


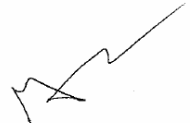
PROJECT No.: TCS/00408/08

**DSD CONTRACT NO. DC/2007/17
DRAINAGE IMPROVEMENT WORKS IN CHEUNG PO,
MA ON KONG, YUEN KONG SAN TSUEN AND TIN SAM
TSUEN OF YUEN LONG DISTRICT AND SEWERAGE AT
TSENG TAU CHUNG TSUEN, TUEN MUN**

FINAL EM&A REPORT – KT14A

PREPARED FOR
CHINA ROAD & BRIDGE CORPORATION

Quality Index

Date	Reference No.	Prepared By	Certified By
30 Nov 2009	TCS00408/08/600/R1258v2	 Nicola Hon Environmental Consultant	 Andrew Lau Environmental Team Leader

Version	Date	Prepared by	Certified by	Description
1	21 Oct 2009	Nicola Hon	Andrew Lau	First submission
2	30 Nov 2009	Nicola Hon	Andrew Lau	Amended against IEC's comments on 6 November 2009

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Ove Arup & Partners
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Our ref 25211/L160/CN/cl

Date 8 December 2009

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Attention: Mr. Clive Cheng

ARUP

Dear Mr. Cheng,

Contract No. DC/2007/17 Drainage Improvement Works in Cheung Po, Ma On Kong, Yuen King San and Tin Sam Tsuen of Yuen Long District and Sewerage at Tseng Tau Chung Tsuen, Tuen Mun
Final EM&A Report for KT14A – Version 2

We refer to the captioned report (ref.: TCS00408/08/600/R1258v2) and advise that we have no further comment on the captioned submission.

We hereby endorse the captioned report for your onward submission.

If you require any further information, please do not hesitate to contact the undersigned.

Yours sincerely,



Coleman Ng
Independent Environmental Checker

cc: China Road and Bridge Corporation (Mr. Raymond Mau) (Fax: 2478 9612)
AUES (Mr. TW Tam / Mr. Andrew Lau) (Fax: 2959 6079)

EXECUTIVE SUMMARY

- ES.01 CRBC has been awarded the DSD Contract No. DC/2007/17 (hereinafter “the Project”). The works to be executed under the Project are located in Kam Tin, Pat Heung and Tuen Mun, New Territories. The Project involves construction of five drainage channels, namely Channels KT12, KT13 (under Environmental Permit No.EP263/2007), KT14A (under Environmental Permit No. EP231/2005A), KT14B and KT14C in Kam Tin and Pat Heung and the sewerage works at Tseng Tau Chung Tsuen in Tuen Mun. As the environmental monitoring requirements for the two Environmental Permits and those not under a permit are different, the EM&A report under the Project is split to the following three stand-alone parts
- EM&A Report – Channel KT13 (under EP No.EP263/2007);
 - EM&A Report – Channel KT14A (under EP No. EP231/2005A); and
 - EM&A Report – Channels KT12, KT14B and KT14C (Non-Designated Project works with no Environmental Permit)
- ES.02 Based on the notification of commencement date of the Drainage work by the Contractor, construction works of Channel KT12, KT14B and KT14C (non-designated works) were commenced on 7 August 2008, 29 September 2008 and 9 October 2008 respectively; while the construction works for Channel KT13 (designated works) was started on 20 October 2008 and Channel KT14A (designated works) was begun on 2 October 2008.
- ES.03 The substantial completion for Channel KT14A was certified by the Engineer’s Representative on 21 August 2009. Upon received the CRBC’s letter (Ref: CRBC/DC200717/S331(1)/233) on 27 August 2009 incorporate with ER letter (Ref: KL/KIL/382047/2007/17/M15/902), the EM&A programme for the project was ceased on 28 August 2009.
- ES.04 This Final EM&A Report for Channel KT14A (Designated Project works) summarized the key environmental monitoring results throughout the construction phase in accordance with the EM&A Manual [382047/E/PP/Issue5] Section 10.5.
- ES.05 The whole period of the drainage work at Channel KT14A covered from 2 October 2008 to 27 August 2009 (hereafter “the Construction Period”). The EM&A programme i.e. air quality, construction noise, water quality and waste management were undertaken as a total of 11 construction months.

Progress of the EM&A Programme

- ES.06 The impact EM&A program was undertaken in accordance with the relevant EM&A manuals. A summary of the monitoring activities in the construction period is listed below:

Environmental Issues	Channel KT14A
• 1-hour TSP Monitoring	162 monitoring events
• 24-hour TSP Monitoring	54 monitoring events (*)
• Noise Monitoring	54 monitoring events
• Water Quality Monitoring	140 monitoring days
• Site Inspection Audit	48 occasions

Remarks (*) only 53 events were successful

Breaches of Environmental Quality Criteria

- ES.07 In the whole construction period, no breaches in 1-hour TSP monitoring were recorded, however, a total of three (3) Action Level exceedances in 24-hour TSP monitoring were recorded which on 27 November 2008, 13 January 2009 and 5 February 2009. Investigations for the cause of the exceedances were conducted and it concluded that all the exceedances were not related to the works under the construction site of Channel KT14A.
- ES.08 During the construction phase, there was one (1) Action Level exceedance in construction

noise due to a complaint was received on 26 March 2009. Investigation report concluded that it was due to project about the noise and vibration generated from sheetpiling work. Since the sheetpiling work was completed on 31 March 2009 and no further complaint and exceedance was received and recorded, no corrective action was required.

ES.09 A total of 153 exceedances of water quality Action/Limit (A/L) Levels of which 62 were exceedances of Action Level and 91 Limit Level. The overall compliance rate of water quality monitoring in the construction period is 81.8%. Investigation showed that all exceedances were not works related.

ES.10 A summary of all environmental exceedances is presented as follows:

Parameter	No. of Exceedance	Compliance of percent (%)
1-hour TSP (Air Quality)	0	100.0%
24-hour TSP (Air Quality)	3	94.3%
Construction Noise	1	98.1%
Suspended Solids	60	57.1%
Turbidity	19	86.4%
Dissolved Oxygen	59	57.9%
pH	0	100.0%
Ammonia	7	95.0%
Zinc	8	94.3%
Overall	157	87.0%

Environmental Complaint, Notifications of Summons and Prosecutions

ES.11 Although one (1) noise complaint was recorded on 26 March 2009 which was due to the project, no notification of summons and successful prosecution was received during the Construction Period. Minor deficiencies found in the weekly site inspection and auditing were in general rectified within the specified deadlines. The environmental performance of the construction works at Channel KT14A was therefore considered satisfactory.

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1 INTRODUCTION

1.1 BASIC PROJECT BACKGROUND

CRBC has been awarded the DSD Contract No. DC/2007/17 (hereinafter “the Project”). The works to be executed under the Project are located in Kam Tin, Pat Heung and Tuen Mun, New Territories. The location plan of the Project is shown in *Appendix A*.

The Project involves construction of five drainage channels, namely Channels KT12, KT13 (under Environmental Permit No.EP263/2007), KT14A (under Environmental Permit No. EP231/2005A), KT14B and KT14C in Kam Tin and Pat Heung and the sewerage works at Tseng Tau Chung Tsuen in Tuen Mun. As the environmental monitoring requirements for the two Environmental Permits and those not under a permit are different, the EM&A report under the Project is split to the following three stand-alone parts:

- (a) EM&A Report – Channel KT13 (under EP No.EP263/2007);
- (b) EM&A Report – Channel KT14A (under EP No. EP231/2005A); and
- (c) EM&A Report – Channels KT12, KT14B and KT14C (Non-Designated Project works with no Environmental Permit)

Due to the substantial completion at the Channel KT14A certified by the Engineer’s Representative on 21 August 2009, a final report shall be submitted to present the overall EM&A results of the Designated Projects in accordance with the requirements in Section 10.5 of the EM&A Manual [382047/E/PP/Issue5]. This final report covers the key environmental monitoring results for the entire 11- month construction period from 2 October 2008 and 27 August 2009.

1.2 REPORT STRUCTURE

This Report is structured as follows:

- | | |
|------------------|--|
| <i>Section 1</i> | Introduction |
| <i>Section 2</i> | Summary of Impact Environmental Monitoring and Audit Requirements |
| <i>Section 3</i> | Monitoring Results and Breaches of Environmental Quality Criteria |
| <i>Section 4</i> | Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions |
| <i>Section 5</i> | Waste Management and Site Inspection & Audit |
| <i>Section 6</i> | Conclusion |

1.3 PROJECT ORGANISATION AND CONSTRUCTION PROGRESS

1.3.1 Environmental Management Organization

The environmental management team comprises: DSD (Project Proponent), CRBC (main Contractor), EPD and AFCD (supervisory departments in Government), BVHKL (ER); ARUP (IEC) and AUES (ET). Detailed management organization including organisation structure and key personnel contacts is presented in *Appendix B*.

1.3.2 Major Works of KT14A Undertaken during the Construction Period

Major construction activities implemented under the project site during the construction Period are presented as below and mile stone of construction program is attached in *Appendix C*.

- (a) Construction of about 0.145 km of secondary drainage channels;
- (b) Construction of DSD maintenance access;
- (c) Construction of public access road with footpath;
- (d) Provisioning and re-provisioning of vehicular/ pedestrian crossings;
- (e) water main laying works;
- (f) Associated ancillary works;
- (g) Landscaping works; and

- (h) Other work as required including the preparation works, site clearance underground utility investigation, tree survey, tree pruning and tree transplant under the Contract of the project site KT14A.

1.4 ENVIRONMENTAL LICENSING STATUS

The environmental licensing status in the construction period is summarized in *Table 1-1*.

Table 1-1 Status of Environmental Licenses and Permits

Item	License / Permit Description	Status
1	Air Pollution Control (Construction Dust)	Notified EPD on 14-Feb-08
2	Water Pollution Control (Discharge License) License No. 1U461/1	Valid
3	Chemical Waste Producer Registration WPN: 5611-531-C3124-28	Registration on 2-May-08
4	Construction Waste Disposal Billing Account Number 7006524	Valid on 9 Jan 2008

2 SUMMARY OF IMPACT ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS

2.1 MONITORING PARAMETERS

The ET has compiled the EM&A requirements set out in the associated EM&A Manuals in the *Environmental Monitoring Methodology*, which has been agreed by the ER and IEC. The monitoring parameters are summarized below.

Table 2-1 Summary of Monitoring Parameters

Env. Aspect	Monitoring Parameters	
Air Quality	(a) 1-hour Total Suspended Particulate (hereinafter '1-hour TSP'); and (b) 24-hour Total Suspended Particulate (hereinafter '24-hour TSP').	
Construction Noise	(a) A-weighted equivalent continuous sound pressure level (30min) (hereinafter 'Leq(30min)') during the normal working hours; and (b) A-weighted equivalent continuous sound pressure level (5min) (hereinafter 'Leq(5min)') for construction work during the restricted hours.	
Water Quality	(a) In Situ Measurement	temperature, Dissolved Oxygen (hereinafter 'DO'), pH & Turbidity
	(b) Laboratory Analysis	Suspended Solids (hereinafter 'SS'), Ammonia Nitrogen (hereinafter 'NH ₃ -N') and Zinc (hereinafter 'Zn')

2.2 MONITORING LOCATIONS

Monitoring locations are summarized in *Table 2-2* and shown in *Appendix A*.

Table 2-2 Summary of Monitoring Locations

Env. Aspect	Monitoring Location ID	Identified Address / Co-ordinates
Air	A8(a)	Entrance of Strong Sing Garden
Noise	N8	Ground floor of Strong Sing Garden H502
Water	W8A	E825274 / N831712
	W8B	E825143 / N831786

2.3 MONITORING FREQUENCY

The impact monitoring frequency and duration for air quality, construction noise, water quality, ecology and other parameters are summarized below.

2.3.1 Air Quality

Frequency: Once every 6 days for 24-hour TSP and three times every 6 days for 1-hour TSP, when the highest construction dust impacts are anticipated.

Duration: Throughout the construction period

2.3.2 Construction Noise

Frequency: Measurement of Leq 30min: Once a week during 0700-1900 on normal weekdays for Leq30min

If the construction work is undertaken at restricted hour, the frequency of noise monitoring will be conducted in accordance with the requirements under the related Construction Noise Permit issued by EPD as follows:

- 3 consecutive Leq5min at restricted hour from 1700 – 2300;
- 3 consecutive Leq5min for restricted hour from 2300 – 0700 next day;
- 3 consecutive Leq5min for Sunday or public holiday from 0700 – 1900;

Duration: Throughout the construction period

2.3.3 Water Quality

Frequency: Three times a week with at least 36 hour intervals between any two consecutive monitoring events

Depths: As the water columns in the stream water within KT14A is generally less than 3 m, measurement is performed at the mid-depths of the monitoring locations. In case the water columns are deeper than 6 m, measurement shall be carried out at three water depths, namely, 1 m below water surface, mid-depth, and 1 m above river bed. If the water depths are between 3 to 6 m, the mid-depth measurement is omitted.

Duration: Throughout the construction period.

2.4 ENVIRONMENTAL QUALITY CRITERIA

The Environmental Quality Criteria i.e. Action and Limit Levels (herein after 'A/L Levels') are summarized as follows:

Table 2-3 Summary of Air Quality Monitoring Results at KT14A-A8(a)

Monitoring Location ID	Action Level ($\mu\text{g}/\text{m}^3$)		Limit Level ($\mu\text{g}/\text{m}^3$)	
	1-hour TSP	24-hour TSP	1-hour TSP	24-hour TSP
KT14A - A8(a)	310	144	500	260

Table 2-4 Action and Limit Levels of Construction Noise Monitoring

Time Period	Action Level in dB(A)	Limit Level in dB(A)
0700-1900 hours on normal weekdays	When one documented complaint is received	75* dB(A)

Note: * Reduces to 70dB(A) for schools and 65dB(A) during the school examination periods.

Table 2-5 Water Quality Action and Limit Levels

Parameter	Monitoring Location	Type of Station	Action Level	Limit Level
DO (mg/L)	W8A	Control	NA	NA
	W8B	Impact	6.378	4.00
Turbidity (NTU)	W8A	Control	NA	NA
	W8B	Impact	120% of the results of upstream control station's of the same day	130% of the results of upstream control station's of the same day
pH	W8A	Control	NA	NA
	W8B	Impact	9.2 (95%-ile of baseline results)	9.3 (99%-ile of baseline results)
SS (mg/L)	W8A	Control	NA	NA
	W8B	Impact	120% of the results of upstream control station's of the same day	130% of the results of upstream control station's of the same day
Ammonia ($\mu\text{g}/\text{L}$)	W8A	Control	NA	NA
	W8B	Impact	120% of the results of upstream control station's of the same day	130% of the results of upstream control station's of the same day
Zinc ($\mu\text{g}/\text{L}$)	W8A	Control	NA	NA
	W8B	Impact	120% of the results of upstream control station's of the same day	130% of the results of upstream control station's of the same day

2.4 EVENT ACTION PLAN

In case of non-compliance was found in the air quality, construction noise and water quality monitoring, more frequent monitoring as specified in the Action Plan is attached in *Appendix D*, shall be carried out. The additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities. The ET, the ER and the Contractor shall undertake the relevant action in accordance with the Action Plan accordingly.

2.5 ENVIRONMENTAL MITIGATION MEASURES

CRBC has committed to implement environmental protection and pollution control and mitigation measures as recommended in the PP, EP and the EM&A Manual. Continuous up-dating of the Mitigation Measures Implementation Schedules attached in the EM&A Manual is required under the PS. The updated Environmental Mitigation Measures Schedule is enclosed in *Appendix E*. The implemented mitigation measures include:

- (a) Watering of exposed dry and dusty surface, including stock piles of dusty materials;
- (b) Covering of the loose soil to minimize water quality impacts;
- (c) Hard pavement of haul road leading to public roads;
- (d) Wheel washing facility at to avoid construction dust impacts on the public roads; and
- (e) Construction of noise barriers.
- (f) During construction works nearly the seasonal wetland, mitigation measures of Ecology will be followed in accordance with EM&A Manual Annex A ECO.1 and ECO.3;

3 MONITORING RESULTS AND BREACHES OF ENVIRONMENTAL QUALITY CRITERIA

The environmental monitoring results were compared against the Action and Limit Levels established based on the baseline monitoring results and statutory criteria. In case the measured data triggered the environmental quality criteria, remedial actions will be followed according to the Event and Action Plan. In the construction period, the graphical plots of the trends of monitored parameter of 11 construction months are presented in *Appendix F*.

