

**4. NOISE IMPACT ASSESSMENT**

**4.1 Introduction**

4.1.1 This section provides an evaluation of the potential noise impacts arising from the construction and operation of the proposed Project. The Study Area is generally defined by a distance of 300 m away from the boundary of the Project Site. Appropriate mitigation measures will be recommended, where necessary, to mitigate any unacceptable impacts.

**4.2 Relevant Legislation, Policies, Standards and Criteria**

***Construction Phase***

4.2.1 The principal legislation relating to the control of construction noise is the Environmental Impact Assessment Ordinance (Cap. 499). The Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), issued under the EIAO, provides guidelines and noise criteria for evaluating noise impacts. The assessment criteria are defined in *Annex 5* of the EIAO-TM.

4.2.2 The Noise Control Ordinance (NCO) (Cap. 400) also provides means to assess construction noise impacts. A number of Technical Memoranda (TMs) have been issued under the NCO to stipulate control approaches and criteria. The Technical Memorandum on Noise from Construction Work Other than Percussive Piling (GW-TM), which provides the guidelines for controlling the construction noise from powered mechanical equipment (PME) in general construction works, is applicable to the control of noise impacts from the construction of this Project.

*General Construction Works during Normal Working Hours*

4.2.3 Under the EIAO, potential noise impact arising from general construction works during normal working hours (i.e. 0700 to 1900 hrs on any day not being a Sunday or public holiday) at 1 m from the external façade of the uses, which rely on opened windows for ventilation, is to be assessed in accordance with the noise criteria specified in the EIAO-TM. The EIAO-TM construction noise standards are presented in **Table 4.1**.

**Table 4.1 - EIAO-TM Day-time Construction Noise Standards**

Use	Noise Standard Leq <sub>30 min</sub> (dB(A))
Domestic premises	75
Educational institutions	70
Educational institutions (during examination periods)	65

Notes:

1. The above standards apply to building uses which rely on opened windows for ventilation.
2. The above standards shall be viewed as the maximum permissible noise levels assessed at 1m from the external façade.

*General Construction Works during Restricted Hours*

4.2.4 The NCO provides statutory controls on general construction works during restricted hours (i.e. 1900 - 0700 hrs Monday to Saturday and at any time on Sundays and public holidays). The use of PME for carrying out construction works during these restricted hours would require a Construction Noise Permit (CNP). The Noise Control Authority will assess all CNP applications on a case-by-case basis guided by the GW-TM.

4.2.5 When assessing an application for CNP for the use of PME during restricted hours, the Noise Control Authority will compare the Acceptable Noise Levels (ANLs) specified in the GW-TM with the Corrected Noise Levels (CNLs) (i.e. after accounting for factors such as barrier effects and reflections) associated with the proposed PME operations. The NCO requires that noise levels from construction at affected Noise Sensitive Receiver (NSR) be less than the specified ANL. The ANLs are related to the inherent noise sensitivity of the noise receiver areas in question, and different area sensitivity ratings (i.e. A, B or C, see **Table 4.2**) have been established to reflect the background characteristics of different areas. Each noise receiver area is assigned an area sensitivity rating based on its predominant land use and the presence, if any, of Influencing Factors (IFs) such as nearby industrial areas, major roads or airports. The appropriate area sensitivity rating for the NSR is determined with reference to **Table 4.2**.

**Table 4.2 – Area Sensitivity Ratings**

Types of Area containing NSR	Degree to which NSR is affected by Influencing Factor (IF)		
	Not Affected	Indirectly Affected	Directly Affected
Rural area, including Country Parks or village type developments	A	B	B
Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
Urban area	B	C	C
Area other than those above	B	B	C

Notes:

The following definitions apply:

- (a) "Country Park" means an area that is designated as a country park pursuant to section 14 of the *Country Parks Ordinance*;
- (b) "directly affected" means that the NSR is at such a location that noise generated by the IF is readily noticeable at the NSR and is a dominant feature of the noise climate of the NSR;
- (c) "indirectly affected" means that the NSR is at such a location that noise generated by the IF, whilst noticeable at the NSR, is not a dominant feature of the noise climate of the NSR;
- (d) "not affected" means that the NSR is at such a location that noise generated by the IF is not noticeable at the NSR; and
- (e) "urban area" means an area of high density, diverse development including a mixture of such elements as industrial activities, major trade or commercial activities and residential premises.

4.2.6 The relevant ANLs for each area sensitivity rating are shown in **Table 4.3**.

**Table 4.3 - Acceptable Noise Levels (ANLs) for General Construction Works to be carried out during Restricted Hours (GW-TM)**

Time Period	Area Sensitivity Rating $L_{eq, 5 \text{ min}} \text{ (dB(A))}$		
	A	B	C
All days during the evening (i.e. 1900-2300 hrs) and general holidays (including Sundays) during the day and evening (i.e. 0700-2300 hrs)	60	65	70
All days during the night-time (i.e. 2300-0700 hrs)	45	50	55

Notes:

The above standard applies to uses which rely on opened windows for ventilation.

