

5 NOISE IMPACT ASSESSMENT

5.1 Introduction

Construction Phase

5.1.1 During the advance surcharge works and construction works for the housing development at Telegraph Bay, nearby Noise Sensitive Receivers (NSRs) will likely be affected by the noise generated from both construction activities and on-site vehicle movements. The construction of Route 7 will commence after the occupation of Telegraph Bay Development (TBD), therefore NSRs at the development will also likely be affected by construction noise. This assessment evaluates the potential noise impacts associated with the construction phases and, where necessary, recommends appropriate mitigation measures.

5.1.2 In summary, the following construction noise impact assessments will be performed:

- Advance Works for Telegraph Bay Development;
- Main Construction Works for Telegraph Bay Development; and
- Route 7 Construction (within Telegraph Bay Area only).

Operational Phase

5.1.3 Traffic noise impacts are anticipated from the existing Victoria Road, future Route 7, as well as the proposed access roads to the study site (Roads D1 and D2, Southern and Northern Access Road). This assessment evaluates the potential traffic noise impacts upon the development and recommends appropriate mitigation measures where necessary. Noise impacts from the traffic on access roads in TBD upon neighbouring NSRs will also be evaluated.

5.1.4 In summary, the following operation noise impact assessments will be performed:

- Traffic noise impacts upon nearby NSRs from road traffic on access roads in TBD at Year 2019;
- Traffic noise impacts upon TBD at Year 2022 (15 years after the commissioning of Route 7); and
- Fixed noise impacts upon TBD from the sewage treatment works (STW) and Water Services Department (WSD) pumping station.

5.2 Description of Surrounding Environment

5.2.1 Baseline Conditions

5.2.1.1 Background noise measurements carried out at seven locations across the site indicate that the study area is located in a quiet natural environment with little disturbance (Figure 5.1).

5.2.1.2 The measured levels are summarised in Table 5.1. These noise levels will serve as the baseline condition for further assessments.

5.2.1.3 There are no construction work being undertaken in the vicinity of the Telegraph Bay area and therefore the nearby Noise Sensitive Receivers (NSRs) are currently not affected by

construction noise. The only existing road in the nearby vicinity is Victoria Road which is located to the east of the proposed development.

Table 5.1 Background Noise Levels (spot measurements during unrestricted hours)

Location	Description	L _{eq} dB(A)
A	Edge of site, north of King Sin Wan Tsuen	52.4
B	Along northern edge of R(B) site adjacent to Kong Sin Wan Tsuen	49.3
C	Western edge of R(B) site, adjacent to Baguio Villa	49.8
D	Boundary between northern R(B) site and adjacent G/IC site	52.6
E	Marine access point along seawall	54.1
F	Southern R(B) site	52.0
G	Southern R(C) site, adjacent to golf centre	52.0

5.2.2 Future Trends

5.2.2.1 The characteristics of the Study area will be subject to significant change after the commissioning of Route 7 in year 2007. The increased traffic activity in the subject area will result in elevated background noise levels.

5.3 Noise Sensitive Receivers

5.3.1 The spatial scope for the assessment of noise impacts from construction and operational activities of the development has been defined as 300 metres from the boundary of the work site(s). In accordance with the Noise Control Ordinance (NCO), domestic premises, hotels, hostels, temporary housing accommodations, hospitals, medical clinics, educational institutions, places of public worship, libraries, courts of law, offices, performing arts centres and country parks are considered as Noise Sensitive Receivers (NSRs). It should also be noted that any identified office developments that rely on openable windows for ventilation are also considered as NSRs. NSRs have been identified through a review of both existing and committed land uses, site visits, reference to Outline Zoning Plans and a view of Planning Department information.

5.3.2 NSRs which may be impacted include the following sectors:

- Current residential populations (including temporary accommodation);
- Future residential populations; and
- Non-residential locations (including places of worship, schools and country parks).

5.3.3 Representative NSRs have been identified based on the proposed construction schedule and operational on-site activities. Nearby NSRs impacted by the construction and operation phases of TBD are given in Table 5.2 and Figure 5.1. The identified NSRs within TBD which will be affected by the construction of Route 7 are given in Table 5.3 and Figure 5.2, and the NSRs which will be affected by traffic noise from Route 7 are given in Figures 5.3 to 5.7.

Table 5.2 Proposed Noise Sensitive Receivers (NSRs) during Construction and Operation of Telegraph Bay Development

NSR No.	Description	Land Use ¹	No. of Storeys
SR2	Tam Villa	R	22
SR3	HKU Staff Quarters	R	12
SR4-8	42, 45, 47, 50 & 60 Sasson Road	R	3
SR9	Magnolia Villas	R	3
SR10	Point Breeze	R	3
SR11	Carriana Sasson	R	3
SR12	Stone Manor	R	3
SR13	Provident Villas	R	3
SR19	16-18 Baguio Villas	R	10
SR19 a, b, c	45-48 Baguio Villas	R	29
SR21	Pok Fu Lam Training Centre	S	7
SR22	Pok Fu Lam Garden	R	28
SR23	Wah Fu Estate	R	21
SR24	Lui Ming Choi Secondary School	S	7
SR25	Precious Blood Primary School	S	5
SR26	Tsui Ching Tong School For the Handicap	S	6
SR27	Kong Sin Wan Tsuen	R	2-3
SR28	Boarding Clinic and Veterinary Clinic	O/C	1
SR40	Pui Ying Secondary School	S	7

Note: ¹ Residential uses (R); School (S); Office/Commercial (O/C)

Table 5.3 Proposed Noise Sensitive Receivers (NSRs) during Construction of Route 7 (within Telegraph Bay Area only)

Site 1 NSRs	Site 2 NSRs	Site 3 NSRs	Site 4 NSRs	Site 5 NSRs
120	208	301	401	510
121	209	302	402	514
-	-	305	409	519
-	-	306	410	520
-	-	-	-	521
-	-	-	-	522

5.4 Construction Phase Noise Impacts

5.4.1 Identification of Noise Impacts

5.4.1.1 Construction works for the proposed site are likely to create noise impacts upon the surrounding NSRs. The extent of the impacts affecting the identified NSRs will vary from phase to phase due to the different types of powered mechanical equipment (PME) used and location of construction works to be carried out. The construction activities related to the proposed development can be categorised into two main stages:

- *Advance Works* – including vertical drain installations and earthwork/surcharging
- *Main Construction Works* – including jetty/quay construction, civil works and building construction works, G/IC construction

5.4.1.2 As the Telegraph Bay Development will be ready for occupation before the completion of Route 7, the noise generated from the construction activities of Route 7 will also likely affect the NSRs within the development.

5.4.2 Assessment Methodology

5.4.2.1 The computer model “siteNoise”, which is based on the calculation method for equivalent continuous sound level in British Standard 5228, “Noise Control on Construction and Open Site”, is used in this Study. The sound power levels of the PMEs have been adopted from Technical Memorandum on Noise from Construction Works other than Percussive Piling (GW-TM). The location of PMEs have been assumed to be at the positions where they are most likely to be during the construction periods.

5.4.2.2 The construction noise impacts will be assessed in accordance with Table 1B of the Technical Memorandum on Environmental Impact Assessment Process (EIA-TM). The construction noise criteria for 0700 to 1900 hours on any day not being a Sunday or public holiday are as follows:

- $L_{eq(30min)}$ 75 dB(A) for residential premises, and
- $L_{eq(30min)}$ 70 dB(A) for schools ($L_{eq(30min)}$ 65 dB(A) during examinations).

5.4.2.3 For periods between 1900 to 0700 hours or any time on Sundays and public holiday, the criteria are laid down in the relevant Technical memoranda under the Noise Control Ordinance, as discussed in Chapter 3. The construction noise impact assessment has been carried out only for daytime construction periods, should night-time construction works be required, a Construction Noise Permit (CNP) will need to be applied for by the contractors. CNPs will not automatically be granted and will be assessed on a case by case basis by the Noise Control Authority.

5.4.2.4 The target construction noise impact upon school adopted in this assessment is 65 dB(A). However, it is recognised that this target is only applicable during examination periods, and that the construction noise criterion for normal classroom activities is 70 dB(A). As examination periods are not anticipated for long periods, appropriate construction activity planning or mitigation measures will be recommended should the target of 65 dB(A) be exceeded.

5.4.3 Impact Prediction

5.4.3.1 For the purpose of this Study, construction noise impact assessments have been separated into the following three stages:

- Advance Works for Telegraph Bay Development;
- Main Construction Works for Telegraph Bay Development; and
- Construction of Route 7 (within Telegraph Bay area).

5.4.3.1 *Advance Works for Telegraph Bay Development*

5.4.3.1.1 The advance works for the development will be conducted by Civil Engineering Department (CED) port division. Advance works for the development include site clearance, predrilling and installation of band drain, excavation /surcharging works and the construction of box culvert. The surcharge works have been scheduled for Sites 2, 3 and 4 only. An underground box culvert across Site 1 will have to be constructed during the advance works stage to substitute the existing surface water body in Site 1 to provide the necessary stormwater drainage connection for Kong Sin Wan and the outfall no. 1. It is understood from CED that the works are likely to be divided into 10 phases with the

preliminary schedule as presented in Table 5.4, the schedule is adopted for the purpose of this study. The areas where surcharge works will be carried out are given in Figure 5.8.

5.4.3.1.2 The different types of work to be carried out during the advance works have been labelled as follow :

- Activity 1 - Site clearance;
- Activity 2 - Predrilling and installation of band drains;
- Activity 3 - Importation and deposition of sandfill;
- Activity 4 - Importation and deposition of public fill;
- Activity 5 - Surcharging period
- Activity 6 - Disposal of surplus materials; and
- Activity 7 - Box culvert construction (across Site 1)

Table 5.4 Adopted Schedule for the Advance Works

Site Areas	Phase									
	AW-I	AW-II	AW-III	AW-IV	AW-V	AW-VI	AW-VII	AW-VIII	AW-IX	AW-X
Site 4 (area 4 & 5)	Act 1	Act 2	Act 3	Act 4	Act 5					Act 6
Site 3 (area 4 & 5)		Act 1	Act 2	Act 3	Act 4	Act 5				Act 6
Site 4 (remaining)			Act 1	Act 2	Act 3	Act 4	Act 5			Act 6
Site 3 (remaining)				Act 1	Act 2	Act 3	Act 4	Act 5		Act 6
Site 2					Act 1	Act 2	Act 3	Act 4	Act 5	Act 6
Site 1	Act 7	Act 7	Act 7	Act 7						

Note:

Act 1 – Site clearance; Act 2 – Pre-drilling and installation of band drain; Act 3 – Importation and deposition of sand fill; Act 4 – Importation and deposition of public fill; Act 5 – Surcharging period; Act 6 – Disposal of surplus material; and Act 7 – Construction of box culvert.

5.4.3.1.3 A list of the powered mechanical equipment (PME) to be used during the advance works period, as well as the associated sound power levels (SWLs) are given in Appendix 5.1. The works schedule is given in Appendix 2.1.

5.4.3.1.4 The Predicted Noise Levels (PNL) are evaluated at different heights/storeys for each of the NSRs, the worst case PNLs are presented in Table 5.5. The PNL at Baguio Villas (SR 19) exceeds the assessment criteria during Phases III to VI, while Kong Sin Wan Village (SR27) exceeds during Phases I to IV. It is also observed that the Pok Fu Lam Training Centre (SR 21) will experience a noise level higher than the criterion for examination period over Phases II to VI. Computer generated plots from the “siteNoise” model, sample input files and detailed Predicted Noise Levels are given in Appendix 5.1.

Table 5.5 Advance Works – Predicted Noise Levels (Without Mitigation)

Sensitive Receivers	L _{eq(30min)} dB(A)									
	Phase									
	AW-I	AW-II	AW-III	AW-IV	AW-V	AW-VI	AW-VII	AW-VIII	AW-IX	AW-X
SR2	NA	NA	NA	NA	NA	NA	NA	NA	--	NA
SR3A	37.9	40.5	42.3	42.3	40.6	41	37.2	36.1		35.8
SR4	NA	NA	NA	NA	NA	NA	NA	NA	--	NA
SR5	72.4	72.8	73.4	73.3	69.3	69.3	65.3	64.5	--	63.4
SR6	NA	NA	NA	NA	NA	NA	NA	NA	--	NA
SR7	62.4	65.1	67.8	67.6	69.3	69.2	65.4	64.6	--	63.6
SR8	62.1	61.2	64.6	65.1	65.8	62.8	63.6	61.1	--	62.2
SR9	NA	NA	NA	NA	NA	NA	NA	NA	--	NA
SR10	62.3	65.1	67.4	64.7	64.4	61.4	61.3	58.5	--	61.5
SR11	69.2	69.8	70.5	70.4	66.9	67.1	62.1	61.5	--	60.3
SR12	67.7	68.4	69.2	69.1	66.4	66.3	61.7	60.8	--	60
SR13	66	66.3	67.6	67.2	65.3	65.4	60.9	60	--	58.7
SR19	73.7	74.8	76.3	77.1	78	76.4	72.6	70.7	--	70.1
SR19a	72.0	73.5	75.3	75.9	78	75.3	71.9	69.0	--	69.7
SR19b	67.6	71.1	74.0	75.3	77.8	74.6	71.2	68.2	--	69.4
SR19c	67.7	71.2	74.0	75.3	77.4	74.1	70.8	67.3	--	69.1
*SR21	64.5	67.2 [#]	69.8 [#]	70.2 [#]	70 [#]	67.9 [#]	63.9	61.6	--	63.6
SR22	63.3	66.4	68.2	68.8	67.6	65.7	61.6	59.2	--	61.8
SR23	60.9	64	65.8	65.6	64.7	61	58.9	53.8	--	59.4
*SR24	53.5	54.8	57.6	57	57.2	56.3	53.9	52	--	52.6
*SR25	54.8	52.4	57.4	56.7	56.6	54.7	53.4	50.6	--	52.8
*SR26	48	49.9	51.9	51.2	51.6	48.4	47.8	44.1	--	47
SR27	80.4	80.5	80.6	80.7	71.6	71.9	67.5	67	--	65.3
SR28	61.3	63.3	62.2	63.1	62.5	57.7	56.5	51.2	--	55.3
*SR40	55.2	57.8	60.8	60.6	61.3	57.4	57.1	53	--	56

Notes:

- (1) * denotes school.
- (2) **Bold** figures indicate an exceedance of the acceptable noise limits – Residential 75 dB(A), Schools 70 dB(A) (for normal school hours).
- (3) [#] indicates an exceedance of the noise criterion 65 dB(A) for Schools during examination period.
- (4) -- implies no noise impact (as no equipment during the surcharge period).
- (5) NA denotes the dwellings are not impacted by the work.

5.4.3.2 Main Construction Works for Telegraph Bay Development

5.4.3.2.1 The main construction phase of the development, which is carried out over an estimated 42-month period from January 2001, can be summarised as follows:

- *Jetty/Quay Construction*
- *Building Construction Works* – which includes foundation, pile cap and superstructure construction
- *Main Civil Works* – which include earthwork, drainage, roadwork, geo-technical and stream alignment works
- *G/IC Site Construction*

5.4.3.2.2 The construction schedule, the required PMEs and their associated SWLs are given in Appendix 5.1. For the purpose of this study, the period when the most noise impacts are anticipated is estimated by adding the SWLs of the equipment scheduled to be utilised

during each month. For this construction phase, the worst case period is found to be between months 23 and 24.

5.4.3.2.3 This Study adopts the worst case scenario by assuming that all the plant (except those associated with G/IC construction and roadwork) is on one site at any given time. The G/IC construction will be carried out throughout the construction period, while the order of construction of the access roads is the Southern Access Road, Northern Access Road, Road D1 and Road D2.

5.4.3.2.4 For the purpose of this Study the adopted phases of construction are given in Table 5.6. The five different sites and three access roads are illustrated in Figure 5.9.

