

5b. WASTE MANAGEMENT IMPLICATIONS (ARTIFICIAL ISLAND NEAR SKC)

5b.1 Introduction

- 5b.1.1.1 Waste management would be the Contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with the recommended good waste management practices and EPD's regulations and requirements.
- 5b.1.1.2 Waste materials generated from construction activities, such as dredged marine sediment, construction and demolition (C&D) materials, chemical waste and general refuse, are recommended to be audited at regular intervals (at least once per week as part of the regular site inspections described in this EM&A Manual) to ensure that proper storage, transportation and disposal practices are being implemented. The Contractor would be responsible for the implementation of the mitigation measures to minimize waste or redress problems arising from the waste materials.
- 5b.1.1.3 Besides, during operation phase of the Project, the EIA Report recommended that the incineration by-products should be tested in accordance with the requirements of the proposed Incineration Residue Pollution Control Limits as recommended in **Table 6b.7** of the EIA Report prior to disposal to landfill. A number of the land contamination preventive measures are also recommended in the EIA Report for the operation of the Project.
- 5b.1.1.4 Biogas generation (under the scenario that dredging is not required for the reclamation of the artificial island near SKC) is assessed in the EIA study. Gas protection measures are recommended to be incorporated in the building design. These recommended mitigation measures to prevent the ingress and/or accumulation of any methane gas emissions to potentially dangerous concentrations are described in **Section 6b** of the EIA Study. Precautionary measures to be taken prior to entry into any below ground services or confined space within the reclamation site are also recommended. The EIA Report recommended that gas monitoring be undertaken in the immediate post-reclamation period to measure methane concentrations in the fill and to determine actual rates of methane gas emissions. The recommended monitoring requirements are detailed below.

5b.2 Waste Management and Control

5b.2.1 Construction Phase

- 5b.2.1.1 Mitigation measures for waste management as recommended in the EIA Report are summarised below. With proper handling, storage and disposal of waste arisings during the construction phase of the Project, the potential to cause adverse environmental impacts would be minimized.

Good Site Practices

- 5b.2.1.2 Adverse environmental impacts in relation to waste management are not expected, provided that good site practices are strictly followed. Recommendations for good site practices during the construction activities would include:
- Obtain relevant waste disposal permits from appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354) and subsidiary Regulations and the Land (Miscellaneous Provisions) Ordinance (Cap. 28);
 - Provide staff training for proper waste management and chemical handling procedures;

- Provide sufficient waste disposal points and regular waste collection;
- Provide appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
- Carry out regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- Separate chemical wastes for special handling and disposed of to licensed facility for treatment; and
- Employ licensed waste collector to collect waste.

Waste Reduction Measures

5b.2.1.3 Good management and control can prevent the generation of a significant amount of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:

- Design foundation works that could minimise the amount of excavated material to be generated;
- Provide training to workers on the importance of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling;
- Sort out demolition debris and excavated materials from demolition works to recover reuseable/recyclable portions (i.e. soil, broken concrete, metal etc.);
- Segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Encourage the collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the work force;
- Proper storage and site practices to minimise the potential for damage or contamination of construction materials; and
- Plan and stock construction materials carefully to minimise amount of waste to be generated and to avoid unnecessary generation of waste.

5b.2.1.4 In addition to the above measures, specific mitigation measures are recommended below for the identified waste so as to minimise environmental impacts during handling, transportation and disposal of the waste.

Dredged Sediments

5b.2.1.5 The basic requirements and procedures for dredged sediment disposal specified under ETWB TCW 34/2002 shall be followed. According to the ETWB TCW 34/2002, the Marine Fill Committee (MFC) is responsible for managing the disposal facilities in Hong Kong for the dredged sediment, while EPD is the authority of issuing marine dumping permit under the DASO.

5b.2.1.6 The project proponent should agree in advance with MFC of CEDD on the site allocation. The project proponent or contractor for the dredging works shall then apply for the site allocations of marine sediment disposal based on the prior agreement with MFC/CEDD. The project proponent or contractor should also be responsible for the application of all necessary permits from relevant authorities, including the dumping permit as required

under DASO from EPD, for the disposal of dredged sediment prior to the commencement of the dredging works.

