4b. NOISE IMPACT (ARTIFICIAL ISLAND NEAR SKC)

4b.1 Introduction

4b.1.1.1 This section presents the noise impact assessment for the construction and operation phases of the Project. Existing and planned noise sensitive receivers in the vicinity of the study area are determined. Potential noise impacts associated with the Project have been identified together with any practicable mitigation measures.

4b.2 Environmental Legislation, Policies, Plans, Standards and Criteria

4b.2.1 General

4b.2.1.1 Noise impacts were assessed in accordance with the criteria and methodology given in the Technical Memoranda (TMs) under the Noise Control Ordinance (NCO), and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM).

4b.2.1.2 The NCO and EIAO provide the statutory framework for noise control. Assessment procedures and standards are set out in the five TMs listed below:

- TM on Environmental Impact Assessment Process (EIAO-TM)
- TM on Noise from Construction Work other than Percussive Piling (GW-TM)
- TM on Noise from Percussive Piling (PP-TM)
- TM on Noise from Construction Work in Designated Areas (DA-TM)
- TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM)

4b.2.2 Construction Noise – General Construction

4b.2.2.1 The NCO provides the statutory framework for noise control of construction work, other than percussive piling, using powered mechanical equipment (PME) between the hours of 1900 and 0700 hours or at any time on Sundays and general holiday (that is, restricted hours). Noise control on construction activities taking place at other times is subject to the *Criteria for Evaluating Noise Impact* stated in Table 1B of Annex 5 in the EIAO-TM. The noise limit is $L_{eq\ (30\ minutes)}$ 75 dB(A) at the façades of dwellings.

4b.2.2.2 Between 1900 and 0700 hours and all day on Sundays and public holidays, activities involving the use of PME for the purpose of carrying out construction work is prohibited unless a construction noise permit (CNP) has been obtained. A CNP may be granted provided that the Acceptable Noise Level (ANL) for the Noise Sensitive Receivers (NSRs) can be complied with. ANLs are assigned depending upon the area sensitive rating (ASR). The corresponding basic noise levels (BNLs) for evening and night time periods are given in **Table 4b.1**.

Table 4b.1 Construction Noise Criteria for Activity other than Percussive Piling

Time Period	Basic Noise Level (BNLs)		
	ASR A	ASR B	ASR C
Evening (1900 to 2300 hours) (1)	60	65	70
Night (2300 to 0700 hours)	45	50	55

Notes: (1) Includes Sundays and Public Holidays during daytime and evening

4b.2.2.3 Despite any description or assessment made in this EIA on construction noise aspects, there is no guarantee that a Construction Noise Permit (CNP) will be issued for the project construction. The Noise Control Authority will consider a well-justified CNP application, once filed, for construction works within restricted hours as guided by the relevant Technical Memoranda issued under the Noise Control Ordinance. The Noise Control Authority will take into account of contemporary conditions / situations of adjoining land uses and any previous complaints against construction activities at the site before making his decision in granting a CNP. Nothing in this EIA shall bind the Noise Control Authority in making his decision. If a CNP is to be issued, the Noise Control Authority shall include in it any condition he thinks fit. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution action under the NCO.

4b.2.2.4 Percussive piling is prohibited between 1900 and 0700 hours on any weekday not being a general holiday and at any time on Sunday or general holiday. A CNP is required for the carrying out of percussive piling between 0700 and 1900 hours on any day not being a general holiday. As the issuance of a CNP by the Noise Control Authority would depend on the compliance of percussive piling noise impact with the limits set out within the PP-TM, the assessment of this type of noise would not be covered in the EIA report.

4b.2.3 Operation Phase

4b.2.3.1 Fixed plant noise sources, such as noise emission from stack and ventilation system at the IWMF, are controlled by the NCO and IND-TM with a noise criteria of 5 dB(A) below the appropriate Acceptable Noise Levels (ANL) shown in Table 3 of the TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites or the prevailing background noise levels (for quiet areas with level 5dB(A) below the ANL). The ANLs for different Area Sensitivity Ratings are summarised in **Table 4b.2** below.