Table 5.6 Adopted Schedule for the Main Construction Works

Phase 1	Phase 2	Phase 3	Phase 4
Site 1	Site 3	Site 4	Site 5
Site 2			
Southern Access Road	Northern Access Road	Roads D1/D2	

5.4.3.2.5 The Predicted Noise Levels (PNL) for each of the NSRs (worst case) are presented in Table 5.7. The PNLs at HKU Staff Quarters (SR 3), Magnolia Villas (SR 9), Baguio Villas (SR 19), Wah Fu Estate (SR 24), Kong Sin Wan Tsuen (SR 27), Boarding Clinic and Veterinary Clinic (SR 28) and Pui Ying Secondary School (SR 40) exceeded the assessment criteria. Computer generated plots from the 'siteNoise' model, sample input files and detailed Predicted Noise Levels are given in Appendix 5.1.

Table 5.7 Main Development Construction Works – Predicted Noise Levels (Without Mitigation)

NSR No.	Phase 1	Phase 2	Phase 3	Phase 4
	$L_{eq(30min)}$ dB(A)	$L_{eq(30min)}$ dB(A)	$L_{eq(30min)}$ dB(A)	$L_{eq(30min)}$ dB(A)
SR2	not affected	43.7	43.7	30.6
SR3	36.9	77.9	77.9	37.3
SR4	not affected	73.1	73.1	not affected
SR5	64.8	67.3	66.3	66.3
SR6	not affected	63.7	63.7	not affected
SR7	59.9	70.8	70.4	65.8
SR8	54.4	74.6	74.6	69.2
SR9	not affected	78.4	78.4	not affected
SR10	37.8	68.8	69.1	45.2
SR11	67.4	63.1	63.7	62.4
SR12	66.1	62.2	62.4	60.7
SR13	65.0	61.5	60.6	59.9
SR19	73.9	73.9	75.5	74.9
SR19a	71.6	73.5	76.5	76.0
SR19b	67.7	73.2	77.4	77.0
SR19c	67.3	72.9	77.9	77.5
*SR21	67.1 [#]	69.4 [#]	71.4	70.3
SR22	68.2	67.1	70.7	70.3
SR23	68.1	64.3	65.4	72.0
*SR24	71.6	54.1	54.9	76.1
*SR25	67.6 [#]	38.2	42.6	68.7 [#]
*SR26	65.4	49.2	48.5	67.1 [#]
SR27	79.5	70.3	72.1	71.2
SR28	73.5	52.4	63.9	75.9
*SR40	68.7 [#]	59.6	58.3	73.3

Notes:

- (1) * denotes school.
- (2) **Bold** figures indicate an exceedance of the acceptable noise limits – Residential 75 dB(A), Schools 70 dB(A) (for normal school hours).
- (3) [#] indicates an exceedance of the noise criterion 65 dB(A) for Schools during examination period.

5.4.3.3 Construction of Route 7 (within Telegraph Bay Area only)

5.4.3.3.1 The construction of Route 7, which will be carried out over an estimated 4-year period starting in August 2003, include the following activities:

- Mobilisation and site clearance;
- Construction of grade separated roundabout and slip road;
- Construction of slip road, roundabout structures and their piers;
- Construction of abutments/retaining wall/noise barriers;
- Reclamation, earthworks, surcharging and landscaping;
- Road works; and
- Drainage works.

5.4.3.3.2 The construction schedule along with the proposed equipment and their associated SWLs, are given in Appendix 5.1. The period when the most noise impacts are anticipated is estimated by adding the SWLs of the equipment scheduled to be utilised during the month. During the construction of Route 7, this period is found to be months 29 and 30.

5.4.3.3.3 For the purpose of this assessment, the section of Route 7 relevant to the development has been separated into three parts, assuming that works will only be carried out in one section at a time. Figure 5.10 illustrates these three sections of Route 7, the NSRs within TBD adopted for the assessment is given in Figure 5.2.

5.4.3.3.4 The Predicted noise Levels (PNL) for each of the NSRs (worst case) are presented in Table 5.8. The results indicate exceedance in noise criteria at all of the NSRs during at least one of the construction phases of Route 7 in the Telegraph Bay Area. Computer generated plots from the “siteNoise” model, sample input files and detailed Predicted Noise Levels are given in Appendix 5.1.

Table 5.8 Construction of Route 7 – Predicted Noise levels (Without Mitigation)

NSR No.	Phase 1 L _{eq(30 min)} dB(A)	Phase 2 L _{eq(30 min)} dB(A)	Phase 3 L _{eq(30 min)} dB(A)
120	64.4	77.1	76.5
121	64.7	76.7	not affected
*208	42.7	69.0 [#]	74.5
*209	53.7	67.9 [#]	59.9
301	68.4	80.3	71.4
302	67.2	79.7	71.1
305	69.8	81.0	70.0
306	70.1	81.1	69.7
401	872.4	83.7	68.0
402	72.6	83.6	67.8
409	75.9	82.1	not affected
410	76.3	82.2	65.9
510	79.9	71.8	60.6
514	79.2	70.8	55.0
519	83.0	69.6	54.5
520	82.9	62.3	42.8
521	80.9	not affected	not affected
522	78.0	not affected	not affected

Note:

(1) * denotes school.

(2) **Bold** figures indicate an exceedance of the acceptable noise limits – Residential 75 dB(A), Schools 70 dB(A) (for normal school hours).

(3) [#] indicates an exceedance of the noise criterion 65 dB(A) for schools during examination period.

5.4.4 Mitigation Measures

5.4.4.1 The predicted results indicate that the construction activities will likely give rise to adverse noise impacts upon some of the identified noise sensitive receivers. Noise mitigation measures are required, these are discussed in the following sections.

5.4.4.1 Adoption of Quiet Plant

5.4.4.1.1 Powered mechanical plant with lower SWLs than that specified in GW-TM are known to be available. Whilst specifying particular plant models can be too restrictive to Contractors’ preferred construction methods, it is reasonable to set noise performance specifications for identified types of PME. Nevertheless, the Contractor is required to deploy quiet plant on site as far as practicable.

5.4.4.1.2 BS 5228: Part 1:1997 “Noise Control on Construction and Open Sites”, Table B.1 gives methods of reducing sound levels from construction plant, extracts of which are given in Table 5.9.

Table 5.9 Methods of Reducing Sound Levels from Construction Plant

Plant	Max SWL dB(A)	Identification Code from GW-TM	Methods of Reducing Sound levels	Sound Reduction dB(A)
Truck with Crane	112	CNP 048	Fit more efficient exhaust sound reduction equipment. Manufacturer’s enclosure should be kept shut.	5 to 10
Bulldozer	115	CNP 030	Fit more efficient exhaust sound reduction equipment. Manufacturer’s enclosure should be kept shut.	5 to 10
Pneumatic Breaker	122	CNP 027	Fit suitably designed muffler or sound reduction equipment to reduce noise without impairing machine efficiency (ensuring all leaks in air line are sealed). Use dampened bit to eliminate ringing.	Up to 15
Backhoe	112	CNP 081	Fit more efficient exhaust sound reduction equipment. Manufacturer’s enclosure should be kept shut.	5 to 10
Dump Truck	117	CNP 067	Fit more efficient exhaust sound reduction equipment. Manufacturer’s enclosure should be kept shut.	5 to 10
Drilling/ Piling Rig	115	CNP 165	Fix more efficient sound reduction equipment or exhaust. Acoustically dampen panels and covers. Manufacturer’s engine panels should be kept closed where intended.	5 to 10
Compressor	102	CNP 002	Acoustically dampen metal casing and fit more efficient sound reduction equipment.	Up to 10
Generator	108	CNP101	Acoustically dampen metal casing and fit more efficient sound reduction equipment.	Up to 10
Tower Crane	95	CNP 049	Fit more efficient exhaust sound reduction equipment. Manufacturer’s enclosure should be kept shut.	5 to 10

5.4.4.2 Portable Acoustic Barriers

5.4.4.2.1 An overall sound reduction of up to 10 dB(A) for PMEs can be achieved with the use of portable acoustic barriers (EPD, 1989). For maximum effectiveness, the barrier should be placed as close to the noise source as possible and the material should have a minimum surface mass of 7 kg/m². The length of the barrier should be at least five times its height, and the height should be such that no part of the noise is visible from the NSR being protected.

5.4.4.3 Temporary Noise Barriers

5.4.4.3.1 Hoarding around site boundaries will provide some partial screening of plant noise from the nearby NSRs. The attenuation will be most effective if there are no gaps or openings in the hoarding. As hoarding locations cannot be clearly defined at this stage, the assessment has not taken into account potential benefits from the screening effects of hoarding.

5.4.4.4 *Good Site Practices*

5.4.4.4.1 In addition to the above mitigation measures, the good site practices listed below should be adopted by all the contractors to further mitigate any residual impacts. Although the noise mitigating effects are not easily quantifiable, and the benefits are specific to site and operation condition, good site practices are easy to implement and do not interrupt with works schedule.

- *Siting of Equipment* – noisy equipment should be sited as far away as possible from any NSRs. Advantage should be taken of the screening effect of material stockpiles and temporary structures such as site offices.
- *Scheduling of Work* – machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum.
- *Maintenance of Equipment* – regular maintenance of plant will reduce noise emissions. This includes lubricating moving parts, tightening loose parts and replacing worn out components.

5.4.5 Residual Impacts

5.4.5.1 Prediction of mitigated noise levels are presented in the following sections. Various mitigation measures for different construction phases are proposed. Worst case noise levels are presented in the tables and noise levels at other elevations are given in Appendix 5.1.

5.4.5.1 *Advance Works for Telegraph Bay Development*

5.4.5.1.1 As highlighted in Table 5.5, there will likely be some adverse impacts at Baguio Villas, Pok Fu Lam Training School and Kong Sin Wan Tsuen during the first six phases of advance works. Models have been re-run to derive the appropriate measures for ameliorating the adverse noise impacts during these phases (I to VI). With adoption of quiet plant and a 3m barrier (or site hoarding) at the northern boundary of Site 1 (Figure 5.11), the noise criteria are met at all the identified NSRs (Table 5.10).

Table 5.10 Advance Works – Predicted Noise Levels (With Mitigation – Adoption of Quiet Plant and 3m barrier along northern boundary of Site 1)

Sensitive Receivers	$L_{eq(30min)}$ dB(A)					
	AW-I	AW-II	AW-III	AW-IV	AW-V	AW-VI
SR2	NA	NA	NA	NA	NA	NA
SR3A	35.1	36.8	38	38	35.8	36.1
SR4	NA	NA	NA	NA	NA	NA
SR5	68.6	68.9	69.4	69.3	64.1	64.2
SR6	NA	NA	NA	NA	NA	NA
SR7	57.7	60.3	62.9	62.8	64.1	64.1
SR8	57.6	57.1	60.3	60.8	60.6	58.3
SR9	NA	NA	NA	NA	NA	NA
SR10	57.5	60.2	62.5	60.5	59.5	56.9
SR11	64.9	65.3	65.9	65.8	61.5	61.8
SR12	63.5	64	64.7	64.6	61	60.9
SR13	62	62.3	63.2	62.9	59.9	59.9
SR19	70.4	71.1	72.3	72.9	72.8	71.3
SR19a	68.4	69.6	70.9	71.5	72.7	70.3
SR19b	62.2	66.0	68.8	70.3	72.6	69.7
SR19c	62.5	66.1	68.8	70.2	72.2	69.2
*SR21	59.2	62.3	64.7	65.2	64.8	63
SR22	58	61.3	63.1	63.7	62.5	60.8
SR23	55.7	58.9	60.7	60.6	59.5	56.2
*SR24	50.4	51.4	54.1	54.1	53.4	52.7
*SR25	50.4	49.3	53.2	53.2	52.2	50.9
*SR26	43.5	45.3	47.4	47	46.7	44.1
SR27	64.6	64.7	65.1	65.2	59.2	58.7
SR28	57.6	59	58.6	59.2	57.4	53.6
*SR40	51	53.2	56.1	56	56.2	52.9

Note:

- (1) * denotes school.
- (2) Noise criteria - Residential 75 dB(A), Schools 70 dB(A) (65 dB(A) during examination periods).
- (3) NA denotes the sensitive receivers are not affected by the works.

5.4.5.2 Main Construction Works for Telegraph Bay Development

5.4.5.2.1 With the adoption of quiet plant and a 3m high barrier (or site hoarding) at the northern site boundary of Site 1 to mitigate noise impacts upon Kong Sin Wan Tsuen (Figure 5.11), the noise criteria for residential NSRs as well as schools (during normal school hours only) are met. The predicted mitigated noise levels are given in Table 5.11.

5.4.5.2.2 The 65 dB(A) noise criterion for examination periods are exceeded at Pok Fu Lam Training (SR 21) during Phase 3, and Lui Ming Choi Secondary School (SR 24) and Pui Ying Secondary School (SR 40) during Phase 4. Portable acoustic barriers, as discussed in Section 5.4.4.2, are proposed for the following PME during examination periods for Phases 3 and 4:

- Phase 3 – concrete pumps; and
- Phase 4 – breakers, backhoes, drilling rigs, vibratory pokers, concrete pumps and compressors.

5.4.5.2.3 With the use of portable acoustic barriers during examination periods, the PNLs at SR 21, SR 24 and SR 40 comply with the criterion as set out in the EIA-TM (Table 5.12).

Table 5.11 Main Development Construction Works – Predicted Noise Levels (With mitigation – Adoption of Quiet plant and 3m High Barrier along Northern Site Boundary of Site 1)

NSR No.	Phase 1	Phase 2	Phase 3	Phase 4
	$L_{eq(30\ min)}$ dB(A)	$L_{eq(30\ min)}$ dB(A)	$L_{eq(30\ min)}$ dB(A)	$L_{eq(30\ min)}$ dB(A)
SR2	not affected	37.3	37.3	28.1
SR3	32.0	71.6	71.6	31.0
SR4	not affected	66.8	66.8	not affected
SR5	65.4	60.2	61.9	60.2
SR6	not affected	57.5	57.5	not affected
SR7	56.0	65.0	64.5	58.5
SR8	48.2	68.3	68.3	61.8
SR9	not affected	72.0	72.0	not affected
SR10	32.8	62.5	62.9	40.3
SR11	62.0	58.4	58.4	56.7
SR12	60.5	57.4	57.0	55.1
SR13	59.2	56.5	55.3	54.1
SR19	69.1	69.1	69.9	68.8
SR19a	66.7	68.6	70.3	68.9
SR19b	63.4	68.3	70.9	69.6
SR19c	62.7	67.9	71.4	69.9
*SR21	61.6	64.3	65.6 [#]	63.7
SR22	62.5	61.9	64.9	64.0
SR23	62.4	59.0	59.7	66.4
*SR24	65.4	49.1	49.5	70.3 [#]
*SR25	60.9	32.9	36.9	63.1
*SR26	58.8	43.9	43.1	61.6
SR27	65.9	60.9	62.5	61.0
SR28	69.0	47.2	58.3	70.7
*SR40	62.8	54.7	53.0	67.7 [#]

Note:

- (1) * denotes school.
- (2) Noise criteria– Residential 75 dB(A), Schools 70 dB(A) (65dB(A) during examination period).
- (3) # indicates an exceedance of the noise criterion 65 dB(A) for schools during examination period.

Table 5.12 Main Development Construction Works – Predicted Noise Levels during Examination Periods (With Additional Mitigation – Portable Acoustic Barriers for selected PME)s)

NSR No.	Phase 3	Phase 4
	$L_{eq(30\ min)}$ dB(A)	$L_{eq(30\ min)}$ dB(A)
*SR21	65.4	-
*SR24	-	65.1
*SR40	-	62.6

Note:

- (1) * denotes school.
- (2) Noise criterion for schools - 65 dB(A) during examination period.