- 5b.2.1.7 As part of **Section 5b.2.1.6** above, the project proponent or contractor will need to satisfy the appropriate authorities that the quality of the marine sediment to be dredged has been identified according to the requirements of ETWB TCW 34/2002. This should be completed well before the dredging works and would include at least the submission of a formal Sediment Quality Report under Tier I of ETWB TCW No. 34/2002 to DEP for approval. Subject to advice from DEP, it is possible that further marine SI in accordance with ETWB TCW 34/2002 might be necessary for the application of dumping permit under DASO. In such case, a sediment sampling and testing proposal shall be submitted to and approved by DEP before the additional marine SI works.
- 5b.2.1.8 The dredged marine sediments would be loaded onto barges, transported to and disposed of at the designated disposal sites (subject to agreement with MFC and given Type 1 sediment were identified, the disposal sites are typically South Cheung Chau and/or East of Ninepin as open sea disposal). In addition to the mitigation measures as discussed in the EIA report, the barge transporting the sediments to the designated disposal sites should be equipped with tight fitting seals to prevent leakage and should not be filled to a level that would cause overflow of materials or laden water during loading or transportation. In addition, monitoring of the barge loading shall be conducted to ensure that loss of material does not take place during transportation. Transport barges or vessels shall be equipped with automatic self-monitoring devices as specified by the DEP.

Construction and Demolition Materials

- 5b.2.1.9 In order to minimise the impact resulting from collection and transportation of C&D materials for off-site disposal, the excavated material arising from site formation and foundation works should be reused on-site as backfilling material and for landscaping works as far as practicable. Other mitigation requirements are listed below:
- A Waste Management Plan (WMP), which becomes part of the Environmental Management Plan (EMP), should be prepared in accordance with *ETWB TCW No.19/2005*;
 - A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) should be adopted for easy tracking; and
 - In order to monitor the disposal of C&D materials at public filling facilities and landfills and to control fly-tipping, a trip-ticket system should be adopted (refer to *ETWB TCW No. 31/2004*).
- 5b.2.1.10 The Contractor should prepare and implement an EMP in accordance with ETWB TCW No.19/2005, which describes the arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from construction activities. Such a management plan should incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials. The EMP should be submitted to the Supervising Officer for approval. The Contractor should implement waste management practices in the EMP throughout the construction stage of the Project. The EMP should be reviewed regularly and updated by the Contractor, preferably on a monthly basis.
- 5b.2.1.11 All surplus C&D materials arising from or in connection with construction works should become the property of the Contractor when it is removed unless otherwise stated. The Contractor would be responsible for devising a system to work for on-site sorting of C&D materials and promptly removing all sorted and process materials arising from the construction activities to minimize temporary stockpiling on-site. The system should be

included in the EMP identifying the source of generation, estimated quantity, arrangement for on-site sorting, collection, temporary storage areas and frequency of collection by recycling Contractors or frequency of removal off-site.

Chemical Wastes

- 5b.2.1.12 Should chemical wastes be produced at the construction site, the Contractor would be required to register with EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste (such as explosive, flammable, oxidizing, irritant, toxic, harmful, or corrosive). The Contractor should employ a licensed collector to transport and dispose of the chemical wastes, to either the Chemical Waste Treatment Centre at Tsing Yi, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

General Refuse

- 5b.2.1.13 General refuse should be stored in enclosed bins or compaction units separate from C&D materials. A licensed waste collector should be employed by the Contractor to remove general refuse from the site, separately from C&D materials. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.

5b.2.2 Operation Phase

Good Site Practices

- 5b.2.2.1 It is recommended that the following good operational practices should be adopted to minimise waste management impacts:
- Obtain the necessary waste disposal permits from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354) and Waste Disposal (Chemical Waste) (General) Regulation;
 - Nomination of an approved person to be responsible for good site practice, arrangements for collection and effective disposal to an appropriate facility of all wastes generated at the site;
 - Use of a waste haulier licensed to collect specific category of waste;
 - A trip-ticket system should be included as one of the contractual requirements and implemented by the Environmental Team to monitor the disposal of solid wastes at landfills, and to control fly tipping. Reference should be made to ETWB TCW No. 31/2004;
 - Training of site personnel in proper waste management and chemical waste handling procedures;
 - Separation of chemical wastes for special handling and appropriate treatment at a licensed facility;
 - Routine cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
 - Provision of sufficient waste disposal points and regular collection for disposal;
 - Adoption of appropriate measures to minimize windblown litter and dust during transportation of waste, such as covering trucks or transporting wastes in enclosed containers; and

- Implementation of a recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites).

