

## 5. NOISE ASSESSMENT

### 5.1 Key Issues

Noise impacts during construction will arise from construction of the port breakwater, dredging and reclamation activities and construction of infrastructure for both the Ancillary Works and port.

Noise impacts during operation will be attributable to :

- (a) the serviced area and CBA with impacts arising from road traffic and operation of the CBA and lorry parking; and
- (b) operation of the container terminals.

### 5.2 Construction Phase

#### 5.2.1 Assessment Methodology, Criteria and Assumptions

The construction programme used for the assessment is discussed in Chapter 3 of this report. There have been some revisions to the construction programme during the course of the study and sensitivity tests have been carried out to determine if these changes will have any material effect on the predictions. The results of the noise sensitivity tests are discussed later in this Chapter.

Noise levels resulting from site activities have been predicted at the facades of the representative NSRs. The sound power levels (SWLs) of the mechanical equipment have been based on those given in TM1 and BS5228 : Part 1 : 1984 "Noise Control on Construction and Open Sites" and the levels are listed in the text. The positioning of the noise sources for the assessment has been based on procedures stated in TM1.

Due to the large distances between noise sources and NSRs it has been necessary to take account of the effects of atmospheric absorption and topographic shielding. The following formulae have been used to take account of distance and atmospheric attenuation for distances over 300m:

$$\text{Distance attenuation} = 20 \log R + 8$$

$$\text{Atmospheric attenuation} = 7.4 (F^2 R / H_r) 10^{-8}$$

where F      geometric mean frequency of band (Hz)  
R      Distance between source and receiver (m)  
H<sub>r</sub>      Relative humidity (%)

We have assumed 77% humidity and temperature of 20°C and a geometric mean frequency of 250Hz throughout the assessment.

#### 5.2.2 Reclamation, Breakwater and Infrastructure

Noise from construction of the reclamation and breakwater may be generated through use of the large marine equipment such as dredgers, derrick barges, hoppers, and tug boats.

The noisiest item of plant in use for forming the reclamation is likely to be a grab dredger with a sound power level of 112 dB(A). It has been assumed that only one item of noisy equipment would be used at any one time (except that a tug might be used for moving spoil barges at the same time as barges or dredgers are being operated). The total sound power level could thus be about 114 dB(A). Plant with this sound power level could be used up to 1300m from the nearest NSR at night time within the acceptable noise levels in TM1.

The method of assessment has followed the procedure outlined in TM1 whereby single activity noise levels at the facades of NSRs are calculated for the types and numbers of powered mechanical equipment employed in each major construction activity. Under TM2 noise from construction activities other than percussive piling is not restricted between 0700 - 1900 except Sundays and public holidays. However, in accordance with S4.4 in Chapter 7 of the HKPSG, a daytime limit of 60 dB(A) (10 dB(A) above the prevailing background noise level) has been applied to the construction phase. Predicted noise levels at the facade of NSRs, have been compared with the limit of 60 dB(A) (for "unrestricted hours") and ANLs (for restricted hours) at NSRs calculated in accordance with TM1. The assessment criteria are summarised in Table 5.1.

**Table 5.1 Assessment Criteria for Construction Noise other than Percussive Piling**

Location	Unrestricted Hours [dB(A)]	Period 1* [dB(A)]	Period 2# [dB(A)]
Discovery Bay	60	60	45
Peng Chau	60	60	45
Fa Peng	60	60	45
Tso Wan	60	60	45

**\*Period 1 :** All days during the evening (1900 - 2300 hours) and general holidays (including Sundays) during the daytime and evening (0700 - 2300 hours).

**#Period 2 :** All days during the night time (2300 - 0700 hours).

The construction programme discussed in Chapter 3 has been used to determine the combinations of noise levels as a result of parallel construction activities in order to simulate a worst case scenario. The locations of the noise sources were defined by x, y co-ordinates where such precision was possible. Alternatively, notional source positions or worst-case locations have been used.

Noise levels resulting from parallel activities have been summed assuming a 3 dB(A) correction to take into account the facade effect where appropriate. This predicted noise level represents the maximum noise level generated at specific NSRs.

The following assumptions have been made in the assessment of impacts from the reclamation, breakwater and infrastructure construction :

- (a) the marine deposits beneath the reclamation will be left in place except in the vicinity of the main road where the marine deposits will be dredged prior to placing sand fill. The reclamation method is referred to as "undredged" or drained;
- (b) marine fill will be used up to + 2.5mPD;
- (c) above +2.5mPD it has been assumed that:
  - (i) marine fill will be used to the final levels for:
    - the main road
    - Advance Works
    - back up area behind CT10 and east of the main road between CT10 and the coastline. This is because the same contractor will be responsible for the reclamation of both these areas
  - (ii) landbased fill will be used for the rest of the reclamation;
- (d) a channel will be left open for Penny's Bay Power Station until 1997 and Cheoy Lee Shipyard will have a channel left open at the head of Penny's Bay until the end of 1996. Once these channels are closed, reclamation to the west of the main road will be completed;
- (e) hours of operation will generally be 16 hours per day 7 days per week for the reclamation and construction of infrastructure. Nighttime working will be required for placing sand in the reclamation because the construction of the reclamation for the Advance Works needs to be completed within 18 months. These works comprise substantial quantities of earth works which include 5.0 M cu.m. of dredging, 9.5 M cu.m. of sand filling and the construction of 1,250 metres of pitched slope rubble seawall. Extended working hours are inevitably required in order to complete the works within the prescribed time frame. The maintenance of a reasonable steady sand filling rate, for the sake of controlling water quality to within acceptable levels, practically translates to 24 hour operation. If the working hours for sand filling is reduced, the rate of sand filling work will have to be increased accordingly. Such increase in the sand filling rate would more than likely impose additional undesirable impact on the ambient water quality.

An application for a Construction Noise Permit (CNP) is required for carrying out construction activities involving the use of PMEs during restricted hours. Issuance of a CNP is subject to the assessment by and discretion of the Noise Control Authority.

- (f) reclamation activities of each of the areas in the Ancillary Works have been assumed to produce the same sound power level. The SWLs for reclamation of CT10 and 11 have been adopted from the assessments produced by the container terminal study.

- (g) The following powered mechanical equipment has been assumed to be used for infrastructure construction :

(i)	Subgrade Formation	No.	SWL dB(A)
	Bulldozer	2	115
	Loader/tracked	2	112
	Road Roller	2	108
	Roller, vibratory	2	108
	Dump truck	4	117
	Grader	2	113
		Total SWL	125.57
(ii)	Asphalt Paving	No.	SWL dB(A)
	Asphalt paver	2	109
	Lorry	6	112
	Road Roller	4	108
		Total SWL	121.34
(iii)	Concrete Casting	No.	SWL dB(A)
	Concrete lorry mix	4	109
	Concrete pump	2	109
	Air compressor (Silenced Model)	2	100
	Poker, vibratory	6	113
		Total SWL	122.29

The worst case of 125.57 dB(A) has been adopted for the assessment. The location of work has been assumed to be at the segment of road nearest to the NSRs.

- (h) two different notional source centres, each being 50m from the nearest boundary, have been adopted. The notional source centre closer to the east has been adopted for Fa Peng & Tso Wan while the one at the west has been adopted for the other NSRs.

### 5.2.3 Haul Road Traffic

Haul road traffic noise levels have been calculated separately using a procedure based on that described in BS5228 : Part 1; Noise Control on Construction and Open Sites, 1984. TM1 does not require that the noise levels from construction activities and haul road traffic be summed unless all activities are undertaken during the same Contract.

The following assumptions have been made in the assessment of the haul road traffic.

- (a) There will be a haul road from north to south. The traffic on this haul road will be :
  - (i) dump truck - 185 veh/hr (both directions) with SWL = 117 dB(A).
  - (ii) scrapers - 2 veh/hr (both directions) with SWL = 119 dB(A).
  - (iii) grader - 2 veh/hr (both directions) with SWL = 113 dB(A).
  
- (b) There will also be a haul road running along the east/west direction directly to the north of the terminal berths. The traffic on this haul road will be :
  - (i) dump truck - 47 veh/hr (both directions) with SWL = 117 dB(A).
  - (ii) scrapers - 1 veh/hr (both directions) with SWL = 119 dB(A).
  - (iii) grader - 1 veh/hr (both directions) with SWL = 113 dB(A).

The distance attenuation has been based on the shortest distance from the road segment to respective NSRs.

#### 5.2.4 CT10 and 11

Results of construction noise assessment for CT10 and 11 have been supplied by the container terminal study and have been included directly into the cumulative construction noise assessment without alteration. Reference should be made to the working papers and Final Report prepared for that study for assumptions used in the assessment. An extract from the container terminal study Final Report is presented in Appendix D of this Report.

#### 5.2.5 Construction Noise

##### Cumulative Noise Impacts

The maximum noise levels resulting from various parallel construction activities at the facades of the representative NSRs throughout the construction period have been predicted based on the summation of single activities. These should be interpreted as the worst case noise levels which would be generated from all parallel activities planned for that period, each single noise level being itself a worst case noise level. In actual cases, however, the noise level at a receiver will vary continuously as the mix of construction plant varies.

Details of the noise assessment are presented in Appendix D. Tables 5.2 to 5.7 summarise the results of the predictions as follows:

- (a) Table 5.2 shows the contribution from the Ancillary Works. The predictions in this table include noise from the reclamation, haul road, breakwater, infrastructure and dredging of the Approach Channel.
- (b) Table 5.3 shows the noise impacts from reclamation and construction of CT10 and 11 as calculated by the container terminal study.
- (c) Table 5.4 shows the cumulative impact of all construction noise associated with the Ancillary Works and CT10 and 11.

Table 5.2 shows that daytime construction noise levels due to the Ancillary Works will exceed 60 dB(A) at Isolated Housing, Peng Chau between January 1996 and July 1997 by up to 2 dB(A) unless mitigation is applied. Impacts at all other NSRs will be below 60 dB(A).

Table 5.3 shows that daytime construction noise levels due to CT10 and 11 will exceed the noise criteria of 60 dB(A) at all NSRs except Central Peng Chau. From the beginning of 1998 through to the middle of 1999 unless mitigation is applied. Isolated Housing Peng Chau and Fa Peng will also be affected from the middle of 1997 through to the middle of 1999.

Table 5.4 shows that cumulative daytime construction noise levels will exceed the noise criteria of 60 dB(A) at all NSRs except Central Peng Chau and New Housing Peng Chau for all of 1998 and the first half of 1999. Isolated Housing Peng Chau will be affected from mid 1995 onwards. Fa Peng will have occasional minor exceedances during 1996 and impacts will exceed 60 dB(A) criteria from mid 1997 onwards. Cherish Court and Twilight Court will also experience impacts in excess of 60 dB(A) from mid 1997 onwards.

#### Analysis of Impacts

The assessment of cumulative impacts has shown that the 60 dB(A) criterion for daytime noise could be exceeded at times. This means that noise mitigation must be applied. An analysis of the impacts from individual construction activities has been carried out to establish the activities which have the greater impact and hence those activities where noise mitigation will be most beneficial.

Tables 5.5 to 5.7 show the noise contribution from individual activities in the Ancillary Works as follows:

- (a) Table 5.5 shows that the noise impacts due to construction of the breakwater and dredging of the approach channel are well within the standards. Any mitigation measures for these activities will not result in major reductions of the total noise impact.
- (b) Table 5.6 shows that noise from forming the reclamation for the Advance Works will not exceed the criteria for Period II at any of the NSRs and the contribution from this activity to the total noise during the daytime will be small. Placing fill for the remainder of the Ancillary Works will have a similar small impact.
- (c) Table 5.7 shows that haul road noise levels are within the standards. However, mitigation measures may be required when considering cumulative impacts.

The analysis in this section has shown that none of the activities for the Ancillary Works will exceed the standards. The major contribution to the cumulative noise impacts will come from the CT10 and 11 construction works. Nevertheless noise mitigation should be applied throughout the Ancillary Works construction to minimize the annoyance to residents. The key activity for noise mitigation in the Ancillary Works will be haul road traffic.

The only activity that is programmed for night time is the placing of sand in the reclamation. The assessment has shown that the noise impacts from this activity will be within the standards.

