virtually none will be suitable for public fill. As such it is expected that all the material will be disposed of to landfill.

14.5.5 Chemical Waste

14.5.5.1 Chemical waste arising from construction activities will be limited to used oil, scrap batteries, solvents, paints, etc from the maintenance of plant at site workshops. A dangerous goods store should be provided on site together with emergency equipment to deal with any spillage or fire. A register of chemical products shall be kept on site together and include information on methods for safe handling, storage and disposal. Wastes of this nature will be collected and disposed in accordance with the Waste Disposal (Chemical Waste) (General) Regulation. It is anticipated that the quantities of this type generated by construction activities will be small and based upon the detailed measures, significant impacts are not predicted.

14.5.6 General Refuse

14.5.6.1 The construction works will result in the generation of a variety of general refuse requiring disposal. These wastes may include office waste, newspapers, and food wastes from canteens and packaging materials. This waste will be disposed of to landfill.

14.5.6.2 The storage of general refuse has the potential to cause a variety of adverse environmental impacts. However, with suitable management and controls over storage, transfer and disposal no significant impacts should result. Potential issues could include malodour, the attraction of pests and vermin or problems with windblown litter. It is therefore important to maintain waste storage facilities in a clean hygienic condition and to ensure waste is collected on a daily basis. Storage facilities need to be conveniently sited, adequate sized and secure. The site should be securely fenced to avoid possible loss of litter off site to adjacent land or sea.

14.5.6.3 Strict management must be maintained over waste collection contractors to ensure their compliance with regulatory requirements and that all waste leaving site is safely delivered to appropriate disposal facilities e.g. licensed landfills and their activities should be routinely audited.

14.5.7 *Sewage*

14.5.7.1 Sewage from the site will be in very small quantities at 0.29 m^3 per capita and only 10 personnel on site at any one time. The sewage will be stored in a sump pit and a specialist contractor with tanker will be employed for the removal of sewage from the sump pit by equipment with appropriate suction device. During the construction emptied by tanker by a licensed contractor on a regular basis.

14.6 Operational Phase

14.6.1 In the operational phase the quantities of general refuse arising will be low and mainly arise from office activities and plant maintenance workshops. Small quantities of chemical waste such as lubrication oils, oil removed from oil-water separators, sludges removed from oil-water separators, paints and solvents, used batteries, oily rags, chemical containers etc. Standard good operating practice requirements should be followed when storing, handling or transporting chemical wastes. Specific recommended mitigatory measures are specified in Section 14.7, below.

14.6.2 The sewage will be stored in a sump pit and a specialist contractor with a tanker will be employed for the removal of sewage from the sump pit by equipment with appropriate suction device. Storm drainage from tanks bunded area, pump platform and truck loading bay will pass through suitably sized and maintained petrol/oil interceptors prior to discharge.

14.7 Mitigation Measures

14.7.1 Mitigation measures are required to ensure the proper handling, storage, transportation and disposal of waste is carried out. Also, measures are necessary to ensure that the generation of waste is avoided and minimised and that waste materials are recycled and treated as far as practicable.

14.7.2 Specific mitigatory recommendations for this project are as follows. These measures are also summarised in the Environmental Mitigation Implementation Schedule in Appendix B:

(a) excavated material shall be re-used on site for purposes such as landscaping or formation of bund walls. If absolutely necessary any surplus should be conveyed to the nearest available public fill site after obtaining a suitable licence;

(b) the site and surroundings shall be kept tidy and litter free;

(c) no waste shall be burnt on site;

(d) waste oils, chemicals or solvents shall not be disposed of to drain;

(e) The Contractor shall identify a co-ordinator for the management of waste. The co-ordinator shall prepare and implement a Waste Management Plan which specifies procedures such as a ticketing system to facilitate tracking of loads and ensure that illegal disposal of waste does not occur, and protocols for the maintenance of records of the quantities of wastes generated, recycled and disposed. The Waste

Management Plan shall be prepared with reference to Works Branch Technical Circular (WBTC) No. 29/2000 "Waste Management Plan" and WBTC 5/99 for the Trip-ticket System for Disposal of Construction and Demolition Material and issued to Engineer for approval and CEDD. CEDD should be contacted to confirm the availability for C&D and public fill waste;

(f) all material shall be reused on site as far as practicable, including formwork, plywood, topsoil and excavated material;

(g) good site practice shall be implemented to avoid waste generation and promote waste minimisation;

(h) waste materials such as paper, metal, timber and waste oil shall be recycled as far as practicable;

(i) falsework shall be constructed using proprietary steel systems rather than wood;

(j) temporary structures used during construction shall be provided in the form of proprietary Portakabin type units sited on areas of permanent hard paving units as far as practicable;

(k) re-use and recycle of waste must always be considered first. Waste disposal shall only be undertaken in the last resort. Any surplus material generated shall be sorted on site into C&D waste and the public fill fraction. The C&D waste shall be disposed of at a licensed landfill or deposited at an authorised waste transfer facility. Material suitable for public fill shall be re-used on site for uses such as landscaping or construction of bundwalls. If absolutely necessary, any surplus shall be delivered to the nearest public filling area, public filling barging point or public fill stockpile area after obtaining an appropriate licence. Suitable provisions shall be included in the construction contract to ensure that the Contractor sorts and recycles waste;

(l) stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust and surface run off;

(m) excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation;

(n) wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads;

(o) dredged marine mud shall be disposed of in a gazetted marine disposal ground under the requirements of the Dumping at Seas Ordinance;

(p) temporary storage areas for general refuse shall be enclosed. Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention of Nuisances By-laws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station.

