

5. NOISE

5.1 Environmental Legislation

5.1.1 Construction Noise Criteria During Non-restricted Hours

5.1.1.1 Non restricted hours include the daytime hours on working days which are not a Sunday or a public holiday between 07:00-19:00. The noise generated by the construction of the Project during the non-restricted daytime hours will be assessed with reference to Table 1B of Annex 5 of the TMEIA, as shown in Table 5.1.

Table 5.1 Recommended Construction Noise Levels (Non-restricted Hours)

| Noise Sensitive Receiver | Noise Level $L_{eq}(30 \text{ min})$ dB(A) |
|--------------------------|---|
| Dwelling | 75 |
| School | 70 (Normal school hours) 65 (During examination) |

5.1.2 Construction Noise Criteria During Restricted Hours

5.1.2.1 If construction works during restricted hours are specified in the construction programme or percussive piling is to be undertaken, a Construction Noise Permit (CNP) will be required for the works and the noise impacts will be assessed to ensure compliance with the relevant Noise Control Ordinance (NCO) noise limits as specified in Annex 5 of the TMEIA. Once applied for, the CNP will be assessed by the Noise Control Authority based upon the contemporary situation at the time of the application.

5.1.2.2 An application for a CNP for percussive piling is assessed in accordance with the Technical Memorandum on Noise from Percussive Piling under the NCO. The NCO limits for percussive piling are shown in Table 5.2 below.

Table 5.2 Acceptable Noise Levels for Percussive Piling

| Time Period | Acceptable Noise Level (dB(A)) |
|--|--------------------------------|
| NSR (or part of NSR) with no windows or other openings | 100 |
| NSR with central air conditioning system | 90 |
| NSR with windows or other openings but without central air conditioning system | 85 |

5.1.2.3 The CNP may contain permitted hours of operation as a condition with reference to the predicted noise levels at noise sensitive receivers. However, while the marine piling for the jetty has been completed as detailed in Section 1, it is not anticipated that other percussive piling works will be required during the construction of this project.

5.1.2.4 The NCO construction noise limits during restricted hours are determined with reference to the type of area within which a Noise Sensitive Receiver (NSR) is located. For village and low-density residential areas not affected by noise, an Area Sensitivity Rating (ASR) of 'A' is applied, while a low-density residential areas in which traffic



noise is noticeable but not dominant, an ASR of ‘B’ is employed. For a similar area in which noise from a major road is readily noticeable and dominates the noise environment, an ASR of ‘C’ is applied. The definition of a major road is provided in the Technical Memorandum on Noise from Construction Work Other than Percussive Piling.

- 5.1.2.5 The NCO limits for noise levels during restricted evening and night-time hours (19:00 to 07:00) and Sundays and general holidays for each sensitivity rating are given in Table 5.3.

Table 5.3 Acceptable Noise Level during the Construction Phase (Restricted Periods)

| Time Period | Acceptable Noise Level Leq(5 min dB(A)) for Area Sensitivity Rating (ASR) | | |
|---|---|---------|---------|
| | ASR = A | ASR = B | ASR = C |
| Restricted Period 1 All days during the evening (19.00-23.00) and general holidays (including Sundays) during the daytime and evening (07.00-23.00) | 60 | 65 | 70 |
| Restricted Period 2 All days during the night-time (23.00-07.00) | 45 | 50 | 55 |

- 5.1.2.6 The construction noise criteria for each NSR are applied to the noise arising from operation of construction equipment. Nonetheless, it should be noted that depending upon the exact locations and orientations of the receiver points/noise sources and the shielding effect of other structures or topographical features, the effect of influencing factors on the receivers and hence the ASRs/ANLs may vary.

- 5.1.2.7 Despite any description or assessment made in this EIA Report 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 contemporary conditions/situation of adjoining land uses and any previous complaints against construction activities at the site before making his decision in granting a CNP. Nothing in the EIA Report 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.