5.4.5.3 Construction of Route 7 (within Telegraph Bay Area only)

5.4.5.3.1 With the adoption of quiet plant, the PNLs at all the NSRs in the Telegraph Bay Development meet the noise criteria (except during examination periods) . The PNLs are given in Table 5.13. It is noted that the PNL at SR 208 exceeded the criterion of 65 dB(A) for examination periods during Phase 3 (66.8 dB(A)), therefore acoustic barriers are proposed for breakers, vibratory pokers and concrete pumps. With the incorporation of

acoustic barriers for above PME during examination periods, the PNL at SR 208 is found to be in compliance with the EIA-TM criterion, at $L_{eq(30 \text{ min})}$ 64.2 dB(A).

Table 5.13 Construction of Route 7 – Predicted Noise Levels (With Mitigation – Adoption of Quiet Plant)

NSR No.	Phase 1 $L_{eq(30 \text{ min})}$ dB(A)	Phase 2 $L_{eq(30 \text{ min})}$ dB(A)	Phase 3 $L_{eq(30 \text{ min})}$ dB(A)
120	57.4	69.4	69.6
121	57.7	68.1	not affected
*208	32.7	60.9	66.8 [#]
*209	46.8	59.9	55.6
301	61.3	71.9	61.7
302	59.4	71.2	64.1
305	62.9	72.5	62.9
306	63.2	72.7	62.6
401	65.7	75.4	60.8
402	65.9	75.4	60.6
409	69.6	74.9	not affected
410	70.1	75.1	57.9
510	72.5	64.4	53.9
514	71.9	63.4	50.4
519	75.0	62.1	49.9
520	74.7	53.8	32.8
521	72.3	not affected	not affected
522	69.9	not affected	not affected

Note:

(1) * denotes school.

(2) Noise criteria– Residential 75 dB(A), Schools 70 dB(A) (65dB(A) during examination period).

(3) # indicates an exceedance of the noise criterion 65 dB(A) for schools during examination period.

5.4.6 Cumulative Impacts

5.4.6.1 There will be a 6 month overlap in the works schedule where the main construction works will commence prior to the completion of advance works. The main construction works include the following:

- Site clearance for Site 5, the Southern Access Road and the Northern Access Road; and
- Submarine outfall dredging.

5.4.6.2 Given that the above works are to be carried out in areas outside of the advance works area, the NSRs which will be affected by the main works will differ from those during the advance works. Therefore provided that all proposed mitigation measures are implemented, the cumulative impacts will unlikely be significant.

5.4.7 Off-site Work Areas

5.4.7.1 As discussed in Chapter 2, the off-site work areas will be used for material transit and temporary site offices. Transport Department has limited the number of vehicles to these areas so as to minimise any potential impacts. The preliminary schedules for the off-site work areas are as follows:

- Sandy Bay, WA1 – construction vehicle: 12 trips/day, private car: 6 trips/day; and

- Ap Lei Chau, WA2 – construction vehicle: 36 trips/day, private car: 18 trips/day, derrick barge: 2-3 trips/day, 2 passenger boats: 2-3 trips/day.

5.4.7.2 The existing peak traffic flow on Sandy Bay Road, which is adjacent to WA1, is 368 veh/hr¹; and the existing peak traffic flow for the road adjacent to WA2, Lee Nam Road, is 638 veh/hr². Given the limited number of vehicle movement, i.e. which is not more than 36 trips/day, the increase in the hourly traffic movement due to the operation of the off-site work area will not be more than 4 trips/hr. The increase in traffic flow is insignificant when compare to the current conditions. This is unlikely to cause any significant increase in the traffic noise levels at the nearby sensitive receivers.

5.5 Operation Phase Noise Impacts

5.5.1 Identification of Noise Impacts

5.5.1.1 The main noise source during the operational phase will be generated from the traffic on nearby road network. This includes traffic on the existing Victoria Road, as well as on the new roads, i.e. proposed access roads to the study site, Route 7 and its associated slip roads. the Telegraph Bay Development (TBD) will be ready for occupation in Year 2004 and Route 7 will be commissioned in Year 2007. The following road traffic noise impact assessments are performed for the Study:

- Traffic noise impacts upon nearby sensitive receivers from traffic in TBD at year 2019 to determine further requirements in mitigation measures; and
- Traffic noise impacts upon TBD at Year 2022 (15 years after the commissioning of Route7).

5.5.1. Other operational noise sources will include plant noise from the proposed sewage treatment works (STW) and WSD pumping station, as well as any other chillers, ventilation fans, emergency generators associated with G/IC facilities.

5.5.2 Assessment Methodology

Traffic Noise

5.5.2.1 The potential traffic noise impacts affecting the identified NSRs are evaluated with the use of the computer model "roadNoise", which implements the calculation methods prescribed in "Calculation of Road Traffic Noise (CRTN)". Future worst case L_{10(1hr)} traffic noise levels are predicted at the NSRs based on the peak hourly traffic data provided by the Traffic Consultant, MVA (Asia) Limited. The traffic data is given in Appendix 5.2.

5.5.2.2 The road traffic noise criteria given in the EIA-TM is L_{10(1hr)} 70 dB(A) of residential premises and L_{10(1hr)} 65 dB(A) for educational premises.

5.5.2.3 The NSRs at the proposed development are presented in Figures 5.3 to 5.7, with the preliminary typical floor plans being given in Figures 5.12 and 5.13. As the future major noise source impacting the proposed development is the road traffic on Route 7, residential

¹ Data obtained from Traffic Consultant, MVA Hong Kong Limited.

² A Further Review of the Forecast Percentage of Heavy Vehicles on Lee Nam Road, Halcrow Fox and Associates, July 1992.

towers at Sites 3 and 4 have been set back 15m from the road. Furthermore, 12m high podiums have been proposed at residential sites 1, 4 and 5 to further mitigate traffic noise directly. Due to height constraints at Site 3, no podium has been proposed in order to maximise the number of storeys to twelve. The number of residential units in each site is given in Table 5.14.

Table 5.14 Number of Residential Units in Each Site

Site	No. of Residential Units
Site 1	684
Site 3	336
Site 4	1036
Site 5	544
Total	2600

5.5.2.4 The layout of Site 2 has posed some constraints on the location of the school, buffer zones have been maximised between the school and the sewage treatment works, as well as between the school and Route 7. The distances between the school and the STW and Route 7 are approximately 38m and 35m, respectively.

5.5.2.5 With the completion of the SSDS in 2007, the CEPT in Site 2 will be decommissioned and replaced by a school. Road noise impact assessment will also be carried out for the future school.

Fixed Noise Sources

5.5.2.6 For fixed noise sources the EIA-TM noise criteria is 5 dB(A) below the Acceptable Noise Levels. For planning purposes, the Area Sensitive Rating (ASR) for the development is assumed to be 'B' as Route 7 cannot be classified as an "influencing factor" before its commissioning or the qualifying requirement under the relevant TM is reached. The ANL-5 dB(A) for the study is therefore 60 dB(A) (0700 to 2300 hours) and 50 dB(A) (2300 to 0700 hours). As detailed sound power levels of plant are not currently known, performance specifications will be given instead(section 5.5.6).

5.5.2.7 In any event, the Area Sensitive Rating (ASR) assumed here is for indicative assessment only given the details of plant layout are not available and the buildings layout is only provisional.

5.5.2.8 It should be noted that fixed noise sources are controlled under section 13 of the NCO. Nothing in this Report shall bind the Noise Control Authority in assessing noise from these sources upon receipt of complaints. The Authority will assess the noise impacts based on the contemporary conditions/situations.

5.5.3 Impact Prediction

5.5.3.1 Predicted traffic noise levels at residential sites for year 2022 are given in Table 5.15 It is noted that the noise criterion of 70 dB(A) is exceeded at all of the sites. The highest percentage exceedance is predicted at 48.2% (Site 5), with the highest noise level at 78 dB(A) (Sites 3 and 4).

5.5.3.2 NSRs at the school in Site 2 will likely be adversely impacted by traffic noise from Route 7. Table 5.16 shows that the highest predicted noise level exceed the criterion of 65 dB(A) by 10.5 dB(A), i.e. at 75.5 dB(A).

5.5.3.3 Detailed predicted noise levels, “road Noise” computer plots and sample files are given in Appendix 5.2.

Table 5.15 Summary of Predicted Traffic Noise Levels at Residential Sites for Year 2022 (Without Mitigation)

L _{10(1hr)} dB(A)	Site 1		Site 3		Site 4		Site 5	
	No. of units	%	No. of units	%	No. of units	%	No. of units	%
71	40	5.8%	18	5.4%	34	3.3%	42	7.7%
72	18	2.6%	15	4.5%	37	3.6%	83	15.3%
73	8	1.2%	13	3.95%	103	9.9%	55	10.1%
74	2	0.3%	8	2.4%	86	8.3%	38	7.0%
75	19	2.8%	10	3.0%	33	3.2%	13	2.4%
76	-	-	20	6.0%	26	2.5%	30	5.5%
77	-	-	15	4.5%	37	3.6%	1	0.2%
78	-	-	3	0.9%	5	0.5%	-	-
Total	87	12.7%	102	30.4%	361	34.8%	262	48.2%

Table 5.16 Predicted Traffic Noise Levels at School (in Site 2) year 2022 (Worst Case and Without Mitigation)

NSR	L _{10(1 hr)} dB(A)
211	69.3
212	69.6
213	70.1
214	70.6
215	71.1
216	72.5
221	70.2
222	69.5
223	69.5
224	69.5
225	69.9
226	70.4

Note:

1. EIA-TM traffic noise criterion for schools - L_{10(1 hr)} 65 dB(A)

5.5.4 Mitigation Measures

5.5.4.1 From the modelling assessments, it is noted that the major noise source impacting the proposed development is traffic on Route 7, therefore direct mitigation measures for the expressway will be proposed. Furthermore, mitigation measures will also be proposed for District Distributor Roads D1 and D2 to abate traffic noise impacts.

5.5.4.2 The following noise mitigation measures are proposed to give 100% noise mitigation at source (Option 1) (Figure 5.14):

- Friction course road surface – on Route 7 (approximately 1462m in length);

- **Partial noise enclosure – on Route 7 (approximately 200m in length);**
- Partial noise enclosure – on Southern Access Road (approximately 36m in length);
- 5.5m high with 3.5m cantilever (at 30° from horizontal) (i.e. a total height of 7.5m) – on roadside of Route 7 (approx. 900m in length), Roads D1 (approx. 175m in length) and D2 (approx. 128m in length);
- 6.0m high vertical barrier with 3.5m cantilever (at 30° from horizontal) (i.e. a total height of 7.5m) – Southern Access Road (approx. 267m in length);
- 6.0m high vertical barrier – on Southern Access Road (approx. 211m in length);
- 5.5m high vertical barrier – on Route 7 (approx. 451m in length);
- 3.5m high vertical barrier on Road D1 (approx. 172m in length);
- 5.0m high vertical barrier – on central reserve of Route 7 (approx. 984m in length);
- 3.0m high vertical barrier – Road D2 (approx. 128m in length) and Route 7 (slip roads) (approx. 559m in length);
- 4.5m high vertical barrier – on Southern Access Road (on the south side of the road to mitigated traffic noise impacts upon nearby NSRs) (approx. 128m in length); and
- 3.0m podium parapet wall with 3.0m cantilever (at 30° from horizontal) – at Towers 2 to 3 in Site 5 (approx. 111m in length).

5.5.4.3 It is noted that if the near-side Route 7 slip roads which access onto Road D2 are constructed in such a way that the supporting walls (on Route 7 side) are vertical, the proposed 5.5m high roadside barrier which extends beneath the interchange would not be required. On the other hand, the barrier would be necessary if the supporting structure is a sloping wall.

5.5.4.4 Traffic noise impact assessment for a second option, where the partial noise enclosure on Route 7 is replaced by 5.5m high vertical barrier with 3.5m cantilever at 30° from horizontal (at roadside and central reserve/median), has also been carried out to give 100% noise mitigation at source (Figure 5.15 - Option 2). The proposed direct mitigation measures are as follows:

- Friction course road surface – on Route 7 (approximately 1462m in length);
- Partial noise enclosure – on Southern Access Road (approximately 36m in length);
- 5.5m high with 3.5m cantilever (at 30° from horizontal) (i.e. a total height of 7.5m) – on roadside of Route 7 (approx. 900m in length), Roads D1 (approx. 175m in length) and D2 (approx. 128m in length);
- **5.5m high with 3.5m cantilever (at 30° from horizontal) (i.e. a total height of 7.5m) – on central reserve/median of Route 7 (approx. 200m in length);**
- 6.0m high vertical barrier with 3.5m cantilever (at 30° from horizontal) (i.e. a total height of 7.5m) – Southern Access Road (approx. 267m in length);
- 6.0m high vertical barrier – on Southern Access Road (approx. 211m in length);
- 5.5m high vertical barrier – on Route 7 (approx. 451m in length);
- 3.5m high vertical barrier on Road D1 (approx. 172m in length);
- 5.0m high vertical barrier – on central reserve of Route 7 (approx. 984m in length);
- 3.0m high vertical barrier – Road D2 (approx. 128m in length) and Route 7 (slip roads) (approx. 559m in length);
- 4.5m high vertical barrier – on Southern Access Road (on the south side of the road to mitigated traffic noise impacts upon nearby NSRs) (approx. 128m in length); and
- 3.0m podium parapet wall with 3.0m cantilever (at 30° from horizontal) – at Towers 2 to 3 in Site 5 (approx. 111m in length).

5.5.4.5 The proposed noise mitigation measures for both Option 1 and Option 2 are feasible and practical, with the only difference being the 200m section along Route 7 being either high

barriers or a semi-enclosure. With both options being viable and of equal suitability in terms of noise mitigation, it is recommended that Option 2 be adopted as it is the least expensive. The sound absorptive surfaces required for barriers in Option 2 are given in Figure 5.15a and include the following:

- Southern Access Road – 4.5m high vertical barrier on southbound direction (approx. 128m in length);
- Road D1 – 5.5m high barrier with 3.5m cantilever on southbound direction, and 3.5m high barrier on northbound direction (approx. 175m in length); and
- Route 7 – 5.5m high barrier with 3.5m cantilever in central reserve (southbound direction only) (approx. 200m in length), and 5m high roadside barrier in southbound direction (approx. 984m in length).

Engineering Issues associated with Noise Barrier Proposals

Route 7 Barriers

- 5.5.4.6 The noise model indicates that for the section of Route 7 adjacent to the housing sites along the reclamation, direct noise mitigation measures are required to be provided, these measures include noise reducing surfacing and noise barriers in the form of either high barriers on the east side of the Aberdeen-bound carriageway, together with a high median barrier; or the use of a ‘semi-enclosure’ to both carriageways extending for a length of some 200 metres adjacent to Site 4. This ‘semi-enclosure’ would comprise a ‘barrier’ on the east side and a ‘roof’ extending over both carriageways. An obstruction would result from use of a continuous noise barrier in the median, or for median column supports for any noise enclosure structure, and this would necessitate a local widening of the Route 7 median to provide 4m clearance on the inside of the curve, a standard required for an expressway.