### Sensitivity Test for Revised Construction Programme and Advance Works Dredged Option

The noise impacts presented in Table 5.2 to 5.7 were based on the construction programme that was prepared at the start of the study which represented a drained option for the Ancillary Works. Some modifications to the programme have been made during the course of the study and a sensitivity test was conducted for the 'worst case' sensitive receiver to assess any changes to the impacts. These changes in the programme reflect, inter alia, the decision to consider a dredged option for the Ancillary Works. The detailed results of the sensitivity test are shown in Appendix D. Most of the impacts are reduced slightly and the noise impacts are more evenly spread. Impacts increase in late 1999 when several activities coincide and extend into 2002. The impacts (without mitigation) exceed the 60 dB(A) criterion from mid-1997 to early 2000.

Cumulative impacts arising from the revised programme are less than 1 dB(A) different to the original predictions. However as the revised programme for the Ancillary Works extends past 1999 the exceedance above 60 dB(A) continues to the end of 1999. The noise impacts from placing fill for the reclamation are also up to 1 dB(A) higher than those predicted for the drained option but are still well below the 60 dB(A) criteria. Impacts from sandfilling are minimal, even for the dredged option. The predicted cumulative impacts for 1999 are 4-6 dB(A) above the criteria and mitigation measures will be required to reduce the impacts to acceptable levels.

**Table 5.2 : Construction Noise Levels - Ancillary Works (dB(A)  $L_{eq}$ )**

NSR	Location	1/95	2/95	3/95	4/95	5/95	6/95	7/95	8/95	9/95	10/95	11/95	12/95
DB1	Cherish Court	57.2	57.2	57.2	57.2	57.2	57.2	57.2	57.2	57.2	57.2	57.2	57.2
DB3	Twilight Court	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.8
DB5	Discovery Bay Plaza	56	56	56	56	56	56	56	56	56	56	56	56
DB9	Woodbury Court	52.1	52.1	52.1	52.1	52.1	52.1	52.1	52.1	52.1	52.1	52.1	52.1
DB13	Greenery Court	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9
R4	Central Peng Chau	47.3	47.3	47.3	47.3	47.3	47.3	47.3	47.3	47.3	47.3	47.3	47.3
R4(A)	New Housing Peng Chau	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3
R4(B)	Isolated Housing Peng Chau	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
	Fa Peng	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9	53.9
	Tao Wan	51.1	51.1	51.1	51.1	51.1	51.1	51.1	51.1	51.1	51.1	51.1	51.1
18	Yi Pak 1 (waterfront)	55.5	55.5	55.5	55.5	55.5	55.5	55.5	55.5	55.5	55.5	55.5	55.5
19	Yi Pak 2 (rear)	55	55	55	55	55	55	55	55	55	55	55	55
20	Hei Ling Chau 1	40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.7
21	Hei Ling Chau 2	40.4	40.4	40.4	40.4	40.4	40.4	40.4	40.4	40.4	40.4	40.4	40.4

**Table 5.2 : Construction Noise Levels - Ancillary Works (dB(A)  $L_{eq}$ ) (Cont'd)**

NSR	Location	1/96	2/96	3/96	4/96	5/96	6/96	7/96	8/96	9/96	10/96	11/96	12/96
DB1	Cherish Court	57.9	57.9	57.9	57.9	58.8	58.8	58.8	58	58	58.1	58	58
DB3	Twilight Court	56.6	56.6	56.6	56.6	57.7	57.7	57.4	57	57	57.1	56.9	56.9
DB5	Discovery Bay Plaza	55.8	55.8	55.8	55.8	56.9	56.9	56.5	56.2	56.2	56.3	56.2	56.2
DB9	Woodbury Court	52.1	52.1	52.1	52.1	53.4	53.4	53.2	52.8	52.8	53	52.8	52.8
DB13	Greenery Court	53.4	53.4	53.4	53.4	54.8	54.8	54.3	52.8	52.8	53	52.7	52.7
R4	Central Peng Chau	47.8	47.8	47.8	47.8	48.2	48.2	48.5	48.6	48.6	49.1	48.5	48.5
R4(A)	New Housing Peng Chau	48.8	48.8	48.8	48.8	49.3	49.3	49.7	49.6	49.6	50.1	49.5	49.5
R4(B)	Isolated Housing Peng Chau	60.8	60.8	60.8	60.8	61.2	61.2	61.5	61.6	61.6	62	61.6	61.6
	Fa Peng	55.3	55.3	55.3	55.3	54.9	54.9	56.1	58.2	58.2	58.9	58.3	58.3
	Tao Wan	52.6	52.6	52.6	52.6	52.2	52.2	53.6	55.2	55.2	56	55.2	55.2
18	Yi Pak 1 (waterfront)	55.1	55.1	55.1	55.1	56.8	56.8	56.5	54.6	54.6	54.9	54.6	54.6
19	Yi Pak 2 (rear)	54.5	54.5	54.5	54.5	56	56	55.7	54	54	54.2	53.9	53.9
20	Hei Ling Chau 1	40.8	40.8	40.8	40.8	40.9	40.9	41	41.1	41.1	41.5	41.1	41.1
21	Hei Ling Chau 2	40.4	40.4	40.4	40.4	40.5	40.5	40.6	40.8	40.8	41.1	40.8	40.8



**Table 5.2 : Construction Noise Levels - Ancillary Works (dB(A) L<sub>eq</sub>) (Cont'd)**

NSR	Location	1/97	2/97	3/97	4/97	5/97	6/97	7/97	8/97	9/97	10/97	11/97	12/97
DB1	Cheriah Court	58.3	54.5	54.5	54.5	57.9	57.7	57.7	56.3	56.3	56.3	56.3	56.3
DB3	Twilight Court	57.4	54.3	54.3	54.3	56.8	56.6	56.6	55.5	55.5	55.5	55.5	55.5
DB5	Discovery Bay Plaza	56.6	53.5	53.5	53.5	55.9	55.7	55.7	54.6	54.6	54.6	54.6	54.6
DB9	Woodbury Court	53.1	49.9	49.9	49.9	52.8	52.6	52.6	51.2	51.2	51.2	51.2	51.2
DB13	Greenery Court	53.5	52.8	52.8	52.8	55.1	54.9	54.9	53.8	53.8	53.8	53.8	53.8
R4	Central Peng Chau	48.9	46.6	46.6	46.6	47.8	47.6	47.6	46.5	46.5	46.5	46.5	46.5
R4(A)	New Housing Peng Chau	49.9	47.6	47.6	47.6	48.9	48.8	48.8	47.6	47.6	47.6	47.6	47.6
R4(B)	Isolated Housing Peng Chau	61.9	59.6	59.6	59.6	60.8	60.6	60.6	59.5	59.5	59.5	59.5	59.5
	Fa Peng	58.5	53.2	53.2	53.2	52.5	52.4	52.4	50.6	50.6	50.6	50.6	50.6
	Tso Wan	55.5	51.2	51.2	51.2	50.6	50.5	50.5	48.8	48.8	48.8	48.8	48.8
18	Yi Pak 1 (waterfront)	55.3	54.6	54.6	54.6	57.2	57	57	55.8	55.8	55.8	55.8	55.8
19	Yi Pak 2 (rear)	54.7	54	54	54	56.4	56.2	56.2	55.1	55.1	55.1	55.1	55.1
20	Hei Ling Chau 1	41.5	40.1	40.1	40.1	40.6	40.5	40.5	39.9	39.9	39.9	39.9	39.9
21	Hei Ling Chau 2	41.1	39.8	39.8	39.8	40.2	40.1	40.1	39.6	39.6	39.6	39.6	39.6

**Table 5.2 : Construction Noise Levels - Ancillary Works (dB(A) L<sub>eq</sub>) (Cont'd)**

NSR	Location	1/98	2/98	3/98	4/98	5/98	6/98	7/98	8/98	9/98	10/98	11/98	12/98
DB1	Cheriah Court	54.8	54.8	53.3	53.3	54.5	54.5	54.5	54.5	55.1	55.1	55.1	54.2
DB3	Twilight Court	52.7	52.7	51	51	52.3	52.3	52.3	52.3	52.4	52.4	52.4	51.2
DB5	Discovery Bay Plaza	51.7	51.7	49.9	49.9	51.2	51.2	51.2	51.2	51.3	51.3	51.3	50.1
DB9	Woodbury Court	49.2	49.2	47.3	47.3	48.6	48.6	48.6	48.6	48.7	48.7	48.7	47.4
DB13	Greenery Court	50.9	50.9	48.9	48.9	50.3	50.3	50.3	50.3	50.4	50.4	50.4	49.1
R4	Central Peng Chau	43.6	43.6	40.2	40.2	41.4	41.4	41.4	41.4	42.1	42.1	42.1	41.5
R4(A)	New Housing Peng Chau	44.9	44.9	41.6	41.6	42.8	42.8	42.8	42.8	43.4	43.4	43.4	42.9
R4(B)	Isolated Housing Peng Chau	56.2	56.2	52.8	52.8	54	54	54	54	54.7	54.7	54.7	54
	Fa Peng	48.7	48.7	43.2	43.2	44.2	44.2	44.2	44.2	46.4	46.4	46.4	46.3
	Tso Wan	46.8	46.8	41.2	41.2	42.2	42.2	42.2	42.2	44.3	44.3	44.3	44.3
18	Yi Pak 1 (waterfront)	53.5	53.5	51.6	51.6	53	53	53	53	53.1	53.1	53.1	51.9
19	Yi Pak 2 (rear)	52.5	52.5	50.5	50.5	51.9	51.9	51.9	51.9	52	52	52	50.7
20	Hei Ling Chau 1	33.8	33.8	30	30	31.1	31.1	31.1	31.1	32	32	32	31.6
21	Hei Ling Chau 2	32.9	32.9	29	29	30.1	30.1	30.1	30.1	31	31	31	30.6

**Table 5.2 : Construction Noise Levels - Ancillary Works (dB(A)  $L_{eq}$ ) (Cont'd)**

NSR	Location	1/99	2/99	3/99	4/99	5/99	6/99
DB1	Cherish Court	53.5	53.5	54.4	54.2	54.2	54.2
DB3	Twilight Court	51.1	51.1	51.2	51.2	51.2	51.2
DB5	Discovery Bay Plaza	50	50	50.1	50.1	50.1	50.1
DB9	Woodbury Court	47.2	47.2	47.4	47.4	47.4	47.4
DB13	Greenery Court	48.9	48.9	49.1	49.1	49.1	49.1
R4	Central Peng Chau	40.7	40.7	41.6	41.4	41.4	41.4
R4(A)	New Housing Peng Chau	42.1	42.1	43	42.9	42.9	42.9
R4(B)	Isolated Housing Peng Chau	53.2	53.2	54.1	53.9	53.9	53.9
	Fa Peng	43.8	43.8	46	45.6	45.6	45.6
	Tao Wan	41.8	41.8	44	43.7	43.7	43.7
18	Yi Pak 1 (waterfront)	51.7	51.7	51.9	51.9	51.9	51.9
19	Yi Pak 2 (rear)	50.6	50.6	50.8	50.7	50.7	50.7
20	Hei Ling Chau 1	30.6	30.6	31.7	31.5	31.5	31.5
21	Hei Ling Chau 2	29.5	29.5	30.7	30.5	30.5	30.5

**Table 5.3 : Construction Noise Levels - CT10 and 11 (dB(A)  $L_{eq}$ )**

NSR	Location	8/95	9/95	10/95	11/95	12/95
DB1	Cherish Court	54.1	53.8	53.9	53.9	53.9
DB3	Twilight Court	53.3	53.0	53.1	53.1	53.1
DB5	Discovery Bay Plaza	52.4	52.1	52.2	52.2	52.2
DB9	Woodbury Court	51.6	51.3	51.5	51.5	51.5
DB13	Greenery Court	52.0	51.7	51.9	51.9	51.9
R4	Central Peng Chau	46.7	44.8	46.8	46.8	46.8
R4(A)	New Housing Peng Chau	46.5	44.5	46.5	46.5	46.5
R4(B)	Isolated Housing Peng Chau	56.2	56.0	56.1	56.1	56.1
	Fa Peng	58.1	57.8	58.0	58.0	58.0