3.1 AIR QUALITY

In the construction period, there were total of 162 measurement events for 1-hour TSP at the designated location KT14A-A8(a). Although there were total of 54 sampling events for 24-hour TSP undertaken at the designated location KT14A-A8(a), only 53 events were successful as one sample on 27 April 2009 was damaged by the seepage of water during the heavy rains and the result was invalidated. The summary of Air Quality of 1-hour and 24-hour TSP in the construction phase are presented in *Table 3-1* and *3-2*.

Table 3-1 Summaries of Air Quality of 1-hour and 24-hour TSP in the Construction Period

Channel	Station	1-hour TSP ($\mu\text{g}/\text{m}^3$)			24-hour TSP ($\mu\text{g}/\text{m}^3$)		
		Max	Min	Mean	Max	Min	Mean
KT14A	A8(a)	241	34	105	189	10	45
Recorded in the date		16 Dec 08	23 May 09	162 events	5 Feb 09	27 Jun 09 & 4 Jul 09	53 events*

* Total of 53 successful monitoring event

Table 3-2 Summaries of Breaches of Air Quality A/L Levels in the Construction Period

Location	Exceedance	1-hour TSP	24-hour TSP	Total
A8(a)	Action Level	0	3	3
	Limit Level	0	0	0

As shown in *Table 3-1* and *3-2* and *Appendix F*, the monitoring results of 1-hour TSP in the construction period fluctuated below the Action Levels of $310 \mu\text{g}/\text{m}^3$. For 24-hour TSP monitoring, a total three (3) Action Level exceedances of which recorded on 27 November 2008 ($164 \mu\text{g}/\text{m}^3$), 13 January 2009 ($149 \mu\text{g}/\text{m}^3$) and 5 February 2009 ($189 \mu\text{g}/\text{m}^3$) in the construction period. Investigation reports revealed that the exceedances were due to the incident of hill-fire during dry season which deteriorated the air quality in the vicinity. Therefore, no specific air quality corrective action was required during the construction period.

3.2 CONSTRUCTION NOISE

Monitoring results are presented in graphic plots in *Appendix F*. Breaches of construction noise A/L Levels during the construction period are summarized in *Table 3-3*.

Table 3-3 Summaries of Breaches of Construction Noise A/L Levels in the Construction Period

Channel	Station	Leq _{30min} (dB(A))		Action Level	Limit Level in dB(A)
		Max	Min		
KT14A	N8	69.6	46.9	When one documented complaint is received	75*
Recorded in the date		18 May 09	6 Jul 09		

As shown in *Tables 3-3* and *Appendix F*, all noise monitoring results fluctuated below the Limit Level. However, one noise complaint about the project (Action Level exceedance) was received on 26 March 2009 and investigation found that it was due to the noise nuisance of the piling work of the project. Since the sheetpiling work was completed on 31 March 2009 and no exceedances

and further complaint related to the work was received. No corrective action was required in the construction period.

3.3 WATER QUALITY

All monitoring results are presented in graphic plots in *Appendix E*. Breaches of water quality A/L Levels during the construction period are summarized in *Table 3-4* and *3-5*, taken into account that W8A is set as the up-stream control station for W8B.

Table 3-4 Summaries of Breaches of Water Quality A/L Levels in Each Construction Month

location	Exceedance	DO	Turbidity	pH	SS	NH ₄ ⁺ N	Zn	Total
Oct 08	Action Level	6	0	0	0	0	2	8
	Limit Level	5	7	0	8	0	3	23
Nov 08	Action Level	6	0	0	0	0	0	6
	Limit Level	0	1	0	5	0	1	7
Dec 08	Action Level	6	0	0	1	1	0	8
	Limit Level	0	3	0	4	0	1	8
Jan 09	Action Level	9	0	0	0	0	0	9
	Limit Level	0	0	0	5	2	0	7
Feb 09	Action Level	6	0	0	0	0	0	6
	Limit Level	0	1	0	1	0	0	2
Mar 09	Action Level	9	0	0	0	0	0	9
	Limit Level	0	1	0	4	0	0	5
Apr 09	Action Level	0	0	0	0	0	0	0
	Limit Level	0	4	0	10	0	0	14
May 09	Action Level	0	0	0	0	0	0	0
	Limit Level	0	0	0	4	0	0	4
Jun 09	Action Level	0	0	0	1	0	0	1
	Limit Level	0	0	0	6	0	0	6
Jul 09	Action Level	7	0	0	1	0	0	8
	Limit Level	0	0	0	3	2	0	5
Aug 09	Action Level	5	1	0	1	0	0	7
	Limit Level	0	1	0	6	2	1	10
Total	Action Level	54	1	0	4	1	2	62
	Limit Level	5	18	0	56	6	6	91

Table 3-5 Summaries of Breaches of the Existing Water Quality A/L Levels at W8B in Construction Period

Parameter	Channels KT14A	
	No. of Exceedance	Compliance of percent
Suspended Solids	60	57.1%
Turbidity	19	86.4%
Dissolved Oxygen	59	57.9%
pH	0	100.0%
Ammonia	7	95.0%
Zinc	8	94.3%
Overall	153	81.8%

As shown in *Table 3-4*, a total of 153 exceedances of water quality A/L Levels, namely 62 exceedances of Action Levels and 91 exceedances of Limit Levels, were recorded during the construction period. Summary of breaches of the existing water quality A/L at W8B is shown in *Table 3-5*.

All NOE and the associated investigation report have been issued upon confirmation of the results and construction information. Investigation found that water mitigation measures such

as erect of sandbags and sedimentation tank were fully implemented, changes of ambient conditions due to natural variation was raised and it considered as the causes of the exceedances. It was concluded that all of the exceedances were not related to the works under Channel KT14A. No corrective actions were recommended.

3.4 OTHER FACTORS AFFECTED THE MONITORING RESULTS DURING THE CONSTRUCTION PHASE

Air Quality Monitoring

The baseline monitoring was conducted during 1 to 15 April 2008 within typical Hong Kong dry season. The baseline data so collected therefore represent the baseline air quality of the dry season immediately prior to commencement of the Project. They may reflect the air quality conditions of another Hong Kong wet season, which are normally significantly different.

Construction Noise Monitoring

Adjacent to the site boundary, the land uses are mainly village house, open area and rural residential which are a high potential development zone. Resident or traffic flow is normally significantly different once developed. So, noise monitoring results might be affected by the land development.

Water Quality Monitoring

It is noted that abnormally high frequency of exceedance of the existing water quality criteria has occurred since the commencement of the water quality monitoring at W8B of KT14A. Refer to baseline monitoring period, which was carried out between 18 March 2008 and 12 April 2008 in typical Hong Kong dry season. The DO condition might be decreased significantly in hot season, in particular under sunlight condition, due to significant increase of the temperature in the monitoring streams to assist the bacteria grow and significant decrease of oxygen concentration. Also, the high water flow during wet seasonal should be affected the water parameters i.e. turbidity, suspended solids, pH, ammonia nitrogen and zinc.

3.4 SUMMARIES WEATHER CONDITIONS DURING THE CONSTRUCTION PERIOD

The construction work at KT14A was commenced on 2 October 2008 and the substantial completion was certified by the Engineer's Representative on 21 August 2009. During the construction period, a simply weather conditions during the construction period are presented as below:

October to December 2008

- October – was unseasonably warm. The monthly mean temperature of 26.5 degrees. The total rainfall in the month was 144.6 millimetres;
- November – was brighter and warmer than usual. The monthly mean temperature of 21.9 degrees was 0.5 degrees above normal. The monthly total rainfall of 54.3 millimetres and;
- December – was warmer and drier than usual. The monthly mean temperature of 18.4 degrees was 0.6 degrees above normal. The monthly total rainfall of 9.0 millimetres was 25.5 millimetres below normal

January to August 2009

- January – was sunnier and drier than usual. Only a trace of rainfall was recorded during the month. The monthly mean temperature of 15.3 degrees was 0.8 degrees below normal;
- February – was warmest February since records began in 1884. The monthly mean temperature of 20.5 degrees was 4.2 degrees higher than normal;
- March – was wetter and milder than usual. The total rainfall in the month was 120.7 millimetres. The mean temperature was 19.7 degrees, 0.8 degrees above the normal figure of 18.9 degrees;
- April – was drier and cooler than usual. The mean temperature was 22.0 degrees, 0.5 degrees below the normal figure of 22.5 degrees. The total rainfall in the month was 108.7 millimetres;
- May – was drier and sunnier than usual. The total rainfall of 245.2 millimetres in the month. The mean temperature was 25.5 degrees, 0.3 degrees below the normal figure of 25.8 degrees.

- June – was drier than usual. The total rainfall of 341.8 millimetres in the month. The mean temperature was 28.1 degrees, 0.2 degrees above the normal figure of 27.9 degrees.
- July – was warmer than usual. The mean temperature was 29.1 degrees, 0.4 degrees above the normal figure of 28.7 degrees. The total rainfall of 389.4 millimetres in the month;
- August – was hotter and drier than usual. The mean temperature was 29.4 degrees, 1.0 degrees above the normal of 28.4 degrees. The total rainfall of 334.1 millimetres in the month.

4 NON-COMPLIANCE, COMPLAINTS, NOTIFICATIONS OF SUMMONS AND SUCCESSFUL PROSECUTIONS

4.1 NON-COMPLIANCE

In the construction period, three (3) Action Level exceedances were recorded in 24-hour TSP monitoring of air quality of which on 27 November 2008, 13 January 2009 and 5 February 2009. However, no breach in 1-hour TSP monitoring was recorded at the construction period. Investigation concluded that all of the exceedances were not related to the works under this project.

During the construction phase, there was only one (1) Action Level exceedance recorded due to a noise complaint received on 26 March 2009. Investigation showed that the complaint was about the noise and vibration generated from sheet piling work at Channel KT14A. Since no further complaint and exceedance was recorded, no corrective action was required.

A total of 153 exceedances of water quality A/L Levels of which are 62 exceedances of Action Level and 91 exceedances of Limit Level, were recorded in the construction period. The overall compliance rate of water quality monitoring is 81.8%. Investigation showed that all exceedances were not works related.

A summary of all environmental exceedances air quality, construction noise and water quality is presented as follows:

Table 4-1 Summaries of Breaches of Air Quality, Construction Noise and Water Quality A/L Levels in Construction Period

Parameter	No. of Exceedance	Compliance of percent (%)
1-hour TSP (Air Quality)	0	100.0%
24-hour TSP (Air Quality)	3	94.3%
Construction Noise	1	98.1%
Suspended Solids	60	57.1%
Turbidity	19	86.4%
Dissolved Oxygen	59	57.9%
pH	0	100.0%
Ammonia	7	95.0%
Zinc	8	94.3%
Overall	157	87.0%

4.2 ENVIRONMENTAL COMPLAINTS

In the construction period, only one noise complaint was received on 26 March 2009. Investigation showed that the complaint was about the noise and vibration generated from sheet piling work at Channel KT14A. Investigation report concluded that it was due to the sheetpiling work of the project. Practically, the piling work for safety protection was only undertaken a few days and ceased on 30 March 2009. Therefore, no corrective action was required to undertake during the construction period.

4.3 NOTIFICATIONS OF SUMMONS AND SUCCESSFUL PROSECUTIONS

No notifications of summons and successful prosecutions were recorded during the construction period. No associated remedial actions were recommended.

5 WASTE MANAGEMENT AND SITE INSPECTION & AUDIT

5.1 WASTE MANAGEMENT STATUS

All types of waste arising from the construction work at Channel KT14A were classified into the following:

- Construction & Demolition (C&D) Material;
- Chemical Waste;
- General Refuse; and
- Excavated Soil and sediment

The quantity of waste generated, re-used, recycled and disposed for the construction site during the construction period are detailed to show in *Appendix G*.

5.2 SITE INSPECTION AND ENVIRONMENTAL AUDIT

A total of 48 occasions of weekly environmental site inspection and audit were conducted jointly by the ER, EO and ET during the construction period. 41 observations of minor deficiencies were found during the site inspection and audit, which were in general rectified within the specified deadlines. The detailed audit findings were noted in the relevant Monthly EM&A Reports.

6 CONCLUSIONS

Substantial completion of works in Channel KT14A of the Project was certified by the Engineer's Representative on 21 August 2009. Upon received the letter of notification by the Contractor on 27 August 2009, the EM&A programme for Channel KT14A was ceased on 28 August 2009.

It follows to the completion of works in Channel KT14A, a Final EM&A Report should be submitted accordance to the EM&A Manual. This Final EM&A Summary Report summarized the results of environmental impact monitoring and audit in the issues of air quality, construction noise, water quality and waste management of the Designated Project works throughout the construction period (from 2 October 2008 to 27 August 2009).

No adverse environmental impacts were observed during the weekly site inspections and environmental audits which indicated that the implemented mitigation measures for air quality, construction noise, water quality and ecology were effective. 43 Minor deficiencies were found in the weekly site inspection and audit which were in general rectified within the specified deadlines.

Only three (3) Action Level exceedances in 24-hour TSP monitoring of air quality were recorded during the entire construction period. These exceedances were not related to the construction work as they were found to be coincident with hill fire which happened on the monitoring dates. No corrective actions were recommended. Monitoring results demonstrated that air quality during the construction period was fulfilled the environmental quality criteria A/L Levels for over 97% compliance.

During the construction period, except for one complaint due to works (action level) was received, all the noise levels were recorded below 75dB(A). It indicated that the prescribed mitigation measures such as temporary noise barriers, use of quiet plant, restrictive usage of the PMEs and locating PMEs further away from the sensitive receiver were effectively adopted in accordance with the EMIS of the EM&A Manual.

Although 153 exceedances of water quality A/L Levels were found during the construction phase, investigations showed that all exceedances were not works related. So, mitigation measures provided in accordance with Mitigation Measure Implementation Schedule (EMIS) as stipulated in EM&A Manual should be considered as effective. The final compliance rate of water quality monitoring in the construction period is over 80%.