TBD District Distributor Roads Barriers

- 5.5.4.7 For the Southern Access Road, high noise barriers have been proposed on the inside of the 88m radius bend below Site 5. These are positioned at the back of the proposed D1 verge and Figure 5.16 indicates that the required visibility sight distance desirable minimum requirement from TPDM Volume 2 (of 70m sightline for 50 km/h) may be met with only minor localised widening behind the back of the 3.5m verge and within the sections requiring cutting. To facilitate future maintenance, a 3m wide non-building area open to Government officials for free and 24-hour unrestricted access should be designated within the lots alongside the road. This requirement would be incorporated in the relevant lease conditions.
- 5.5.4.8 The semi-enclosure proposed at Southern Access Road to the east of the access road to Site 5 would extend onto Bridge No 1. The semi-enclosure is feasible from a structural standpoint although it is appreciated that it presents more difficult conditions for maintenance access for HyD for inspection of bridge soffit and bearings and for cleaning and repair of the enclosure cladding. Furthermore, other alternative noise mitigation measures have been explored, including noise barriers, laying of friction course on road surfaces, and building orientation. The Southern Access Road at the noise enclosure section is at 8% gradient with a design speed of 50kph. Under these circumstances, the engine noise of the vehicle would become the dominant noise source. Friction course road surfacing material is only effective for at-grade and high speed roads where the dominant noise source is from the rolling action of tyres on the road surfaces. The effectiveness of

putting barriers with different heights at this section of the Southern Access Road has also been investigated. Because the distance separation between the sensitive receivers and the noise source is very small (less than 15m), the middle and higher levels of the block would still have a direct view of the road. In fact, the model results show that even with a roadside barrier of 5.5m, the middle and upper floors of the isolated tower in Site 5 will still exceed the HKPSG criteria. Due to the topographical constraint of Site 5, the tower in northern part of the Site 5 cannot be set back any further from the Southern Access Road. The topographical constraint of Site 5 also limit the possibility of moving the block to the southern part of Site 5. Besides, the planning objective (for providing 2600 residential flats) also imposes constraints in establishing the building layout. In view of the above, none of these measures are found to be effective or practicable in mitigating noise impacts to acceptable levels.

5.5.5 Residual Impacts

5.5.5.1 *Traffic Noise Impacts upon Telegraph Bay Development*

5.5.5.1.1 The assessment indicated that for both Option 1 and Option 2, there will be no exceedance at the NSRs at Sites 1, 3, 4 and 5. Detailed predicted noise levels, “road Noise” computer plots and sample files are given in Appendix 5.2. Table 5.17 summarises the noise levels predicted as representative NSRs (with and without mitigation measures).

5.5.5.1.2 With the incorporation of the proposed noise mitigation measures (Options 1 and 2) the predicted noise levels for the two schools in Site 2 are found to comply with the $L_{10(1 \text{ hr})}$ 65 dB(A) criterion.

Table 5.17 Predicted Traffic Noise Levels at Representative NSRs (with and without Mitigation Measures)

NSR	Floor	Predicted Noise Level $L_{10}(1 \text{ hr})$ dB(A) at Year 2022		
		Without Mitigation	With Mitigation (Option 1)	With Mitigation (Option 2)
120	12/F	75.1	67.2	67.2
121	12/F	72.7	63.5	63.5
211	5/F	69.3	63.3	63.3
216	5/F	72.5	64.5	64.5
221	5/F	70.2	64.7	64.7
226	5/F	70.4	63.3	63.3
301	12/F	76.1	66.7	66.6
302	12/F	75.7	66.4	66.3
304	12/F	75.4	63.8	63.8
305	12/F	77.3	69.3	68.9
309	12/F	73.3	59.4	57.7
317	12/F	73.4	62.5	62.5
401	18/F	75.9	69.7	69.9
402	18/F	75.8	68.8	69.0
406	32/F	73.4	66.5	66.7
410	15/F	76.4	64.7	65.6
432	19/F	73.7	66.5	68.0
501	1/F	71.9	70.4	70.4
503	3/F	76.2	70.2	70.2
506	29/F	72.2	70.4	70.4
509	26/F	71.8	70.0	70.0
510	11/F	73.5	68.4	68.5
511	10/F	72.3	65.8	65.9
514	8/F	73.1	66.4	66.6
518	18/F	70.9	69.1	69.1
519	14/F	75.4	68.7	68.9
520	14/F	75.7	69.6	69.6
521	14/F	74.3	68.8	68.8
522	14/F	74.0	69.7	69.7
523	14/F	72.2	68.5	68.5

5.5.5.2 *Traffic Noise Impacts Upon Nearby NSRs*

5.5.5.2.1 The contribution of traffic noise impacts upon nearby NSRs from the access roads in the proposed development are evaluated. The following roads are taken into account in this assessment:

- Southern Access Road,
- Northern Access Road,
- Road D1, and
- Road D2.

5.5.5.2.2 The mitigated traffic noise levels at nearby NSRs for Year 2019 are found to comply with the criteria as set out in the EIA-TM, The highest predicted noise levels are given in Table 5.18, and the noise levels on all other floors are given in Appendix 5.2.

Table 5.18 Predicted Traffic Noise Levels at Nearby NSRs from Road Traffic in TBD for Year 2019 (Worst case)

NSR No.	Description	Unmitigated Traffic Noise Level L _{10(1hr)} dB(A)	Mitigated Traffic Noise Level L _{10(1hr)} dB(A)
SR2	Tam Villa	31	31.0
SR3	HKW Staff Quarters	59.2	59.2
SR4	42 Sasson Road	58.9	58.9
SR5	45 Sasson Road	43.1	38.7
SR6	47 Sasson Road	50.8	50.8
SR7	50 Sasson Road	59.7	58.1
SR8	60 Sasson Road	62.3	62.3
SR9	Magnolia Villas	65.4	65.4
SR10	Point Breeze	56.3	56.2
SR11	Carriana Sasson	29.4	29.1
SR12	Stone Manor	35.2	34.6
SR13	Provident Villas	48.9	48.9
SR19	16-18 Baguio Villas	66.6	66.5
SR19a	45-48 Baguio Villas	65.5	65.4
SR19b	45-48 Baguio Villas	64.9	64.9
SR19c	45-48 Baguio Villas	64.1	64
*SR21	Pok Fu Lam Training Centre	56.7	56.7
SR22	Pok Fu Lam Garden	58.7	58.2
SR23	Wah Fu Estate	62	61
*SR24	Lui Ming Choi Secondary School	66.6	62.5
*SR25	Precious Blood Primary School	60.2	58.3
*SR26	Tsui Ching Tong School for the Handicap	57.0	55.3
SR27	Kong Sin Wan Tsuen	51.1	47.7
SR28	Boarding Clinic and Veterinary Clinic	67.3	65.1
*SR40	Pui Ying Secondary School	62.1	60.8

Note:

(1) *denotes school.

(2) Acceptable noise criteria – Residential; 70dB(A), Schools 65dB(A).

5.5.6 Fixed Noise Source

5.5.6.1 Other operational noise sources likely to impact the NSRs is plant breakout noise from the sewage treatment works and the Water Services Department (WSD) pumping station. As the plant schedules are not currently known, a performance specification is given instead. Based on the criteria of ANL-5dB(A) and the distance between the plant and the nearest sensitive receiver, the maximum permissible breakout noise from the plant can be calculated (Table 5.19).

5.5.6.2 For conservative measure, distance attenuation for a point source instead of for an area source is adopted. The distance attenuation equation is give below:

$$\text{Distance Attenuation } dB(A) = 20 \log_{10} r \quad \dots(5.1)$$

Where r = distance between noise source and receiver (m)

Correction factors for façade, tonality and intermittency effect are also taken into account. A standard correction of 3 dB(A) is used for façade effect. Although the octave band frequency sound power levels of plant are currently unknown, correction factors for tonality

and intermittency are adopted in accordance with the IND-TM. Noise generated from plant associated with the STW and pumping station is not anticipated to have impulsive characteristics and therefore a correction for impulsiveness has not been allowed for.

Table 5.19 Breakout Noise Criteria for Sewage Screening Plant and WSD Pump Station

	Sewage Treatment Works	WSD Pump Station
Distance to nearest sensitive receiver, <i>r</i>	28 m	100 m
Distance Attenuation, $20 \log_{10} r$	29 dB(A)	40 dB(A)
<u>Noise Criteria</u>		
• Daytime (0700 to 2300)	60 dB(A)	60 dB(A)
• Night-time (2300 to 0700)	50 dB(A)	50 dB(A)
<u>Correction Factors</u>		
• Façade Effect	3 dB(A)	3 dB(A)
• Tonality	3 dB(A)	3 dB(A)
• Intermittency	3 dB(A)	3 dB(A)
<u>Maximum Allowable Breakout Noise Level</u>		
• Daytime (0700 to 2300)	80 dB(A)	91 dB(A)
• Night-time (2300 to 0700)	70 dB(A)	81 dB(A)

5.5.6.3 As both plants will be in operation 24 hours a day, the maximum permissible “breakout” noise levels are 70 dB(A) for the sewage treatment works and 81 dB(A) for the pumping station. The most effective form of mitigating plant noise is from the source, and therefore it is recommended that local attenuating devices and vibration isolators be used as well as plant room wall insulation, if necessary. In addition, plant noise breakout areas should be directed away from the noise sensitive uses.

5.5.6.4 The maximum breakout noise criteria calculated above is based on an assumed Area Sensitive Rating ‘B’ for the residential development (see Paragraph 5.5.2.6 to 5.5.2.8), therefore the above criteria is only applicable if the rating remains to be ‘B’.

5.6 Conclusions and Recommendations

5.6.1 5.6.1 This assessment has predicted the construction noise impacts associated with the advance works, the construction works of the proposed development and the construction of Route 7 within the Telegraph Bay Area. With the use of quiet plant and a 3m high barrier on the northern site boundary of Site 1, the predicted noise levels at the NSRs at different phases of the construction work meet the stipulated criteria. For examination periods, the use of portable acoustic barriers will be required for selected PMEs to further mitigate any residual impacts upon nearby schools. Therefore, the Study concludes that there will not be any major adverse noise impacts during the construction phases.

5.6.2 Traffic noise impacts have been evaluated for the proposed development for Year 2022. Two options have been proposed, however due to cost-effectiveness the preferred option is the use of a high roadside and central reserve barriers (Option 2) instead of semi-enclosure on Route 7 (Option 1). With the incorporation of extensive direct mitigation measures on Route 7, Roads D1 and D2 and Southern Access Road the 70 dB(A) criterion (for residential) 65 dB(A) criterion (for schools) are met at all identified sensitive receivers.

- 5.6.3 With the incorporation of a 4.5m high barrier along approximately 100m of the Southern Access Road, the traffic noise levels at nearby NSRs are found to comply with the established criteria. Therefore noise impacts from the traffic within the proposed development are considered to be acceptable.
- 5.6.4 Breakout noise criteria for the sewage treatment works and the WSD pumping station have been established. The criteria will form part of the performance specifications for the plants.

5.7 References

British Standards Institution, 1997, BS 5228 : Part 1: 1997 "Noise Control on Construction and Open Sites".

Environmental Protection Department (EPD), 1997, Technical Memorandum on Environmental Impact Assessment Process.

Environmental Protection Department (EPD), September 1996, Technical memorandum on Noise for Construction Work other Than Percussive Piling.

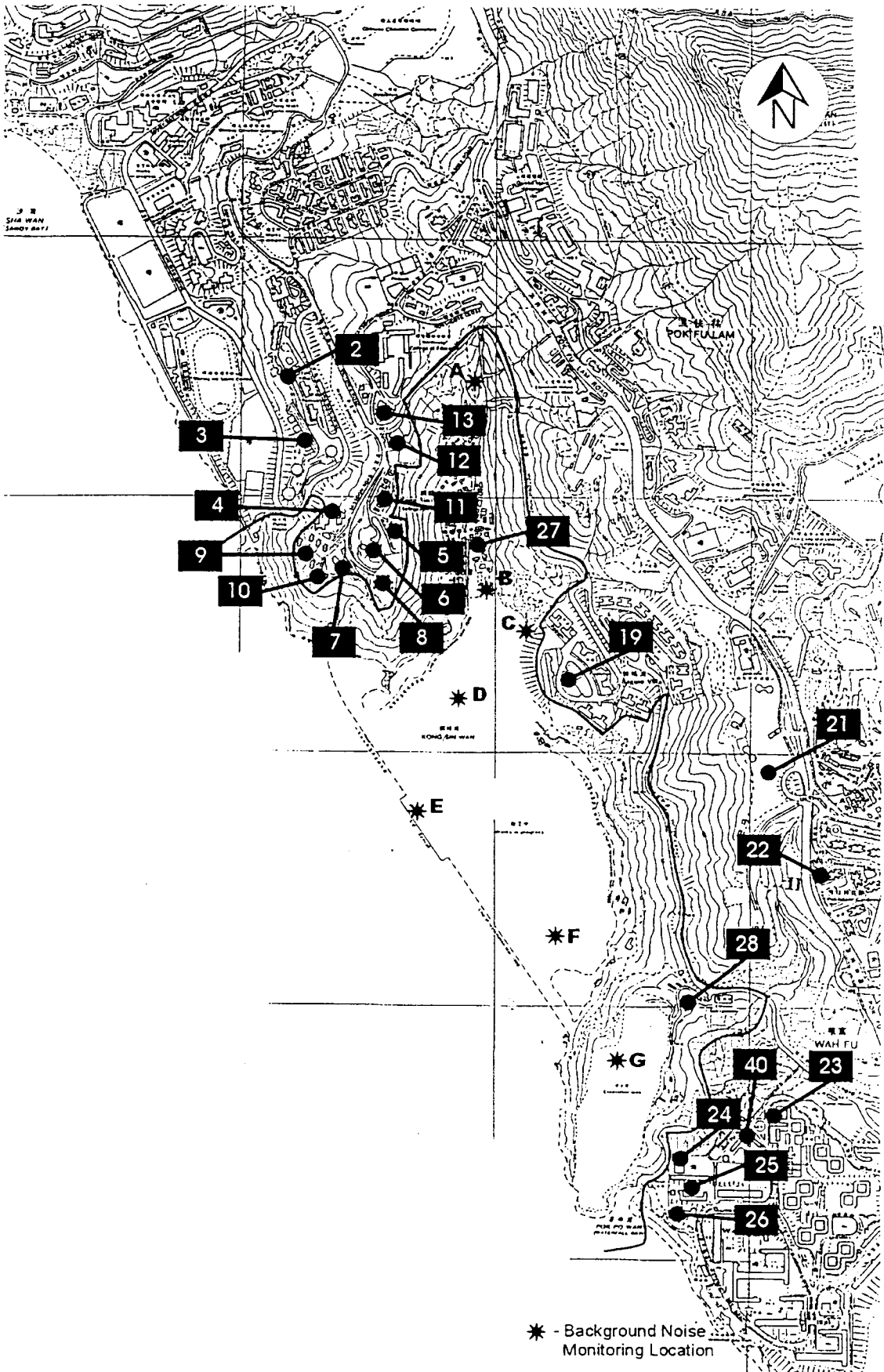
Environmental Protection Department (EPD), July 1989, A Practical Guide for the Reduction of Noise from Construction Works.

Kowloon-Canton Railway Corporation (KCRC), 1998, West Kowloon to Tuen Mun Centre, Contract No TS-900, Environmental Impact Assessment – Final Assessment Report..

Acoustic Terminology

Decibel, dB	-	A dimensionless unit used to express logarithmically the ration of one sound power or pressure to a reference value.
dB(A)	-	The A-weighted decibel is a commonly used unit for measuring environmental noise taking into account the way human ear responds to noise
Sound Power Level, - SWL	-	A measure of the total acoustic power radiated by a given sound source. It is independent of any reference distance or other extraneous factors.
$L_{eq}(T)$	-	Equivalent continuous sound level over a defined time period T
$L_{10}(T)$	-	A time-varying noise level, measured in dB(A), which is exceeded for 10% of the total time period T. Also a typical noise measurement for traffic noise.