4.2.7 The Noise Control Authority will consider a well-justified CNP application for construction works within restricted hours as guided by the relevant Technical Memorandum issued under the NCO. The Noise Control Authority will take into account adjoining land uses and any previous complaints against construction activities at the site before making a decision. Factors influencing the outcome of a CNP application, such as the assigning of ANLs, would be determined by the Noise Control Authority at the time of the application review based on the prevailing site conditions which may change from time to time.

4.2.8 The Technical Memorandum on Noise from Construction Works in Designated Areas (DA-TM) issued under the NCO indicates a list of Specified Powered Mechanical Equipment (SPME) and the types of Prescribed Construction Work (PCW) to be regulated within restricted hours in Designated Areas (DAs). Under the DA-TM, the use of five types of SPME and the carrying out of three types of PCW within a designated area during restricted hours would require a valid CNP. The SPME includes hand-held breaker, bulldozer, concrete lorry mixer, dump truck and hand-held vibratory poker. The PCW are:

- Erecting or dismantling of formwork or scaffolding;
- Loading, unloading or handling of rubble, wooden boards, steel bars, wood or scaffolding material; and
- Hammering.

4.2.9 The Project site falls within the designated area under the NCO (ref. EPD/AN/NT-02). The Noise Control Authority will assess the CNP applications based on procedures and requirements as described in the DA-TM. In general, it should not be presumed that a CNP would be granted for the carrying out of PCW within a designated area during the restricted hours. The CNP may be granted for the execution of construction works within a designated area during restricted hours involving the use of SPME if the relevant ANL and criteria stipulated in the DA-TM can be satisfied.

***Operational Phase***

4.2.10 Fixed plant noise associated with the operation of a project is controlled under Section 13 of the NCO. The Technical Memorandum on Noise from Places Other than Domestic Premises, Public Places or Construction Sites (IND-TM) specifies the applicable ANLs for assessing potential operational noise impacts. The noise standards are set out in the EIAO-TM as follows:

- The total fixed source noise level at the facade of the nearest NSR is at least 5 dB(A) lower than the appropriate ANL (as shown in **Table 4.4**) as specified in the IND-TM; or
  - Where the prevailing background noise level in the area is 5 dB(A) or more below the appropriate ANL, the total fixed source noise level must not exceed this noise level.
- 4.2.11 The noise criteria stipulated in the IND-TM apply for all days and general holidays. The ANLs are dependent on the area sensitivity rating of the NSRs and the time of the day and are presented in **Table 4.4**.

**Table 4.4 – Acceptable Noise Levels for used as Operational Noise Criteria**

Time Period	L <sub>eq 30min</sub> (dB(A))		
	Area sensitivity rating "A"	Area sensitivity rating "B"	Area sensitivity rating "C"
Day-time (0700 - 1900 hrs)	60 (55)	65 (60)	70 (65)
Evening (1900 - 2300 hrs)	60 (55)	65 (60)	70 (65)
Night-time (2300 - 0700 hrs)	50 (45)	55 (50)	60 (55)

Note:

The number in brackets indicates the noise limit (ANL -5 dB(A)) for operational noise impact assessment.

- 4.2.12 The main Sha Tau Kok area is located within Closed Area and is only partly covered by the Sha Tau Kok Outline Zoning Plan (No. S/NE-STK/2). Given its rural environment, the identified NSR has been assigned an area sensitivity rating of "A".
- 4.2.13 Baseline noise measurements were conducted in January 2014 to determine the prevailing background noise levels near the Project area. Results are summarized in **Section 4.3** and [Annex 4A](#). Noise criteria has been assigned to the NSRs that will be affected by the operational noise from the expanded STKSTW based on the ANL (**Table 4.4**) and the prevailing noise levels (**Table 4.5**), as tabulated in **Table 4.6**.
- 4.2.14 In any event, the noise criteria employed in this Report is for an indicative operational noise assessment only. It should be noted that fixed noise sources are controlled under Section 13 of the NCO. At the time of investigation, the Noise Control Authority shall determine noise impact from concerned fixed noise sources on the basis of prevailing legislation and practices being in force, and taking account of contemporary conditions / situations of adjoining land uses. Nothing in this Report shall bind the Noise Control Authority in the context of law enforcement against any fixed noise source being assessed.

