Highways Department

Route 9 between Cheung Sha Wan and Sha Tin

Lai Chi Kok Viaduct & Eagle's Nest Tunnel

Baseline Environmental Monitoring Report Version 1.0

October 2003

Certified By _____
(Environmental Team Leader)

REMARKS:

The information supplied and contained within this report is, to the best of our knowledge, correct at the time of printing.

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EXECUTIVE SUMMARY

1. This baseline environmental monitoring is prepared by Cinotech Consultants Ltd. for the Project of "Route 9 between Cheung Sha Wan and Sha Tin – Lai Chi Kok Viaduct and Eagle's Nest Tunnel". This report presents the baseline dust and noise monitoring works performed between 31st July 2003 and 8th October 2003.

Air Quality

2. The baseline 1-hour and 24-hour TSP (Total Suspended Particulates) monitoring was conducted at three locations (AM1, AM2 and AM3) for 14 days between 31st July 2003 and 8th October 2003. Monitoring schedule is shown in Appendix D. For 1-hour TSP monitoring, measurements were taken three times per day while the highest dust impact was expected.

3. Station AM2 (Lai Chi Kok Indoor Centre) is designated in the Environmental Monitoring and Audit (EM&A) Manual (1999) whist Station AM1 was relocated from Government Quarters to Yew Chung International School/ Po Leung Kuk Choi Kai Yau School due to the delay in getting permission from the Quarters for conducting environmental monitoring. Station AM3 (Garden Villa) was added as an additional monitoring station of the Project to further evaluate the environmental impact of the Project on the nearby sensitive receivers.

4. Data collected was reviewed and analyzed to determine the Action and Limit Levels for air quality during impact/compliance monitoring throughout the construction of the Project. Details of the methodology, locations and results are presented in the report.

5. No major dust source was observed near Station AM1 during the baseline monitoring period. The major dust sources identified at Stations AM2 and AM3 were road traffic dust. The other dust source at AM3 may be the dust generated from the construction activities of Route 9 – Sha Tin Section throughout the baseline monitoring period. However, the baseline monitoring results are considered representative to the pre-construction dust levels.

6. The air quality monitoring results are summarized as follows:

Table I Air Quality Baseline Monitoring Results

Monitoring Station	Average 1-hour TSP Level, $\mu g/m^3$ (Range)	Average 24-hour TSP Level, $\mu g/m^3$ (Range)
AM1	70.6 (14.9 – 158.9)	58.9 (18.5 – 90.8)
AM2	78.2 (46.5 – 229.5)	72.0 (52.2 – 85.2)
AM3	244.0 (24.5 – 857.0)	108.5 (43.5 – 210.7)

7. Following the criteria set out in the EM&A Manuals, the Action and Limit Levels for air quality impact monitoring have been set as follows:

Table II Action and Limit Levels for Impact Air Quality Monitoring

Monitoring Station	1-hour TSP		24-hour TSP	
	Action Level, $\mu g/m^3$	Limit Level, $\mu g/m^3$	Action Level, $\mu g/m^3$	Limit Level, $\mu g/m^3$
AM1	296	500	168	260
AM2	301		177	
AM3	350		200	

Noise

8. Baseline noise monitoring was conducted at five monitoring locations (NM1, NN2, NM3, NM4 and NM5) between 29th August 2003 and 26th September 2003. All these stations are designated in the EM&A Manual (1999) except stations NM1 and NM5. Station NM1 was relocated from Miu Kong Village to Yew Chung International School/ Po Leung Kuk Choi Kai Yau School since the village has been resumed and all villagers moved out within September 2003. Station NM5 was relocated from Pinehill to Villa Carlton as Pinehill is sheltered by a natural slope and hence monitoring at Pinehill cannot totally reflect the impacts arise from the Project. Villa Carlton was considered as a better alternative noise monitoring station for the Project.

9. Monitoring schedule is provided in Appendix D. Noise monitoring was suspended on 2nd, 3rd, 14th and 15th September 2003 due to rains and typhoon (Typhoon Signal No. 8 was hoisted on 2nd September 2003). The noise monitoring was rescheduled to later dates. The baseline noise monitoring data was processed according to the following three periods:

- Daytime: 0700-1900 hrs on normal weekdays
- Evening-time: 1900-2300 hrs on all other days and Holiday: 0700-1900 hrs on holidays
- Night-time: 2300-0700 of next day

10. Noise levels at the five monitoring stations were measured continuously for 24 hours for a period of 14 days. Baseline noise monitoring was conducted in accordance with the methodology in the EM&A Manuals. Monitoring Data collected was reviewed and analyzed. Details of the locations and results are presented in this report.