Source : Container Terminal Study

**Table 5.3 : Construction Noise Levels - CT10 and 11 (dB(A) L<sub>eq</sub>) (Cont'd)**

NSR	Location	1/96	2/96	3/96	4/96	5/96	6/96	7/96	8/96	9/96	10/96	11/96	12/96
DB1	Cherish Court	53.9	53.7	55.2	53.6	53.9	53.9	54.0	54.0	45.0	51.5	51.5	51.5
DB3	Twilight Court	53.1	52.9	54.4	52.8	53.2	53.1	53.2	53.2	*	50.4	50.4	50.4
DB5	Discovery Bay Plaza	52.2	52.0	53.5	51.9	52.2	52.2	52.3	52.3	*	49.3	49.3	49.3
DB9	Woodbury Court	51.5	51.3	52.8	51.1	51.5	51.5	51.5	51.5	*	48.3	48.3	48.3
DB13	Greenery Court	51.9	51.7	53.2	51.5	51.9	51.9	51.9	51.9	42.5	48.7	48.7	48.7
R4	Central Peng Chau	46.8	44.3	47.5	44.5	46.8	46.8	44.7	44.7	*	46.3	46.3	46.3
R4(A)	New Housing Peng Chau	46.5	44.0	47.2	44.3	46.6	46.6	44.5	44.5	*	46.3	46.3	46.3
R4(B)	Isolated Housing Peng Chau	56.1	55.9	57.4	55.8	56.1	56.1	56.1	56.1	*	52.9	52.9	52.9
	Fa Peng	58.0	57.8	59.3	57.6	58.0	58.0	57.8	57.8	*	52.9	52.9	52.9

Source : Container Terminal Study

Note : For the month 9/96 results produced by the consultants for the container terminal study show that there is virtually no construction taking place

**Table 5.3 : Construction Noise Levels - CT10 and 11 (dB(A) L<sub>eq</sub>) (Cont'd)**

NSR	Location	1/97	2/97	3/97	4/97	5/97	6/97	7/97	8/97	9/97	10/97	11/97	12/97
DB1	Cherish Court	51.9	51.9	51.9	52.5	52.5	52.5	45.4	60.4	60.4	60.4	60.4	60.4
DB3	Twilight Court	50.8	50.8	50.8	51.5	51.5	51.5	59.5	59.5	59.5	59.5	59.5	59.5
DB5	Discovery Bay Plaza	49.7	49.7	49.7	50.4	50.4	50.4	58.6	58.6	58.6	58.6	58.6	58.6
DB9	Woodbury Court	48.7	48.7	48.7	49.4	49.4	49.4	57.8	57.8	57.8	57.8	57.8	57.8
DB13	Greenery Court	49.2	49.2	49.2	49.8	49.8	49.8	58.2	58.2	58.2	58.2	58.2	58.2
R4	Central Peng Chau	47.3	47.3	47.3	48.7	48.7	48.7	52.4	52.4	52.4	52.4	52.4	52.4
R4(A)	New Housing Peng Chau	47.3	47.3	47.3	48.7	48.7	48.7	52.2	52.2	52.2	52.2	52.2	52.2
R4(B)	Isolated Housing Peng Chau	53.3	53.3	53.3	54.0	54.0	54.0	62.5	62.5	62.5	62.4	62.4	62.4
	Fa Peng	53.5	53.5	53.5	54.2	54.2	54.2	64.1	64.1	64.1	64.1	64.1	64.1

Source : Container Terminal Study

**Table 5.3 : Construction Noise Levels - CT10 and 11 (dB(A)  $L_{eq}$ ) (Cont'd)**

NSR	Location	1/98	2/98	3/98	4/98	5/98	6/98	7/98	8/98	9/98	10/98	11/98	12/98
DB1	Cherish Court	63.8	63.8	63.8	63.7	63.7	63.7	65.0	65.0	65.0	65.0	65.0	65.0
DB3	Twilight Court	62.8	62.8	62.8	62.8	62.8	62.8	64.0	64.0	64.0	64.0	64.0	64.0
DB5	Discovery Bay Plaza	61.7	61.7	61.7	61.7	61.7	61.7	62.9	62.9	62.9	62.9	62.9	62.9
DB9	Woodbury Court	60.8	60.8	60.8	60.7	60.7	60.7	61.9	61.9	61.9	61.9	61.9	61.9
DB13	Greenery Court	61.2	61.2	61.2	61.2	61.2	61.2	62.3	62.3	62.3	62.3	62.3	62.3
R4	Central Peng Chau	54.5	54.5	54.5	54.5	54.5	54.5	54.9	54.9	54.9	54.9	54.9	54.9
R4(A)	New Housing Peng Chau	54.4	54.4	54.4	54.4	54.4	54.4	54.9	54.9	54.9	54.9	54.9	54.9
R4(B)	Isolated Housing Peng Chau	65.5	65.5	65.5	65.4	65.4	65.4	66.6	66.6	66.6	66.6	66.6	66.6
	Fa Peng	66.3	66.3	66.3	66.2	66.2	66.2	67.0	67.0	67.0	67.0	67.0	67.0

Source : Container Terminal Study

**Table 5.3 : Construction Noise Levels - CT10 and 11 (dB(A)  $L_{eq}$ ) (Cont'd)**

NSR	Location	1/99	2/99	3/99	4/99	5/99	6/99
DB1	Cherish Court	65.0	65.0	65.0	65.0	65.0	65.0
DB3	Twilight Court	64.0	64.0	64.0	64.0	64.0	64.0
DB5	Discovery Bay Plaza	62.9	62.9	62.9	62.8	62.8	62.8
DB9	Woodbury Court	61.9	61.9	61.9	61.8	61.8	61.8
DB13	Greenery Court	62.3	62.3	62.3	62.3	62.3	62.3
R4	Central Peng Chau	54.9	54.9	54.9	54.8	54.8	54.8
R4(A)	New Housing Peng Chau	54.9	54.9	54.9	54.7	54.7	54.7
R4(B)	Isolated Housing Peng Chau	66.6	66.6	66.6	66.5	66.5	66.5
	Fa Peng	66.9	66.9	66.9	66.9	66.9	66.9

Source : Container Terminal Study

**Table 5.4 : Cumulative Construction Noise Levels (dB(A)  $L_{eq}$ )**

NSR	Location	1/95	2/95	3/95	4/95	5/95	6/95	7/95	8/95	9/95	10/95	11/95	12/95
DB1	Cherish Court	57.2	57.2	57.2	57.2	57.2	57.2	57.2	58.9	58.8	58.8	58.8	58.8
DB3	Twilight Court	56.8	56.8	56.8	56.8	56.8	56.8	56.8	58.4	58.3	58.3	58.3	58.3
DB5	Discovery Bay Plaza	56	56	56	56	56	56	56	57.6	57.5	57.5	57.5	57.5
DB9	Woodbury Court	52.1	52.1	52.1	52.1	52.1	52.1	52.1	54.9	54.7	54.8	54.8	54.8
DB13	Greenery Court	53.9	53.9	53.9	53.9	53.9	53.9	53.9	56.1	56.0	56.0	56.0	56.0
R4	Central Peng Chau	47.3	47.3	47.3	47.3	47.3	47.3	47.3	50.0	49.2	50.1	50.1	50.1
R4(A)	New Housing Peng Chau	48.3	48.3	48.3	48.3	48.3	48.3	48.3	50.5	49.8	50.5	50.5	50.5
R4(B)	Isolated Housing Peng Chau	60.3	60.3	60.3	60.3	60.3	60.3	60.3	61.8	61.7	61.7	61.7	61.7
	Fa Peng	53.9	53.9	53.9	53.9	53.9	53.9	53.9	59.5	59.3	59.4	59.4	59.4

Note: The impact at Fa Peng indicates the worst case scenario for both Fa Peng and Tao Wan

**Table 5.4 : Cumulative Construction Noise Levels (dB(A)  $L_{eq}$ ) (Cont'd)**

NSR	Location	1/96	2/96	3/96	4/96	5/96	6/96	7/96	8/96	9/96	10/96	11/96	12/96
DB1	Cherish Court	59.4	59.3	59.8	59.3	60.1	60.1	60.0	59.5	58.3	59.0	58.9	58.9
DB3	Twilight Court	58.2	58.1	58.7	58.1	59.0	59.0	58.8	58.5	57	57.9	57.8	57.8
DB5	Discovery Bay Plaza	57.4	57.3	57.8	57.3	58.1	58.1	57.9	57.6	56.2	57.1	57.0	57.0
DB9	Woodbury Court	54.8	54.7	55.4	54.7	55.6	55.6	55.5	55.2	52.8	54.2	54.1	54.1
DB13	Greenery Court	55.7	55.6	56.3	55.6	56.6	56.6	56.3	55.3	53.1	54.4	54.2	54.2
R4	Central Peng Chau	50.3	49.4	50.7	49.5	50.6	50.6	50.0	50.1	48.6	50.9	50.6	50.6
R4(A)	New Housing Peng Chau	50.8	50.1	51.1	50.1	51.2	51.2	50.8	50.7	49.6	51.6	51.2	51.2
R4(B)	Isolated Housing Peng Chau	62.1	62.0	62.4	62.0	62.4	62.4	62.6	62.7	61.6	62.5	62.1	62.1
	Fa Peng	59.8	59.7	60.7	59.6	59.7	59.7	60.1	61.0	58.2	59.8	59.4	59.4

Note: The impact at Fa Peng indicates the worst case scenario for both Fa Peng and Tao Wan

**Table 5.4 : Cumulative Construction Noise Levels (dB(A)  $L_{eq}$ ) (Cont'd)**

NSR	Location	1/97	2/97	3/97	4/97	5/97	6/97	7/97	8/97	9/97	10/97	11/97	12/97
DB1	Cherish Court	59.2	56.4	56.4	56.7	59.0	58.9	58.0	61.8	61.8	61.8	61.8	61.8
DB3	Twilight Court	58.2	55.9	55.9	56.1	57.9	57.8	61.3	61.0	61.0	61.0	61.0	61.0
DB5	Discovery Bay Plaza	57.4	55.0	55.0	55.2	57.0	56.8	60.4	60.1	60.1	60.0	60.0	60.0
DB9	Woodbury Court	54.5	52.3	52.3	52.6	54.4	54.3	58.9	58.7	58.7	58.6	58.6	58.6
DB13	Greenery Court	54.9	54.4	54.4	54.6	56.2	56.1	59.9	59.5	59.5	59.5	59.5	59.5
R4	Central Peng Chau	51.2	50.0	50.0	50.8	51.3	51.2	53.6	53.4	53.4	53.4	53.4	53.4
R4(A)	New Housing Peng Chau	51.8	50.5	50.5	51.2	51.8	51.8	53.8	53.5	53.5	53.5	53.5	53.5
R4(B)	Isolated Housing Peng Chau	62.4	60.5	60.5	60.7	61.6	61.5	64.7	64.2	64.2	64.2	64.2	64.2
	Fa Peng	59.7	56.4	56.4	56.7	56.4	56.4	64.4	64.3	64.3	64.3	64.3	64.3

Note: The impact at Fa Peng indicates the worst case scenario for both Fa Peng and Tso Wan

**Table 5.4 : Cumulative Construction Noise Levels (dB(A)  $L_{eq}$ ) (Cont'd)**

NSR	Location	1/98	2/98	3/98	4/98	5/98	6/98	7/98	8/98	9/98	10/98	11/98	12/98
DB1	Cherish Court	64.3	64.3	64.2	64.1	64.2	64.2	65.4	65.4	65.5	65.5	65.5	65.4
DB3	Twilight Court	63.2	63.2	63.1	63.0	63.1	63.1	64.3	64.3	64.3	64.3	64.3	64.2
DB5	Discovery Bay Plaza	62.1	62.1	62.0	62.0	62.0	62.0	63.2	63.2	63.2	63.2	63.2	63.1
DB9	Woodbury Court	61.1	61.1	61.0	60.9	61.0	61.0	62.1	62.1	62.1	62.1	62.1	62.0
DB13	Greenery Court	61.6	61.6	61.5	61.4	61.5	61.5	62.6	62.6	62.6	62.6	62.6	62.5
R4	Central Peng Chau	54.8	54.8	54.6	54.6	54.7	54.7	55.1	55.1	55.1	55.1	55.1	55.1
R4(A)	New Housing Peng Chau	54.9	54.9	54.6	54.6	54.7	54.7	55.1	55.1	55.2	55.2	55.2	55.1
R4(B)	Isolated Housing Peng Chau	65.9	65.9	65.7	65.6	65.7	65.7	66.8	66.8	66.8	66.8	66.8	66.8
	Fa Peng	66.3	66.3	66.3	66.2	66.2	66.2	67	67	67	67	67	67