Table 4b.2 Operation Noise Criteria for Fixed Noise Sources

Time Period	ANL, dB(A)			Criteria (ANL-5), dB(A)		
	ASR A	ASR B	ASR C	ASR A	ASR B	ASR C
Day (0700 to 1900 hours)	60	65	70	55	60	65
Evening (1900 to 2300 hours)	60	65	70	55	60	65
Night (2300 to 0700 hours)	50	55	60	45	50	55

4b.2.3.2 The Project areas are located in the rural area and the prevailing background noise level measurements at selected representative NSRs have been conducted on 12 January 2010. Results indicated that the measured average daytime & evening time noise levels were in the range of 55-58 dB(A); and the measured average night-time noise levels were in the range of 44 - 50 dB(A) at various monitoring locations (see **Table 4b.3**). As the background noise levels for daytime and evening time are higher than the relevant planning criteria of ANL - 5 dB(A), the planning criteria would be adopted as the daytime and evening time assessment criterion. On the other hand, as the background noise levels at night-time are the same or lower than the relevant planning criteria of 45 dB(A), the planning criteria would be adopted as the nighttime assessment. A summary of the noise criteria for operation noise is given in the following **Table 4b.3**.

Table 4b.3 Summary of Measured Prevailing Background Noise Level

NSRs	Location	Time Period	Prevailing Noise Level, dB(A) (1)	Area Sensitivity Rating	ANL-5 (2)	Criteria, dB(A) Min of (1) & (2)
N_S1	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 1	Daytime	58 Measurement Time: 16:30	A	55	55
		Evening time	57 Measurement Time: 20:30	A	55	55
		Nighttime	44 Measurement Time: 00:30	A	45	44
N_S2	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 2	Daytime	57 Measurement Time: 15:30	A	55	55
		Evening time	55 Measurement Time: 20:00	A	55	55
		Nighttime	50 Measurement Time: 0:30	A	45	45
N_S3	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 3	Daytime	57 Measurement Time: 14:30	A	55	55
		Evening time	55 Measurement Time: 19:30	A	55	55
		Nighttime	44 Measurement Time: 23:30	A	45	44

4b.3 Description of the Environment

4b.3.1.1 The artificial island near SKC is to be formed mainly by reclamation at the south-western coast of Shek Kwu Chau, an island located to the southwest of Cheung Chau and to the south of Chi Ma Wan Peninsula, Lantau Island. The artificial island near SKC would cover approximately 10 ha of reclaimed land. Shek Kwu Chau was granted by the HKSAR Government to the Society for the Aid and Rehabilitation of Drug Addicts (SARDA) for use as a rehabilitation centre. There is no other existing or planned residential, commercial or industrial development on the island.

4b.4 Noise Sensitive Receivers

4b.4.1.1 In order to evaluate the construction and operation noise impacts from the Project, representative NSRs within the Study Area are identified for assessment. Only the first layer of NSRs has been identified for assessment because it would provide acoustic shielding to those receivers at further distance behind. **Table 4b.4** and **Figure 4b.1** shows the representative NSRs selected for this noise impact assessment. The photographs of the representative NSRs are shown in **Appendix 4.1**.

Table 4b.4 Representative Noise Sensitive Receivers for Noise Impact Assessment

NSR ID	Name of building	Use	Number of floor	Distance to the IWMF Plant, m
N_S1	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 1	Hostel	2	209
N_S2	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 2	Hostel	1	229
N_S3	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 3	Hostel	1	144

4b.5 Assessment Methodology

4b.5.1 Construction Noise during Unrestricted Hours

4b.5.1.1 The construction activities of the Project taking place concurrently within 300 m of a given NSR are considered to contribute to the cumulative impact at that NSR. Noise sources from the areas greater than this distance were excluded from the assessment.

4b.5.1.2 The methodology outlined in the GW-TM was used for the assessment of construction noise (excluding percussive piling). Sound Power Levels (SWLs) of the equipment were taken from Table 3 of this TM. Where no SWL is provided in the GW-TM, reference was made to BS 5228 or other previous similar studies or from measurements taken at other sites in Hong Kong.