11. No major noise source was identified at Stations NM1 and NM3 (Lai Chi Kok Hospital). The major noise source identified at the other monitoring stations was road traffic noise. For Station NM5, the baseline noise levels (Leq) ranged from 73.1 to 79.8 dB(A) during daytime, 70.3 to 80.5 dB(A) during evening-time & holidays, and 80.0 to 63.7 dB(A) during night-time. Such higher noise levels (as compared with that of the other monitoring stations) obtained at NM5 may be due to the fact the station is relatively closed to Tai Po Road The baseline monitoring results are considered representative to the ambient noise level.

12. The noise monitoring results are summarized in the following tables.

Table III Summary of Day-Time Noise Monitoring Results

Daytime 0700-1900 hrs on normal weekdays	Range of Noise Level, dB(A)								
	L_{eq}(30min)			L_{10}(30min)			L_{90}(30min)		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
NM1	61.5	67.1	55.7	62.7	70.2	56.7	59.2	62.6	53.9
NM2	68.4	71.9	64.8	70.3	73.5	67.7	66.0	69.9	62.0
NM3	61.4	70.6	59.6	63.1	73.1	60.4	58.2	66.0	57.3
NM4	73.8	75.8	69.2	75.2	76.8	71.7	71.5	73.7	64.5
NM5	77.1	79.8	73.1	80.3	82.8	76.5	69.3	73.3	59.1

Table IV Summary of Evening-Time and Holidays Noise Monitoring Results

Evening-time 1900-2300 hrs on all days & Holidays 0700-2300	Range of Noise Level, dB(A)								
	L_{eq}(5min)			L_{10}(5min)			L_{90}(5min)		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
NM1	60.3	69.4	56.0	61.4	70.0	57.0	57.5	66.5	54.0
NM2	67.3	71.1	63.6	69.5	73.5	66.0	64.6	68.5	60.5
NM3	58.7	71.6	54.1	60.3	74.5	54.5	56.0	66.5	52.0
NM4	72.6	78.0	69.3	74.5	83.0	71.0	69.8	73.0	63.5
NM5	75.8	80.5	70.3	79.3	83.5	73.5	66.1	72.0	54.5

Table V Summary of Night-Time Noise Monitoring Results

Night-time 2300-0700 hrs of the next day	Range of Noise Level, dB(A)								
	L_{eq}(5min)			L_{10}(5min)			L_{90}(5min)		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
NM1	58.3	64.7	53.9	59.4	68.0	54.5	55.3	62.5	52.0
NM2	64.6	69.0	60.4	66.7	73.5	61.5	61.9	65.5	58.5
NM3	54.6	70.9	50.8	55.8	75.0	51.0	52.8	62.0	50.0
NM4	68.3	73.8	59.1	70.7	76.0	62.0	63.6	71.0	52.0
NM5	71.9	80.0	63.7	75.3	83.5	67.5	59.3	70.0	49.5

13. Following the criteria set out in the EM&A Manuals, the Action and Limit Levels for noise impact monitoring have been set as follows:

Table VI Action and Limit Levels for Impact Noise Monitoring

Action Level		Limit Level
0700-1900 hrs on normal weekdays	When one documented complaint is received	75* dB(A)
1900-2300 hrs on holidays & 0700-2300 hrs on all other days		60/65/70** dB(A)
2300-0700 hrs of next day		45/50/55** dB(A)

(*) reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.

(**) to be selected based on Area Sensitivity Rating. If Specified Powered Mechanical Equipment (SPME) is employed, the noise limits should be 15 dB(A) less than that shown above for the restricted hours.

1. INTRODUCTION

Background

1.1 Route 9 (Kowloon Section) (R9K) (hereinafter call the Project) forms part of the Route 9 between Cheung Sha Wan and Sha Tin (R9-CSWST) project, which will be a new expressway connecting west Kowloon and Sha Tin. It will be the fourth external link between Sha Tin and Kowloon and will form an important link between the northeast New Territories and the west Kowloon, Lantau Island and the western New Territories. R9K is being managed and implemented by the Highways Department (HyD).