### **4.3 Baseline Conditions**

- 4.3.1 Sha Tau Kok is situated within a quiet rural area. The existing ambient noise levels are mainly generated by cross boundary traffic along Sha Tau Kok Road, Sha Ho Road and nearby local roads. Other noise sources include community activities, marine traffic and tour activities at Chun Ying Street.
- 4.3.2 Baseline noise measurements to investigate the prevailing background noise levels near the Project area have been undertaken in January 2014. Measurement results and locations are presented in [Annex 4A](#) and summarised in **Table 4.5**.

**Table 4.5 – Measured Baseline Noise Levels**

Measurement Station	Measurement Location	Time Periods	Measured Noise Levels, $L_{eq, 30min}$ dB(A)
N1	Junction of Sha Tau Kok Road – Shek Chung Au and Shan Tsui Village Road	Day-time/evening: 0700 to 2300 hrs	61 – 77
		Night-time:2300 to 0700 hrs	56 – 77
N2	Sha Tau Kok Police Operation Base	Day-time/evening: 0700 to 2300 hrs	49 – 60
		Night-time:2300 to 0700 hrs	50
N3	Sha Tau Kok Chuen Block 1	Day-time/evening: 0700 to 2300 hrs	62 – 75
		Night-time:2300 to 0700 hrs	56 – 73
N4	Sha Tau Kok Chuen Block 44	Day-time/evening: 0700 to 2300 hrs	60 – 72
		Night-time:2300 to 0700 hrs	42 – 71
N5	Sha Tau Kok Chuen Block 13	Day-time/evening: 0700 to 2300 hrs	58 – 71
		Night-time:2300 to 0700 hrs	58 – 74
N6	Sha Tau Kok Central Primary School	Day-time/evening: 0700 to 2300 hrs	45 – 68
		Night-time:2300 to 0700 hrs	35 – 70
N7	Proposed Sha Tau Kok Chuen development site	Day-time/evening: 0700 to 2300 hrs	57 – 75
		Night-time:2300 to 0700 hrs	56 – 67
N8	Shun Lung Street	Day-time/evening: 0700 to 2300 hrs	53 – 67
		Night-time:2300 to 0700 hrs	41 – 66

4.3.3 Based on the measured baseline noise levels, the noise criteria for operational noise assessment at NSRs that will be affected by the operational noise from the expanded STKSTW has been determined and tabulated in **Table 4.6** below.

**Table 4.6 – Noise Criteria for Operational Noise Impact Assessment**

Measurement Station	Representative NSRs	Time Periods	Measured Noise Levels, $L_{eq, 30min}$ dB(A)	ANL-5, dB(A)	Operational Noise Criteria, dB(A)*
N1	NSR 1, NSR 2	Day-time/evening: 0700 to 2300 hrs	61 – 77	55	55
		Night-time:2300 to 0700 hrs	56 – 77	45	45
N6	NSR 3	Day-time/evening: 0700 to 2300 hrs	<u>45</u> – 68	55	45
		Night-time:2300 to 0700 hrs	<u>35</u> – 70	45	35
N3	NSR 4, NSR 5	Day-time/evening: 0700 to 2300 hrs	62 – 75	55	55
		Night-time:2300 to 0700 hrs	56 – 73	45	45
N4	NSR 6	Day-time/evening: 0700 to 2300 hrs	60 – 72	55	55
		Night-time:2300 to 0700 hrs	<u>42</u> – 71	45	42
N7	NSR 7	Day-time/evening: 0700 to 2300 hrs	57 – 75	55	55
		Night-time:2300 to 0700 hrs	56 – 67	45	45
N8	NSR 8	Day-time/evening: 0700 to 2300 hrs	<u>53</u> – 67	55	53

**Expansion of Sha Tau Kok Sewage Treatment Works**

Measurement Station	Representative NSRs	Time Periods	Measured Noise Levels, Leq, 30min dB(A)	ANL-5, dB(A)	Operational Noise Criteria, dB(A)*
		Night-time:2300 to 0700 hrs	41 – 66	45	41
N2	NSR 9	Day-time/evening: 0700 to 2300 hrs	49 – 60	55	49**
		Night-time:2300 to 0700 hrs	50	45	**

Note:

\* ANL -5 dB(A) or the prevailing background noise levels (for quiet areas with level 5 dB(A) below the ANL).

\*\* For NSR 9 (Tin Hau Temple), night-time (2300 to 0700 hrs) use is not expected. The noise criteria for day-time / evening (0700 to 2300 hrs) is adopted.

