Agreement No. CE 53/2008 (CE)

# PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - I N V E S T I G A T I O N

Contamination Assessment Report and Remediation Action Plan for Area A
July 2010









Planning Department and Civil Engineering and Development Department

Agreement No. CE6153/20072008(CE) Planning and Engineering Study on Development of Lok Ma Chau Loop -Investigation

Contamination
Assessment Report and
Remediation Action
Plan for Area A
(CAR and RAP
for Area A)

July 2010

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party



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### 1 Introduction

### 1.1 Background

On 26 May 2009, Planning Department (PlanD) in association with Civil Engineering and Development Department (CEDD) commissioned Ove Arup & Partners Hong Kong Limited (Arup) as the Consultant for undertaking the "Planning and Engineering Study on Development of Lok Ma Chau Loop – Investigation" (the Study).

The Study commenced on 1 June 2009 and is expected to complete before end of 2011 in 28 months' time to carry out planning, environmental and engineering feasibility studies and associated site investigation works with a view to formulating land use and development proposals, confirming the feasibility of implementing the land use and development proposals, carrying out preliminary engineering design, and formulating the implementation strategies and programme for delivering the Development and Infrastructure.

Section 3.4.9.4 of the EIA Study Brief No.: ESB-201/2008 for the LMC Loop Development project dated January 2009 issued by the EPD specified that a land contamination assessment shall be undertaken and that a Contamination Assessment Plan (CAP) shall be submitted to the EPD prior to conducting the assessment.

The CAP for Area A has been prepared and submitted to EPD in July 2009. EPD indicated no further comments on the CAP for Area A in October 2009. Environmental site investigation works were carried out between 25 November 2009 and 1 February 2010.

### 1.2 Study Area

As a result of the training of the Shenzhen River, which serves as the administrative boundary between Hong Kong and Shenzhen, an area of about 87 ha, previously lying to the north of the river course, became situated to the south of the re-aligned river course and falls within the boundary of the HKSAR. The area, commonly known as the Lok Ma Chau Loop (the Loop), was used as a dumping ground for mud dredged from the river training work, some of which were contaminated.

The study area comprises the area within the LMC Loop (Area A in **Figure 1.1**) together with the adjoining area in Hong Kong (Area B in **Figure 1.1**). A separate study for the adjoining area in Shenzhen (i.e. Area C of **Figure 1.1**) has been commissioned by the Shenzhen side.

The LMC Loop is located near several major cross-boundary transport nodes including the Lok Ma Chau Control Point, the Lok Ma Chau Station of the Lok Ma Chau Spur Line and the San Tin Interchange. To the north across the Shenzhen River is the Huanggang Control Point of Shenzhen. To the southwest is the Mai Po Nature Reserve and to the northeast is Hoo Hok Wai, comprising fish ponds of high ecological value.

Site characteristics of the LMC Loop and its surrounding land uses are:

predominantly flat land with grasses and shrubs on it;

- surrounding area mainly rural in nature, comprising mostly wetland, natural landscape, hilly terrain, woodland, village settlements, agricultural land and fishponds;
- the Mai Po Nature Reserve, i.e. the Ramsar Site, is at about 5.4 km to the southwest of the Loop;
- the LMC Station of the LMC Spur Line and the LMC Spur Line Boundary Control Point (BCP) is located in close proximity to the southwest;
- across the Shenzhen River to the north is the Futian CBD of Shenzhen, where the Huanggang Station of Shenzhen Metro Line can be connected to the LMC Station via the LMC Spur Line BCP; and
- apart from the LMC Spur Line BCP, the Loop also lies in close proximity to the Lok Ma Chau BCP.

### 1.3 Objective

Land contamination impact is one of the issues to be addressed in the EIA Study. An assessment shall be conducted prior to the construction in Area A to assess any potential land contamination.

EPD indicated no further comment on the Contamination Assessment Plan (CAP) for Area A in October 2009. Site investigation works were carried out between 25 November 2009 and 1 February 2010 by Tysan Foundation Limited. This Contamination Assessment Report (CAR) and Remediation Action Plan (RAP) summarize the following issues:

- Contamination assessment program;
- Investigation procedures and methodologies;
- Analytical results of soil and groundwater samples;
- Scope of any remedial work required; and
- The particular health and safety requirement that may be required during the works.

### 1.4 Statutory Legislation and Evaluation Criteria

This CAR and RAP is prepared in accordance with the following Technical Memorandum and Guidance Notes:

- Annex 19 of the Technical Memorandum on Environmental Impact Assessment Process (TM-EIA), Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts (Section 3 : Potential Contaminated Land Issues);
- Guidance Notes for Investigation Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repairing/Dismantling Workshops, EPD, 1999;
- Guidance Notes for Contaminated Land Assessment and Remediation; and
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management, EPD, 2007.

### 2 Summary of Sampling and Testing Strategy

### 2.1 Background of Potentially Contaminated Site

Area A (i.e. former agricultural land and fish ponds in 1980s and early 1990s) was used as a dumping ground for mud extracted from Shenzhen River Training Works Stages 1 and 2. Approximately 1Mm³ contaminated mud and 3Mm³ uncontaminated mud were dredged and disposed of in Area A from year 1995 to 2000. The depth of the disposed mud in Area A was approximately 5m (i.e. include about 1m to 1.5m thick top layer of uncontaminated mud for capping). However, the disposal pattern, e.g. the disposal location and area of contaminated mud in Area A is unknown. Therefore, the entire Area A is considered as a potentially contaminated site, namely "Site A" (Figure 2.1 and Table 2.1).

Table 2.1 Potentially contaminated land use

Site ID	Location	Current Land Use	Potential Sources of Contamination	Approximate Area (m²)	Recommended No. of Boreholes
Α	Entire Lok Ma Chau Loop (Area A)	Flat land with Grasses and Shrubs	Approx. 1Mm³ contaminated mud and 3Mm³ uncontaminated mud were dredged from the Shenzhen River and disposed of in Area A from year 1995 to 2000. Total filling depth in Area A is about 5m, which include 1m to 1.5m thick top layer of uncontaminated mud for capping.	870,000 (87ha)	35

# **Chemicals of Concern**

The proposed sampling and testing schedule for the chemicals of concern (COCs) associated with potential contaminants in Area A are summarized in Table 2.2.

Table 2.2 Sampling and testing schedule

Site	Site Borehole No. Sam	Sample Type	No. of				Testing F	Testing Parameter			
9			samples	SVOCs (1) Metals (2)	Metals (2)	PCBs	Dioxins	Cyanide, free	Chlorinated Pesticides	T0C	Grain Size / Moisture Content
A	A-S01 to A-S25, and	Soil at all 3	105	>	>	>	>	>	>	>	^
0	A-SG01 to A-SG10 (Total 35)	sampling				,II			ă,		
	(20 (20)	2000					, u		6		
	A-SG01 to A-SG10	Groundwater	10	>	>	>			>	>	
	(Total 10) <sup>(4)</sup>										
	A-SG01 to A-SG10	Deepest soil	10	>	>	>			>		
	(Total 10) <sup>(4)</sup>	sample (for									
		elutriate test) (3)									

Note:

The objective of Elutriate Test is to assess any potential release of contaminants from the filled mud during excavation in Area A, if required in the future. Only 11 out of 19 SVOCs parameters are required for groundwater sample and soil elutriate test (refer to Appendix B for details)
 Only "Mercury" test is required for groundwater sample and soil elutriate test.
 The objective of Elutriate Test is to assess any potential release of contaminants from the filled mud during excavation in Area A,
 The exact borehole locations of groundwater sampling and elutriate testing are different from the proposed.

The exact borehole locations of groundwater sampling and elutriate testing are different from the proposed locations (refer to Section 3.1.3 for details)

### 2.3 Proposed Sampling Locations and Depths

The sampling locations and sampling depths proposed in the CAP for Area A are in **Table 2.3**. The proposed sampling locations are shown in **Figure 2.2**.

Table 2.3 Sampling strategy for Site A

	Locations	S	Coor	dinates	Sampling S	Strategy
Site ID	Area (m²)	Borehole No.	Easting	Northing	Termination Level for Env. Sampling (1)	Frequency of Sampling (1)
		A-S01	826297	842935		
		A-S02	826457	842866		
		A-S03	826627	842800		
		A-S04	826089	842857		
		A-S05	826256	842804		
		A-S06	826592	842698		
		A-S07	826203	842637		
		A-S08	826370	842583		
		A-S09	826538	842530		
		A-S10	826706	842476		
		A-S11	825981	842522		Drilling of borehole
			& collection of soil			
			5 mbgl	samples at the		
		A-S14	846094	842301		depths of 1.5m,
		A-S15	826263	842248		3.0m and 4.5m.
	igure 870,000 A-S17 826551 842192 A-S18 825875 842187	A-S16	826431	842194		
Α		A-S17	826551	842192		
(Figure						
2.1)	(offia)	A-S19 826042 842133				
		A-S20	0 826341 842035			
		A-S21 825696 842043				
	A-S22 825989 841966 A-S23 826156 841912					
		A-S24	825822	841887	87	
		A-S25 825944 841825				
	A-SG01 826142 843025		21 632			
		A-SG02	826423	842751		Drilling of borehole
		A-SG03	826738	842631		& collection of soil
		A-SG04	826035	842690		samples at the
		A-SG05	826317	842415		depths of 1.5m,
		A-SG06	826622	842323	5 mbgl	3.0m and 4.5m.
		A-SG07	825928	842354		One groundwater
		A-SG08	826210	842080		sample should be
		A-SG09	825821	842019		collected, if
		A-SG10	826067	841813		encountered.

Note: (1) The proposed Termination Levels and Sampling Frequency are just for reference purpose. The exact termination levels and no. of soil/ groundwater samples of each borehole should be decided by the on-site Land Contamination Specialist.

### 3 Site Investigation Works

### 3.1 Soil and Groundwater Sampling

### 3.1.1 Borehole Locations

Site investigation works were carried out by Tysan Foundation Limited between 25 November 2009 and 23 December 2009. 35 boreholes were drilled for soil and groundwater sampling in accordance with the CAP for Area A. The entire SI programme was supervised by the on-site Land Contamination Specialist. The actual locations and drilling depths are summarized in **Table 3.1**.