1.2 The engineering design of R9K is covered under Agreement No. CE 50/98 "Route 9 between Cheung Sha Wan and Sha Tin – Design Construction Assignment". The main consultant engaged under Agreement No. CE 50/98 is Maunsell Hyder Joint Venture (MHJV), who will act as the Engineer for the construction contracts. The works of R9K manly comprise a 1.4km dual 3-lane Lai Chi Kok Viaduct from Lai Wan Interchange to Butterfly Valley; 0.5 km of dual 3-lane at-grade carriageway linking to the 2.1 km dual 3-lane twin-bore Eagle's Nest Tunnel with associated portal buildings; a toll plaza with an administration building located with the Sha Tin valley woodland; a ventilation building and an adit; associated noise barriers, noise enclosures, drainage, slope and landscape works; and electrical and mechanical works for the whole R9-CSWST. The remainder of the R9-CSWST forms the Sha Tin Section (R9S) of the project and is being managed and implemented separately by the Territory Development Department (TDD).

1.3 The R9-CSWST project is a Designated Project under the Environmental Impact Assessment Ordinance (Cap. 449) (EIAO). An environmental impact assessment (EIA) report has been prepared in 1998 for the R9-CSWST project (1998 R9 EIA) to consider the key issues of noise, air quality, water quality, ecological, construction waste, landscape and visual, land use and cultural impacts, and identify possible mitigation measures.

1.4 An Updated Final EIA report was subsequently competed in August 1999 for the R9-CSWST project (1999 R9 EIA), to cater for some changes in R9K portion as mentioned in paragraph 1 in the report. The 1999 R9 EIA was endorsed by Environmental Protection Department (EPD) in November 1999. The 1998 R9 EIA and the 1999 R9 EIA (R9 EIA Reports) were included in the EIA register under the EIAO as report no. EIA-135/BC and AEIAR-022/1999 respectively. An Environmental Monitoring and Audit (EM&A) Manuals for each of the R9 EIA Reports (EM&A Manuals) were also included as part of the EIA reports in the register.

1.5 Subsequent to the endorsement of the R9 EIA Reports by EPD in November 1999, the project programme was deferred to start in 2002/2003 for completion by 2006/07. The implementation of the project was then separated into the R9S and R9K portion. An Environmental Permit (EP) No. EP-103/2001 was issued on 17 September 2001 for R9K to the HyD as Permit Holder. A revised EP No. EP-103/2001/A was issued on 20 May 2003 for R9K (R9K EP) to HyD as Permit Holder.

1.6 Two works of the R9K project referred to the R9K EP will be mainly constructed under HyD's construction contract nos. HY/2003/01 entitled "Route 9 – Lai Chi Kok Viaduct" and "Route 9 – Eagle's Nest Tunnel and Associated Works", which are currently planned to commence in October/November 2003 for completion in April 2007.

1.7 Cinotech Consultants Limited (Cinotech) was commissioned by HyD to undertake the Environmental Team (ET) Services for the Project in July 2003. This Baseline Environmental Monitoring Report is prepared by Cinotech for the Project prior to the commencement of any construction activity in accordance with the EM&A Manuals.

Purpose of the Report

1.8 The purpose of this Baseline Environmental Monitoring Report is to set out baseline levels for the air quality and noise in accordance with the EM&A Manuals. These baseline levels will be used as the basis for the impact and compliance monitoring during construction stage of the Project. This report presents the monitoring locations, equipment, period, methodology, results and observations for the air and noise measurements during the baseline period.

Structure of the Baseline Monitoring Report

1.9 The structure of the report is as follows:

Section 1: Introduction, purpose, background and the structure of the report.
Section 2: Air Quality, which describes the baseline air quality monitoring.
Section 3: Noise, which describes the baseline noise monitoring.
Section 4: Revisions for inclusion in the EM&A Manual
Section 5: Conclusions

2. AIR QUALITY

Monitoring Requirements

2.1 In accordance with the EM&A Manuals, baseline air quality monitoring should be conducted for a period of fourteen days, in terms of 1-hour and 24-hour TSP. The 1-hour TSP should be carried out three times per day and 24-hour TSP should be monitored once everyday for 14 consecutive days.