**4.4 Noise Sensitive Receivers**

- 4.4.1 In accordance with the requirements stated in Clause 3.4.3.2 of the EIA Study Brief, the Study Area for the noise impact assessment shall covered an area of 300 m from the boundary of the Project Site. The assessment area will be reduced accordingly if the first layer of NSRs, closer than 300 m from the outer Project limit, provides acoustic shielding to those receivers at distances further away from the Project. The representative NSRs closest to the Project Site was identified. If these worst affected representative NSRs comply with the relevant noise standards, the NSRs further away will also comply with the relevant noise standards according to acoustic principles. Representative NSRs identified according to the criteria set out in the EIAO-TM are shown in [Figure 4.1](#) and are indicated in **Table 4.7**. Photos of the NSRs are shown in [Annex 4B](#). Reference has been made to the approved Sha Tau Kok Outline Zoning Plan (No. S/NE-STK/2) in identifying appropriate NSRs. In addition, site visits have been conducted to verify the NSRs and its assessment point.
- 4.4.2 Apart from the future residences of NSR 7, there are no planned NSRs in the Study Area.
- 4.4.3 According to information from the HKPF, the Police Operation Base adjacent to STKSTW is used mainly as staff changing rooms, canteen, kitchen, laundry and fitness centre, while the Operation Base – Sha Tau Kok Division Border District is used for working only. There is no staff quarter in the nearby Sha Tau Kok Fire Station. As such, they are not considered as NSR.

**Table 4.7 – Representative Noise Sensitive Receivers (NSRs)**

NSR ID	Description	Type of Usage	No. of Floors	Approximate Distance from Notional Source Position of Work to NSR, m				Approximate Distance from the boundary of the Operational Noise Source to NSR, m	
				STKSTW	HDD	Gravity Sewers	STKSPS	STKSTW	TSTP
NSR 1	Village house at Ha Tam Shui Hang	Residential	3	143	141	165	498	124	175
NSR 2	Village house at Ha Tam Shui Hang	Residential	3	150	164	85	414	140	185
NSR 3	Sha Tau Kok Central Primary School	Educational	6	405	456	163	152	392	409
NSR 4	Block 1, Sha Tau Kok Chuen	Residential	4	170	214	73	268	154	186
NSR 5	Sun Ying Lau, No. 10 Sha Tau Kok Road	Residential	5	199	252	87	198	184	200
NSR 6	Block 45, Sha Tau Kok Chuen	Residential	5	195	252	16	180	172	175
NSR 7*	Future Sha Tau Kok Chuen (under construction)	Residential	5	320	375	18	61	304	304
NSR 8	Building along Shun Lung Street	Residential	4	395	452	16	23	382	384
NSR 9	Tin Hau Temple	Place of Public Worship	1	90	140	70	290	74	70

\* No layout is available. The no. of floor and layout is based on the adjacent similar housing development. Reference has also been made to the Master Urban Design Plan in CE 48/2008 (TP) Study on the Enhancement of the Sha Tau Kok Rural Township and Surrounding Areas – Feasibility Study.

## **4.5 Potential Sources of Impacts**

### ***Construction Phase***

4.5.1 The Project includes the following main construction works:

- expansion of the Sha Tau Kok Sewage Treatment Works (STKSTW);
- construction of a temporary sewage treatment plant (TSTP);
- demolition of the existing Sha Tau Kok Sewage Pumping Station (STKSPS) and decommissioning of the rising main between STKSPS and STKSTW;
- construction of new gravity sewers; and
- decommissioning of the existing submarine outfall and construction of a new one.

4.5.2 The details of Project are given in **Section 2**. The major construction activities during the construction phase will include site clearance, demolition of existing structures, excavation, construction of substructure/superstructure, backfilling works and E&M installation. Potential sources of noise impacts during the construction phase of the Project will mainly arise from Powered Mechanical Equipment (PME) operating at the construction sites. Based on the current engineering design, percussive piling and

blasting are not required. Ground-borne construction noise is not envisaged from the above construction activities.

- 4.5.3 The submarine outfall will be constructed by Horizontal Directional Drilling (HDD) method. A launching pit will be constructed within the STKSTW for drilling works. A cofferdam will be constructed at the proposed outfall area to form a receiving pit to retrieve the drill head, excavation of marine sediment and construction of the outfall diffuser. The receiving pit works site will be on marine waters well over 1 km from Sha Tau Kok town. The associated noise impact at the receiving pit is expected to be negligible and is not assess further. In addition, HDD will start construction from the STKSTW towards the sea (Starling Inlet) and will not drill underneath any NSRs. Ground-borne construction noise is therefore not envisaged. The indicative location of the launching and receiving pits is shown in [Figure 4.1](#).
- 4.5.4 The laying of gravity sewers involved mainly open trench method (cut and cover) and trenchless method. Trenchless method is adopted at the section outside Sha Tau Kok Playground to minimize impact to the nearby Tin Hau Temple. The location of the trenchless works is shown in [Figures 2.1a&b](#). For the trenchless method, majority of the PME will be underground. Noise generated for trenchless method is therefore assumed to be largely similar to the noise level during open trench. For the open trench method, construction works will generally take place in sections to minimize inconvenience to public from road closure. The construction works will take place in sequences, such as excavation, welding of trench support, pipe laying, backfilling, compaction and resurfacing. Each work front will be around 20m to 30m in length and will last for about one to two months.
- 4.5.5 For the decommissioning of the existing outfall and rising main, grout or foam concrete will be used to fill the pipe to avoid the need for excavation. Works will be conducted at both ends of the rising main (i.e. within the STKSTW and STKSPS) and within the STKSTW for the outfall, only upon operation of the expanded STKSTW and new outfall.
- 4.5.6 Upon completion of all construction works, the existing STKSPS will be demolished.
- 4.5.7 Based on the current programme, no construction works will be required during the restricted hours under the NCO. The normal working hours of the construction of the Project will be between 0700 and 1900 hours from Monday to Saturday (except general holidays). Should evening and night works between 1900 and 0700 hours or on public holidays (including Sundays) be required, the Contractor will submit a CNP application which will be assessed by the Noise Control Authority.