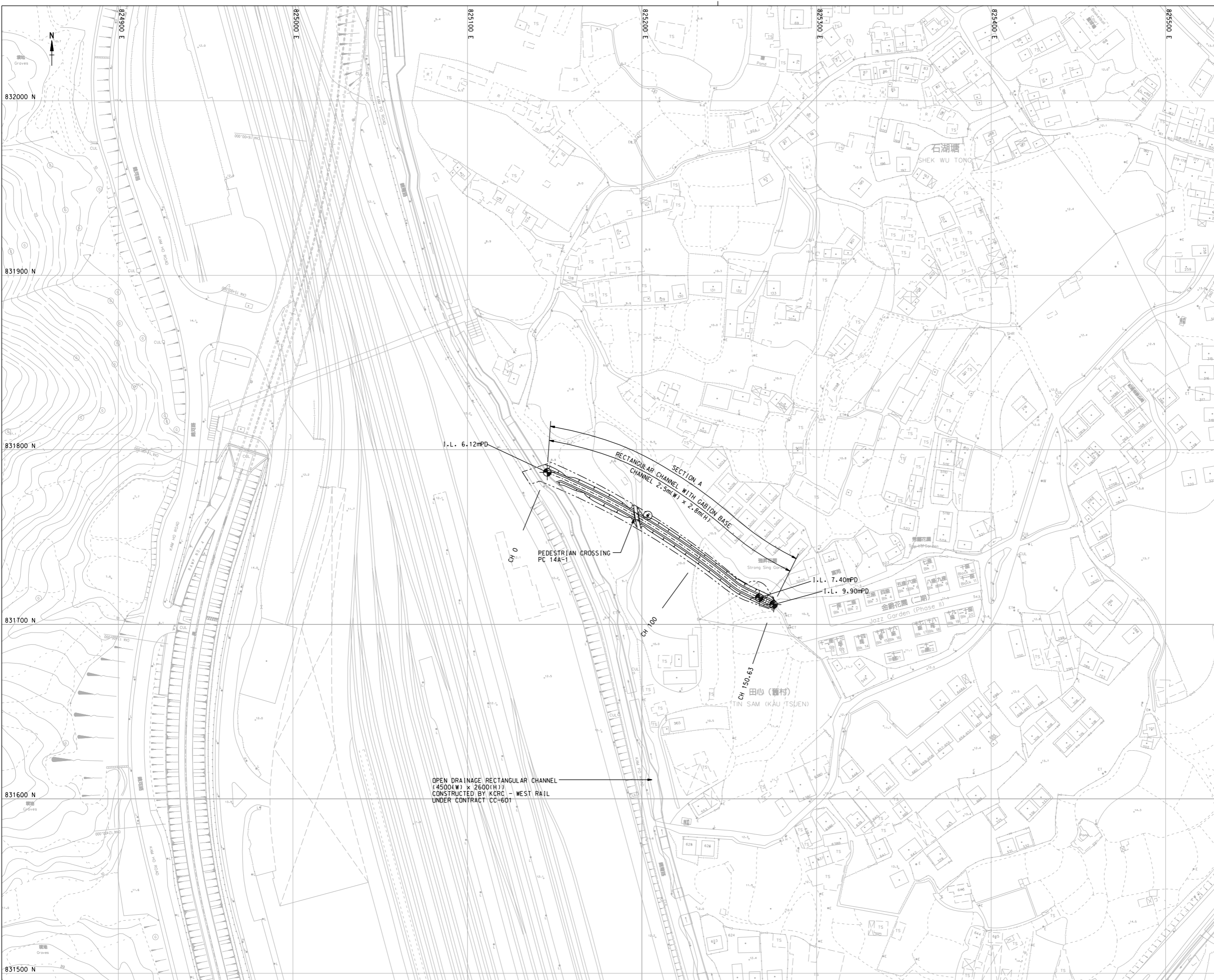
Overall, the environmental performance of the Project during construction period is considered satisfactory. However, CRBC should still keep in mind the potential impacts due to construction noise, air quality, water quality and other environmental issues identified in the EM&A Manual and to adopt the necessary mitigation measures recommended in the EIA and summarized in the EMIS during the maintenance period.

END OF TEXT

Appendix A

**Location Plan of the Project and
Environmental Monitoring Locations**

NOTES :
1. FOR NOTES AND LEGEND REFER TO DRAWING NO. 021.



Revision	Date	Description	Initial	
	Designed	Checked	Drawn	Verified
Initial	BW	WLC	LWL	KIL
Date	09/07	09/07	09/07	09/07
Approved				

CONTRACT NO. DC /2007 /17

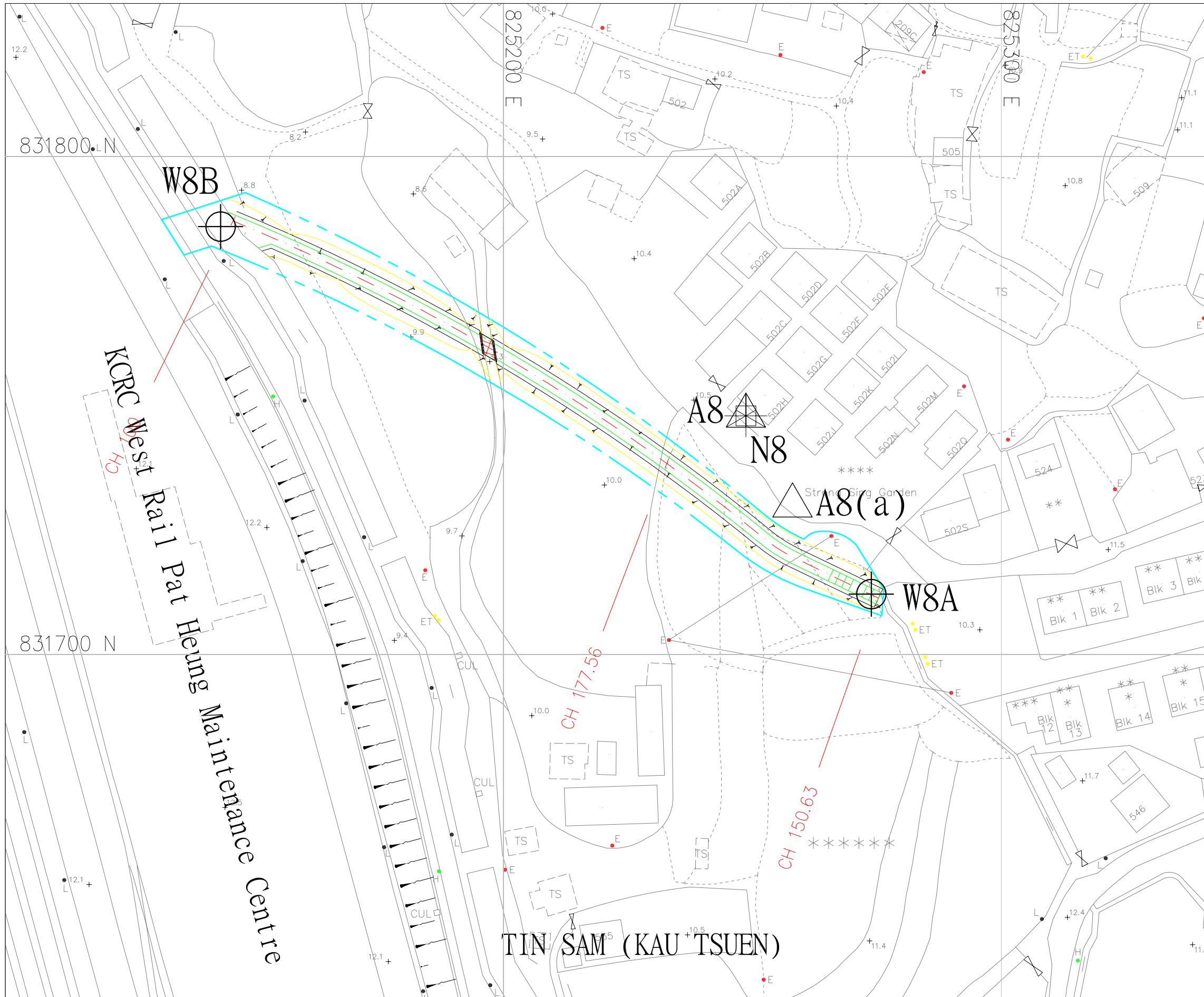
Contract title
DRAINAGE IMPROVEMENT WORKS
IN CHEUNG PO, MA ON KONG,
YUEN KONG SAN TSUEN AND TIN SAM
TSUEN OF YUEN LONG DISTRICT AND
SEWERAGE AT TSENG TAU CHUNG TSUEN,
TUEN MUN





Drawing title
CHANNEL KT14
GENERAL LAYOUT PLAN
(SHEET 1 OF 2)

Drawing no.	Scale
024	1:1000 A1 1:2000 A3



Plot Date : 9/25/2007



- Legends**
-  Construction Noise Monitoring Location
 -  Air Quality Monitoring Location
 -  Water Quality Monitoring Location
 -  Monitoring Location access is not allow (Air or Noise or Water) for measurement

Table

Monitoring Parameter	Location ID	Address	Remarks
Water	W8A	E825274 / N831712	
Water	W8B	E825143 / N831786	
Air	A8		Replaced by A8(a)
Air	A8(a)	Entrance of Strong Sing Garden	Recommended Location
Noise	N8	No. 205H of Strong Sing Garden	

Note:
 Air Monitoring Location A8 are proposed to relocate at the entrance of Strong Sing Garden A8(a) due to request of the property management. The relocated monitoring point is considered suitable as representative sensitive receiver for Strong Sing Garden.

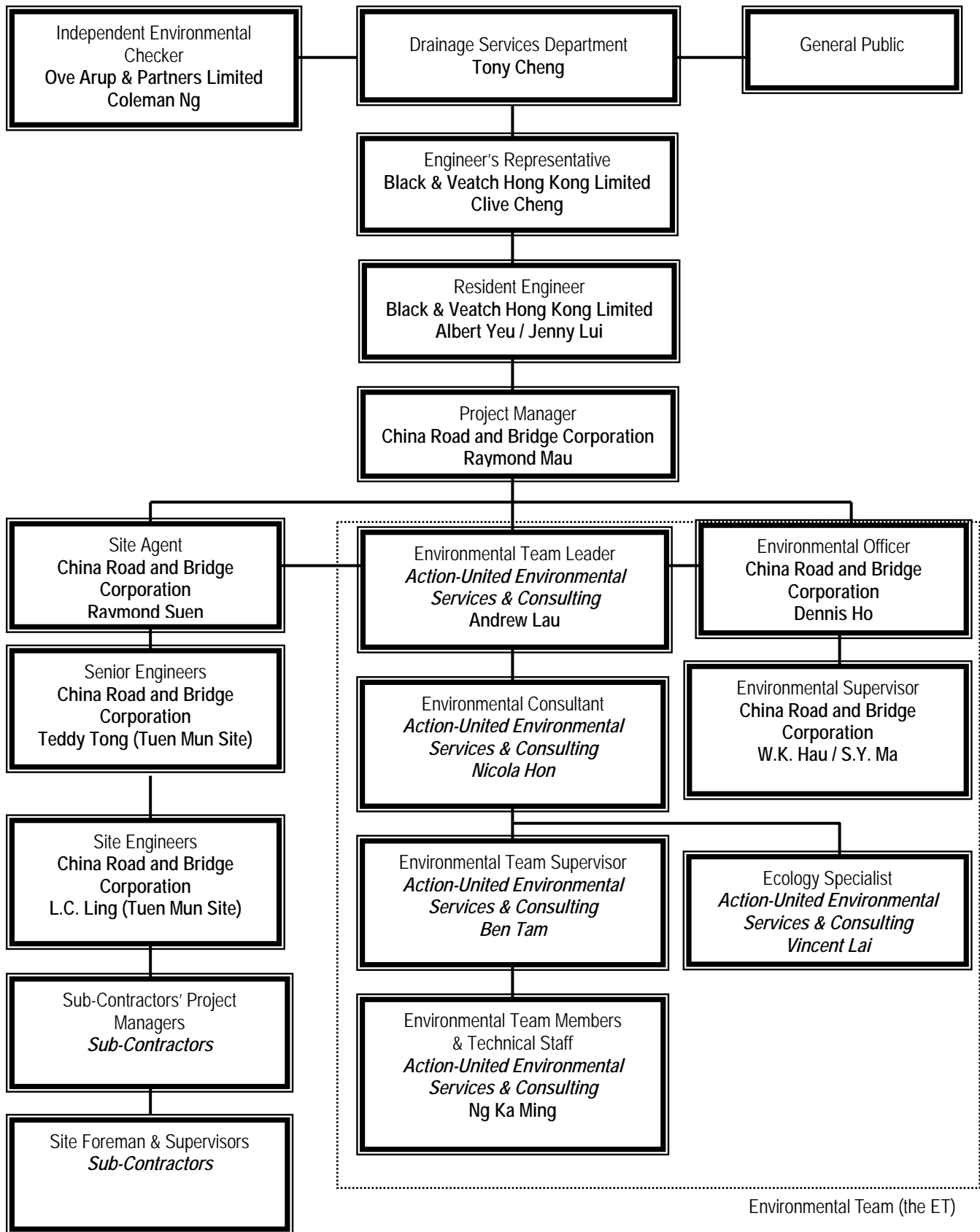
Drawing:
 Air, Noise and Stream Water Monitoring Location at KT-14A

Contract No. DC/2007/17-
 Drainage Improvement Works in Cheung Po, Ma On Kong, Yuen Kong San Tsuen and Tin Sam Tsuen of Yuen Long District and Sewerage at Tseng Tau Chung Tsuen, Tuen Mun



Appendix B

**Environmental Management Organization and
Contacts of Key Personnel**



Environmental Management Organization

Contact Details of Key Personnel

Organization	Project Role	Name of Key Staff	Tel No.	Fax No.
DSD	Employer	Mr. Tony Cheng	2594-7264	2827-8526
B&V	Engineer's Representative	Mr. Clive Cheng	2478-9161	2478-9369
B&V	Resident Engineer	Mr. Albert Yeu	2478-9161	2478-9369
B&V	Resident Engineer	Mr. Jenny Lui	2478-9161	2478-9369
OAP	Independent Environmental Checker	Mr. Coleman Ng	2268-3097	2268-3950
CRBC	Project Director	Mr. Wang Yanhua	2283-1688	2283-1689
CRBC	Project Manager	Mr. Raymond Mau	9048-3669	2283-1689
CRBC	Site Agent	Mr. Raymond Suen	9779-8871	2283-1689
CRBC	Senior Engineer (Tuen Mun Site)	Mr. Teddy Tong	6283-9684	2283-1689
CRBC	Site Engineer (Tuen Mun Site)	Mr. L.C. Ling	6770-4010	2283-1689
CRBC	Environmental Officer	Mr. Dennis Ho	6474-6975	2283-1689
CRBC	Environmental / Construction Supervisor (Tuen Mun and Yuen Long site)	Mr. W.K. Hau	6283-9696	2283-1689
CRBC	Environmental / Construction Supervisor (Yuen Long site)	Mr. S.Y. Ma	9401-6296	2283-1689
CRBC	Safety Officer	Kenny Sze	9374-8954	2283-1689
AUES	Environmental Team Leader	Mr. Andrew Lau	2959-6059	2959-6079
AUES	Environmental Consultant	Miss Nicola Hon	2959-6059	2959-6079
AUES	Environmental Site Inspector	Mr. Ben Tam	2959-6059	2959-6079
AUES	Ecologist	Mr. Vincent Lai	2959-6059	2959-6079

Legend:

