


Barbican Construction Co. Ltd.

DSD Contract No. DC/2000/19

**Regulation of Shenzhen River Stage III Phase I
Reprovisioning of Border Road and Fence at Yuen
Leng Chai and Man Kam To**

**Environmental Monitoring and Audit Report
(Version 01)**

March 2003

Verified 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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TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
Introduction.....	1
Environmental Monitoring Works.....	1
Environmental Licensing and Permitting	2
Complaints and Prosecutions.....	2
Future Key Issues.....	2
1. INTRODUCTION.....	3
Background.....	3
Project Organizations.....	3
Construction Programme	4
Summary of EM&A Requirements.....	4
2. AIR QUALITY.....	5
Monitoring Requirements	5
Monitoring Locations.....	5
Monitoring Equipment.....	5
Monitoring Parameters, Frequency and Duration	5
Monitoring Methodology and QA/QC Procedure.....	6
Results and Observations.....	7
3. NOISE	9
Monitoring Requirements	9
Monitoring Locations.....	9
Monitoring Equipment.....	9
Monitoring Parameters, Frequency and Duration	9
Monitoring Methodology and QA/QC Procedures	10
Maintenance and Calibration	10
Results and Observations.....	11
4. ENVIRONMENTAL AUDIT	12
Site Audits.....	12
Review of Environmental Monitoring Procedures	12
Status of Environmental Licensing and Permitting	12
Implementation Status of Environmental Mitigation Measures	13
Implementation Status of Event Action Plans	13
Summary of Complaints	13
5. FUTURE KEY ISSUES.....	14
Key Issues for the Coming Month	14
Monitoring Schedule for the Next Month.....	14
6. CONCLUSIONS AND RECOMMENDATIONS.....	15
Conclusions.....	15
Recommendations.....	15

LIST OF TABLES

Table 1.1	Key Project Contacts
Table 2.1	Locations for Air Quality Monitoring
Table 2.2	Air Quality Monitoring Equipment
Table 2.3	Impact Dust Monitoring Parameters, Frequency and Duration
Table 3.1	Noise Monitoring Stations
Table 3.2	Noise Monitoring Equipment
Table 3.3	Noise Monitoring Parameters, Frequency and Duration
Table 4.1	Summary of Environmental Licensing and Permit Status

LIST OF FIGURES

Figure 1	Layout Plan and Locations of the Monitoring Stations
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LIST OF APPENDICES

A	Trigger Action and Limit Levels for Air Quality and Noise
B	Copies of Calibration Certificates
C	Environmental Monitoring Schedules for the Reporting Month
D	1-hour TSP Monitoring Results and Graphical Presentations
E	24-hour TSP Monitoring Results and Graphical Presentations
F	Noise Monitoring Results and Graphical Presentations
G	Site Audit Summary
H	Event Action Plans
I	Summary of Exceedances
J	Tentative Monitoring Schedule for the Next Month

EXECUTIVE SUMMARY

Introduction

This is the seventh monthly Environmental Monitoring and Audit (EM&A) Report prepared by Cinotech Consultants Limited for the “Regulation of Shenzhen River Stage III Phase I – Re-provisioning of Border Road and Fence At Yuen Leng Chai and Man Kam To” (the Project). This report documents the findings of EM&A Works conducted in between 26th February 2003 and 25th March 2003.

The construction activities undertaken in the reporting month were:

- Site clearance of fish pond at Portion A;
- Stage II construction of Box Culvert B;
- Compaction for embankment at CHR 2200-2310 and CHR 2950-3350;
- Construction Reinforced Fill Wall (RFW) 2 and 4;
- Construction of inlet and concrete pipe at Drain Pipe E;
- Excavation for RFW3; and
- Relocation of fencing and clearance at Muk Wu Pumping Station for construction of Drain pipe D.

Environmental Monitoring Works

Environmental monitoring for the Project was performed regularly as stipulated in the EM&A Manual and the results were checked and reviewed. Site audits were conducted once per week. The implementation of the environmental mitigation measures and environmental complaint handling procedures were also checked.

Air Quality

1-hour TSP Monitoring

All 1-hour TSP monitoring was conducted as scheduled. One Limit Level exceedance was reported at IM1A on 27th February 2003. As there was no direct evidence showing that the exceedance was due to the construction activities under Contract No. DC/2000/19, the exceedance was considered to be invalid.

24-hour TSP Monitoring

All 24-hour TSP monitoring was conducted as scheduled. No Action/Limit Level exceedance was recorded during the reporting month.