Note: The impact at Fa Peng indicates the worst case scenario for both Fa Peng and Tso Wan

**Table 5.4 : Cumulative Construction Noise Levels (dB(A)  $L_{eq}$ ) (Cont'd)**

NSR	Location	1/99	2/99	3/99	4/99	5/99	6/99
DB1	Cherish Court	65.3	65.3	65.4	65.3	65.3	65.3
DB3	Twilight Court	64.2	64.2	64.2	64.2	64.2	64.2
DB5	Discovery Bay Plaza	63.1	63.1	63.1	63.1	63.1	63.1
DB9	Woodbury Court	62.0	62.0	62.0	62.0	62.0	62.0
DB13	Greenery Court	62.5	62.5	62.5	62.5	62.5	62.5
R4	Central Peng Chau	55.1	55.1	55.1	54.9	54.9	54.9
R4(A)	New Housing Peng Chau	55.1	55.1	55.1	55.0	55.0	55.0
R4(B)	Isolated Housing Peng Chau	66.7	66.7	66.8	66.8	66.8	66.8
	Fa Peng	67	67	67	66.9	66.9	66.9

Note: The impact at Fa Peng indicates the worst case scenario for both Fa Peng and Tso Wan

**Table 5.5 Construction Noise Levels - Breakwater and Approach Channel (dB(A)  $L_{eq}$ )**

NSR	Location	Breakwater	Approach Channel
DB1	Cherish Court	35.6	43.6
DB3	Twilight Court	36.2	43.6
DB5	Discovery Bay Plaza	34.7	42
DB9	Woodbury Court	29.6	36.2
DB13	Greenery Court	32.1	39.7
R4	Central Peng Chau	35.2	37.1
R4(A)	New Housing Peng Chau	34.8	38.7
R4(B)	Isolated Housing Peng Chau	49.9	52.2
	Fa Peng	27.7	36.4
18	Yi Pak 1 (waterfront)	33.5	41.7
19	Yi Pak 2 (rear)	32.8	40.8
20	Hei Ling Chau (1)	33.4	34.3
21	Hei Ling Chau (2)	34.1	33.7

Note : Assumes 16 hour working day (0700 - 2300).

**Table 5.6 Construction Noise Levels - Placing Fill for the Reclamation (dB(A) L<sub>eq</sub>)**

NSR	Location	12/94	1/95	2/95	3/95	4/95	5/95	6/95	7/95
DB1	Cheriah Court	39.4	39.4	40.4	40.4	40.4	40.2	40.2	40.2
DB3	Twilight Court	37.6	37.6	38.6	38.6	38.6	38.5	38.5	38.5
DB5	Discovery Bay Plaza	36.7	36.7	37.7	37.7	37.7	37.6	37.6	37.6
DB9	Woodbury Court	34.6	34.6	35.6	35.6	35.6	35.5	35.5	35.5
DB13	Greenery Court	26.0	26.0	27.0	27.0	27.0	26.9	26.9	26.9
R4	Central Peng Chau	28.5	28.5	29.5	29.5	29.5	29.4	29.4	29.4
R4(A)	New Housing Peng Chau	29.5	29.5	30.5	30.5	30.5	30.4	30.4	30.4
R4(B)	Isolated Housing Peng Chau	31.6	31.6	32.6	32.6	32.6	32.5	32.5	32.5
	Fa Peng	35.3	35.3	36.3	36.3	36.3	36.2	36.2	36.2
	Tso Wan	32.5	32.5	33.5	33.5	33.5	33.4	33.4	33.4
18	Yi Pak (1)	28.1	28.1	29.1	29.1	29.1	29	29	29
19	Yi Pak (2)	28.1	28.1	29.1	29.1	29.1	29	29	29
20	Hei Ling Chau (1)	28.1	28.1	29.1	29.1	29.1	29	29	29
21	Hei Ling Chau (2)	28.1	28.1	29.1	29.1	29.1	29	29	29

Note : Assumes 24 hour working for sandfilling  
Impacts are for the Advance Works only

**Table 5.6 Construction Noise Levels - Placing Fill for the Reclamation (dB(A) L<sub>eq</sub>) (Cont'd)**

NSR	Location	8/95	9/95	10/95	11/95	12/95	1/96	2/96	3/96	4/96	5/96
DB1	Cheriah Court	40.2	40.2	40.2	39.4	39.4	38.7	38.7	38.7	38.7	38.7
DB3	Twilight Court	38.5	38.5	38.5	37.6	37.6	37	37	37	37	37
DB5	Discovery Bay Plaza	37.6	37.6	37.6	36.7	36.7	36.1	36.1	36.1	36.1	36.1
DB9	Woodbury Court	35.5	35.5	35.5	34.6	34.6	34	34	34	34	34
DB13	Greenery Court	26.9	26.9	26.9	26	26	25.4	25.4	25.4	25.4	25.4
R4	Central Peng Chau	29.4	29.4	29.4	28.5	28.5	27.8	27.8	27.8	27.8	27.8
R4(A)	New Housing Peng Chau	30.4	30.4	30.4	29.5	29.5	28.8	28.8	28.8	28.8	28.8
R4(B)	Isolated Housing Peng Chau	32.5	32.5	32.5	31.6	31.6	31	31	31	31	31
	Fa Peng	36.2	36.2	36.2	35.3	35.3	34.7	34.7	34.7	34.7	34.7
	Tso Wan	33.4	33.4	33.4	32.5	32.5	31.9	31.9	31.9	31.9	31.9
18	Yi Pak (1)	29	29	29	28.1	28.1	27.5	27.5	27.5	27.5	27.5
19	Yi Pak (2)	29	29	29	28.1	28.1	27.5	27.5	27.5	27.5	27.5
20	Hei Ling Chau (1)	29	29	29	28.1	28.1	27.5	27.5	27.5	27.5	27.5
21	Hei Ling Chau (2)	29	29	29	28.1	28.1	27.5	27.5	27.5	27.5	27.5

Note : Assumes 24 hour working for sandfilling  
Impacts are for the Advance Works only



**Table 5.7 Construction Noise Levels - Haul Road Traffic (dB(A)  $L_{eq}$ )**

NSR	Location	1995	1/96 - 6/96	7/96 - 12/96	97
	Fa Peng	47.5	45.9	43.8	45.5
	Tao Wan	46.1	44.7	42.2	43.9
R4	Central Peng Chau	43.4	41.9	39.5	41.2
R4(A)	New Housing, Peng Chau	44.2	42.7	40.4	42.1
R4(B)	Isolated Housing, Peng Chau	55.4	53.9	51.5	53.2
DB-1	Cherish Court	51.8	50.1	48.0	49.8
DB-3	Twilight Court	53.5	51.9	49.7	51.5
DB-5	Discovery Bay Plaza	52.9	51.3	49.1	50.8
DB-9	Woodbury Court	48.3	46.7	44.4	46.2
DB-13	Greenery Court	52.3	50.7	48.5	50.2
18	Yi Pak (1) (waterfront)	53.5	51.9	49.7	51.5
19	Yi Pak (2) (rear)	53.2	51.6	49.4	51.1
20	Hei Ling Chau (1)	36.8	34.9	32.4	34.1
21	Hei Ling Chau (2)	35.8	34.4	31.8	33.5

### 5.2.6 Mitigation Measures

Mitigation of noise from the Ancillary Works has been considered in this study, while mitigation of noise from construction of CT10 and 11 has been considered by the container terminal study. The conclusions of each are presented below.

#### Ancillary Works

While it is not feasible to dictate the methods of construction to the contractor, noise control requirements should be incorporated in the tender/contract documents to specify the noise standards to be met. Noise monitoring will be particularly important and the results of the monitoring surveys will determine the level of mitigation required at any particular location and time.

Options for mitigating construction noise include :

- (a) use of silenced equipment. The noise generated from mechanical plant can often be reduced by the fitting of acoustic mufflers and linings. In general this can reduce the sound power levels by upto 10 dB(A) for each item of heavy equipment and by at least 5 dB(A) for each activity. It is recommended that mufflers and linings are fitted to all equipment;
- (b) scheduling activities to avoid parallel operations of several sets of powered mechanical equipment. Scheduling of construction activities will be the contractor's responsibility and it is recommended that the contract conditions include clauses instructing the contractor to schedule his activities such that noisy activities are not carried out in parallel. This may have some effect on the total time taken for building the project and it is recommended that the construction period should be as long as practical to allow the contractor this flexibility;

- (c) siting of equipment as far as practical from noise sensitive receivers; and
- (d) use of temporary enclosures and/or noise barriers placed close to the noise sources to screen specific receivers. Due to the height of the receivers temporary barriers will generally only be effective if they are placed close to the noise sources.

It is anticipated that if the above mitigation measures are applied, the noise levels experienced by the receivers could be reduced. Requirements for mitigating the noise should be included in the Ancillary Works construction contracts but these alone will not be sufficient to reduce noise to acceptable levels as most of the noise will be from the construction of CT10 and 11. This is discussed further below.

### Container Terminals CT10 and 11

An analysis of mitigation measures applicable to the construction of CT10 and 11 has been carried out by the container terminal study. A copy of that analysis is presented in Appendix D of this Report. In summary it has been concluded that the construction noise can be reduced by up to 5 dB(A) to 10 dB(A) and hence the noise impacts will be within acceptable levels.

### Effectiveness of Mitigation of Cumulative Noise Impacts

#### Ancillary Works

Table 5.2 shows that the contribution of the Ancillary Works to the construction noise levels does not exceed 60 dB(A) except at Isolated Housing, Peng Chau for 1995 and 1996. The worst case is 62 dB(A) at the end of 1996 and the main contributors to these noise levels are dumptrucks, bulldozers and excavator/loaders. The sound power levels of these items of equipment with and without mitigation at source, assuming that the mitigation comprises silencing as described in paragraph 5.2.6(a), will be as follows:

(a)	dumptrucks	-	without mitigation	117 dB(A)
			with mitigation	107 dB(A)
(b)	bulldozers	-	without mitigation	115 dB(A)
			with mitigation	105 dB(A)
(a)	excavators/loaders	-	without mitigation	112 dB(A)
			with mitigation	102 dB(A)

The total sound power levels of subgrade formation will be 120 dB(A) with mitigation, and the impact at the receivers will reduce to 56 dB(A).

Thus if we assume that the SWL of dumptrucks, bulldozers and excavations/loaders can be reduced by 10 dB(A) each then the impact at this sensitive receiver will be well below 60 dB(A). However as agreed in the preliminary design study, the NSRs on the northern headland of Peng Chau are scattered and heavily influenced by surrounding topography. It would therefore be misleading to select a "representative" NSR in this areas. It is proposed that a more detailed survey of these sites and a review of the construction programme will be conducted as part of the Detailed Design study. Receiver mitigation at Peng Chau may be required. This assumption follows through when assessing the impacts from the container terminals and the cumulative impacts.

## CT10 and 11

Table 5.3 shows that noise levels from CT10 and 11 exceed the 60 dB(A) criterion for significant periods of time. The container terminal study proposed a calculation of noise reduction for the worst case sensitive receiver. Their assessment is referred to in Appendix D1 and shows that mitigation of noise from reclamation equipment can reduce the impacts to below 60 dB(A) at all NSRs.

### Cumulative Impacts

The cumulative impact assessment is presented in Table 5.4. The worst case sensitive receivers correspond directly in value and timeframe to the worst impacts produced by the construction of the container terminals. The contribution from the Ancillary Works at this time is less than 55 dB(A). This is approximately 12 dB(A) less than the contribution from the container terminals and therefore negligible in terms of the impact on NSRs.

The reduction in noise calculated for the contribution from the container terminals during construction also demonstrates that the cumulative noise impacts can be reduced to below 60 dB(A) at affected NSRs.

The application of the recommended noise mitigation to all construction contracts will result in noise from cumulative activities being within acceptable levels.

### 5.2.7 Compliance Monitoring

Noise monitoring has already been undertaken during the LAPH Study so that representative background levels have already been established. A pre-works assessment needs to be conducted.

Prior to commencement of the relevant construction work, baseline monitoring should be conducted to determine baseline noise levels at the noise sensitive receivers. The baseline monitoring should be carried out for a period of at least two weeks, with measurements taken every day at locations and to a schedule determined by the Engineer. The baseline noise levels  $L_{eq}$  (5 min) and  $L_{eq}$  (30 min.) will be calculated from these measurements.