Table 3.1 Sampling location and drilling depths

Borehole	Proposed	Borehole in r Area A	Actual Borehole Location		Terminatio Env Sampl		Ground Level
No.	Easting	Northing	Easting Northing		Proposed	Actual	(mPD)
A-S01	826297	842935	Same a	s in CAP			5.83
A-S02	826457	842866	Same as in CAP Same as in CAP				6.22
A-S03	826627	842800	Same a	s in CAP			3.98
A-S04	826089	842857	Same a	s in CAP			6.06
A-S05	826256	842804	Same a	s in CAP			5.40
A-S06	826592	842698	Same a	s in CAP			5.15
A-S07	826203	842637	Same a	s in CAP			5.14
A-S08	826370	842583	Same a	s in CAP			5.67
A-S09	826538	842530	Same a	s in CAP			4.22
A-S10	826706	842476	Same a	s in CAP			4.63
A-S11	825981	842522	Same a	s in CAP			6.05
A-S12	826149	842469	826162	842481	]		4.42
A-S13	826485	842361	826479	842379	]		4.55
A-S14	846094	842301	Same a	s in CAP	1		5.37
A-S15	826263	842248	826246	842239	1		4.60
A-S16	826431	842194	826464	842214	1		4.55
A-S17	826551	842192	Same as in CAP		1		4.78
A-S18	825875	842187	825891 842177		5	5	5.52
A-S19	826042	842133	Same as in CAP				5.77
A-S20	826341	842035	Same a	Same as in CAP			4.57
A-S21	825696	842043	Same a	Same as in CAP			4.55
A-S22	825989	841966	Same a	Same as in CAP			4.08
A-S23	826156	841912	Same a	Same as in CAP			5.33
A-S24	825822	841887	Same a	s in CAP			3.55
A-S25	825944	841825	Same a	s in CAP	1		4.29
A-SG01	826142	843025	Same a	s in CAP			6.12
A-SG02	826423	842751		s in CAP			6.64
A-SG03	826738	842631		s in CAP			3.16
A-SG04	826035	842690	Same as	s in CAP			5.74
A-SG05	826317	842415	826367	842408			4.05
A-SG06	826622	842323	A5540-000-000-000-000-000-000-000-000-000	s in CAP			4.82
A-SG07	825928	842354		s in CAP			5.84
A-SG08	826210	842080	826180	842055		1	5.79
A-SG09	825821	842019	825827	842012			4.94
A-SG10	826067	841813		s in CAP			5.14

The as-built drawing showing the actual environmental boreholes locations is given in **Figure 3.1**.

Eight boreholes have been shifted from the original proposed locations ranged from approximately 10m to 50m due to the actual site situation and constrain, e.g. to avoid the damage of reedbed and trees. Deviation from original proposed boreholes locations are summarized in **Table 3.2**.

Table 3.2 Change of borehole locations due to site constraints

Borehole No.	Deviation from Original Location	Justification
A-S12	18m north-east of original location	Avoid damage to reedbed
A-S13	19m north-west of original location	Avoid damage to reedbed
A-S15	10m south-east of original location	Avoid damage to reedbed
A-S16	44m south-east of original location	Avoid damage to reedbed
A-S18	19m east of original location Avoid damage to forest	
A-SG05	05 50m south-east of original location Avoid damage to reedbed	
A-SG08	A-SG08 39m south-west of original location Avoid damage to banana trees	
A-SG09	A-SG09 10m south-east of original location Original proposed drilling point lowater pond	

### 3.1.2 Soil Sampling

Inspection pits from ground surface to 1.5 meter below ground level (mbgl) were excavated at each borehole location before drilling in order to determine the thickness of the top soil (i.e. Area A was capped by a layer of clean top soil after the disposal of dredged mud from Shenzhen River). The on-site observation of inspection pits indicated that the thickness of the top soil ranged approximately from 0.8mbgl to 1.5mbgl. Three U-100 undisturbed soil samples were then collected from each borehole at the depths of 1.5m (1.5-1.95mbgl), 3.0m (3.0-3.45mbgl) and 4.5m (4.5-4.95mbgl).

### 3.1.3 Groundwater Sampling

The Land Contamination Specialist also re-assigned the groundwater sampling locations as groundwater was not encountered at some of the original proposed groundwater sampling boreholes. Nevertheless, total of 10 groundwater samples were collected during the SI. The final groundwater sampling locations were relatively evenly distributed in Area A. The locations of groundwater sampling boreholes are shown in **Figure 3.1**.

The drill-rig casings were removed from the environmental drillhole after completion of soil sampling, and the drillhole could stand hollow without collapse as the depth of drillholes was relatively shallow (i.e. only 5m depth). As the drill-rig casing, core-head and other accessories have been decontaminated prior to the drilling, and dry drilling method (i.e. refer to **Section 3.1.4** for details) was used during the drilling, the on-site Contamination Specialist decided not to install the groundwater standpipe in

order to avoid the cross-contamination of groundwater due to placing the sand filter pack and bentonite seal during well installation. Well flushing is considered not required as no standpipe was installed and no sand filter pack/bentonite was used. The drillholes were then purged for approximately three times volumes of the drillholes by a Teflon bailer prior to groundwater sampling in order to collect freshly refilled groundwater samples. No free product was encountered during the groundwater sampling.

The pH level and temperature of the collected groundwater samples were insitu measured. The groundwater levels before purging were also recorded. The groundwater levels, pH and temperature of groundwater samples are summarized in **Table 3.3**.

Table 3.3	Groundwater	level nH and	temperature of co	llected aroun	dwater samples
I able o.o	Olouliuwatel	icvci. Di i alla	terriberature or co	ilicolou urouri	uwalti Janibita

Borehole No.	Groundwater Level (mbgl)	рН	Temperature (°C)
A-S02	2.50	6.32	22.4
A-S07	1.36	6.25	23.2
A-S09	3.85	6.34	21.7
A-S14	3.90	6.79	21.2
A-S16	2.82	6.73	22.0
A-S24	1.70	7.18	23.8
A-SG01	3.65	6.91	23.3
A-SG03	1.85	66.7	22.9
A-SG06	2.15	6.82	21.2
A-SG09	1.45	6.78	23.3

### 3.1.4 Decontamination Procedures

Before drilling / excavation, the sampler and all equipment in contact with the ground were thoroughly decontaminated by phosphate-free detergent between each sampling event to minimize potential cross contamination. All drilling machines were decontaminated by phosphate free detergent and high pressure hot water jet before mobilization to site. During sampling and decontamination activities, disposable latex gloves were worn to prevent the transfer of contaminants from other sources.

Moreover, dry drilling method was adopted for the entire environmental SI in order to prevent any influence of flushing medium to the soil and groundwater testing results.

### 3.2 Analytical Parameters

The collected soil and groundwater samples were analyzed for the parameters in accordance with the sampling and testing schedule shown in **Table 2.2**. The testing parameters include:

- Semi Volatile Organic Compounds (SVOCs): Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g.h.i)perylene, Benzo(k)fluoranthene, Bis-(2-Ethylhexyl)phthalate, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Hexachlorobenzene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Phenol, Pyrene
- Metals: Antimony, Arsenic, Barium, Cadmium, Chromium III, Chromium VI, Cobalt, Copper, Lead, Manganese, Mercury, Molybdenum, Nickel, Tin, Zinc
- Dioxins / PCBs: Dioxins (I-TEQ), PCBs
- · Cyanide: Cyanide, free
- **Chlorinated Pesticides:** alpha-BHC, beta-BHC & gamma-BHC, delta-BHC, p,p'-DDE, p,p'-DDD, p,p'-DDT.
- Total Organic Carbon (TOC)
- Grain Size / Moisture Content: Grain Size (% <63μm) and Moisture Content (%)

### 3.3 HOKLAS Accredited Laboratory

A testing laboratory "ALS Technichem (HK) Pty Ltd", accredited under Hong Kong Laboratory Accreditation Scheme (HOKLAS) was appointed to conduct chemical testing for the soil and groundwater samples. All laboratory testing methods were accredited by the HOKLAS or one of its Mutual Recognition Arrangement Partners, except the testing of metal "Chromium III". However, the laboratory is accredited for the testing of "Total Chromium" and "Hexavalent Chromium" (Chromium IV), and the difference of these 2 testing results is reported as the concentration of Chromium III.

### 3.4 Strata Logging

Strata logging for boreholes was undertaken during the course of drilling and sampling by qualified geologists. The logs included the general stratigraphic descriptions, depth of soil sampling, and sample notation etc.

The strata logs indicated that the site was mainly covered by "Fill" material with "Swamp Deposit" underneath. The strata logs of boreholes are given in **Appendix A**.

Of the 35 environmental investigation drillholes, a total of 10 drillholes A-S01, A-S07, A-S11, A-S16, A-S19, A-S21, A-S23, A-S24, A-SG05 and A-SG09 were further drilled down after completion of first 5m environmental drilling and soil & groundwater sampling in order to collect geotechnical information (i.e. geotechnical investigation) for assessing the geotechnical character of Area A, and water was used as "flushing medium" during the geotechnical investigation. As such, the "flushing medium" in the drillhole records of these 10 drillholes was recorded as "Air / Water". The "Remarks" of these 10 drillhole records have also stated that "Flushing medium for first 5m is air".

### 4 Assessment Criteria

The assessment criteria for the proposed testing parameters are described below:

### SVOCs, Metals, Dioxins / PCBs, Cyanide

The chemicals of concern (COCs) listed in EPD's *Guidance Manual for Use* of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management were referred to when proposing the analytical parameters of SVOCs, Metals, Dioxins / PCBs, and Cyanide. The RBRGs for soil and soil saturation limits and RBRGs for groundwater and groundwater solubility limits are given in **Appendix B**.

The RBRGs have developed four different post-restoration land uses, namely "Urban Residential", "Rural Residential", "Industrial" and "Public Parks", to reflect the actual settings which people could be exposed to contaminated soil or groundwater. Definition of post-restoration land uses are given in EPD's *Guidance Note for Contaminated Land Assessment and Remediation and RBRGs Guidance Manual*.

The planning study for the future land uses of Area A is still ongoing. At this stage, only a Preliminary Outline Development Plan (PODP) is available and the future land uses still could not be confirmed yet. For the sake of the present assessment (i.e. interpretation of the soil and groundwater testing results), the most stringent set of "Rural Residential" RBRG has been adopted for the interpretation of the soil and groundwater testing results.