Monitoring Equipment

2.2 1-hour TSP monitoring and continuous 24-hour TSP air quality monitoring was performed using Graseby GMW Model GS2310 High Volume Sampler (HVS) which associated with equipment and shelter complied with the specifications stipulated in the EM&A Manuals. Table 2.1 summarizes the equipment used in the baseline air quality monitoring programme. Copies of the calibration certificates for the HVS are presented in Appendix A1

Table 2.1 Air Quality Monitoring Equipment

Equipment	Model and Make	Qty.
HVS Sampler	Graseby GMW Model GS2310 High Volume TSP Sampler and associated equipment and shelter in accordance with the USA standard Title 40, code of Federal regulations, Chapter 1 (part 50), Appendix B	6
Calibrator	GMW 25	1

Monitoring Locations

2.3 Baseline air quality monitoring was conducted at the 3 monitoring stations. Station AM2 (Lai Chi Kok Indoor Centre) is designated in the EM&A Manual (1999) whist station AM1 was relocated from Government Quarters to Yew Chung International School/Po Leung Kuk Choi Kai Yau School due to the delay in getting permission from the Quarters for conducting environmental monitoring. Station AM3 (Garden Villa) was added as an additional monitoring station of the Project to further evaluate the environmental impact of the Project on the nearby sensitive receivers. Table 2.2 describes the locations of the monitoring stations and their locations are shown in Figures 1a and 1b.

Table 2.2 Air Quality Monitoring Locations

Monitoring Stations	Description	Location of Measurement
AM1	Yew Chung International School / Po Leung Kuk Choi Kai Yau School	Rooftop
AM2	Lai Chi Kok Park Sports Centre	Rooftop
AM3	Garden Villa	Rooftop

Monitoring Parameters, Frequency and Duration

2.4 Table 2.3 summarizes the monitoring parameters, monitoring period and frequencies of baseline air quality monitoring.

Table 2.3 Frequency and Parameters of Air Quality Monitoring

Monitoring Stations	Parameter	Period	Frequency
AM1, AM2 and AM3	24-hour TSP	24 hours	Daily
	1-hour TSP	0700-1900	3 times/day

Monitoring Methodology and QA/QC Procedure

2.5 Weather data was recorded during the baseline period and is shown in Appendix C. The mean air temperature, wind speed, precipitation, wind direction and the mean relative humidity data was obtained from the Hong Kong Observatory Webpage. The weather conditions (i.e. sunny, cloudy or rainy) were recorded by the field staff's observation on the monitoring day.

1-hour TSP and 24-hour TSP Monitoring

Instrumentation

2.6 High volume (HVS) samplers (Model GS-2310) completed with appropriate sampling inlets was employed for 24-hour TSP. The sampler was composed of a motor, a filter holder, a flow controller and a sampling inlet and its performance specification complies with that required by USEPA Standard Title 40, Code of Federation Regulations Chapter 1 (Part 50).

Operating/Analytical Procedures

2.7 Operating/analytical procedures for the operation of HVS were as follows:

- A horizontal platform was provided with appropriate support to secure the samplers against gusty wind.
- No two samplers were placed less than 2 meters apart.
- The distance between the sampler and an obstacle, such as buildings, was at least twice the height that the obstacle protrudes above the sampler.
- A minimum of 2 meters of separation from walls, parapets and penthouses was required for rooftop samples.
- A minimum of 2 meters separation from any supporting structure, measured horizontally was required.
- No furnaces or incineration flues were nearby.
- Airflow around the sampler was unrestricted.
- The samplers were more than 20 meters from the drip line.
- Any wire fence and gate, to protect the sampler, should not cause any obstruction

during monitoring.

2.8 Prior to the commencement of the dust sampling, the flow rate of the high volume sampler was properly set (between 1.1 m^3/min. and 1.4 m^3/min.) in accordance with the manufacturer's instruction to within the range recommended in USEPA Standard Title 40, CFR Part 50.

2.9 For TSP sampling, fiberglass filters (G810) were used [Note: these filters have a collection efficiency of > 99% for particles of 0.3 mm diameter].

2.10 The power supply was checked to ensure the sampler worked properly.

2.11 On sampling, the sampler was operated for 5 minutes to establish thermal equilibrium before placing any filter media at the designated air quality monitoring station.

2.12 The filter holding frame was then removed by loosening the four nuts and carefully a weighted and conditioned filter was centered with the stamped number upwards, on a supporting screen.

2.13 The filter was aligned on the screen so that the gasket formed an airtight seal on the outer edges of the filter. Then the filter holding frame was tightened to the filter holder with swing bolts. The applied pressure should be sufficient to avoid air leakage at the edges.

2.14 The shelter lid was closed and secured with the aluminum strip.

2.15 The timer was then programmed. Information was recorded on the record sheet, which included the starting time, the weather condition and the filter number (the initial weight of the filter paper can be found out by using the filter number).

2.16 After sampling, the filter was removed and sent to the laboratory for weighing. The elapsed time was also recorded.

2.17 Before weighing, all filters were equilibrated in a conditioning environment for 24 hours. The conditioning environment temperature should be between 25°C and 30°C and not vary by more than ±3°C; the relative humidity (RH) should be < 50% and not vary by more than ±5%. A convenient working RH is 40%.