4b.5.1.3 There is no concurrent construction activities identified within the 300m study area for noise impact assessment. Locations of notional sources and distance for NSRs are given in **Appendix 4.3**. A positive 3 dB(A) façade correction was added to the predicted noise levels in order to account for the facade effect at each noise assessment point.

4b.5.2 Operation Phase

4b.5.2.1 Fixed plant noise source is controlled by the NCO and IND-TM with a criteria of 5dB(A) below the appropriate Acceptable Noise Levels (ANL) shown in Table 3 of the TM on Noise from Place other than Domestic Premises, Public Places or Construction Sites or the prevailing background noise levels. The following procedures were applied to the operation phase fixed plant noise assessment.

- Identify fixed plant noise;
- Calculate the correction factors based on the distance between the NSRs and the noise source positions;
- Apply acoustics correction factors for façade, distance, barrier attenuation, acoustic reflection where applicable; and
- Quantify the level of impact at the NSRs in accordance with IND-TM.

4b.6 Identification of Environmental Impacts

4b.6.1 Construction Phase

4b.6.1.1 The potential construction impact arising from this Project includes reclamation work, site formation and building construction and other related works. These construction activities will involve the use of Powered Mechanical Equipment (PME) including barges, dredger, excavators, mobile cranes, concrete pumps, concrete mixers, rollers, etc. The

construction noise impact assessment was carried out based on the best available construction plant inventory. Mitigation measures, where required, would be formulated and the residual construction noise impact assessed. The use of PMEs adopted for the assessment is detailed in **Appendix 4.4**.

4b.6.2 Operation Phase

4b.6.2.1 Most of the noise sources such as shredding, waste bunker, boiler, turbine generator and other machine system are enclosed in concrete building structures. Any doors and windows will be closed during normal operation to avoid noise leakage. Noise impact from these noise sources is not expected. The potential operation noise sources within the IWMF include the following:

- Stack of the incinerator – total of 6 stacks of the incinerator and the design flow rate for each stack was assumed to be 175,033m^3/hr;
- Ventilation systems within the IWMF – total 3 ventilation systems for within the IWMF, 1 system is for main building and 2 systems for Main Building and Mechanical Treatment Plant. The design flow rate for the ventilation systems of Main Building and Mechanical Treatment Plant are 108,000 and 205,000m^3/hr, respectively;
- Container vehicle – transport the MSW between the berth and the IWMF plant;
- Air-cooled condenser – the cooling system is equipped to condense the exhaust steam from the turbine generator and to maintain a desired turbine exhaust pressure. During normal operation, total 3 sets of air-cooled condensers will be operated; and.
- Marine Vessel – the barge is used for transport the MSW from RTS to the IWMF at the artificial island near SKC. Since the artificial island near SKC is only accessible by marine transport, shuttle ferries between Cheung Chau and the IWMF at the artificial island near SKC for staffs and visitors would be operated as necessary. The operation mode of marine vessel are described in **S4b.6.2.2** below.

4b.6.2.2 The MSW collected at Island East Transfer Station (IETS), Island West Transfer Station (IWTS) & West Kowloon Transfer Station (WKTS) will be delivered to the IWMF using marine transportation. The operation information and SWLs of the marine vessels from these transfer station as stated in the approved WENT Landfill Extensions EIA Report have been adopted for this assessment. By-products would be generated from the operation of the IWMF and will be containerized in containers and then transported by marine vessels to the berth at the WENT Landfill. The artificial island near SKC is only accessible by marine transport. Shuttle ferries between Cheung Chau and SKC for the staffs and visitors would be operated as necessary. The operation mode of the berths at the artificial island near SKC are summarized in **Table 4b.5**. All berths (except berth for WKTS) are relying on the crane installed on the barge to load and unload the containers. For the berth for WKTS, the gantry crane will be installed in the berth. The sound power level for the gantry crane adopted in the WENT Landfill Extensions EIA Report had been used in the assessment.