5.2 Noise Sensitive Receivers

- 5.2.1 The Environmental Impact Assessment Ordinance (EIAO) and Technical Memorandum on the Environmental Impact Assessment Process (TMEIA) specify criteria for the identification of Noise Sensitive Receivers (NSRs). In accordance with this criteria, no NSRs are present within 300m of the site boundary, the study area as specified by the Study Brief.
- 5.2.2 The Tuen Mun Area 38 site is located on newly formed reclaimed land in an area zoned for industrial use. The existing land adjacent to the site is occupied by the cement plant and Shiu Wing Steel Mill, with Castle Peak Power Station further to the west. To the east, a further lot of reclaimed land is proposed for use as an EcoPark and construction works have commenced. The River Trade Terminals are located further down the coast. None of these are classed as noise sensitive receivers.
- 5.2.3 The closest noise sensitive receivers to the proposed PAFF are low rise residential properties at Lung Kwu Tan and high rise residential blocks at Butterfly Beach in Tuen Mun, both about 2km and 3km away respectively. In addition, these sensitive receivers are shielded from the PAFF site by topography and there will be no line of sight to the facility. There is also a planned Holiday Camp to the east along Lung Man Road but this is about 550m away and as such not within the study area for the noise assessment. The relative locations of the industrial and residential properties to the PAFF are shown in Figure 5.1.
- 5.2.4 In addition, according to the current planning aims, all other future landuses this area will be industrial/utility and will not be sensitive to noise.

5.3 Existing Conditions

- 5.3.1 As described above, the setting of the PAFF is industrial in nature with many existing industrial facilities in operation. The area is served by one dual-two lane road, the Lung Mun Road, which is largely used by heavy vehicles serving both the facilities in this area but Black Point Power Station and WENT landfill further round the coastline.
- 5.3.2 In addition, as the majority of facilities also accept marine traffic, the waters off the proposed PAFF site are well utilised, with about 35 vessels an hour using the adjacent waters (see Table 10.3 for a further breakdown). Based upon this, despite the isolated location from major built-up areas, the noise levels in the area would already be expected to be relatively high and levels in the region of 65 dB(A) would be anticipated.

5.4 Construction Activities

- 5.4.1 Typical construction activities for the construction of the tank farm, jetty and pipe laying works have been defined. The works can be broadly divided into land based construction and marine works. The land based works will comprise the site formation, construction of the tanks foundations and erection of the tanks, utilities, and construction of access roads and ancillary buildings. The tank farm will initially house 8 storage tanks, 6 tanks of 43.5m diameter by 24.7m in height, one of 41.5m diameter by 24.7m in height and one of 35m diameter by 24.7m in height. The individual tanks will provide a storage capacity of between 35,000m³ to 22,000m³. It is intended that the

remaining 4 tanks would likely be built in one phase between 2025 and 2030 as required to increase the tankage capacity to the ultimate design tankage capacity of the PAFF i.e. 388,000m³.

- 5.4.2 Marine works will comprise the construction of the jetty, requiring percussive piling (which has been completed as detailed in Section 1), construction of the dolphin and associated decking and the submarine activities associated with the pipe laying, requiring dredging of the pipe trench, pipe laying and backfilling with sand and rock armour protection.
- 5.4.3 Typical equipment requirements for each of the key activities have been determined, as shown in Table 5.4, with the equipment for the tanks based upon the initial 8 tank requirement for 2009. Each piece of equipment will have a sound power level as defined in the *Technical Memorandum on Noise from Construction Work Other than Percussive Piling* and *Technical Memorandum on Noise from Percussive Piling*. The equipment listed in Table 5.4 has been confirmed by the Project Proponent as being practical for completing the works.

5.5 Key Issues

- 5.5.1 Noise during the construction phase will be associated with the construction of the tank farm and ancillary buildings and infrastructure and all these activities will require the use of heavy machinery. Noise will also arise during the construction of the supplementary fuel tanks, which will be undertaken after 2025 as required.
- 5.5.2 Operational noise will potentially result from the overall operation of the plant, maintenance activities and during berthing of the vessels. Noise generation is expected to be intermittent based upon infrequent berthing requirements and periodic maintenance activities. General operational noise is expected to be insignificant as all pumping of fuel will be largely undertaken via the underground pipeline which will provided effective attenuation for any noise.
- 5.5.3 Underwater noise during construction and operation phases is a key issue to the Chinese White Dolphins (*Sousa chinensis*). This issue has been assessed in the Ecology Section 7 and is not considered further here.