Figures



* - Background Noise Monitoring Location

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- ENGINEERING FEASIBILITY STUDY

Noise Sensitive Receivers (NSRs) and
Baseline Monitoring Locations

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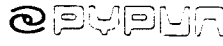
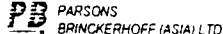
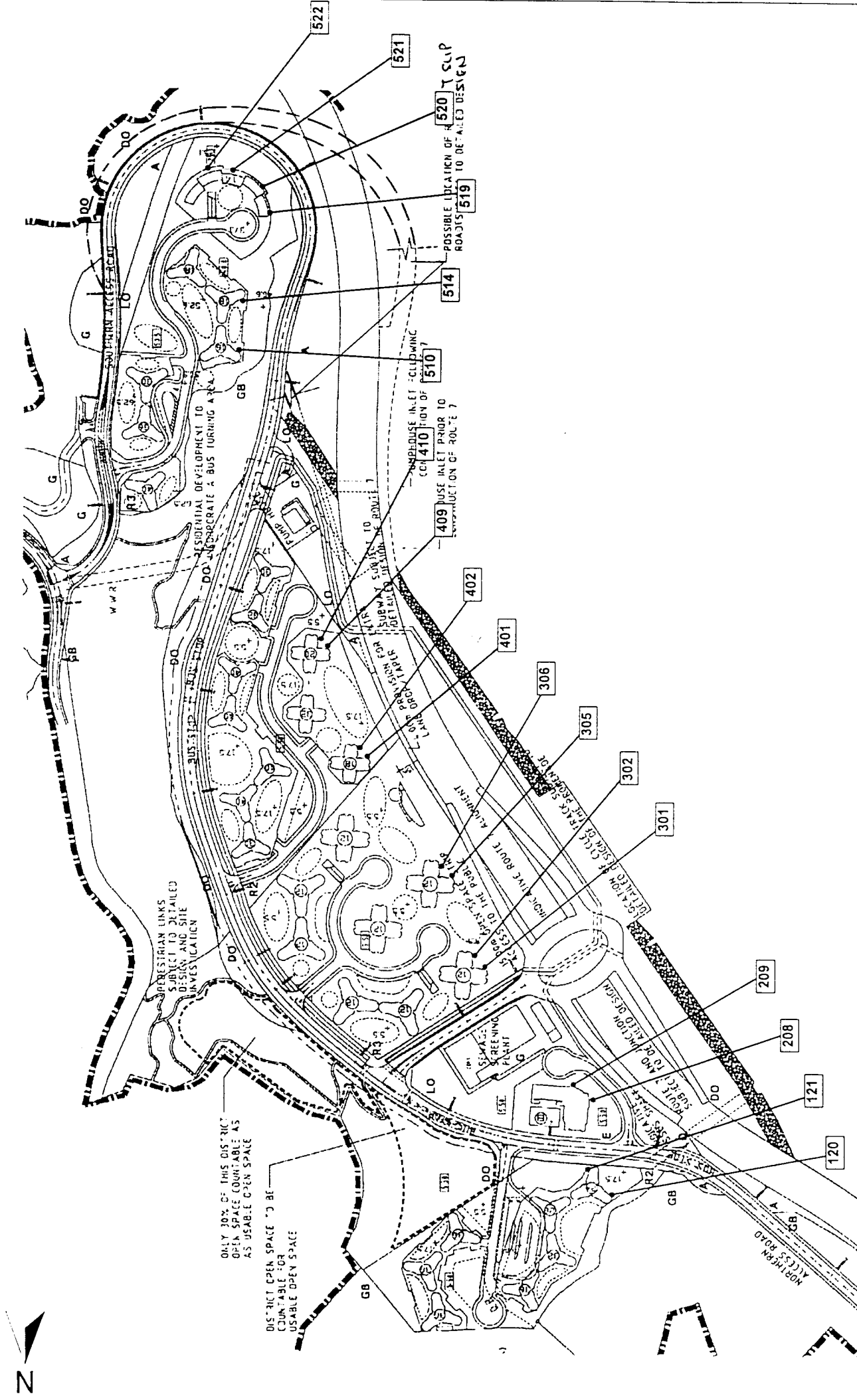
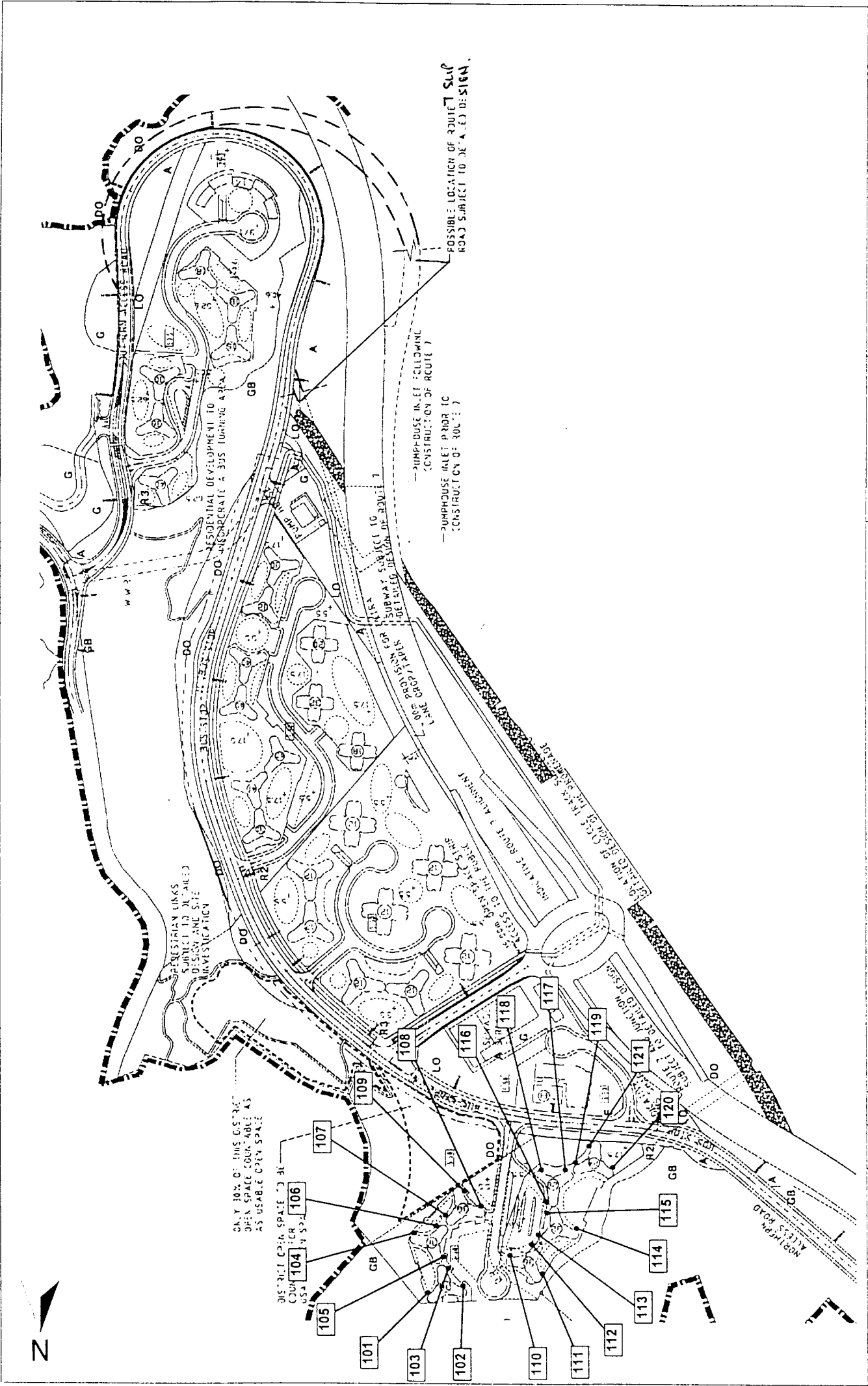
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Figure No.	5.1	Rev.	a
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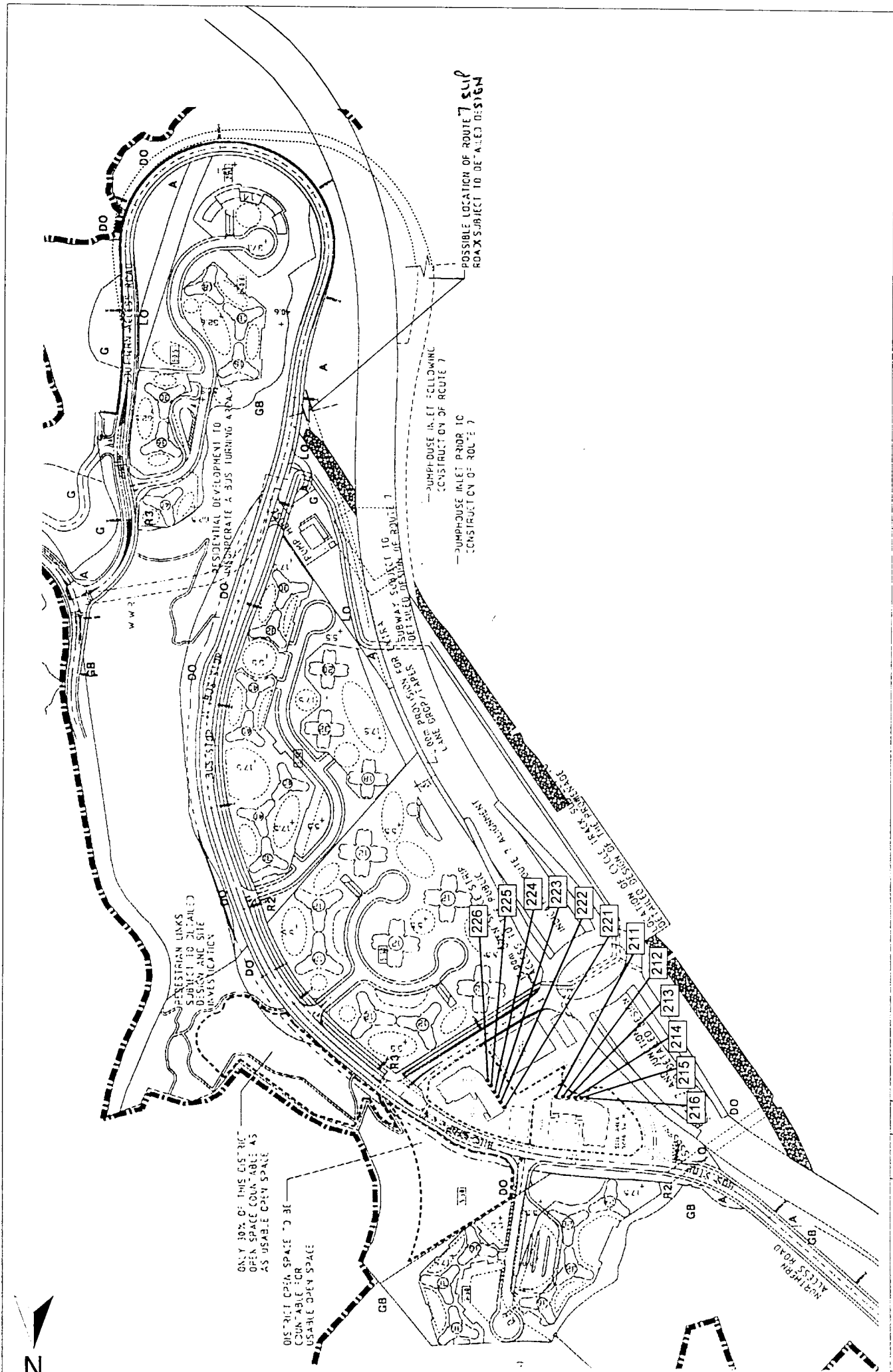


Rev	Description	Approved	Date	AGREEMENT NO. CE 9297 INFRASTRUCTURAL WORKS FOR HOUSING DEVELOPMENT AT TELEGRAPH BAY - ENGINEERING FEASIBILITY STUDY						
				Construction Noise Sensitive Receivers at Proposed Development						
				 TERRITORY DEVELOPMENT DEPARTMENT, HONG KONG AND ISLANDS DEVELOPMENT OFFICE	 PYPUN / PBA JOINT VENTURE	 PYPUN PARSONS BRINCKERHOFF (ASIA) LTD.	Figure No.	5.2	Rev.	1
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Traffic Noise Prediction Locations at Site 1			
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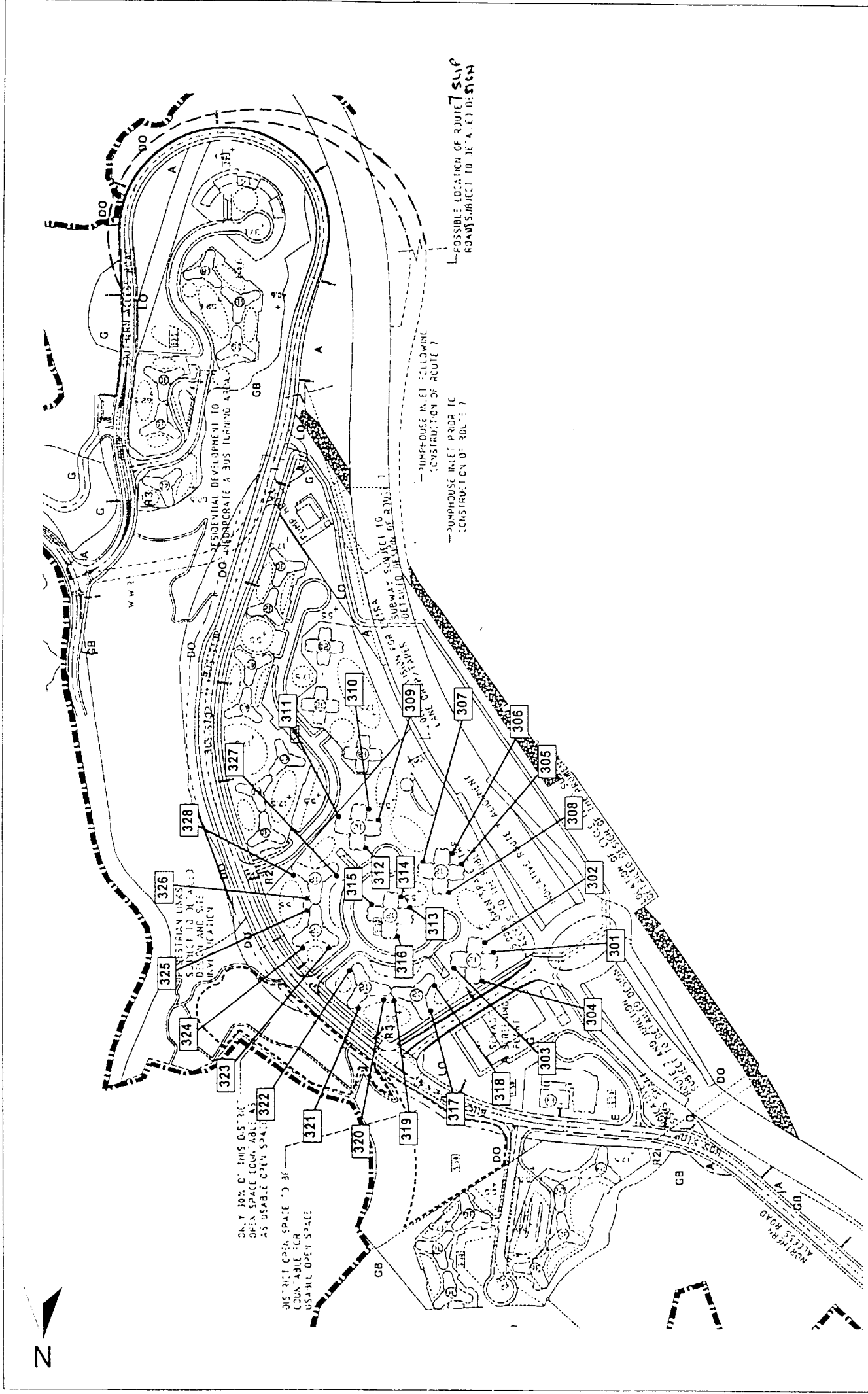
Traffic Noise Prediction Locations at Site 2