DSD (Employer) – Drainage Services Department

B&V (Engineer) – Black & Veatch Hong Kong Limited

CRBC (Main Contractor) – China Road and Bridge Corporation

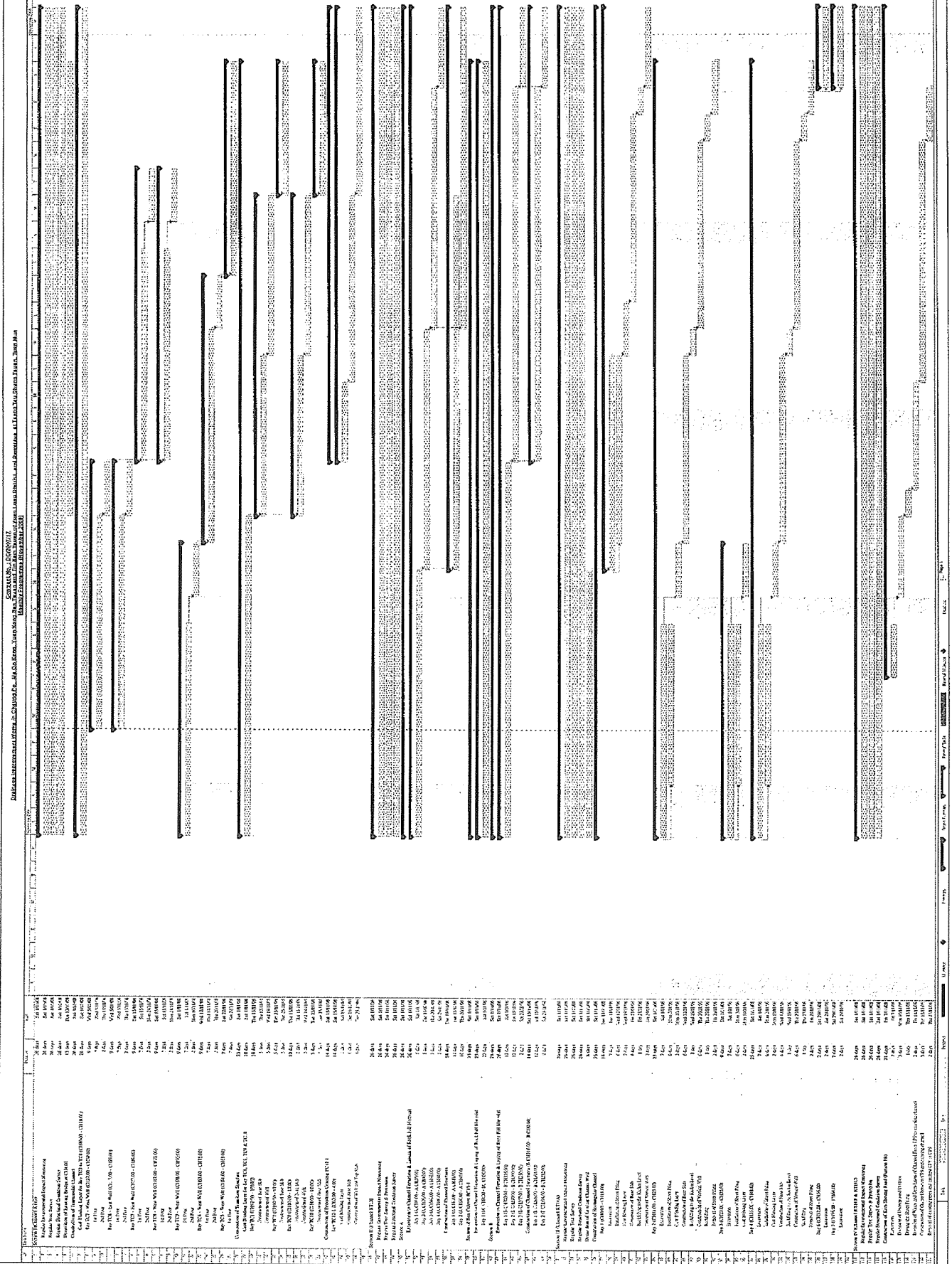
OAP (IEC) – Ove Arup & Partners Ltd

AUES (ET) – Action-United Environmental Services & Consulting

Appendix C

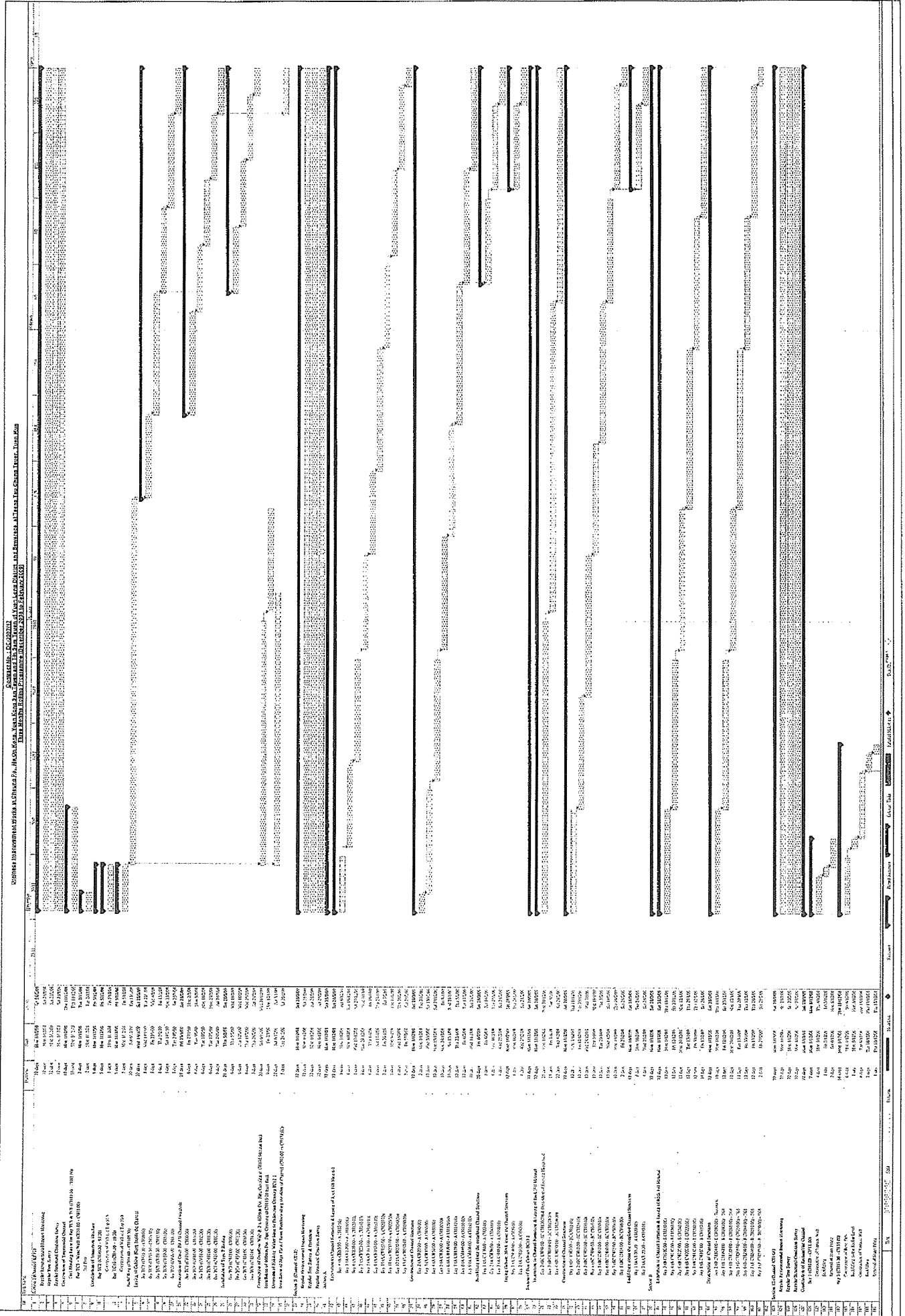
Construction Program

DATE: 05/11/2008 14:15 FAX: +852 2478 9612



No.	Room Name	Area (sqm)	Remarks
1	RECEPTION	24.00	
2	OFFICE	12.00	
3	CONFERENCE	18.00	
4	MEETING	15.00	
5	OFFICE	10.00	
6	OFFICE	10.00	
7	OFFICE	10.00	
8	OFFICE	10.00	
9	OFFICE	10.00	
10	OFFICE	10.00	
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98	OFFICE	10.00	
99	OFFICE	10.00	
100	OFFICE	10.00	

CONCRETE INSTRUMENTATION DATA FOR THE PILING AND BEAMS AT THE CHINA TOWER, HONG KONG



NO.	DESCRIPTION	UNIT	VALUE	DATE
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General Information: Project Name: ...

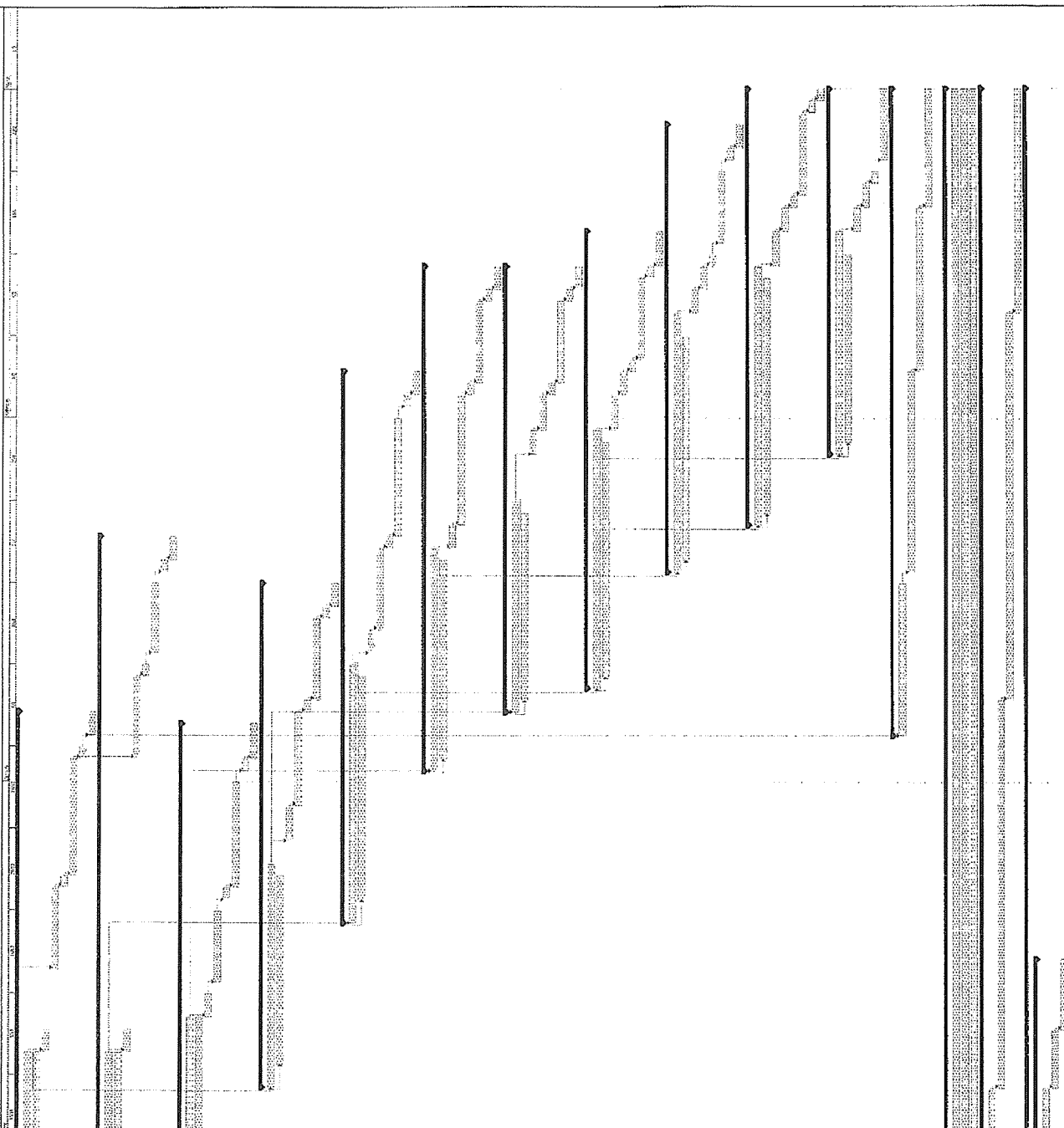
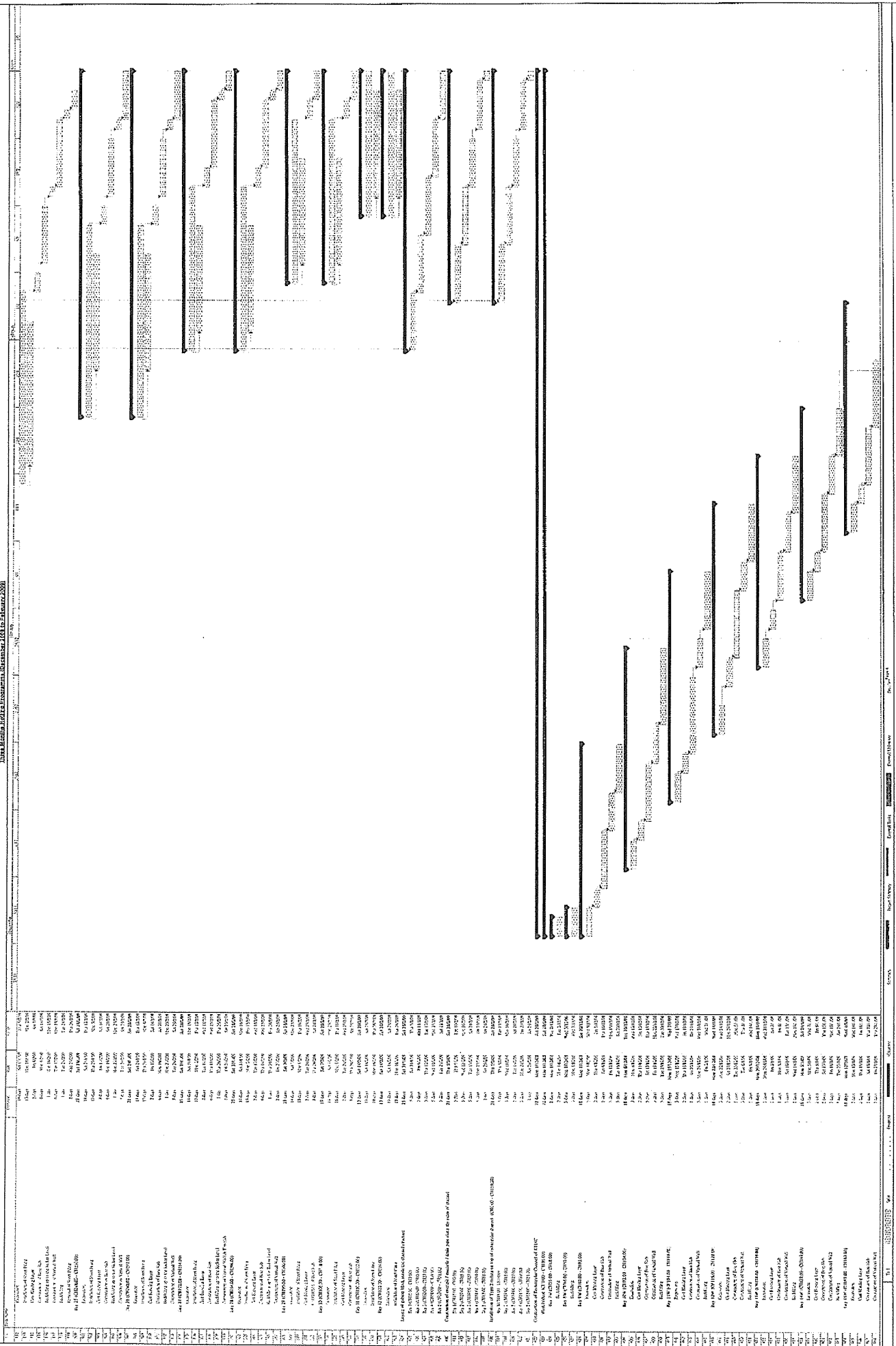


Table with columns for Item No., Description, Unit, and Quantity. It lists various construction materials and their estimated quantities for the project.