Waste Reduction Measures

5b.2.2.2 Good management and control can prevent the generation of significant amounts of waste. It is recommended that the following good operational practices should be adopted to ensure waste reduction:

- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Encourage collection of aluminium cans, plastic bottles and packaging material (e.g. carton boxes) and office paper by individual collectors. Separate labelled bins should be provided to help segregate this waste from other general refuse generated by the work force; and
- Any unused chemicals or those with remaining functional capacity should be reused as far as practicable.

Storage, Handling, Treatment, Collection and Disposal of Incineration By-Products

5b.2.2.3 The following measures are recommended for the storage, handling and collection of the incineration by-products:

- Ash should be stored in storage silos;
- Ash should be handled and conveyed in closed systems fully segregated from the ambient environment;
- Ash should be wetted with water to control fugitive dust, where necessary;
- All fly ash and air pollution control (APC) residues should be treated, e.g. by cement solidification or chemical stabilization, for compliance with the proposed Incineration Residue Pollution Control Limits and leachability criteria prior to disposal;
- The ash should be transported in covered trucks or containers to the designated landfill site.

5b.2.2.4 The Contractor should provide EPD with chemical analysis results of the bottom ash, and treated fly ash and APC residues to confirm that the ash/residue can comply with the proposed Incineration Residue Pollution Control Limits before disposal.

5b.3 Monitoring Requirements for Biogas Generation

5b.3.1.1 If the biogas monitoring is required, monitoring should be undertaken via purposely installed monitoring wells within boreholes drilled into the fill material. The boreholes should be drilled down to the level of the groundwater (mean sea water level) and standard landfill gas-type monitoring wells installed. These should be fitted with a removable cap and gas monitoring valve so that gas concentrations as well as flow rates may be measured from the open well. During the drilling of boreholes, the safety and working procedures described in the Landfill Gas Hazard Assessment Guidance Note, EPD (1997) should be followed.

5b.3.1.2 Concentrations of methane gas should be measured using portable gas monitoring instruments, as described in **Section 5b.3.1.4**. Fluxes should also be measured if the emission velocities are not too low. It is recommended that monitoring be undertaken bi-weekly for a period of at least 3 months (preferably 6 months or more) prior to the

commencement of construction works on the reclamation. The results of the gas monitoring should be reviewed to determine whether the length of the monitoring period should be extended. It is also recommended that gas flow rates from the wells be monitored under different meteorological conditions and to include some occasions when atmospheric pressure is falling quite quickly (e.g. immediately preceding a typhoon).

5b.3.1.3 Where possible, it is recommended that monitoring wells be located in areas designated for open space as it may be possible to continue monitoring at these locations throughout the construction period. Monitoring wells should be located away from the areas dredged for the permanent stormwater culvert and the temporary channel/culvert construction.

5b.3.1.4 Monitoring shall be carried out using intrinsically safe, portable gas monitoring instruments. The gas monitoring instrument shall:

- Be capable of continuous monitoring of methane;
- Be capable of continuous barometric pressure and gas pressure measurements;
- Be capable of monitoring temperature of the gas;
- Where possible, comply with BS6020 and be approved by BASEEFA as intrinsically safe, suitable for use in a Zone 2 area to BS5345;
- Normally operate in diffusion mode unless required for spot sampling, when it should be capable of operating by means of an aspirator or pump;
- Display any parameters monitored by clear unambiguous readings given on an alpha numeric display LCD screen with wide angle viewing;
- Have low battery, fault and over range indication incorporated;
- Store monitoring date, and shall be capable of being down-loaded directly to a PC;
- Measure in the following ranges:
 - methane 0-100% LEL & 0-100% v/v
 - barometric pressure mBar (absolute)
 - gas pressure (relative to atmospheric) Pascals atmospheric
 - temperature 0-100°C
- Have removable and rechargeable batteries with more than 12 hours continuous operating life;
- Have back-up batteries; and
- Have an oxygen sensor with a life of not less than twelve months and other sensors shall have a life of more than two years before deterioration in performance of the sensor.