Figure No. **5.4**

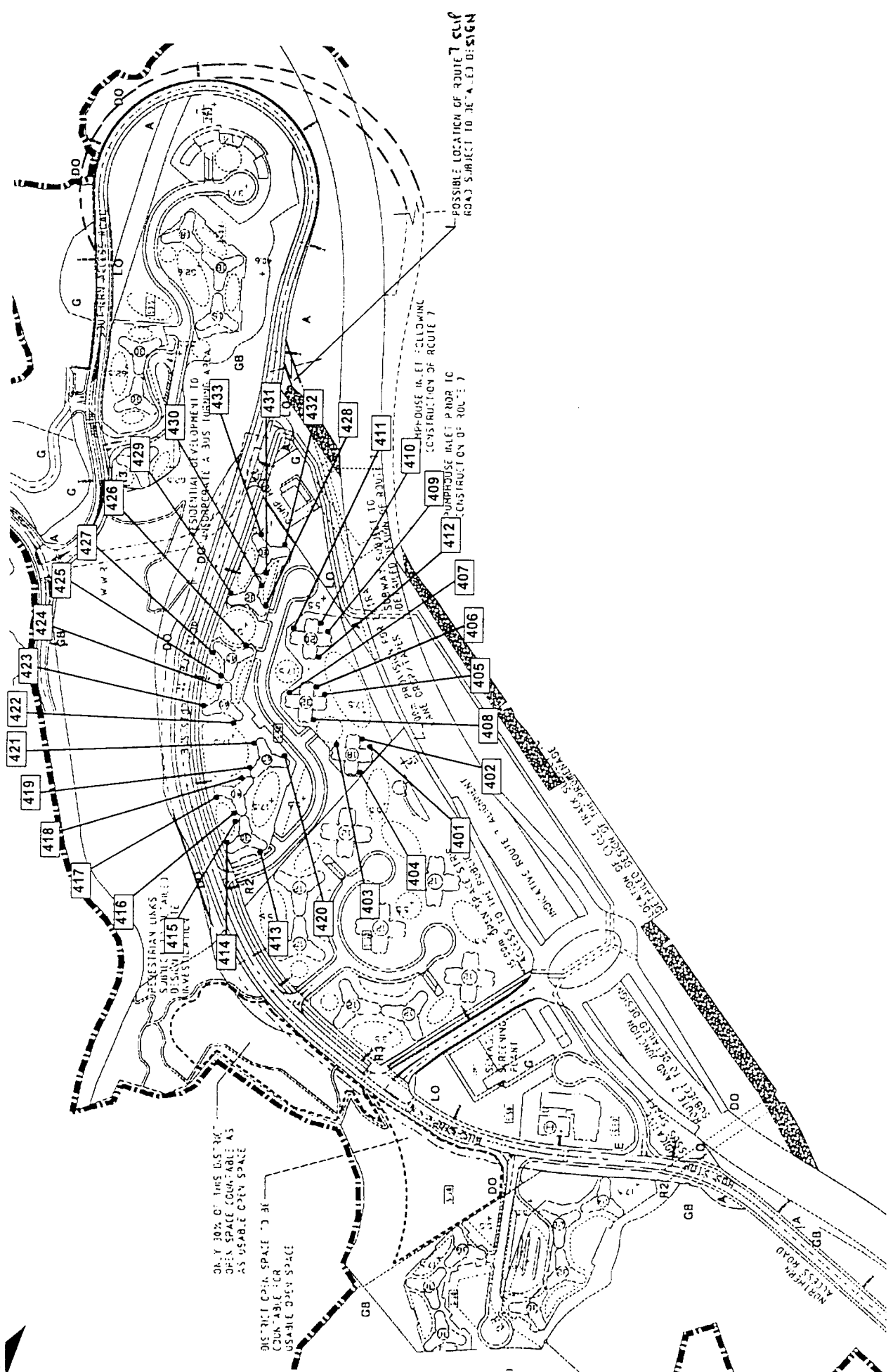
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Traffic Noise Prediction Locations at Site 3			
Description	Approved	Date	



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Traffic Noise Prediction Locations at Site 4		HONG KONG ISLAND AND ISLANDS DEVELOPMENT OFFICE		PYPUN		Designed By		Scale	NTS
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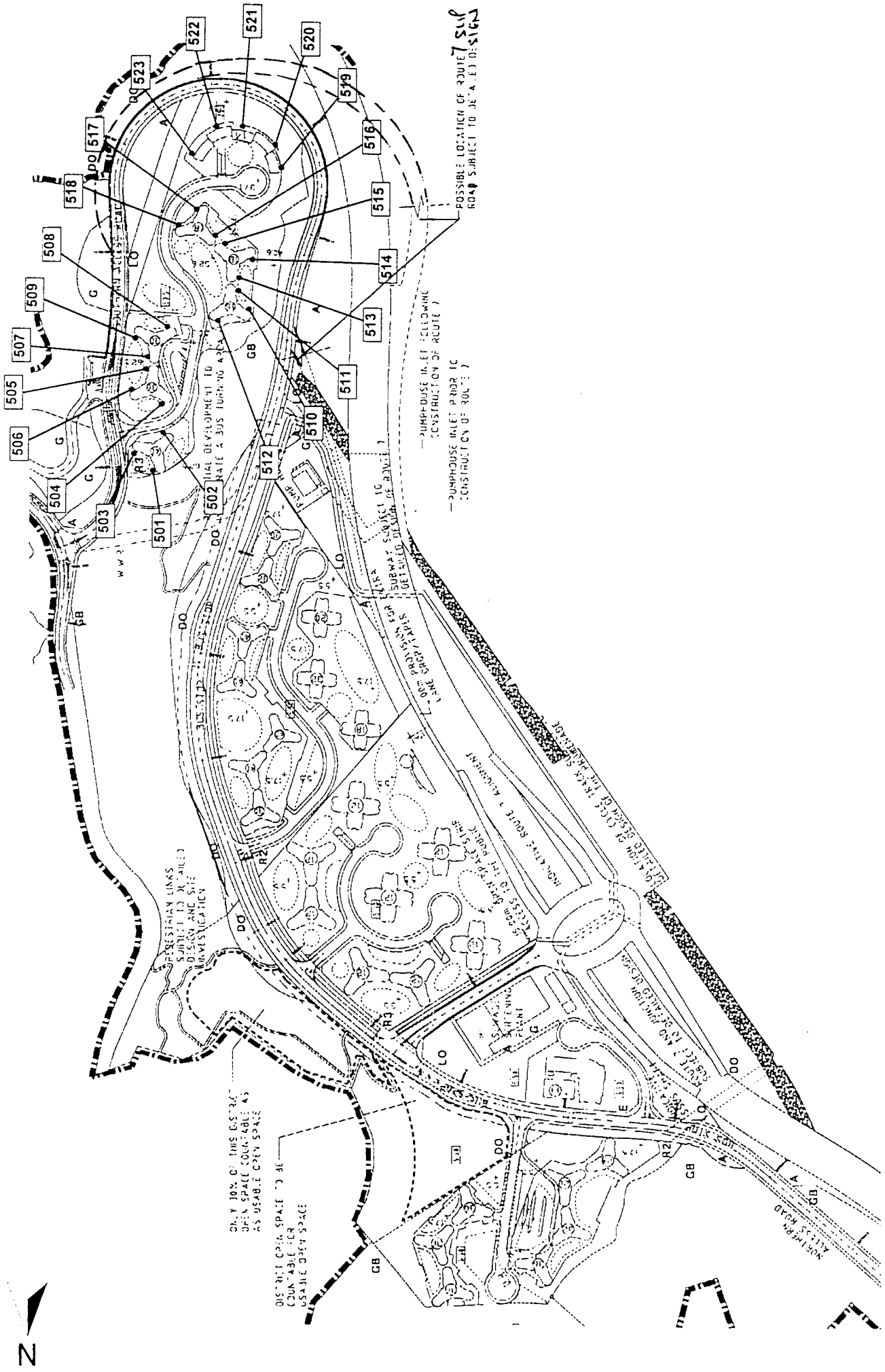


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 Date Jun '99

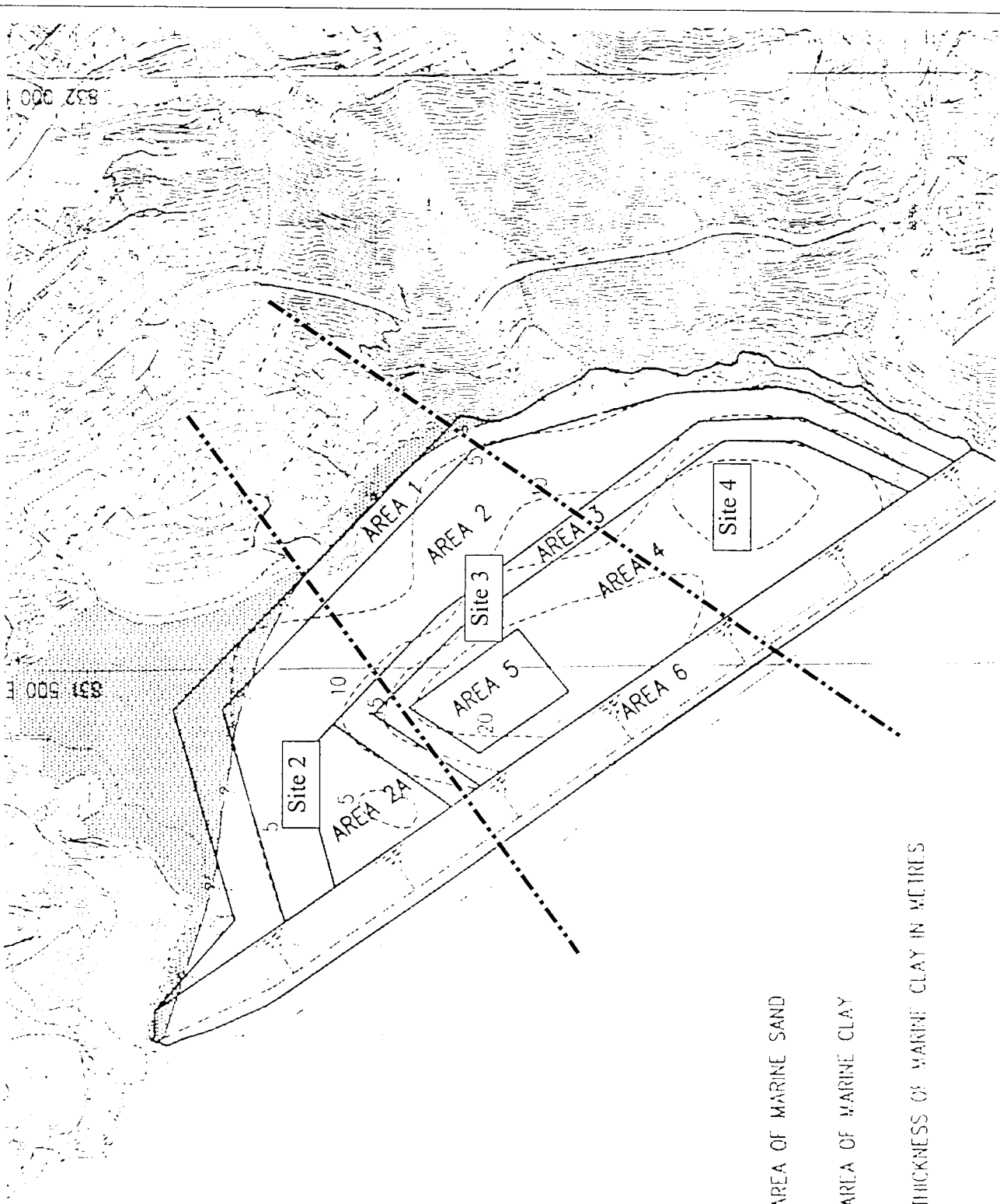
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 ENGINEERING FEASIBILITY STUDY

Traffic Noise Prediction Locations at Site 5




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813 500 N

813 000 N

LEGEND

-  AREA OF MARINE SAND
-  AREA OF MARINE CLAY
-  THICKNESS OF MARINE CLAY IN METRES

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Area of Advance Works

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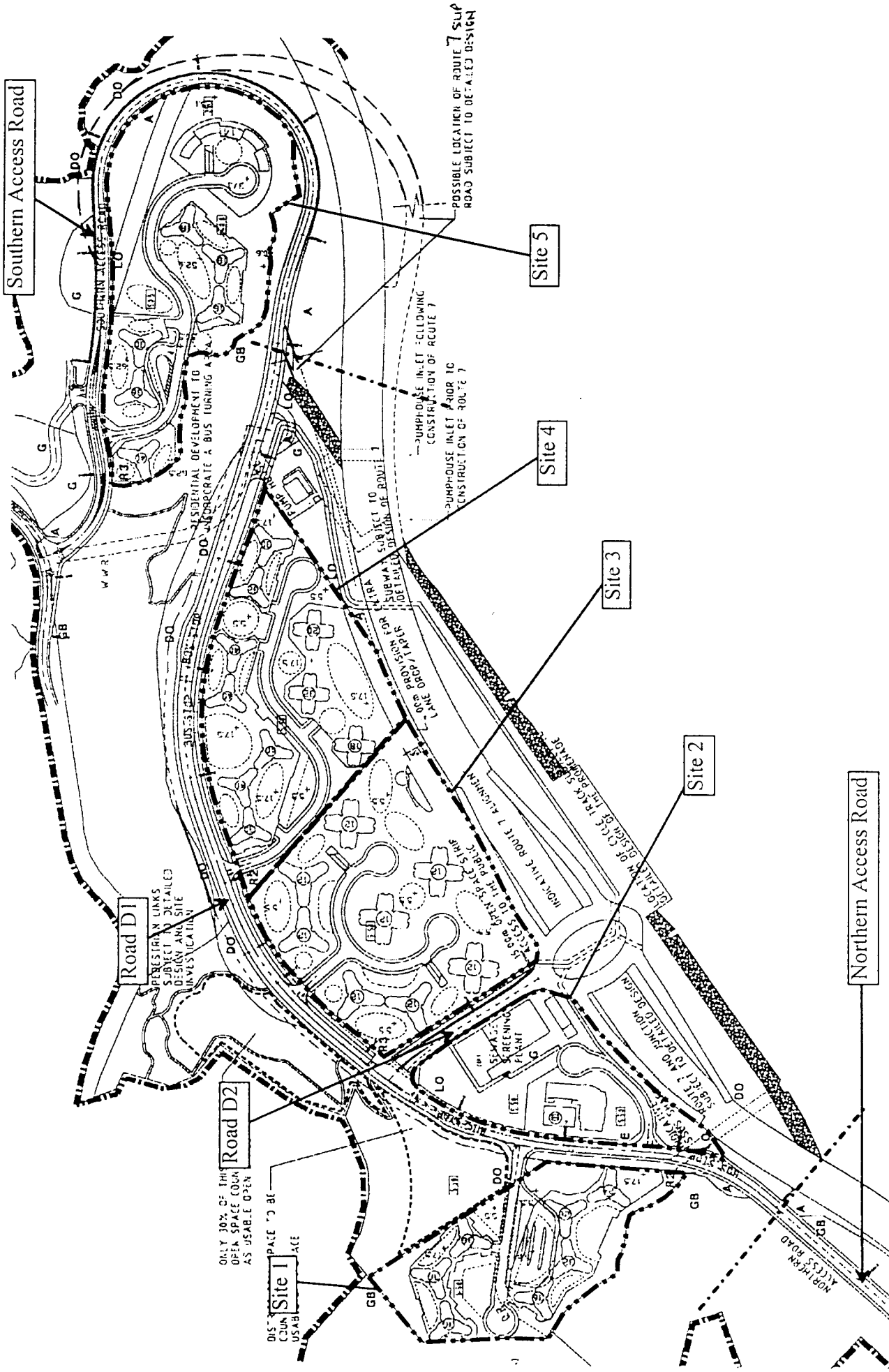
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831 000 F