(q) all waste containers shall be in good condition and fitted with lids or covers to prevent waste from escaping or the ingress of water;

(r) all waste containers shall be in a secure area on hardstanding;

(s) The Contractor shall register with EPD as a chemical waste producer under the Waste Disposal (Chemical Waste) (General) Regulation. A licensed contractor shall be employed to collect chemical waste for delivery to a licensed treatment facility. Suitable chemical waste storage areas shall be formed on site for temporary storage pending collection. All chemical wastes shall be handled, stored, transported and disposed of in accordance with the Code of Practice on the Package, Labelling and Storage of Chemical Wastes and A guide to the Chemical Waste Control Scheme published by the EPD.

(t) emergency equipment to deal with any spillage or fire shall be kept on site;

(u) a register of chemical products shall be kept on site together and include information on methods for safe handling, storage and disposal;

(v) all containers used for storage of chemical waste shall be maintained in good condition and clearly labelled in both English and Chinese;

(w) all storage areas for chemical waste shall be:

- clearly labelled;
- enclosed on at least 3 sides;
- have impermeable floor and bunding sufficient to fully retain any spillage or leakages;
- ventilated; and
- covered to prevent rainfall from entering.

(x) all types of asbestos including sources (such as clutch linings) shall be treated as chemical waste. Asbestos containing wastes shall be kept separate from other wastes;

(y) all leaking containers shall be contained and removed from site as soon as practically possible;

(z) empty oil drums an chemical containers shall be removed from site as soon as is reasonably practicable;

(aa) nightsoil arising from chemical toilets shall be transported by a licensed contractor to a Government Sewage Treatment Works for disposal in accordance with the Sanitation and Conservancy (Regional Sanitation and Conservancy Council) By-laws;

(bb) training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling; and

(cc) in the operational phase the Operator shall ensure that all contaminated water from the bilges of boats used by the Operator will be disposed of as chemical waste and not discharged to the coastal waters off the Tuen Mun site or Sha Chau. Reception facilities should be provided at the jetty to facilitate transfer to shore based storage facilities for contaminated bilge water.

14.8 Waste Disposal Recommendations

14.8.1 Based upon the estimated quantities and types of waste to be generated by the project, disposal options have been determined, as detailed in Table 14.2 below. In terms of C&D waste not suitable for public fill and general refuse, both the WENT landfill and the NWNT Transfer Station have been recommended. Which facility is used may depend upon how the Contractor organises the collection and disposal of the material, but with removal to WENT landfill directly having advantages of avoiding moving the waste twice. However, the NWNT Transfer Station is a new facility and with a daily permitted throughput of 1200 tonnes per year, has ample spare capacity but with the disadvantage of having to remove any material via the Tuen Mun area.

14.8.2 Excavated materials from the onshore PAFF site should be re-used in their entirety for purposes such as landscaping or construction of bund walls.

Table 14.2 Recommended Waste Disposal Sites

Type of Waste	Disposal Site
Inert material (dirt/soil, concrete, bricks, masonry, ceramics, tiles, etc.) which comply with the requirements of the Public Dumping Licence	Re-use on site or deposit at C&D recycling facility at Tuen Mun Area 38.
C&D waste (plastics, glass, wood, including cleared vegetation etc.)	WENT Landfill; or NWNT Transfer Station
Chemical waste (as defined under Schedule 1 of the Waste Disposal (Chemical Waste) Regulation)	Chemical waste treatment facility at Tsing Yi; or other approved facility.
General refuse	WENT Landfill; or NWNT Transfer Station
Marine dredged mud(1)	South of Cheung Chau, the Brothers or East Sha Chau

(1) Subject to the quality of the mud.

14.9 Residual Impacts

14.9.1 Assuming all the mitigation measures are implemented, no residual adverse impacts from the handling, storage, transportation or disposal of the waste generated by the project are predicted.

14.10 Monitoring and Audit Requirements

14.10.1 The assessment has concluded that the handling, transportation and disposal of waste materials during construction will not give rise to significant impacts if the recommended mitigation measures are implemented. Nevertheless it is recommended that during the construction phase, regular site inspections and supervision of the waste

management procedures shall be undertaken as part of the EM&A procedures to ensure proper control. The specific requirements of this work are described in more detail in the EM&A manual. Waste management in the operational phase will be fully regulated and no compliance difficulties are anticipated. There is no need for any formal EM&A stipulations under the provisions of EIAO in the operational phase.

14.11 Conclusions

14.11.1 A series of mitigatory measures have been recommended to give effect to the waste minimisation principles of the waste management hierarchy and provide for effective controls and ensure safe disposal of all generated waste materials. With the implementation of these measures no adverse residual impacts from the handling, storage, transportation or disposal of waste generated in the lifetime of the project are anticipated.