5.6 Impact Assessment

- 5.6.1 As detailed above, there are no sensitive receivers within the designated study area of 300m of the proposed site and works. The closest sensitive receiver is the proposed Holiday Camp along Lung Man Road some 550m away from the closest boundary of the tank farm. However, this facility is not programmed to be built and operational until 2009, when the Phase I works for the tank farm are also planned to be completed. As such the Holiday Camp will not be subject to construction phase impacts from the Phase I works. As such, the closest existing sensitive receivers are about 2km away. Notwithstanding, the holiday camp may be subject to noise impacts from the construction of the supplementary tanks between 2025 and 2030.
- 5.6.2 The total sound power levels of the equipment for the key construction scenarios (Table 5.4) are shown in Table 5.5. Based upon the worst case construction scenario, the sound

power level is 128.1 dB(A) during site formation (Earthwork - soil compaction¹). Taking this worst case noise level and without applying any noise mitigation measures, the predicted noise level at a distance of 2 km away from the construction site would be 57dB(A). The worst case scenario for the construction of the supplementary tanks is tank erection – panel assembling which has a SWL of 122.8 dB(A) and, without applying any mitigation, the predicted noise level at the proposed holiday camp, some 650m away from the Phase II tanks works, would be 62 dB(A). The predicted noise level from construction activities is, therefore, well below the 75dB(A) criteria and is expected to be lower than the background noise at the sensitive receivers. As such significant noise impacts during the construction phase are not anticipated.

5.6.3 During the operational phase, minimal noise is anticipated from the PAFF. There will be a requirement to construct additional tanks between 2025 and 2030 but as no future sensitive receivers are anticipated, the noise impacts will be as described above. The tank farm will contain on-site equipment which has the potential to generate some noise. A inventory of the main equipment which will be present on the PAFF site during the operational phase is as follows:

- ◆ 7 electric fuel pumps on the tank farm comprising 3 pumps to pump fuel from the tank farm to the airport, 2 pumps for internal transfer within the tank farm and 2 small product recovery pumps;
- ◆ 2 small product recovery pumps on the jetty, one on each berth;
- ◆ 21 electric fire pumps;
- ◆ 2 standby generator for emergency power;
- ◆ 4 ventilation fans in the roof of the fire service room; and
- ◆ 23 air conditioners for the site buildings.

5.6.4 The standby generator and the fire service pumps will normally only generate noise when tested which will be on a monthly basis for 1-2 hours at the most and the ventilation fans will only be operational when activated. The noise from the fuel pumps and the air conditioners will be insignificant given the small numbers involved, the industrial setting of the area and the lack of sensitive receivers in this area.

5.6.5 The other key noise source during normal operation will be the delivery of fuel by tankers, with general maintenance and pumping operations considered not to be a significant noise source, in light of the industrial nature of the study area and the existing activities in adjacent areas. As shown in Table 3.3 in Section 3, the maximum delivery rate in 2040 will be an average of 3.6 tankers per week, rising from 3 vessels per week at the commissioning of the PAFF. In comparison, the existing marine traffic in this area is about 35 vessels per hour, or 1680 vessels per week, based upon a conservative 8 hours per day, and this rate would be expected to significantly rise over the next 35 years. The PAFF vessels at the commissioning date will form only about 0.2% of the total marine traffic. While some of these vessels are small and would not be expected to generate the same level of noise, the volume of existing traffic in comparison to that projected for the PAFF is so much higher that the PAFF vessels would not yield any additional marine traffic noise impacts in this area.

¹ Note: Percussive piling is controlled under Noise Control Ordinance and should not be included in this assessment.

5.7 Mitigation Measures

5.7.1 Notwithstanding that no significant noise impacts on NSRs are predicted during the construction phase of the PAFF, measures to minimise noise levels as far as possible are recommended. Based upon the equipment requirements detailed in Table 5.1, measures which could be employed are as follows.

- ◆ use quiet equipment with suitable noise levels and labels;
- ◆ regular maintenance of equipment;
- ◆ ensure noise attenuation devices are fitted to plant and equipment such as:
 - fitting more efficient exhaust sound reduction equipment and ensuring the Manufacturers' enclosure panels are kept closed on dump trucks, lorries, excavators and cranes;
 - fitting suitably designed muffler or sound reduction equipment and using dampened bit to eliminate ringing on breakers; and
 - ensure all leaks in air lines are sealed on all pneumatic equipment.
- ◆ use temporary noise barriers where applicable;
- ◆ restrict or modify working hours to minimise high noise activities;
- ◆ provide awareness training in the need to minimise noise;
- ◆ proper planning of work area; and
- ◆ good site practice to limit noise emissions at source.