Construction Noise

All construction noise monitoring was conducted as scheduled. No Action/Limit Level exceedance was recorded during the reporting month.

Environmental Licensing and Permitting

License/Permits granted to the Project include the Environmental Permit (EP) for the Project and Waste Disposal (Chemical Waste) license.

Complaints and Prosecutions

No environmental complaints and prosecution was received during the reporting month.

Future Key Issues

Major construction site activities for the coming month include:

- E&M works at Portion E;
- Construction of Box Culvert B (Stage II);
- Construction of RFW 2,3 and 4; and
- Construction of Drain Pipe D and E.

1. INTRODUCTION

Background

- 1.1 Cinotech Consultants Limited (hereinafter called the “ET”) was commissioned by Barbican Construction Co., Ltd. (hereinafter called the "Contractor") to undertake the Environmental Monitoring and Audit (EM&A) works for the Project “Shenzhen River Regulation Project Stage III Phase I – Re-provisioning of Border Road and Fence at Yuen Leng Chai and Man Kam To” (the Project).
- 1.2 The scope of the works in the project comprises:-
 - Re-provisioning of border road and border fence;
 - Re-construction and re-surfacing of existing border road;
 - Ancillary road and drainage works; and
 - Landscaping works.
- 1.3 The Project is the Phase I of the Designated Project under the Environmental Impact Assessment Ordinance (Cap. 449) and an environmental impact assessment report titled “Shenzhen River Regulation Project Stage III, Environmental Impact Assessment (EIA) Study” (Register No. AEIAR – 035/2000) has been approved and deposited with Environmental Protection Department (EPD). An Environmental Permit (EP) No. EP-078/2000/B has been issued by EPD for the construction of the proposed works under the Project.
- 1.4 Figure 1 shows the layout plan of the Project. The works have been commenced under DSD Contract No. DC/2000/19. Under the requirements of Conditions 5 of the EP, EM&A programme as set out in the EM&A Manual, environmental monitoring of air quality and noise are required for the construction phase of the project.
- 1.5 Barbican Construction Co., Ltd. was awarded for the project as the Contractor. The Project was commenced on 26 July 2002. This is the seventh monthly EM&A report summarizes the impact EM&A works for the Project between 26th February 2003 and 25th March 2003 (25th of each month as the cut-off day).

Project Organization

- 1.6 Different parties with different levels of involvement in the project organization include:
 - Engineer or Engineer’s Representative (E/ER) – Drainage Services Department
 - Contractor - Barbican Construction Co., Ltd.
 - Environmental Team (ET) – Cinotech Consultants Limited
- 1.7 The responsibilities of respective parties are detailed in Section 2.4 of the Environmental Management Plan of the Project.
- 1.8 The key contacts of the Project are shown in Table 1.1.

Table 1.1 Key Project Contacts

Party	Name	Role	Phone No.	Fax No.
EPD	Mr. Saxon Sein	EPO	2835 1117	2591 0558
DSD	Mr. Ben Siu, Iu-bun	Engineer	2594 7595	2116 0061
Contractor	Mr. Joseph Tsang	Deputy Project Manager	2668 2165	2668 2740
	Mr. Joe Cheng	Site Agent	2668 2165	2668 2740
ET	Dr. Priscilla Choy	ET Leader	2151 2089	3107 1388
	Mr. Jesse Yuen	ET's Coordinator	2151 2091	3107 1388

Construction Programme

- 1.9 The construction activities undertaken in the reporting month were:
- Site clearance of fish pond at Portion A;
 - Stage II construction of Box Culvert B;
 - Compaction for embankment at CHR 2200-2310 and CHR 2950-3350;
 - Construction Reinforced Fill Wall (RFW) 2 and 4;
 - Construction of inlet and concrete pipe at Drain Pipe E;
 - Excavation for RFW3; and
 - Relocation of fencing and clearance at Muk Wu Pumping Station for construction of Drain pipe D.

Summary of EM&A Requirements

- 1.10 The EM&A programme requires construction phase monitoring for air quality and construction noise and environmental site audit. The EM&A requirements for each parameter are described in following sections:
- All monitoring parameters;
 - Action and Limit levels for all environmental parameters;
 - Event / Action Plans;
 - Environmental mitigation measures, as recommended in the project EIA study final report;
 - Environmental requirements in contract documents.
- 1.11 This report presents the monitoring results, observations, locations, equipment, period, methodology and QA/QC procedures of the required monitoring parameters, namely dust and noise levels and audit works for the Project in the reporting period.