### Chlorinated Pesticides

The testing results provided in the Shenzhen River Regulation Project Final EIA Study Report indicated that the total concentration of alpha-BHC, beta-BHC, gamma-BHC and delta-BHC, and the total concentration of DDE, DDD and DDT in Shenzhen River sediment were at detectable levels. Hence, testing of these 7 Chlorinated Pesticide parameters is proposed in order to determine the level of pesticide / insecticide residuals left in the filled mud of Area A. The "Intervention Value" for soil remediation published in the Netherlands Government Gazette of the 24<sup>th</sup> February 2000 was referred to establishing the assessment criteria for soil contamination. The assessment criteria of BHCs (i.e. equivalent to HCHs), DDE, DDD and DDT are summarized in **Table 4.2**. The relevant summary tables of the Intervention Value downloaded from the website of Ministry of Housing, Spatial Planning and Environment, Netherland is given in **Appendix C**.

 Table 4.2
 Assessment criteria extracted from Intervention Value for soil remediation

Contaminant	Soil Sediment (mg/kg dry weight)
DDT / DDD / DDE (total) (1)	4
BHC combined (2)	2

Note: (1) DDT / DDD / DDE is the total of DDT, DDD, DDE

(2) BHC combined is the total of alpha, beta, gamma and delta BHC.

It should be noted that Netherlands is using groundwater for potable purpose, and its stringent "Intervention Value" of groundwater is considered inappropriate in Hong Kong. Therefore, the laboratory's "Reporting Limits"

are adopted as preliminary screening goals for assessing the groundwater quality. In case elevated level of pesticide is detected (i.e. higher than the reporting limits), a site-specific screening levels would be developed to deal with that particular contaminant(s).

### • TOC, Grain Size, and Moisture Content

Testing of TOC, Grain Size and Moisture Content is mainly for information gathering.

### 5 Interpretation of Laboratory Testing Results

### 5.1 Soil Contamination

A total of 105 soil samples were collected from 35 boreholes (i.e. 3 soil samples per borehole) from 25 November 2009 to 23 December 2009. All available laboratory testing results of the soil samples have been reviewed.

The testing results indicated that nearly all the soil samples were below the value of RBRG for Rural Residential (i.e. the stringent set of RBRGs for SVOCs, Metals, Dioxins / PCBs, Cyanide) and Intervention Value (i.e. for Chlorinated Pesticides), except 6 soil samples collected from 5 boreholes. In these 6 samples, the concentration of only the metal "Arsenic (As)" marginally exceeded the RBRGs of Rural Residential and Urban Residential land uses. The laboratory testing results exceeding the RBRGs are given in **Table 5.1** and those for all soil samples are detailed in **Appendix D**. The laboratory testing reports are given in **Appendix H**. The locations of the 5 concerned boreholes are shown in **Figure 5.1**.

Table 5.1 Summary of soil samples exceeding RBRGs

Borehole No.	Depth of Soil Sampling (mbgl)	Contaminant	Concentration (mg/kg dry soil)	RBRGs of Arsenic (mg/kg dry soil)
A CO1	3.0 – 3.45	Arsenic	22.2	
A-S01	4.5 – 4.95	Arsenic	24.0	Rural Residential RBRG : 21.8
A-S03	3.0 – 3.45	Arsenic	26.8	Urban Residential RBRG : 22.1
A-S20	3.0 – 3.45	Arsenic	23.0	Public Parks RBRG : 73.5
A-S24	3.0 – 3.45	Arsenic	27.7	Industrial RBRG : 196
A-SG10	4.5 – 4.95	Arsenic	27.3	

### 5.1.1 Additional Soil Sampling and Testing

In order to further ascertain the extent of contamination at these 5 locations, 3 additional boreholes near each of the 5 contaminated boreholes were drilled (i.e. total 15 additional boreholes were drilled) from 26 January 2010 to 1 February 2010 for additional soil sampling and testing. The locations of the additional boreholes were chosen roughly mid-way between the contaminated boreholes and their respective adjacent boreholes, as shown in **Figure 5.2** and depicted in **Figures 5.2.1** to **5.2.5**.

The same soil sampling strategy was adopted, in which three U-100 undisturbed soil samples were collected from each additional borehole at the depths of 1.5m (1.5-1.95mbgl), 3.0m (3.0-3.45mbgl) and 4.5m (4.5-4.95mbgl). The soil samples collected from the additional boreholes were tested for metals in order to further define the extent of arsenic contamination. The laboratory testing results of the additional soil samples show compliance with the RBRG for Rural Residential (i.e. the stringent set of RBRGs). The testing results of the additional soil samples are detailed in **Appendix E**, and the laboratory testing reports are given in **Appendix I**.

The estimation of the quantity of contaminated soils is given in **Section 6**. It is Government policy that soils containing contaminants in exceedance of the RBRGs should be remediated. Details of the soil remediation method and the disposal criteria of the contaminated soils are described in **Section 7**.

### 5.2 Groundwater Contamination

Groundwater samples were taken from 10 boreholes as shown in **Figure 3.1**. The testing results indicated that none of the groundwater samples exceeded the RBRG levels for Rural Residential land use (i.e. the stringent set of RBRGs). Chlorinated Pesticides were not detected in the groundwater samples. The analytical results of all groundwater samples are presented in **Appendix F**. The laboratory testing reports are given in **Appendix H**.

### 5.3 Elutriate Test

The objective of Elutriate Test is to assess any potential release of contaminants from the filled mud during excavation, if required, in Area A.

Elutriate test was conducted for the deepest soil samples (i.e. 4.5mbgl) collected from 10 boreholes of groundwater sampling as shown in **Figure 3.1**. The testing results indicated that the potential of contaminants releasing from the filled mud during excavation was insignificant as only non-detected levels of contaminants were recorded in all 10 soil samples. The analytical results of all elutriate soil samples are presented in **Appendix G**. The laboratory testing reports are given in **Appendix H**.

### 6 Possible Soil Contamination Extent

### 6.1 Estimation of Possible Soil Contamination Extent

The possible extent of contamination was estimated based on the results from the SI works. The estimation made the best use of available information to delineate the possible vertical and horizontal extents of soil contamination present at the site and would be used for preliminarily appraising any soil remediation needed in connection with the development of the Loop. Nevertheless, the deduced volume based on the possible vertical and horizontal extents should only be seen as a first estimation to indicate a conservative order of quantity for reference. The actual extent of contamination requiring remediation would be subject to confirmation by further environmental investigation boreholes before the commencement of remediation works on site.

### 6.1.1 Estimation of the Horizontal Extent of Contamination

With reference to **Figures 5.2.1** to **5.2.5**, the areas of horizontal contamination extent is estimated by the curvilinear area formed by taking the contaminated borehole at the centre and the boundary joining the adjacent additional boreholes (i.e. which reveal no contamination), or along site boundary (i.e. Shenzhen meander). A software called "MicroStation" (i.e. common graphical software similar to "AutoCad") was used to draw the curvilinear plan area in which the horizontal extent of contamination lies. The areas so automatically computed by the software present a first estimation on the conservative side. It should be noted that the plan areas in which the horizontal contamination extents lie are subject to further investigation before commencing remediation works on site.

It should be noted that the 5 contaminated boreholes only marginally exceeded the RBRG (i.e. testing results of arsenic 22.2-27.7mg/L against the respective Rural Residential RBRG 21.8mg/L), and this estimation is considered conservative. As the estimated quantity of contaminated soil is highly sensitive to how the plan area (in which the actual horizontal extent of contamination lies) is estimated in the preceding paragraph, the Project Proponent should conduct further investigation to confirm the actual horizontal extent of contamination prior to the commencement of remediation works on site in order to avoid over-remediation (Refer to **Section 6.2.2** for details).

### 6.1.2 Estimation of Vertical Extent of Contamination

For such sample with contaminated laboratory testing results, the full depth of soil sampling is taken as contaminated. Besides, a depth of 0.5m above and below that sampling depth respectively will be taken as contaminated as a conservative estimate. For example, for the sampling depth of 3.0–3.5mgbl with contaminated laboratory testing finding, the vertical extent of contamination will be estimated from 2.5mgbl (i.e. 3mbgl - 0.5m) to 4mbgl (i.e. 3.5mbgl + 0.5m), and the vertical extent of contamination is therefore estimated as 1.5m.

### 6.1.3 Conservative Estimation of Contaminated Soil Quantity

Based on the above conservative approach, an estimate of the quantity order of contaminated soil is summarized in **Tables 6.1**. The extents of 5 estimated plan areas in which the contaminated zones lie are depicted in **Figure 6.1** and **Figures 6.1.1** to **6.1.5**. It should be noted that this first estimation of a conservative order of contaminated soil quantity is subject to variation after the completion of further investigation to confirm the horizontal extent of contamination before commencing the remediation works on site.

Table 6.1 Estimation of the order of quantity of contaminated soil by conservative approach

Contaminated Borehole (Contaminated Zone ID)	Additional Borehole ID	Distance from Contaminated Borehole to the Additional Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Plan Area in which Contaminated Area Lies (m²)	Estimated of Order of Quantity of Contaminated Materials (m³)
	A-S01a	90			
A-S01	A-S01b	69	3.0 (2.5m-5.5m)	18,519	55,557
	A-S01c	87			
	A-S03a	91			
A-S03	A-S03b	54	1.5 (2.5m-4.0m)	12,684	19,026
	A-S03c	102			
	A-S20a	96			
A-S20	A-S20b	112	1.5 (2.5m-4.0m)	26,131	39,197
	A-S20c	82			
	A-S24a	63			
A-S24	A-S24b	92	1.5 (2.5m-4.0m)	14,361	21,542
	A-S24c	68			
	A-SG10a	62			
A-SG10	A-SG10b	86	1.5 (4.0m-5.5m)	12,749	19,124
	A-SG10c	67			
			Total (2):	84,444	154,446

Note (1) The "Estimated Plan Area in which the Horizontal Contaminated Area (m²) Lies" was computed by a software call "MicroStation". (i.e. common graphical software similar to "AutoCad")

### 6.2 Remediation Strategy

### 6.2.1 Proposed Remediation

The planning study for the future land uses of Area A is ongoing. However, based on the most updated planning information (i.e. the Preliminary Outline Development Plan, PODP), the 5 contaminated zones are either within the land uses of "Public Park" or "Industrial" under RBRGs as summarized in **Table 6.2** though such planned land uses may still need to be confirmed after the present assessment.