**Operational Phase**

- 4.5.8 During operation, noise will be generated from fixed plant sources at the expanded STKSTW. These include screens, blowers, pumps and fans. Most of the equipment will be located inside the plant rooms and hence fully enclosed.
- 4.5.9 The main areas of the expanded STKSTW that will generate operational noise (see [Annex D](#) for location) are:
- preliminary treatment area;
  - sludge dewatering and thickening area;
  - air blower area;
  - MBR area; and
  - outfall pumping area.

4.5.10 A TSTP (see [Figure 4.1](#) and [Annex E](#) for location) is proposed as the interim measure to cope with the sewage flow in order to isolate the existing STKSTW to facilitate its expansion. The TSTP will employ secondary treatment process at a treatment capacity of 2,500 m<sup>3</sup>/day.

#### **4.6 Assessment Methodology**

##### ***Construction Phase***

4.6.1 The construction noise impact assessment was undertaken in accordance with the procedures outlined in the GW-TM, which is issued under the NCO and the EIAO-TM. The assessment methodology is summarised as follows:

- Identify the representative NSRs that may be affected by the construction of the Project;
- Determine the plant teams for corresponding construction activities, based on the agreed plant inventory;
- Assign sound power levels (SWLs) to the PME proposed based on the GW-TM and list of SWLs of other commonly used PME<sup>1</sup>;
- Calculate the correction factors based on the distance between the NSRs and the notional noise source positions of different works areas;
- Apply corrections in the calculations, such as potential screening effects and acoustic reflection, if any; and
- Predict the construction noise levels at NSRs in the absence of any mitigation measures.

4.6.2 The construction noise assessment was undertaken based on the proposed construction works programme and plant inventory, and appropriate utilisation rates of the PME items ([Annex 4C](#)). The design engineer has reviewed the programme and plant inventory, and has confirmed that they are reasonable and practicable for completing the Project within the scheduled timeframe.

4.6.3 For the purpose of assessing the worst case scenario in the construction noise assessment, the proposed Project was divided into five separate works activities, namely (A) expansion of STKSTW / construction of TSTP, (B) construction of submarine outfall using HDD, (C) laying of gravity sewers, (D) decommissioning of the existing outfall and rising main, and (E) demolition of STKSPS.

4.6.4 For worst case assessment, the works (A) expansion of STKSTW / construction of TSTP, (B) construction of submarine outfall using HDD and (C) laying of gravity sewers is assumed to overlap. Expansion of STKSTW will commence upon completion of the TSTP hence the works will not overlap. Decommissioning of the existing outfall and rising main (D) will be conducted only upon operation of the STKSTW. Finally, demolition of STKSPS (E) will be conducted upon completion of all

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<sup>1</sup> "Sound power levels of other commonly used PME" prepared by the Noise Control Authority ([http://www.epd.gov.hk/epd/english/application\\_for\\_licences/guidance/files/OtherSWLe.pdf](http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf))