Impact noise monitoring should be performed throughout the contract at the NSRs closest to any noisy construction activities. For construction during normal working (unrestricted) hours (0700 - 1900 hours) impact monitoring should comprise  $L_{eq}$  (30 min) taken at least once a week. Impact monitoring for construction outside normal working (restricted) hours (0000 - 2400 hours) in general holidays (including Sundays) and (1900 - 0700 hours) other than general holidays should comprise  $L_{eq}$  (5 min) taken twice per day, once in each of the restricted periods, unless complaints are received in which case more frequent measurements will be necessary. The precise programme for impact monitoring should be determined when details of the contractors programme for construction are known.

The reporting and auditing of this impact monitoring programme should be carried out monthly and should commence on completion and approval of the Environmental Monitoring and Audit (EM&A) Manual. This manual will include data collected during the baseline monitoring programme and also contingency plans to take account of the following :

- (a) prolonged non-availability of monitoring site;
- (b) non-suitability of monitoring site;
- (c) equipment failure or shift;
- (d) non-availability of laboratory facilities; and
- (e) adverse weather conditions.

The contingency plans should also be included in the contract documents in accordance with the HKPSG, Pollution Ordinance, and EPD monitoring guidelines.

Where monitoring of noise levels shows an excessive noise level, the Contractor should take necessary steps to ensure that his actions are not contributing to the excess. These steps should include, but not be limited to the following :

- (a) checking plant and equipment;
- (b) maintenance or replacement of any plant or equipment contributing to the excess;
- (c) review of working methods.

The resident site staff should be kept informed of steps taken, and written reports and proposals for action should be passed to the contractor whenever monitoring shows an excessive noise level is arising.

Table 5.8 shows a proposed action plan should there be any complaints or any exceedance of the specified noise levels.

**Table 5.8 Construction Noise Action Plan**

Event	Action	
	Engineer	Contractor
When a complaint is received	<ul style="list-style-type: none"> <li>· Notify contractor</li> <li>· conduct measurement</li> <li>· Investigate noisy operations</li> </ul>	
When more than one complaint on the same event is received within a 2 weeks period	<ul style="list-style-type: none"> <li>· Notify contractor</li> <li>· Analyse investigation</li> <li>· Require contractor to propose measures to reduce the noise</li> <li>· Increase monitoring frequency to check mitigation effectiveness</li> </ul>	<ul style="list-style-type: none"> <li>· Submit noise mitigation proposal to Engineer</li> <li>· Implementation noise mitigation measures</li> </ul>
60 dB(A) exceeded between 0700 - 2300 hours	<ul style="list-style-type: none"> <li>· Notify contractor</li> <li>· Notify EPD</li> <li>· Require contractor to implement mitigation measures</li> </ul>	<ul style="list-style-type: none"> <li>· Submit noise mitigation proposals to the Engineer</li> <li>· Implement mitigation measures</li> </ul>
45 dB(A) exceeded between 2300 - 0700 hours of next day	<ul style="list-style-type: none"> <li>· Increase monitoring frequency to check mitigation effectiveness</li> </ul>	<ul style="list-style-type: none"> <li>· Prove to Engineer effectiveness of measures applied</li> </ul>

## 5.3 Operation Phase

### 5.3.1 Assessment Methodology, Assumptions and Criteria

Noise during operation of the port will be attributable to road traffic, vehicles moving around and handling containers in the CBA and operation of CT10 and 11. The impact from traffic noise has been calculated at the facades of the representative NSRs identified in Section 4.2 in terms of 1 hour  $L_{10}$  in dB(A) using a computer model based on "Calculation of Road Traffic Noise", U.K. Department of Transport, 1988 (CRTN). The potential noise impact from road traffic was assessed by comparing the predicted levels with the HKPSG standard of  $L_{10}$  70 dB(A). Impacts from other activities have been calculated in accordance with the procedures set out in TM3.

Representative receivers for the operational noise assessment are the same as those for the construction noise assessment except that there will be a health centre in the commercial centre which will be a receiver during operation only. No details of the health centre are available at the present time so this has not been identified in the noise assessment as a sensitive receiver. It is most likely that the health centre will be sheltered from noise by the surrounding buildings and care needs to be taken in the detailed design of the commercial centre so that the noise from road traffic does not exceed 55 dB(A) and that noise from other sources is within the requirements of TM3.

Corrections have been made to take account of the effects of distance attenuation and air absorption where applicable. No adjustments have been made for the impulsive or intermittent nature of these noise sources or of the barrier effects of stacked containers.

#### Road Traffic

Design speeds, projected morning peak hour traffic flows and corresponding percentages of heavy vehicles in 2011 and 2001 have been in the calculations. The design speeds are those predicted by the transport models. These assumptions are presented in detail in Appendix C.

Assumptions for road traffic noise are as follows :

- (a) the main roads will be surfaced with pervious macadam (or friction course). All other roads incorporated in the model are assumed to be impervious in nature;
- (b) the model allows for the effects due to the ground conditions and topography;
- (c) the relative noise contribution from roads not included has been assumed to be negligible compared to those included in the assessment;
- (d) the road network has been divided into 40 segments for 2001 and 54 segments for 2011 according to traffic volume and location of bends. Assessment of segments is based on the Calculation of Road Traffic Noise, Department of Transport, 1988;
- (e) the roads are assumed to climb 10m in order to pass over another road segment during crossover. Otherwise, it is assumed that the roads would stay level (gradient = 0) at an elevation of 5m;

- (f) the split of traffic at ramps (which not available in veh/hr or % of heavy vehicle units) has been carried out in accordance with the ratio calculated from the traffic volume in p.c.u. as provided from the latest transportation model, the percentage of heavy vehicles being the same;
- (g) different barriers (topographical features or acoustic screens) are identified for different NSRs. The barrier closest most effectively screening the NSR has been adopted. Only road segments in the shadow zone will be screened by the barrier; and
- (h) road surface correction for pervious macadam = -3.5 dB(A) and facade effect of +2.5 dB(A) have been adopted (see assumption (a)).

**CBA**

The method employed to assess the noise impacts from the operation of the CBA has been similar to that used in the assessment of construction noise impacts and has been based upon TM3. The analysis was performed by separating the SWL for each piece of equipment into spectral bands to give a more accurate presentation of the impact.

The following assumptions have been made in developing the noise model for the CBA:

- (a) the port has been assumed to handle 2 million TEUs p.a. of throughput per container terminal [i.e. 2 million TEU p.a. for 2001 and 4 million TEU p.a. for 2011]. The land usage in the CBA has been subdivided into container yards and container lorry parking. The proportion of land assumed for these is 44% for container yards and 56% for container lorry parking. For each berth (each Container Terminal has 4 berths), 10 ha of CBA is required and hence the area of the container yards is 4.4 ha/berth. The inventory of equipment has been established in accordance with the maximum capacity requirements, a 12 hour working day 300 days/year and a dwell time of 7 days. The sound power levels for each item of equipment are shown in Table 5.9 and frequency spectra are shown in Table 5.10.

**Table 5.9 Powered Mechanical Equipment for CBA**

Power Mechanical Equipment	SWL [dB(A)]	
	Quiet	Standard
Electric Forklift	95	95
Tractors	106.5	110
Misc. Vehicles	106.5	112
Crawler Cranes	112	112
Lorry	106.5	112

**Table 5.10 Frequency Spectrum for Powered Mechanical Equipment**

PME	Frequency	Forklift	Tractor	Mis Veh.	Crane	Lorry
<b>Standard (SWL, dB(A))</b>	63	82.4	83.8	86.3	101	86.3
	125	85.4	93.5	96	104	96
	250	83.4	102.5	105	102	105
	500	84.4	105.2	107.7	103	107.7
	1000	88.4	103.5	106	107	106
	2000	88.4	99.9	102.4	107	102.4
	4000	88.4	95.9	98.4	107	98.4
	8000	77.4	86.5	89	96	89
<b>Quiet (SWL, dB(A))</b>	63	82.4	80.8	80.8	101	80.8
	125	85.4	90.5	90.5	104	90.5
	250	83.4	99.5	99.5	102	99.5
	500	84.4	102.2	102.2	103	102.2
	1000	88.4	100.5	100.5	107	100.5
	2000	88.4	96.9	96.9	107	96.9
	4000	88.4	92.9	92.9	107	92.9
	8000	77.4	83.5	83.5	96	83.5

- (b) the powered mechanical equipment from each CBA area have been assumed to be operated and located at the notional source centres shown on Figures 5.1 and 5.2. Due to the large distance separating the source and the NSRs, two notional source centres with one along the eastern boundary (affecting Fa Peng and Tso Wan) and the other one located along the western boundary (affecting other NSRs) have been adopted for each CBA area. The corrected noise level from respective CBA areas have been summed at the NSRs with due consideration being given to topographical barriers and acoustic screens. The equipment assumed for each notional source is listed in Table 5.11. The port is expected to operate 24 hrs a day and it was therefore determined that the CBA would be used to a certain extent at night time as it would also need to be operational 24 hrs a day. However, it is not expected that the CBA will operate at 100% capacity at night time. It was therefore agreed that 50% utilisation of the equipment CBA would be assumed for night time; 100% utilisation would be assumed during the day time;
- (c) Figures 5.1 and 5.2 also show the location of container yards and container lorry parking that have been assumed for the noise study. These assumptions have been based on the best information available during the study. The land uses may change during the development of the project or when land is leased but these changes are not likely to cause major changes in the noise impacts;
- (d) 25m acoustic screens have been assumed to be built along the south west boundaries of CT10 and 11.

**Table 5.11 Equipment Assumed at Each Notional Source**

Powered Mechanical Equipment	Number											
	Phase 1				Phase 2							
	A-1	B-1	C-1	D-1	A-2	B-2	C-2	D-2	E-2	F-2	G-2	H-2
<b>24 hour</b>												
Electric Forklifts	4	4	5	4	4	4	4	4	4	4	4	4
Tractors	2	2	2	2	2	2	2	2	2	2	2	2
Misc Vehicles	1	1	2	1	1	1	1	1	1	1	1	1
Crawler Cranes	2	2	2	2	2	2	2	2	2	2	2	2
Lorries	2	2	2	2	2	2	2	2	2	2	2	2
<b>12 hour</b>												
Electric Forklifts	6	6	8	6	6	6	5	6	6	6	7	6
Tractors	3	3	4	3	3	3	3	3	3	3	4	3
Misc Vehicles	2	2	3	2	2	2	2	2	2	2	2	2
Crawler Cranes	2	2	2	2	2	2	2	2	2	2	2	2
Lorries	3	3	4	3	3	3	3	3	3	3	4	3

CT10 and 11 and Cumulative Assessment

The container terminal study has conducted a cumulative operational noise assessment using results supplied by this study for operational noise impacts from the Ancillary Works. We have taken their assessment and conclusions, submitted for their Final Report and included the findings directly in this report, to provide the full picture of cumulative impacts.

5.3.2 Impact Assessment and Evaluation

The following section examines, on a site by site basis, the location characteristics of the representative NSR's and the predicted noise levels at these sites with and without mitigation. Full details of the calculations are presented in Appendix D.

Road Traffic Noise

Noise levels at each representative receiver have been predicted as total noise levels from all road traffic sources, for design years 2001 and 2011. The results indicated that there will be no exceedance of noise criteria as a result of road traffic noise produced within the study area.

It should be noted that the noise levels predicted beyond 300m in the CRTN model are less accurate and are therefore only an indication of impact at distant sensitive receivers.

However, traffic noise will exceed the HKPSG in 2011 at Fa Peng. This is due to the Sham Tseng Link which will be in operation in 2011. This link passes less than 100m away from Fa Peng. Mitigation measures that could be considered to reduce the noise to acceptable levels could include the use of vertical barriers. It should be noted that the Sham Tseng Link is beyond the study area and therefore impact and mitigation directly related to it should be considered in a separate EIA. It is also likely that the sensitive receivers may be relocated by this time.