General Information: 0005/008
Contract No. 0005/008
Item Name: 0005/008
Contract Description: 0005/008
Contract Start Date: 0005/008
Contract End Date: 0005/008

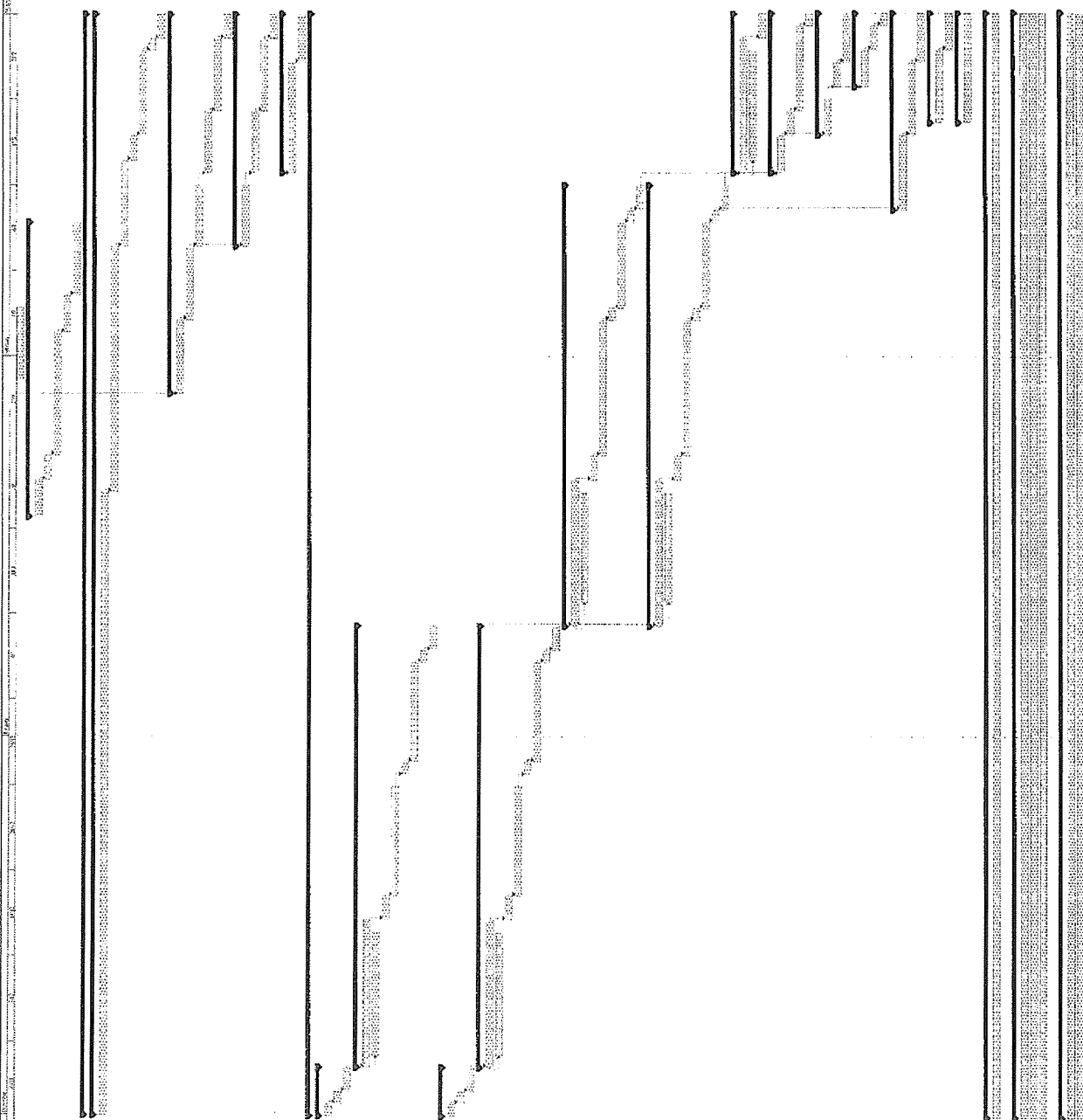
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Building Information Model (BIM) - 3D Model of the proposed development at Cheong Chee Nam Road, Tuen Mun, New Territories, Hong Kong



Room No.	Room Name	Area (sqm)	Volume (cu m)
101	RECEPTION	10.5	10.5
102	OFFICE	15.2	15.2
103	CONFERENCE	25.8	25.8
104	MEETING	12.1	12.1
105	TRAINING	18.7	18.7
106	WORKSHOP	30.4	30.4
107	LABORATORY	45.6	45.6
108	STORAGE	8.9	8.9
109	RESTROOM	3.2	3.2
110	TOILET	2.1	2.1
111	LOBBY	12.5	12.5
112	HALLWAY	5.8	5.8
113	STAIR	4.3	4.3
114	ELEVATOR	2.5	2.5
115	UTILITY	6.7	6.7
116	MECHANICAL	11.2	11.2
117	ELECTRICAL	3.8	3.8
118	TELEPHONE	1.5	1.5
119	SERVER	2.8	2.8
120	DATA	4.1	4.1
121	PRINTING	1.9	1.9
122	SCANNING	2.3	2.3
123	COPIING	1.7	1.7
124	ARCHIVING	3.4	3.4
125	REPRODUCTION	2.6	2.6
126	POSTAL	1.4	1.4
127	MAIL	1.1	1.1
128	POSTAL	1.1	1.1
129	MAIL	1.1	1.1
130	MAIL	1.1	1.1
131	MAIL	1.1	1.1
132	MAIL	1.1	1.1
133	MAIL	1.1	1.1
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198	MAIL	1.1	1.1
199	MAIL	1.1	1.1
200	MAIL	1.1	1.1

General Note: DISCOUNT
General Note: You have to pay the discount and interest at the same time.
General Note: The discount is calculated on the basis of the actual number of days.



Time	Value 1	Value 2	Value 3	Value 4	Value 5
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00:15	100	100	100	100	100
00:20	100	100	100	100	100
00:25	100	100	100	100	100
00:30	100	100	100	100	100
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05:55	100	100	100	100	100
06:00	100	100	100	100	100
06:05	100	100	100	100	100
06:10	100	100	100	100	100
06:15	100	100	100	100	100
06:20	100	100	100	100	100
06:25	100	100	100	100	100
06:30	100	100	100	100	100
06:35	100	100	100	100	100
06:40	100	100	100	100	100
06:45	100	100	100	100	100
06:50	100	100	100	100	100
06:55	100	100	100	100	100
07:00	100	100	100	100	100
07:05	100	100	100	100	100
07:10	100	100	100	100	100
07:15	100	100	100	100	100
07:20	100	100	100	100	100
07:25	100	100	100	100	100
07:30	100	100	100	100	100
07:35	100	100	100	100	100
07:40	100	100	100	100	100
07:45	100	100	100	100	100
07:50	100	100	100	100	100
07:55	100	100	100	100	100
08:00	100	100	100	100	100
08:05	100	100	100	100	100
08:10	100	100	100	100	100
08:15	100	100	100	100	100
08:20	100	100	100	100	100
08:25	100	100	100	100	100
08:30	100	100	100	100	100
08:35	100	100	100	100	100
08:40	100	100	100	100	100
08:45	100	100	100	100	100
08:50	100	100	100	100	100
08:55	100	100	100	100	100
09:00	100	100	100	100	100
09:05	100	100	100	100	100
09:10	100	100	100	100	100
09:15	100	100	100	100	100
09:20	100	100	100	100	100
09:25	100	100	100	100	100
09:30	100	100	100	100	100
09:35	100	100	100	100	100
09:40	100	100	100	100	100
09:45	100	100	100	100	100
09:50	100	100	100	100	100
09:55	100	100	100	100	100
10:00	100	100	100	100	100

Appendix D

Event Action Plan

Event/Action Plan for Air Quality

EVENT	ACTION			
	ET	IEC	Engineer	Contractor
ACTION LEVEL				
1. Exceedance for one sample	<ol style="list-style-type: none"> Identify source Inform IEC and Engineer Repeat measurement to confirm finding Increase monitoring frequency to daily 	<ol style="list-style-type: none"> Check monitoring data submitted by ET Check Contractor's working method 	Notify Contractor	<ol style="list-style-type: none"> Rectify any unacceptable practice Amend working methods if appropriate
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> Identify source Inform IEC and Engineer Repeat measurements to confirm findings Increase monitoring frequency to daily Discuss with IEC and Contractor on remedial actions required If exceedance continues, arrange meeting with IEC and Engineer If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> Check monitoring data submitted by ET Check Contractor's working method Discuss with ET and Contractor on possible remedial measures Advise Engineer on the effectiveness of the proposed remedial measures Supervise implementation of remedial measures 	<ol style="list-style-type: none"> Confirm receipt of notification of failure in writing Notify Contractor Ensure remedial measures properly implemented 	<ol style="list-style-type: none"> Submit proposals for remedial actions to IEC within 3 working days of notification Implement the agreed proposals Amend proposal if appropriate
LIMIT LEVEL				
1. Exceedance for one sample	<ol style="list-style-type: none"> Identify source Inform Engineer and EPD Repeat measurement to confirm finding Increase monitoring frequency to daily Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and Engineer informed of the results 	<ol style="list-style-type: none"> Check monitoring data submitted by ET Check Contractor's working method Discuss with ET and Contractor on possible remedial measures Advise Engineer on the effectiveness of the proposed remedial measures Supervise implementation of remedial measures 	<ol style="list-style-type: none"> Confirm receipt of notification of failure in writing Notify Contractor Ensure remedial measures properly implemented 	<ol style="list-style-type: none"> Take immediate action to avoid further exceedance Submit proposals for remedial actions to IEC within 3 working days of notification Implement the agreed proposals Amend proposal if appropriate
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> Notify IEC, Engineer and EPD Identify source Repeat measurement to confirm findings Increase monitoring frequency to daily Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented. Arrange meeting with IEC and Engineer to discuss the remedial actions to be taken Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and Engineer informed of the results If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> Discuss amongst Engineer, ET and Contractor on potential remedial actions Review Contractor's remedial actions whether necessary to assure their effectiveness and advise the Engineer accordingly Supervise implementation of remedial measures 	<ol style="list-style-type: none"> Confirm receipt of notification of failure in writing Notify Contractor In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented Discuss amongst Environmental Team Leader and the Contractor potential remedial actions Ensure remedial measures properly implemented If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated 	<ol style="list-style-type: none"> Take immediate action to avoid further exceedance Submit proposals for remedial actions to IEC within 3 working days of notification Implement the agreed proposals Resubmit proposals if problem still not under control Stop the relevant portion of works as determined by the Engineer until the exceedance is abated

Event/Action Plan for Construction Noise

EVENT	ACTION			
	ET Leader	IEC	Engineer	Contractor
ACTION LEVEL	<ol style="list-style-type: none"> 1. Notify Contractor and Engineer 2. Carry out investigation 3. Report the results of investigation to the IEC and Contractor 4. Discuss with the Contractor and formulate remedial measures 5. Increase monitoring frequency to check mitigation effectiveness 	<ol style="list-style-type: none"> 1. Review the analysed results submitted by ET 2. Review the proposed remedial measures by the Contractor and advice the Engineer accordingly 3. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Require Contractor to propose remedial measures for the analysed noise problem 4. Ensure remedial measures properly implemented 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals for remedial actions to IEC 2. Implement the agreed proposals
LIMIT LEVEL	<ol style="list-style-type: none"> 1. Notify IEC, Engineer, EPD and Contractor 2. Identify source 3. Repeat measurement to confirm findings 4. Increase monitoring frequency 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented 6. Inform IEC, Engineer and EPD the causes & actions taken for the exceedances 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and Engineer informed of the results 8. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Discuss amongst Engineer, ET and Contractor on potential remedial actions 2. Review Contractor's remedial actions whether necessary to assure their effectiveness and advice the Engineer accordingly 3. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Require Contractor to propose remedial measures for the analysed noise problem 4. Ensure remedial measures properly implemented 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant portion of works as determined by the Engineer until the exceedance is abated

Event and Action Plan for Stream Water Quality

Event	ET Leader	IEC	Engineer	Contractor
ACTION LEVEL (being exceeded by one sampling day)	<ol style="list-style-type: none"> Repeat in-situ measurement to confirm findings Identify source(s) of impact Inform IEC and Contractor Check monitoring data, all plant, equipment and Contractor's working methods Discuss mitigation measures IEC and Contractor Repeat measurement on next day of exceedance 	<ol style="list-style-type: none"> Discuss with ET and Contractor on the mitigation measures Review proposals on mitigation measures submitted by Contractor and advice Engineer accordingly Assess the effectiveness of the implemented mitigation measures 	<ol style="list-style-type: none"> Discuss with IEC on the proposed mitigation measures Make agreement on the mitigation measures to be implemented 	<ol style="list-style-type: none"> Inform Engineer and confirm notification of the non-compliance in writing Rectify unacceptable practice Check all plant and equipment Consider changes of working methods Discuss with ET and Contractor and propose mitigation measures to IEC and Engineer Implement the agreed mitigation measures
ACTION LEVEL (being exceeded by more than one sampling day)	<ol style="list-style-type: none"> Repeat in-situ measurement to confirm findings Identify source(s) of impact Inform IEC, Contractor and EPD Check monitoring data, all plant, equipment and Contractor's working methods Discuss mitigation measures IEC, Engineer and Contractor Repeat measurement on next day of exceedance Ensure mitigation measures are implemented Prepare to increase the monitoring frequency to daily Repeat measurement on next day of exceedance 	<ol style="list-style-type: none"> Discuss with ET and Contractor on the mitigation measures Review proposals on mitigation measures submitted by Contractor and advice Engineer accordingly Assess the effectiveness of the implemented mitigation measures 	<ol style="list-style-type: none"> Discuss with IEC on the proposed mitigation measures Make agreement on the mitigation measures to be implemented Assess the effectiveness of the implemented mitigation measures 	<ol style="list-style-type: none"> Inform Engineer and confirm notification of the non-compliance in writing Rectify unacceptable practice Check all plant and equipment Consider changes of working methods Discuss with ET and IEC and propose mitigation measures to IEC and Engineer within 3 working days Implement the agreed mitigation measures
LIMIT LEVEL (being exceeded by one sampling days)	<ol style="list-style-type: none"> Repeat in-situ measurement to confirm findings Identify source(s) of impact Inform IEC, Contractor and EPD Check monitoring data, all plant, equipment and Contractor's working methods Discuss mitigation measures IEC, Engineer and Contractor Ensure mitigation measures are implemented Increase the monitoring frequency to daily until no exceedance of Limit Level 	<ol style="list-style-type: none"> Discuss with ET and Contractor on the mitigation measures Review proposals on mitigation measures submitted by Contractor and advice Engineer accordingly Assess the effectiveness of the implemented mitigation measures 	<ol style="list-style-type: none"> Discuss with IEC, ET and Contractor on the proposed mitigation measures Request Contractor to critically review the working methods Make agreement on the mitigation measures to be implemented Assess the effectiveness of the implemented mitigation measures 	<ol style="list-style-type: none"> Inform Engineer and confirm notification of the non-compliance in writing Rectify unacceptable practice Check all plant and equipment Consider changes of working methods Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within 3 working days Implement the agreed mitigation measures
LIMIT LEVEL (being exceeded by more than one sampling days)	<ol style="list-style-type: none"> Repeat in-situ measurement to confirm findings; Identify source(s) of impact; Inform Contractor, Engineer, IEC and EPD; Check monitoring data, all plant, equipment and Contractor's working methods; Discuss mitigation measures with IEC, Engineer and Contractor; Ensure mitigation measures are implemented; Increase the monitoring frequency to daily until no exceedance of Limit Level 	<ol style="list-style-type: none"> Discuss with ET and Contractor on the mitigation measures Review proposals on mitigation measures submitted by Contractor and advice Engineer accordingly Assess the effectiveness of the implemented mitigation measures 	<ol style="list-style-type: none"> Discuss with IEC, ET and Contractor on the proposed mitigation measures Request Contractor to critically review the working methods Make agreement on the mitigation measures to be implemented Assess the effectiveness of the implemented mitigation measures Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until daily until no exceedance of Limit Level 	<ol style="list-style-type: none"> Inform Engineer and confirm notification of the non-compliance in writing Rectify unacceptable practice Check all plant and equipment Consider changes of working methods Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within 3 working days Propose mitigation measures to Engineer within 3 working days Implement the agreed mitigation measures; As directed by Engineer, to slow down or to stop all or part of the construction activities