Table 4b.5 Operation Mode of the Berths

Vessels	Idling Period at the Artificial Island near SKC berth	Daytime & Evening Time	Night Time
IETS	19.5 hrs (21:30 - 17:00)	Idling, loading and unloading	Idling
IWTS	21 hrs (21:00 - 18:00)	Idling, loading and unloading	Idling
IWMF	21 hrs (21:00 - 18:00)	Idling, loading and unloading	Idling
WKTS	07:30 - 19:30	Idling, loading and unloading	Idling
Staffs	07:00 - 0900, 14:00 - 16:00, 17:00 - 18:00 & 21:00 - 23:00	Idling	No Activity
Visitors	09:00 - 18:00	Idling	No Activity

4b.6.2.3 For the worst case scenario, concurrent operation of all vessels at the berth of the artificial island near SKC was assumed for the daytime and evening time. Loading and unloading activities will not be carried out during nighttime period. In other words, the marine vessels would be berthing without switching on the engine during the nighttime period.

4b.6.2.4 A summary of the identified fixed plant noise sources inventories and their SWL are presented in **Table 4b.6**. Locations of these potential noise sources during operation phase are shown in **Figure 4b.2.**

Table 4b.6 Noise Inventories

Plant	SWL/unit, dB(A)	Qty.	Util,%
Berth 1 – IWMF (1)	100	1	Daytime: 80% (9) Evening time: 50% Nighttime: N/A
Berth 2 – IWTS(2)	100	1	
Berth 3 – IETS(2)	100	1	
Berth 4 – WKTS(2)	98	1	
Berth 5 – Staff/Visitor (1)	100	2	Daytime: 20% (10) Evening time: 20% Nighttime: N/A
Stack of the incinerator (3) (5) (6)	97	6	100% for all time period
Ventilation systems within IWMF (3) (5) (7)	97	3	
Air-cooled chillers(3) (8)	109	3	
Container Vehicle (4)	101	54	Daytime: 100% Evening time: 100% Nighttime: N/A

Remarks:
(1) Based on maximum SWL among of IWTS, IETS and WKTS.
(2) Based on SWL adopted in the approved WENT Landfill Extensions EIA Report.
(3) Based on the estimated volume flow rate/cooling capacity, the SWL is made reference to Good Practices on Ventilation System Noise Control.
(4) Maximum SWL of container vehicles has been adopted from Appendix 4.9 of the approved NENT Landfill Extension EIA Report.
(5) The equipment will be installed with silencer and acoustics treatment. 10 dB(A) noise reduction was assumed.
(6) The design flow rate for each stack of the incinerator is 175,033m^3/hr
(7) The design flow rate for the ventilation systems of Main Building and Mechanical Treatment Plant are 108,000 and 205,000m^3/hr, respectively.
(8) The design cooling capacity for air-cooled chillers is 400 ton. The equipment will be installed with enclosure and discharge silencer. 20 dB(A) noise reduction was assumed.
(9) The Utilization rate is based on the approved WENT Landfill Extensions EIA Report.
(10) The frequency of staff/visitor vessels is once per half hour and assume the idling time would be around 5-6 mins.

4b.7 Prediction and Evaluation of Environmental Impacts

4b.7.1 Construction Phase

4b.7.1.1 For normal daytime working hours, no exceedances of the construction noise criteria ($L_{eq\ (30\text{-}min)}$ 75 dB(A) for residential uses are predicted at representative NSRs in the absence of mitigation measures. Details of construction noise calculations are presented in **Appendix 4.5**. The assessment results show that the predicted noise levels arising from the Project are in the range of $L_{eq(30\text{-}min)}$ 60 to 74 dB(A). A summary of the unmitigated construction noise levels of the representative NSRs during normal daytime working hours within the construction period of the Project is listed in **Table 4b.7**. No exceedance of construction noise is predicted at the NSRs.