## CBA Noise

### Method of Assessment

The analysis of impacts from the CBA has followed a multi-stage approach as follows :-

- (a) the noise impacts without any mitigation have been calculated;
- (b) the changes resulting from the noise barriers agreed for CT10 and 11 have been calculated;
- (c) the first two stages showed that additional noise mitigation will be needed to meet the standards. A standard of 'zero contribution' from the CBA was specified and in order to achieve this the noise level from the CBA would need to be no more than 35 dB(A) at night time. The third stage of the calculation was thus an assessment of the noise barriers that would be needed to meet this target; and
- (d) the results of (c) showed that extremely high barriers would be needed and these are not considered feasible for the CBA. The final stage of the calculation has therefore been to assess the noise impacts using a 'best means practical' approach. In this case 5m high barriers have been specified throughout the CBA. This is considered to be the best achievable noise mitigation for the CBA since 5m high barriers were judged to be the maximum practical height that could be used for walls not requiring extensive piling nor needing to take up excessive plot area. These barriers could have the added value of mitigating some of the visual aspects associated with container stacking, especially if they are aesthetically constructed and landscaped.
- (e) use of both quiet and standard equipment have been assessed for 24 hour operation. In addition a sensitivity test for ultra quiet equipment has been conducted. It should be noted that the term "quiet" equipment refers to equipment readily available on the market and incorporating reasonable levels of noise mitigation. This equipment is already in use in terminals in Hong Kong, but not necessarily in existing CBAs which are often operated in a different manner to those to be constructed in this project. "Ultra quiet" equipment refers to equipment where additional mitigation may be included in the equipment design to further quieten the equipment. "Quiet" equipment has been assumed in all the modelling (and compared with standard equipment) as the availability of ultra quiet equipment is still in question.
- (f) as the most stringent criterion to be met for night-time operation and there is a requirement to meet a 'zero contribution' criteria for impacts associated with the CBA, i.e. 35 dB(A), all impacts are presented assuming 50% utilisation of equipment in the CBA. To ascertain the impacts for 100% utilisation (that is for daytime operation), 3 dB(A) can be added to the figures in the tables.
- (g) the assessment indicated a need for some noise mitigation measures to be in place at the south western corner of the CBA to mitigate operational noise impacts in Discovery Bay. It has been proposed to extend the CT11 western noise bund to the Sz Pak headland as this will most effectively screen the noise. The results presented assume that this extension will be in place unless stated otherwise. Table 5.12 shows the predicted impacts for 50% utilisation of equipment with no extension of the noise bund. This can be compared with Table 5.13 to show the effectiveness of the noise bund extension.

### Summary of Impacts

The results of the assessment are summarised in Tables 5.13 to 5.16. Table 5.13 shows that the 35 dB(A) 'zero contribution' criteria for the CBA will be exceeded at Cherish Court, Twilight Court, New Housing at Peng Chau and Isolated Housing Peng Chau for 50% utilization. Assuming 100% utilization Discovery Bay Plaza, Twilight Court, Woodbury Court, and Yi Pak (2) will also have some levels of exceedance in either or both of Phases I and II.

### Assessment of Impacts to Achieve Zero Contribution

Barriers required to mitigate the noise to zero contribution assuming 50% utilisation range between 9m and 17m. However, even with these very large barriers, the higher sensitive receivers at Cherish Court, Twilight Court, Woodbury Court and Yi Pak (2) will be exposed to levels exceeding the 35 dB(A) criteria if 100% utilization is assumed. These barriers are not considered to be practical and are not recommended. This exercise was conducted to ascertain the height of barriers required in order to meet the 35 dB(A) criterion and has concluded that this criterion is not achievable using practical mitigation measures.

### Assessment of Impacts Assuming "Best Mean Practical"

The barriers discussed in the previous section are not considered to be practical. An assessment has therefore been carried out of the maximum reduction in impacts that could be achieved using barriers which are practical. The location of these barriers are shown in Figure 5.3. Table 5.14 shows the impacts for 50% utilisation assuming these barriers are built but excluding the extension of the noise bund and Table 5.15 shows the predicted impacts assuming these barriers and including the extension of the noise bund.

The zero contribution criterion is exceeded at several, but not all, receivers. Comparison of the two tables with Table 5.12 and 5.13 shows that the effect of the 5m barriers is quite small at many receivers but can be as much as 2 dB(A).

### Sensitivity Test for Ultra Quiet Equipment

Table 5.16 shows the results of a sensitivity test assuming ultra quiet equipment but it should be noted that there is no guarantee that this type of equipment could be made available for the CBA. Noise impacts are substantially reduced in the sensitivity analysis and the 35 dB(A) target for zero contribution is achieved except at the Isolated Housing on Peng Chau and at Cherish Court at 2011.

**Table 5.12 Total Noise Level from CBA - Unmitigated**

NSR	Name of NSR	E	N	Elevation mPD	2001		2011	
					Quiet	Std.	Quiet	Std.
DB-1	Cherish Court	820720	817305	81	35.4	36.7	39.8	41.2
DB-3	Twilight Court	820105	817330	91	35.0	36.2	38.1	39.5
DB-5	Discovery Bay Plaza	819730	817445	28	34.8	36.0	38.5	39.9
DB-9	Woodbury Court	819070	817350	103	33.0	34.2	37.4	38.7
DB-13	Greenery Court	819130	818270	117	26.9	27.9	35.6	37.0
R4	Central Peng Chau	822050	816250	10	27.1	28.1	31.4	32.4
R4(A)	New Housing Peng Chau	821900	816560	28	31.9	33.2	36.9	38.2
R4(B)	Isolated Housing, Peng Chau	822540	816900	24	39.6	41	44.4	45.9
	Fa Peng	823660	821310	15.6	27.1	28.5	25.5	27.0
	Tso Wan	823645	821865	15.6	23.4	24.7	22.9	24.2
19	Yi Pak (1) - waterfront	819660	818505	16.2	20.7	21.6	37.5	39.1
20	Yi Pak (2) - rear	819440	818500	126.4	27.5	28.7	36.9	38.4
21	Hei Ling Chau (1)	821100	813300	31.4	22.8	23.9	30.6	31.7
22	Hei Ling Chau (2)	822350	812900	103.4	28.1	29.2	29.7	31.0

NOTE	YES	NO
1. 50% utilisation of equipment	✓	
2. EAST and WEST barriers in container terminals	✓	
3. Extension of CT11 western noise bund to Sz Pak headland		✓
4. Barriers 5m high in CBA		✓
<p>Note : To obtain 100% utilisation for the same conditions add 3 dB(A) to these results.</p>		

**Table 5.13 Total Noise Level from CBA - Mitigated by CT11 Western Noise Bund Extension**

NSR	Name of NSR	E	N	Elevation mPD	2001		2011	
					Quiet	Std.	Quiet	Std.
DB-1	Cherish Court	820720	817305	81	35.4	36.7	39.1	40.5
				72	35.3	36.7	38.8	40.2
				63	35.3	36.6	38.6	40.0
				54	35.2	36.6	38.2	39.6
DB-3	Twilight Court	820105	817330	91	35.0	36.2	35.4	36.8
				82	35.0	36.2	34.8	36.2
				73	35.0	36.2	34.4	35.7
				64	34.9	36.2	34.0	35.3
DB-5	Discovery Bay Plaza	819730	817445	28	34.8	36.0	31.3	32.4
DB-9	Woodbury Court	819070	817350	103	33.0	34.2	32.3	33.6
				94	33.0	34.2	31.9	33.2
				85	33.0	34.2	31.6	32.8
				76	33.0	34.2	31.3	32.5
DB-13	Greenery Court	819130	818270	117	26.9	27.9	31.7	33.0
				108	26.3	27.2	31.2	32.4
				99	25.6	26.5	30.8	32.0
				90	24.9	25.8	30.5	31.7
R4	Central Peng Chau	822050	816250	10	27.1	28.1	31.4	32.4
R4(A)	New Housing, Peng Chau	821900	816560	28	31.9	33.2	36.9	38.2
R4(B)	Isolated Housing, Peng Chau	822540	816900	24	39.6	41.0	44.4	45.9
	Fa Peng	823660	821310	16	27.1	28.5	25.5	27.0
	Tso Wan	823645	821865	16	23.4	24.7	22.9	24.2
19	Yi Pak (1) - waterfront	819660	818505	16	20.7	21.6	28.7	29.8
20	Yi Pak (2) - rear	819440	818500	126	27.5	28.7	34.1	35.7
				117	26.7	27.8	33.3	34.9
				108	25.9	27.0	32.6	34.1
				99	25.2	26.2	31.9	33.3
21	Hei Ling Chau (1)	821100	813300	31	22.8	23.9	30.6	31.7
22	Hei Ling Chau (2)	822350	812900	103	28.1	29.2	29.7	31

NOTE	YES	NO
1. 50% utilisation of equipment	✓	
2. EAST and WEST barriers in container terminals	✓	
3. Extension of CT11 western noise bund to Sz Pak headland	✓	
4. Barriers 5m high in CBA		✓

**Table 5.14 Total Noise Level from CBA - Mitigated with 5m High Barriers Only**

NSR	Name of NSR	2001		2011	
		Quiet	Std.	Quiet	Std.
DB-1	Cherish Court	32.2	33.6	37.7	39.1
DB-3	Twilight Court	31.9	33.3	36.4	37.9
DB-5	Discovery Bay Plaza	29.9	31.1	34.1	35.5
DB-9	Woodbury Court	28.3	29.5	33.5	35.0
DB-13	Greenery Court	26.9	27.9	32.6	34.0
R4 AT	Central Peng Chau	27.1	28.1	31.4	32.4
R4(A)	New Housing, Peng	31.9	33.2	36.9	38.2
R4(B)	Isolated Housing	34.7	36.0	40.2	41.7
NSR AT	Fa Peng	27.1	28.5	25.5	27.0
NSR AT	Tso Wan	23.4	24.7	22.9	24.2
NSR19	Yi Pak (1)	20.7	21.6	32.8	34.4
NSR20	Yi Pak (2)	27.5	28.7	34.3	36.0
NSR21	Hei Ling Chau (1)	22.8	23.9	29.0	30.1
NSR22	Hei Ling Chau (2)	23.2	24.3	27.7	28.9

NOTE	YES	NO
1. 50% utilisation of equipment	✓	
2. EAST and WEST barriers in container terminals	✓	
3. Extension of CT11 western noise bund to Sz Pak headland		✓
4. Barriers 5m high in CBA	✓	

**Table 5.15 Total Noise Level from CBA Mitigated with 5m High Noise Barriers and the Extension to the Western Noise Bund**

NSR	Name of NSR	Elevation mPD	2001		2011	
			Quiet	Std.	Quiet	Std.
DB-1	Cherish Court	81	32.2	33.6	37.5	38.9
		72	31.9	33.3	37.2	38.6
		63	31.7	33.0	36.8	38.1
		54	31.5	32.8	36.3	37.6
DB-3	Twilight Court	91	31.9	33.3	35.1	36.5
		82	31.5	32.9	34.8	36.1
		73	31.2	32.5	34.5	35.8
		64	30.9	32.2	34.1	35.4
DB-5	Discovery Bay Plaza	28	29.9	31.1	31.2	32.3
DB-9	Woodbury Court	103	28.3	29.5	31.7	33.0
		94	28.3	29.4	31.6	32.8
		85	28.2	29.4	31.4	32.6
		76	28.2	29.3	31.2	32.4
DB-13	Greenery Court	117	26.9	27.9	31.3	32.6
		108	26.3	27.2	30.8	32.0
		99	25.6	26.5	30.4	31.6
		90	24.9	25.8	30.1	31.3
R4	Central Peng Chau	10	27.1	28.1	31.4	32.2
R4(A)	New Housing, Peng Chau	28	31.9	33.2	36.9	38.2
R4(B)	Isolated Housing, Peng Chau	24	34.7	36.0	40.2	41.7
	Fa Peng	16	27.1	28.5	25.5	27.0
	Tso Wan	16	23.4	24.7	22.9	24.2
19	Yi Pak (1) - waterfront	16	20.7	21.6	28.7	29.8
20	Yi Pak (2) - rear	126	27.5	28.7	34.1	35.7
		117	26.7	27.8	33.3	34.9
		108	25.9	27.0	32.6	34.1
		99	25.2	26.2	31.9	33.3
21	Hei Ling Chau (1)	31	22.8	23.9	29.0	30.1
22	Hei Ling Chau (2)	103	23.2	24.3	27.7	28.9

NOTE	YES	NO
1. 50% utilisation of equipment	✓	
2. EAST and WEST barriers in container terminals	✓	
3. Extension of CT11 western noise bund to Sz Pak headland	✓	
4. Barriers 5m high in CBA	✓	
Note : To obtain 100% utilisation for the same conditions add 3 dB(A) to these results.		