Appendix E

Mitigation Measure Implementation Schedule

Mitigation Measure Implementation Schedule – Construction Noise

Construction Noise Impact Mitigation								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
Noise 1	<p>The Contractor is required to adopt Level 1 and 2 site-specific direct technical measures as specified below during the construction phase</p> <p><i>Level 1 Mitigation Measures</i></p> <ul style="list-style-type: none"> The use of equipment with sound power level lower than that stipulated in the Technical Memorandum on Noise from Construction Works Other Than Percussive Piling is recommended as the first level mitigation (Level 1 mitigation) for all construction works under this Project. Quiet plant is defined as PME whose actual sound power level is less than the value specified in the Technical Memorandum on Noise from Construction Works Other Than Percussive Piling for the same piece of equipment. BS5228 also provides examples of quiet construction plant and their sound power level. The quiet plant used in the noise calculation including the BS5228 reference number is shown in Attachment 1 for reference <p><i>Level 2 Mitigation Measures</i></p> <ul style="list-style-type: none"> In addition to the use of quiet plant purpose-built site noise barriers shall be used as hoarding where construction works would be undertaken close (about 30m or less) to the NSRs (Figure 5.4). Temporary noise barrier with a minimum height of 3m shall be erected along the part of site boundary closest to the NSRs. Notwithstanding the required minimum height these barriers shall be constructed in a way such that no construction works and PME can be visible from the NSRs nearby. The minimum height is estimated 	Prevent noise impact at sensitive receivers	To be implemented at the works site of KT14 during the Construction Phase (Figure 5.4 show locations of proposed temporary noise barriers.)	Construction Contractor		√		EIAO

Construction Noise Impact Mitigation								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
Noise 1 (Cont'd)	<p>assuming the construction equipment activities will be located on the channel bed 2m below the surrounding ground level.</p> <ul style="list-style-type: none"> Stationary equipment shall be placed on the channel bed during construction works. For the construction works which are predicted to exceed 75dB(A) (Leq30min) at nearby NSR and whose line of sight cannot be blocked by the temporary noise barrier (i.e. further away from the hoardings), movable (mobile) noise barrier of more than 3m high shall be provided. A typical example is shown in Figure 5.7. The noise barriers or screens shall be constructed of appropriate material with a minimum surface density of 10kg/m². Generators and compressors, shall be completely screened by construction barriers giving a total noise reduction of 10dB(A) or more. The location of the proposed temporary noise barriers for KT14 is shown on Figures 5.4. 	Prevent noise impact at sensitive receivers	To be implemented at the works site of KT14 during the Construction Phase (Figure 5.4 show locations of proposed temporary noise barriers.)	Construction Contractor		√		EIAO

Mitigation Measure Implementation Schedule – Air Quality

Air Quality Impact Mitigation								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
Air 1	The Contractor shall prevent dust nuisance arising from the construction activities. The Contractor is required to follow all the requirements for dust control stipulated in the Air Pollution Control (Construction Dust) Regulation	Prevent dust nuisance	To be implemented at all works are of KT14 site during the Construction Phase.	Construction Contractor		√		Air Pollution Control Ordinance Air Pollution Control (Construction Dust Regulation)
Air 2	The following dust suppression measures shall be installed as part of construction practice, and these shall be incorporated in the Contract Specification and implemented to minimize dust nuisance to within acceptable levels. i) The Contractor shall frequently clean and water the site to minimise fugitive dust emissions. ii) Effective water sprays shall be used during the delivery and handling of aggregate, and other similar materials, when dust is likely to be created and to dampen all stored materials during dry and windy weather. iii) Watering of exposed surfaces shall be exercised at least three times a day. iv) Areas within the site where there is a regular movement of vehicles must be regularly watered at minimum three times a day. v) The Contractor shall restrict all motorised vehicles within the site, excluding those on public roads, to a maximum speed of 15 km per hour and confine haulage and delivery vehicles to designated road ways inside the site. vi) Any stockpiles of construction materials that are likely to generate fugitive dust shall be covered with tarpaulins including the materials on lorries or trucks.	Prevent dust nuisance	To be implemented at all works are of KT14 site during the Construction Phase.	Construction Contractor		√		Air Pollution Control Ordinance Air Pollution Control (Construction Dust Regulation)

Air Quality Impact Mitigation								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
Air 2 (Cont'd)	<p>vii) Wheel washing facilities shall be installed and used by all vehicles leaving the site. No earth, mud, debris, dust and the like shall be deposited on public roads. Water in the wheel cleaning facility shall be changed at frequent intervals and sediments shall be removed regularly. The Contractor shall submit details of proposals for the wheel cleaning facility. Such wheel washing facilities shall be usable prior to any earthworks excavating activity on the site. The Contractor shall also provide a hard-surfaced road between any washing facility and the public road.</p> <p>viii) Any materials dropped on paved roads will need to be cleaned up immediately to prevent dust nuisance.</p>	Prevent dust nuisance	To be implemented at all works are of KT14 site during the Construction Phase.	Construction Contractor		√		<p>Air Pollution Control Ordinance</p> <p>Air Pollution Control (Construction Dust Regulation)</p>

Mitigation Measure Implementation Schedule – Water Quality

Water Quality Impact Mitigation								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
Water 1	Wash facilities for workers and wheel wash waste result in muddy construction site runoff. Temporary earth hunds and sand barriers shall be used to direct such runoff to a designated settlement area within the site.	Prevent additional pollution load being added to stream due to KT14 works	To be implemented at the works sites of KT14 during the Construction Phase	Construction Contractor		√		WPCO & ProPECC PN1/94
Water 1 (Cont'd)	The settlement area shall be located within the temporary site area. Construction site runoff shall be settled in this settlement area, while runoff from the surface should be channelled through a local site drainage system into the settlement area. When solids build up in the settlement area, and certainly before the onset of the wet season (Apr-Oct) solids shall be excavated from the base of the settlement area. No excavation shall be allowed in rainy weather.	Prevent additional pollution load being added to stream due to KT14 works	To be implemented at the works sites of KT14 during the Construction Phase	Construction Contractor		√		WPCO & ProPECC PN1/94
Water 2	All discharged waters, including sewage and site runoff, should comply with the appropriate standards in the Technical Memorandum on Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters, prior to discharge. Licensed contractors shall dispose the collected sewage to the government sewers. No sewage shall be allowed to enter wash facilities or sediment setting area.	Prevent additional pollution load being added to stream due to KT14 works	To be implemented at the works sites of KT14 during the Construction Phase	Construction Contractor		√		WPCO & ProPECC PN1/94

Mitigation Measure Implementation Schedule – Waste Management

Waste Management								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
	<p><i>Waste Management Plan</i></p> <p>Upon appointment, the main contractor of each construction contract should submit a Waste Management Plan (WMP) to the Engineer for approval. The WMP shall describe the arrangements for avoidance, reuse, recovery and recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities and shall take into account the recommended mitigation measures in the Project Profile report. Such a management plan shall incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials. All mitigation measures numbered Waste 1 to 6 shall be included in the WMP</p>	<p>Planning for waste reduction, re-use, recycling and proper disposal and form compliance with Waste Disposal Ordinance and other guideline.</p>	<p>To be implemented at the works sites of KT14 during the Construction Phase.</p>	<p>Construction Contractor</p>		<p>✓</p>		<p>WBTC No. 2/93, 2/93B, 16/96, 4/98, 4/98A, 25/99 25/99A, 25/99C, 12/2000, 19/2001</p> <p>ETWB TC No. 33/2002, 34/2002, 15/2003, 31/2004</p>
Waste 1	<p>i) Trip-ticket system – In order to monitor the disposal of C&D and solid wastes at public filling facilities and landfills, and control fly-tipping, a trip-ticket system shall be included.</p> <p>ii) Records of wastes – A recording system for the amount of wastes generated, recycled and disposed (including the disposal sites) shall be proposed.</p> <p>iii) Training – Training should be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.</p>	<p>Planning for waste reduction, re-use, recycling and proper disposal and form compliance with Waste Disposal Ordinance and other guideline.</p>	<p>To be implemented at the works sites of KT14 during the Construction Phase.</p>	<p>Construction Contractor</p>		<p>✓</p>		<p>WBTC No. 2/93, 2/93B, 16/96, 4/98, 4/98A, 25/99 25/99A, 25/99C, 12/2000, 19/2001</p> <p>ETWB TC No. 33/2002, 34/2002, 15/2003, 31/2004</p>

Waste Management								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
Waste 2	<p><i>Site Clearance Waste / Demolition Waste</i></p> <p>All construction waste shall be sorted on site into inert and non-inert components. Non-inert materials (wood, glass, metals and plastics) shall be recycled or reused and disposed to landfill only as a last resort. Inert materials (soil, rubble, sand, rock, brick and concrete) shall be separated and reused on site prior to final disposal at public filling facilities. The final disposal site for public fill shall be the Public Filling Facility at Tuen Mun Area 38. The final disposal site for construction and demolition waste shall be the North East New Territories (NENT) Landfill.</p>	<p>Planning for waste reduction, re-use, recycling and proper disposal and form compliance with Waste Disposal Ordinance and other guideline.</p>	<p>To be implemented at the works sites of KT14 during the Construction Phase.</p>	<p>Construction Contractor</p>		√		<p>WBTC No. 2/93, 2/93B, 16/96, 4/98, 4/98A, 25/99, 25/99A, 25/99C, 12/2000, 19/2001</p> <p>ETWB(TC) W No. 33/2002, 34/2002, 15/2003, 31/2004</p>
Waste 3	<p>Excavated Material</p> <p>Any excavated material from the stream shall not be stockpiled, and shall be removed from site on the same day. The material shall be stored in covered impermeable skips while awaiting removal from site.</p> <p>Any leachate from skips shall be treated to meet discharge standard from Government sewers before being collected along with toilet waste by licensed contractor.</p>	<p>Planning for waste reduction, re-use, recycling and proper disposal and form compliance with Waste Disposal Ordinance and other guideline. Planning for waste reduction, re-use, recycling and proper disposal and form compliance with Waste Disposal Ordinance and other guideline.</p>	<p>To be implemented at the works sites of KT14 during the Construction Stage.</p> <p>To be implemented at the works sites of KT14 during the Construction Stage</p>	<p>Construction Contractor during Construction Stage</p> <p>Construction Contractor during Construction Stage</p>		√	√	<p>ETWB(TC) W No. 34/2002,</p> <p>WBTC 12/2000</p> <p>ETWB(TC) W No. 34/2002,</p> <p>WBTC 12/2000</p>

Waste Management								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
Waste 4	<p><i>Recycling the Use of Non-Reusable Materials on Site</i></p> <p>Hoarding, shutters, form works and false works made of reusable materials such as steel or plastic concrete panels shall be used as a preferred alternative to non-reusable materials such as wood and timber, with reference to WBTC No. 19/2001 – Metallic Site Hoarding and Signboards.</p>	<p>Planning for waste reduction, re-use, recycling and proper disposal and form compliance with Waste Disposal Ordinance and other guideline</p>	<p>To be implemented at the works sites of KT14 during the Construction Phase</p>	<p>Construction Contractor</p>		√		<p>WBTC 19/2001</p>
Waste 5	<p><i>Chemical Waste</i></p> <p>Any Contractor generating waste oil, lubricants, paints or other chemicals as a result of his activities should register in a chemical waste producer. Storage, handling, transport and disposal of chemical waste should be arranged in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published by EPD. Chemical waste should be collected by licensed collector.</p> <p>The Contractor shall provide a storage area with hard standing, impermeable surface for storing chemicals on site to prevent inadvertent release of waste oil or other chemicals into nearby water bodies. Oil and fuel bunkers should be bunded and/or enclosed on three sides to prevent discharge due to accidental spillages or breaches of tanks. Bunded area should be of sufficient capacity to accommodate 110% of the volume of the largest container or 20% of the total volume of waste, whichever is largest. For construction plant that is likely to leak oil, absorbent inert materials e.g. sand, shall be placed beneath it. This material should be replaced on a regular basis and the contaminated material disposed as chemical wastes. Storage areas should have adequate ventilation and be covered to prevent rain entering.</p>	<p>Planning for waste reduction, re-use, recycling and proper disposal and form compliance with Waste Disposal Ordinance and other guideline</p>	<p>To be implemented at the works sites of KT14 during the Construction Phase</p>	<p>Construction Contractor</p>		√		<p>WDO Waste Disposal (Chemical Waste) General Regulation)</p>

Waste Management								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
Waste 5 (Cont'd)	Grease traps shall be installed for site drains. These traps shall be cleared at least once a week. A licensed contractor shall regularly clear the traps and dispose waste oils. No chemicals should be allowed to discharge into water courses, either by direct discharge, or as contaminants carried in surface water runoff from the construction site. Training on safety codes and relevant manuals related to the chemicals stored on site should be obligatory for the personnel who handle the chemicals on site.	Planning for waste reduction, re-use, recycling and proper disposal and form compliance with Waste Disposal Ordinance and other guideline	To be implemented at the works sites of KT14 during the Construction Phase	Construction Contractor		√		WDO Waste Disposal (Chemical Waste) General Regulation)
Waste 6	Domestic garbage generated by site staff shall be stored at dry locations in covered impermeable skips. It should be collected daily and disposed to the nearest Refuse Collection Point or arranged for collection by licensed contractors. The Engineer is responsible for checking that no chemical waste, sewage, excavated material or sorted reusable material is disposed as domestic garbage.	Planning for waste reduction, re-use, recycling and proper disposal and form compliance with Waste Disposal Ordinance and other guideline	To be implemented at all of KT14 construction site	Construction Contractor		√		Public Health and Municipal Services Ordinance

Mitigation Measure Implementation Schedule – Landscape / Visual

Landscape / Visual Impact Mitigation								
Item Ref:	Mitigation Measures	Objectives of Proposed Measures	Location/Duration of Measures/Timing of Completion of Measures	Implementation Agent(s)	Implementation Stage			Relevant Legislation & Guidelines
					Design	Construction	Operation	
Land 1	A survey of existing trees shall be completed in accordance with Works Branch Technical Circular No. 14/2002. Management and Maintenance of Natural Vegetation and Landscape Works, and Tree Preservation during detailed design stage. The results of the survey shall form consideration in the detail design for the proposed Secondary Channels KT14, in order that any significant trees shall be protected during both the design and construction periods. Parameters assessed in the survey shall include species, health, form, transplant-ability and amenity value (assessed according to form, size, age, condition and situation of the tree). All surveyed trees should be checked with species listed under the “Animals and Plants (Protection of Endangered Species) Ordinance (CAP 187)” and Forestry and Countryside Ordinance (CAP. 96)” to ensure that no endangered species are affected. Where tree felling is unavoidable, compensatory planting proposal shall be prepared and submitted to EPD and LandsD for approval.	Protect visual quality of project area and proposed works	To be implemented along KT14 during the Detail Design Phase and Construction Phase.	Design Engineer to conduct tree survey during detailed design stage.	√			Works Bureau Technical Circular No. 14/2002
		Ensure protection of trees.		Construction Contractor to follow the results during construction		√		
		Protect visual quality of project area and proposed works	To be implemented along KT14 during the Detail Design Phase and Construction Phase.	Design Engineer to conduct tree survey during detailed design stage.	√			Works Bureau Technical Circular No. 14/2002
		Ensure protection of trees		Construction Contractor to follow the results during construction		√		

