

Environmental Protection Department

Agreement No. CE7/2008 (EP)

**Organic Waste Treatment Facilities,
Phase I – Feasibility Study****EIA Executive Summary**

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EIA EXECUTIVE SUMMARY

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1 INTRODUCTION

- 1.1 The Organic Waste Treatment Facilities (OWTF) Phase I development (hereinafter referred to as "the Project") is to construct and operate a biological treatment facility with a capacity of about 200 tonnes per day (tpd) at Siu Ho Wan, North Lantau to convert source-separated organic waste into compost and biogas through proven biological treatment technologies.
- 1.2 The Project is a designated project under Item G.4 of Part 1, Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499): "*A waste disposal facility (excluding any refuse collection point), or waste disposal activities, for (a) refuse; or (b) chemical, industrial or special wastes.*" An environmental permit is required for the implementation of the Project under the EIAO.
- 1.3 An Environmental Impact Assessment (EIA) Study was undertaken in accordance with the EIA Study Brief No.ESB-172/2007 issued by the Environmental Protection Department (EPD) in December 2007. The EIA Study was also conducted based on the reference design of the OWTF Phase I development so as to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities that take place concurrently.

2 PROJECT DESCRIPTION

Need of the Project

- 2.1 The Project is important, not only to mitigate landfill space depletion, but because resources are conserved, and valuable products such as composts and biogas (a renewable energy) can be generated. The compost could be used as organic fertilizer for farming and horticulture. The biogas, if employed to generate electricity, could meet the electricity demand of some 2,000 households, thereby contributing to reduction in use of fossil fuel and reduction in greenhouse gas emission. In addition, organic waste diversion from landfills reduces leachate and landfill gas generation. The Project would positively contribute to the Hong Kong SAR Government's MSW Management Policy.

Location of the Project

- 2.2 The Project is proposed to be located in the Siu Ho Wan, North Lantau. The total area of the proposed project site comprises a total area of approximately 2 hectares with no nearby residential development. As shown in **Figure 1**, infrastructure facilities such as refuse transfer station, sewage treatment works, water treatment works and vehicle pound/vehicle examination and weigh station are located in the vicinity of the proposed site.

Scale of the Project

- 2.3 The Project site boundary is shown in **Figure 2**. Key elements of the proposed OWTF Phase I development include:
- Pre-treatment facilities – The collected source-separated organic waste would be transported to the Project site by enclosed waste vehicles. The incoming waste would be delivered to the enclosed waste reception area and pre-treated through a trommel screen, overhead magnets and shredder, etc.
 - Anaerobic digestion process – The pre-treated material would be fed into the buffer tanks to start the hydrolysis stage of the anaerobic digestion. The mixed organic waste with high moisture content will be directed to the individual vertical cylindrical digesters.
 - Post-treatment of digestate – After digestion, the material from digesters would be pumped to dewatering facility and further treated by tunnel composting. All the post-treatment facilities would be located in an enclosed building with air extraction system.
 - Energy recovery system – Cogeneration units would be installed to convert the energy contained in the biogas to electricity and heat. The biogas generated from the digesters would be firstly treated by a biological desulphurization process and the treated biogas would be temporarily stored in the gas buffer prior to feeding to the cogeneration units. A stand-by flare would be installed in the Project site for emergency use only.
 - Air and wastewater treatment facilities – A centralized air pollution control unit would be provided to treat the vented air extracting from a number of operation units, including the pre-treatment and post-treatment facilities. All the wastewater generated from the Project would be properly treated by the wastewater treatment unit.

Project Programme

- 2.4 The Project is planned to be implemented through a Design, Build and Operate (DBO) contract arrangement. The construction of the Project is scheduled for commencement in late 2011 for completion and commissioning in early 2013.

Consideration of Alternatives

Site Selection

- 2.5 The following potential sites for the OWTF Phase I development were identified and evaluated:
- Sha Ling Livestock Waste Composting Plant, Sheung Shui;
 - EcoPark Phase II, Tuen Mun;
 - Siu Ho Wan, North Lantau; and
 - Tseung Kwan O (TKO) Area 137, Tseung Kwan O.
- 2.6 The proposed site in Siu Ho Wan was considered as the most suitable site for the OWTF Phase I development in consideration of the following advantages:
- No nearby residential development was found and the site is presently reserved for deployment as waste treatment facility and thus the proposed development of OWTF is in line with the planning intention for the site.
 - Infrastructure facilities such as sewage and water treatment works, refuse transfer station, etc are found in the vicinity of the site. These infrastructural facilities are considered as potential users of the electricity generated from the Project.
 - The site is accessible via Cheung Tung Road and Sham Fung Road adjacent to the North Lantau Highway.