2. AIR QUALITY

Monitoring Requirements

- 2.1 1-hour and 24-hour TSP monitoring was conducted to monitor the air quality. Appendix A shows the established Action/Limit Levels for the environmental monitoring works.

Monitoring Locations

- 2.2 Three designated monitoring stations, IM1A and IM2 were selected for impact dust monitoring and IC was selected as a control station. Table 2.1 describes the air quality monitoring locations, which are also depicted in Figure 1.

Table 2.1 Locations for Air Quality Monitoring

Monitoring Stations	Location
IM1A	A village house near Lo Wu KCRC station
IM2	A village house in Nga Yiu Tsuen
IC (Control Station)	A village house in Muk Wu Tsuen

Monitoring Equipment

- 2.3 Table 2.2 summarizes the equipment used in the impact air monitoring programme. Copies of calibration certificates are attached in Appendix B.

Table 2.2 Air Quality Monitoring Equipment

Equipment	Model and Make	Quantity
Calibrator	GMW 25	1
HVS Sampler	GMWS 2310 c/w of TSP sampling inlet	3

Monitoring Parameters, Frequency and Duration

- 2.4 Table 2.3 summarizes the monitoring parameters and frequencies of impact dust monitoring for the whole construction period. The air quality monitoring schedule for the reporting month is shown in Appendix C.

Table 2.3 Impact Dust Monitoring Parameters, Frequency and Duration

Parameters	Frequency
1-hr TSP	Three times / 6 days
24-hr TSP	Once / 6 days

Monitoring Methodology and QA/QC Procedures

1-hour and 24-hour TSP Monitoring

Instrumentation

- 2.5 High volume (HVS) samplers (Model GMWS-2310 Accu-Vol) completed with appropriate sampling inlets were employed for 1-hour and 24-hour TSP monitoring. The sampler was composed of a motor, a filter holder, a flow controller and a sampling inlet and its performance specification complied with that required by USEPA Standard Title 40, Code of Federation Regulations Chapter 1 (Part 50). Moreover, the HVS also met all the requirements in section 2.3 of the EM&A Manual.

Operating/Analytical Procedures

- 2.6 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 sampler was more than 20 meters from the drip line.
 - Any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring.
- 2.7 Prior to the commencement of the dust sampling, the flow rate of the high volume sampler was properly set (between 1.1 m³/min. and 1.4 m³/min.) in accordance with the manufacturer's instruction to within the range recommended in USEPA Standard Title 40, CFR Part 50.
- 2.8 For TSP sampling, fiberglass filters (G810) were used [Note: these filters have a collection efficiency of > 99% for particles of 0.3 mm diameter].
- 2.9 The power supply was checked to ensure the sampler worked properly.
- 2.10 On sampling, the sampler was operated for 5 minutes to establish thermal equilibrium before placing any filter media at the designated air monitoring station.
- 2.11 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.

- 2.12 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.
- 2.13 The shelter lid was closed and secured with the aluminum strip.
- 2.14 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).
- 2.15 After sampling, the filter was removed and sent to the laboratory for weighing. The elapsed time was also recorded.
- 2.16 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 $\pm 3^\circ\text{C}$; the relative humidity (RH) should be $< 50\%$ and not vary by more than $\pm 5\%$. A convenient working RH is 40%.

Maintenance/Calibration

- 2.17 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 3-month intervals using GMW-25 Calibration Kit throughout all stages of the air quality monitoring.

Results and Observations

- 2.18 Dust monitoring was conducted as scheduled in the reporting month. The monitoring data and graphical presentations of 1-hour and 24-hour TSP monitoring results are shown in Appendices D and E respectively.
- 2.19 Key dust monitoring findings and observations are provided as below.
- 2.20 The weather during the monitoring session was mainly sunny or cloudy. Weather conditions are provided in Appendices D and E.

1-hour TSP Monitoring

- 2.21 All 1-hour TSP monitoring was conducted as scheduled. One Limit Level exceedance was reported at IM1A on 27th February 2003. The main dust source observed was the construction activities on Shenzhen side near the station, the exceedance was therefore considered not caused by the work under Contract No. DC/2000/19.

24-hour TSP Monitoring

- 2.22 All 24-hour TSP monitoring was conducted as scheduled. No Action/Limit Level exceedance was recorded during the reporting month.

3. NOISE

Monitoring Requirements

- 3.1 Noise monitoring was conducted in accordance with the EM&A Manual. Appendix A shows the established Action Limit Levels for the environmental monitoring works.