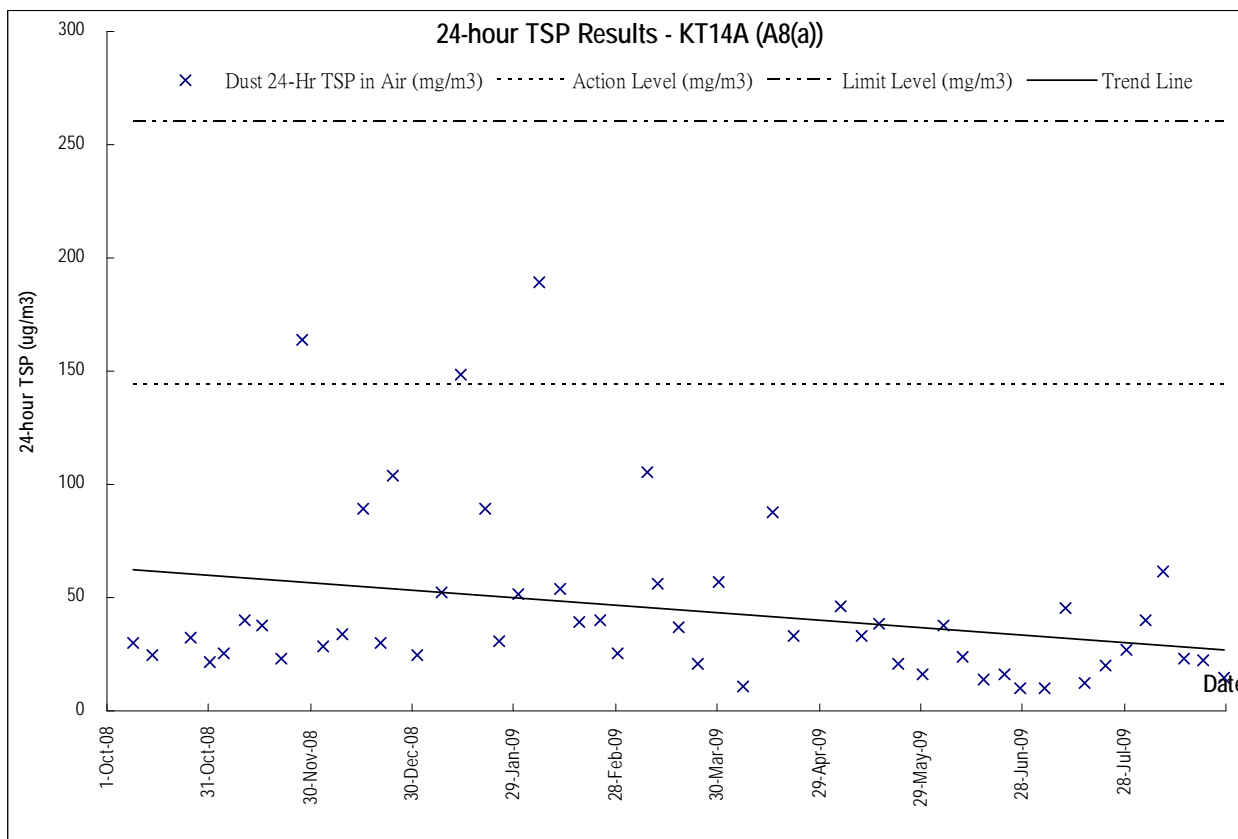
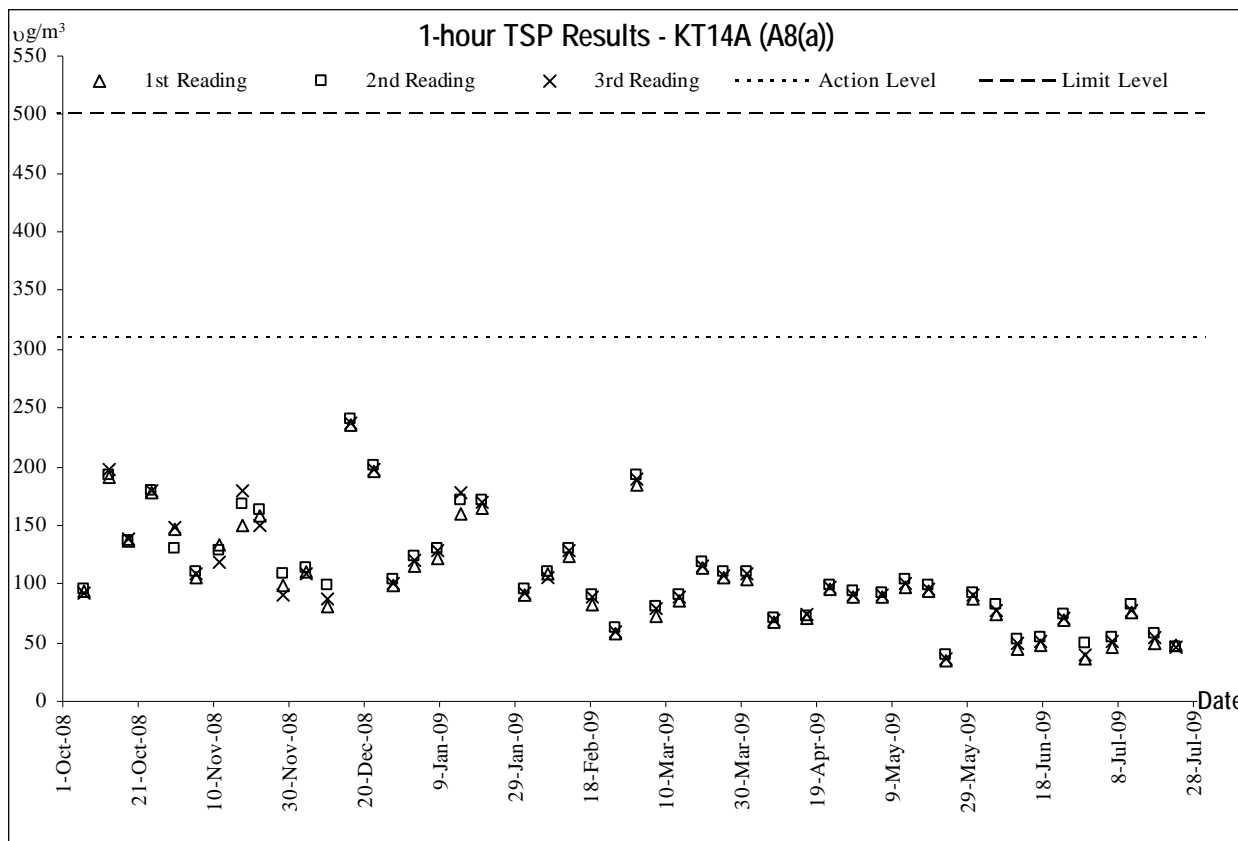
Note:
 EIAO Environmental Impact Assessment Ordinance
 WDO Waste Disposal Ordinance
 WPCO Water Pollution Control Ordinance
 TMEIA Technical Memorandum on Environmental Impact Assessment Process

Appendix F

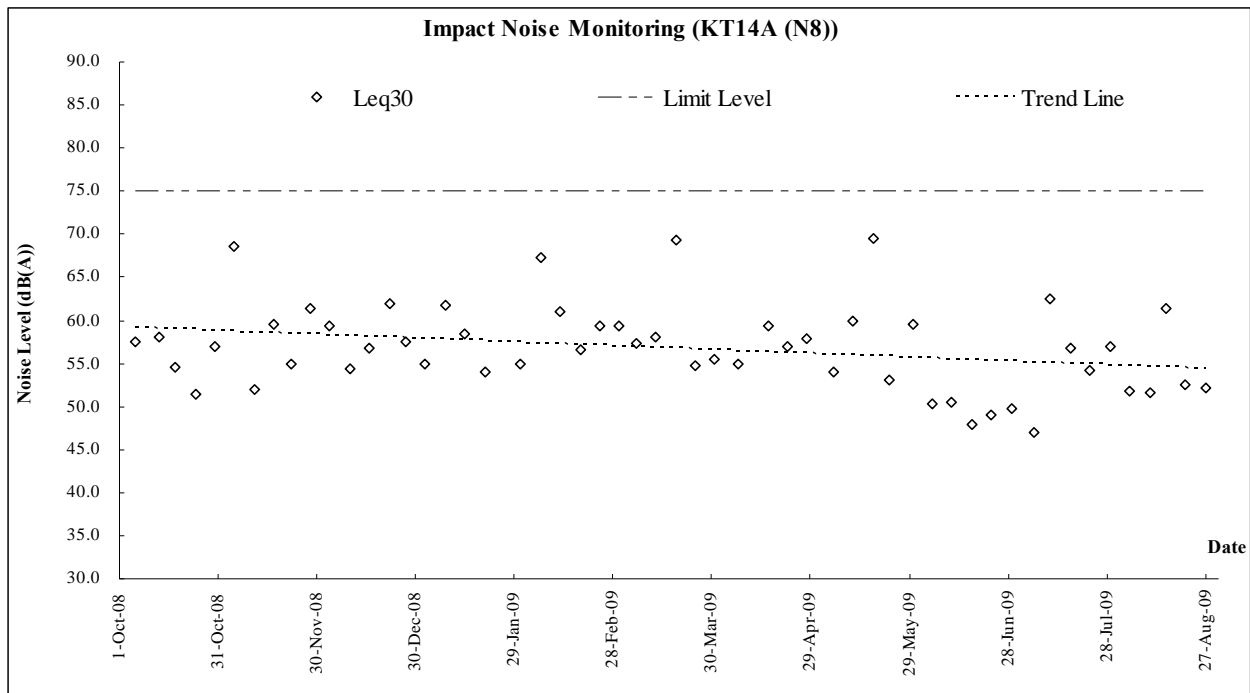
Graphic Plots of

- (a) Air Quality**
- (b) Construction Noise**
- (c) Water Quality**

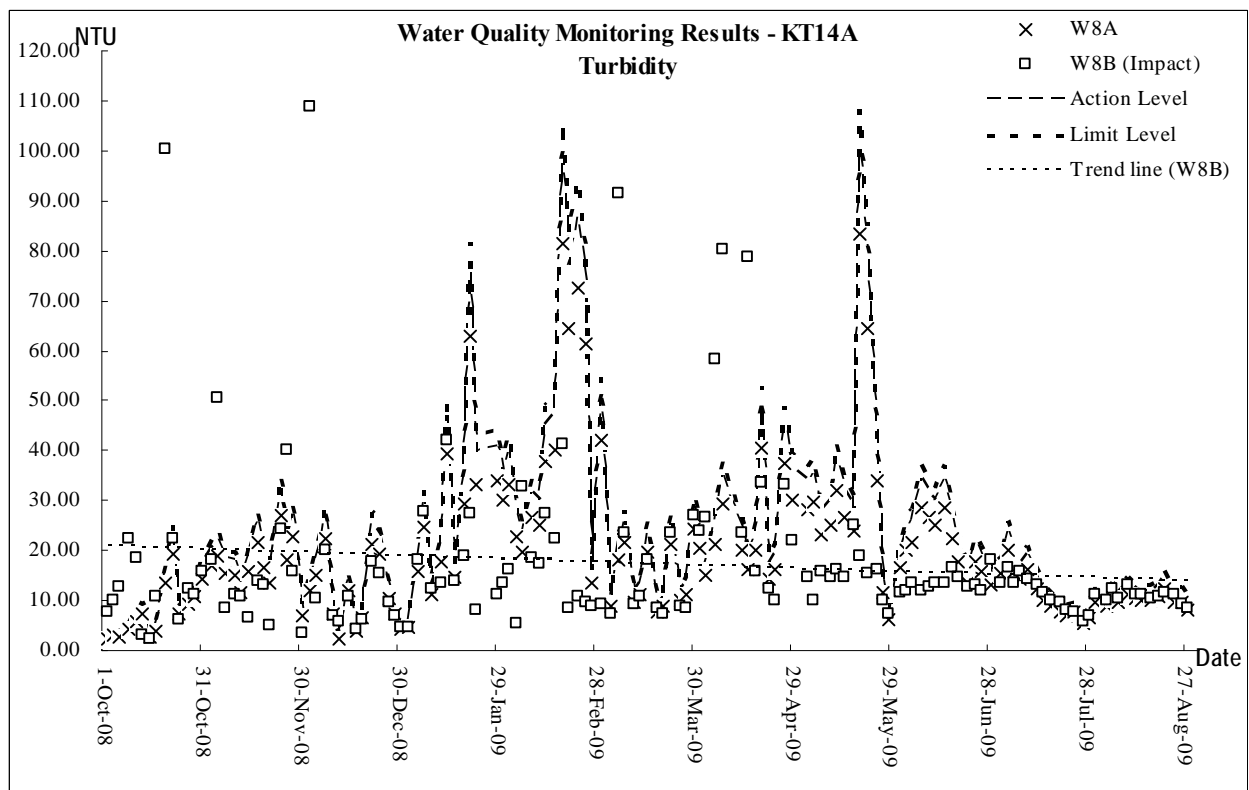
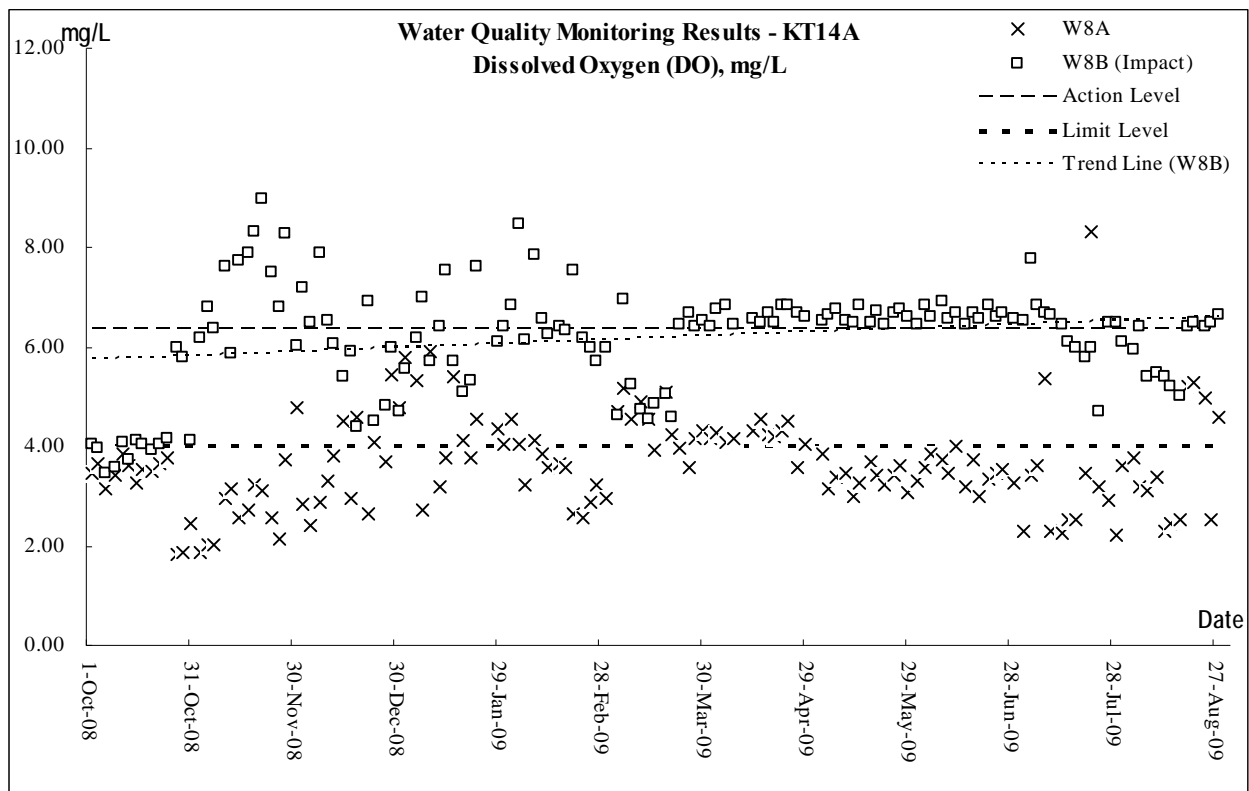
Air Quality