- main construction and operation of the STKSTW, hence both works (D) and (E) will not overlap and are assessed separately.
- 4.6.5 The total SWL associated with each construction activity for the corresponding works areas was established. The potential noise impacts at NSRs were subsequently evaluated by comparing the predicted noise levels with the EIAO-TM day-time construction noise limits.
- Operational Phase**
- 4.6.6 The methodology for the operational noise impact assessment follows the procedures outlined in the IND-TM. The methodology is summarised as follows:
- Identify types of equipment and the number of equipment;
  - Assign sound power levels (SWLs) to the proposed equipment, with reference to other approved EIA studies in similar nature, Good Practices on Pumping System Noise Control (GP-PS) and Good Practices on Ventilation System Noise Control (GP-VS);
  - Identify representative NSRs that may be affected by the fixed plant;
  - Calculate the correction factors, using a conservative approach, based on the horizontal distance between the NSRs and the fixed plant sources;
  - Calculate the corrected noise levels after taking into account other corrections such as potential screening effects by adopting standard acoustics principles; and
  - Present the results in terms of  $L_{eq, 30min}$  dB(A), as specified in the IND-TM.
- 4.6.7 The equipment inventory and operation modes have been provided by design engineer and validated by DSD.
- 4.6.8 The main operating areas of the expanded STKSTW that will generate operational noise are:
- Area A: preliminary treatment area;
  - Area B: sludge dewatering and thickening area;
  - Area C: air blower area;
  - Area D: MBR area; and
  - Area E: outfall pumping area.
- 4.6.9 For the expanded STKSTW, distance attenuation was taken into account in the noise calculations where the direct distance between the nearest boundary of each operating area and each of the representative NSRs in the vicinity was estimated. All the equipment will be totally enclosed inside building structure. The exhaust fans will be fitted with acoustic louvre/silencer. Barrier correction was considered in which a noise reduction of 20 dB(A) was applied for equipment that are fully enclosed within the concrete building structure and 10 dB(A) reduction was applied to the exhaust fan with acoustic louver/silencer. A positive 3 dB(A) correction was included in the calculations to predict the noise levels at the NSRs due to façade effect.
- 4.6.10 For the TSTP, the noise source is assumed to be located at the boundary of the TSTP closest to the respective NSR. The pumps and air blowers will be enclosed within a tank and acoustic enclosure respectively, in which a noise reduction of 20 dB(A) was

applied. The screens may be located outdoor but will be protected by weatherproof steel casing. The deodourizing unit may also be located outdoor but the fan will be enclosed inside the deodourization unit with the exhaust facing away from the NSRs (i.e. towards the sea). A noise reduction of 10 dB(A) has been applied to the screens and deodourization unit. A positive 3 dB(A) correction was included in the calculations to predict the noise levels at the NSRs due to façade effect.

4.6.11 The TSTP will cease to operate once the expanded STKSTW is in operation and will only act as a standby during the testing and commissioning stage. It will ultimately be removed from site. Concurrent operation of both the expanded STKSTW and TSTP is not expected.

**4.7 Impact Assessment**

***Construction Phase***

4.7.1 The predicted construction noise levels during the construction phase are calculated in accordance with the methodology described in GW-TM. The results are summarised in **Table 4.8** with details of the noise calculations given in [Annex 4C](#).

**Table 4.8 – Predicted Construction Noise Levels (Without Mitigation Measures)**

<b>NSR ID</b>	<b>Description</b>	<b>Predicted Noise Level, dB(A)</b>
NSR 1	Village house at Ha Tam Shui Hang	62 – 77
NSR 2	Village house at Ha Tam Shui Hang	64 – 77
NSR 3	Sha Tau Kok Central Primary School	64 – 72
NSR 4	Block 1, Sha Tau Kok Chuen	66 – 77
NSR 5	Sun Ying Lau, No. 10 Sha Tau Kok Road	66 – 76
NSR 6	Block 45, Sha Tau Kok Chuen	66 – 88
NSR 7	Future Sha Tau Kok Chuen (under construction)	72 – 87
NSR 8	Building along Shun Lung Street	80 – 89
NSR 9	Tin Hau Temple	67 – 80

**Note:**

Noise criteria for residential premises: 75 dB(A), educational institutions: 70 dB(A) (65 dB(A) during examination). Noise criteria for NSR 9 (Tin Hau Temple) assumed similar to residential premises.

4.7.2 Results indicate that the construction noise levels at the majority of the representative NSRs exceeded the EIAO-TM noise criteria in day-time during the course of the construction period. Therefore, mitigation measures will be required.

***Operational Phase***

4.7.3 The predicted fixed plant noise levels at the representative NSRs due to the operation of the expanded STKSTW and TSTP are summarised in **Table 4.9**. The predicted noise levels at all the representative NSRs comply with the day-time / evening and night-time noise criteria. Details of the calculation are given in [Annex 4D](#) and [Annex 4E](#).

**Table 4.9 – Predicted Fixed Plant Noise Levels due to the Expanded STKSTW and TSTP**

**Expansion of Sha Tau Kok Sewage Treatment Works**

NSR ID	Description	Predicted Fixed Plant Noise Level, dB(A)		Operational Noise Criteria, dB(A)		Comply with Operational Noise Criteria
		STKSTW	TSTP	Daytime / Evening (0700 - 2300 hrs)	Night-time (2300 - 0700 hrs)	
NSR 1	Village house at Ha Tam Shui Hang	38	35	55	45	Y
NSR 2	Village house at Ha Tam Shui Hang	38	35	55	45	Y
NSR 3	Sha Tau Kok Central Primary School	29	28	45	35	Y
NSR 4	Block 1, Sha Tau Kok Chuen	36	35	55	45	Y
NSR 5	Sun Ying Lau, No. 10 Sha Tau Kok Road	35	34	55	45	Y
NSR 6	Block 45, Sha Tau Kok Chuen	35	35	55	42	Y
NSR 7	Future Sha Tau Kok Chuen (under construction)	31	30	55	45	Y
NSR 8	Building along Shun Lung Street	29	28	53	41	Y
NSR 9	Tin Hau Temple	41	43	49	*	Y

\*\* For NSR 9 (Tin Hau Temple), night-time (2300 to 0700 hrs) use is not expected. The noise criteria for day-time / evening (0700 to 2300 hrs) is adopted.