Monitoring Locations

- 3.2 In accordance with the EM&A Manual, noise monitoring was conducted at two monitoring stations, namely IM1N and IM2, and one control station, namely IC. Figure 1 shows the locations of these stations.

Table 3.1 Noise Monitoring Stations

Monitoring Stations	Location
IM1N	Lo Wu Public School
IM2	A village house in Nga Yiu Tsuen
IC (Control Station)	A village house in Muk Wu Tsuen

Monitoring Equipment

- 3.3 Integrating Sound Level Meters were used for noise monitoring. They were 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). They comply with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1).
- 3.4 Table 3.2 summarizes the noise monitoring equipment model being used. Copies of calibration certificates are attached in Appendix B.

Table 3.2 Noise Monitoring Equipment

Equipment	Model	Quantity
Integrating Sound Level Meter	B&K 2238	4
Calibrator	B&K 4231	2
Wind Speed Anemometer	Extech-Van Anemometer, Model 451104	1

Monitoring Parameters, Frequency and Duration

- 3.5 Table 3.3 summarizes the monitoring parameters, frequency and total duration of monitoring. The noise monitoring schedule is shown in Appendix C.

Table 3.3 Noise Monitoring Parameters, Frequency and Duration

Monitoring Station	Parameter	Period	Frequency	Measurement
IM1A	L ₁₀ (30 min.)dB(A)	0700-1900	Once per week	Free Field
IM2	L ₉₀ (30 min.)dB(A)	hrs. on		Free Field
IC	L _{eq} (30 min.)dB(A)	weekdays		Free Field

Monitoring Methodology and QA/QC Procedures

- The Sound Level Meter was set on a tripod at a height of 1.2 m above the ground.
- For free field measurement, the meter was positioned away from any nearby reflective surfaces. All records for free field noise levels were adjusted with a correction of +3 dB(A).
- The battery condition was checked to ensure the correct functioning of the meter.
- Parameters such as frequency weighting, the time weighting and the measurement time were set as follows:
 - frequency weighting : A
 - time weighting : Fast
 - time measurement : 30 minutes / 5 minutes
- Prior to and after each noise measurement, the meter was calibrated using a Calibrator for 94 dB at 1000 Hz. If the difference in the calibration level before and after measurement was more than 1 dB(A), the measurement would be considered invalid and repeat of noise measurement would be required after re-calibration or repair of the equipment.
- The wind speed was frequently checked with the portable wind meter.
- At the end of the monitoring period, the L_{eq}, L₉₀ and L₁₀ were recorded. In addition, site conditions and noise sources were recorded on a standard record sheet.
- Noise measurement was paused during periods of high intrusive noise if possible and observation was recorded when intrusive noise was not avoided.
- 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 10 m/s.

Maintenance and Calibration

- 3.6 The microphone head of the sound level meter and calibrator was cleaned with soft cloth regularly.
- 3.7 The meter was sent to the supplier to check and calibrate on yearly intervals.

Results and Observations

- 3.8 Noise monitoring was performed at three designated locations (2 monitoring stations and 1 control station) during the daytime period (0700 to 1900) as scheduled in the reporting month. Results and graphical presentations are shown in Appendix F.
- 3.9 The weather during the monitoring sessions was mainly sunny or cloudy. Weather conditions are provided in Appendix F.
- 3.10 No Action/Limit Level exceedance was recorded during the reporting month.

4. ENVIRONMENTAL AUDIT

Site Audits

- 4.1 Site audits were carried out on weekly basis to monitor the timely implementation of proper environmental management practices and mitigation measures in the Project site. The summaries of site audits are attached in Appendix G.
- 4.2 Site audits were conducted on 27th February 2003 and 6th, 13th and 20th March 2003.

Review of Environmental Monitoring Procedures

- 4.3 The monitoring works conducted by the monitoring team were inspected regularly. The following observations have been recorded for the monitoring works:

Air Quality Monitoring

- The monitoring team recorded all observations around the monitoring stations within and outside of the construction site.
- The monitoring team recorded the temperature and weather conditions on the monitoring day.

Noise Monitoring

- The monitoring team recorded all observations around the monitoring stations, which might affect the monitoring result.
- Major noise sources were identified and recorded. Other intrusive noise attributing to the result was trimmed off by pausing the monitoring temporarily.

Status of Environmental Licensing and Permitting

- 4.4 All permits/licenses obtained are summarized in Table 4.1.