Table 4b.7 Summary of Cumulative Unmitigated Construction Noise Levels at Representative NSRs During Normal Daytime Working Hours

NSR	Noise Criteria, dB(A)	Predicted Unmitigated Construction Noise Levels during Normal Daytime Working Hour (Leq (30-min), dB(A))	Exceedance, dB(A)
N1	75	71	0
N2	75	70	0
N3	75	74	0

4b.7.2 Operation Phase

4b.7.2.1 The predicted operation noise levels at the representative NSRs would be in the range of 52 to 53 dB(A), 51 to 52 dB(A) and 42 to 44 dB(A) for daytime, evening time and nighttime, respectively. All representative NSRs would meet the daytime, evening time and nighttime noise criterion. A summary of the predicted noise levels at all representative NSRs is presented in **Table 4b.8**. The detailed calculations are shown in **Appendix 4.6**.

Table 4b.8 Summary of Predicted Operation Noise Levels

NSR	NSR Description	Predicted Noise Level, dB(A) / Criteria, dB(A)		
		Daytime	Evening	Nighttime
N_S1	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 1	53 / 55	52 / 55	42 / 44
N_S2	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 2	52 / 55	51 / 55	42 / 45
N_S3	Shek Kwu Chau Treatment & Rehabilitation Centre Hostel 3	52 / 55	51 / 55	44 / 44

4b.8 Mitigation of Environmental Impacts

4b.8.1 Construction Phase

4b.8.1.1 The assessment results have demonstrated that daytime noise criteria would not be exceeded by the predicted construction noise levels under the unmitigated scenario. Good practices for the control of noise emissions from construction sites are still recommended to further eliminate the potential of noise impact. These include:

- Good site practices to limit noise emissions at source;

- Use of quiet plant and working methods, whenever practicable.

4b.8.2 Operation Phase

4b.8.2.1 Other than provision of silencer or other acoustic treatment equipment for the stack of the incinerator and ventilation system, the detailed design should incorporate the following good practice in order to minimise the nuisance on the neighbouring NSRs.

- The exhaust of the ventilation system and any opening of the building should be located facing away from any NSRs; and
- Louver or other acoustic treatment equipment could also be applied to the exhaust of the ventilation system.

4b.8.2.2 Residual fixed plant noise impacts are not anticipated with the provision of silencer or acoustics treatment for the noisy plant such as the stack of incinerator and the ventilation system. In order to ensure compliance of the operation noise level with the stipulated noise standards in TM, noise commissioning tests for all major fixed noise sources should be included in the Contract Document.

4b.9 Evaluation of Residual Impacts

4b.9.1.1 Adverse residual construction and operation noise impacts are not anticipated. In order to ensure compliance of the operation noise level with the stipulated noise standards in TM, noise commissioning tests for all major fixed noise sources should be included in the Contract Document.

4b.10 Environmental Monitoring and Audit

4b.10.1 Construction Phase

4b.10.1.1 An EM&A programme is recommended to be established according to the expected occurrence of noisy activities. All the recommended mitigation measures for daytime normal working activities should be incorporated into the EM&A programme for implementation during construction. Details of the EM&A requirements are provided in the EM&A Manual.

4b.10.2 Operation Phase

4b.10.2.1 The assessment has indicated that the noise from fixed plant noise would comply with the EIAO-TM criteria. Having said that, monitoring of operation noise from the proposed fixed plants during the testing and commissioning stage would be recommended to verify the compliance of the EIAO-TM criteria.

4b.10.2.2 No adverse noise impact from operation of the Project is anticipated, therefore, no environmental monitoring and audit is proposed.

4b.11 Conclusion

4b.11.1 Construction Phase

4b.11.1.1 This assessment has predicted the construction noise impacts of the Project during normal daytime working hours. The predicted unmitigated noise levels would range from

60 to 74 dB(A) at the representative NSRs and comply with the construction noise standard.

4b.11.1.2 A construction noise EM&A programme is recommended to check the compliance of the noise criteria during normal daytime working hours.

4b.11.2 Operation Phase

4b.11.2.1 Operation noise impacts from fixed plant noise can be effectively mitigated by implementing noise control treatment at source during the design stage and adverse residual operation noise impacts are not anticipated. The need for noise measurement during commissioning of fixed noise sources should be included in the Contract Document.

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