5.7.2 Measures used to minimise underwater noise for the protection of dolphins during the now completed piling works are discussed in the Ecology chapter, Section 7.

5.8 Cumulative Impacts

5.8.1 It should be noted that construction works for Phase I of the EcoPark is scheduled for completion in mid 2007 and Phase II of the EcoPark is likely to be constructed between the end of 2008 and the end of 2009. However, while commencement of construction of Phase I for PAFF is scheduled for about March 2007, the initial works will relate to superstructure works for the tanks in the bund closest to the seafront, for which the foundations have already been constructed, because of the need to gain Buildings Department approval for the new tanks foundations. As such, foundation works for the remaining 4 tanks in the second bunded area, which are likely to be the key noisy activity, are not likely to commence until late 2007. Notwithstanding, the distance of the identified sensitive receivers and the fact that no impacts are predicted from the PAFF (see section 5.6.2 above), as the works for the PAFF are unlikely to coincide with any construction works for the EcoPark and, therefore, cumulative impacts are not predicted. The second phase of the PAFF development will not commence until after 2025 when all works for the EcoPark will be complete.

5.8.2 In terms of operational impacts, neither the PAFF or the EcoPark is expected to generate significant noise and no significant impacts were predicted by both the EcoPark EIA and for the PAFF given the large distance to the closest sensitive receivers, the proposed Holiday Camp. As such, cumulative operational impacts are not expected.

5.9 Residual Impacts

5.9.1 Adverse residual impacts are not predicted during the construction or operational phases.

5.10 Environmental Monitoring and Audit

5.10.1 The assessment has concluded that no sensitive receivers will be affected by construction noise, although mitigation measures have been proposed to reduce noise levels to a practical minimum. Based upon this, no noise monitoring is considered necessary during the construction phase. However, in order to ensure noise is kept to a minimum, audit of the construction activities is recommended during the construction phase. No operational phase EM&A is required. EM&A requirements during the construction phase are described in more detail in Section 15 of this report and in the EM&A Manual.



Table 5.4 Typical Equipment Requirements

| CONSTRUCTION TASK | EQUIPMENT | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------------|---------|---------------------|---------------------|------------------------------------|----------------|-------------|--------------|-----------|-------------|--------|------------------|-----------|--------------------------------|------------------|-------------------|----------------|----------------|--------------------|--------------------|--------------|-------------------------|------------------|-------|------------------|--|--|
| | Lifting/Drilling | | | | | | | | | Earthwork | | | | | Concrete Works | | | | Assembling/Testing | | | | | | | | |
| | Drilling Rig | Dredger | Tug Boat/Motor Boat | Barge/Derrick Barge | Piling Barge with Hydraulic Hammer | Boring Machine | Tower Crane | Mobile Crane | Generator | Crane Lorry | Loader | Pneumatic Roller | Backactor | Backactor mounted with Breaker | Dump Truck/Lorry | Concrete Agitator | Concrete Pumps | Air Compressor | Vibrator | Bar Bender Machine | Electric Saw | Welding/Cutting Machine | Grinding Machine | Pumps | Ventilation Fans | | |
| Contract Award | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Mobilisation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Land Based Works | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ground Investigation | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Earthwork | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Clearance | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 3 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Soil Compaction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Tank Construction | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Foundation (Ring Beam) Construction | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Excavation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 | 2 | 0 | 0 | 2 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Steel Fixing & Formwork | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | | |
| Concreting | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Tank Erection | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Steel Panel Fabrication* | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 6 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | | |
| Panel Assembling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 6 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 12 | 0 | 8 | | |
| Tank Inspection & Testing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Ancillary Facilities Installation | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Excavation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Steel Fixing & Formwork | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | | |
| Concrete | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Installation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | | |
| Testing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | |
| Commissioning | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Pipe, Drainage & Utilities Installation | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Excavation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Casting Concrete (Manholes) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | | |
| Pipe Installation & Utilities Laying | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Backfilling and Soil Compression | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Testing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | |
| Roadwork | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sub-base | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Paving | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | | |
| Office Building Construction | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Foundation (Raft) Construction | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Excavation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Formwork | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | | |
| Steel Fixing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | |
| Concreting | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Superstructures (Wall, Beam, Column & Slab) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Formwork | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | | |
| Steel Fixing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | |
| Casting Concrete | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Marine Works | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ground Investigation | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Dredging | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Pile Construction | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Circular Pile driven by Precussive Method | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | | |
| Load test | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Dolphins Construction | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Formwork | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | | |
| Steel Fixing | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | |
| Casting Concrete | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Decking Construction | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Formwork | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | | |
| Steel Fixing | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | |
| Concreting (Prefabrication Yard) | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Erection of Prefabricated Member | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Casting Concrete (In-situ) | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Installation of Plant | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | | |
| Testing | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | |
| Commissioning | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Underwater Works | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ground Investigation | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Dredging | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Pipe Laying | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Backfilling | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Testing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | |
| Commissioning | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