Technology Selection

- 2.7 A review of international organic waste treatment practices was carried out. In consideration of the objectives and scale of the Project, and the future development of waste management facilities in Hong Kong, it was concluded that anaerobic digestion (AD) was the most preferable option with the following merits:
- Highly applicable for organic waste including food waste;
 - Production of considerable amounts of energy from waste;
 - Reduction in greenhouse gas emission; and
 - Good odour control.

3 KEY FINDINGS OF THE ENVIRONMENTAL STUDY

Air Quality

Construction Phase

- 3.1 Air quality impacts from the construction works of the Project would mainly be related to construction dust from excavation, materials handling, spoil removal and wind erosion. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation and good site practices, dust impacts on nearby air sensitive receivers would be minimal.

Operation Phase

- 3.2 During the operation of the OWTF, a centralized air pollution control unit would be used to remove air pollutants, dust and odorous gas in the air extracted from the main buildings of OWTF and the wastewater treatment unit. The potential major sources of air quality impacts arising from the OWTF would be the air emissions from the stacks of centralized air pollution control unit and cogeneration units. Flaring emissions may be emitted if there is a failure in the cogeneration units.
- 3.3 The air quality background level for the operation year of the OWTF has been predicted using the PATH model and has taken into account key pollution sources such as power stations, aviation, marine traffic, vehicular traffic, industrial chimneys within HKSAR as well as emissions within Pearl River Delta Economic Zone.
- 3.4 Modelling for air emissions from the stacks of centralized air pollution control unit and cogeneration units or standby flaring gas unit of OWTF, as well as vehicular emissions and marine emissions within the study area has been undertaken and the results have been combined with the air quality background levels. The predicted maximum hourly, daily and annual average nitrogen dioxide (NO₂) concentrations at the representative air sensitive receivers (ASRs) would be 273, 145 and 53 µg/m³. The predicted maximum daily and annual average respirable suspended particulates (RSP) concentrations at the representative ASRs would be 123 and 47 µg/m³. The predicted hourly, daily and annual sulphur dioxide (SO₂) concentrations would be 379, 76 and 12 µg/m³. The predicted cumulative air pollutants levels would comply with Air Quality Objectives.
- 3.5 Assessment has also been conducted for potential odour impacts arising from the OWTF, taking into account of cumulative odour impacts from North Lantau Refuse Transfer Station and Siu Ho Wan Sewage Treatment Works. The predicted cumulative odour concentrations at the representative ASRs are in the range of 0.5 – 4.6 odour units based on an averaging time of 5 seconds and thus comply with the EIAO-TM criteria (i.e. 5 odour units based on an averaging time of 5 seconds).
- 3.6 Commissioning tests would be conducted for emissions from the stacks of the centralized air pollution control unit, cogeneration units and standby flaring gas unit. During operation phase, stack monitoring would be installed for the OWTF to ensure that the air emissions from the OWTF will meet the design emission limits as well as EPD criteria. Odour patrol at the plant boundary is also proposed to monitor any odour impact arising from the operation of the OWTF. The predicted air quality impact from the operation of the OWTF would be insignificant.
- #### **Hazard to Life**
- 3.7 A hazard assessment has been carried out to evaluate the risk to construction workers and operational staff of the OWTF due to the transport, storage and use of chlorine associated with the operations at Siu Ho Wan Water Treatment Works (SHWWTW).

- 3.8 Hazardous scenarios associated with the operations at SHWWTW have been identified and assessed in this study. Hazardous events for biogas storage have been investigated through consequence analysis. These hazardous events would not escalate to additional chlorine release scenario at SHWWTW. Thus, no hazardous scenario associated with the operations at SHWWTW due to impact from biogas storage is found.
- 3.9 A quantitative risk assessment has been conducted to determine the impact of the identified hazardous scenarios on the surrounding population during construction and operation phases of the OWTF in terms of individual and societal risks. Individual risk at the Project site is found to be at the order of 1E-06 per year which is acceptable in comparison with the criteria (1E-05 per year) in the Risk Guidelines. Both individual and societal risks comply with the risk guidelines stipulated in Annexes 4 and 22 of the Environmental Impact Assessment Ordinance Technical Memorandum (EIAO-TM).
- 3.10 An As Low As Reasonably Practicable (ALARP) assessment has been carried out by identifying all practicable mitigation measures and assessing the cost effectiveness of each measure in terms of the risk reduction achieved and the cost of implementing the measures. Societal risk curves for both construction and operation phases with the implementation of the proposed mitigation measures are indicated in **Figure 3**. The results show compliance with the ALARP principles and the Risk Guidelines (EIAO-TM Annex 4) provided recommendations are implemented.