**4.8 Mitigation Measures**

***Construction Phase***

4.8.1 In view of the predicted noise exceedances during the construction of the Project, the following mitigation measures have been considered:

- Use of quiet PME / quiet construction method;
- Adoption of temporary noise barriers;
- Good construction site practice; and
- Scheduling of PME / construction activities.

*Use of Quiet PME / Quiet Construction Method*

4.8.2 The use of quiet PME is considered to be a practicable means to mitigate the construction noise impact. Quiet plant is defined as a PME having actual SWL lower than the value specified in the GW-TM. The total SWL of all plant items to be used on-site at each works area will be specified so that flexibility is allowed for the Contractor to select plant items to suit the construction needs. Quiet PME that have been adopted in the assessment are presented in [Annex 4C](#).

4.8.3 During demolition of existing structures in STKSTW and STKSPS, concrete crusher should be used in place of the excavator mounted breaker. Alternatively, hand held

breaker or excavator mounted breaker of noise level similar to concrete crusher can be considered.

*Adoption of Temporary Noise Barriers*

4.8.4 The use of noise barriers will be an effective means to mitigate the noise impact arising from the construction works, particularly for low-rise NSRs. The use of noise barrier for certain PME could generally provide a 5 dB(A) reduction for movable PME and 10 dB(A) for stationary PME. Movable noise barriers of 3 m in height with skid footing should be used and located within a few metres of stationary plant and mobile plant such that the line of sight to the NSR is blocked by the barriers. The length of the barrier should be at least five times greater than its height.

4.8.5 Temporary noise barriers in the form of purposely-built site hoarding should be erected at the works boundary of the STKSTW. In addition, movable noise barriers should be used for construction of gravity sewers.

4.8.6 With reference to "A Practical Guide for the Reduction of Noise from Construction Works", the noise barrier material should have a superficial surface density of at least 7 kg/m<sup>2</sup> and have no openings or gaps. The movable noise barrier will be about 3 m tall and with a short cantilevered section on the top, if necessary, such that the line of sight to the NSR is blocked by the barriers.

*Good Construction Site Practice*

4.8.7 Good construction site practice and noise management can considerably reduce the potential noise impact of the construction activities on nearby NSRs. The noise benefits of these practices can vary according to specific site conditions and operations. Since the effect of the good construction site practices could not be quantified, the mitigated noise levels calculated in the subsequent sections have not taken account of this effect. The following site practices should be followed during the construction of the Project:

- Only well-maintained plant will be operated on-site and plant will be serviced regularly during the construction phase;
- Silencers or mufflers on construction equipment will be utilised and will be properly maintained during the construction phase;
- Mobile plant, if any, will be sited as far away from NSRs as possible;
- Machines and plant (such as trucks) that may be in intermittent use will be shut down between work periods or will be throttled down to a minimum;
- Plant known to emit noise strongly in one direction will, wherever possible, be orientated so that the noise is directed away from the nearby NSRs; and
- Material stockpiles and other structures will be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

*Scheduling of PME / Construction Activities*

4.8.8 The construction activities should be planned and carried out in sequence rather than simultaneously at each location. Therefore, only one unit of each type of equipment should be operated at any one time. For open trench construction of the gravity sewers, each work front should be around 20m to 30m in length.

4.8.9 With the implementation of quiet PME / quiet construction method and temporary noise barriers for various construction activities, the mitigated noise levels at the representative NSRs were calculated and the results are summarised in **Table 4.10** with details of the calculations given in **Annex 4C**. The results indicated that the predicted construction noise levels comply with the EIAO-TM daytime construction noise standards.

**Table 4.10 – Predicted Construction Noise Levels (With Mitigation Measures)**

NSR ID	Description	Predicted Noise Level, dB(A)
NSR 1	Village house at Ha Tam Shui Hang	47 – 63
NSR 2	Village house at Ha Tam Shui Hang	49 – 64
NSR 3	Sha Tau Kok Central Primary School	57 – 59
NSR 4	Block 1, Sha Tau Kok Chuen	52 – 64
NSR 5	Sun Ying Lau, No. 10 Sha Tau Kok Road	55 – 62
NSR 6	Block 45, Sha Tau Kok Chuen	56 – 75
NSR 7	Future Sha Tau Kok Chuen (under construction)	65 – 74
NSR 8	Building along Shun Lung Street	74 – 75
NSR 9	Tin Hau Temple	52 – 68

**Note:**

Noise criteria for residential premises: 75 dB(A), educational institutions: 70 dB(A) (65 dB(A) during examination). Noise criteria for NSR 9 (Tin Hau Temple) assumed similar to residential premises.

