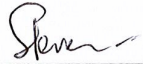
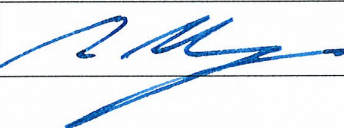


The HongKong Electric Company Limited

Lamma Power Station – Unit L2 Flue Gas Desulphurization Plant Retrofit Project

Project Profile

July 2007

	Name	Signature
Reviewed & Checked:	Steven Wong	
Approved:	Freeman Cheung	

Version: 1	Date: 17 July 2007
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1. BASIC INFORMATION

Project Description

- 1.1 As a commitment to further reducing the total emissions from Lamma Power Station, The Hongkong Electric Company, Limited (HEC) is planning to retrofit Flue Gas Desulphurization (FGD) Plant to the existing 250MW Unit L2 Coal-fired Unit for reducing sulphur dioxide emissions as one of the emission reduction measures to meet HEC's 2010 emission targets.
- 1.2 Same as the technology adopted for recent Lamma Units L4 & L5 FGD retrofit, the "Wet Limestone-Gypsum" process will be adopted for Unit L2 (L2) FGD retrofit. This FGD technology is proven and reliable, and has been adopted for the existing FGD plants for Units L6, L7 & L8 of Lamma Power Station.
- 1.3 The proposed FGD process involves directing the flue gas from the boiler of Unit L2 to FGD plant, in which limestone slurry is introduced to react with flue gas for removal of SO₂, before discharging to the chimney. As a result, the temperature of flue gas entering the chimney will be reduced, waste water from the FGD absorber will be produced and gypsum will also be produced as by-product. This Project Profile serves to address the environmental impacts arising from construction and operation of the proposed Unit L2 FGD Retrofit for application for permission to apply directly for an environmental permit under S 5(10) of the Environmental Impact Assessment Ordinance Chapter 499.

Project Title

- 1.4 The title of this project is known as "Lamma Power Station – Unit L2 Flue Gas Desulphurization Plant Retrofit Project".

Purpose and Nature of the Project

- 1.5 Lamma Power Station has an installed capacity of 3,420MW comprising 3x250MW and 5x350MW coal-fired units, 1x365MW oil-fired combined cycle unit, and 1x55MW and 4x125MW oil-fired open cycle gas-turbine units. The latest three 350MW coal-fired units, Units L6, L7 & L8, are equipped with FGD plants and Units L4 & L5 are being retrofitted with FGD plants. The proposed retrofit project will include the installation of FGD plant with flue gas desulphurization efficiency of 90% for the 250MW coal-fired Unit L2 to reduce the overall SO₂ emissions from Lamma Power Station.

Name of Project Proponent

- 1.6 The Hongkong Electric Company Limited (HEC)

Location of Project

- 1.7 The Project is located at the existing Lamma Power Station. Figure 1.1 shows the location of proposed FGD plant.

Name and Telephone Number of Contact Person(s)

- 1.8 All queries regarding the Project can be addressed to the project proponent:

Ms. Mimi Yeung
General Manager (Public Affairs)
The Hongkong Electric Company Limited
Tel.: 2843 3268

Dr. C. W. Tso
General Manager (Projects)
Tel.: 3143 3808

Proposed addition, modification and alteration

- 1.9 At present, the flue gas from Unit L2 Boiler is directly discharged to the atmosphere via a 215 m above PD high chimney. The proposed FGD plant will be located in the area as shown in Figure 1.1 and some of the existing pipeworks will be relocated to make room for this FGD plant for Unit L2.
- 1.10 The flue gas from the boiler will be directed to the FGD absorber inside which removal of SO₂ will take place by reaction with limestone slurry. After passing through the absorber, the treated flue gas will be heated up by a gas-gas heater to over 80°C and directed back to the existing chimney for discharge to the atmosphere.
- 1.11 As the existing common limestone powder/gypsum handling and storage facilities serving the existing Units L6, L7 & L8 FGD plants and new Unit L4 & L5 FGD retrofit plants have spare capacity to cater for one additional 250MW FGD unit, the additional equipment required for Unit L2 FGD retrofit will be limited to the unitized FGD equipment with no addition of common facilities.
- 1.12 The additional equipment to be installed for the proposed retrofit project are listed below and shown in Figure 1.2.
- One set of FGD absorber and associated ductworks
 - One set of Booster fan
 - One set of Gas-gas heater
 - FGD electrical and control equipment building

Timetable for addition, modification and alteration

- 1.13 The retrofit work is scheduled at the existing Lamma Power Station during October 2007. The tentative schedule is as follows:
- | | |
|--|---------------|
| Commencement of demolition/clearance works | October 2007 |
| Commencement of Unit L2 FGD civil works | January 2008 |
| Commencement of Unit L2 FGD plant erection | December 2008 |
| Commercial operation of L2 FGD Plant | April 2010 |

2. POSSIBLE IMPACTS ON THE ENVIRONMENT

Major Elements of the Surrounding Environment

- 2.1 The Project area is situated in existing Lamma Power Station at the western edge of Lamma Island. Major elements of the surrounding environment include Lamma Power Station, Hung Shing Ye to the east, Ko Long to the north and Country Side Conservation Area, Agricultural Areas and Open Space Areas in various directions. Same set of air, noise and water sensitive receivers stated in the EIA of Lamma Power Station Units L4 & L5 Flue Gas Desulphurization Plant Retrofit Project, Register No.: AEIAR-098/2006 (hereafter called “Approved EIA (2006)”) has been adopted in the study. The air, noise and water sensitive receivers (ASRs, NSRs & WSRs) are shown in Table 2.1 to 2.3. Locations of ASRs, NSRs & WSRs are shown in Figure 2.1, 2.2 & 2.3 respectively.

Table 2.1 List of Air Sensitive Receivers

Receptor / ASR	Location	Receptor Height	Receptor / ASR	Location	Receptor Height
1	Yung Shue Wan	30	36	HKU Quarters	145
2	Pak Kok San Tsuen	10	37	Mt Davies	220
3	Ko Long	50	38	Queen Mary Hospital	170
4	North Lamma	50	39	Queen Mary Hospital	255
5	Pak Kok Tsui	10	40	Smithfield	90
6	Pak Kok Tsui	60	41	Smithfield	190
7	Pak Kok Tsui	110	42	Telegraph Bay	10
8	Lo Tik Wan	20	43	Telegraph Bay	110
9	Lo Tik Wan	70	44	Baguio Villa	70
10	Lo Tik Wan	120	45	Baguio Villa	130
11	Tai Wan To, Beach	10	46	High West	470
12	Lo Tik Wan, Sea	0	47	HKU	100
13	Kat Tsai Wan	10	48	HKU	200
14	Lamma Quarry W	70	49	Chi Fu Fa Yuen	130
15	Lamma Quarry E	30	50	Chi Fu Fa Yuen	245
16	Lamma Quarry E	80	51	Overthroe	490
17	Lamma Quarry E	130	52	Wah Fu estate	50
18	Ngai Tau	20	53	Wah Fu estate	120
19	Tit Sha Long	20	54	Sherwood's Bluff	430
20	Sok Kwu Wan	0	55	Admiralty	90
21	Ling Kok Shan	210	56	Admiralty	190
22	Sea shore, Lamma South	10	57	Wah Kwai Estate	50
23	Mt Stenhouse	320	58	Wah Kwai Estate	160
24	Tai Kok	110	59	Mt Kellet	400
25	Ha Mei Tsui	10	60	South Horizons	10
26	Sea shore, Lamma South	20	61	South Horizons	150
27	West Lamma Channel	0	62	Aberdeen Centre	40
28	West Lamma Channel	0	63	Aberdeen Centre	135
29	Sea, Cheung Chau West	10	64	Lei Tung Estate	50
30	Cheung Chau	50	65	Lei Tung Estate	155
31	Green Island	0	66	Wong Chuk Hang	30
32	West Lamma Channel	100	67	Wong Chuk Hang	90
33	Honey Villa	70	68	Ocean Park	70
34	Honey Villa	145	69	Ocean Park	30
35	HKU Quarters	50			

Note: Receiver height, meters above sea level

Table 2.2 List of Noise Sensitive Receivers

NSR	Location	Type of Use
NSR1	Hung Shing Ye/ Tai Wan To	Residential use (3-storey)
NSR2	Ko Long	Residential use (3-storey)

Table 2.3 List of Water Sensitive Receivers

WSR	Location
SR1	Pak Kok (Coral)
SR2	Shek Kok Tsui (Coral)
SR3	Luk Chau (Coral)
SR4	Lo Tik Wan Fish Culture Zone
SR5	HEC Lamma Power Station Intake
SR6	Hung Shing Ye Beach
SR7	Lo So Shing Beach
SR8	Sok Kwu Wan Fish Culture Zone
SR9	Ha Mei Wan (Fish Spawning Ground)
SR10	SW Lamma 1
SR11	SW Lamma 2

AirConstruction Phase

- 2.2 The construction activities of the Project will involve civil and E&M erection. Civil works of the retrofitting of FGD Plant to existing 250MW coal-fired Unit L2 are the major construction works of the Project. Due to the small scale of excavation, the air quality impact at the representative ASR location at a distance of 450m is expected to be insignificant. Control measures stipulated in the Air Pollution Control (Construction Dust) Regulation of Air Pollution Control Ordinance (APCO) should be implemented to ensure compliance with the Regulation. Hence, no adverse air quality impact is envisaged from the construction of the Project.

Operational Phase

- 2.3 The Project aims at a significant improvement of air quality in the direct vicinity of the Lamma Power Station and in the wider region. The operation of the project will not increase emissions of air pollutants, while the SO₂ and particulate emission will be reduced as a result of the Project:

- Unit L2 SO₂ emission reduction by about 90%; and
- Unit L2 Particulate (PM) emission reduction by about 30%.

- 2.4 After installing the FGD unit, the efflux temperature of Unit L2 flue gas will be reduced from 120°C to 80°C. It is noted that Units L4 & L5 will be retrofitted with low nitrogen oxides burners (low-NO_x burner) by end March 2010. The NO_x emission from Units L4 and L5 will be reduced from 1200mg/Nm³ to 660mg/Nm³. The details on the L2, L4 & L5 emission levels before and after the retrofit are provided in Table 2.4.

Table 2.4 Emission Characteristic before and after L2, L4 & L5 retrofit

Pollutants	Unit	Before ⁽¹⁾	After	Changes
SO ₂ emission, mg/Nm ³	L2	1910	191	-1719
	L4	200	200	0
	L5	200	200	0
NO _x emission, mg/Nm ³	L2	1200	1200	0
	L4	1200	660	-540
	L5	1200	660	-540
PM emission, mg/Nm ³	L2	125	85	-40
Efflux Temperature, °C	Stack A	L1 – 120	L1 – 120	L1 – 0
	(L1, L2 & L3)	L2 – 120	L2 – 80	L2 – -40

Pollutants	Unit	Before ⁽¹⁾	After	Changes
		L3 – 120 Efflux Temp: 120	L3 – 120 Efflux Temp: 107 ⁽²⁾	L3 – 0 Efflux Temp: -13
	Stack B (L4, L5 & L6)	80	80	0
	Stack C (L7 & L8)	80	80	0
	Stack D1 (GTs)	390	390	0
	Stack D2 (CC (GT5/7))	80	80	0
Efflux Velocity, m/s	L2, L4, L5	15	15	0

Notes (1) Data extracted from the Approved EIA (2006)

(2) The calculated efflux temperature is based on Ideal Gas Law. Since same air flow volume will discharge for each unit assuming that air flow will well mix on the stack, the averaged efflux temperature (107°C) for Stack A is adopted for this assessment.

- 2.5 The updated air quality impacts arising from the Project are based on the previous wind tunnel modelling results. The wind tunnel test was conducted in 1998 by ERM's sub-contractor, RWDI of Guelph, Ontario, Canada (hereafter called "WTM Report") in support of the EIA study for Lamma Power Station Extension. The same test results also formed a basis for the Air Quality Assessment presented in the Project Profile of Lamma Power Station Conversion of Two Existing Gas Turbines into a Combined Cycle Unit (hereafter called "Project Profile (2000)") and the Approved EIA (2006). The parameters of sources in the wind tunnel tests are updated in the Approved EIA (2006) and those relevant to this study are listed in Table 2.5.

Table 2.5 Parameters of Exhaust Sources before Retrofit

Source	Units	SO ₂ emission, mg/Nm ³	NO _x emission, mg/Nm ³	PM emission, mg/Nm ³	Efflux Temp, °C	Efflux Velocity, m/s
A	L1, L2, L3	1910	1200	125	120	15
B	L4 & L5	200	1200	85	80	15
	L6	191	660	85	80	15
C	L7 & L8	200	411	50	80	15
D1	GTs	290	185	12	390	32
D2	CC (GT5/7)	10	90	5	80	15

Note: Data from Table 3.6 of the Approved EIA (2006)

- 2.6 Flue gases from the exhaust of the boilers are released through tall stacks after treatment. There are total five stacks in Lamma Power Station. For Source A, it represents a single stack containing three separate flues (Units L1, L2 and L3). Each of the three flues contributing to the total stack exhaust has identical efflux temperatures, efflux velocities and emission concentrations. Since the efflux temperature on Source A will be reduced to 107°C after retrofit of Unit L2, the slight reduction in the efflux temperature would slightly lower plume rise which may affect some air sensitive receivers.
- 2.7 The plume centreline will decrease about 9m at the worst affected receptor 29 due to the reduced efflux temperature of 107°C. The detailed calculation is shown in Appendix 2.1. The relative height of plume centreline is only slightly altered when compared with the effective stack height. In addition, the horizontal transport of pollutants over such distance will tend to even out the concentration. It is expected that the slight reduction in the efflux temperature and hence the plume centreline would have a negligible effect on the predicted pollutant concentrations. Therefore, the Wind Tunnel Modelling results stated in the Approved EIA (2006) are still applicable for this study.
- 2.8 The predicted results stated in the Approved EIA (2006) will be updated by multiplying a correction factors, C_T, due to retrofit of Unit L2. The WTM Report stated that the air pollutants emitted from L4 to L8 are tested with the efflux temperature of 80°C during wind tunnel testing. Therefore, the wind tunnel test was conducted under the worst case scenario. The predicted concentration at receptor in WTM Report is calculated by equations below:

$$C_T = C_o \times C_R,$$

$$C_o = \text{Emission} \times \text{Tested Efflux Temperature} / \text{Operating Efflux Temperature}$$

where C_T is predicted concentration at receptor locations;

C_o is the actual source concentration emitted from the stack; and

C_R is concentration ratios (%) measured in the wind tunnel

- 2.9 Therefore, the C_T can be determined by comparison of C_o at different operating efflux temperatures.

For SO_2 operating efflux temperature at 120°C ,

$$C_o = 1910 \times 3\text{mg/m}^3 / 3 \times (273 + 0) / (273+120) = 1326.8\text{mg/m}^3$$

For SO_2 operating efflux temperature at 107°C ,

$$C_o = (1910 \times 2 + 191)\text{mg/m}^3 / 3 \times (273 + 0) / (273+107) = 960.5\text{mg/m}^3$$

For NO_x operating efflux temperature at 120°C ,

$$C_o = 1200 \times 3\text{mg/m}^3 / 3 \times (273 + 0) / (273+120) = 833.6\text{mg/m}^3$$

For NO_x operating efflux temperature at 107°C ,

$$C_o = 1200 \times 3 \text{ mg/m}^3 / 3 \times (273 + 0) / (273+107) = 862.1\text{mg/m}^3$$

- 2.10 The predicted SO_2 concentration at receptors would be decreased by 28% after retrofit of Unit L2. The correction factor of 0.72 due to retrofit efflux temperature changes and reduction in SO_2 emission was adopted for this assessment. The retrofit project will also result in 4% increase in NO_2 concentration at receptors due to retrofit efflux temperature changes.

- 2.11 As the retrofit project will reduce NO_x emission by installing low- NO_x burners to reduce NO_x emission at Units L4 & L5, the predicted hourly average concentration at various ASRs presented in the Approved EIA (2006) needs to be appropriately adjusted due to reduction of NO_x emission from Source B. The scaling factor on the reduce emission can be calculated below:

$$\text{Source B NO}_x: (2 \times 660 + 660) / (2 \times 1200 + 660) = 0.647$$

- 2.12 Based on proposed retrofit, the predicted results of SO_2 and NO_2 hourly average concentration will be further reduced when compared with results presented in the Approved EIA (2006). The maximum predicted SO_2 and NO_2 hourly concentration at Receptor 29 are $351\mu\text{g/m}^3$ and $241\mu\text{g/m}^3$ respectively. Slight reduction in the predicted concentrations are predicted at the identified ASRs. Adverse air quality impacts on identified ASRs are not expected. The detailed calculations and predicted results are shown in Appendix 2.2.

- 2.13 The RSP concentration at the worst-case Receptor 29 had been predicted. The predicted result is based on above assumption and calculation principle stated in the Approved EIA (2006). The correction factor for RSP is $[(125 \times 2 + 85) \times 273 / (273 + 107)] / [(125 \times 3) \times 273 / (273 + 120)] = 0.92$ or 8% reduction. Slight reduction in the RSP concentration is predicted and adverse air quality impact is not expected.

Noise

Construction Phase

- 2.14 The construction activities of the Project will involve civil works and E&M erection, and will coincide with those of Unit L4 and L5 retrofit project. However, most civil and structural works for Unit L4 and L5 retrofit project would have been completed by the time the Project starts and the remaining works for Unit L4 and L5 retrofit project will be plant erection which will not generate significant noise.
- 2.15 The proposed Project is in small scale. In addition, the residential areas are shielded from construction noise to varying degrees by the intervening hill (Kam Lo Hom) and the existing plants. There is also considerable separation between the NSR and the Project. Thus, the noise generated during the construction stage is not expected to be a concern and a quantitative construction noise assessment is not required.

Operational Phase

- 2.16 Potential operational noise sources are the additional equipment for the L2 FGD unit. With reference to the operation mode of existing FGD units in Lamma Power Station, the potential noise sources and their Sound Power Levels (SWL) are presented in Table 2.6.

Table 2.6 Noise data of L2 FGD Unit

Equipment	No. of Unit	SWL ⁽¹⁾ per unit, dB(A)
Absorber	1	107
Absorber Recirculation Pump	4	88
Oxidation Air Blower	2	100
Booster Fan	1	99
Booster Fan Motor	1	90
Gas-Gas Heater (untreated side)	1	95
Gas-Gas Heater (treated side)	1	85
Total SWL		109

- Notes (1) Sound Power Levels of the equipment were provided by the FGD Suppliers and extracted from the Approved EIA (2006)
- (2) Where necessary, proper mitigation measures will be provided for the equipment to ensure that the above sound power levels are achieved.

- 2.17 The predicted noise levels at NSRs due to L2 FGD unit are presented in Table 2.7. Results indicate that the identified NSRs will be subject to noise level of up to 33dB(A), which will comply with both the stipulated daytime and nighttime noise criteria.

Table 2.7 Predicated Façade Noise Levels at NSR1 and NSR2

		NSR1	NSR2
Total SWL, dB(A)		109	109
Horizontal Distance to the NSRs, m		1250	520
Correction Factor	Distance	-69.9	-62.3
	Barrier ⁽¹⁾	-5	-20
	Air absorption ⁽²⁾	-3.5	-1.5
	Façade	2.5	2.5
Predicated Façade Noise Level, dB(A)		33	28
Criteria ⁽³⁾	Daytime	49	49
	Nighttime	45	45

- Notes (1) A negative correction of 5dB(A) has been included for the NSR screened by the existing equipment units and 20 dB(A) has been included for the NSRs screened by the existing equipment units and natural topography (Kam Lo Hom)
- (2) A sound absorption by the atmosphere (assumed at 500Hz, 20°C, RH 70%) has been accounted for in accordance with ISO 9613-1 Acoustics – Attenuation of sound during propagation outdoor – Part 1: Calculation of the absorption of sound by the atmosphere, the air absorption is 2.8dB / km.
- (3) The ambient noise level and criteria at the NSRs are made reference to the Approved EIA (2006). The existing ambient noise level is expected not lower than that obtained in 1997 in consideration of the recent development in the study area. Thus, adopting the same criteria as the Approved EIA (2006) is in fact a conservative approach.

- 2.18 Potential operation noise generated from the existing Lamma Power Station, Extension Plant and Units L4 & L5 Flue Gas Desulphurization Plant Retrofit Project have been assessed in the Approved EIA (2006) which concluded that no adverse operational noise impact was anticipated. Table 2.8 summarises the operational noise levels at NSR1 during the operation of the Lamma Power Station since NSR1 will be subject to highest façade noise level.

