

13. ENVIRONMENTAL MONITORING & AUDIT

13.1 Introduction

This Section presents the Environmental Monitoring and Audit (EM&A) requirements that have been included in the EM&A Manual for the Route 10 (NLYLH). It describes the necessary EM&A requirements based on the findings of the assessment in the previous Sections of this Report. As discussed in Sections 3 and 4, construction noise and dust may lead to exceedance of environmental criteria and therefore EM&A at the affected sensitive receivers is recommended. EM&A is also required to ensure that the air quality inside the Tai Lam Tunnel is maintained in accordance with the Tunnel Air Quality Guidelines (TAQG) specified under the "*Practice Notes on Control of Air Pollution in Vehicle Tunnels*".

13.2 Objectives of Environmental Monitoring & Audit

The objectives of carrying out EM&A for Route 10 (NLYLH) include the following:

- to provide a database against which any short or long term environmental impacts of the project can be determined;
- to provide an early indication should any of the environmental control measures or practices fail to achieve acceptable standards;
- to monitor the performance of the project and the effectiveness of mitigation measures;
- to verify the environmental impacts predicted in the EIA Study;
- to determine project compliance with regulatory requirements, standards and government policies;
- to take remedial action if unexpected problems or unacceptable impacts arise; and
- to provide data to enable an environmental audit.

The following sections summarise the recommended EM&A requirements.

13.3 Construction Noise

Noise produced during the construction phase will impact upon nearby noise sensitive receivers (NSRs) as assessed in Section 4. The construction noise criteria of 75 dB(A) and 70dB(A) will be exceeded at some of the representative NSRs if construction noise is unmitigated.

13.3.1 Mitigation Measures

Noise mitigation measures have been recommended in the EIA report to reduce the noise impact to within the noise criteria and are presented in Section 4.8. It is anticipated that if the mitigation measures described in Section 4.8 can be successfully applied, the noise levels experienced by the affected receivers will be reduced to within the noise criteria.

13.3.2 Monitoring Locations

Noise monitoring requirements have been recommended in the EM&A Manual in order to ensure compliance with the criteria. Noise monitoring should be carried out at the ten monitoring locations, M1 - M11, listed in *Table 13.1* and additional locations considered necessary, in agreement with the EPD. The location of the monitoring stations is shown on *Figure 13.1 - 13.4*.

Table 13.1 Noise Monitoring Stations

Location	Monitoring Station	Name
North Lantau	M1	Tso Wan Village
	M2	Fa Peng Village
Tsing Lung Tau	M4	Hong Kong Garden
Tai Lam Chung	M5	Tai Lam Chung Tsuen
	M6	Correctional Institutional (Clinic)
Siu Lam and So Kwun Wat	M7	So Kwun Wat Sun Tsuen
	M8	Scattered Houses at So Kwun Wat
	M9	So Kwun Wat Govt. School
	M10	Scattered House to the West of Poseidon Court
	M11	Siu Lam Hospital

13.3.3 Baseline Monitoring

Baseline noise monitoring should be carried out prior to the commencement of the construction works. The baseline monitoring should be carried out daily for a period of at least two weeks.

13.3.4 Impact Monitoring

Noise monitoring should be carried out at all the designated monitoring stations. The monitoring frequency will depend on the scale of the construction activities. The following is an initial guide to the regular monitoring frequency for each station on a per week basis when noise generating activities are underway:

- one set of measurements between 07.00 - 19.00 hours on normal weekdays;
- one set of measurements between 19.00 - 23.00 hours;
- one set of measurements between 23.00 - 07.00 hours of next day; and
- one set of measurements between 07.00 - 19.00 hours on holidays.

General construction work carried out during restricted hours is controlled by the CNP system under the NCO.

The monitoring is required to ensure compliance with the EIAO in providing feedback to the Contractors for the management of their operations. The EM&A programme is presented separately in the EM&A Manual.

13.4 Operational Noise

Noise monitoring during the operational phase of Route 10 (NLYLH) should be carried out at NSRs in the vicinity of the recommended direct technical remedies. The purpose of this monitoring is to ensure the proposed mitigation measures are effective and that the impact at NSRs that are not protected will be within acceptable noise limits. It is recommended that Highways Department be responsible for the operational phase monitoring. A qualified noise monitoring contractor or laboratory should be employed to carry out the proposed monitoring.

The noise monitoring locations are recommended to be at NSRs located along Route 10 (NLYLH) and are in the vicinity of the recommended direct technical remedies. The operational noise monitoring locations are shown in *Figure 13.5-6.* and summarised in *Table 13.2.* However, the exact locations where the noise monitoring should be conducted should be confirmed after the completion of Route 10 (NLYLH) and in agreement with the EPD.

Table 13.2 Operational Noise Monitoring Stations

Location	Monitoring Station	Name
North Lantau	NL -1A	Tso Wan (Low and high levels)
So Kwun Wat	SKW-19	Lo Tsing Shan Tsuen (Low and high levels)
Siu Lam	SL-N9	Castle Peak Villa (Low and high levels)

13.4.1 Baseline Monitoring

As there will be no traffic on Route 10 (NLYLH) before its official opening, baseline monitoring is not considered necessary.