Maintenance/Calibration

2.18 The following maintenance/calibration was required for the HVS:

- The high volume motors and their accessories were properly maintained. Appropriate maintenance such as routine motor brushes replacement and electrical wiring checking were made to ensure that the equipment and necessary power supply are in good working condition.

- High volume samplers were calibrated at 2-month intervals (five point calibration) using GMW-25 Calibration Kit throughout all stages of the air quality monitoring.

Results and Details on Influencing Factors

Results

2.19 Baseline air quality monitoring was conducted at 3 monitoring stations, namely AM1, AM2 and AM3, between 31st July 2003 and 8th October 2003. The detailed monitoring schedule is shown in Appendix D.

2.20 The monitoring data are summarized in Tables 2.4 and 2.5. All monitoring data of 1-hour and 24-hour TSP are presented in Appendices A2 and A4 respectively. Graphical presentations of the 1-hour TSP and 24-hour TSP results are shown in Appendices A3 and A5 respectively. Detailed weather conditions at the monitoring location during the baseline monitoring period are shown in Appendix C.

2.21 No major dust source was observed near Station AM1 during the baseline monitoring period. The major dust sources identified at Stations AM2 and AM3 were road traffic dust.

Table 2.4 Summary of 1-hour TSP Monitoring Results

Monitoring Station	Average TSP Concentration, $\mu g/m^3$ (Range)
AM1	70.6 (14.9 – 158.9)
AM2	78.2 (46.5 – 229.5)
AM3	244.0 (24.5 – 857.0)

Table 2.5 Summary of 24-hour TSP Monitoring Results

Monitoring Station	Average TSP Concentration, $\mu g/m^3$ (Range)
AM1	58.9 (18.5 – 90.8)
AM2	72.0 (52.2 – 85.2)
AM3	108.5 (43.5 – 210.7)

Details on Influencing Factors

2.22 The weather was generally sunny or cloudy during the baseline monitoring periods. Nevertheless, rainy days were also encountered.

2.23 No influencing factors that may affect the baseline dust monitoring results were identified for Stations AM1 and AM2.

2.24 For Station AM3, road traffic dust from Tai Po Road was the major dust source observed. The other dust source at AM3 may be the dust generated from the construction activities from R9S throughout the baseline monitoring period since the activities were carried out near to the station. Higher levels of 1-hour TSP (larger than 350 μg/m^3, the Action Level set in Section 2.26) and 24-hour TSP (larger than 200 μg/m^3, the Action Level set in Section 2.26) were recorded on 2nd, 4th, 5th and 6th August 2003 and on 31st July 2003 and 4th August 2003 respectively. These higher TSP levels recorded may be due to the R9S construction activities. Nevertheless, the baseline monitoring results are considered representative to the pre-construction dust levels.

Action and Limit Levels

2.25 The Action and Limit Levels have been set in accordance with the EM&A Manuals, which are summarized in Table 2.6.

2.26 Following these criteria, the Action and Limit Levels for air quality impact monitoring have been set as Tables 2.7 and 2.8.

Table 2.6 Action and Limit Levels for Air Quality

Parameters	Action	Limit
1 hour TSP Level in μg/m^3	• For baseline <154 μg/m^3, average of 130% of baseline and the Limit Level • For 154 < baseline <269 μg/m^3, 350 μg/m^3 • For baseline >269 μg/m^3, 130% of baseline level	500
24 hour TSP Level in μg/m^3	• For baseline <108 μg/m^3, average of 130% of baseline and the Limit Level • For 108 < baseline <154 μg/m^3, 200 μg/m^3 • For baseline >154 μg/m^3, 130% of baseline level	260

Table 2.7 Action and Limit Levels for 1-hour TSP

Location	Action Level, $\mu g/m^3$	Limit Level, $\mu g/m^3$
AM1	296	500
AM2	301	
AM3	350	

Table 2.8 Action and Limit Levels for 24-hour TSP

Location	Action Level, $\mu g/m^3$	Limit Level, $\mu g/m^3$
AM1	168	260
AM2	177	
AM3	200	

3. NOISE

Monitoring Requirements

3.1 Baseline noise monitoring was conducted continuously for fourteen days at five monitoring stations between 29th August 2003 and 27th September 2003. Logger function check and calibration was carried out according to manufacturer's recommendations. The equipment was checked and inspected not less than once every two days after the set up at each monitoring station.