Table 2.8 Predicted Cumulative Noise Levels at NSR1

Period	Predicated Noise Level for Existing Plant, Extension Plant and New L4 and L5 FGDs, Leq, 30min dB(A) ⁽¹⁾	L2 FGD, Leq, 30min dB(A)	Cumulative Noise Impact, Leq, 30min dB(A)
Daytime	55	33	55
	52	33	52
Nighttime	50	33	50
	50	33	50

Notes (1) Reference was made to the prediction results of Approved EIA (2006)

- 2.19 The additional equipment to be installed will have insignificant contribution when compared with the cumulative operational noise of the Lamma Power Station. Therefore, the plant noise associated with the retrofit plant is not expected to give rise to any unacceptable noise impact.

Water

Construction Phase

- 2.20 Potential major sources of water quality impact may arise from the discharge of construction run-off and sewage effluent due to workforce during the construction phase. The Contractor is required to implement good site practices and appropriate mitigation measures as stipulated in ProPECC PN 1/94 Construction Site Drainage to control the construction site discharges. It is anticipated that there will be no adverse water quality impact.

Operational Phase

- 2.21 Potential source of impacts to water quality from the operation of the FGD plant are anticipated as a result of filtrate generated from the dewatering of gypsum slurry.
- 2.22 The limestone slurry is introduced to react with flue gas for removal of SO₂. Water will be filtered out from the gypsum slurry after passing through the hydrocyclones. It is then retained in the reclaimed water tanks before discharging to the existing wastewater treatment plant (WWTP).
- 2.23 In line with the existing practice adopted for the Units L6, L7 & L8 FGD plants, operational plant effluent from the proposed FGD plant will be reused as far as possible for preparation of limestone slurry, conditioning of PFA for offsite transportation, etc. to minimise discharge to the existing WWTP. Same practice will be adopted for operational effluent generated from Units L4 & L5 FGD plants which are currently under construction.
- 2.24 The WWTP is equipped with a number of storage tanks/pits and recirculation lines to temporary store the effluent for re-treatment if the action limit is triggered. Design capacity of the existing WWTP is 54 m³/hr which has adequate spare capacity to handle the additional wastewater of below 5 m³/hr from the proposed retrofit project since the actual effluent discharge based on operational data from Units L6, L7 and L8 FGDs are much lower than their designed values of 6.3 m³/hr.
- 2.25 Referring to the past record (January 2006 to December 2006) at the sampling point of the Rejected Treated Water Storage Tank (Table 2.9), the effluent generated is well below the licence limit. Note that not all parameters require monitoring in accordance with the WPCO licence. In addition, there is no normal and emergency plant maintenance discharge so far.

Table 2.9 Monitoring Records of FGD Wastewater Treatment Plant Discharge to Ash Lagoon

Month	Daily Average			Concentration (Daily Average)						
	Volume (m ³ /day)	pH	S.S. (mg/L)	Ba (µg/L)	Hg (µg/L)	Cd (µg/L)	Fe (µg/L)	TP (mg/L)	TN (mg/L)	CN (mg/L)
<i>Licence Limit</i>	200	6-9	30	1500	5	5	4000	8	400	0.1
Jan-2006	62.1	8.3	16.0	137	<0.5	3.6	50	0.5	105	<0.01
Feb-2006	59.3	8.2	15.6	175	<0.5	3	<50	0.1	95	<0.01
Mar-2006	60.1	8.2	15.7	324	<0.5	1	70	<0.1	104	0.02
Apr-2006	79.6	8.2	15.8	277	<0.5	1	<50	<0.1	81	<0.01
May-2006	95.1	8.3	16.4	216	<0.5	1	<50	<0.1	151	0.01
Jun-2006	101.1	8.1	15.6	81	<0.5	<1	240	0.2	152	<0.01
Jul-2006	70.5	8.1	15.3	182	1.6	2	<50	<0.1	125	<0.01
Aug-2006	75.5	8.1	15.7	170	<0.5	2	<50	<0.1	115	0.03
Sep-2006	88.6	8.1	15.4	225	<0.5	4	<50	<0.1	189	0.02
Oct-2006	108.2	8.1	17.6	256	<0.5	3	<50	<0.1	143	0.04
Nov-2006	106.8	8.2	17.3	236	<0.5	3	<50	<0.1	196	<0.01
Dec-2006	92.3	8.1	16.1	365	2.1	4.4	<50	<0.1	177	<0.01

- 2.26 As the Unit L2 FGD would adopt the same wet limestone-gypsum process, similar properties of effluent would be generated with the following properties and the expected influent and effluent are given in Table 2.10.

Table 2.10 Expected Influent and Effluent Characteristics on FGD Wastewater Treatment Plant

Constituents	Units	Designed Influent for 5x350MW + 1x250MW FGD	Expected Influent for 5x350MW + 1x250MW FGD	Effluent at sampling point
pH	pH	5~6	5~6	6~9
Temperature	°C	46	43~44	≤40
Suspended Solids	mg/L	71,800	64,400~66,200	≤30

- 2.27 As it can be seen from Table 2.9 above, the current average daily discharge volume is well below the licence limit of 200m³/day. It is expected that effluent from the WWTP to the Ash Lagoon even with the additional effluent from Unit L2 FGD will meet the requirements in the WPCO licence for the Ash Lagoon Decantrate Tower.
- 2.28 The decanted water discharged from the Ash Lagoon is closely monitored. The monitoring results of the decanted water discharged from the Ash Lagoon to the Cooling Water Outfall from October 2004 to September 2005 have been presented in Table 4.8 of the EIA Report for L4&5 FGD Retrofit Project (February 2006). The results showed that concentrations of the effluent from Ash Lagoon were well below the limit and the overall quality of effluent from Ash Lagoon is better than that from the FGD WWTP. It has been shown that the additional flow from the FGD plants is in compliance with the licence and is environmentally acceptable. Further monitoring results of effluent discharged from Ash Lagoon to the Cooling Water Outfall has not been monitored as there has been no discharge of effluent from Ash Lagoon to the Cooling Water Outfall since October 2005.
- 2.29 On the basis of past monitoring results and the fact that the discharge point of the cooling water outfall for the ash lagoon decantrate is directed away from WSRs, effluent from the Cooling Water Outfall is not expected to pose any unacceptable adverse impacts on the WSRs.
- 2.30 Based on the above, no unacceptable impacts to WSRs are expected as a result of either the construction or operation of the FGD Retrofit.

Waste

Construction Phase

- 2.31 Construction waste would be generated during site clearance and equipment packing materials. Owing to the small scale of the construction activities, the quantity of chemical waste will be minimal.

Provided that the wastes generated from the Project are properly handled, stored, recycled as far as possible, and that they will be disposed of in accordance with relevant regulations and requirements under the Waste Disposal Ordinance, no adverse impact arising from waste management during construction stage of the Project is anticipated.

- 2.32 One light oil tank will be demolished and soil materials around and underlying the tank will be excavated during the subsequent retrofit programme. Land contamination assessment has been completed and confirmed the soil within the area is noncontaminated. Copy of the Contamination Assessment Plan (CAP) and Contamination Assessment Report (CAR) are given in Appendix 2.3.

Operational Phase

- 2.33 The following wastes/by-products will be generated from the operation of the new FGD plant which is of the same type of waste generated from L4 & L5 unit:

- Gypsum produced from the new FGD plant;
- Additional sludge from existing WWTP;
- Industrial waste; and
- Chemical waste;

Gypsum

- 2.34 Gypsum is by-product of the dewatering gypsum slurry. It should be noted that high quality commercial grade gypsum is produced from the operation of the existing FGD plants at Lamma Power Station. The gypsum to be generated from the new FGD units should also be commercial grade. It is a useful construction material in building industry and the demand for gypsum is high in both Hong Kong and mainland China.
- 2.35 A total of 18,000 tonnes gypsum will be produced per year during the operation of new FGD plant. Under existing contract arrangement, the limestone suppliers are required to collect an equivalent amount of gypsum produced from the FGD Plants and no gypsum will be stored on-site. This arrangement has worked satisfactorily for the existing Units L6, L7 & L8 FGD plants. The same contract arrangement will therefore be used for the new FGD plant.

Additional Sludge from WWTP

- 2.36 The existing WWTP has spare capacity to handle the additional wastewater produced from the new FGD plant. It is expected that a maximum 5m³/hr of wastewater will be produced from the new FGD plant and an additional 500 tonnes per year of sludge will be produced from the WWTP.
- 2.37 Same as current operation practices, the sludge generated from WWTP will be off-taken by the limestone suppliers together with the gypsum by barges. All sludges will be reused for production of building materials (ie plaster board) in China.

Industrial Waste

- 2.38 Waste generated from the new FGD plant mainly consists of small amount of woods, packaging material, scrap materials from maintenance of plant and equipment and cleaning material. They will be cleared regularly and collected by the licensed waste collector. From the operational experience of the existing FGD plant, the amount of waste generated from the maintenance of the FGD plant is minimal.

Chemical Waste

- 2.39 With reference to the operational experience of the existing FGD plant at Lamma Power Station, the amount of chemical waste to be generated from the maintenance of the plant is minimal. The

existing chemical waste management system will be strictly followed. No adverse environmental impacts are anticipated.

Landscape and Visual

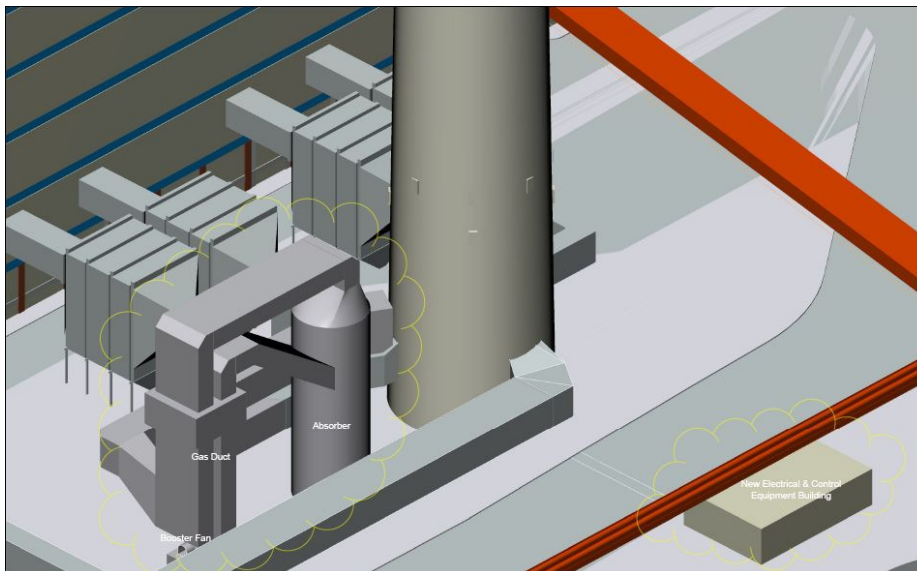
Construction Phase

- 2.40 Landscape and visual impacts during the construction phase will be negligible. No existing trees will needed to be felled or transplanted due to the work. The Unit L2 FGD Plant will be well surrounded by the existing station facilities with a low landscape quality. Therefore, no direct impact on the existing land form and coastal morphology of Lamma Island is anticipated.

Operation Phase

- 2.41 The Unit L2 FGD Plant will be well surrounded by the existing station facilities with a low landscape quality. The size of the new FGD units are approximately listed below:
- Unit L2 Absorber and Auxiliaries: 15m(W) x 40m(L) x 45m(H); and
 - FGD Electrical & Control building: 15m(W) x 22m(L) x 7m(H).
- 2.42 New FGD Auxiliaries and Unit L2 Absorber are adjacent to an existing 215m high chimney. FGD Electrical & Control Building is to be installed in an open area between Temporary Storage Shed and Main Road. The maximum height of new facilities will be lower than existing facilities. The new equipments are small and gave relatively low visual character. Views from many of the more populated areas on Lamma Island will be obstructed by the Po Lo Tsui headland. The absorber and ductwork would be enclosed by aluminium cladding that will complement the existing surrounding industrial facility. The new FGD Electrical and Control Equipment Building will be finished with medium grey and greyish white colours that will complement with existing buildings.
- 2.43 Figure 2.4 is a 3D model showing the location and size of the proposed retrofit. This shows the scale of the retrofit works which will be relatively small with respect to the existing facilities on the site.

Figure 2.4 3D model of the Proposed FGD Retrofit Plant



- 2.44 All the additional equipments for the proposed Project are within the boundary of the existing power station and will have no impact on the surrounding landscape. Adverse landscape and visual impact is not expected.

3. DESCRIPTION OF MITIGATION MEASURES

Air

Construction Phase

- 3.1 In order to minimize the air quality impact during the construction of the Project, the dust mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation should be implemented whenever necessary.

Operational Phase

- 3.2 No mitigation measures would be required during operation phase of the Project.

Noise

Construction Phase

- 3.3 Although no adverse noise impact is anticipated during construction, it is still recommended to carry out the good site practices listed below during the construction phase of the Project:

- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction program.
- Silencers or mufflers on construction equipment should be utilized and should be properly maintained during the construction program.
- Powered mechanical equipment that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum.
- Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs.
- Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

Operational Phase

- 3.4 No mitigation measures would be required during operation phase of the Project.

Water

Construction Phase

- 3.5 The practices outlined in ProPECC PN 1/94 Construction Site Drainage will be adopted during the construction of the Project where appropriate. Water quality impact will be minimized during construction stage with the adoption of good site management practices.

Operational Phase

- 3.6 The operational plant effluent from the FGD plants should be reused as much as possible to minimize discharge to the WWTP. Maintenance of the WWTP should be performed regularly to ensure the effluent from the WWTP would not exceed the current requirements stipulated in the WPCO license for Ash Lagoon Decantrate Tower.

Waste

Construction Phase

- 3.7 The Contractors will be required to observe and comply with the Waste Disposal Ordinance and its subsidiary regulations, as well as good waste management practices.

Operational Phase

- 3.8 There are no major waste management issues associated with the operation of the new FGD plant. The existing operation waste management practices will be applied to the new FGD plant. The chemical waste should be properly stored and collected by the licensed chemical waste collector.

Landscape and Visual

Construction Phase

- 3.9 No mitigation measures would be required during construction phase of the Project.

Operational Phase

- 3.10 No mitigation measures would be required during operation phase of the Project.

4. USE OF PREVIOUSLY APPROVED EIA REPORTS

4.1 This Project Profile has made reference to the following EIA Reports:

Reference 1

Title: The Hongkong Electric Company Limited – Environmental Impact Assessment of Lamma Power Station Unit L4 & L5 Flue Gas Desulphurization Plant Retrofit Project

Time of Approval: 24th March 2006

Approval by: Director of Environmental Protection Department

Environmental Aspects Addressed: Air quality

Noise quality

Water quality

Waste impact

Visual impact

Land contamination

Reference 2

Title: The Hongkong Electric Company Limited – Environmental Impact Assessment of a 1,800MW Gas-Fired Power Station at Lamma Extension

Time of Approval: 5th May 1999

Approval by: Director of Environmental Protection Department

Environmental Aspects Addressed: Air quality

Noise quality

Water quality

Waste management

Landscape and Visual impact

Land contamination

Ecology

Fisheries

Hazard to life

Reference 3

Title: The Hongkong Electric Company Limited – Environmental Impact Assessment of Conversion of Two Existing Gas Turbines into a Combined Cycle Unit