**Table 5.16 Total Noise Level from CBA - Sensitivity Test for Ultra Quiet Equipment**

NSR	Name of NSR	E	N	Elevation mPD	2001		2011	
					Ultra Quiet	Std.	Ultra Quiet	Std.
DB-1	Cherish Court	820720	817305	81	33.2	36.7	37.7	41.3
DB-3	Twilight Court	820105	817330	91	32.8	36.2	33.2	36.8
DB-5	Discovery Bay Plaza	819730	817445	28	32.5	36	28.6	32.4
DB-9	Woodbury Court	819070	817350	103	30.6	34.2	30	33.6
DB-13	Greenery Court	819130	818270	117	24.3	27.9	29.3	33
R4	Central Peng Chau	822050	816250	10	24.3	28.1	28.5	32.4
R4(A)	New Housing, Peng Chau	821900	816560	28	29.7	33.2	34.7	38.2
R4(B)	Isolated Housing, Peng Chau	822540	816900	24	37.6	41	42.4	45.9
	Fa Peng	823660	821310	15.6	25.2	28.5	23.4	27
	Tso Wan	823645	821865	15.6	21.2	24.7	20.6	24.2
19	Yi Pak (1) - waterfront	819660	818500	16.2	17.4	21.6	25.8	29.8
20	Yi Pak (2) - rear	819440	818505	126.4	24.6	28.7	32	35.7
21	Hei Ling Chau (1)	821100	813300	31.4	19.7	23.9	27.7	31.7
22	Hei Ling Chau (2)	822350	812900	103.4	25.1	29.2	27.1	31

NOTE	YES	NO
<ol style="list-style-type: none"> <li>1. 50% utilisation of equipment</li> <li>2. EAST and WEST barriers in container terminals</li> <li>3. Extension of CT11 western noise bund to Sz Pak headland</li> <li>4. Barriers 5m high in CBA</li> </ol> <p>Note : To obtain 100% utilisation for the same conditions add 3 dB(A) to these results.</p> <p>These results represent a sensitivity test for 'ultraquiet' equipment. We feel the only piece of equipment where further noise reduction may be possible is the crane.</p> <p>We have assumed -5dB reduction across the whole spectrum (i.e. each band).</p>	✓ ✓ ✓	✓

## Cumulative Operational Noise

The assessment of cumulative impacts during operation has been carried out by the container terminal study. Appendix D includes a copy of the report on cumulative impacts taken from the Final Report of that study.

Both the cumulative assessment and the assessment of the Ancillary Works have concluded that mitigation is required. Mitigation measures have focused on building noise barriers either at the western side of the port or inside the CBA close to the source. The options that have been considered are:

- (a) to extend the noise bund at the western end of CT11 up to the hillside. A tunnel through the noise bund would be needed for the Discovery Bay access road and the culvert for the stormwater drains would need to be strengthened to take the load from the noise bund. Should future tenants want to remove the temporary bund, they should provide alternative equivalent mitigation measures to the satisfaction of the DEP;
- (b) build a noise bund from the Sz Pak headland parallel to the western noise bund. The gap between the two noise bunds would allow for stormwater drains. The culverts would thus not need to bear the load of the noise bund;
- (c) extend the Sz Pak headland at the western end of CT11 on a skewed angle to abut the western noise bund;
- (d) construct buildings as an acoustic screen at the south west of the CBA;
- (e) construct barriers within the CBA to mitigate the impacts associated with operation of the CBA. However barriers to mitigate the impacts would be very high i.e. between 19 and 17m. These are not recommended due to the cost, visual impact, potential loss of land and inconvenience of having these barriers located in the CBA. The number of SRs affected at Peng Chau still requires further investigation and the consultants for CT10 and 11 have proposed the need for more detailed noise assessment at that site;
- (f) construct smaller more practical barriers of 5m around all CBA areas.

A combination of an extension to the CT11 western noise bund and barriers close to the noise sources inside the CBA is recommended to minimise the noise impacts. This option is considered the best means practical to reduce the noise.

The extension of the western noise bund will be temporary since the land used by the noise bund will eventually be needed for other purposes. It is intended that the noise bund should be demolished when the land in this area is leased and the noise mitigation will then be by buildings that will be built by the lessee. A schematic layout of the dimensions and height of the buildings that would be required to achieve the same noise mitigation as the bund is shown in Figure 5.4. The calculation details showing that the buildings can achieve the same protection for Cherish Court (the worst affected sensitive receiver) are presented in Appendix D. The requirement to construct these buildings or equivalent noise barriers should be included in the lease conditions for this plot.



## 5.4 Monitoring and Audit

It is considered that environmental monitoring for noise impacts from the Ancillary Areas should not be necessary as the impacts will be small in comparison with those from CT10 and 11 and it will be difficult to differentiate between the many noise sources in the port.

The container terminal study has considered the need for environmental monitoring and audit for noise from CT10 and 11. The proposals made in that study will be adequate for monitoring the cumulative noise including the Ancillary Works.

## 5.5 Conclusions

### 5.5.1 Construction Phase

Noise impacts are predicted to be less than the HKPSG standard at night during the construction phase.

Cumulative construction impacts will exceed the 60 dB(A) daytime guideline by 7 dB(A) at the worst affected NSRs unless noise mitigation is applied. The major contribution to the noise will be from the CT10 and 11 works. Mitigation of noise from the Ancillary Areas should be applied but this alone will not reduce the cumulative noise impacts to within the 60 dB(A) guideline at all NSR's. The container terminal study has considered mitigation of noise during construction and has concluded that these noise impacts can be reduced to within the guidelines.

### 5.5.2 Operation Phase

#### Traffic Noise

Traffic noise levels experienced at sensitive receivers during operation of the port road network will exceed the HKPSG level at Fa Peng unless noise mitigation is applied. This is due to the completion of the Sham Tseng Link which will be in operation by 2011. However, as this is outside the study area, it is recommended that an EIA assessment be conducted for the Sham Tseng Link at which time appropriate mitigation measures could be discussed.

#### CBA Noise

The zero contribution criterion of 35 dB(A) will be exceeded at Cherish Court, Twilight Court and the Isolated Housing on Peng Chau even with the extension of the CT11 western noise bund.

These can be mitigated by building barriers in the CBA, but these would need to be between 9m and 17m high to meet the zero contribution criterion. Barriers of this height are quite impractical.

Noise can be mitigated at most NSR's by using barriers of a more practical height in a larger number of locations but the 35 dB(A) zero contribution criteria may not be met. Barriers of 5m height have been recommended and this is considered to be the best practical means of mitigation in the CBA.

## Cumulative Noise

The container terminal study concluded that the noise planning criteria may be exceeded during the daytime at the exposed receivers at Fa Peng and the northern headland of Peng Chau. Mitigation at receivers has been proposed by the container terminal study at these scattered NSRs.

Mitigation measures at these NSRs will be determined upon a detailed site survey to be carried out in the Detailed Design Study, in conjunction with the study of the operational noise mitigation requirements at these NSRs.

The planning criteria are anticipated to be exceeded during the night time at exposed receivers at all the locations assessed. The planning criteria used for this study allow for a 5 dB(A) safety factor when compared with the NCO criteria.

Noise impacts at the health clinic to be built in the commercial area have not been assessed directly since no details of the design of the buildings are available. The requirements of the HKPSG should be followed in the detail design of the health centre and assuming this is done the noise impacts at the health centre should be within acceptable levels.

## **5.6 Recommendations**

### Construction

The key recommendations arising from this study are as follows:

- (a) noise mitigation should include:
  - (i) use of silenced equipment;
  - (ii) scheduling of activities to avoid parallel operations of several sets of powered mechanical equipment;
  - (iii) siting of equipment as far as practical from noise sensitive receivers; and
  - (iv) use of temporary enclosures and/or noise barriers placed close to the noise sources to screen specific receivers;
- (b) noise monitoring and audit will be required to ensure that the noise standards are met and to determine the level of mitigation required at any particular location and time.

## Operation

Recommended mitigation measures are:

- (a) the 25m high CT11 western noise bund should have a temporary extension to the Sz Pak headland. This may be removed at some time in the future when these lots in this area are released so long as the lessee erects buildings or some other form of barrier with a mitigation equivalent to the noise bund. Should future tenants wish to provide alternative building configurations to those assessed under this Consultancy, it will be necessary for the tenants to prove, to the satisfaction of the DEP, that the alternatives proposed will have a mitigation effect equivalent to the temporary noise bund extension. This requirement should be included in the lease for this plot;
- (b) five metre high barriers should be built in the CBA. The requirement to construct these barriers can be included in the lease conditions of the CBA lots; and
- (c) detailed planning of the commercial centre should take account of the health clinic which is proposed so that the requirements of HKPSG and the Noise Control Ordinance are met.