Table 5.5 Sound Power Level of Equipment for Predicted Construction Scenarios

| Work Stage | Equipment | CNP No. | Number of Equipment | Sound Power Level of Each Equipment, dB(A) | Total Sound Power Level, dB(A) |
|---|--------------------------------|---------|---------------------|--|--------------------------------|
| Land Based Work | | | | | |
| Mobilisation | Generator | 101 | 2 | 108 | 111.0 |
| Ground Investigation | Drilling rig | 064 | 3 | 103 | 107.8 |
| Earth Work - Site Clearance | Loader | 081 | 2 | 112 | 126.4 |
| | Backactor | 081 | 3 | 112 | |
| | Backactor mounted with Breaker | 028 | 1 | 122 | |
| Earthwork - Soil Compaction | Dump Truck | 067 | 4 | 117 | 128.1 |
| | Roller | 185 | 1 | 108 | |
| | Backactor mounted with Breaker | 028 | 4 | 122 | |
| Foundation (Ring Beam) Construction - Excavation | Mobile Crane | 048 | 3 | 112 | 105.8 |
| | Backactor | 081 | 4 | 112 | |
| | Dump Truck | 067 | 4 | 117 | |
| | Generator | 101 | 6 | 108 | |
| | Lorry | 141 | 2 | 112 | |
| Foundation (Ring Beam) Construction - Steel Fixing & Formwork | Mobile Crane | 048 | 3 | 112 | 120.9 |
| | Bar Bender Machine | 021 | 1 | 90 | |
| | Electric Saw | 201 | 1 | 108 | |
| | Generator | 101 | 6 | 108 | |
| | Lorry | 141 | 2 | 112 | |
| Foundation (Ring Beam) Construction - Concreting | Mobile Crane | 048 | 3 | 112 | 121.8 |
| | Concrete Mixing Truck | 044 | 3 | 109 | |
| | Air Compressor | 003 | 2 | 104 | |
| | Vibrator | 050 | 2 | 105 | |
| | Generator | 101 | 6 | 108 | |
| | Lorry | 141 | 2 | 112 | |
| Tank Erection - Steel Panel Fabrication | Barge/Derrick Barge | 061 | 1 | 104 | 122.8 |
| | Mobile Crane | 048 | 1 | 112 | |
| | Dump Truck | 067 | 1 | 117 | |
| | Generator | 101 | 6 | 108 | |
| | Lorry | 141 | 2 | 112 | |
| Tank Erection - Panel Assembling | Ventilation Fans | 241 | 8 | 108 | 122.3 |
| | Mobile Crane | 048 | 3 | 112 | |
| | Wedding/Cutting Machine | 021 | 4 | 90 | |
| | Grinding Machine | 065 | 4 | 98 | |
| | Generator | 101 | 6 | 108 | |
| | Lorry | 141 | 2 | 112 | |
| Ventilation Fans | 241 | 8 | 108 | | |
| | | | | | |
| Ancillary Facilities Installation | | | | | |
| Excavation | Backactor | 081 | 1 | 112 | 112.0 |