Time of Approval: 11th August 2000

Approval by: Director of Environmental Protection Department

Environmental Aspects Addressed: Air quality

Noise quality

Water quality

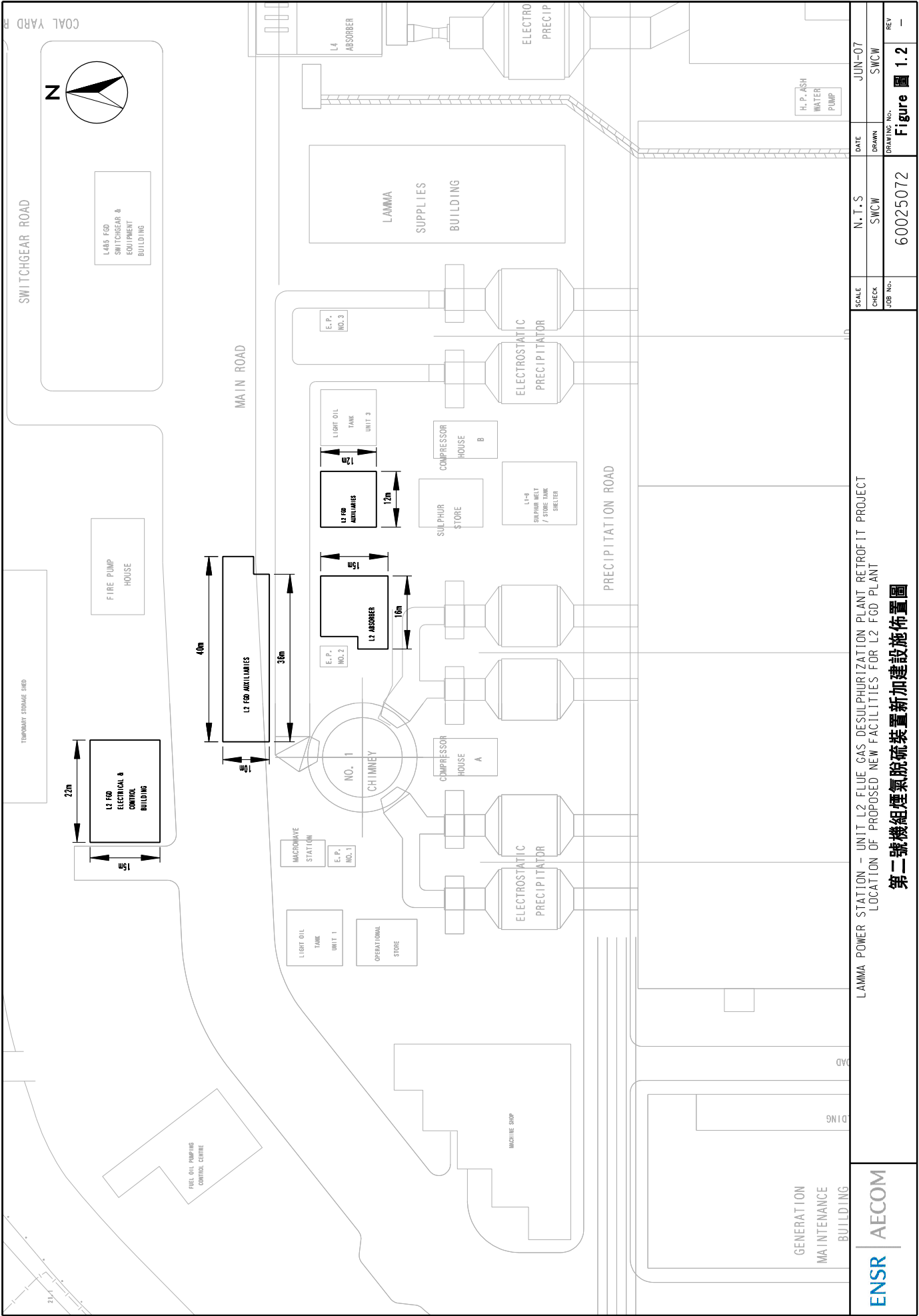
Waste management

Landscape and Visual impact

Cultural & Heritage

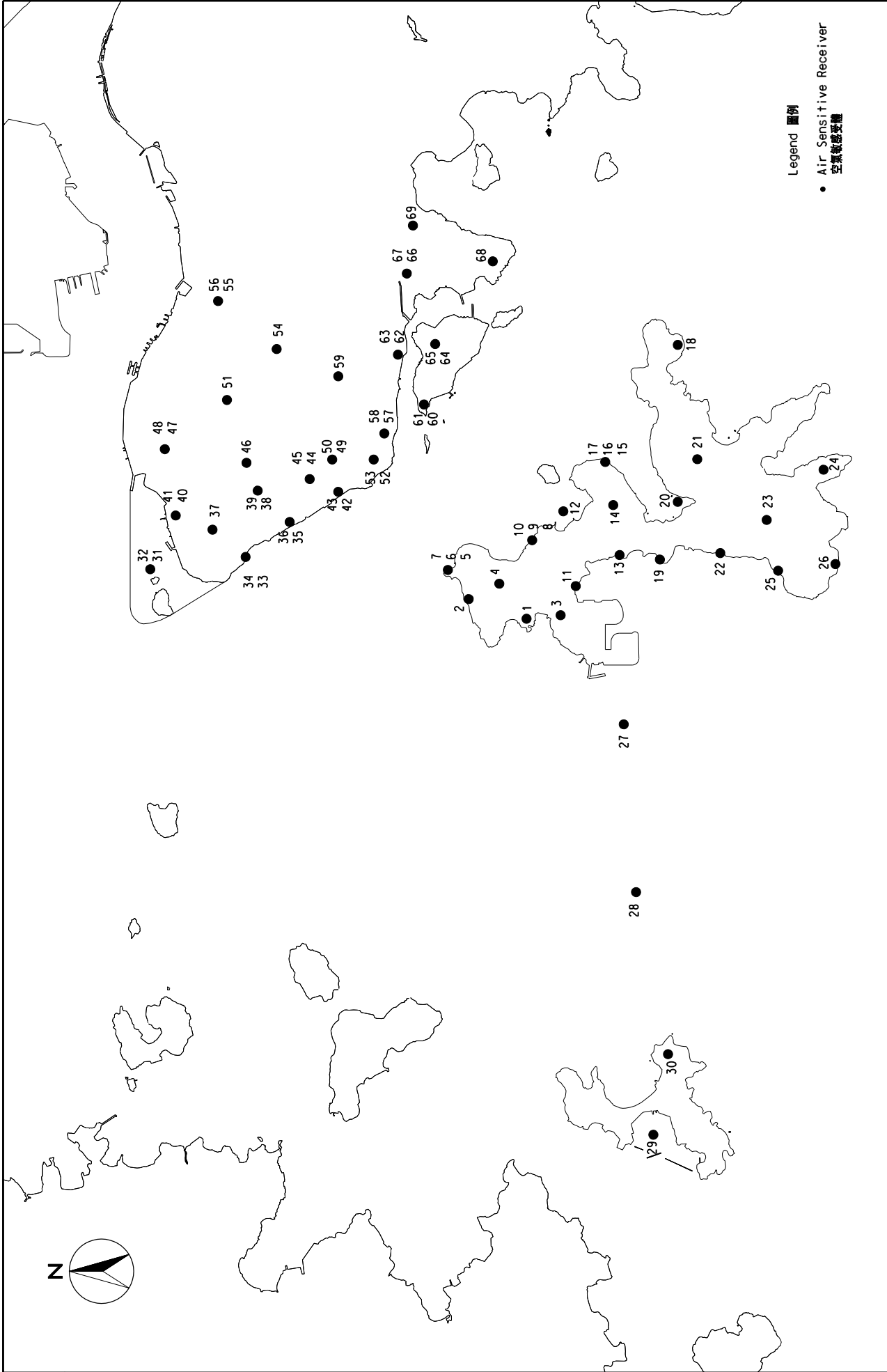
Ecology

FIGURES 附圖

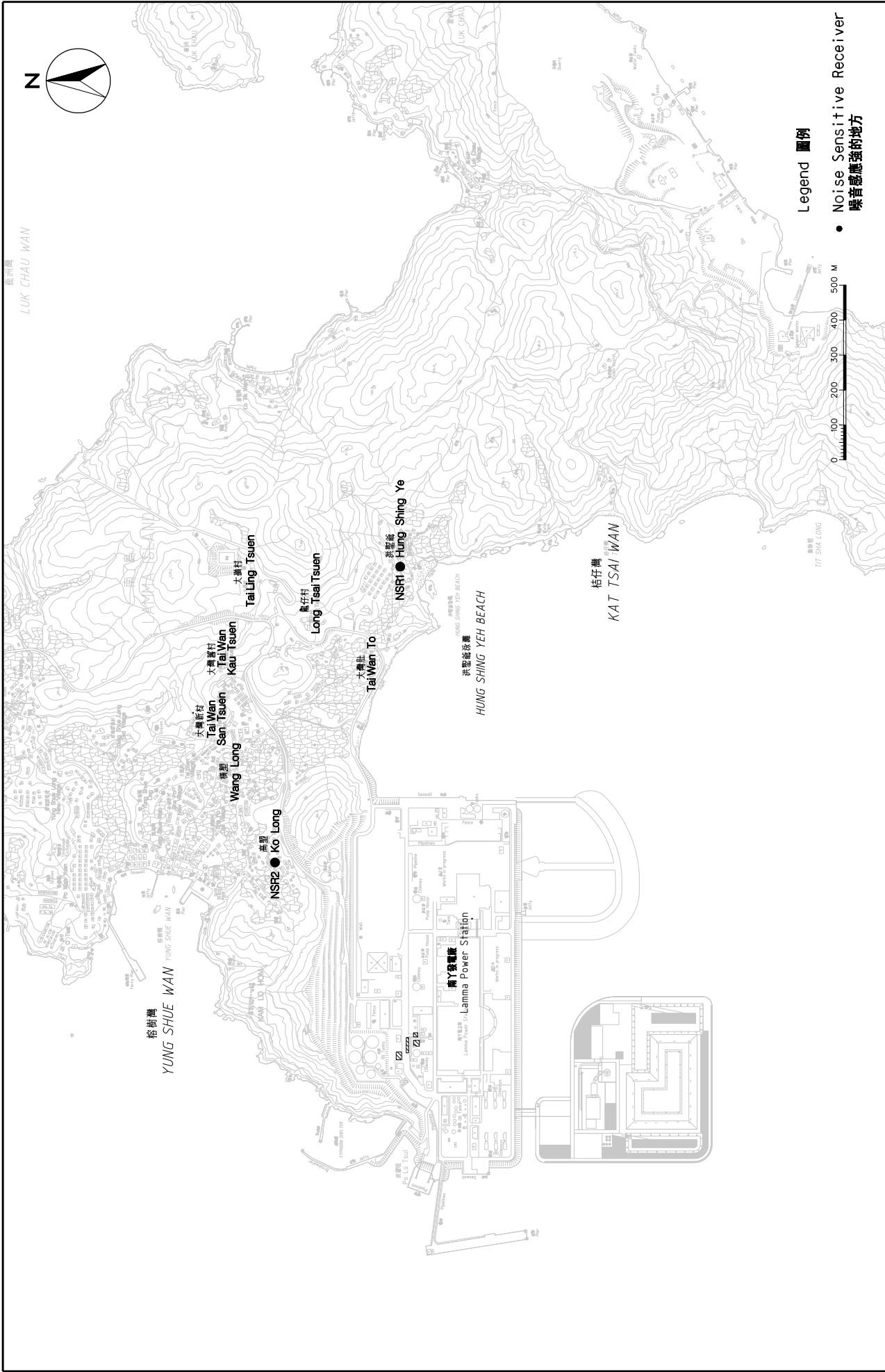


LAMMA POWER STATION - UNIT L2 FLUE GAS DESULPHURIZATION PLANT RETROFIT PROJECT
LOCATION OF PROPOSED NEW FACILITIES FOR L2 FGD PLANT
第二號機組煙氣脫硫裝置新加建設佈置圖

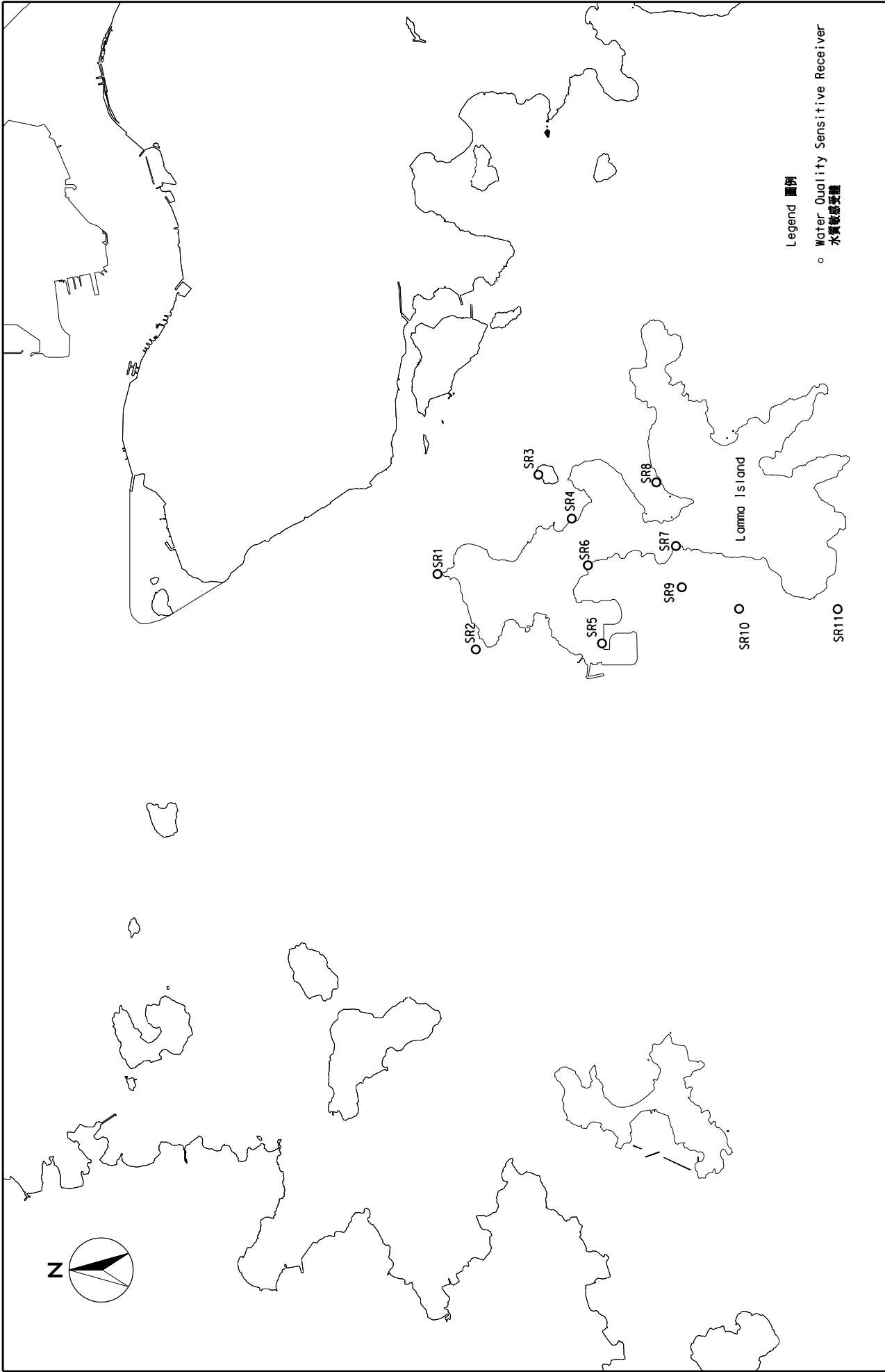
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CHECK	SWCW	DRAWN	SWCW
JOB No.	60025072	DRAWING No.	Figure 1.2
REV			-



ENSR AECOM	LAMMA POWER STATION – UNIT L2 FLUE GAS DESULPHURIZATION PLANT RETROFIT PROJECT									
	LOCATIONS OF AIR SENSITIVE RECEIVERS (ASRS)									
	空氣敏感受體位置									
SCALE		N.T.S		DATE		JUN-07				
CHECK		SWCW		DRAWN		SWCW				
JOB No.		60025072		DRAWING No.		Figure 圖 2.1				
						REV		–		



ENSR AECOM	LAMMA POWER STATION - UNIT L2 FLUE GAS DESULPHURIZATION PLANT RETROFIT PROJECT LOCATIONS OF NOISE SENSITIVE RECEIVERS (NSRs)			
	SCALE	1:10000 @A3	DATE	JUN-07
	CHECK JOB No.	SWCW	DRAWN	SWCW
60025072		DRAWING No.		Figure 2.2
		REV		-



ENSRAECOM	LAMMA POWER STATION - UNIT L2 FLUE GAS DESULPHURIZATION PLANT RETROFIT PROJECT LOCATIONS OF WATER QUALITY SENSITIVE RECEIVERS				SCALE	N.T.S		DATE	JUN-07
					CHECK	SWCW		DRAWN	SWCW
	水質敏感受體位置				JOB No.	60025072		DRAWING No.	Figure 2.3
								REV	-

APPENDICES 附件

**APPENDIX 2.1 - Calculation of Effective
Stack Height**
附件 2.1 – 有效煙囪高度計算

Prediction of effective stack height for the worst affected receptor 29

最受影響的 29 號受體之有效煙囪高度預測

$$F_b = g v_s d_s^2 \left(\frac{\Delta T}{4 T_s} \right) \quad (1-8)$$

for $F_b \geq 55$,

$$(\Delta T)_c = 0.00575 T_s \frac{v_s^{2/3}}{d_s^{1/3}} \quad (1-11)$$

$$u_s = u_{ref} \left(\frac{h_s}{Z_{ref}} \right)^p \quad (1-6)$$

for $F_b \geq 55$:

$$h_e = h_s + 38.71 \frac{F_b^{3/5}}{u_s} \quad (1-15)$$

Efflux Temperature, °C 排放溫度	120	107	
Acceleration due to gravity (g), m/s ² 重力造成的加速度	9.8	9.8	
Stack gas exit velocity (V _s), m/s 煙囪氣體離開速度	15	15	
Stack inside diameter (d _s), m 煙囪之內直徑	8.85	8.85	
Stack gas exit temperature (T _s), K 煙囪氣體離開溫度	393	380	
Ambient temperature (T _a), K 環境溫度	298	298	
Buoyancy flux parameter (F _b), m ⁴ /s ³ 浮力通量參數	696.2	621.5	(From 1-8)
Crossover Temperature difference, ΔT _c 交換溫差	6.6	6.4	(From 1-11)
Physical stack height (h _s), m 實際煙囪高度	215	215	
Reference height for wind speed power law (Z _{ref}), m 風速幕律之參考高度	10	10	
Wind speed measured at reference anemometer height (U _{ref}) 於參考風速計高度量得之風速	8.8	8.8	
Wind speed power law profile exponent for Class D (p) D 類之風速幕律廓線指數	0.15	0.15	
Wind speed adjusted to release height (U _s), m/s 按釋出高度調整後風速	14	14	(From 1-6)
Effective stack height (h _e), m 有效煙囪高度	356	347	(From 1-15)
Difference 差額, m	-9		

Note:

All equations are reference to "User's Guide for the Industrial Source Complex (ISC3) Dispersion Models - Volume II"

所有公式均參考《大氣污染擴散數學模型（ISC3）用戶指南第二冊》

**APPENDIX 2.2 – Predicted Cumulative SO₂
and NO₂ Concentration at ASRs**

**附件 2.2 – 空氣質素敏感受體之二氧化硫及二氧化
化氮預測累積濃度**

Predicted cumulative SO₂ concentration before and after the Project

本工程項目進行之前和之後的二氧化硫預測累積濃度

受體 Receptor	加裝前之源頭 A Source A before retrofit, µg/m ³ (1)	加裝後之源頭 A Source A after retrofit, µg/m ³ (2)	源頭 B Source B, µg/m ³ (3)	其他源頭 Other sources, µg/m ³ (3)	距離修正 Distance correction (3)	背景 Background (3) (4)	加裝前總數 Total before retrofit, µg/m ³ (3)	加裝後總數 Total after retrofit, µg/m ³ (5)	加裝影響 Retrofit Impact, µg/m ³	加裝影響 Retrofit impact, %
1	0	0	0	113	1	23	136	136	0	0
2	3	2	0	88	1	23	114	113	-1	-1
3	0	0	0	45	1	23	68	68	0	0
4	0	0	1	164	1	23	188	187	-1	-1
5	8	6	0	125	1	23	156	154	-2	-1
6	29	21	1	117	1	23	170	161	-9	-5
7	128	92	10	121	1	23	282	236	-46	-16
8	1	1	1	132	1	23	157	156	-1	-1
9	16	12	3	133	1	23	175	168	-7	-4
10	55	40	14	211	1	23	303	274	-29	-10
11	0	0	1	65	1	23	89	88	-1	-1
12	4	3	1	76	1	23	104	102	-2	-2
13	12	9	0	15	1	23	50	47	-3	-6
14	4	3	0	36	1	23	63	62	-1	-2
15	11	8	4	44	1	23	82	75	-7	-9
16	22	16	2	48	1	23	95	87	-8	-8
17	36	26	5	58	1	23	122	107	-15	-12
18	42	30	6	34	1	23	105	87	-18	-17
19	1	1	1	39	1	23	64	63	-1	-2
20	4	3	0	62	1	23	89	88	-1	-1
21	82	59	2	39	1	23	146	121	-25	-17
22	10	7	15	25	1	23	73	55	-18	-25
23	18	13	24	51	1	23	116	87	-29	-25
24	106	76	45	51	1	23	225	150	-75	-33
25	64	46	26	19	1	23	132	88	-44	-33
26	137	99	19	45	1	23	224	167	-57	-25
27	15	11	2	180	1	23	220	214	-6	-3
28	133	96	17	128	1	23	301	247	-54	-18
29	301	217	39	111	1	23	474	351	-123	-26
30	149	107	26	44	1	23	242	174	-68	-28
31	50	36	12	29	1	33	124	98	-26	-21
32	56	40	14	23	1	33	126	96	-30	-24
33	23	17	3	52	1	23	101	92	-9	-9
34	40	29	5	60	1	23	128	112	-16	-13
35	126	91	16	57	1	23	222	171	-51	-23
36	155	112	20	62	1	23	260	197	-63	-24
37	83	60	7	34	1	23	147	117	-30	-20
38	76	55	10	78	1	23	187	156	-31	-17
39	70	50	10	39	1	23	142	112	-30	-21
40	127	91	18	26	1	33	204	150	-54	-26
41	54	39	7	25	1	33	119	97	-22	-18
42	136	98	17	75	1	23	251	196	-55	-22
43	99	71	13	54	1	23	189	148	-41	-22
44	52	37	7	41	1	23	123	101	-22	-18
45	113	81	14	55	1	23	205	159	-46	-22
46	142	102	18	61	1	23	244	186	-58	-24
47	79	57	10	36	1	33	158	126	-32	-20
48	67	48	9	34	1	33	143	115	-28	-20
49	29	21	4	60	1	23	116	104	-12	-10
50	76	55	10	69	1	23	178	147	-31	-17
51	126	91	16	46	1	23	211	160	-51	-24
52	51	37	6	69	1	23	149	129	-20	-13
53	80	58	10	80	1	23	193	161	-32	-17
54	281	202	36	68	1	23	408	293	-115	-28

Predicted cumulative SO₂ concentration before and after the Project

本工程項目進行之前和之後的二氧化硫預測累積濃度

受體 Receptor	加裝前之源頭 A Source A before retrofit, µg/m ³ (1)	加裝後之源頭 A Source A after retrofit, µg/m ³ (2)	源頭 B Source B, µg/m ³ (3)	其他源頭 Other sources, µg/m ³ (3)	距離修正 Distance correction (3)	背景 Background (3) (4)	加裝前總數 Total before retrofit, µg/m ³ (3)	加裝後總數 Total after retrofit, µg/m ³ (5)	加裝影響 Retrofit Impact, µg/m ³	加裝影響 Retrofit impact, %
55	77	55	10	24	1	33	144	112	-32	-22
56	99	71	13	31	1	33	176	135	-41	-23
57	84	60	11	67	1	23	185	150	-35	-19
58	102	73	13	55	1	23	193	151	-42	-22
59	113	81	15	53	1	23	204	157	-47	-23
60	83	60	11	107	1	23	224	190	-34	-15
61	149	107	19	76	1	23	267	206	-61	-23
62	98	71	12	77	1	23	210	171	-39	-19
63	68	49	9	82	1	23	182	154	-28	-15
64	145	104	19	115	1	23	302	242	-60	-20
65	123	89	16	114	1	23	276	226	-50	-18
66	171	123	22	74	1	23	290	220	-70	-24
67	136	98	17	67	1	23	243	188	-55	-23
68	46	33	6	82	1	23	157	138	-19	-12
69	204	147	26	78	1	23	331	248	-83	-25

Notes 註:

(1) Data from the Project Profile (2000)

摘自工程項目簡介 (2000) 之數據

(2) Equal to Source A contribution before retrofit x correction factor (0.72) for reduction of SO₂.

等於加裝前之源頭 A 的貢獻 x 二氧化硫減少之修正因子 (0.72)

(3) Data from Table C.2 of the Approved EIA (2006)

摘自《已批准環評 (2006)》表 C.2 之數據

(4) Overview the recent trend in the annual SO₂ concentration at the Central/Western AMS and from the EC network available from Air Quality Report.

The background concentration of stated in the Approved EIA (2006), should be more conservative. Therefore, the SO₂ background concentration of 23µg/m³ and 33µg/m³ were adopted for rural and urban area.