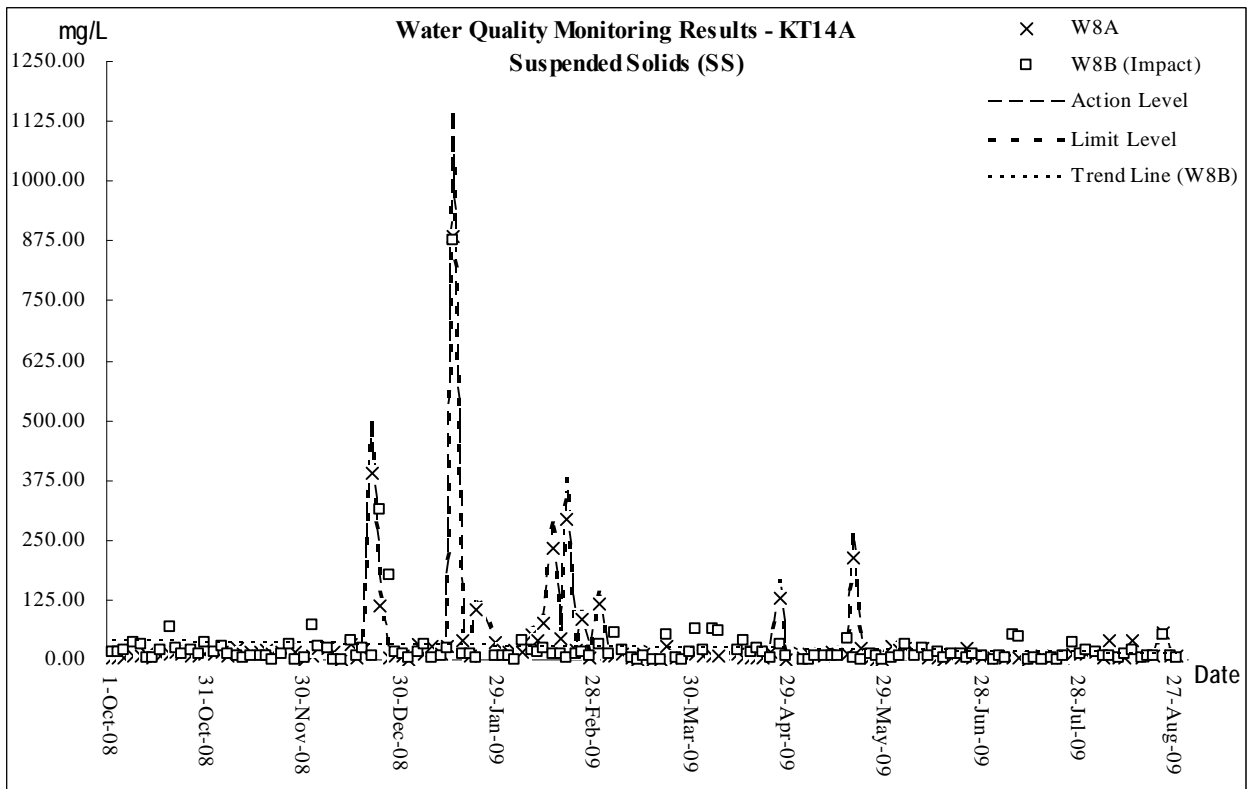
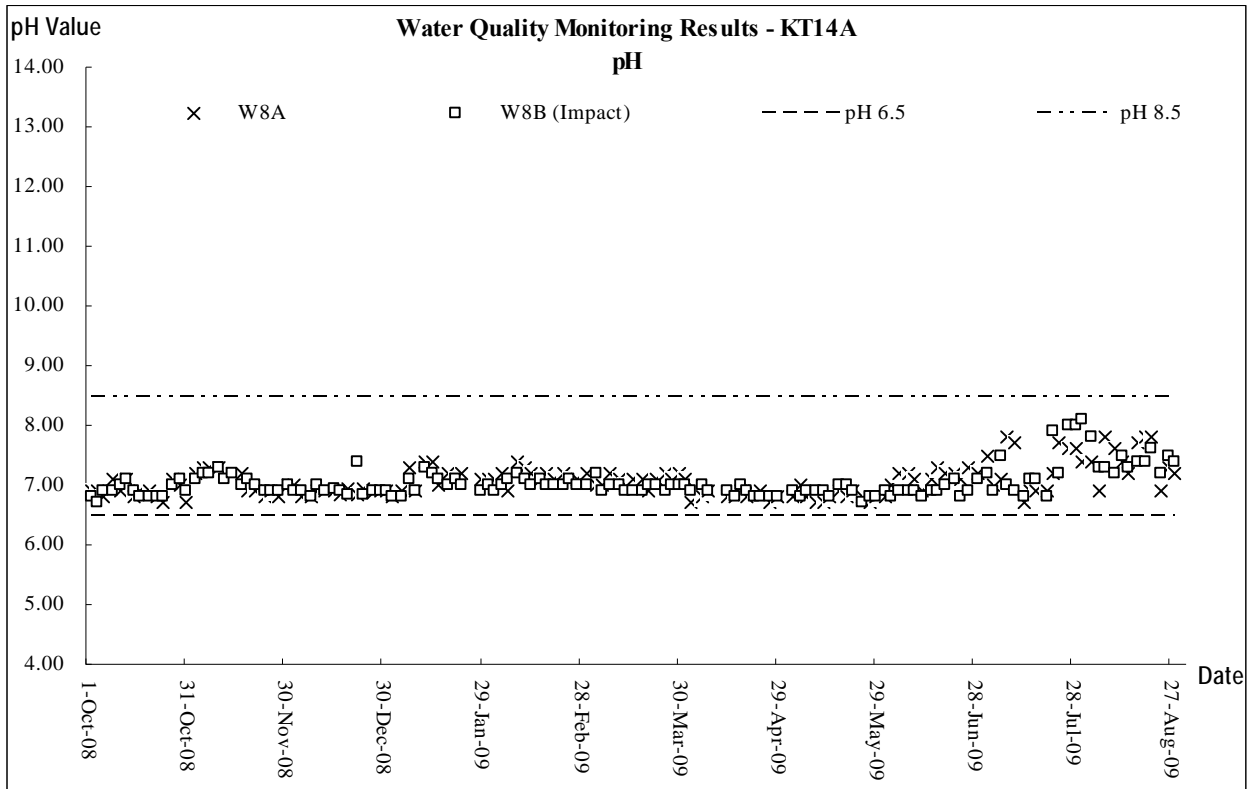


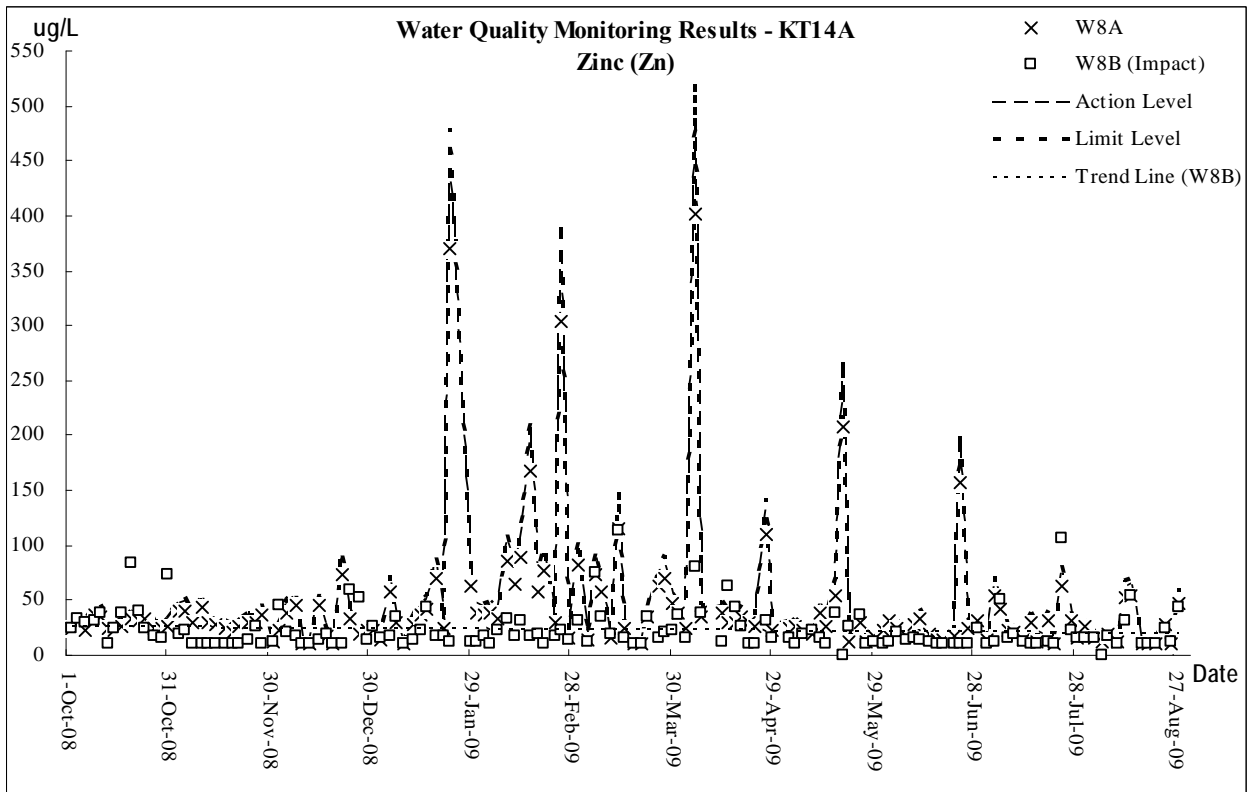
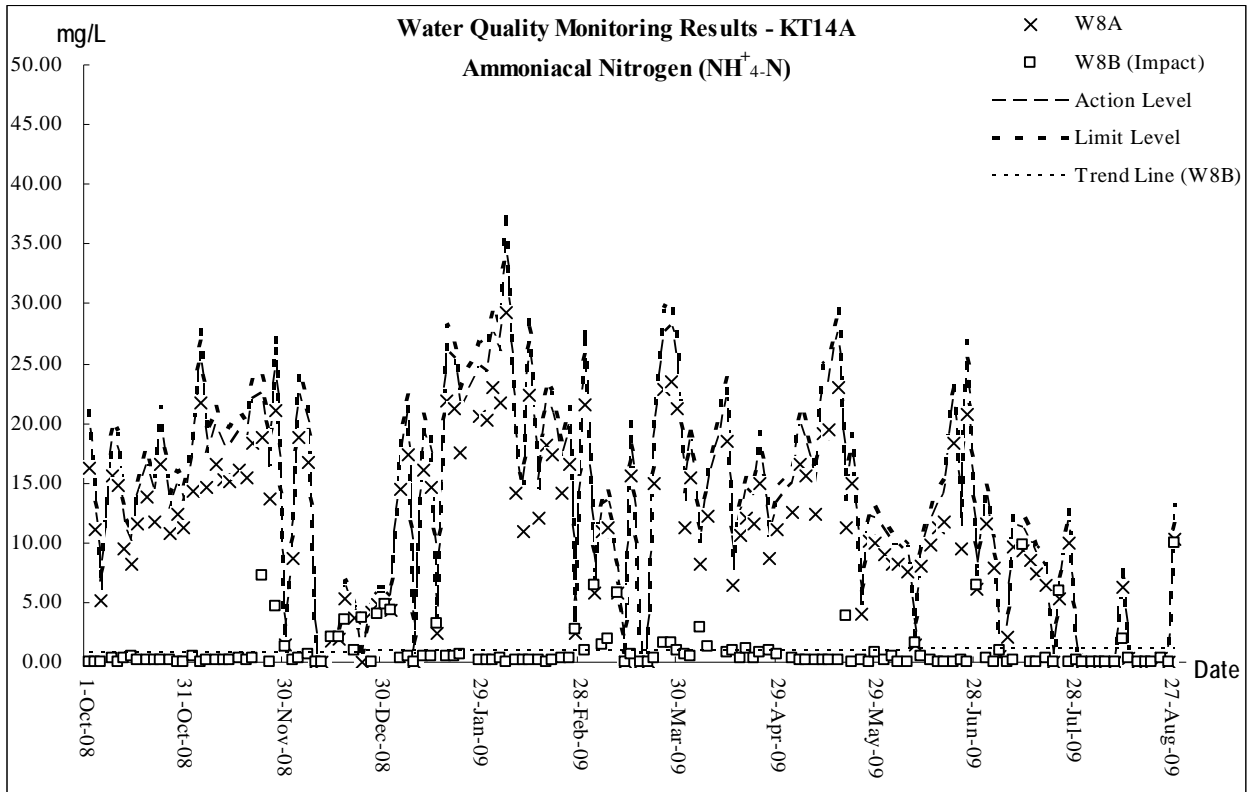
Construction Noise



Water Quality







Appendix F

Waste Flow Table

Monthly Summary Waste Flow Table

Date: 31-Dec-08
Year/Month: Dec-08

Monthly Summary Waste Flow Table for <u>December 2008</u>										
Year	Actual Quantities of Inert C & D Materials Generated Monthly					Estimated Annual Quantities of C & D Wastes Generated Monthly				
	Total Quantity Generated	Broken Concrete (see note 4)	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Metals	Paper/ Cardboard packaging	Plastics (see note 3)	Chemical Waste	Others, e.g. General refuse
	(in '000M ³)	(in '000M ³)	(in '000M ³)	(in '000M ³)	(in '000M ³)	(in '000KG)	(in '000KG)	(in '000KG)	(in '000KG)	(in '000M ³)
Jan	0	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0	0
Apr	0	0	0	0	0	0	0	0	0	0
May	0.08	0.04	0.04	0	0	0	0	0	0	0
Jun	0.00	0.001	0.001	0	0	0	0	0	0	0
Sub-Total	0.08	0.041	0.041	0	0	0	0	0	0	0
Jul	0.021	0.003	0.018	0	0	0	0	0	0	0
Aug	0.899	0.005	0.894	0	0	0	0	0	0	0.01
Sep	5.055	0.003	3.480	0	1.572	0	0	0	0	0.06
Oct	4.044	0.002	2.526	0	1.516	0	0	0	0	0
Nov	6.647	0.011	5.262	0	1.374	0	0	0	0	0.012
Dec	9.050	0.032	8.286	0	0.732	0	0	0	0	0
Total	25.799	0.097	20.507	0.000	5.194	0.000	0.000	0.000	0.000	0.082

- Notes:
- (1) The performance targets are given in PS Clause 28.10(14)
 - (2) The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.
 - (3) Plastics refer to plastic bottles/ containers, plastic sheets/ foam form packaging material
 - (4) Broken concrete for recycling into aggregates

Monthly Summary Waste Flow Table

Date: 30-Sept-09
Year/Month: Sep-09

Monthly Summary Waste Flow Table for Sept 2009										
Year	Actual Quantities of Inert C & D Materials Generated Monthly					Estimated Annual Quantities of C & D Wastes Generated Monthly				
	Total Quantity Generated	Broken Concrete (see note 4)	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Metals	Paper/ Cardboard packaging	Plastics (see note 3)	Chemical Waste	Others, e.g. General refuse
	(in '000M ³)	(in '000M ³)	(in '000M ³)	(in '000M ³)	(in '000M ³)	(in '000KG)	(in '000KG)	(in '000KG)	(in '000KG)	(in '000M ³)
Jan	6.716	0.008	6.708	0	0	0	0	0	0	0
Feb	8.001	0.009	7.632	0.360	0	0	0	0	0	0
Mar	5.792	0.014	5.778	0	0	0	0	0	0	0
Apr	6.622	0.004	6.864	-0.246	0	0	0	0	0	0
May	7.632	0.006	7.674	-0.048	0	0	0	0	0	0
Jun	6.002	0.008	5.676	-0.498	0.816	0	0	0	0	0
Sub-Total	40.76	0.049	40.332	-0.432	0.816	0	0	0	0	0
Jul	4.163	0.005	5.016	-0.858	0	0	0	0	0	0
Aug	5.666	0.007	6.354	-0.828	0.132	0	0	0	0	0
Sep	5.647	0.017	3.510	1.994	0.126	0	0	0	0	0
Oct										
Nov										
Dec										
Total	56.240	0.078	55.212	-0.124	1.074	0.000	0.000	0.000	0.000	0.000

- Notes:
- (1) The performance targets are given in PS Clause 28.10(14)
 - (2) The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.
 - (3) Plastics refer to plastic bottles/ containers, plastic sheets/ foam form packaging material
 - (4) Broken concrete for recycling into aggregates