837 500 F

832 000 F



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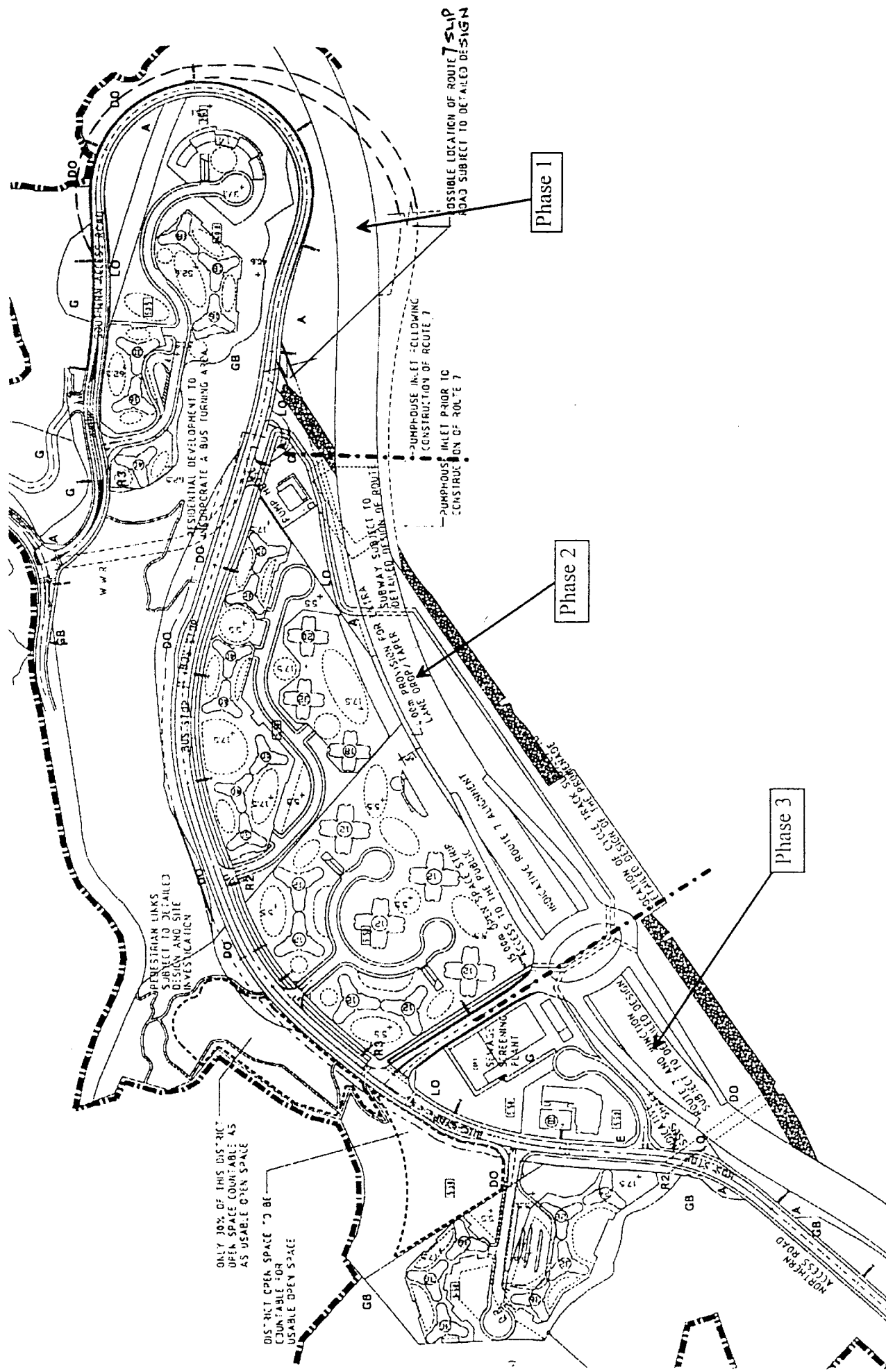
Area of Main Development Works

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Figure No.	5.9	Rev	
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							Designed By	Scale NTS
							Checked By	Date Jan 99

Estimated Phasing of the Construction of Route 7

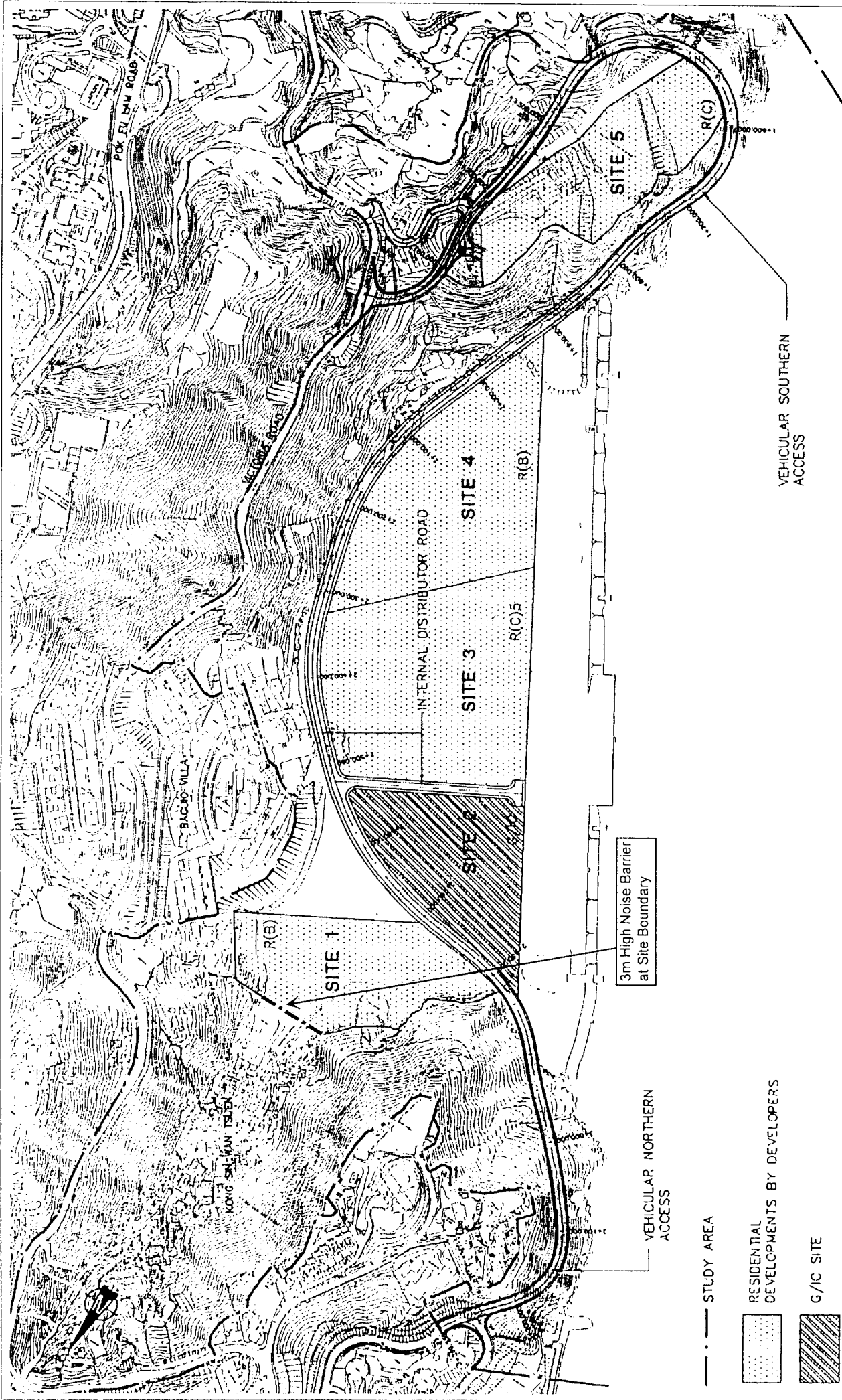


Figure No.	5.11	Rev.	
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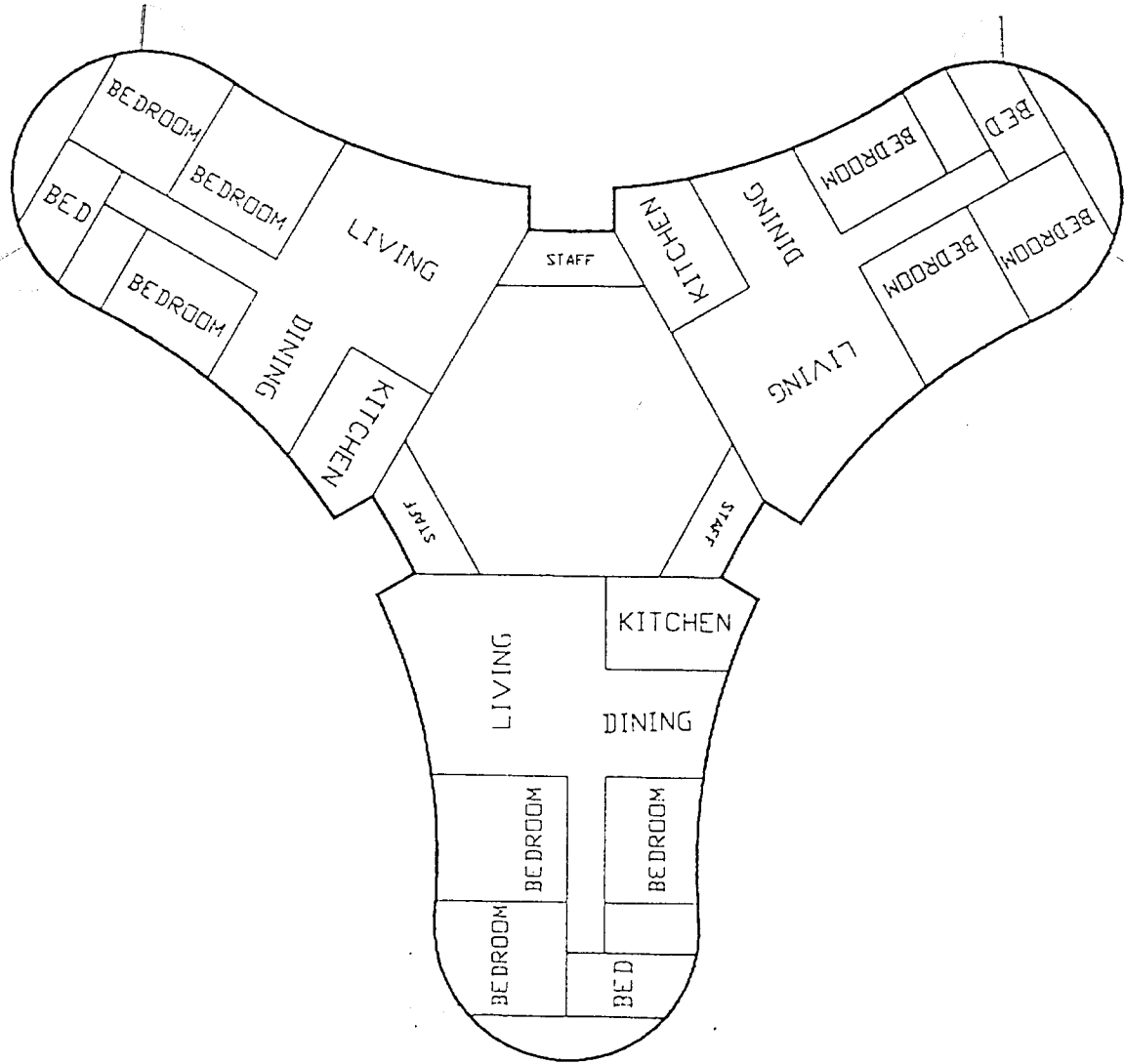
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Construction Noise Mitigation Measures


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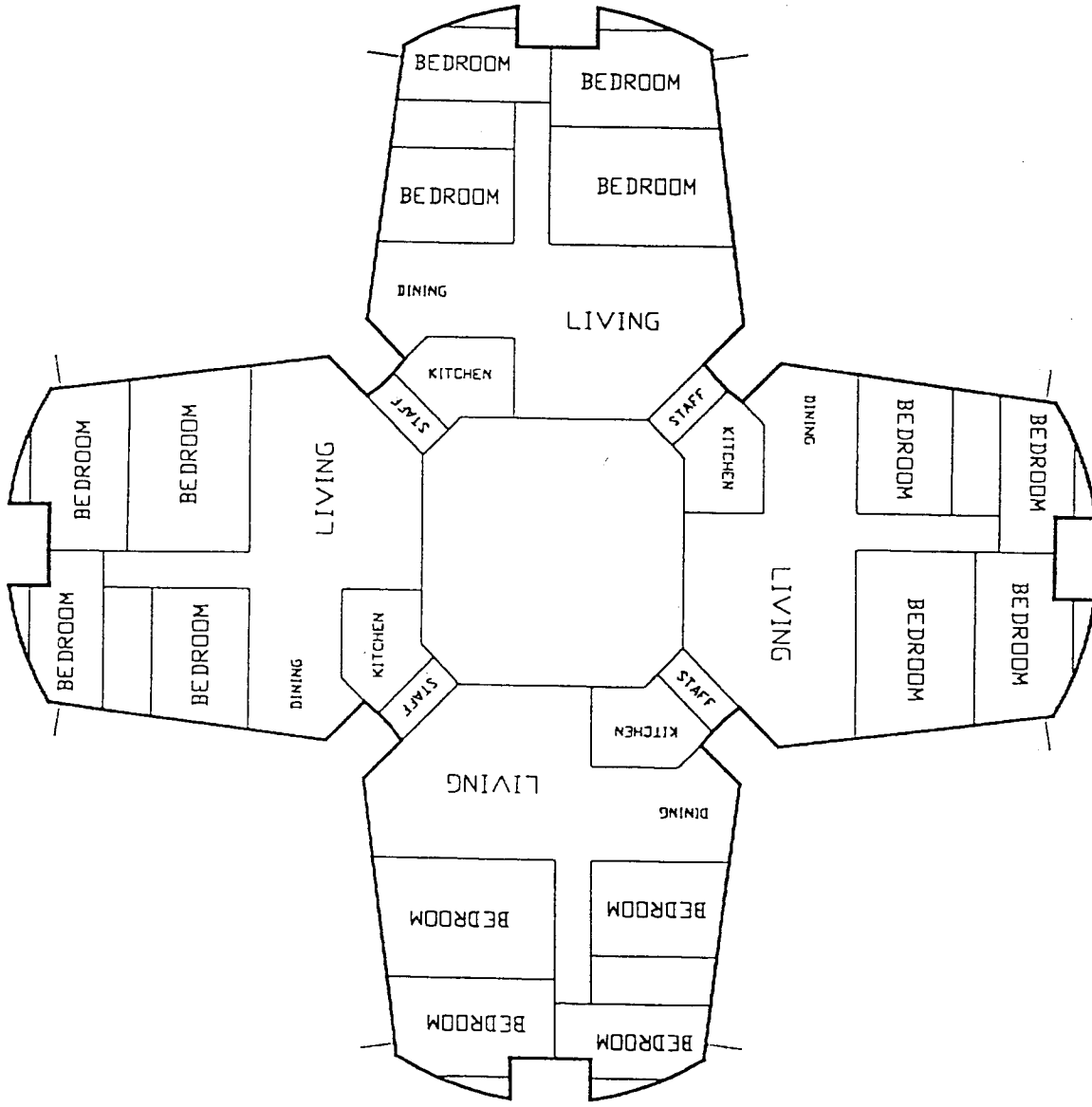
Legend:
 Openable Window





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							Designed By	Scale NTS
							Checked By	Date Jan 99