縱觀中西區空氣質素監測站的二氧化硫年度平均濃度，以及空氣質素報告中有關港燈電網部份的近期趨勢，《已批准環評 (2006)》所述的背景濃度應該較為保守。因此，郊區和市區的二氧化硫背景濃度分別採用了23µg/m³和33µg/m³的數值。

(5) Total after retrofit = (Source A after the retrofit + Source B + other sources) x distance correction + background

加裝後總數 = (加裝後之源頭 A + 源頭 B + 其他源頭) x 距離修正 + 背景

Predicted cumulative NO₂ concentration before and after the Project

本工程項目進行之前和之後的二氧化氮預測累積濃度

受體Receptor	加裝前之源頭 A Source A before retrofit, µg/m ³ (1)	加裝後之源頭 A Source A after retrofit, µg/m ³ (2)	加裝前之源頭 B Source B before retrofit, µg/m ³ (3)	加裝後之源頭 B Source B after retrofit, µg/m ³ (4)	其他源頭 Other sources, µg/m ³ (5)	距離修正 Distance correction (3)	背景 Background (3) (5)	加裝前總數 Total before retrofit, µg/m ³ (3)	加裝後總數 Total after retrofit, µg/m ³ (6)	加裝影響 Retrofit Impact, µg/m ³	加裝影響 Retrofit impact, %
1	0	0	0	0	29	0.52	49	64	64	0	0
2	0	0	0	0	23	0.81	49	68	68	0	0
3	0	0	0	0	13	0.38	49	54	54	0	0
4	0	0	1	1	43	0.71	49	80	80	0	0
5	1	1	0	0	34	0.96	49	83	83	0	0
6	4	4	1	1	33	0.93	49	84	84	0	0
7	16	17	10	6	33	0.96	49	106	103	-3	-3
8	0	0	1	1	35	0.72	49	75	75	0	0
9	2	2	3	2	34	0.76	49	79	78	-1	-1
10	8	8	14	9	49	0.72	49	100	97	-4	-4
11	0	0	1	1	20	0.42	49	58	58	0	0
12	1	1	1	1	21	0.69	49	65	65	0	0
13	2	2	0	0	3	0.4	49	51	51	0	0
14	0	0	0	0	8	0.71	49	55	55	0	0
15	1	1	4	3	11	1	49	65	64	-1	-2
16	3	3	3	2	11	0.93	49	65	64	-1	-1
17	5	5	5	3	15	0.91	49	72	70	-2	-3
18	5	5	9	6	7	1.44	49	79	75	-4	-5
19	0	0	1	1	9	0.5	49	54	54	0	0
20	0	0	0	0	16	0.82	49	62	62	0	0
21	10	10	2	1	10	1	49	71	70	-1	-1
22	1	1	16	10	9	0.69	49	67	63	-4	-6
23	2	2	26	17	21	0.92	49	94	86	-8	-9
24	13	14	48	31	21	1.23	49	150	130	-20	-13
25	8	8	27	17	6	0.83	49	83	75	-8	-10
26	17	18	20	13	12	1.09	49	102	96	-7	-6
27	2	2	2	1	45	0.61	49	79	78	-1	-1
28	17	18	16	10	41	1.25	49	141	135	-6	-4
29	38	40	41	27	34	1.9	49	264	241	-23	-9
30	19	20	28	18	16	1.68	49	154	140	-14	-9
31	6	6	13	8	10	1.92	80	135	126	-9	-7
32	7	7	14	9	8	1.93	80	136	126	-10	-7
33	3	3	3	2	17	1.69	49	88	86	-2	-2
34	5	5	5	3	19	1.76	49	100	97	-4	-4
35	16	17	17	11	18	1.54	49	128	120	-8	-6
36	20	21	21	14	20	1.52	49	142	133	-9	-6
37	7	7	7	5	20	1.77	49	109	106	-4	-3
38	10	10	10	6	23	1.64	49	119	113	-6	-5
39	11	11	12	8	6	1.61	49	95	89	-6	-6
40	18	19	19	12	4	1.88	80	157	146	-11	-7
41	7	7	7	5	10	1.84	80	125	120	-5	-4
42	17	18	18	12	22	1.47	49	133	125	-7	-6
43	12	12	13	8	16	1.49	49	110	103	-7	-7
44	8	8	7	5	19	1.55	49	102	99	-3	-3
45	14	15	15	10	14	1.55	49	116	109	-6	-5
46	18	19	19	12	18	1.75	49	146	135	-11	-8
47	10	10	11	7	11	1.93	80	142	134	-8	-5
48	8	8	9	6	11	1.92	80	134	128	-6	-4
49	4	4	4	3	20	1.47	49	90	89	-1	-2
50	10	10	10	6	18	1.5	49	106	100	-6	-6
51	16	17	17	11	14	1.84	49	135	126	-9	-7
52	6	6	7	5	20	1.46	49	97	94	-3	-3
53	10	10	11	7	24	1.41	49	113	107	-6	-5
54	35	36	38	25	25	1.81	49	226	205	-22	-10
55	10	10	10	6	9	2	80	137	130	-7	-5
56	12	12	13	8	10	2	80	150	140	-10	-7
57	11	11	11	7	23	1.4	49	112	106	-6	-5
58	13	14	14	9	19	1.36	49	111	106	-5	-4
59	1	1	15	10	32	1.7	49	130	122	-8	-6
60	4	4	11	7	38	1.39	49	123	117	-6	-5
61	19	20	20	13	24	1.37	49	135	127	-8	-6
62	12	12	13	8	24	1.6	49	127	119	-8	-6

Predicted cumulative NO₂ concentration before and after the Project

本工程項目進行之前和之後的二氧化氮預測累積濃度

受體Receptor	加裝前之源頭 A Source A before retrofit, µg/m ³ (1)	加裝後之源頭 A Source A after retrofit, µg/m ³ (2)	加裝前之源頭 B Source B before retrofit, µg/m ³ (3)	加裝後之源頭 B Source B after retrofit, µg/m ³ (4)	其他源頭 Other sources, µg/m ³ (5)	距離修正 Distance correction (3)	背景 Background (3) (5)	加裝前總數 Total before retrofit, µg/m ³ (3)	加裝後總數 Total after retrofit, µg/m ³ (6)	加裝影響 Retrofit Impact, µg/m ³	加裝影響 Retrofit impact, %
63	9	9	9	6	24	1.53	49	114	109	-5	-5
64	18	19	20	13	30	1.52	49	153	143	-10	-6
65	15	16	17	11	31	1.52	49	144	137	-7	-5
66	21	22	23	15	21	1.79	49	165	153	-13	-8
67	17	18	18	12	18	1.8	49	145	135	-10	-7
68	6	6	6	4	24	1.68	49	109	106	-3	-3
69	26	27	28	18	22	1.85	49	189	173	-16	-8

Notes 註：

(1) Data from the Project Profile (2000)

摘自工程項目簡介 (2000) 之數據

(2) Equal to Source A contribution before retrofit x correction factor (1.04) for changes of efflux temperature

等於加裝前之源頭 A 的貢獻 x 排放溫度改變之修正因子 (1.04)

(3) Data from Table C.2 of the Approved EIA (2006)

摘自《已批准環評 (2006)》表 C.2 之數據

(4) Equal to Source B contribution before the retrofit x correction factor of 0.647

等於加裝前之源頭 B 的貢獻 x 修正因子 0.647。

(5) Overview the recent trend in the annual NO₂ concentration at the Central/Western AQMS and from the HEC Network available from Air Quality Report.

The background concentration of stated in the Approved EIA (2006), should be more conservative. Therefore, the NO₂ background concentration of 49µg/m³ and 80µg/m³ were adopted for rural and urban area.

縱觀中西區空氣質素監測站的二氧化氮年度平均濃度，以及空氣質素報告中有關港燈電網部份的近期趨勢。《已批准環評 (2006)》所述的背景濃度應該較為保守。因此，郊區和市區的二氧化氮背景濃度分別採用了 49µg/m³ 和 80µg/m³ 的數值。

(6) Total after retrofit = (Source A after the retrofit + Source B after the retrofit + other sources) x distance correction + background

加裝後總數 = (加裝後之源頭 A + 加裝後之源頭 B + 其他源頭) x 距離修正 + 背景

**APPENDIX 2.3 – Contamination Assessment
Plan & Contamination Assessment Report**
**附件 2.3 – 土地污染評估計劃及土地污染評估報
告**

The Hongkong Electric Company Ltd



Lamma Power Station – Demolition of the Light Oil Tank No. 2

Contamination
Assessment Plan

May 2007

Report no: 01496R0011





The Hongkong Electric Company Ltd

Lamma Power Station – Demolition of the Light Oil Tank No.2

Contamination Assessment Plan

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Report no: 01496R0011

04

Date:

May 2007

This report has been prepared for Hong Kong Electric Company Ltd in accordance with the terms and conditions of appointment for Land Contamination Assessment dated 16 April 2007. Hyder Consulting Ltd (COI Number 126012) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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1 Introduction

1.1 Background

The Hongkong Electric Company Limited (HEC) intends to carry out demolition work for the Light Oil Tank No.2 located at Lamma Power Station.

The Light Oil Tank No.2 to be demolished is located at Stage 1 area to the east of Chimney No.1 at Lamma Power Station. Capacity of the Light Oil Tank No.2 is approximately 200 cubic metres, which is equivalent to 170 tonnes based on relative density of light oil of 0.85. The demolition of this Light Oil Tank is not classified as a designated project under Schedule 2 Part II Item 16 of the Environmental Impact Assessment Ordinance.

The proposed future use of the area of site currently occupied by the Light Oil Tank No.2 is likely to be, but has not been confirmed, an industrial use.

In accordance with the guidelines set out in the EPD's Practice Note for Professional Person (ProPECC) PN 3/94 "Contaminated Land Assessment and Remediation", a land contamination assessment at the concerned site shall be carried out to identify any potential land contamination and associated impact, risk and hazards resulted from the proposed demolition work.

Hyder Consulting Limited was commissioned by HEC to undertake an assessment of potential land contamination for the demolition of the Light Oil Tank No.2, hereafter referred to as the "Project".

In accordance with EPD's Guidance Notes for 'Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards and Car Repair/Dismantling Workshops', a Contamination Assessment Plan (CAP) shall be prepared prior to the commencement of the land contamination site investigation work. This document serves the purpose to outline the requirements and extent of the associated site investigation.

1.2 Objectives of the Contamination Assessment Plan

The purpose of the CAP is to provide information, guidance and instruction for characterising land contamination at the Project Site, namely the site of Light Oil Tank No.2, prior to the demolition work. The CAP provides the procedures required for identifying any land contamination, the site investigation and procedures for evaluating the results to identify the nature and extent of the contamination.

The CAP includes details of the actual site including:

- The results of a site appraisal and review of the land history,
- Identification of potential contamination and associated impacts, risks or hazards connected to the storage of hydrocarbons; and
- A method of assessment to be employed should it be concluded that potential contamination is present and could be impacting soils, ground or surface waters or other receptors.

A contamination assessment will be conducted in accordance with the CAP and the findings of the site investigation will be evaluated and reported in the Contamination Assessment Report (CAR).

If the site is found to be contaminated and agreement is reached with the EPD that a pollutant linkage is present resulting in the potential for a significant risk of harm to an identified receptor then a Remediation Action Plan (RAP) shall be prepared and submitted to EPD for approval.

1.3 Environmental Legislation and Non-Statutory Guidelines

The CAP has been prepared in accordance with the following guidelines:

- Practice Note for Professional Persons (ProPECC) PN 3/94 “Contaminated Land Assessment and Remediation”; and
- EPD’s Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards and Car Repair/Dismantling Workshops (Guidance Notes).
- The EPD is currently reviewing soil guidelines and until this time it is understood the Dutch Indicative Index should be referenced.

2 Site Appraisal

2.1 Site Walkover

The purpose of the site appraisal is to identify current and historical uses of the site that have the potential to cause land contamination. By reviewing current and historical activities that have taken place at the site of concern, information can be obtained to clarify whether the former land uses have any potential to cause land contamination. Recommendation of suitable locations for sampling shall take into account the visual inspection at the site area.

Hyder Consulting conducted a site appraisal of the proposed project area on 25 April 2007. Selected site photographs are presented in Annex A.

The site walkover involved a visual inspection for all physical facilities at the site area including the condition of the tank and associated overground pipe works and any open underground trenches to verify the actual site condition and identify any potential sources of contamination. The surrounding land uses near the tank were noted.

Areas that could not be visually assessed were covered underground pipes, cables and the neighbouring power station buildings.

A site layout plan is presented in Annex B.

2.1.1 Light Oil Tank No.2

The oil tank is a steel tank underlain by concrete and surrounded with a concrete bund. The bund is believed to be capable of preventing the release of the complete contents of the tank between 200 and 250 cubic metres of light oil. It is understood that the bund wall was constructed with reinforced concrete.

Within the bunded area, approximately 30 square metres, are several over ground pipes leading to the tank. There was no evidence within the bunded area that the tank or pipes have leaked. The area of ground below the base of the tank could not be seen. It is believed that the base of the tank is underlain by concrete raft foundations.

There are trenches within the bunded area containing pipework. Accumulated rainwater within these trenches was clean.

The concrete hard standing appeared to be in good condition. Visual inspection of the pipework in the bunded area did not reveal any pipes in poor condition.

It was confirmed by HEC that no spillage or leakage has occurred from the tank since it was commissioned.

2.2 Site History

Located at Po Lo Tsui on Lamma Island, Lamma Power station has been in operation since 1982.

The site was developed by the cutting and quarrying of granite in the hillside that originally made up the area occupied by the power station.

The area was then levelled and excavated granite was used to increase the area of flat land by extension into the sea.

The area occupied by the Light Oil Tank No.2 could have been originally under the hillside or could be an area reclaimed by granite material.

It can be concluded that prior to use as a storage tank, the area of land was not used for any purpose and was natural granite hillside or is an area of infilled natural granite.

The majority of the power station site is now covered with concrete and it is assumed that this was laid onto the levelled and infilled crushed granite when the site was developed.

In the vicinity of the Light Oil Tank No.2, the concrete was observed to be approximately 300mm thick and it is assumed to be underlain by granite and other natural materials.

2.3 Potential Contamination Sources

Based on the historical information, current practices of the power station, and following the site visit, potential sources of contamination at the location of the Light Oil Tank No.2 are considered to be:

- Pipes. Within the vicinity of the Light Oil Tank No.2 there are a network of pipes not connected to the tank. Leakage from the nearby pipe network to the surrounding soil and groundwater could have occurred.
- Light Oil Tank No.2. The tank itself could be a potential source of contamination, Leakage and/or spillage from the oil tank to the underlying soil and groundwater could have occurred;
- Supply pipes supplying the tank could also be potential sources of contamination; and
- Spillage of oils during the filling of the tanks from the connecting pipes could have occurred, which may have entered the underlying ground.

The likely contaminants of concern (CoC's) associated with the fuel storage facilities include total petroleum hydrocarbons (TPH), simple aromatic hydrocarbons (BTEX) and poly-aromatic hydrocarbons (PAH).

2.4 Conceptual model

The following table presents the potential linkages that could be present at the site of the Light Oil Tank No.2.

Table 2-1 Potential pollutant linkages based on the current site use

SOURCE	PATHWAY	RECEPTOR	SIGNIFICANCE
Hydrocarbons, BTEX in soil	Skin contact, inhalation, ingestion.	Humans – current site users	NONE – surface is covered with hardstanding
		Construction workers	Potential significance – appropriate health and safety method statement and equipment to be used
		Humans – current users / construction workers	NONE to current users. Potential significance for workers – PPE to be worn by construction workers as appropriate
Hydrocarbons in soil	Soil pore water	Groundwater	Low likelihood of significance based on current information
Hydrocarbons in groundwater	Skin contact and ingestion	Construction workers	Potential significance – PPE to be worn
	Migration in groundwater	Surface waters	Unlikely given the dilution potential and volume of water in harbour

The overall potential of any contamination that is likely to be encountered in concentrations likely to pose a significant risk is considered overall as low.

Any contamination present is likely to present a potential risk to construction workers undertaking any excavation work.

The soil and groundwater sampling that is proposed aims to determine if soil / groundwater contamination is present. The information collected on levels of contamination present can then be used by the future Contractors to prepare a suitable Health and Safety method statement.

In addition, the information collected can be used in a Contaminated Assessment Report (CAR) in order to review the conceptual model above and if necessary prepare a Remedial assessment plan (RAP).

3 Site Investigation

3.1 Sampling Strategy

As presented in Section 2, the potential risk for soil and groundwater contamination at the Project area to be present in significant concentrations is considered low. The potential contaminants of concern associated with oil storage and oil separation facilities are hydrocarbons.

The main objectives of the land contamination site investigation are to:

- i. identify subsurface geological conditions and groundwater depth;
- ii. identify if the primary and secondary contaminants of concern are present;
- iii. determine their concentrations at the sampling locations chosen.

3.1.1 Subsurface Geological Conditions and Groundwater Movement

It is important to know the subsurface geology and groundwater flow at the site. Some substances, particularly petroleum hydrocarbons, can float on top of groundwater and migrate some distance away from the sources of leaks or spillage. Selection of remediation method also depends on subsurface geology, i.e. low permeability soil may not be amenable to soil venting.

3.1.2 Sampling Location and Depth

The sampling locations and depths are recommended based on the findings of the site appraisal and having made reference to the Guidance Notes. The proposed soil and groundwater sampling locations are shown in Annex B.

After the site visit it was apparent that a safe location to undertake the borehole drilling was restricted by the presence of cables, pipes and overhead obstructions. Two location points were discussed with HEC and it was agreed that these were possibly the only suitable locations. One other possible location was discussed which could be used if service scanning reveals one of the two original points to be unsuitable.

The proposed site investigation programme is summarised below.

- Two (2) boreholes (BH1 and BH2) shall be drilled to 2m below the groundwater level. Groundwater direction is unknown but previous work on site indicates the flow to be to the south / south westerly direction (Ref. E.I.A Lamma Power Station, units L4 and L5, Feb 2006 ERM;
- Three soil samples shall be collected from each borehole to ascertain the vertical distribution of any detected contamination¹. Soils samples shall be taken at various depths from the unsaturated zone to the soil and groundwater interface, believed to be at 4 metres.
- One duplicate soil sample shall be taken for quality assurance purposes.
- All boreholes shall be converted into two (2) temporary groundwater monitoring wells to facilitate groundwater sampling;
- One (1) groundwater sample shall be collected from each monitoring well; and free-floating products in groundwater, if observed, shall also be collected for laboratory analysis.
- One duplicate groundwater sample shall be taken for quality assurance purposes.
- In addition other quality assurance samples as described below shall be used.

Table 3-1 Proposed site investigation sampling programme

Location	Rationale	Depth	Monitoring Well	Soil Samples	GW Samples
Borehole/Monitoring Well					
BH1	Located at a GW up-gradient from the Light Oil Tank No.2	2m below Groundwater Level	1	3	1
BH2	Located at a GW down-gradient from the Light Oil Tank No.2	2m below Groundwater Level	1	3	1
(To be selected on Site)				1 Duplicate Soil Sample	1 Duplicate GW sample
Trip blank – distilled water in sample container to be taken to site in sample box, returned to lab and tested to ensure no contamination of samples has occurred					1 (water sample)
Equipment rinsate – to ensure uncontaminated equipment					1 (water sample)
Total				7	5

¹ In accordance with ProPECC PN 3/94 and the Guidance Notes

3.1.3 Analytical Parameters

With respect to the potential contaminants that have been identified, it is proposed that the soil and groundwater samples collected shall be analysed for BTEX (benzene, toluene, ethyl benzene and xylene), TPH and PAH's.

Current guidance from the EPD is to compare the results against the 'Dutch List' (Annex C) and shall be implemented in the analysis. The laboratory detection limits will be of a limit that enables comparisons to be made in order to determine if the contamination is above level A "unpolluted". Landfill Disposal Criteria are referenced in Annex D.

Extra soil samples shall be collected during the site investigation and stored in the laboratory for possible Toxic Characteristic Leaching Procedure (TCLP) testing. The TCLP tests shall be conducted for the samples with pollutant concentrations exceeding Dutch "B" guideline values.

3.1.4 Sampling Method

A site utility scan shall be conducted prior to the commencement of any excavation/drilling.

Following concrete breakout at each sampling location, a trial pit shall be excavated to 2.0m, or deeper if safety issues dictate, below ground level. Trial pits shall be dug manually using hand tools and necessary concrete saw cut and lift up method to ensure no interference with underground utilities. All saw cut equipment and hand tools shall be properly cleaned prior to mobilisation to the Site. Distilled water shall be used for cooling purpose in the course of saw cutting.

Sampling below trial pit levels, shall be conducted using a drilling rig, if deemed to be safe to do so. This is dependent on the depth to which the trial pits have to be dug for safety reasons. Sampling from trial pits should take place if the trial pits have to be dug to a deeper depth for safety reasons.

Drilling rigs and drilling equipment that do not come in contact with samples and hand breakers shall be properly cleaned prior to mobilisation to the Site.