Table 6.2 Possible future land uses of the contaminated zones

Contaminated Zone	Proposed Future Land Uses	Corresponding RBRGs	Exceed the Corresponding RBRGs
A-S01	Public Transport Interchange     Commercial Building	Industrial     Public Park	No
A-S03	Sewage Treatment Works	<ul> <li>Industrial</li> </ul>	No
A-S20	Flood Retention Ponds     Reedbed Compensation Area	Public Park     Public Park	No

<sup>(2)</sup> The data presented based on the conservative approach are subject to variation after the completion of further investigation to confirm the actual horizontal extent of contamination (Refer to Sections 6.1.1, 6.1.3 and 6.2.2 for details).

Contaminated Zone	Proposed Future Land Uses	Corresponding RBRGs	Exceed the Corresponding RBRGs
A-S24	District Cooling System	<ul> <li>Industrial</li> </ul>	No
A-SG10	Flood Retention Ponds     Reedbed Compensation Area	Public Park     Public Park	No

Although the testing results do not exceed the corresponding RBRGs based on the proposed land uses in the current PODP, excavation is not unexpected at the 5 contaminated zones for the proposed future land uses during the construction stage. The chance of construction workers and other site staff having contact with the contaminated soil cannot be ruled out. In view of the safety concerns about human contact with the contaminated soil, it is recommended to remediate all the contaminated soil within the confirmed horizontal extent as determined in **Section 6.2.2** below. The proposed remediation allows higher flexibility in proposed land uses as an added advantage.

Details of the soil remediation method of the contaminated soils are described in **Section 7**. As the remediated soil would be fully reused within Area A and off-site disposal or reuse of the remediated soil is not allowed (i.e. refer to **Section 7** for details), the full scale remediation would not increase the disposal loading of the landfill sites or other disposal sites.

# **6.2.2 Further Investigation in Horizontal Extent of Contamination**

As mentioned in **Section 6.1.1**, the deduced quantity of contaminated soil highly depends on how the horizontal contamination extent is assumed with limited test results. Therefore, the Project Proponent should conduct further investigation to confirm the horizontal extent of contamination prior to the commencement of remediation work so as to minimize the over-remediation of uncontaminated soil.

The further investigation should include the drilling of new boreholes at such locations between the contaminated boreholes and their respective adjacent additional uncontaminated boreholes within the possible plan area conservatively identified in **Section 6.1.1** so as to confirm the horizontal extent of contamination. Soil samples should be collected in the new boreholes at the respective depths of contamination detected in the 5 contaminated boreholes, and tested for Arsenic. The further investigation should be conducted strictly in compliance with the technical procedures in the approved Contamination Assessment Plan (CAP for Area A) such as dry drilling of boreholes, decontamination requirements, soil sampling procedures and the analytical methodologies etc.

The quantity of contaminated soil should be comprehensively updated based on the further investigation results which should be submitted to EPD for approval/agreement prior to the commencement of remediation work.

### 7 Remediation Action Plan

### 7.1 Objective

This section presents possible remediation proposals and recommends appropriate remediation actions for the contaminated areas found.

The objectives of the Remediation Action Plan (RAP) are as follows:

- To propose remediation method(s) for the soil contamination;
- To propose a mean to confirm completed excavation of contaminated soil; and
- To provide guidelines regarding the handling and/or disposal of contaminated soil.

### 7.2 Potential Remediation Methods

### 7.2.1 Selection Criteria

Soil remediation options applicable to the contaminated areas in Area A were addressed based on the followings:

- Technical and cost effectiveness;
- Technology development status;
- Environmental benefits and disbenefits;
- Commercial availability;
- Experience; and
- Expertise requirement.

### 7.2.2 Available Soil Remediation Methods

A number of soil remediation technologies considered suitable for the nature of contaminant (i.e. metal "arsenic") found in Area A are selected for detailed examination. The applicability and limitations of the candidate treatment technologies are detail in **Table 7.1**.

In assisting the formulation of appropriate remedial measures, the following factors suggested in the Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshops issued by EPD would also be taken into consideration when evaluating different available remediation methods:

- Degree and extent of the contamination;
- Anticipated future use of the site;
- Nature of the contaminants;
- Soil characteristics; and
- Time available for remediation.

Table 7.1 List of possible soil remediation methods for metal contaminated soil

			HAMANA AND AND AND AND AND AND AND AND AND
Remediation Option	Descriptions	Applicability / Environmental Benefits	Limitations / Environmental Disbenefits
Solidification / Stabilization	Ex-situ immobilization technique treating	Applicable to clean-up inorganic contaminants such as heavy metals	The effectiveness reduces with the presence of organic
	contaminated soil by mixing soil with binding agents, e.g. cement so as to physically bind contaminants into stable mass.	<ul> <li>Solidification/stabilization are used on certain contaminated sites in Hong Kong and successfully demonstrated treatment method for inorganic contaminated soil, e.g. decontamination works at the Cheoy Lee Shipyard at Penny's Bay, reclamation works at North Tsing Yi Shipyard site and few isolated sites identified in the Deep Bay Link project.</li> </ul>	<ul> <li>Large boulders may hinder the mixing process. Soil sorting is necessary prior to the treatment taken place.</li> </ul>
Soil Washing	An Ex-situ soil separation method primarily based on mineral processing techniques. A water-based process for scrubbing soils ex-situ to remove contaminants.	Applicable to clean inorganic contaminants such as heavy metals from coarse-grained soils.	<ul> <li>Effectiveness of treatment dependent on soil coarseness.         Fine soil particles may require addition of polymer for removal of contaminant by the washing fluid.</li> <li>Complex waste mixtures make formulating washing fluid difficult.</li> <li>Further treatment and disposal for residuals required.</li> </ul>
Electrokinetic Separation	This in-situ method uses electrochemical and electrokinetic processes to desorb and remove metals and polar organics from soil. Low intensity direct current is applied to the soil to mobilize the charged species.	Applicable to treat soil with low permeability and heavily confaminated with metals.	<ul> <li>Effectiveness dependent on moisture content of soil and decreases with moisture content less than 10%.</li> <li>Require further treatment for removal of desorbed contaminants and thus increase cost of remediation.</li> <li>Variability of electrical conductivity in soil may be induced by presence of anomalies such as large gravels and insulating material. This may reduce treatment effectiveness.</li> </ul>
Excavation and Landfill Disposal	Ex-situ method whereby contaminants are removed by excavation of the contaminated soil and direct disposal to landfill	<ul> <li>Most simple and quickest way to dispose of large volume of contaminated soil</li> <li>Contamination is removed definitely</li> <li>Higher certainty of success</li> <li>Wide experience in Hong Kong</li> <li>Applicable to all waste or mixture that meet land disposal restriction treatment standards.</li> <li>Common practice for shallow, highly-contaminated soils.</li> </ul>	<ul> <li>Pre-freatment may be required for contaminated soil to meet landfill disposal criteria</li> <li>Landfill space limited and valuable.</li> <li>Indirect costs to the landfill management on monitoring and maintenance.</li> <li>Potential long-term liabilities to landfill</li> <li>Need large volume of clean backfill materials</li> <li>No access to the working site until completion of backfilling</li> <li>Least desirable management option.</li> </ul>

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### 7.3 Nature of Arsenic

Arsenic is a naturally occurring element that is widely distributed in the Earth's crust. Arsenic is classified chemically as a metalloid, having both properties of a metal and a nonmetal; however, it is frequently referred to as a metal. Elemental arsenic (sometimes referred to as metallic arsenic) is a steel grey solid material. However, arsenic is usually found in the environment combined with other elements such as oxygen, chlorine, and sulfur. Arsenic combined with these elements is called inorganic arsenic. Arsenic combined with carbon and hydrogen is referred to as organic arsenic.

Most inorganic and organic arsenic compounds are white or colorless powders that do not evaporate. They have no smell, and most have no special taste. Many arsenic compounds sorb strongly to soils and are therefore transported only over short distance in groundwater and surface water.

In the past, inorganic arsenic compounds were predominantly used as pesticides. Nevertheless, Inorganic arsenic compounds can no longer be used in agriculture. Organic arsenic compounds are still used as pesticides. Some organic arsenic compounds are also used as additives in animal feed. Small quantities of elemental arsenic are added to other metals to form metal mixtures or alloys with improved properties. The greatest use of arsenic in alloys is in lead-acid batteries for automobiles. Another important use of arsenic compounds is in semiconductors and light-emitting diodes.

Arsenic was also widely used as a preservative for wood to make it resistant to rotting and decay. The preservative is copper chromated arsenate (CCA) and the treated wood is referred to as "pressure-treated." Nevertheless, this preservative had been phased out in many developed countries, such as U.S. in year 2003.

### 7.4 Proposed Remediation Method

Considering the cost effectiveness and applicability of different remediation methods listed in **Table 7.1**, "Excavation" followed by "Solidification/Stabilization" are regarded as the most practical and cost-effective method to remediate the arsenic contaminated soil.

### 7.4.1 Solidification/Stabilization

Solidification/Stabilization (S/S) is an immobilisation technique applicable to the treatment of soil contaminated with inorganic contaminants such as metals. By mixing contaminated soil with binders such as Portland cement or lime, the metal contaminants in soil become physically bound within a stable mass. The solid monolithic block is extremely resistant to the leaching of inorganic contaminants. Additives such as phosphate or sulfur reagents could also be added not only to reduce the setting or curing time and leachability of contaminants, but also to assist in chemically binding the contaminants in a matrix that typically shows unconfined compressive strengths similar to a soil-cement mix.

Beside several local successful case studies as listed in **Table 7.1**, other overseas case studies, as stipulated in "Solidification/Stabilization Use at

Superfund Sites" published by U.S. Environmental Protection Agency's Technology Innovation Office under EPA Contract Number 68-W-99-003 (<a href="http://www.clu-in.org/s.focus/c/pub/i/611/">http://www.clu-in.org/s.focus/c/pub/i/611/</a>), also reveals that inorganic contaminants in USEPA superfund remedial sites could be successfully treated by S/S method.