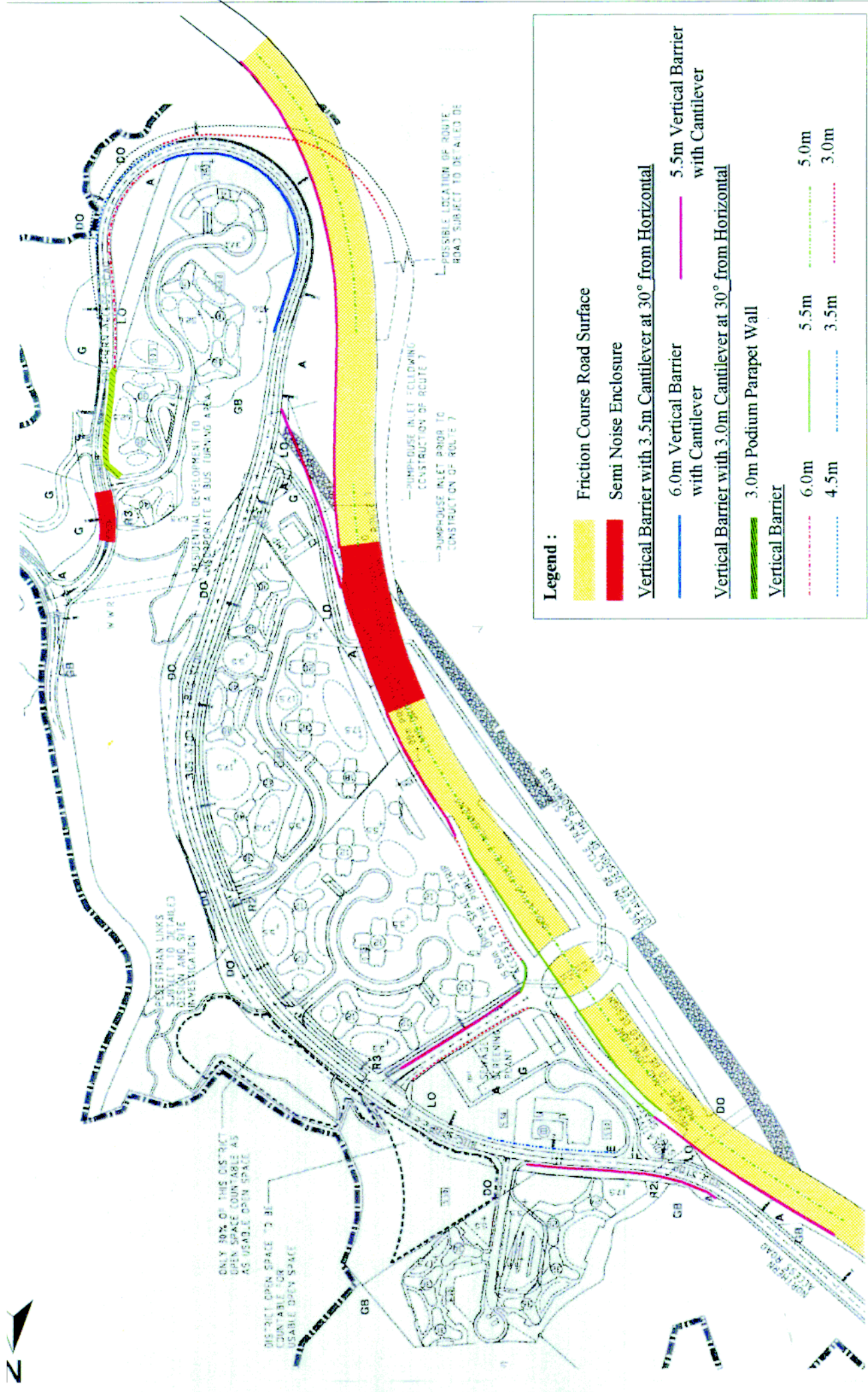
Typical Floor Plan (Tri-Axial Form)

Legend:
 Openable Window

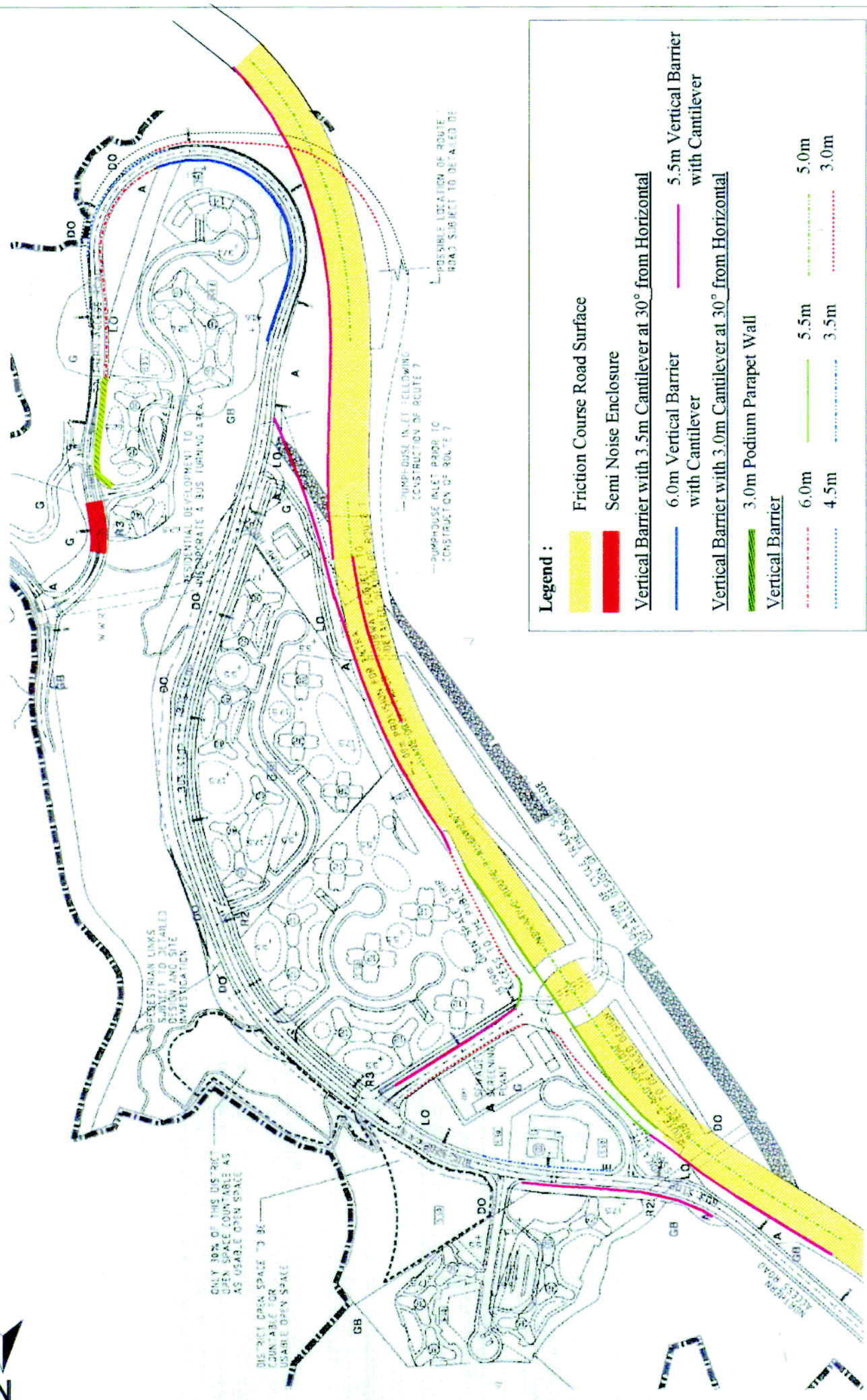


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Typical Floor Plan (Cruciform)



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Noise Mitigation Measures (Option 1)		HONG KONG ISLAND AND ISLANDS DEVELOPMENT OFFICE		PYPUN / PBA JOINT VENTURE		Designed By	Scale NTS
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Rev.	Description	Approved	Date				



Legend :

- Friction Course Road Surface
- Semi Noise Enclosure
- Vertical Barrier with 3.5m Cantilever at 30° from Horizontal
- 6.0m Vertical Barrier with Cantilever
- Vertical Barrier with 3.0m Cantilever at 30° from Horizontal
- 3.0m Podium Parapet Wall
- 6.0m
- 4.5m
- 5.5m
- 3.5m
- 5.0m
- 3.0m

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 - ENGINEERING FEASIBILITY STUDY

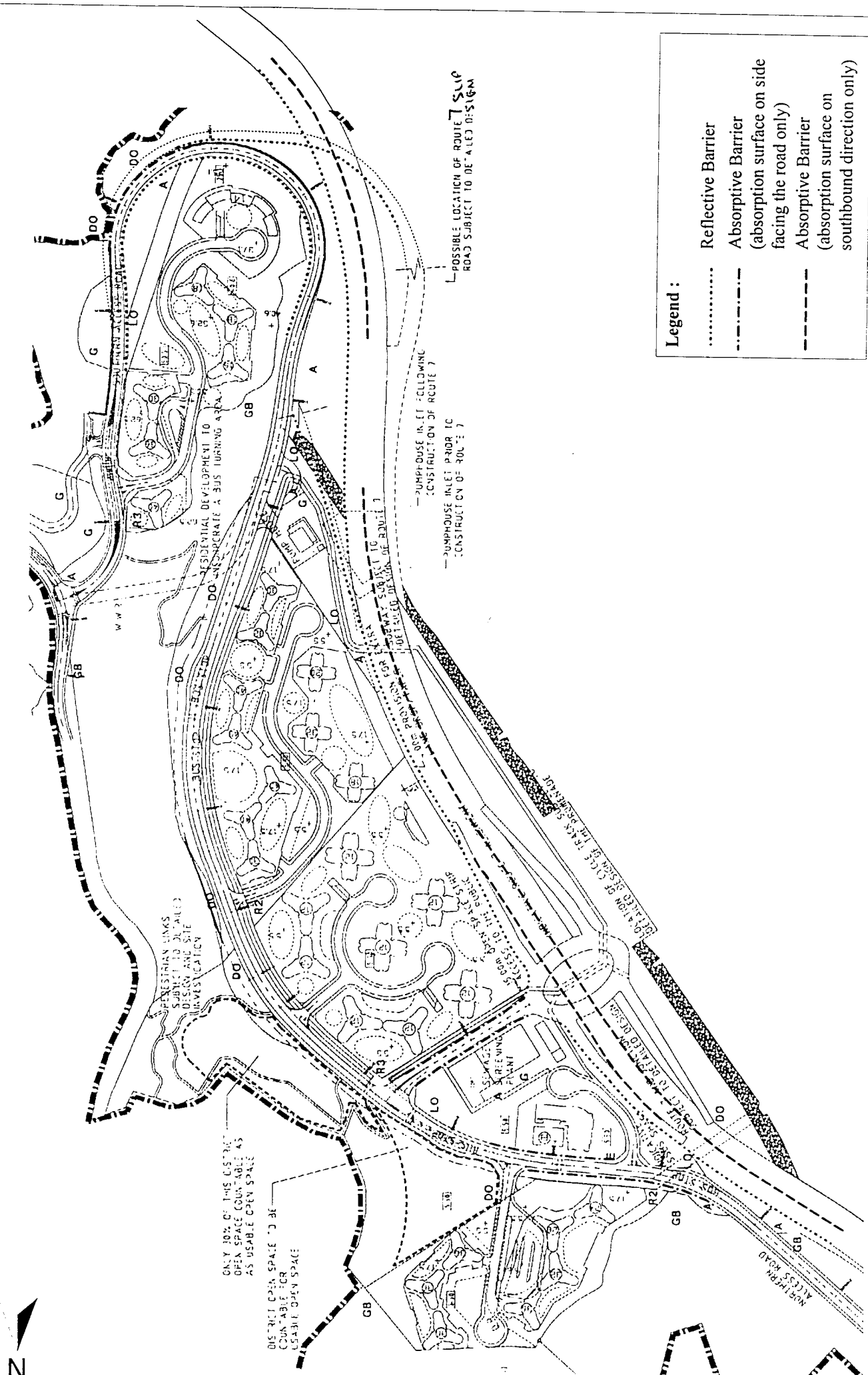


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Noise Mitigation Measures (Option 2)

Rev.	Description	Approved	Date



Legend :

- Reflective Barrier
- - - - Absorptive Barrier (absorption surface on side facing the road only)
- - - - Absorptive Barrier (absorption surface on southbound direction only)

Rev.	Figure No.	Scale	NTS
b	5.15a		

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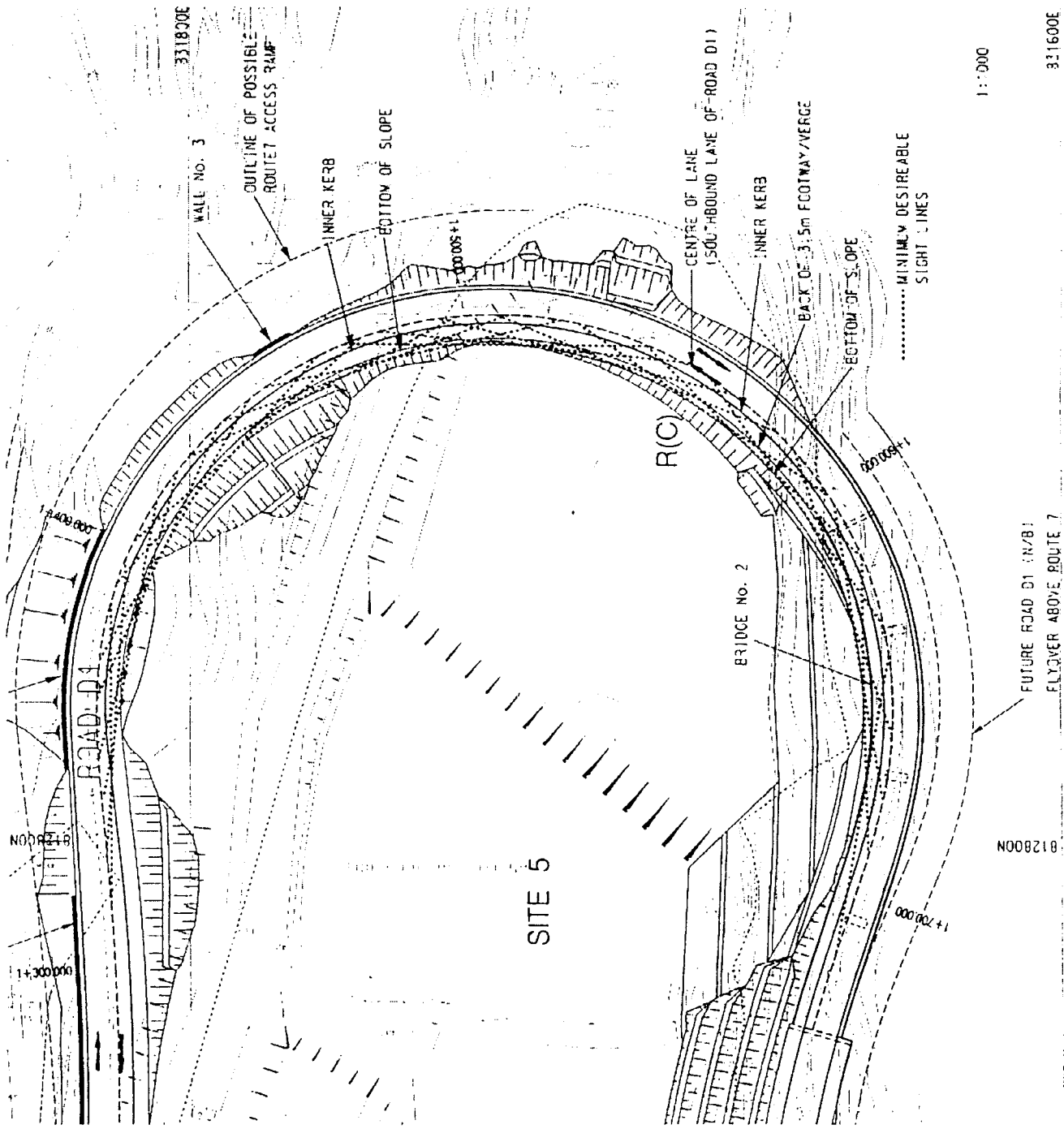
Rev.	Description	Approved	Date

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Location of Absorptive and Reflective Barriers

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FUTURE ROAD D1 (R/B)
FLYOVER ABOVE ROUTE 7

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