Prior to sampling, all sampling equipment and well materials shall be cleaned with a non-phosphate soap solution and water, with a distilled rinse. This procedure shall be repeated after use, at each sampling location to avoid potential cross contamination, and during sampling to ensure that any contamination from the surface of the Site does not affect deeper substrata or the groundwater.

In addition to taking samples for analysis, the strata log shall be recorded. This includes recording the general structure of the ground and the depth and thickness of each band of material. The depths at which samples are taken shall be recorded with a description of each sample such as grain size, colour and wetness.

Extreme care shall be exercised when toxic gases or hazardous materials are suspected. Photographs shall be taken during the site investigation and for each sample.

3.1.5 Sample Collection

The soil or groundwater sampling shall be undertaken following appropriate protocols as to minimise the potential for cross contamination between sampling locations and depths. The soil sampling methodologies shall be based on methods developed by the US Environmental Protection Agency (USEPA), as outlined below:

Decontamination Procedures

Sampling equipment used during the course of the site investigation programme shall be decontaminated using the following procedures:

- Manual washing and scrubbing with non-phosphate detergent;
- Distilled water rinse; and
- Air-drying.

Where available, steam cleaner or pressure washer shall be used.

During the sampling and decontamination activities, disposable latex gloves shall be worn to prevent transfer of contaminants from other sources. Any disposable equipment such as latex gloves shall be disposed of as general waste after each use. Provisions shall be made to containerise any decontamination fluids, although the volume of fluids to be produced is expected to be low.

Soil Sample Collection

Soil samples shall be taken and placed into appropriate clean glass bottles or sampling containers (provided by Contractor's laboratory) immediately after collection. Before sampling commences, the Contractor's laboratory shall be consulted and confirm the particular sample size and preservation procedures that are necessary for each chemical analyses. The sample containers shall be laboratory cleaned, made of glass or other suitable materials with aluminium or Teflon-lined lids, so that the container surface will not react with the sample or adsorb contaminants. The containers shall be labelled with the sampling location codes and the depths at which the samples are taken. They shall then be transferred to an icebox or cooler container. Samples shall be kept between 0°C and 4°C but not frozen.

Groundwater Sample Collection

Groundwater, if encountered, shall be sampled from the trial pits using a Teflon bailer. If the same bailer is to be used the bailer will be rinsed with distilled water and be uncontaminated prior to sample collection. Separate clean bailers for each sample shall be considered.

Sampling Management

Samples shall be dispatched to the analytical laboratory for analysis as soon as practicable following sampling. All samples shall be handled under chain of custody protocols and relinquished to the laboratory representative at the Site or at a location specified by the laboratory.

Analytical Method

The above-described parameters (Section 3.1.3) shall be analysed using the methods stated in Table 3-2, which are in accordance with current guidance.

Table 3-2 Analytical Methods of Contaminants in Soil and Groundwater Samples

Contaminant	Analytical Methods
BTEX (benzene, toluene, ethyl benzene, xylene)	US EPA Method 8260
TPH	US EPA Method 8260 & 8015
PAH	US EPA Method 8260
TCLP	EPA SW-846 (Method 1311)

3.1.6 Quality Control and Quality Assurance (QC/QA)

Samples collected shall be representative of field conditions. At each sampling location, soil (and groundwater, if encountered) samples shall be collected using pre-cleaned sampling equipment. The contracted laboratory, which guarantees their sterilisation and preservative contents, shall provide all sample containers.

Appropriate QC/QA samples shall also be collected during the field investigation, including:

- Equipment (rinsate) blank for the full suite of parameters, in order to assess the adequacy of the decontamination procedures;
- Trip blank for hydrocarbons, in order to assess the potential contamination of the sample handling and transportation process; and
- Groundwater (1) or soil duplicate (1) for the full suite of analyses to assess the precision of the procedures.



Precision shall be calculated as the relative percentage difference (RPD) between the original sample and the blind duplicate. For water and soil, the acceptance criteria for precision are 20% and 30% RPD, respectively. Accuracy shall be assessed by analysis of blank samples to ensure that no bias is present in the analytical data.

3.1.7 Analytical Laboratory

An appropriate HOKLAS-certified (or other equivalent scheme approved by the EPD) analytical laboratory shall carry out the analysis of the samples. The laboratory shall maintain high standards of analytical and technical services for the detection of trace organic contaminants. All analysis shall be conducted in accordance to standard procedures set by the US EPA, along with internal QC/QA procedures.

4 Programme Schedule and Reporting

4.1 Assessment and Reporting

A CAR shall be prepared after obtaining analytical results from the laboratory. The CAR shall detail the findings of the site investigation and evaluate the impact should land contamination be identified during the site investigation. The CAR shall be submitted to EPD for approval.

As there are currently no legislative standards requiring clean up of soil and groundwater contamination in Hong Kong, the analytical results will be compared against international standards for soil and groundwater contamination.

The ProPECC Note PN3/94, which follows the Dutch A, B, C Classification system will be followed for the interpretation of contamination status. The Dutch "B" values are currently being used as the soil cleanup target for most cases in Hong Kong. Soil with contaminants exceeding such values is considered as contaminated.

Based on the on-site observations and the quantitative sampling results received, professional judgement will be provided regarding soil and groundwater contamination, and the necessity of any mitigation measures.

If the findings confirm that the site is contaminated, a RAP shall be prepared and submitted to EPD for approval.

4.2 Work Programme

No demolition work involving excavation shall be conducted at the Project area before the assessment and necessary remediation works have been completed.

The overall assessment will comprise the following activities:

- Preparation of the CAP.
- Site Investigation Programme
- Analytical Analysis / Laboratory turnaround
- Preparation of a CAR to report and evaluate the findings of the Site Investigation and results.
- If the findings confirm that the site is contaminated, a RAP detailing what remediation, from no remedial action if the linkage is not considered significant to a stated action, such as off site landfill. The RAP shall be prepared and submitted to EPD for approval.

Annex A

Site Photographs

Site Photographs

Photo A1 **Base of Light Oil Tank No.2 shows no Indication of Oil Staining or Spillage**

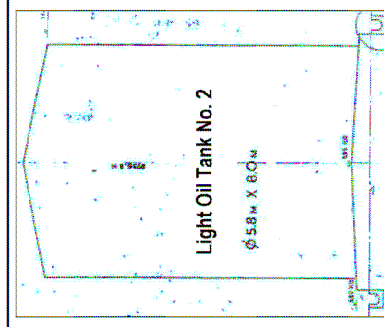
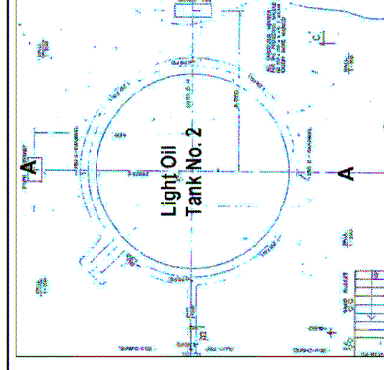
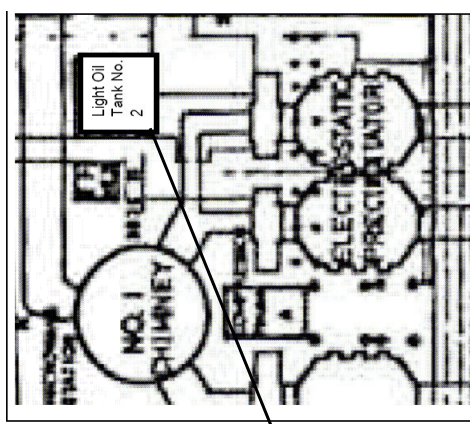
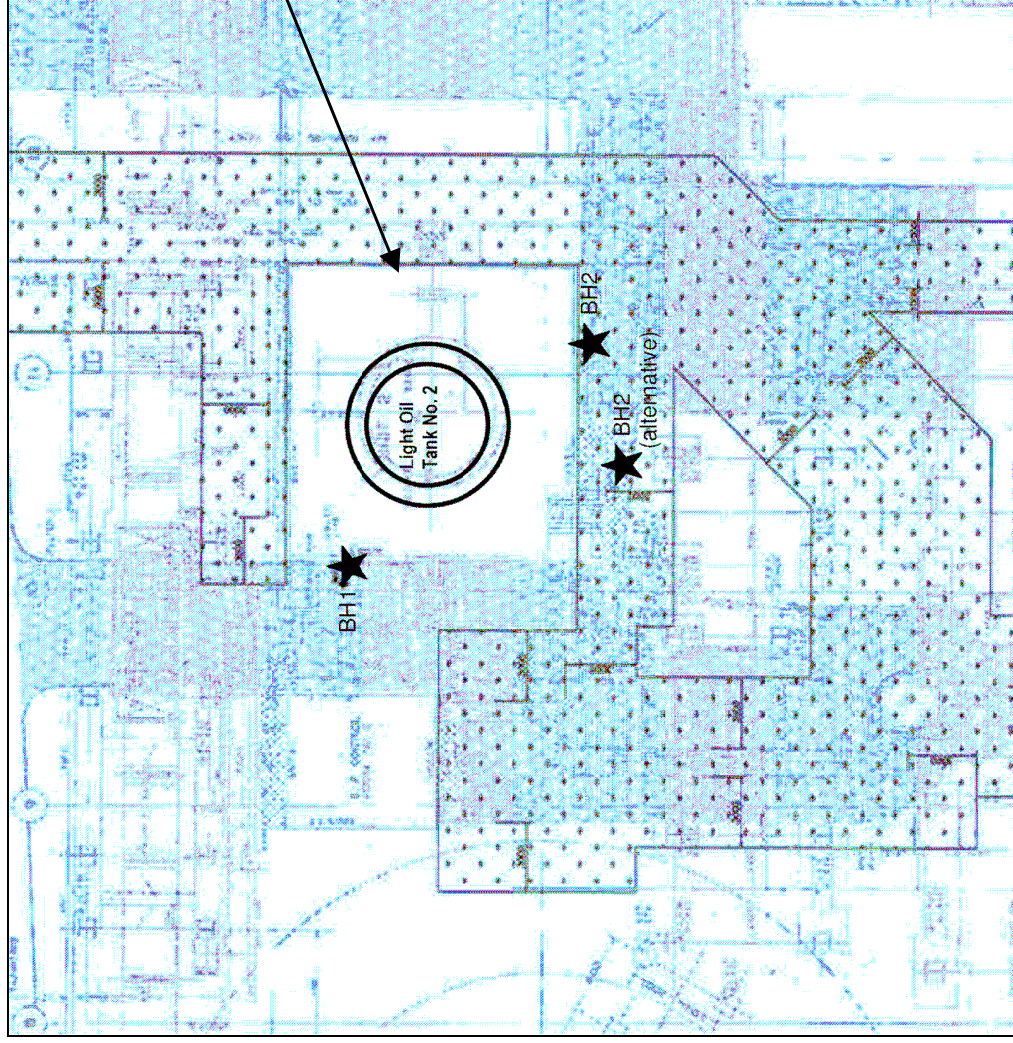


Photo A2 **The Pipe Work within the Bunded Area shows no Visible Staining.**



Annex B

Site Layout Plan and Proposed Borehole Locations



Plan

Section A-A

Layout Plan and Borehole Location for Light Oil Tank No. 2

Figure B1



Proposed Locations for Borehole 1 and Borehole 2

Photo B1

Approximate Location of Borehole 1 (BH1)



Proposed approximate location for BH1

Photo B2

Approximate Location of Borehole 2 (BH2)



Proposed possible alternative location for BH2

Proposed location for BH2 (it is noted that the bund is in good condition)

Annex C

Dutch List

Dutch List

Table C Soil and Groundwater Criteria used in the Netherlands for contaminated land (“Dutch List”)

Component	Soil (mg/kg dry soil)			Ground water (ug/L)		
	A	B	C	A	B	C
1. Metals						
Cr	100	250	800	20	50	200
Co	20	50	300	20	50	200
Ni	50	100	500	20	50	200
Cu	50	100	500	20	50	200
Zn	200	500	3000	50	200	800
As	20	30	50	10	30	100
Mo	10	40	200	5	20	100
Cd	1	5	20	1	2.5	10
Sn	20	50	300	10	30	150
Ba	200	400	2000	50	100	500
Hg	0.5	2	10	0.2	0.5	2
Pb	50	150	600	20	50	200
2. Inorganics						
NH ₄ (as N)	—	—	—	200	1000	3000
F (total)	200	400	2000	300	1200	4000
CN	(tot.free)	1	10	5	30	100
	(tot.comb.)	5	50	10	50	200
S (total)	2	20	200	10	100	300
Br (total)	20	50	300	100	500	2000
PO ₄ (as P)	—	—	—	50	200	700
3. Aromatics Compounds						
Benzene	0.01	0.5	5	0.2	1	5
Ethylbenzene	0.05	5	50	0.5	20	60
Toluene	0.05	3	30	0.5	15	50
Xylenes	0.05	5	50	0.5	20	60
Phenols	0.02	1	10	0.5	15	50
Total	0.1	7	70	1	30	100
4. Polycyclic Hydrocarbons						
Naphthalene	0.1	5	50	0.2	7	30
Anthracene	0.1	10	100	0.1	2	10
Benanthrene	0.1	10	100	0.1	2	10
Flouranthene	0.1	10	100	0.02	1	5
Pyrene	0.1	10	100	0.02	1	5
1,2-benzopyrene	0.05	1	10	0.01	0.2	1
Total	1	20	200	0.2	10	40
5. Chlorinated Hydrocarbons						
Aliphatics						
	(Individual)	0.1	5	1	10	50
	(Total)	0.1	7	1	15	70
Chlorobenzenes						
	(Individual)	0.05	1	0.02	0.5	2
	(Total)	0.05	2	0.02	1	5
Chlorophenols						
	(Individual)	0.01	0.5	0.01	0.3	1.5
	(Total)	0.01	1	0.01	0.5	2
Chlor. PAHs (Tot.)	0.05	1	10	0.01	0.2	1
PCB's (Tot.)	0.05	1	10	0.01	0.2	1
EOCL (Tot.)	0.1	8	80	1	15	70
6. Pesticides						
Chlorinated organics						
	(Individual)	0.1	0.5	0.5	0.2	1
	(Total)	0.1	1	0.1	0.5	2
Pesticides						
	(Total)	0.1	2	0.1	1	5
7. Other Pollutants						
Tetrahydrofuran	0.1	4	40	0.5	20	60
Pyridine	0.1	2	20	0.5	10	30
Tetrahydrothiophene	0.1	5	50	0.5	20	60
Cyclohexanes	0.1	6	60	0.5	15	50
Styrene	0.1	5	50	0.5	20	60
Gasoline	20	100	800	10	40	150
Mineral oil	100	1000	5000	20	200	600

These values are not “standards” but rather guidelines for use in assessing the significance of contaminated land. A simplified explanation of the ABC levels: A – level implies unpolluted, B – level implies pollution present and further investigation required, C – level implies significant pollution present and cleanup (preferably back to the A – level) required.

Annex D

Landfill Disposal Criteria

Landfill Disposal Criteria

Table D Landfill Disposal Criteria for Contaminated Soil

Parameter	TCLP Limit (ppm)*
Cadmium	10
Chromium	50
Copper	250
Nickel	250
Lead	50
Zinc	250
Mercury	1
Tin	250
Silver	50
Antimony	150
Arsenic	50
Beryllium	10
Thallium	50
Vanadium	250
Selenium	1
Barium	1000

Note: Soil samples should be stored at 0-4 °C. This allowable storage time for mercury in soil samples is 8 days while the storage time for the rest of the parameters (above) in soil samples can be up to 6 months. Soil samples, if stored beyond the allowable storage time, are not considered representative of the actual site conditions (ASTM-E1391-90).

**Reference to EPDs Guidance Notes for Investigation and Remediation of Contaminated Sites of: Petrol Filling Stations, Boatyards, Car Repair/Dismantling workshops.*



Contaminated Assessment Report

Report no: 01496R0021





Lamma Power Station Demolition of the Light Oil Tank No.2

Contaminated Assessment Report

Winn

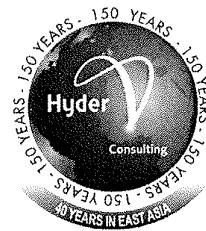
James P. Allen

Date: _____

Date: June 2007

This report has been prepared for The Hongkong Electric Company Ltd in accordance with the terms and conditions of appointment for Demolition of the Light Oil Tank No.2 dated 16 April 2007. Hyder Consulting Limited (COI 126012) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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1 Introduction

1.1 Background

The Hongkong Electric Company Limited (HEC) intends undertake clearance work of redundant equipment at Lamma Power Station. The current plan is to demolish and clear the area currently occupied by the Light Oil Tank No.2 at Lamma Power Station.

The Light Oil Tank No.2 to be demolished is located at Stage 1 area to the east of Chimney No.1 at Lamma Power Station. Capacity of the Light Oil Tank No.2 is approximately 200 cubic metres, which is equivalent to 170 tonnes based on relative density of light oil of 0.85. The demolition of this Light Oil Tank is not classified as a designated project under Schedule 2 Part II Item 16 of the Environmental Impact Assessment Ordinance.

In accordance with the guidelines set out in the EPD's Practice Note for Professional Person (ProPECC) PN 3/94 "Contaminated Land Assessment and Remediation", a land contamination assessment at the Light Oil Tank No.2 site was carried out in order to identify any potential land contamination and associated impacts, risks and hazards which may occur as a result of the proposed demolition work.

In accordance with EPD's Guidance Notes for 'Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards and Car Repair/Dismantling Workshops', a Contamination Assessment Plan (CAP) was submitted to HEC as guidance for the carrying out of the site investigation work.

Hyder Consulting Limited have been commissioned by HEC to undertake an assessment of potential land contamination at the site of the Light Oil Tank No.2.

1.2 Objectives of the Contamination Assessment Report

The purposes of the CAR were to assess the presence or absence of soil and groundwater contamination and the degree and extent of soil and groundwater contamination. In order to complete this objective a site investigation was undertaken in accordance with the CAP. The investigation would involve soil and groundwater sampling at a number of sampling locations in the vicinities of the tank. These samples would be analysed and the results used by Hyder in compiling the CAR.

1.3 Scope of the Land Contamination Assessment

The scope of the assessment includes the following:



- To review the historical land use and the available geology and hydrology information of the Site;
- To use information gained from the site investigation through soil and groundwater sampling at two sampling locations;
- To analyse and interpret sampling results for target parameters;
- To report on the findings of the available information including the field observation, the laboratory analytical results and the assessment of soil and groundwater contamination.

2 Site Background Information

2.1 Site History

Located at Po Lo Tsui on Lamma Island, Lamma Power station has been in operation since 1984 and prior to 1978 the power station site was undeveloped.

It is understood, that the site was developed by the cutting and quarrying of the granite hillside that originally occupied the area. The power station site area was levelled and excavated granite was used to increase the area of flat land by extension into the sea.

The area occupied by the Light Oil Tank No.2 could have been originally under the hillside or could have been an area of seashore or an area originally occupied by the sea and subsequently reclaimed by the placement of granite material.

Whichever scenario is correct, it can be concluded that prior to use as a storage tank, the area of land was not used for any purpose. The site prior to the tank being built is either levelled natural ground or is an area that was previously water and is now infilled with quarried soils and natural granite.

The majority of the power station site is now covered with concrete and it is assumed that this was laid onto the levelled ground when the site was developed.

In the vicinity of the Light Oil Tank No.2, the concrete was observed to be approximately 300mm thick and it was assumed prior to any intrusive investigation to be underlain by granite and other natural materials.

2.2 Site Description

The Light Oil Tank No.2 is a steel tank underlain by concrete and surrounded with a concrete bund. The bund is believed to be capable of preventing the release of the complete contents of the tank between 200 and 250 cubic metres of light oil. It is understood that the bund wall was constructed with reinforced concrete.

Within the bund area, which is estimated to be approximately 30 square metres, are several over ground pipes leading to the tank. There was no evidence within the bund area that the tank or pipes have leaked, however it is noted that the area of ground below the base of the tank could not be inspected.

It is understood by Hyder that the base of the tank is underlain by concrete raft foundations.

Site photographs and the approximate layout plan is shown in Annex A.

There are trenches within the bunded area containing pipework. Accumulated rainwater within these trenches was clean.

The concrete hard standing appeared to be in good condition. Visual inspection of the pipework in the bunded area did not reveal any pipes in poor condition.

It was confirmed by HEC that no spillage or leakage has occurred from the tank since it was commissioned.

2.2.1 Surrounding area

The surrounding area is used for power station activities. The whole area is covered in concrete hardstanding.

2.3 Previous Investigation

No previous soil and groundwater contamination investigations had reportedly been carried out at the study area.