Table 4.1 Summary of Environmental Licensing and Permit Status

Permit No.	Valid Period		Section	Status
	From	To		
Environmental Permit				
EP-078/2000/B * a copy was attached in the monthly report of September 2002	31/08/02	N/A	Re-provisioning of border road and border fence, re-construction and re-surfacing of existing border road, ancillary road and drainage works and Landscaping works.	Valid
Waste Disposal (Chemical Waste)				
WPN:5213-641-B2270-04 * a copy was attached in the monthly report of September 2002	N/A	N/A	Disposal of chemical waste such as waste lubricating oil and diesel oil arising from construction work.	Valid

Implementation Status of Environmental Mitigation Measures

- 4.5 During site inspections in the period, the following observations and recommendations were made.

Air Quality

- 4.6 On 13th March 2003, the access road inside the site was observed dry. The Contractor was recommended to provide measures to prevent dust generation.

Water Quality

- 4.7 Muddy water was occasionally observed inside the wheel washing bay during the inspections. The contractor was recommended to renew the water regularly.

Chemical and Waste Management

- 4.8 During the site inspections, it was observed that the chemical drums and generators were placed on bare ground. The Contractor was recommended to provide drip trips or other alternatives to avoid oil leaking from the said equipment/drums to the ground.
- 4.9 On 13th March 2003, oil leakage from oil drum was observed at portion F. The Contractor was recommended to clean up the contaminated soil immediately.

Implementation Status of Event Action Plans

- 4.10 The Event Action Plans for air quality and noise are presented in Appendix H.
- 4.11 All 1-hour TSP monitoring was conducted as scheduled. A total of One Limit Level exceedance was reported at IM1A on 27th February 2003. As there was no direct evidence showing that the exceedance was due to the construction activities under Contract No. DC/2000/19, the exceedance was considered to be invalid.
- 4.12 All 24-hour TSP monitoring was conducted as scheduled. No Action/Limit Level exceedance was recorded during the reporting month.
- 4.13 All construction noise monitoring was conducted as scheduled. No Action/Limit Level exceedance was recorded during the reporting month.

Summary of Complaints

- 4.14 No environmental complaint against the Project works was received during the reporting period.

5. FUTURE KEY ISSUES

Key Issues for the Coming Month

5.1 Key issues to be considered in the coming month include:

- Generation of dust from stockpiles, haul road and vehicles movement on-site;
- Noise from operation equipment and machinery on-site;
- Ineffective use of sand traps and/or baffles;
- Regular removal of mud, sand and silt along u-channel and wheel washing bay;
- Wastewater discharge from site; and
- Storage of chemicals/fuel and chemical waste/waste oil on site.

Monitoring Schedule for the Next Month

5.2 The tentative environmental monitoring schedule for the next month is shown in Appendix J.

6. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

- 6.1 Environmental monitoring for the Project was performed in the reporting month and all monitoring results were checked and reviewed.
- 6.2 Site auditing for the Project was performed in the reporting month on weekly basis. The environmental monitoring of air quality and noise were performed as scheduled.
- 6.3 One Limit Level exceedance for 1-hour TSP was reported at IM1A on 27th February 2003. As there was no direct evidence showing that the exceedance was due to the construction activities under Contract No. DC/2000/19, the exceedance was considered to be invalid.
- 6.4 No Action/Limit Level exceedance for 24-hour TSP was recorded during the reporting month.
- 6.5 No Action/Limit Level exceedance for construction noise was recorded during the reporting month.
- 6.6 No environmental complaint was received during the reporting month

Recommendations

- 6.7 According to the environmental audit performed in the reporting month, the following recommendations were made:

Dust Impact

- To prohibit any open burning on site.
- To regularly maintain the machinery and vehicles on site.
- To follow up any exceedance caused by the construction works.
- To implement dust suppression measures on all haul roads, stockpiles and dry surfaces.

Noise Impact

- To inspect the noise sources from inside and outside of the site.
- To follow up any exceedance caused by the construction works.
- To space out noisy equipment and position as far away as possible from sensitive receivers.
- To provide temporary noise barriers for operations of noisy equipment near the noise sensitive receivers.

Water Impact

- To identify any wastewater discharges from site.
- To regularly maintain the condition of u-channel, catch pits and wheel washing facilities

on site.

- To regularly maintain the sediment control measures after rainstorms.

Waste/Chemical Management

- To check for any accumulation of waste materials or rubbish on site.
- To avoid any discharge of chemical waste or oil directly from the site.