Another technical document "Arsenic Treatment Technologies for Soil, Waste, and Water" published by U.S. Environmental Protection Agency's Technology Innovation Office under EPA Contract Numbers 68-W-99-003 and 68-W-02-034"

(<u>http://www.clu-in.org/download/remed/542r02004/arsenic report.pdf)</u> also indicates that S/S method has been widely applied for treating the arsenic-contaminated soil and was the most common remediation method for arsenic-contaminated soil.

The recommended remediation method as discussed above is summarized in **Table 7.2**. The design and operation of the recommended remediation method is presented in the outline process in the following sections.

Table 7.2 Recommended remediation method for arsenic-contaminated soil

Soil Contaminant	Remediation Method	Justification
Arsenic	Excavation followed by	Well developed technology with operation experience in Hong Kong     Higher certainty of success
	Solidification/Stabilization.	Simple operation without necessity of further treatment
		Cost effective
		Treated soil is acceptable to be reused as backf

### 7.5 Outline Process and Operation of Remediation

### 7.5.1 Excavation

Detailed design drawings for planned excavations in the indicated areas should be prepared by the Remediation Contractor. Factors such as excavation areas and depths, engineering properties and stability of the soils should be considered for safe working conditions. The excavations should be designed in accordance with the geotechnical properties of the soils and appropriate safety factors as determined by the Engineer. The excavated areas should be set out by an appropriate qualified and licensed land surveyor. Proposed contaminated zones requiring excavation are shown in **Figures 6.1.1** to **6.1.5** respectively. It should be noted that the horizontal extent of contaminated zones within the estimated plan areas is subject to further investigation as detailed in **Sections 6.1.1** and **6.2.2**.

The excavation sequence would be as follows:

- At each location as set out by the surveyor, the clean top soil above the identified contamination depth would be excavated and transferred to a designated area for stockpiling.
- After the clean top soil is removed, the contaminated soil at the identified contamination depth would be excavated and transferred to a designated

area for treatment. The contaminated soil should be on heavy-duty impermeable sheeting within the soil treatment area.

- Both the stockpiles of clean top soil and contaminated soil should be fully covered by impermeable sheeting to prevent dust emission and runoff.
- Any free product (if encountered) during excavation should be recovered and drummed properly and collected by licensed chemical waste collector for proper handling and treatment.
- Closure Assessment (i.e. refer to **Section 8.5.2**) should be undertaken to confirm the closure/completion for the excavation work.
- Backfill the excavation with suitable imported or reworked site materials.

### 7.5.2 Closure Assessment

The objective of closure assessment is to determine if all contaminated soil has been excavated before backfilling takes place.

Following excavation and prior to the backfilling, confirmatory sampling and analysis should be carried out at the limits/sidewalls and base of the excavations to confirm that all the contaminated soil has been excavated.

As the contaminated areas are relatively large (i.e. over 1,000m<sup>2</sup> in size), confirmation samples should be collected from sidewalls of the excavation with a lateral spacing of not more than 15m. The depth of sidewall samples should be at the depth where the contamination was identified. Confirmation samples from the bottom of excavation areas should be collected on grid spacing not larger than 15m x 15m (i.e. one sample per approximately every 225m<sup>2</sup>).

The collected confirmation soil samples should be analysed for the defined contaminant (arsenic). If the analytical results exceed the Rural Residential RBRG, additional soil samples should be excavated in 0.5m increments vertically and 7.5m in horizontal increments depending on whether the exceeding confirmation sample is collected from a sidewall or excavation base. Additional samples should be collected and analysed until all confirmation samples are below the Rural Residential RBRG. If the analytical results are below the Rural Residential RBRG, removal of contaminated soil should be considered complete and the open excavations then backfilled with suitable imported or reworked site materials.

All construction activities should be carried out by persons appropriately trained in health and safety and appropriated personal protective equipment should be used by the person engaged in decontamination activities. The following guidelines of health and safety should be strictly followed by all site personal working on the contaminated areas at all times:

- Temporary fencing or warning ribbons should be provided to the boundary of excavation, slope crest and temporarily stockpiled areas.
   Where necessary, the exposed areas should be temporarily covered with impermeable sheeting during heavy rainstorm.
- Workers are required to wear appropriate protective clothing and safety equipment.

- Smoking, eating and drinking are strictly prohibited.
- Relevant occupational health and safety regulations and guidelines during excavation should be observed.

The excavation and confirmatory sampling works should be supervised by a qualified Land Contamination Specialist. Subsequent construction activities could only be carried out after closure assessment or remediation at the subject site is completed as agreed by the Land Contamination Specialist.

### 7.5.3 Solidification/Stabilization (S/S)

A treatment area should be confined for carrying out the S/S mixing and temporary soil stockpile. Prior to solidification, the contaminated soils should be screened to segregate soil from debris, rock fragments and other materials and to break soil clumps into sizes allow effective mixing solidifying agents.

During the S/S process, Ordinary Portland Cement (OPC) (or other equivalent), water and/or other additive(s) (such as fly ash, lime and soluble silicates etc) should be added to the contaminated soils to form a solid matrix. Uniform mixing of contaminated soils, cement, water and other additives(s) should be undertaken within a pugmill, lorry mixer or equivalent at the designated treatment area to minimise the potential leaching during solidification process. Detail S/S method statements, include but not limit to the proposed solidify agents and additives, mixing ratio, mixing equipment, and mixing trial test proposal etc should be prepared by the Remediation Contractor and verified and approved by the Land Contamination Specialist prior to the commencement of S/S treatment.

The total volume of the concrete blocks could be increased by up to 10% from the original soil volume. The solidified blocks should be of suitable size to allow easy handling and transporting, and large blocks should be broken up into smaller size for transportation.

The soil mixture in the concrete blocks would be solidified within about 1 week. After setting, the samples of the blocks should be collected for testing to confirm if the contaminated materials meet the:

- (i) Toxicity Characteristic Leaching Procedure (TCLP) Test; and
- (ii) Unconfined Compressive Strength (UCS) Test.

which indicate the achievement of the stabilization targets.

# 7.5.4 Toxicity Characteristic Leaching Procedure (TCLP) Test

The sampling frequency for the TCLP test should be 1 TCLP sample per 100m³ of broken up hardened mixture after S/S treatment. Each TCLP sample should be a composite sample collected at 5 locations throughout the 100m³ broken up hardened mixture. Same volume of sample should be collected at each of the 5 locations in order to facilitate unbiased sample compositing.

Any hardened samples to be submitted to laboratory for TCLP analysis should be broken up to small pieces with maximum diameter of 10cm. The sample preparation method of USEPA Method 1311 will be followed for the

TCLP analysis. It is specified in USEPA Method 1311 that the maximum grain size of samples to be analysed is 1cm. As such, the samples should be further broken up in the laboratory prior to TCLP analysis.

TCLP tests should be conducted in accordance with USEPA Method 1311 and USEPA Method 6020 for metal arsenic. The EPD's TCLP limits as specified in EPD's Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repairing/Dismantling Workshops are standard leachability test standards. However, this set of standards is only applicable to disposal to landfill. For on-site reuse, these standards are not applicable.

"Universal Treatment Standards" (UTS) could be used for interpretation of the TCLP testing results in this Study. The UTS were derived from the performance of the Best Demonstrated Available Technologies (BDAT) for treating most prohibited hazardous wastes and were adopted in pervious local land contamination studies e.g. decontamination works at the Cheoy Lee Shipyard at Penny's Bay and reclamation works at North Tsing Yi Shipyard site. The UTS for the metal arsenic is given in **Table 7.3**.

Table 7.3 Universal Treatment Standards (UTS) for metal arsenic

Parameter	Universal Treatment Standard (1)
Arsenic	5 mg/L as TCLP

Note: (1) Reference to Universal Treatment Standards (UTS) of U.S. Resource Conservation and Recovery Act (RCRA) in Title 40 of the Codes of Federal Regulations (CFR) Parts 268.

Any pile of broken up solidified mixture that does not meet the UTS of arsenic should be crushed and re-treated by S/S. The re-treated pile should be tested again for TCLP to confirm if it could be reused on site.

### 7.5.5 Unconfined Compressive Strength (UCS)

The treated material should be allowed to set to achieve the Unconfined Compressive Strength (UCS) of not less than 1mPa with reference to the USEPA guideline (1986) — Handbook of Stabilization / Solidification of Hazardous Wastes, EPA/540/2-86-00. The test procedure of UCS test should be based on BS 1377 - Methods of test for soils for civil engineering purposes.

### 7.5.6 Handling of Treated Material

Upon completion of the leachability testing and meeting the UTS and the UCS requirements, the solidified materials should be fully reused on site as backfilling or stockpiled for future reuse. As the maximum grain size of filling material is 250mm (i.e. according to the general practice), the solidified soil should be broken down to below this size before being used as filling materials. The solidified material for reuse as filling materials should be put below at least 1m of clean fill layer. Off-site disposal or reuse of the solidified material is not allowed.

### 7.6 Mitigation Measures and Safety Measures

### 7.6.1 Environmental Mitigation Measure

In order to minimise the potentially environmental impacts arising from the handling of contaminated materials, the following environmental mitigation measures are recommended during the course of the site remediation:

### **Excavation and Transportation**

- Excavation profiles must be properly designed and executed with attention to the relevant requirements for environment, health and safety;
- In case the soil to be excavated is situated beneath the groundwater table, it may be necessary to lower the groundwater table by installing well points or similar means;
- Excavation should be carried out during dry season as far as possible to minimise contaminated runoff from contaminated soils;
- Stockpiling site(s) should be lined with impermeable sheeting and bunded. Stockpiles should be properly covered by impermeable sheeting to reduce dust emission during dry season or contaminated run-off during rainy season. Watering should be avoided on stockpiles of contaminated soil to minimise contaminated runoff;
- Supply of suitable clean backfill material after excavation, if require;
- Vehicles containing any excavated materials should be suitably covered to limit potential dust emissions or contaminated run-off, and truck bodies and tailgates should be sealed to prevent any discharge during transport or during wet season;
- Speed control for the trucks carrying contaminated materials should be enforced; and
- Vehicle wheel washing facilities at the site's exit points should be established and used.