***Operational Phase***

4.8.10 While no noise impact is expected due to the operation of fixed plant items, it is still recommended that the following measures be implemented to minimise the potential impact:

- All the equipment will be totally enclosed inside building structure;
- Quieter equipment should be chosen;
- Include noise levels specification when ordering new equipment items;
- All openings, including louvres for ventilation and machine room doors should be oriented away from the NSRs;
- Silencers, acoustic louvres or acoustic doors should be used where necessary; and
- Develop and implement a regularly scheduled equipment maintenance programme so that equipment items are properly operated and serviced. The programme should be implemented by properly trained personnel.

4.8.11 No secondary impact is expected from the mitigation measures proposed in the EIA report.

#### **4.9 Residual Impacts**

##### ***Construction Phase***

4.9.1 With the implementation of practical noise mitigation measures, including the use of quiet PME / quiet construction method, temporary noise barriers, and good site practices, it is predicted that there is no exceedance of the daytime construction noise criteria at all NSRs. Therefore, no residual impact is anticipated.

##### ***Operation Phase***

4.9.2 By enclosing the fixed-noise sources and use of acoustic louvres, the predicted operational noise is within the relevant noise criteria. Therefore, no residual impact is anticipated.

4.9.3 No residual impact is identified in the EIA report. Hence, no additional study is required.

#### **4.10 Cumulative Impacts**

##### ***Construction Phase***

4.10.1 According to **Table 2.11**, two projects will likely be conducted concurrently with the proposed Project.

- Sediment Removal at Sha Tau Kok Fish Culture Zone, Boat Shelter and Approach Channel (CEDD)
- CE 78/2014 (DS) Drainage Improvement Works at North District – Package B (DSD)

4.10.2 The CEDD sediment removal project will mainly be marine dredging works conducted in Starling Inlet. The project is a designated project and an EIA study is being conducted. Details of the construction works and programme are not yet available at the time of assessment. Nonetheless, it is envisaged that such dredging works would require limited construction equipment (mainly grab dredger). Adverse cumulative impact is not expected. Close liaison with responsible department will be carried out to formulate a best programming to minimise project interfaces.

4.10.3 For the DSD drainage improvement works, some of the drainage works will have interface with the proposed gravity sewers. Details of the construction works and programme are not yet available at the time of assessment. Close liaison with responsible department will be carried out to formulate a best programming to minimise project interfaces. Appropriate phasing of the proposed gravity sewers works will be carefully considered to avoid multiple or repeated road openings to minimize nuisance to the public. Possibility of entrustment of works will be considered. By avoiding concurrent works, adverse cumulative impact is not expected.

##### ***Operation Phase***

4.10.4 No cumulative operational noise impact is expected.

#### **4.11 Monitoring and Audit Requirement**

##### ***Construction Phase***

4.11.1 The recommended mitigation measures, monitoring procedures and locations are summarised in detail in the Environmental Monitoring and Audit (EM&A) Manual. This will facilitate the Contractor to have early warning and undertake the necessary actions to reduce noise emissions at specific areas. The effectiveness of on-site

control measures could also be evaluated through the regular site audits. All the recommended mitigation measures should be incorporated into the EM&A programme for implementation during construction.

***Operation Phase***

- 4.11.2 Since the predicted operational noise levels at all NSRs are well within the relevant noise criteria, commissioning test and noise monitoring for the expanded STKSTW and TSTP is considered unnecessary during the operation phase.

**4.12 Conclusion**

**Construction Phase**

- 4.12.1 A construction noise assessment has been undertaken to predict the noise levels at the representative NSRs due to the construction of the Project. Practicable mitigation measures, including use of quiet construction plant / quiet construction method, temporary noise barriers and good site practices, have been recommended. With the implementation of the recommended mitigation measures, the predicted construction noise levels at all NSRs comply with the noise criteria during the daytime period. Therefore, no noise impact is expected to arise from the construction activities. Also, no cumulative impact or residual impact is anticipated. Regular noise monitoring at NSRs as part of the EM&A programme during the construction stage is recommended.

**Operation Phase**

- 4.12.2 Potential noise impact from the operation of the expanded STKSTW and TSTP has been assessed. The predicted fixed plant noise levels at the representative NSRs due to the operation of the expanded STKSTW and TSTP are well within the relevant noise criteria.