Water Quality

- 3.11 Potential sources of water quality impact associated with the construction of the Project would be site run-off, sewerage effluent from the workforce, accidental spillage and discharge of wastewater from various construction activities. With the implementation of recommended mitigation measures and good site practices, water quality impacts from the land-based construction works can be controlled to comply with the Water Pollution Control Ordinance (WPCO) standards. No adverse water quality impacts would be expected during the construction phase of the Project.
- 3.12 The operation of OWTF is to convert organic waste into compost and biogas. All sewage or wastewater generated from the operation of the Project will be adequately treated in the on-site wastewater treatment plant before reused on-site or discharged to the public sewerage system. Wastewater to be discharged to the public sewerage will comply with the Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS) under WPCO. No adverse water quality impacts would be anticipated.

Waste Management

- 3.13 Waste types to be generated during the construction of the Project would likely include excavated material, construction and demolition materials, chemical waste and general refuse. Waste sorting from pre-treatment process, chemical waste and general refuse are expected to be the major types of waste arising from the operation of the OWTF.
- 3.14 With effective implementation of good practices and mitigation measures, it is anticipated that the impacts on the environment and the potential impacts on the capacity of waste collection, transfer and disposal facilities will be insignificant during both construction and operation phases of the Project.
- 3.15 Limited amount of chemicals or chemical wastes would be used or generated for the operation of the OWTF. With proper implementation of the recommended practices and response procedures for contamination prevention, the potential for contamination due to the OWTF operation is expected to be minimal.

Landscape and Visual

- 3.16 A landscape and visual impact assessment has been carried out in accordance to the criteria and guidelines as stipulated in Annexes 10 and 18 of EIAO-TM and EIAO Guidance Note No.8/2002.
- 3.17 Three landscape resources and seven landscape character areas were identified within 500m radius area from the OWTF site. The impact to these landscape resources and landscape character areas would be insubstantial or slight, except for the tree covered hill slope located at the east and north-east of the OWTF site. For the visual impact, fifteen visual sensitive receivers (VSRs) were identified within the Zone of Visual Influence (ZVI). Most of these VSRs have low sensitivity, and the magnitude of impact to them would be negligible or small. Only the visual impact to the site staff in Siu Ho Wan Water Treatment Works, passengers on North Lantau Highway and hikers in Lantau North (Extension) Country Park would be moderate.
- 3.18 To mitigate the potential landscape and visual impacts associated with the construction of the Project, it is recommended that topsoil should be stripped and stored for re-use in the construction of the soft landscape works; compensatory tree planting should be provided to compensate for felled trees; night-time lighting should be controlled; and decorative screen hoarding should be erected. With the implementation of these mitigation measures, no adverse landscape and visual impacts would be expected during the construction phase of the Project.
- 3.19 During the operation of the OWTF Phase I development, with the implementation of the proposed mitigation measures shown in **Figures 4a** and **4b**, such as aesthetic design of the proposed OWTF matching with adjacent landscape setting of the site, green roofing, tree planting along the site boundary to provide screening, the Project will not only be complimentary to the existing neighbours and surrounding areas, but will also be Beneficial as it will provide the much needed visual relief to offset and alleviate much of the existing negative elements within the Study Area. In addition, it will also greatly improve and increase the value of the existing landscape character.
- 3.20 Overall, it is considered that the residual landscape and visual impacts of the proposed OWTF development would be acceptable with mitigation measures during construction phase and beneficial during operation phases.

Noise

- 3.21 No existing or planned sensitive receivers were identified within 300m from the Project boundary. The Discovery Bay, located at the distance of over 1km away from the Project site, was identified as the nearest existing noise sensitive receiver (**Figure 5**). Since the nearest noise sensitive receiver is located considerably distant from the Project and is substantially screened by natural terrain, the noise impact caused by the Project itself and any cumulative noise impact associated with the Project is thus considered insignificant.

Environmental Monitoring and Audit

- 3.22 Environmental monitoring and audit (EM&A) requirements for the Project have been specified in an EM&A Manual. The EM&A Manual contains details of proposed baseline and compliance monitoring programme, implementation schedule of the environmental protection / mitigation measures, EM&A reporting procedures and compliant handling procedures.

4 CONCLUSION

- 4.1 The EIA Study has determined the likely nature and extent of environmental impacts predicted to arise from the Project. Where necessary and practicable, the EIA Study has specified mitigation and control measures to reduce the environmental impacts to acceptable levels.
- 4.2 With the recommended mitigation measures applied, the Project would be environmentally acceptable and no unacceptable residual impacts are anticipated. The schedule of implementation of the recommended mitigation measures has been provided in the EIA report. Monitoring requirements have also been specified in a separate EM&A Manual to ensure proper implementation of the recommended mitigation measures.