5b.3.1.5 To measure the gas flow rates from the open monitoring wells, very sensitive techniques (such as micro-anemometer) will need to be used to measure the anticipated very low flow rates.

5b.3.1.6 The gas monitoring equipment shall be calibrated and maintained in accordance with the manufacturer's recommendations for calibration and maintenance.

5b.3.1.7 Prior to entry of any below ground service voids, chambers or any confined environment, the atmosphere within the chamber should be checked for oxygen, methane and carbon dioxide concentrations. The chamber may then only be entered if oxygen is greater than 18% by volume, methane is less than 10% of the Lower Explosive Limit (LEL), which is equivalent to 0.5% by volume (approximately), and carbon dioxide is less than 0.5% by volume. If either carbon dioxide or methane is higher, or oxygen lower than the values

given above, then entry to the chamber should be prohibited and expert advice sought. Even if conditions are safe for entry, no worker should be permitted to enter the chamber without having another worker present at the surface. The worker who enters the chamber should wear an appropriate safety/recovery harness and, preferably, should carry a portable methane, carbon dioxide and oxygen meter.

5b.3.1.8 In general, when work is being undertaken in confined spaces sufficient approved resuscitation equipment, breathing apparatus and safety torches should be available. Persons involved in or supervising such work should be trained and practised in the use of such equipment. A permit-to-work system for entry into confined spaces should be developed by an appropriately qualified person and consistently employed.

5b.4 Approach to Prevent Land Contamination

5b.4.1 Fuel Oil Spillage Prevention

5b.4.1.1 Precautionary measures to prevent fuel oil spillage are presented below.

- (i) Fuel Oil Tank Construction and Test
 - The fuel tank to be installed should be of specified durability.
 - Double skin tanks are preferred.
 - Underground fuel storage tank should be placed within a concrete pit.
 - The concrete pit shall be accessible to allow regular tank integrity tests to be carried out at regular intervals.
 - Tank integrity tests should be conducted by an independent qualified surveyor or structural engineer.
 - Any potential problems identified in the test should be rectified as soon as possible.
- (ii) Fuel Oil Pipeline Construction and Test
 - Installation of aboveground fuel oil pipelines is preferable; if underground pipelines are unavoidable, concrete lined trenches should be constructed to contain the pipelines.
 - Double skin pipelines are preferred.
 - Distance between the fuel oil refuelling points and the fuel oil storage tank shall be minimized.
 - Integrity tests for the pipelines should be conducted by an independent qualified surveyor or structural engineer at regular intervals.
 - Any potential problems identified in the test should be rectified as soon as possible.
- (iii) Fuel Oil Leakage Detection
 - Installation of leak detection device at storage tank and pipelines.
 - Installation and use of pressure gauges (e.g. at the two ends of a filling line) in fuel filling, which allows unexpected pressure drop or difference and sign of leakage to be detected.

- (iv) Fuel Oil Storage Tank Refuelling
 - Storage tank refuelling (from road tanker) should only be conducted by authorized staff of the oil company using the company's standard procedures.

- (v) Fuel Oil Spillage Response
 - An Oil Spill Response Plan should be prepared by the operator to document the appropriate response procedures for oil spillage incidents in detail. General procedures to be taken in case of fuel oil spillage are presented below.
 - Training

Training on oil spill response actions should be given to relevant staff. The training shall cover the followings:

 - Tools & resources to combat oil spillage and fire, e.g. locations of oil spill handling equipment and fire fighting equipment;
 - General methods to deal with oil spillage and fire incidents;
 - Procedures for emergency drills in the event of oil spills and fire; and
 - Regular drills shall be carried out.

 - Communication

Establish communication channel with the Fire Services Department (FSD) and EPD to report any oil spillage incident so that necessary assistance from relevant department can be quickly sought.

 - Response Procedures

Any fuel oil spillage within the IWMF site should be immediately reported to the Plant Manager with necessary details including location, source, possible cause and extent of the spillage.

Plant Manager should immediately attend to the spillage and initiate any appropriate action to confine and clean up the spillage. The response procedures shall include the following:

 - Identify and isolate the source of spillage as soon as possible.
 - Contain the oil spillage and avoid infiltration into soil/ groundwater and discharge to storm water channels.
 - Remove the oil spillage.
 - Clean up the contaminated area.
 - If the oil spillage occurs during storage tank refuelling, the refueling operation should immediately be stopped.
 - Recovered contaminated fuel oil and the associated material to remove the spilled oil should be considered as chemical waste. The handling and disposal procedures for chemical wastes are discussed in the following paragraphs.