### Solidification / Stabilization

- The loading, unloading, handling, transfer or storage of cement should be carried out in an enclosed system;
- Mixing process and other associated material handling activities should be properly scheduled to minimise potential noise impact and dust emission;
- The mixing facilities should be sited as far apart as practicable from the nearby noise sensitive receivers;
- Mixing of contaminated soil and cement / water / other additive(s) should be undertaken at a solidification plant to minimise the potential for leaching;
- Runoff from the solidification / stabilization area should be prevented by constructing a concrete bund along the perimeter of the solidification / stabilization area;

- If stockpile of treated soil is required, the stockpiling site(s) should be lined with impermeable sheeting and bunded. Stockpiles should be properly covered by impermeable sheeting to reduce dust emission during dry season or site run-off during rainy season; and
- If necessary, there should be clear and separated areas for stockpiling of untreated and treated materials.

### 7.6.2 Safety Measures

In order to minimize the potential adverse effects on health and safety of construction workers during the course of site remediation, the Occupation Safety and Health Ordinance (OSHO) (Charter 509) and its subsidiary Regulations should be followed by all site personnel working on the site at all times. In addition, basic health and safety measures should be implemented, including but not limited to the followings:

- Set up a list of safety measures for site workers;
- Provide written information and training on safety for site workers;
- Keep a log-book and plan showing the contaminated zones and clean zones;
- Maintain a hygienic working environment;
- Avoid dust generation;
- Provide face and respiratory protection gear to site workers if necessary;
- Provide personal protective clothing (e.g. chemical resistant jackboot, liquid tight gloves) to site workers if necessary;
- Provide first aid training and materials to site worker;
- Bulk earth moving equipment should be utilized as much as possible to minimize workers' handling and contact of the contaminated materials; and
- Eating, drinking and smoking should not be allowed in contaminated areas to avoid inadvertent ingestion of contaminant.

### 7.7 Remediation Report

Remediation Report (RR) for identified contaminated zones upon completion of remediation should be prepared by the Land Contamination Specialist to report the remediation process and demonstrate that contaminated soil are all removed, properly handled, decontaminated and reinstated. All relevant information, including details of closure assessment and photographical records, should be included in the RR. The RR should be submitted to EPD for record and agreement prior to the commencement of any construction works.

### 8 Conclusion and Recommendation

Site investigation works involving sampling and testing of soil and groundwater were conducted from 25 November 2009 to 1 February 2010 with reference to the CAP for Area A that EPD indicated no further comment in October 2009. This CAR/RAP presents the findings together with necessary remediation actions.

A total of 105 soil samples were collected from 35 boreholes (i.e. 3 soil samples per borehole) from 25 November 2009 to 23 December 2009. 6 soil samples collected from 5 boreholes, in which the concentration of the metal "Arsenic (As)" marginally exceeded the Rural Residential RBRG.

3 additional boreholes near each of the 5 contaminated boreholes were drilled (i.e. total 15 additional boreholes were drilled) from 26 January 2010 to 1 February 2010 for additional soil sampling and testing. The soil samples collected from the additional boreholes were tested for metals in order to define the extent of arsenic contamination. The testing results of the additional soil samples showed compliance with the RBRG for Rural Residential (i.e. the stringent set of RBRGs). Based on the entire plan are in which the horizontal extent of contamination lies, the quantity of arsenic-contaminated soil was estimated to be approximately 154,446m³ representing only a conservative order of quantity for reference at this stage. It should be noted that further investigation to ascertain the horizontal extent of contamination should be conducted prior to the commencement of remediation work in order to minimize over-remediation of uncontaminated soil.

10 groundwater samples were collected and tested. The testing results indicated that none of the groundwater samples exceeded the RBRGs levels for Rural Residential land use. Chlorinated Pesticides were not detected in the groundwater samples. Remediation of groundwater is not required.

Elutriate test was conducted for the deepest soil samples (i.e. 4.5mbgl) collected from 10 boreholes of groundwater sampling The testing results indicated that the potential of contaminants releasing from the filled mud during excavation was insignificant as only non-detected levels of contaminants were recorded in all 10 soil samples.

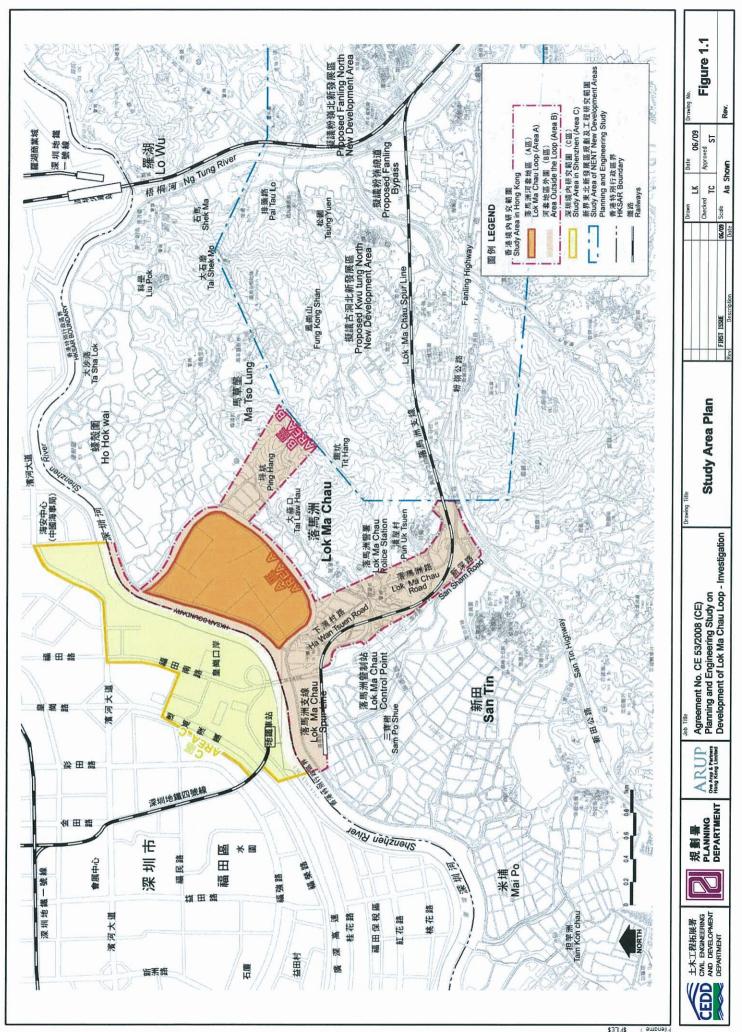
After review of various remediation methods, "Solidification/Stabilization" (S/S) treatment method was proposed for the remediation of arsenic-contaminated soil. Toxicity Characteristic Leaching Procedure (TCLP) test should be undertaken after S/S in order to ensure that the contaminant will not leach to the environment. Unconfined Compressive Strength (UCS) test should be conducted, and not less than 1mPa should be met prior to the backfilling or stockpiled for future reuse within the study area. Off-site disposal or reuse of the solidified material is not allowed.

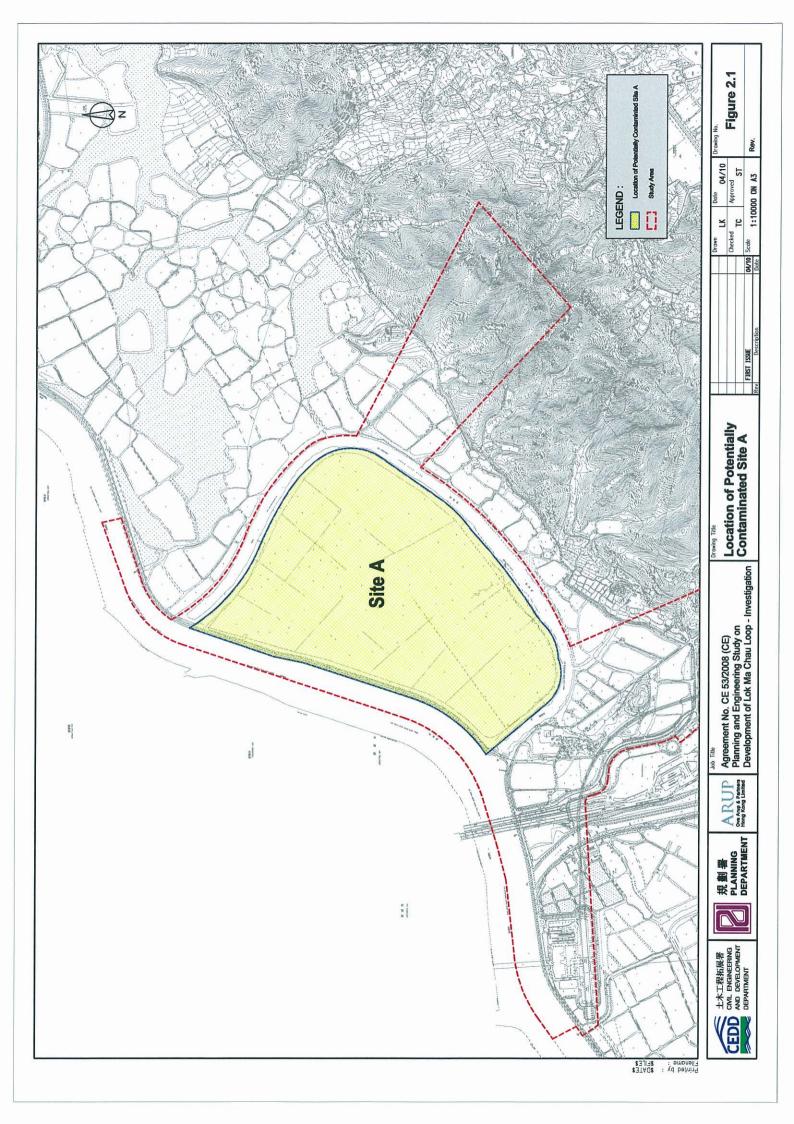
For complete removal of contaminated soil, a closure assessment in the form of confirmatory test should be conducted after excavation to confirm complete clean-up of the contaminated zones/concerned areas. A Remediation Report (RR) should be submitted to EPD for agreement upon completion of all remediation works.