| Steel Fixing & Formwork | Bar Bender Machine | 021 | 1 | 90 | 108.1 |
| | Electric Saw | 201 | 1 | 108 | |
| Concrete | Concrete Mixing Truck | 044 | 2 | 109 | 114.4 |
| | Air Compressor | 003 | 2 | 104 | |
| | Vibrator | 050 | 2 | 105 | |
| Installation | Wedding/Cutting Machine | 021 | 2 | 90 | 101.6 |
| | Grinding Machine | 065 | 2 | 98 | |
| Testing | Pumps | 283 | 1 | 85 | 85.0 |
| Pipe, Drainage & Utilities Installation | | | | | |
| Excavation | Backactor | 081 | 2 | 112 | 121.2 |
| | Dump Truck | 067 | 2 | 117 | |
| Casting Concrete (Manholes) | Backactor | 081 | 1 | 112 | 119.3 |
| | Dump Truck | 067 | 1 | 117 | |
| | Concrete Mixing Truck | 044 | 1 | 109 | |
| | Air Compressor | 003 | 1 | 104 | |
| | Vibrator | 050 | 1 | 105 | |
| Testing | Electric Saw | 201 | 1 | 108 | 85.0 |
| | Pumps | 283 | 1 | 85 | |
| Roadwork | | | | | |
| Roadwork - Sub-base | Pneumatic Roller | 186 | 1 | 108 | 118.8 |
| | Dump Truck | 067 | 1 | 117 | |
| | Grader | 104 | 1 | 113 | |
| Roadwork - Paving | Dump Truck | 067 | 1 | 117 | 119.2 |
| | Concrete Mixing Truck | 044 | 2 | 109 | |
| | Air Compressor | 003 | 2 | 104 | |
| | Vibrator | 050 | 2 | 105 | |
| | Electric Saw | 201 | 1 | 108 | |
| Office Building Construction | | | | | |
| Foundation (Raft) Construction - Excavation | Backactor | 081 | 1 | 112 | 120.6 |
| | Dump Truck | 067 | 2 | 117 | |
| Foundation (Raft) Construction - Formwork | Mobile Crane | 048 | 1 | 112 | 113.5 |
| | Electric Saw | 201 | 1 | 108 | |
| Foundation (Raft) Construction - Steel Fixing | Mobile Crane | 048 | 1 | 112 | 112.0 |
| | Bar Bender Machine | 021 | 1 | 90 | |
| Foundation (Raft) Construction - Concrete | Mobile Crane | 048 | 1 | 112 | 116.3 |
| | Concrete Mixing Truck | 044 | 2 | 109 | |
| | Air Compressor | 003 | 2 | 104 | |
| | Vibrator | 050 | 2 | 105 | |
| Superstructures - Formwork | Electric Saw | 201 | 1 | 108 | 108.0 |
| Superstructures - Steel Fixing | Bar Bender Machine | 021 | 1 | 90 | 90.0 |
| Superstructures - Casting Concrete | Concrete Mixing Truck | 044 | 2 | 109 | 115.5 |
| | Concrete Pumps | 047 | 1 | 109 | |
| | Air Compressor | 003 | 2 | 104 | |
| | Vibrator | 050 | 2 | 105 | |