2.4 Environmental Information

2.4.1 Geology

The geology reported in a 2006 report (Ref 1) reported brown silty clayey sands with boulders, cobbles and gravels to depths of 8 to 9 m below ground level. Below the gravels pinkish brown and grey sands containing weathered granite to depths of 13 to 21 metres below ground level. The granite head was detected at depths of around 14 to 22 metres below ground level.

With reference to the previous CAR (Ref.1) and the knowledge that the Light Oil Tank No.2 site was likely to be located on reclaimed land. It was expected, prior to drilling, that the geology in the investigation area (to a maximum depth of approximately 10 metres below ground level) would consist of silty clayey sands underlain by granite boulders excavated from the hillside and used for levelling or infill.

Trial pit logs have been produced by the drillers and these are contained in Annex D.

2.4.2 Hydrology and hydrogeology

The power station is located on the southwestern side of Lamma Island. The coast line is located approximately 200 to 500m to the north, the south and the west of the Site. With reference to previous investigations and site observations the direction of groundwater flow would be difficult to determine because it is extremely likely that groundwater flow is being

Hydrocarbons in groundwater near Light Oil Tank No.2	Skin contact and ingestion	Construction workers	Potential significance – PPE to be worn
	Migration in groundwater	Surface waters	Unlikely given the dilution potential and volume of water in harbour

Table 2-1 Potential pollutant linkages based on the current site use

Based on the provisional conceptual model an investigation into the soils and groundwater was designed and implemented. The investigation is described in Section 3.

3 Site Investigation Programme

3.1 Background

The soil and groundwater investigation were carried out between 16 and 28 May 2007. The investigation program was designed in accordance with Environmental Protection Department (EPD)'s Practice Note for Professional Persons (ProPECC) PN 3/94 "Contaminated Land Assessment and Remediation" and Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards and Car Repair/Dismantling Workshops (Guidance Notes).

In addition, a Quality Control and Quality Assurance (QC/QA) programme was implemented for the investigation programme. Details for the investigation programme are discussed in the following sections.

3.2 Sampling Location and Depth

Soil and groundwater sampling was carried out at two locations (BH1 and BH2) at the Site. Service scanning was undertaken at the two locations prior to drilling.

Prior to any excavation, the sampling spade was thoroughly cleaned using solutions supplied by the laboratory and rinsed off with distilled water.

After concrete break out, trial pits were dug to 1 metre below ground level.

Soil samples at BH1 were collected at 1m below ground level and soil samples at BH2 were collected 0.6 m below ground level.

Due to safety concerns the trial pits were dug to deeper depth than originally planned. This was advantageous because the underlying soil conditions could then be visually assessed.

3.2.1 Soil profile within trial pits

At both the borehole locations, below the concrete layer (300mm approximately) a thin layer of gravel fill was seen. This was presumed to be the foundation base of the concrete.

Below this yellowish brown silty / clayey sands were seen. The soils encountered were visually clean silty sands containing small stones and rocks. No odours were detected. The clean excavated materials can be seen in photograph 1.

A slight band of discolouration was seen in around the sides of the trial pit excavated at borehole 2 at 0.6 metres below ground level. Photograph 2 in Annex A shows this discolouration. A sample (BH2 sample a) was taken from this band of material.



up to the top metre. The remaining metre was installed using solid piping. The pipe was surrounded by aggregate backfill and the top of the borehole sealed with impermeable material.

After the groundwater well installation the monitoring wells were left for two days to allow conditions to settle after the drilling disturbance.

Groundwater samples were collected using disposable sealed Teflon bailers. The bailers were opened on site prior to sampling.

Location	Top and base of borehole	Depth of groundwater
BH1 plus duplicate sample	6.14mPD / -2.8m PD	2.74 m PD / 2.84mPD
BH2	6.19mPD / -2.59m PD	1.79m PD / 1.89mPD

Table 3-2 Groundwater sampling locations (PD= Principal Datum)

The base of the BH1 groundwater well was measured as -2.8mPD with ground level measured as +6.14mPD, (the depth of monitoring well at BH1 is 8.94m). The groundwater was measured at a depth of 2.74m PD/2.84m PD (3.3 /3.4m below ground level).

The base of BH2 groundwater well was measured as -2.59mPD with ground level measured as +6.19mPD, (the depth of monitoring well at BH2 is 8.78m). The groundwater was measured at a depth of 1.79m PD / 1.89m PD (4.3/4.4m below ground level).

The reason for the difference in water levels between BH1 and BH2 is currently unknown. The water in BH1 may be perched on impermeable material such as clay, making the levels higher than those in BH2.

Taking into account the site setting the groundwater is anticipated to flow in a generally southern or south-westerly direction, but as discussed previously the groundwater regime is likely to be influenced by tidal movement.

Five times the well volume was removed prior to taking the water samples. All the groundwater samples collected from the wells were placed into the laboratory supplied sample bottles (which were pre-cleaned and preserved prior to delivery).

3.4 Field QA/QC programme

The QA/QC programme included the collection of one soil and one groundwater field duplicate, one equipment blank and one trip blank.

All the soil and groundwater samples were stored in cool boxes prior to collection by the laboratory.



The samples were all accompanied by a completed chain of custody, copies of which are included in Annex B.

3.5 Laboratory analysis

All the soil and groundwater samples plus the QA/QC samples were collected for the analysis of polycyclic aromatic hydrocarbons (PAH), TPH and benzene, toluene, ethylbenzene and xylene (BTEX).

The analysis was performed by ALS Technichem (HK) Limited.

4 Analytical Results

4.1 Analytical Parameter

The analytical results for the soil and water samples collected from the Site are summarized in Table 4-1 and Table 4-2. The assessment criteria for assessing soil and groundwater contamination are based on the Dutch Ministry of Housing, Planning and Environment Soil and Groundwater Standards (the 'Dutch List') as shown in Annex C. It is understood that the EPD plan to replace the Dutch list, but currently this process has not been formally completed. Therefore the results have been compared against the Dutch values.

The interpretations of the Dutch List are outlined as below:

- Concentrations below A and/ or B values refer to a situation in which the soil/ groundwater is considered as "unpolluted" and no further actions are required.
- Concentrations above B but below C values refer to a situation in which soil/ groundwater is potentially contaminated and requires further investigation. The contaminated levels need to be remediated to below B values.
- Concentrations above C refer to a situation of significant contamination and mitigation measures are required.

4.2 Soil analysis results

The soil analysis results are shown in Table 4-1 and discussed below.

4.2.1 Total Petroleum Hydrocarbons (TPH)

No TPH in the fractions of gasoline, light diesel, heavy diesel and heavy oil were detected at concentrations exceeding the Dutch B Limit of 100 mg/kg for gasoline or 1000 mg/kg for mineral oil. The fractions of light diesel, heavy diesel and heavy oil were below the Dutch A value of 100 mg/kg.

The results indicate no remedial action is required.

4.2.2 Polycyclic Aromatic Hydrocarbons (PAHs)

All fractions of PAHs were detected at concentrations below the Dutch B value levels in all the soil samples collected from the Site indicating no remedial action is required.



4.2.3 Benzene, Toluene, Ethyl Benzene and Xylene (BTEX)

All fractions of BTEX were detected at concentrations below the Dutch B value levels in all soil samples collected from the Site indicating no remedial action is required.

4.3 Groundwater analysis results

The groundwater results are presented in Table 4-2 and discussed below

4.3.1 Total Petroleum Hydrocarbons

The only Total Petroleum Hydrocarbons (TPH) detected were in the C15 to C28 fraction, indicating some minor trace of heavy diesel oil. The levels detected were below the Dutch B level of 200 ug/l indicating no remedial action is necessary.

The values for heavy diesel oil in the duplicate sample when added together are still below 200ug/l.

4.4 Data usability

The assessment of the laboratory QA/QC results indicated no anomalies and based on this review of the QA/QC results, all the laboratory results are deemed suitable for use in the assessment of contamination at the site.



Parameter	Units	Dutch		B	C	Report Limit	BH1	BH1	BH1	BH2	BH2	BH2	BH2	BH1 ^a
		A					1m	2m	3m	0.6m	1.5m	2.5m	2m	
TPH														
Gasoline	mg/kg	20		100	800	2	<2	<2	<2	<2	<2	<2	<2	<2
(C6-C9)														
Light Diesel	mg/kg				-	50	<50	<50	<50	<50	<50	<50	<50	<50
(C10-C14)														
Heavy Diesel	mg/kg	-			-	100	<100	<100	<100	<100	<100	<100	<100	<100
(C15-C28)														
Heavy Diesel	mg/kg				-	100	<100	<100	<100	<100	<100	<100	<100	<100
(C29-C36)														
PAHs														
Naphthalene	mg/kg	0.1		5	50	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.1		10	100	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	mg/kg	0.1		10	100	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.1		10	100	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.1		10	100	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	mg/kg	0.05		1	10	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BTEX														
Benzene	mg/kg	0.01		0.5	5	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	0.05		3	30	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	0.05		5	50	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Xylenes ^b	mg/kg	0.05		5	50	0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6

- a. Duplicated soil sample for assurance purpose
b. Xylenes is total of meta-¶- Xylene and ortho-Xylene.

Table 4-1 Soil Sampling Results



Parameter	Units	Dutch		B		C		Report Limit	BH1		BH1 duplicate	BH2
		A										
TPH												
Gasoline												
(C6-C9)	ug/l	10		40		150		25 ug/l	<20 ug/l		<20 ug/l	<20 ug/l
Light Diesel												
(C10-C14)	ug/l	N/A		N/A		N/A		25 ug/l	<25 ug/l		<25 ug/l	<25 ug/l
Heavy Diesel												
(C15-C28)	ug/l	N/A		N/A		N/A		25 ug/l	77 ug/l		110 ug/l	82 ug/l
Heavy Diesel												
(C29-C36)	ug/l	N/A		N/A		N/A		25 ug/l	<25 ug/l		63 ug/l	<25 ug/l
Mineral oil	ug/l	20		200		600		N/A	<102 ug/l		173 ug/l	<107 ug/l
PAHs												
Naphthalene	ug/l	0.2		7		30		<0.5 ug/l	<0.5 ug/l		<0.5 ug/l	<0.5 ug/l
Phenanthrene	ug/l	0.1		2		10		<0.5 ug/l	<0.5 ug/l		<0.5 ug/l	<0.5 ug/l
Anthracene	ug/l	0.1		2		10		<0.5 ug/l	<0.5 ug/l		<0.5 ug/l	<0.5 ug/l
Fluoranthene	ug/l	0.02		1		5		<0.5 ug/l	<0.5 ug/l		<0.5 ug/l	<0.5 ug/l
Pyrene	ug/l	0.02		1		5		<0.5 ug/l	<0.5 ug/l		<0.5 ug/l	<0.5 ug/l
Benzo(a)pyrene	ug/l	0.2		10		40		<0.05 ug/l	<0.05 ug/l		<0.05 ug/l	<0.05 ug/l
BTEX												
Benzene	ug/l	0.2		1		5		<0.5	<0.5		<0.5	<0.5
Toluene	ug/l	0.5		15		50		<0.5	<0.5		<0.5	<0.5
Ethylbenzene	ug/l	0.5		20		60		<0.5	<0.5		<0.5	<0.5
Xylenes ^b	ug/l	0.5		20		60		N/A	<0.5		<0.5	<0.5

Table 4-2 Water analysis Results

- a. Duplicated groundwater sample for assurance purpose.
b. Xylenes is total of meta-¶- Xylene and ortho-Xylene.



The potential pollutant linkages identified in the CAP have been revised based on the data available.

SOURCE	PATHWAY	RECEPTOR	SIGNIFICANCE
Hydrocarbons / BTEX in soil near Light Oil Tank No.2	Skin contact, inhalation, ingestion.	Humans – current site users	NONE No evidence of any BTEX being present
		Construction workers	NONE No evidence of any BTEX being present. Contractors should have suitable plans in place should any unknown contamination be detected during any site work
	Soil pore water	Groundwater	NONE no significant contamination detected.
Hydrocarbons in groundwater near Light Oil Tank No.2	Skin contact and ingestion	Construction workers	NONE – Situation should be reviewed during any site work and PPE worn as appropriate
	Migration in groundwater	Surface waters	NONE – no significant impact likely based on data available.

Table 5.1. Revised Pollutant linkages based on the data available.

For the purposes of future development of the area and if disposal of soils is necessary the soil materials in the areas of borehole 1 and 2 should meet the Landfill Disposal Criteria for Contaminated Soil listed in Reference 2.



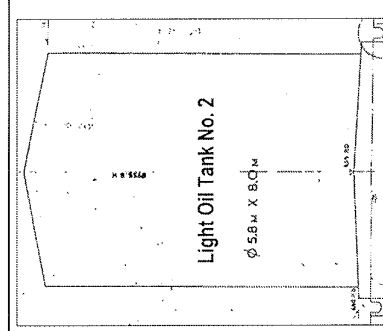
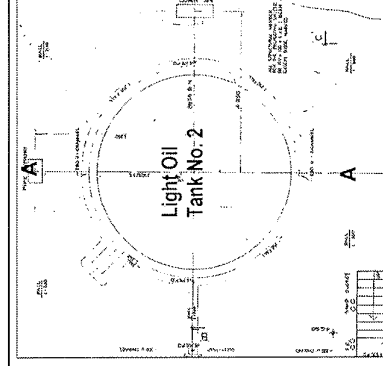
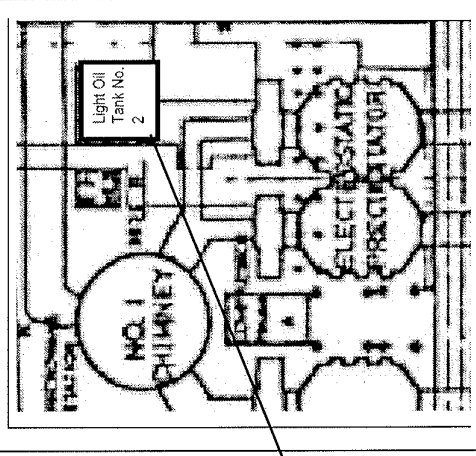
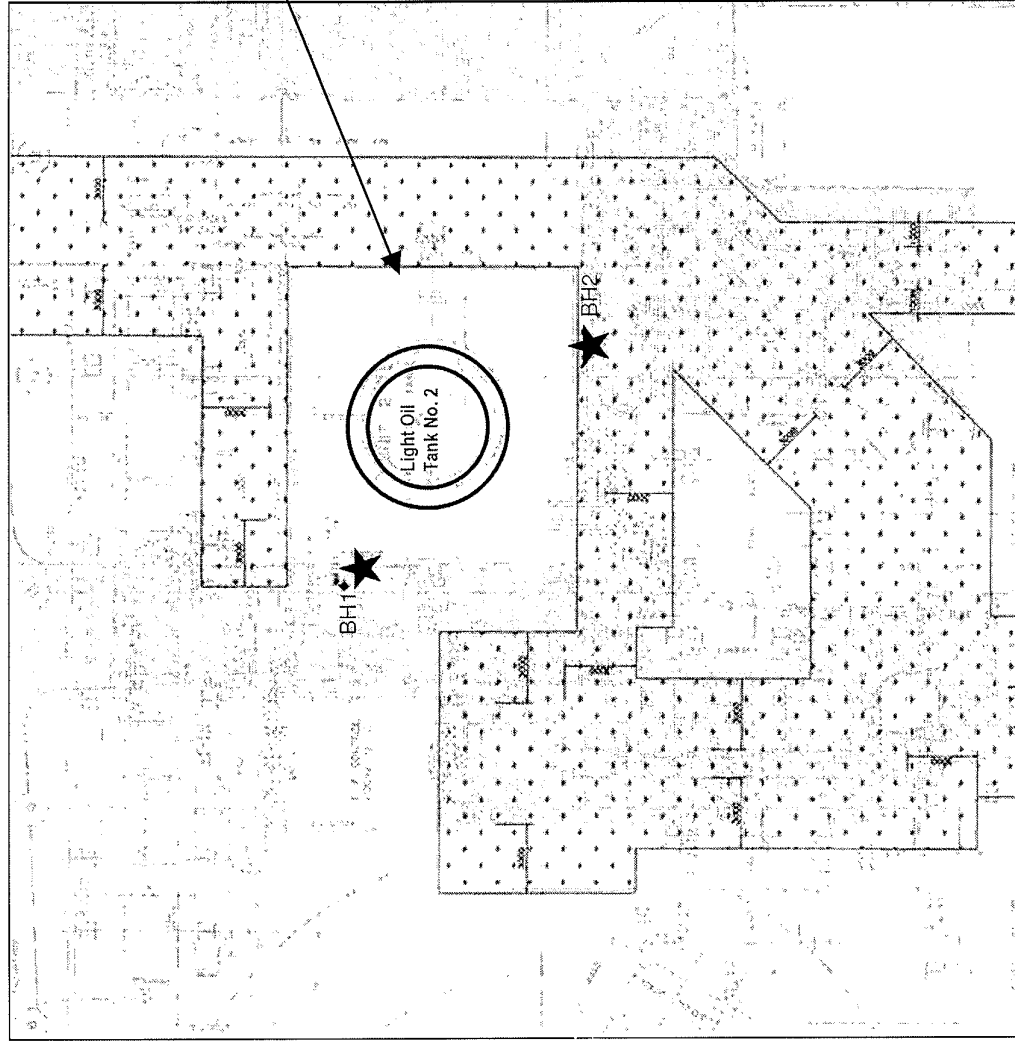
6 References

- 1 ERM Contaminated Assessment Report contained in annex A of February 2006 EIA.
- 2 EPD Guidance notes for investigation and remediation of contaminated sites of petrol filling stations, boatyards and car dismantling workshops May 1999 including Dutch Tables.



Annex A

Site layout plan and Site photographs



Plan

Section A-A

Layout Plan and Borehole Location for Light Oil Tank No. 2

Figure A1



Demolition of the Light Oil Tank No.2
Lamma Power Station
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Annex B


Analysis certificates and chain of custody

CHAIN OF CUSTODY DOCUMENTATION

127806



ALS Laboratory Group

	
ALS Laboratory Group	
CLIENT: <u>Hongkong Electric Company</u>	SAMPLER: <u>Kaden</u>
ADDRESS / OFFICE:	MOBILE:
PROJECT MANAGER (PM):	PHONE:
PROJECT ID: <u>Light 121 Trench No. 2 Gamma Power Station</u>	EMAIL REPORT TO: <u>HEC</u>
SITE:	EMAIL INVOICE TO: (if different to report)
P.O. NO.:	

RESULTS REQUIRED (Date):						QUOTE NO.:			ANALYSIS REQUIRED INCLUDING SUITES (note - suite codes must be listed to attract suite prices)									
STRIKESLAB ONLY USE ONLY COOLER SEAL (for site inspection) <div style="display: flex; justify-content: space-between;"> CHECKED: YES NO </div>						COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:												
SAMPLE TEMPERATURE																		
CHILLED: YES																		
SAMPLE INFORMATION (note: S = Sol, W=Water)						CONTAINER INFORMATION												
ALS ID	SAMPLE ID	MATRIX	DATE	TIME	Type / Code	Total bottles												
1	Borehole 1a	W			Big Glass Bottle	1	Nickel	Copper	Lead	Semi-Volatile Organics	VOC, PTEX, TPH	PTEX, VOC						
	Borehole 1b	W			Plastic Bottle	1	✓	✓										
	Borehole 1c/d	W			Small Glass Bottle	2				✓								
2	Borehole 2a	W			Big Glass Bottle	1												
	Borehole 2b	W			Plastic Bottle	1	✓	✓										
	Borehole 2c/d	W			Small Glass Bottle	2				✓								
3	Borehole 3a (Duplicate)	W			Big Glass Bottle	1												
	Borehole 3b (Duplicate)	W			Plastic Bottle	1	✓	✓										
	Borehole 3c/d (Duplicate)	W			Small Glass Bottle	2				✓								
4	Trip Blank	H																

RELINQUISHED BY:		RECEIVED BY	
Name:	Date: 28/5/2007	Name:	Date: 28/5/07
Of: HK Electric	Time: 4:00 pm	Of:	Time:
Name:	Date:	Name:	Date:
Of:	Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Iod Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber
I = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = F.
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Solis; B = Unpreserved Bag.