Monitoring Equipment

3.2 Integrating Sound Level Meters were used for noise monitoring. The meters are Type 1 sound level meters capable of giving a continuous readout of the noise level readings including equivalent continuous sound pressure level (L_{eq}) and percentile sound pressure level (L_x) and also complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1) specifications. Table 3.1 summarizes the noise monitoring equipment being used.

Table 3.1 Noise Monitoring Equipment

Equipment	Model and Make	Qty.
Integrating Sound Level Meter	B&K Model 2238	5
Calibrator	B&K 4231	2

Monitoring Locations

3.3 Table 3.2 describes the locations of the monitoring stations and their locations are shown in Figures 1a and 1b.

Table 3.2 Noise Monitoring Locations

Monitoring Stations	Description	Locations for Measurement
NM1	Yew Chung International School / Po Leung Kuk Choi Kai Yau School	Rooftop
NM2	Lai Chi Kok Reception Centre	Rooftop
NM3	Lai Chi Kok Hospital	Rooftop of Block L
NM4	Mei Foo Sun Chuen, Phase 5	Rooftop of Block 9
NM5	Villa Carlton	Ground Floor[1]

Note: [1] The noise measurement was taken at 2m above the ground floor of Villa Carlton, where at a level about 1.5m above the Tai Po Road and has a line of sight of the construction site in the opposite.

3.4 All the monitoring stations are designated in the EM&A Manual (1999) except stations NM1 and NM5. Station NM1 was relocated from Miu Kong Village to Yew Chung International School since the village has been resumed and all villagers have moved out within September 2003. Station NM5 was relocated from Pinehill to Villa Carlton as Pinehill is sheltered by a natural slope and hence monitoring at Pinehill cannot totally reflect the impacts arise from the Project. Villa Carlton was considered as a better alternative noise monitoring station for the Project.

Monitoring Parameters, Frequency and Duration

3.5 In accordance to the EM&A Manuals, baseline noise for the A-weighted levels L_{eq}, L_{10} and L_{90} was recorded at 5 minutes intervals. Data obtained from the baseline noise monitoring was processed and presented according to the following three periods:

- Daytime: 0700-1900 hrs on normal weekdays
- Evening time on all days (1900-2300 hrs) and Holidays (including Sundays) during the daytime and evening (0700-2300 hrs)
- Night-time: 2300-0700 hrs of next days

3.6 The frequency and parameters of noise measurement are present in Table 3.3.

Table 3.3 Frequency and Parameters of Noise Monitoring

Time Period	Duration, min	Parameters
Daytime on normal weekdays (0700-1900 hrs)	30 (average of 6 consecutive L_{eq}(5min))	L_{eq}, L_{90} & L_{10}
Evening time on all days (1900-2300 hrs) and Holidays (including Sundays) during daytime and evening (0700-2300 hrs)	3 consecutive Leq(5min)	
All days during the night-time (2300-0700 hrs)		

Monitoring Methodology and QA/QC Procedures

3.7 Table 3.4 summarizes the type of measurement undertaken in the 5 monitoring stations.

Table 3.4 Type of Measurement

Monitoring Station	Measurement
NM1	Façade measurement
NM2	Façade measurement
NM3	Façade measurement
NM4	Façade measurement
NM5	Façade measurement

3.8 Weather data was recorded during the baseline period. The mean air temperature, wind speed, precipitation, wind direction and the mean relative humidity data was obtained from the Hong Kong Observatory Webpage. The weather conditions (i.e. sunny, cloudy or rainy) were recorded by the field staff's observation on the monitoring day.

Field monitoring

3.9 The monitoring procedures are as follows:

- For façade measurement, the microphone head of the head level meter was positioned 1m exterior of the Noise Sensitive Receivers and lowered sufficiently so that the building's external wall acts as a reflecting surface. The noise meter was also set as a position 1.2 m above the ground.

- The battery condition was checked to ensure good functioning of the meter.

- Parameters such as frequency weighting, the time weighting and the measurement time was set as follows:
  - frequency weighting :A
  - time weighting :Fast
  - time measurement :5 minutes

- Prior to and after each noise measurement, the meter was calibrated using the calibrator for 94 dB at 1000 Hz. If the difference in the calibration level before and after measurement is more than 1 dB(A), the measurement was considered invalid and repeat of noise measurement was required after re-calibration or repair of the equipment.

- The wind speed was frequently checked with the portable wind meter.