Table 5.5 Sound Power Level of Equipment for Predicted Construction Scenarios (Con't)

| Work Stage | Equipment | CNP No. | Number of Equipment | Sound Power Level of Each Equipment, dB(A) | Total Sound Power Level, dB(A) |
|--|-------------------------|---------|---------------------|--|--------------------------------|
| Marine Work | | | | | |
| Ground Investigation | Drilling rig | 064 | 2 | 103 | 112.2 |
| | Barge/Derrick Barge | 061 | 1 | 104 | |
| | Tug Boat | 221 | 1 | 110 | |
| Dredging | Dredger | 063 | 1 | 112 | 114.1 |
| | Tug Boat | 221 | 1 | 110 | |
| Pile Construction | | | | | |
| Circular Pile Driven by Precussive Method | Barge/Derrick Barge | 061 | 1 | 104 | 113.8 |
| | Wedding/Cutting Machine | 021 | 2 | 90 | |
| | Grinding Machine | 065 | 2 | 98 | |
| | Tug Boat | 221 | 2 | 110 | |
| | Hydraulic Hammer* | - | 2 | 129 | |
| Load test | Barge/Derrick Barge | 061 | 2 | 104 | 114.0 |
| | Tug Boat | 221 | 2 | 110 | |
| Dolphins Construction | | | | | |
| Formwork | Barge/Derrick Barge | 061 | 2 | 104 | 115.0 |
| | Electric Saw | 201 | 1 | 108 | |
| | Tug Boat | 221 | 2 | 110 | |
| Steel Fixing | Barge/Derrick Barge | 061 | 2 | 104 | 114.0 |
| | Bar Bender Machine | 021 | 1 | 90 | |
| | Tug Boat | 221 | 2 | 110 | |
| Casting Concrete | Barge/Derrick Barge | 061 | 2 | 104 | 118.2 |
| | Concrete Mixing Truck | 044 | 4 | 109 | |
| | Concrete Pumps | 047 | 1 | 109 | |
| | Air Compressor | 003 | 2 | 104 | |
| | Vibrator | 050 | 2 | 105 | |
| | Tug Boat | 221 | 1 | 110 | |
| Decking Construction | | | | | |
| Formwork | Barge/Derrick Barge | 061 | 2 | 104 | 115.0 |
| | Electric Saw | 201 | 1 | 108 | |
| | Tug Boat | 221 | 2 | 110 | |
| Steel Fixing | Barge/Derrick Barge | 061 | 2 | 104 | 114.0 |
| | Bar Bender Machine | 021 | 1 | 90 | |
| | Tug Boat | 221 | 2 | 110 | |
| Concreting (Prefabrication Yard) | Barge/Derrick Barge | 061 | 2 | 104 | 118.8 |
| | Concrete Mixing Truck | 044 | 4 | 109 | |
| | Concrete Pumps | 047 | 1 | 109 | |
| | Air Compressor | 003 | 2 | 104 | |
| | Vibrator | 050 | 2 | 105 | |
| | Tug Boat | 221 | 2 | 110 | |
| Erection of Prefabricated Member | Barge/Derrick Barge | 061 | 2 | 104 | 114.0 |
| | Tug Boat | 221 | 2 | 110 | |
| | Barge/Derrick Barge | 061 | 2 | 104 | |
| Casting Concrete (In-Situ) | Barge/Derrick Barge | 061 | 2 | 104 | 118.8 |
| | Concrete Mixing Truck | 044 | 4 | 109 | |
| | Concrete Pumps | 047 | 1 | 109 | |
| | Air Compressor | 003 | 2 | 104 | |
| | Vibrator | 050 | 2 | 105 | |
| | Tug Boat | 221 | 2 | 110 | |
| Installation of Plant | | | | | |
| Installation of Plant | Barge/Derrick Barge | 061 | 1 | 104 | 111.5 |
| | Wedding/Cutting Machine | 021 | 2 | 90 | |
| | Grinding Machine | 065 | 2 | 98 | |
| | Pumps | 283 | 0 | 85 | |
| | Tug Boat | 221 | 1 | 110 | |
| | | | | | |
| Testing | | | | | |
| Testing | Barge/Derrick Barge | 061 | 1 | 104 | 111.0 |
| | Pumps | 283 | 1 | 85 | |
| | Tug Boat | 221 | 1 | 110 | |
| Commissioning | | | | | |
| Commissioning | Barge/Derrick Barge | 061 | 1 | 104 | 111.0 |
| | Tug Boat | 221 | 1 | 110 | |
| Underwater Works | | | | | |
| Ground Investigation | Drilling rig | 064 | 2 | 103 | 112.2 |
| | Barge/Derrick Barge | 061 | 1 | 104 | |
| | Tug Boat | 221 | 1 | 110 | |
| Dredging | Dredger | 063 | 2 | 112 | 116.5 |
| | Barge/Derrick Barge | 061 | 1 | 104 | |
| | Tug Boat | 221 | 1 | 110 | |
| Pipe Laying | Barge/Derrick Barge | 061 | 1 | 104 | 111.0 |
| | Tug Boat | 221 | 1 | 110 | |
| Backfilling | Barge/Derrick Barge | 061 | 1 | 104 | 111.0 |
| | Tug Boat | 221 | 1 | 110 | |
| Testing | | | | | |
| Testing | Pumps | 283 | 1 | 85 | 85.0 |

* Note: Percussive piling is controlled under Noise Control Ordinance and should not be included in this assessment