Figure 5.1  
Notional Operation Noise Source Centres  
2001

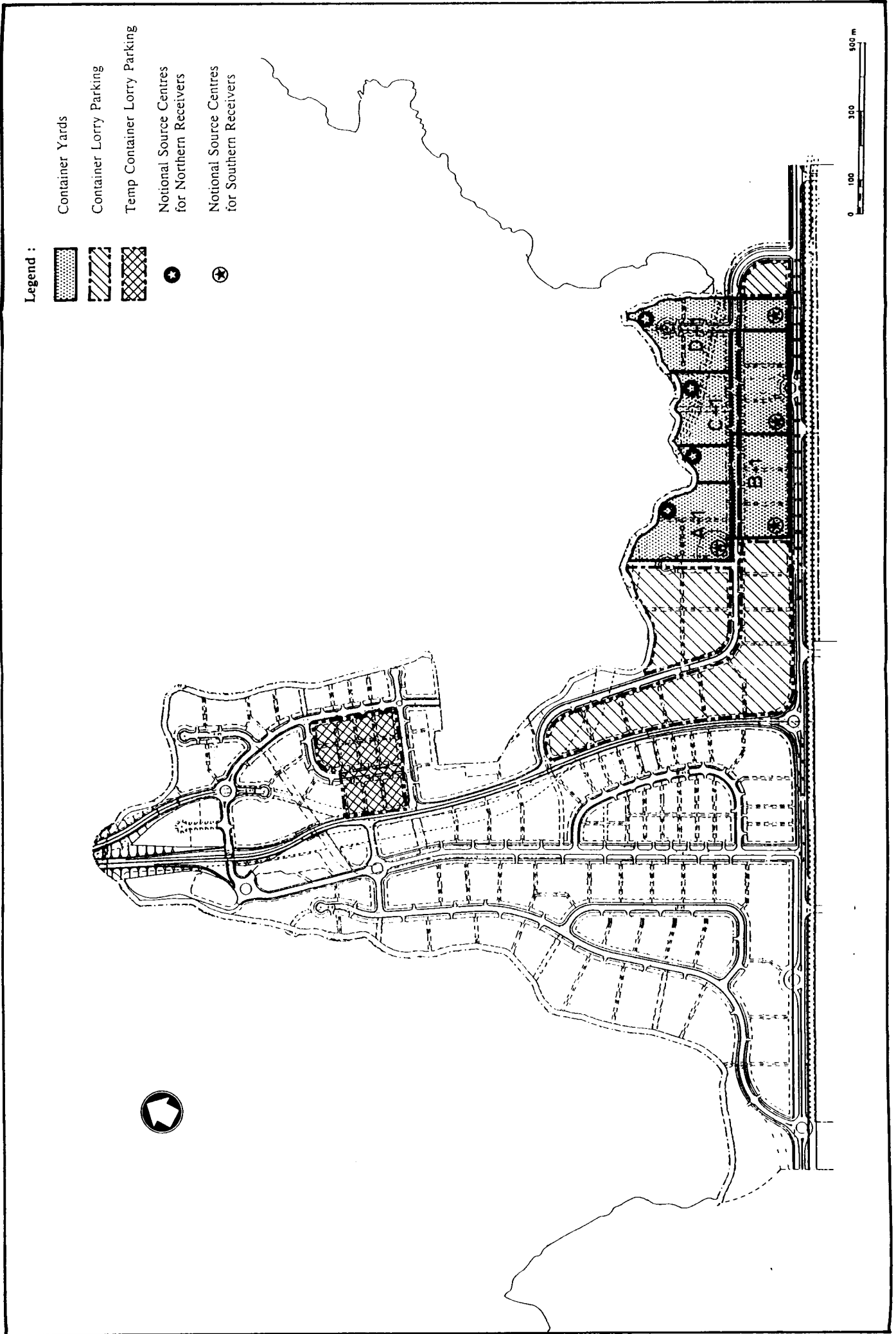


Figure 5.2  
Notional Operation Noise Source Centres  
2011

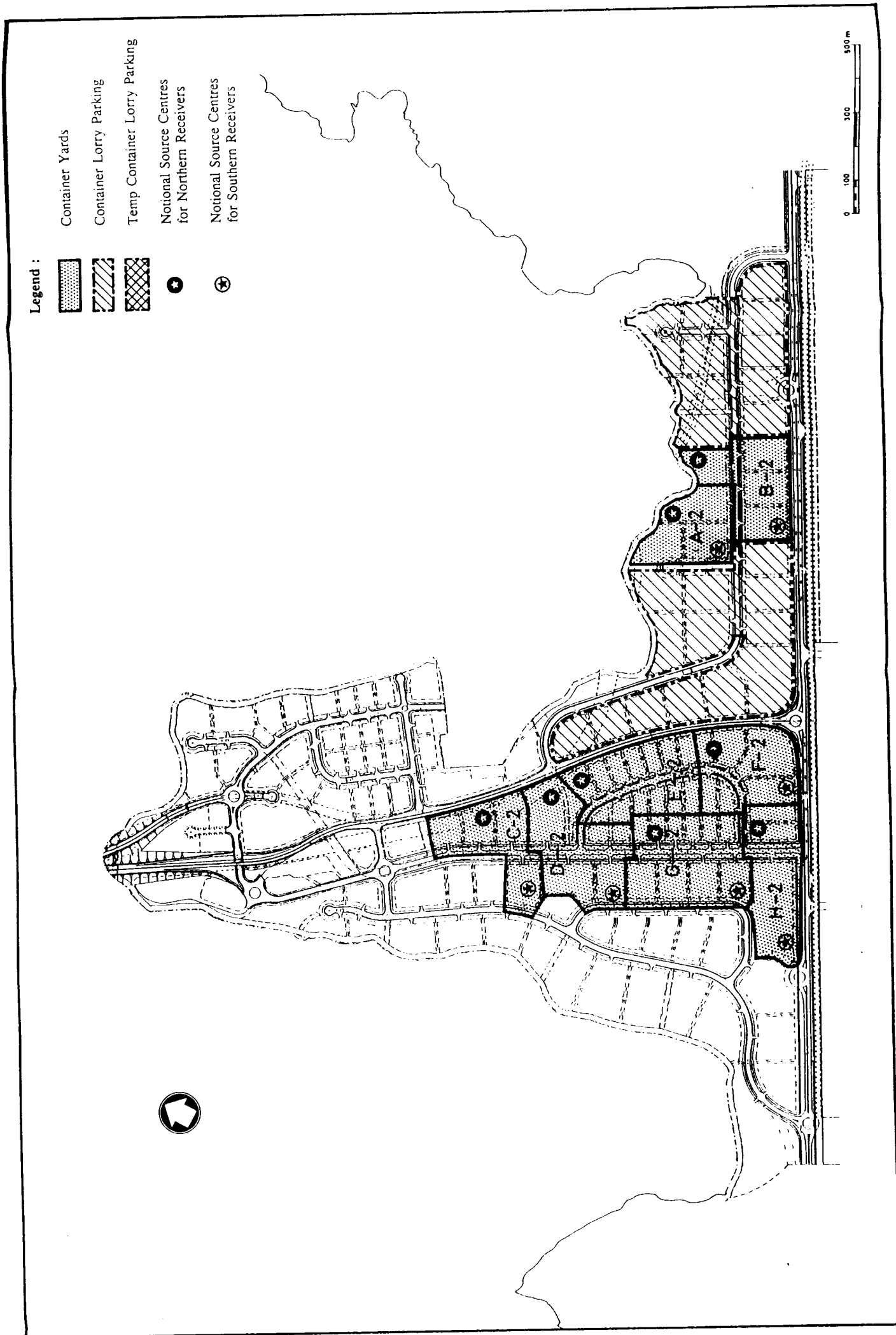
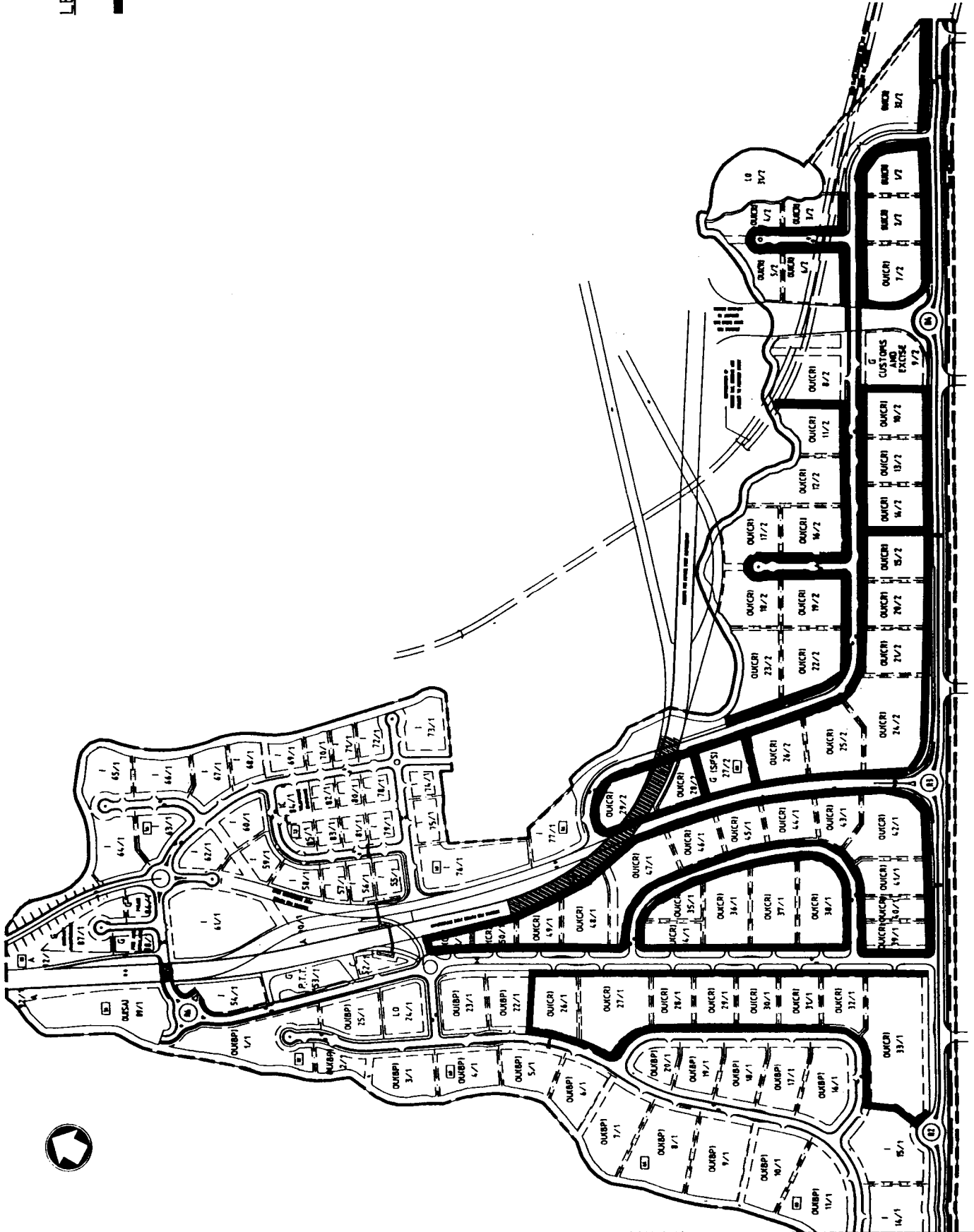


Figure 5.3

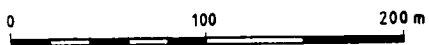
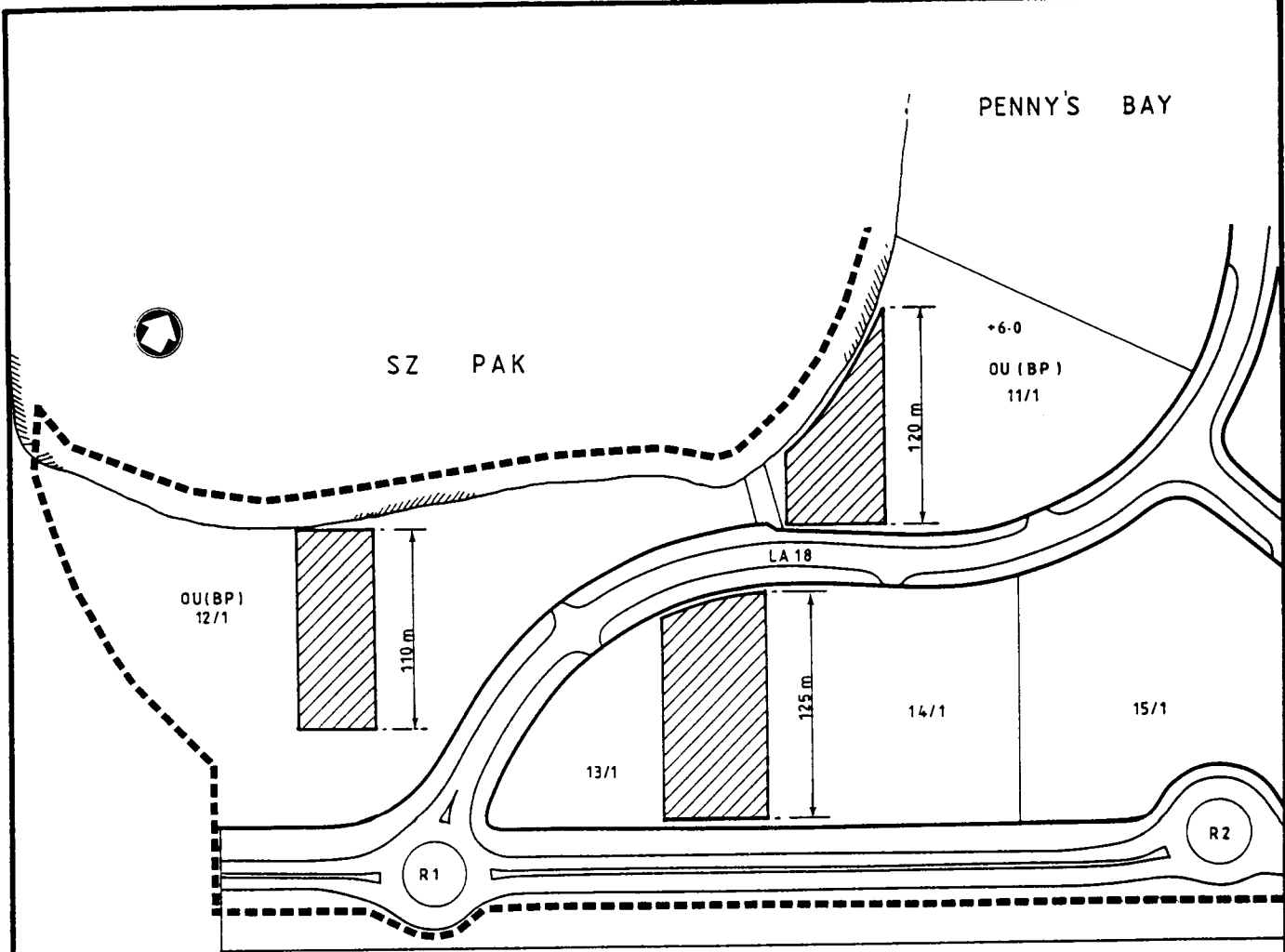
**LEGEND**



5m high barrier



**Figure 5.4**  
**Buildings for Noise Mitigation**



**LEGEND:**

 PROPOSED CONFIGURATION OF BUILDINGS FOR NOISE MITIGATION PURPOSES .

**NOTE :** ALL BUILDINGS TO BE TO 30m P.D.