5b.4.2 Chemicals and Chemical Wastes Handling & Spillage Prevention

5b.4.2.1 The precautionary measures to prevent improper handling/ use of chemicals and chemical waste spillage are presented below.

- (i) Chemicals and Chemical Wastes Handling & Storage
 - Chemicals and chemical wastes should only be stored in suitable containers in purpose-built areas.

- The storage of chemical wastes should comply with the requirements of the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.
 - The storage areas for chemicals and chemical wastes shall have an impermeable floor or surface. The impermeable floor/ surface shall possess the following properties:
 - Not liable to chemically react with the materials and their containers to be stored.
 - Able to withstand normal loading and physical damage caused by container handling
 - The integrity and condition of the impermeable floor or surface should be inspected at regular intervals to ensure that it is satisfactorily maintained
 - For liquid chemicals and chemical wastes storage, the storage area should be banded to contain at least 110% of the storage capacity of the largest containers or 20% of the total quantity of the chemicals/chemical wastes stored, whichever is the greater.
 - Storage containers shall be checked at regular intervals for their structural integrity and to ensure that the caps or fill points are tightly closed.
 - Chemical handling shall be conducted by trained workers under supervision.
- (ii) Chemicals and Chemical Wastes Spillage Response
- A Chemicals and/ or Chemical Wastes Spillage Response Plan shall be prepared by the operator to document in detail the appropriate response procedures for chemicals or chemical wastes spillage incidents. General procedures to be undertaken in case of chemicals/ chemical waste spillages are presented below.
 - Training

Training on spill response actions should be given to relevant staff. The training shall cover the followings:

 - Tools & resources to handle spillage, e.g. locations of spill handling equipment;
 - General methods to deal with spillage; and
 - Procedures for emergency drills in the event of spills.
 - Communication

Establish communication channel with FSD and EPD to report the spillage incident so that necessary assistance from relevant department can be quickly sought.
 - Response Procedures

Any spillage within the IWMF site should be reported to the Plant Manager.

Plant Manager shall attend to the spillage and initiate any appropriate actions needed to confine and clean up the spillage. The response procedures shall include the followings:

 - Identify and isolate the source of spillage as soon as possible;
 - Contain the spillage and avoid infiltration into soil/ groundwater and discharge to storm water channels (in case the spillage occurs at locations out of the designated storage areas);
 - Remove the spillage; the removal method/ procedures documented

in the Material Safety Data Sheet (MSDS) of the chemicals spilled should be observed;

- Clean up the contaminated area (in case the spillage occurs at locations out of the designated storage areas); and
- The waste arising from the cleanup operation should be considered as chemical wastes.

5b.4.3 Preventive Measures for Incineration By-products Handling

5b.4.3.1 The recommended measures listed below can minimize the potential contamination to the surrounding environment due to the incineration by-products:

- Ash should be stored in storage silos;
- Ash should be handled and conveyed in closed systems fully segregated from the ambient environment;
- Ash should be wetted with water to control fugitive dust, where necessary;
- All fly ash and APC residues should be treated, e.g. by cement solidification or chemical stabilization, for compliance with the proposed Incineration Residue Pollution Control Limits and leachability criteria prior to disposal;
- The ash should be transported in covered trucks or containers to the designated landfill site.

5b.4.4 Incident Record

5b.4.4.1 After any spillage, an incident report should be prepared by the Plant Manager. The incident report should contain details of the incident including the cause of the incident, the material spilled and estimated spillage amount, and also the response actions undertaken. The incident record should be kept carefully and able to be retrieved when necessary.

5b.4.4.2 The incident report should provide sufficient details for the evaluation of any environmental impacts due to the spillage and assessment of the effectiveness of measures taken.

5b.4.4.3 In case any spillage or accidents results in significant land contamination, EPD should be informed immediately and the IWMF operator should be responsible for the cleanup of the affected area. The responses procedures described in **Section 5b.4.1.1** and **Section 5b.4.2.1** above should be followed accordingly together with the land contamination assessment and remediation guidelines stipulated in the *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management* and the *Guidance Note for Contaminated Land and Remediation*.