- Noise monitoring was carried out continuously for 24 hours during the 14 days baseline monitoring period. Monitoring data was recorded and stored automatically within the sound level meter system. At the end of the monitoring period, all the L_{eq}, L_{90} and L_{10} was recorded. In addition, site conditions and noise sources were recorded when the equipment were checked and inspected every two days.

- All the monitoring data within the sound level meter system was downloaded through the computer software, and all these data was checked and reviewed within the computer.

- Noise monitoring was cancelled in the presence of fog, rain, and wind with a steady speed exceeding 5 m/s, or wind with gusts exceeding 10m/s.

Maintenance and Calibration

3.10 Maintenance and Calibration procedures were as follows:

- The microphone head of the sound level meter and calibrator were cleaned with a soft cloth at quarterly intervals.
- The meter and calibrator were sent to a HOKLAS laboratory to check and calibrate at yearly intervals.

Results and Details on Influencing Factors

Results

3.11 Baseline noise monitoring at all stations was conducted between 29th August 2003 and 27th September 2003. Noise monitoring was suspended on 2nd, 3rd, 14th and 15th September 2003 and rescheduled to later dates due to the rains and typhoon (Typhoon Signal No. 8 was hoisted on 2nd September 2003). The detail monitoring schedule is shown in Appendix D.

3.12 The monitoring results are summarized in Tables 3.5 to 3.7. All baseline noise monitoring data at the five stations are given in Appendices B2 – B5. Graphical presentations of baseline noise monitoring are provided in Appendix B6. Weather conditions recorded at the monitoring locations during the baseline monitoring period are shown in Appendix C.

Table 3.5 Summary of Day-Time Noise Monitoring Results

Daytime 0700-1900 hrs on normal weekdays	Range of Noise Level, dB(A)								
	L_{eq}(30min)			L_{10}(30min)			L_{90}(30min)		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
NM1	61.5	67.1	55.7	62.7	70.2	56.7	59.2	62.6	53.9
NM2	68.4	71.9	64.8	70.3	73.5	67.7	66.0	69.9	62.0
NM3	61.4	70.6	59.6	63.1	73.1	60.4	58.2	66.0	57.3
NM4	73.8	75.8	69.2	75.2	76.8	71.7	71.5	73.7	64.5
NM5	77.1	79.8	73.1	80.3	82.8	76.5	69.3	73.3	59.1

Table 3.6 Summary of Evening-Time and Holidays Noise Monitoring Results

Evening-time 1900-2300 hrs on all days & Holidays 0700-2300	Range of Noise Level, dB(A)								
	L_{eq}(5min)			L_{10}(5min)			L_{90}(5min)		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
NM1	60.3	69.4	56.0	61.4	70.0	57.0	57.5	66.5	54.0
NM2	67.3	71.1	63.6	69.5	73.5	66.0	64.6	68.5	60.5
NM3	58.7	71.6	54.1	60.3	74.5	54.5	56.0	66.5	52.0
NM4	72.6	78.0	69.3	74.5	83.0	71.0	69.8	73.0	63.5
NM5	75.8	80.5	70.3	79.3	83.5	73.5	66.1	72.0	54.5

Table 3.7 Summary of Night-Time Noise Monitoring Results

Night-time 2300-0700 hrs of the next day	Range of Noise Level, dB(A)								
	L_{eq}(5min)			L_{10}(5min)			L_{90}(5min)		
	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min
NM1	58.3	64.7	53.9	59.4	68.0	54.5	55.3	62.5	52.0
NM2	64.6	69.0	60.4	66.7	73.5	61.5	61.9	65.5	58.5
NM3	54.6	70.9	50.8	55.8	75.0	51.0	52.8	62.0	50.0
NM4	68.3	73.8	59.1	70.7	76.0	62.0	63.6	71.0	52.0
NM5	71.9	80.0	63.7	75.3	83.5	67.5	59.3	70.0	49.5

3.13 No major noise source was identified at Stations NM1 and NM3 (Lai Chi Kok Hospital).

3.14 The major noise source identified at the other monitoring stations NM2, NM4 and NM5 was road traffic noise.

3.15 Noted that for Station NM5, the baseline noise levels (Leq) ranged from 73.1 to 79.8 dB(A) during daytime, 70.3 to 80.5 dB(A) during evening-time & holidays, and 80.0 to 63.7 dB(A) during night-time. Such higher noise levels (as compared with that of the other monitoring stations) obtained at NM5 may be due to the fact the station is relatively closed to Tai Po Road The baseline monitoring results are considered representative to the ambient noise level.