13.4.2 Impact Monitoring

Traffic noise monitoring should be carried out at the proposed monitoring stations (subject to approval by EPD) when Route 10 (NLYLH) is fully operational. It is recommended that two sets of traffic noise monitoring data be obtained during the first year of the operation of Route 10 (NLYLH) (i.e. 2007). The following is a guide to the traffic noise monitoring for each station when Route 10 (NLYLH) is operational:

- one set of measurements at the morning traffic peak hour on normal weekdays (exact timing to be confirmed with Transport Department and agreed with EPD); and
- one set of measurements at the evening traffic peak hour on normal weekdays (exact timing to be confirmed with Transport Department and agreed with EPD).

During the traffic noise monitoring, traffic counts should also be conducted so as to ensure the traffic noise of the peak periods is covered.

13.5 Construction Dust

The construction work will inevitably lead to dust emissions, mainly from blasting, concrete batching, excavation, truck haulage and material handling. It is predicted that the dust generated will exceed the hourly and daily criteria of $500 \mu\text{g m}^{-3}$ and $260 \mu\text{g m}^{-3}$ respectively at some ASRs.

13.5.1 Mitigation Measures

Mitigation measures are presented in Section 3.5.5 and recommended to limit the dust emission and dispersion. With proper dust control measures in accordance with *Air Pollution Control (Construction Dust) Regulations*, the TSP levels at the affected air sensitive receivers will comply with the dust criteria.

13.5.2 Monitoring Locations

Dust monitoring requirements have been recommended in the EM&A Manual to ensure the efficacy of the control measures. Monitoring stations should be set up at six locations, M1, M4, M5, M7 - M9 as listed in *Table 13.3* below and shown in *Figure 13.1 -13.4*.

Table 13.3 Air Monitoring Locations

	Monitoring Station	Description
North Lantau	M1	Tso Wan Village
Tsing Lung Tau	M4	Hong Kong Garden
Tai Lam Chung	M5	Tai Lam Chung Tsuen
Siu Lam and So Kwun Wat	M7 M8 M9	So Kwun Wat Sun Tsuen Scattered Houses at So Kwun Wat Scattered House to the West of Poseidon Court

13.5.3 Baseline Monitoring

Baseline monitoring should be carried out at all of the designated monitoring locations for at least 14 consecutive days prior to the start of the construction works to obtain daily 24-hr TSP samples. 1-hr sampling should also be done at least 3 times per day while the highest dust impact is expected.

13.5.4 Impact Monitoring

Impact monitoring should be carried out during the course of the Works. For regular impact monitoring, the sampling frequency of at least once in every six-days, should be strictly observed at all the monitoring stations for 24-hr TSP monitoring. For 1-hr TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs.

The monitoring is required to ensure compliance with the EIAO in providing feedback to the Contractors for the management of their operations. The EM&A programme will be presented separately in the EM&A Manual.

13.6 Tunnel Air Quality

Vehicular emissions during the operation of Tai Lam Tunnel will generate major air pollutants such as NO₂, CO and SO₂. Table 13.4 gives the air quality guidelines which should be attained and maintained inside the vehicle tunnel and noise enclosures:

Table 13.4 Tunnel Air Quality Guideline

Air Pollutants	Averaging Time	Maximum Concentration	
		Microgrammes Per Cubic Metre (μgm^{-3})	Parts Per Million (ppm)
Carbon monoxide	5 minutes	115,000	100
Nitrogen dioxide	5 minutes	1,800	1
Sulphur dioxide	5 minutes	1,000	0.4

In addition, the visibility in tunnels is a gross indicator of the particulate concentration. It should be monitored and controlled to a level equivalent to an extinction coefficient of 0.005 per metre or less during any 5-minute interval.

13.6.1 Operational Practice

Effective control of air pollution within the tunnel sections of the Tai Lam Tunnel requires proper supervision of the maintenance and operation of the ventilation system and the monitoring equipment. Good preventive maintenance should be employed and appropriate measures are presented in the EM&A Manual.

13.7 Waste Management

It has been recommended that auditing of each waste stream should be carried out periodically by the Route 10 (NLYLH) (Southern Section) contractor to determine if wastes are being managed in accordance with approved procedures and the site waste management plan. The audits should look at all aspects of waste management including waste generation, storage, recycling, treatment, transport, and disposal. An appropriate audit programme would be to undertake a first audit at the commencement of the construction works, and then to audit quarterly thereafter.

13.8 Water Quality

Water quality monitoring should be undertaken when working at the Toll Plaza, especially when dredging works are being undertaken. Although no dredging works will be undertaken at Tsing Lung Tau water quality monitoring may be required to ensure there is no off-site runoff to the receiving waters. Streams and inland water courses will be monitored under the provisions of the ecology M&A programme.

13.9 Ecology

The mitigation measures should be included into contract clauses for the Route 10 (NLYLH). The implementation of the measures should be checked as part of the EM&A procedures during the construction period. Details of the procedures are presented in the EM&A Manual.

13.10 Landscape

The monitoring of landscaping works will be required to ensure that the proposals for re-instatement and minimisation of visual impacts are achieved.