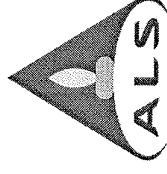
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ALS Laboratory Group

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES



CERTIFICATE OF ANALYSIS

Client	: THE HONG KONG ELECTRIC CO LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 5
Contact	: MR NORMAN LOK MAN CHAN	Contact	: Alice Wong	Work Order	: HK0707244
Address	: LAMMA POWER STATION CHEMISTRY SECTION, HONGKONG ELECTRIC CENTRE, NO 44 KENNEDY ROAD, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: ---	E-mail	: Alice.Wong@alsenviro.com		
Telephone	: 3143 3819	Telephone	: +852 2610 1044		
Facsimile	: 2580 9032	Facsimile	: +852 2610 2021		
Project	: LIGHT OIL TANK NO.2 LAMMA POWER STATION	Quote number	: ---	Date received	: 28 May 2007
Order number	: ---			Date of issue	: 11 Jun 2007
C-O-C number	: 127806			No. of samples	: 4
Site	: ---				: 4

Report Comments

This report for ALS Technichem (HK) Pty Ltd work order reference HK0707244 supersedes any previous reports with this reference. The completion date of analysis is 31 May 2007. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number. LOR = Limit of reporting.

Specific comments for Work Order HK0707244 :

Project Name: Lamma Power Station - Laboratory Analysis for Land Contamination Assessment for Demolition of Light Oil Tank No.2.
Samples were picked up from client by ALS Technichem (HK) staff in a chilled condition.
Water sample(s) analysed and reported on an as received basis.
Water samples were filtered prior to dissolved metal analysis.

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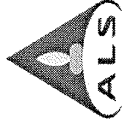
This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in the 'Electronic Transactions Ordinance' of Hong Kong, Chapter 553, Section 6.	
Signatory	Position
Anh Ngoc Huynh	Senior Chemist
Fung Lim Chee, Richard	General Manager
Authorised results for:-	
	Organics
	Inorganics

ALS Laboratory Group
Trading Name: **ALS Technichem (HK) Pty Ltd**
11/F., Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T., Hong Kong
Tel: +852 2610 1044 Fax: +852 2610 2021 www.alsenviro.com
A Campbell Brothers Limited Company



Analytical Results

Analytical Results										
Submatrix: WATER			Client Sample ID :				BOREHOLE 1A, 1B, 1C/1D HK0707244-001 [28 May 2007]	BOREHOLE 2A, 2B, 2C/2D HK0707244-002 [28 May 2007]	BOREHOLE 1A (DUPLICATE), 1C/1D (DUPLICATE) HK0707244-003 [28 May 2007]	TRIP BLANK HK0707244-004 [28 May 2007]
			Laboratory Sample ID :							
			Sample Date / Time :							
Method, Analysis Description	CAS number	LOR	Units							
EG: Metals and Major Cations - Filtered										
EG020: Copper	7440-50-8	1	µg/L	1			1		<1	-----
EG020: Lead	7439-92-1	1	µg/L	<1			<1		<1	----
EG020: Nickel	7440-02-0	1	µg/L	<1			<1		<1	----
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BTEX										
C6 - C9 Fraction	----	20	µg/L	<20			<20		<20	<20
EP-071: Total Petroleum Hydrocarbons (TPH)										
C10 - C14 Fraction	----	25	µg/L	<25			<25		<25	-----
C15 - C28 Fraction	----	25	µg/L	77			82		110	-----
C29 - C36 Fraction	----	25	µg/L	<25			<25		63	-----
EP-080: BTEX										
Benzene	71-43-2	0.5	µg/L	<0.5			<0.5		<0.5	<0.5
Toluene	108-88-3	0.5	µg/L	<0.5			<0.5		<0.5	<0.5
Ethylbenzene	100-41-4	0.5	µg/L	<0.5			<0.5		<0.5	<0.5
meta- & para-Xylene	108-38-3	1	µg/L	<1			<1		<1	<1
	106-42-3									
ortho-Xylene	95-47-6	0.5	µg/L	<0.5			<0.5		<0.5	<0.5
EP-080S: TPH(Volatile)/BTEX Surrogate										
Dibromofluoromethane	1868-53-7	0.1	%	118			111		116	106
Toluene-D8	2037-26-5	0.1	%	96.8			92.3		95.4	94.0
4-Bromofluorobenzene	460-00-4	0.1	%	92.1			92.0		92.2	87.2
EP-075B: Polyaromatic Hydrocarbons (PAHs)										
Naphthalene	91-20-3	0.5	µg/L	<0.5			<0.5		<0.5	-----
Phenanthrene	85-01-8	0.5	µg/L	<0.5			<0.5		<0.5	-----
Anthracene	120-12-7	0.5	µg/L	<0.5			<0.5		<0.5	-----
Fluoranthene	206-44-0	0.5	µg/L	<0.5			<0.5		<0.5	-----
Pyrene	129-00-0	0.5	µg/L	<0.5			<0.5		<0.5	-----
Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05			<0.05		<0.05	-----
EP-075S: Acid Extractable Surrogates										
2-Fluorophenol	367-12-4	0.1	%	40.7			37.0		29.5	-----
Phenol-d6	13127-88-3	0.1	%	31.4			24.9		21.3	-----
2,4,6-Tribromophenol	118-79-6	0.1	%	86.4			89.4		85.0	-----
EP-075T: Base/Neutral Extractable Surrogates										
Nitrobenzene -d5	4165-60-0	0.1	%	60.8			68.7		35.4	Surrogate control limits listed at end of this report.



Analytical Results

Analytical Results							
Submatrix: WATER	Client Sample ID :		BOREHOLE 1A, 1B, 1C/1D	BOREHOLE 2A, 2B, 2C/2D	BOREHOLE 1A (DUPLICATE), 1C/1D (DUPLICATE) HK0707244-003 [28 May 2007]	TRIP BLANK HK0707244-004 [28 May 2007]	
	Laboratory Sample ID :	Sample Date / Time :	HK0707244-001 [28 May 2007]	HK0707244-002 [28 May 2007]			
	Method: Analysis Description	CAS number	LOR	Units	Surrogate control limits listed at end of this report.		
EP-075T: Base/Neutral Extractable Surrogates							
2-Fluorobiphenyl	321-60-8	0.1	%	51.7	65.1	43.3	
4-Terphenyl-d14	1718-51-0	0.1	%	85.0	94.8	94.8	



Quality Control - Laboratory Duplicate (DUP) Results

Matrix Type: WATER		Duplicate (DUP) Results						
Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	LOR	Units	Original Result	Duplicate Result	RPD (%)
EG: Metals and Major Cations - Filtered (QC Lot: 422177)								
HK0707272-001	Anonymous	EG020: Lead	7439-92-1	1	µg/L	<1	<1	0.0
		EG020: Nickel	7440-02-0	1	µg/L	<1	<1	0.0
		EG020: Copper	7440-50-8	1	µg/L	<1	<1	0.0
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QC Lot: 421400)								
HK0707149-001	Anonymous	C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0
EP-080: BTEX (QC Lot: 421400)								
HK0707149-001	Anonymous	Benzene	71-43-2	2	µg/L	<2	<2	0.0
		Toluene	108-88-3	2	µg/L	<2	<2	0.0
		Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0
		meta- & para-Xylene	108-38-3	4	µg/L	<4	<4	0.0
		ortho-Xylene	106-42-3	2	µg/L	<2	<2	0.0

Quality Control - Method Blank (MB), Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results

Matrix Type: WATER		Method Blank (MB) Results						
Method: Analysis Description	CAS number	LOR	Units	Result	Spike Concentration	Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results	RPDs (%)	
						Spike Recovery (%)	Recovery Limits (%)	Control Limit
						SCS	Low	High
EG: Metals and Major Cations - Filtered (QC Lot: 422177)								
EG020: Lead	7439-92-1	1	µg/L	<1	100 µg/L	94.2	85	115
EG020: Nickel	7440-02-0	1	µg/L	<1	100 µg/L	93.8	85	115
EG020: Copper	7440-50-8	1	µg/L	<1	100 µg/L	92.8	85	115
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QC Lot: 421400)								
C6 - C9 Fraction	----	20	µg/L	<20	200 µg/L	103	78	124
EP-071: Total Petroleum Hydrocarbons (TPH) (QC Lot: 422189)								
C10 - C14 Fraction	----	50	µg/L	<50	150 µg/L	80.7	34	141
C15 - C28 Fraction	----	100	µg/L	<100	350 µg/L	86.7	42	140
C29 - C36 Fraction	----	50	µg/L	<50	300 µg/L	83.6	39	137
EP-080: BTEX (QC Lot: 421400)								
Benzene	71-43-2	2	µg/L	<2	10 µg/L	95.2	93	128
Toluene	108-88-3	2	µg/L	<2	10 µg/L	78.5	73	116
Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	80.3	74	132
meta- & para-Xylene	108-38-3	4	µg/L	<4	20 µg/L	92.4	79	114
ortho-Xylene	106-42-3	2	µg/L	<2	10 µg/L	85.0	84	112
EP-075B: Polyaromatic Hydrocarbons (PAHs) (QC Lot: 422190)								
Naphthalene	91-20-3	0.5	µg/L	<0.5	5 µg/L	75.4	49	124



Matrix Type: WATER

Matrix Type: WATER			Method Blank (MB) Results			Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results							
Method: Analysis Description	CAS number	LOR	Units	Result	Spike		Spike Recovery (%)		Recovery Limits (%)		RPDs (%)		
					Concentration	SCS	DCS	Low	High	Value	Control Limit		
EP-075B: Polycyclic Aromatic Hydrocarbons (PAHs) (QCLot: 422190) - continued													
Phenanthrene	85-01-8	0.5	µg/L	<0.5	5 µg/L	88.1			66	117			
Anthracene	120-12-7	0.5	µg/L	<0.5	5 µg/L	87.2			61	118			
Fluoranthene	206-44-0	0.5	µg/L	<0.5	5 µg/L	98.6			58	117			
Pyrene	129-00-0	0.5	µg/L	<0.5	5 µg/L	97.9			59	119			
Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05	5 µg/L	112			52	120			

Quality Control - Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results

Matrix Type: WATER

Matrix Type: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results							
Laboratory Sample ID		Client Sample ID	Method: Analysis Description	CAS number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Limit	
EG: Metals and Major Cations - Filtered (QCLot: 422177)											
HK0707244-001		BOREHOLE 1A, 1B, 1C/1D	EG020: Lead	7439-92-1	100 µg/L	91.9		75	125		
			EG020: Nickel	7440-02-0	100 µg/L	95.3		75	125		
			EG020: Copper	7440-50-8	100 µg/L	93.1		75	125		

Surrogate Control Limits

Submatrix Type: WATER

Method: Analysis Description	Units	Lower Limit	Upper Limit
EP-080S: TPH(Volatile)/BTX Surrogate			
Dibromofluoromethane	%	86	118
Toluene-D8	%	88	110
4-Bromofluorobenzene	%	86	115
EP-075S: Acid Extractable Surrogates			
2-Fluorophenol	%	21	100
Phenol-d6	%	20	94
2,4,6-Tribromophenol	%	20	123
EP-075T: Base/Neutral Extractable Surrogates			
Nitrobenzene -d5	%	35	114
2-Fluorobiphenyl	%	43	116
4-Terphenyl-d14	%	33	141

CHAIN OF CUSTODY DOCUMENTATION

127805



ALS Laboratory Group

CLIENT: Hongkong Electric Company

SAMPLER: Kaden

ADDRESS / OFFICE:

MOBILE:

PROJECT MANAGER (PM):

PHONE:

PROJECT ID: Light oil tank 2 Lamma Power Station

EMAIL REPORT TO: HEC

SITE: Light oil tank - LAMMA P.O. NO.:

EMAIL INVOICE TO: (if different to report)

RESULTS REQUIRED (Date):

QUOTE NO.:

ANALYSIS REQUIRED INCLUDING SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (date and signature)

TEMPERATURE

CHILLED

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL

Notes: e.g. Highly contaminated samples e.g. "High PAHs expected". Extra volume for QC or trace LORs etc.

ALS ID	SAMPLE ID	MATRIX	DATE	TIME	CONTAINER INFORMATION		ANALYSIS REQUIRED										Notes
					Type / Code	Total bottles	Nickel	Copper	Lead	TPH - General	TPH - Aromatics	TPH - Monoaromatics	TPH - Polycyclic Aromatics	PAHs	BTEX	Low Volatile Organics	
1	Borehole 1a	S	16/5	11:42	GLASS JAR	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1m below ground
2	Borehole 1b	S	16/5	15:20	"	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2m below ground
3	Borehole 1b(i)	S	16/5	15:25	"	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2m (DUPLICATE)
4	Borehole 1-3	S	16/5	15:30	"	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3m
5	Borehole 2	S	17/5	11:30	"	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Sample 1 0.6m ash bag
6	Borehole 2 sample 2	S	17/5	11:15	"	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Sample 2 1.5m
7	Borehole 2 sample 3	S	17/5	15:40	"	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Sample 3 2.5m
8	Waste Water, M22C	W	16/5	11:40	Small bottle	2				✓	✓	✓	✓	✓	✓	✓	ALS Technichem (HK) Pty Ltd
	Waste Water, M22C	W	16/5	11:40	Big bottle	1											Work Order
	Waste Water, M22C	W	16/5	11:40	Plastic bottle	1	✓	✓	✓								HK0706844

RELINQUISHED BY: Asriel Date: 16/5 Time: 11:40

RECEIVED BY: ALS Date: 16/5 Time: 11:40

Name: Asriel Of: ALS

Name: ALS Of: ALS

Name: ALS Of: ALS

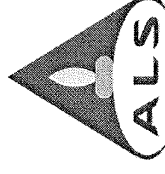
Name: ALS Of: ALS

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide Preserved Plastic; AG = Amber G. V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Plastic; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; F = FOTA Preserved Bottle; ASS = Plastic Bottle for Acid Substrate; B = Blank Bottle

Telephone : + 852 2610 1044

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES



CERTIFICATE OF ANALYSIS

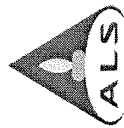
Client	: THE HONG KONG ELECTRIC CO LTD	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 12
Contact	: MR NORMAN LOK MAN CHAN	Contact	: Alice Wong	Work Order	: HK0706844
Address	: LAMMA POWER STATION CHEMISTRY SECTION, HONGKONG ELECTRIC CENTRE, NO 44 KENNEDY ROAD, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: ---	E-mail	: Alice.Wong@alsenviro.com		
Telephone	: 3143 3819	Telephone	: +852 2610 1044		
Facsimile	: 2580 9032	Facsimile	: +852 2610 2021		
Project	: LIGHT OIL TANK NO.2 LAMMA POWER STATION	Quote number	: ---	Date received	: 18 May 2007
Order number	: ---			Date of issue	: 2 Jun 2007
C-O-C number	: 127805			No. of samples	: 8
Site	: LIGHT OIL TANK - LAMMA				: 8

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Signatory	Position	Authorised results for:-
Anh Ngoc Huynh	Senior Chemist	Organics
Fung Lim Chee, Richard	General Manager	Inorganics

ALS Laboratory Group
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Page Number : 2 of 12
Client : THE HONG KONG ELECTRIC CO LTD
Work Order : HK0706844

Report Comments

This report for ALS Technichem (HK) Pty Ltd work order reference HK0706844 supersedes any previous reports with this reference. The completion date of analysis is 29 May 2007. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number. LOR = Limit of reporting.

Specific comments for Work Order HK0706844 :

Project Name: Lamma Power Station - Laboratory Analysis for Land Contamination Assessment for Demolition of Light Oil Tank No.2.

Samples were picked up from client by ALS Technichem (HK) staff in a chilled condition.

Water sample(s) analysed and reported on an as received basis.

Soil sample(s) analysed on an as received basis. Result(s) reported on a dry weight basis.

Water samples were filtered prior to dissolved metal analysis.

Soil sample(s) as received, digested by In-house method E-ASTM D3974-81 based on ASTM D3974-81, prior to the determination of metals.



Analytical Results

Submatrix: SOIL

Analytical Results									
Client Sample ID :				BOREHOLE 1A	BOREHOLE 1B	BOREHOLE 1B (I)	BOREHOLE 13	BOREHOLE 2 SAMPLE 1	
Laboratory Sample ID :				HK0706844-001	HK0706844-002	HK0706844-003	HK0706844-004	HK0706844-005	
Sample Date / Time :				16 May 2007 11:42	16 May 2007 15:20	16 May 2007 15:25	18 May 2007 15:30	17 May 2007 11:30	
Method: Analysis Description	CAS number	LOR	Units						
EA/ED: Physical and Aggregate Properties									
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	14.0	17.6	19.2	22.7	7.4	
EG: Metals and Major Cations									
EG020: Copper	7440-50-8	1	mg/kg	49	8	9	2	12	
EG020: Lead	7439-92-1	1	mg/kg	81	69	95	79	38	
EG020: Nickel	7440-02-0	1	mg/kg	4	2	2	<1	6	
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BTEX									
C6 - C9 Fraction	----	2	mg/kg	<2	<2	<2	<2	<2	
EP-071: Total Petroleum Hydrocarbons (TPH)									
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100	
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100	
EP-080: BTEX									
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
meta- & para-Xylene	108-38-3	0.4	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	
ortho-Xylene	106-42-3								
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
EP-080S: TPH(Volatile)/BTEX Surrogate									
Dibromofluoromethane	1868-53-7	0.1	%	97.8	102	105	101	98.6	
Toluene-D8	2037-26-5	0.1	%	97.0	96.3	99.4	100	94.5	
4-Bromofluorobenzene	460-00-4	0.1	%	81.7	83.1	85.6	82.0	87.0	
EP-075B: Polyaromatic Hydrocarbons (PAHs)									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
EP-075S: Acid Extractable Surrogates									
2-Fluorophenol	367-12-4	0.1	%	72.5	80.0	88.7	80.0	86.7	
Phenol-d6	13127-88-3	0.1	%	67.2	72.7	80.6	70.2	75.9	
2,4,6-Tribromophenol	118-79-6	0.1	%	82.3	79.5	95.5	83.5	86.9	



Analytical Results

Submatrix: SOIL

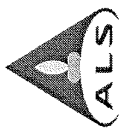
<u>Analytical Results</u>																	
Client Sample ID :				BOREHOLE 1A		BOREHOLE 1B		BOREHOLE 1B (I)		BOREHOLE 13		BOREHOLE 2 SAMPLE 1					
Laboratory Sample ID :				HK0706844-001		HK0706844-002		HK0706844-003		HK0706844-004		HK0706844-005					
Sample Date / Time :				16 May 2007 11:42		16 May 2007 15:20		16 May 2007 15:25		18 May 2007 15:30		17 May 2007 11:30					
Submatrix: SOIL		Method: Analysis Description		CAS number		LOR		Units		Surrogate control limits listed at end of this report.							
EP-075T: Base/Neutral Extractable Surrogates																	
Nitrobenzene -d5		4165-60-0		0.1		%		86.5		90.7		102		89.7		99.9	
2-Fluorobiphenyl		321-60-8		0.1		%		74.2		74.6		83.3		74.3		81.8	
4-Terphenyl-d14		1718-51-0		0.1		%		102		105		118		106		110	



Analytical Results

Submatrix: SOIL

Method: Analysis Description		CAS number	Client Sample ID :		BOREHOLE 2 SAMPLE 2 HK0706844-006 17 May 2007 11:15	BOREHOLE 2 SAMPLE 3 HK0706844-007 18 May 2007 15:40		
EA/ED: Physical and Aggregate Properties			Laboratory Sample ID :	Sample Date / Time :				
EA055: Moisture Content (dried @ 103°C)		---	0.1	%	5.8	12.0		
EG: Metals and Major Cations								
EG020: Copper	7440-50-8	1	mg/kg	50	8			
EG020: Lead	7439-92-1	1	mg/kg	47	15			
EG020: Nickel	7440-02-0	1	mg/kg	<1	1			
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BTEX								
C6 - C9 Fraction	---	2	mg/kg	<2	<2			
EP-071: Total Petroleum Hydrocarbons (TPH)								
C10 - C14 Fraction	---	50	mg/kg	<50	<50			
C15 - C28 Fraction	---	100	mg/kg	<100	<100			
C29 - C36 Fraction	---	100	mg/kg	<100	<100			
EP-080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2			
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2			
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2			
meta- & para-Xylene	108-38-3	0.4	mg/kg	<0.4	<0.4			
	106-42-3							
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2			
EP-080S: TPH(Volatile)/BTEX Surrogate								Surrogate control limits listed at end of this report.
Dibromofluoromethane	1868-53-7	0.1	%	98.0	104			
Toluene-D8	2037-26-5	0.1	%	100	99.6			
4-Bromofluorobenzene	460-00-4	0.1	%	83.5	83.0			
EP-075B: Polyaromatic Hydrocarbons (PAHs)								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5			
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5			
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5			
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5			
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5			
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5			
EP-075S: Acid Extractable Surrogates								Surrogate control limits listed at end of this report.
2-Fluorophenol	367-12-4	0.1	%	83.7	91.7			
Phenol-d6	13127-88-3	0.1	%	71.4	77.3			
2,4,6-Tribromophenol	118-79-6	0.1	%	91.6	99.4			



Analytical Results

Submatrix: SOIL

<u>Analytical Results</u>									
Submatrix: SOIL		Client Sample ID :			BOREHOLE 2 SAMPLE 2		BOREHOLE 2 SAMPLE 3		
		Laboratory Sample ID :			HK0706844-006		HK0706844-007		
		Sample Date / Time :			17 May 2007 11:15		18 May 2007 15:40		
Method: Analysis Description		CAS number	LOR	Units					
EP-075T: Base/Neutral Extractable Surrogates									
Nitrobenzene -d5		4165-60-0	0.1	%	96.5	104			
2-Fluorobiphenyl		321-60-8	0.1	%	79.8	83.6			
4-Terphenyl-d14		1718-51-0	0.1	%	109	115			
Surrogate control limits listed at end of this report.									