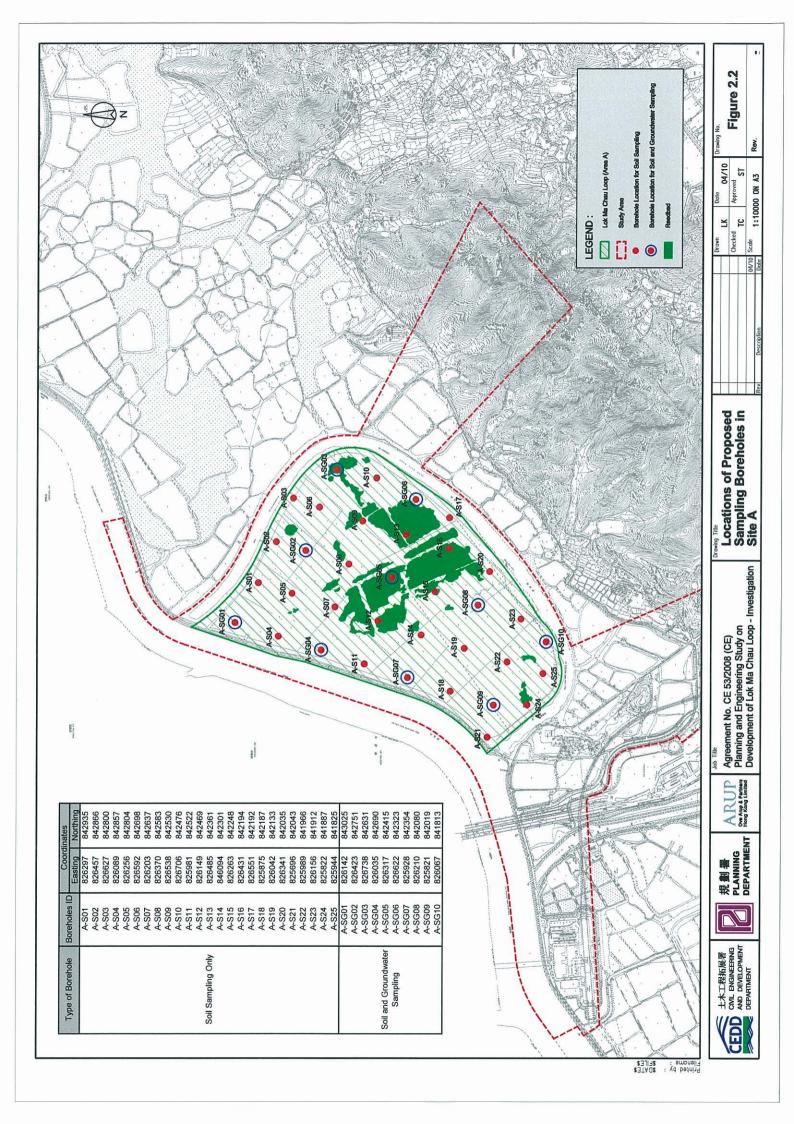
Agreement No. CE53/2008(CE)
Planning and Engineering Study on
Development of Lok Ma Chau Loop – Investigation
Contamination Assessment Report and Remediation Action Plan for Area A

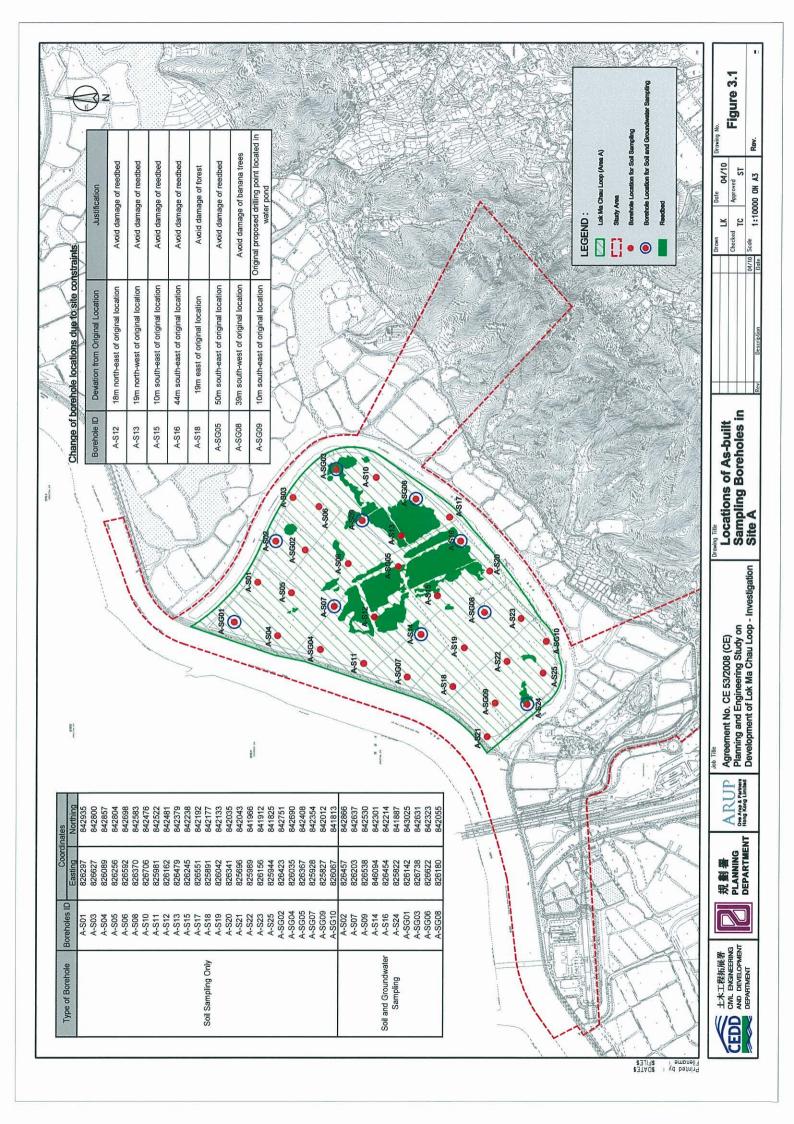
Appropriate environmental mitigation measures have been proposed to minimize the potential environmental impacts of the remediation activities. Health and safety measures should be followed to minimize safety hazard posed to site workers.