Details on Influencing Factors

3.16 The weather was generally sunny or cloudy during the baseline monitoring periods. Rainy days were recorded on 3rd, 14th and 15th September 2003. Typhoon Signal No. 8 was hoisted on 2nd September 2003. Monitoring sessions on these days have been rescheduled to later dates. All monitoring was conducted with the wind speed below 5m/s.

3.17 There was a construction site near Station NM5 where construction activities (Route 9 encrusted portion) were undertaking throughout the baseline monitoring period. However, these activities have not generated high noise levels during the monitoring period. The baseline monitoring results are considered representative to the ambient noise levels.

Action and Limit Levels

3.18 The Action and Limit Levels were established in accordance with the EM&A Manuals. The baseline noise level shall act as a basis for the correction to the impact noise monitoring. Table 3.8 presents the Action and Limit Levels for construction noise.

Table 3.8 Action Limit Levels for Noise during Construction Period

Action Level		Limit Level
0700-1900 hrs on normal weekdays	When one documented complaint is received	75* dB(A)
1900-2300 hrs on holidays & 0700-2300 hrs on all other days		60/65/70** dB(A)
2300-0700 hrs of next day		45/50/55** dB(A)

(*) reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.

(**) to be selected based on Area Sensitivity Rating. If Specified Powered Mechanical Equipment (SPME) is employed, the noise limits should be 15 dB(A) less than that shown above for the restricted hours.

4. REVISIONS FOR INCLUSION IN THE EM&A MANUALS

4.1 The baseline environmental monitoring was conducted according to the Environmental Monitoring and Audit Manuals (EM&A Manuals) for air quality and noise.

4.2 The monitoring methodology, parameters monitored, and monitoring locations are in line with the EM&A Manuals except that there were some changes in monitoring stations.

4.3 For the three air quality monitoring stations namely AM1, AM2 and AM3, Station AM1 was relocated from Government Quarters to Yew Chung International School/ Po Leung Kuk Choi Kai Yau School due to the delay in getting permission from the Quarters for conducting environmental monitoring. Station AM3 (Garden Villa) was added as an additional monitoring station of the Project to further evaluate the environmental impact of the Project on the nearby sensitive receivers.

4.4 For noise monitoring stations, all the five stations are designated in the EM&A Manual (1999) except stations NM1 and NM5. Station NM1 was relocated from Miu Kong Village to Yew Chung International School/ Po Leung Kuk Choi Kai Yau School since the village has been resumed and all villagers would move out within September 2003. Station NM5 was relocated from Pinehill to Villa Carlton as Pinehill is sheltered by a natural slope and hence monitoring at Pinehill cannot totally reflect the impacts arise from the Project. Villa Carlton was considered as a better alternative noise monitoring station for the Project.

5. CONCLUSIONS

5.1 The baseline air quality and noise monitoring was conducted between 31st July 2003 and 8th October 2003. The monitoring results were used to establish the Action and Limit Levels for the relevant parameters during impact/compliance monitoring throughout construction periods.

5.2 The baseline air quality monitoring at the 3 monitoring stations, AM1, AM2 and AM3 was conducted between 31st July 2003 and 8th October 2003. During the baseline air quality monitoring, the weather was generally sunny or cloudy.

5.3 No major dust source was observed near Station AM1 during the baseline monitoring period. The major dust sources identified at Stations AM2 and AM3 were road traffic dust. The other dust source at AM3 may be the dust generated from the construction activities of R9S throughout the baseline monitoring period. However, the baseline monitoring results are considered representative to the pre-construction dust levels.

5.4 Baseline noise monitoring was conducted at 5 monitoring stations locations (NM1, NN2, NM3, NM4 and NM5) between 29th August 2003 and 26th September 2003. Noise monitoring was suspended on 2nd, 3rd, 14th and 15th September 2003 due to rains and typhoon (Typhoon Signal No. 8 was hoisted on 2nd September 2003). The noise monitoring was rescheduled to later dates.

5.5 No major noise source was identified at Stations NM1 and NM3 (Lai Chi Kok Hospital). The major noise source identified at the other monitoring stations was road traffic noise. Noted that for Station NM5, the baseline noise levels (Leq) ranged from 73.1 to 79.8 dB(A) during daytime, 70.3 to 80.5 dB(A) during evening-time & holidays, and 80.0 to 63.7 dB(A) during night-time. Such higher noise levels (as compared with that of the other monitoring stations) obtained at NM5 may be due to the fact the station is relatively closed to Tai Po Road The baseline monitoring results are considered representative to the ambient noise level.