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Client : THE HONG KONG ELECTRIC CO LTD
Work Order : HK0706844

Analytical Results

Submatrix: WATER

Client Sample ID : Laboratory Sample ID : Sample Date / Time :				RESINATE BLANK HK0706844-008 16 May 2007 11:40				
Method: Analysis Description	CAS number	LOR	Units					
EG: Metals and Major Cations - Filtered								
EG020: Copper	7440-50-8	1	µg/L	<1				
EG020: Lead	7439-92-1	1	µg/L	<1				
EG020: Nickel	7440-02-0	1	µg/L	<1				
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BTEX								
C6 - C9 Fraction	----	20	µg/L	<20				
EP-071: Total Petroleum Hydrocarbons (TPH)								
C10 - C14 Fraction	----	25	µg/L	<25				
C15 - C28 Fraction	----	25	µg/L	41				
C29 - C36 Fraction	----	25	µg/L	<25				
EP-080: BTEX								
Benzene	71-43-2	2	µg/L	<2				
Toluene	108-88-3	2	µg/L	<2				
Ethylbenzene	100-41-4	2	µg/L	<2				
meta- & para-Xylene	108-38-3	4	µg/L	<4				
	106-42-3							
ortho-Xylene	95-47-6	2	µg/L	<2				
EP-080S: TPH(Volatile)/BTEX Surrogate								
Dibromofluoromethane	1868-53-7	0.1	%	115				Surrogate control limits listed at end of this report.
Toluene-D8	2037-26-5	0.1	%	93.7				
4-Bromofluorobenzene	460-00-4	0.1	%	90.2				
EP-075B: Polyaromatic Hydrocarbons (PAHs)								
Naphthalene	91-20-3	0.5	µg/L	<0.5				
Phenanthrene	85-01-8	0.5	µg/L	<0.5				
Anthracene	120-12-7	0.5	µg/L	<0.5				
Fluoranthene	206-44-0	0.5	µg/L	<0.5				
Pyrene	129-00-0	0.5	µg/L	<0.5				
Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05				
EP-075S: Acid Extractable Surrogates								
2-Fluorophenol	367-12-4	0.1	%	35.7				Surrogate control limits listed at end of this report.
Phenol-d6	13127-88-3	0.1	%	30.9				
2,4,6-Tribromophenol	118-79-6	0.1	%	91.8				
EP-075T: Base/Neutral Extractable Surrogates								
Nitrobenzene-d5	4165-60-0	0.1	%	66.2				Surrogate control limits listed at end of this report.
2-Fluorobiphenyl	321-60-8	0.1	%	61.0				
4-Terphenyl-d14	1718-51-0	0.1	%	115				



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Client : THE HONG KONG ELECTRIC CO LTD
Work Order : HK0706844

Quality Control - Laboratory Duplicate (DUP) Results

Matrix Type: SOIL				Duplicate (DUP) Results				
Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	LOR	Units	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 415077)								
HK0706813-004	Anonymous	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	37.2	41.3	10.5
HK0706815-012	Anonymous	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	20.2	20.2	0.0
EA/ED: Physical and Aggregate Properties (QC Lot: 418321)								
HK0706844-004	BOREHOLE 13	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	22.7	22.1	2.4
HK0707004-014	Anonymous	EA055: Moisture Content (dried @ 103°C)	---	0.1	%	28.5	27.4	4.1
EG: Metals and Major Cations (QC Lot: 414717)								
HK0706815-003	Anonymous	EG020: Lead	7439-92-1	0.05	mg/kg	36.6	40.5	10.1
		EG020: Nickel	7440-02-0	0.05	mg/kg	1.37	1.42	3.7
		EG020: Copper	7440-50-8	0.05	mg/kg	5.55	5.67	2.2
		EG020: Lead	7439-92-1	1	mg/kg	79	74	6.9
HK0706844-004	BOREHOLE 13	EG020: Nickel	7440-02-0	1	mg/kg	<1	<1	0.0
		EG020: Copper	7440-50-8	1	mg/kg	2	3	41.5
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QC Lot: 414605)								
HK0706737-004	Anonymous	C6 - C9 Fraction	---	2	mg/kg	<2	<2	0.0
EP-071: Total Petroleum Hydrocarbons (TPH) (QC Lot: 414586)								
HK0706737-004	Anonymous	C10 - C14 Fraction	---	50	mg/kg	<50	<50	0.0
		C15 - C28 Fraction	---	100	mg/kg	<100	<100	0.0
		C29 - C36 Fraction	---	100	mg/kg	<100	<100	0.0
EP-080: BTEX (QC Lot: 414605)								
HK0706737-004	Anonymous	Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0
		Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.0
		Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.0
		meta- & para-Xylene	108-38-3	0.4	mg/kg	<0.4	<0.4	0.0
			106-42-3					
		ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.0
EP-075B: Polyaromatic Hydrocarbons (PAHs) (QC Lot: 414587)								
HK0706737-004	Anonymous	Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0
		Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0
		Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0
		Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0
		Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0
		Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0
Matrix Type: WATER								
Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	LOR	Units	Original Result	Duplicate Result	RPD (%)
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QC Lot: 417391)								
HK0706471-007	Anonymous	C6 - C9 Fraction	---	20	µg/L	<20	<20	0.0



Matrix Type: WATER		Method: Analysis Description		Duplicate (DUP) Results	
Laboratory Sample ID	Client Sample ID	CAS number	Units	Original Result	Duplicate Result
EP-080: BTEX (QC Lot: 417391)					
HK0706471-007	Anonymous	71-43-2	µg/L	<2	<2
		108-88-3	µg/L	<2	<2
		100-41-4	µg/L	<2	<2
		108-38-3	µg/L	<4	<4
		106-42-3	µg/L	<2	<2
		95-47-6	µg/L	<2	<2

Quality Control - Method Blank (MB), Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results

Matrix Type: SOIL		Method Blank (MB) Results		Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results	
Method: Analysis Description	CAS number	LOR	Units	Result	Spike Concentration
EG: Metals and Major Cations (QCLot: 414717)					
EG020: Lead	7439-92-1	1	mg/kg	<0.05	5 mg/kg
EG020: Nickel	7440-02-0	1	mg/kg	<0.05	5 mg/kg
EG020: Copper	7440-50-8	1	mg/kg	<0.05	5 mg/kg
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QCLot: 414605)					
C6 - C9 Fraction	---	2	mg/kg	<2	4 mg/kg
EP-071: Total Petroleum Hydrocarbons (TPH) (QCLot: 414586)					
C10 - C14 Fraction	---	50	mg/kg	<50	16 mg/kg
C15 - C28 Fraction	---	100	mg/kg	<100	53 mg/kg
C29 - C36 Fraction	---	100	mg/kg	<100	45 mg/kg
EP-080: BTEX (QCLot: 414605)					
Benzene	71-43-2	0.2	mg/kg	<0.2	0.2 mg/kg
Toluene	108-88-3	0.2	mg/kg	<0.2	0.2 mg/kg
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	0.2 mg/kg
meta- & para-Xylene	108-38-3	0.4	mg/kg	<0.4	0.4 mg/kg
ortho-Xylene	106-42-3	0.2	mg/kg	<0.2	0.2 mg/kg
EP-075B: Polyaromatic Hydrocarbons (PAHs) (QCLot: 414587)					
Naphthalene	91-20-3	0.5	mg/kg	<0.5	0.25 mg/kg
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	0.25 mg/kg
Anthracene	120-12-7	0.5	mg/kg	<0.5	0.25 mg/kg
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	0.25 mg/kg
Pyrene	129-00-0	0.5	mg/kg	<0.5	0.25 mg/kg
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	0.25 mg/kg

Matrix Type: WATER		Method Blank (MB) Results		Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results	
Method: Analysis Description	CAS number	LOR	Units	Result	Spike Concentration
Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results					
		SCS	DCS	Recovery Limits (%)	RPDs (%)
				Low	High
				Value	Control Limit



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Client : THE HONG KONG ELECTRIC CO LTD
Work Order : HK0706844

Matrix Type: WATER

Matrix Type: WATER			Method Blank (MB) Results			Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results						
			LOR	Units	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Method: Analysis Description			CAS number				SCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations - Filtered (QCLot: 414723)												
EG020: Lead		7439-92-1	1	µg/L	<1	100 µg/L	95.9		85	115		
EG020: Nickel		7440-02-0	1	µg/L	<1	100 µg/L	96.4		85	115		
EG020: Copper		7440-50-8	1	µg/L	<1	100 µg/L	97.7		85	115		
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QCLot: 417391)												
C6 - C9 Fraction			20	µg/L	<20	200 µg/L	105		78	124		
EP-071: Total Petroleum Hydrocarbons (TPH) (QCLot: 414616)												
C10 - C14 Fraction			50	µg/L	<50	150 µg/L	87.4		34	141		
C15 - C28 Fraction			100	µg/L	<100	350 µg/L	84.6		42	140		
C29 - C36 Fraction			50	µg/L	<50	300 µg/L	85.8		39	137		
EP-080: BTEX (QCLot: 417391)												
Benzene		71-43-2	2	µg/L	<2	10 µg/L	101		93	128		
Toluene		108-88-3	2	µg/L	<2	10 µg/L	98.2		73	116		
Ethylbenzene		100-41-4	2	µg/L	<2	10 µg/L	99.4		74	132		
meta- & para-Xylene		108-38-3	4	µg/L	<4	20 µg/L	97.7		79	114		
		106-42-3										
ortho-Xylene		95-47-6	2	µg/L	<2	10 µg/L	99.9		84	112		
EP-075B: Polyaromatic Hydrocarbons (PAHs) (QCLot: 414617)												
Naphthalene		91-20-3	0.5	µg/L	<0.5	5 µg/L	69.7		49	124		
Phenanthrene		85-01-8	0.5	µg/L	<0.5	5 µg/L	76.2		66	117		
Anthracene		120-12-7	0.5	µg/L	<0.5	5 µg/L	76.8		61	118		
Fluoranthene		206-44-0	0.5	µg/L	<0.5	5 µg/L	82.9		58	117		
Pyrene		129-00-0	0.5	µg/L	<0.5	5 µg/L	84.7		59	119		
Benzo(a)pyrene		50-32-8	0.05	µg/L	<0.05	5 µg/L	89.2		52	120		

Quality Control - Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results

Matrix Type: SOIL

Laboratory Sample ID				Client Sample ID		Method: Analysis Description		CAS number		Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results					
EG: Metals and Major Cations (QCLot: 414717)										Spike		Recovery Limits (%)		RPDs (%)	
										Concentration	MS	MSD	Low	High	Value
HK0706815-001				Anonymous		EG020: Lead		7439-92-1		5 mg/kg	Not Determined		75	125	
						EG020: Nickel		7440-02-0		5 mg/kg	76.6		75	125	
						EG020: Copper		7440-50-8		5 mg/kg	84.6		75	125	
EP-0711080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QCLot: 414605)															
HK0706737-001				Anonymous		C6 - C9 Fraction				12.5 mg/kg	99.1		50	130	
EP-071: Total Petroleum Hydrocarbons (TPH) (QCLot: 414586)															
HK0706737-001				Anonymous		C10 - C14 Fraction				16 mg/kg	107		50	130	
						C15 - C28 Fraction				53 mg/kg	103		50	130	



Matrix Type: SOIL

Matrix Type: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results					
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)
Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	MS	MSD	Low	High	Value	Control Limit
EP-071: Total Petroleum Hydrocarbons (TPH) (QCLot: 414586) - continued									
HK0706737-001	Anonymous	C29 - C36 Fraction	---	45 mg/kg	106	----	50 130	----	----
EP-080: BTEX (QCLot: 414605)									
HK0706737-001	Anonymous	Benzene	71-43-2	0.625 mg/kg	90.2	----	50 130	----	----
		Toluene	108-88-3	0.625 mg/kg	82.8	----	50 130	----	----
		Ethylbenzene	100-41-4	0.625 mg/kg	98.4	----	50 130	----	----
		meta- & para-Xylene	108-38-3	1.25 mg/kg	94.8	----	50 130	----	----
			106-42-3						
		ortho-Xylene	95-47-6	0.625 mg/kg	94.3	----	50 130	----	----

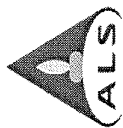
Matrix Type: WATER

Matrix Type: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results						
Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
				Concentration	MS	MSD	Low	High	Value	Control Limit
EG: Metals and Major Cations - Filtered (QCLot: 414723)										
HK0706844-008		RESINATE BLANK	7439-92-1	100 µg/L	95.8		75	125		
		EG020: Lead	7440-02-0	100 µg/L	95.4		75	125		
		EG020: Nickel								
		EG020: Copper	7440-50-8	100 µg/L	96.2		75	125		

Surrogate Control Limits

Submatrix Type: SOIL

Method: Analysis Description	Units	Lower Limit	Upper Limit
EP-080S: TPH(Volatile)/BTEX Surrogate			
Dibromofluoromethane	%	80	120
Toluene-D8	%	81	117
4-Bromofluorobenzene	%	74	121
EP-075S: Acid Extractable Surrogates			
2-Fluorophenol	%	25	121
Phenol-d6	%	24	113
2,4,6-Tribromophenol	%	20	122
EP-075T: Base/Neutral Extractable Surrogates			
Nitrobenzene -d5	%	23	120
2-Fluorobiphenyl	%	30	115
4-Terphenyl-d14	%	20	137



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Client : THE HONG KONG ELECTRIC CO LTD
Work Order : HK0706844

Submatrix Type: WATER

Method: Analysis Description	Units	Lower Limit	Upper Limit
EP-080S: TPH(Volatile)/BTEX Surrogate			
Dibromofluoromethane	%	86	118
Toluene-D8	%	88	110
4-Bromofluorobenzene	%	86	115
EP-075S: Acid Extractable Surrogates			
2-Fluorophenol	%	21	100
Phenol-d6	%	20	94
2,4,6-Tribromophenol	%	20	123
EP-075T: Base/Neutral Extractable Surrogates			
Nitrobenzene -d5	%	35	114
2-Fluorobiphenyl	%	43	116
4-Terphenyl-d14	%	33	141



Annex C

Dutch List

Dutch List

Table C Soil and Groundwater Criteria used in the Netherlands for contaminated land ("Dutch List")

Component	Soil (mg/kg dry soil)			Ground water (ug/L)		
	A	B	C	A	B	C
1. Metals						
Cr	100	250	800	20	50	200
Co	20	50	300	20	50	200
Ni	50	100	500	20	50	200
Cu	50	100	500	20	50	200
Zn	200	500	3000	50	200	800
As	20	30	50	10	30	100
Mo	10	40	200	5	20	100
Cd	1	5	20	1	2.5	10
Sn	20	50	300	10	30	150
Ba	200	400	2000	50	100	500
Hg	0.5	2	10	0.2	0.5	2
Pb	50	150	600	20	50	200
2. Inorganics						
NH ₄ (as N)	—	—	—	200	1000	3000
F (total)	200	400	2000	300	1200	4000
CN	(tot.free)	1	10	5	30	100
	(tot.comb.)	5	50	10	50	200
S (total)	2	20	200	10	100	300
Br (total)	20	50	300	100	500	2000
PO ₄ (as P)	—	—	—	50	200	700
3. Aromatics Compounds						
Benzene	0.01	0.5	5	0.2	1	5
Ethylbenzene	0.05	5	50	0.5	20	60
Toluene	0.05	3	30	0.5	15	50
Xylenes	0.05	5	50	0.5	20	60
Phenols	0.02	1	10	0.5	15	50
Total	0.1	7	70	1	30	100
4. Polycyclic Hydrocarbons						
Naphthalene	0.1	5	50	0.2	7	30
Anthracene	0.1	10	100	0.1	2	10
Benanthrene	0.1	10	100	0.1	2	10
Flouranthene	0.1	10	100	0.02	1	5
Pyrene	0.1	10	100	0.02	1	5
1,2-benzopyrene	0.05	1	10	0.01	0.2	1
Total	1	20	200	0.2	10	40
5. Chlorinated Hydrocarbons						
Aliphatics	(Individual)	0.1	5	1	10	50
	(Total)	0.1	7	1	15	70
Chlorobenzenes	(Individual)	0.05	1	0.02	0.5	2
	(Total)	0.05	2	0.02	1	5
Chlorophenols	(Individual)	0.01	0.5	0.01	0.3	1.5
	(Total)	0.01	1	0.01	0.5	2
Chlor. PAHs (Tot.)		0.05	1	0.01	0.2	1
PCB's (Tot.)		0.05	1	0.01	0.2	1
EOCL (Tot.)		0.1	8	1	15	70
6. Pesticides						
Chlorinated organics	(Individual)	0.1	0.5	0.5	0.2	1
	(Total)	0.1	1	0.1	0.5	2
Pesticides	(Total)	0.1	2	0.1	1	5
7. Other Pollutants						
Tetrahydrofuran		0.1	4	0.5	20	60
Pyridine		0.1	2	0.5	10	30
Tetrahydrothiophene		0.1	5	0.5	20	60
Cyclohexanes		0.1	6	0.5	15	50
Styrene		0.1	5	0.5	20	60
Gasoline		20	100	10	40	150
Mineral oil		100	1000	20	200	600

These values are not "standards" but rather guidelines for use in assessing the significance of contaminated land. A simplified explanation of the ABC levels: A – level implies unpolluted, B – level implies pollution present and further investigation required, C – level implies significant pollution present and cleanup (preferably back to the A – level) required.



Annex D

Trial pit logs and borehole location plan

AS-BUILT RECORD OF TRIAL PIT EXCAVATION FOR SI AT
LIGHT OIL TANK NO.2 AREA
SCALE:1:200
DATE:19-05-07
FILE:SI AREA.dwg

LEGEND:

⊕ AS-BUILT BOREHOLE LOCATION

BH-1
8939.2N
29025.0E
G.L+6.25

BH-2
8927.2N
29036.0E
G.L+6.20

-6.26

-6.26

-6.23

-6.19



PROJECT Lamma Power Station - S.I. at Light Oil Tank No.2 Area				WORKS ORDER NO. D-356	
CO-ORDINATES E 029025.00 N 008939.20		GROUND LEVEL: +6.25 mPD		LOGGED L. Zhang DATE 19.05.2007	
SAMPLES and TESTS		DEPTH (m)		FACE A: 1.20 m	
FACE B: 1.20 m		FACE C: 1.20 m		FACE D: 1.20 m	
CHECKED C. Lun DATE 22.05.2007		LEGEND GRADE		DEPTH (m)	
EXCAVATION DATES: 16.05.2007 to 19.05.2007		BACKFILL DATES: 21.05.2007 to 21.05.2007		DESCRIPTION	
Light grey, CONCRETE pavement.		0.00		0.20	
Very loose to loose, moist to wet, light yellowish brown, clayey silty sandy angular to subangular COBBLES with some boulders and fine to coarse gravel of rock, concrete and occasional refuse fragments. (FILL)		0.20		2.70	
0.40m to 0.80m: On Face A: Light grey, CONCRETE structure ?					
End of trial pit at maximum depth of 2.70 m.					
REMARKS		SECTION (not to scale)		PLAN (not to scale)	
Maximum Depth: 2.70 m Average Depth: 2.70 m					
Water Seepage: *** 1. *** 50mm water above bottom.					

DRILTECH

TRIAL PIT RECORD

CONTRACT NO. 06/8005

TRIAL PIT NO. **BH 1**

SHEET 1 of 1

- ↑ SMALL DISTURBED SAMPLE
- ↓ LARGE DISTURBED SAMPLE
- ▨ / ▨ U78 SAMPLE (VERTICAL / HORIZONTAL)
- ▨ / ▨ U100 SAMPLE (VERTICAL / HORIZONTAL)
- ▨ BLOCK SAMPLE
- ⊥ IN-SITU DENSITY TEST
- ▲ WATER SAMPLE
- ▽ WATER SEEPAGE
- ↪ N-SCHMIDT HAMMER TEST