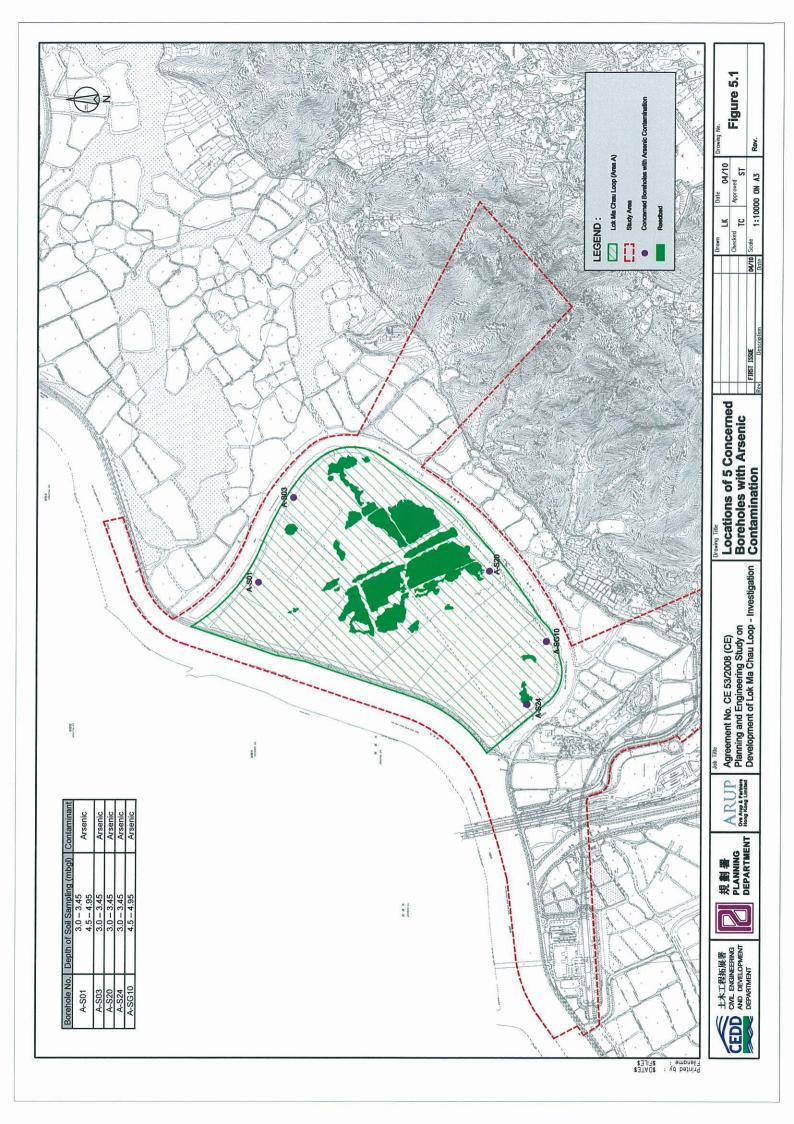
# Figures

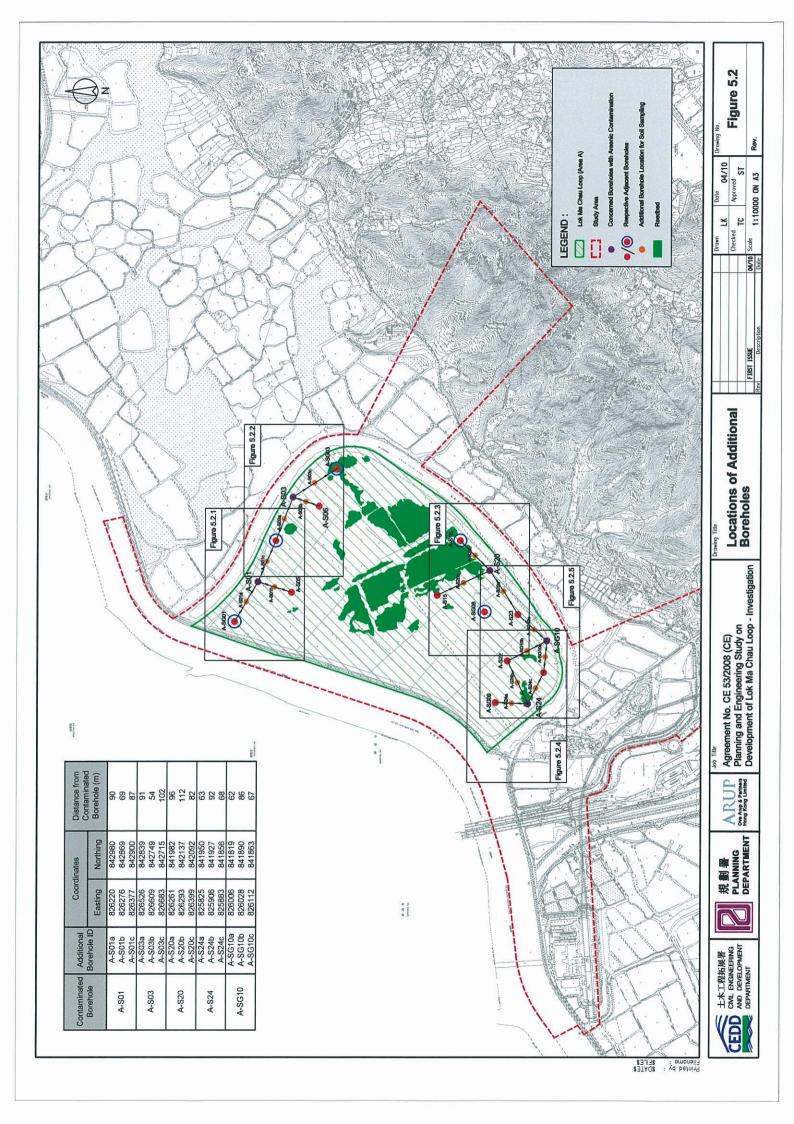


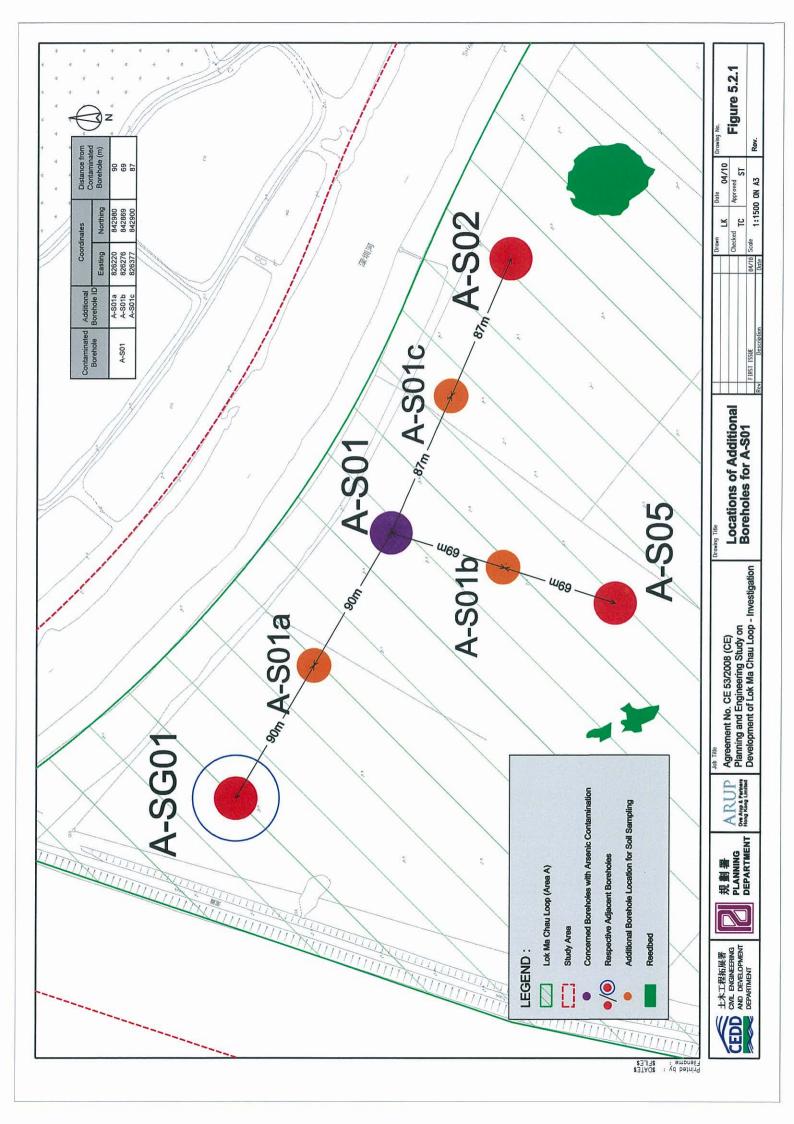


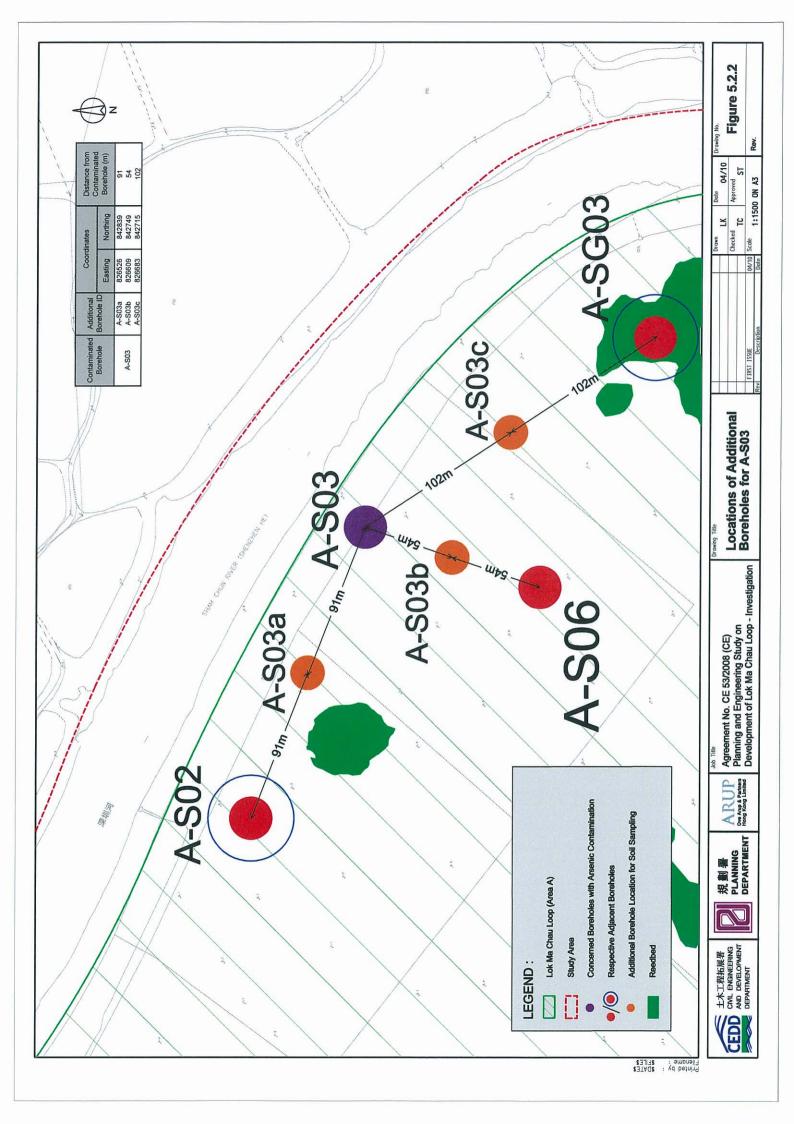


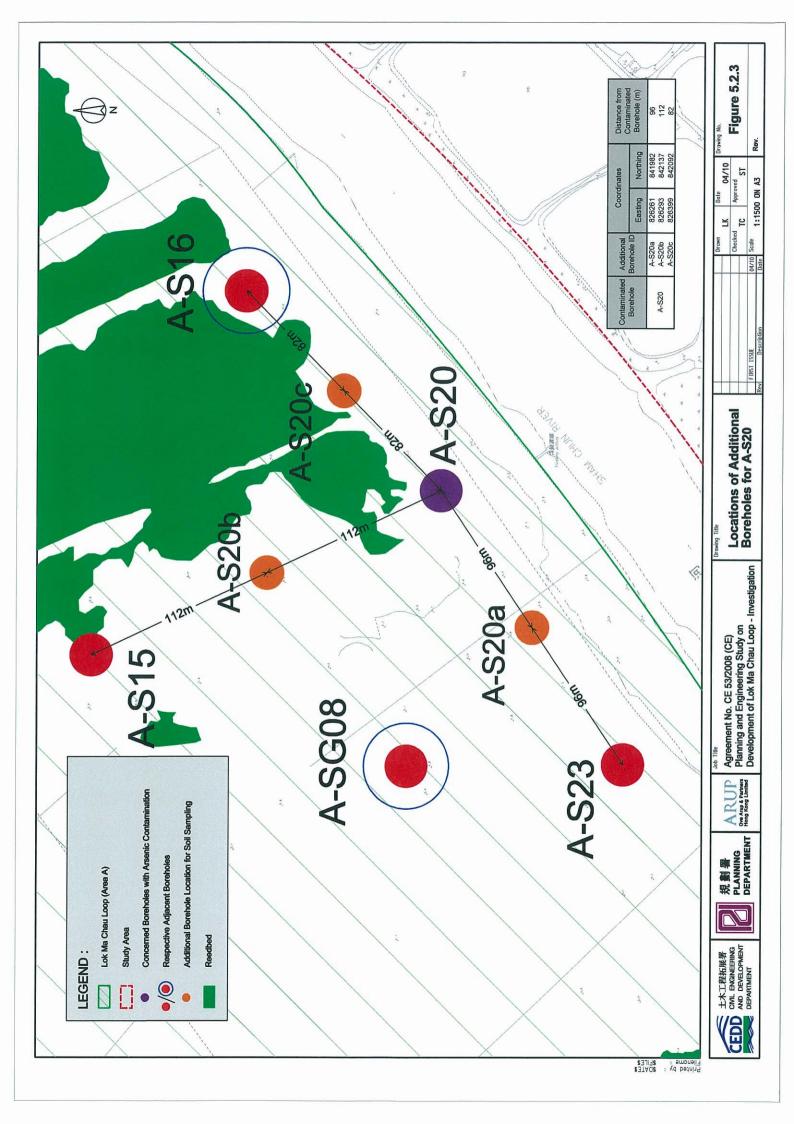


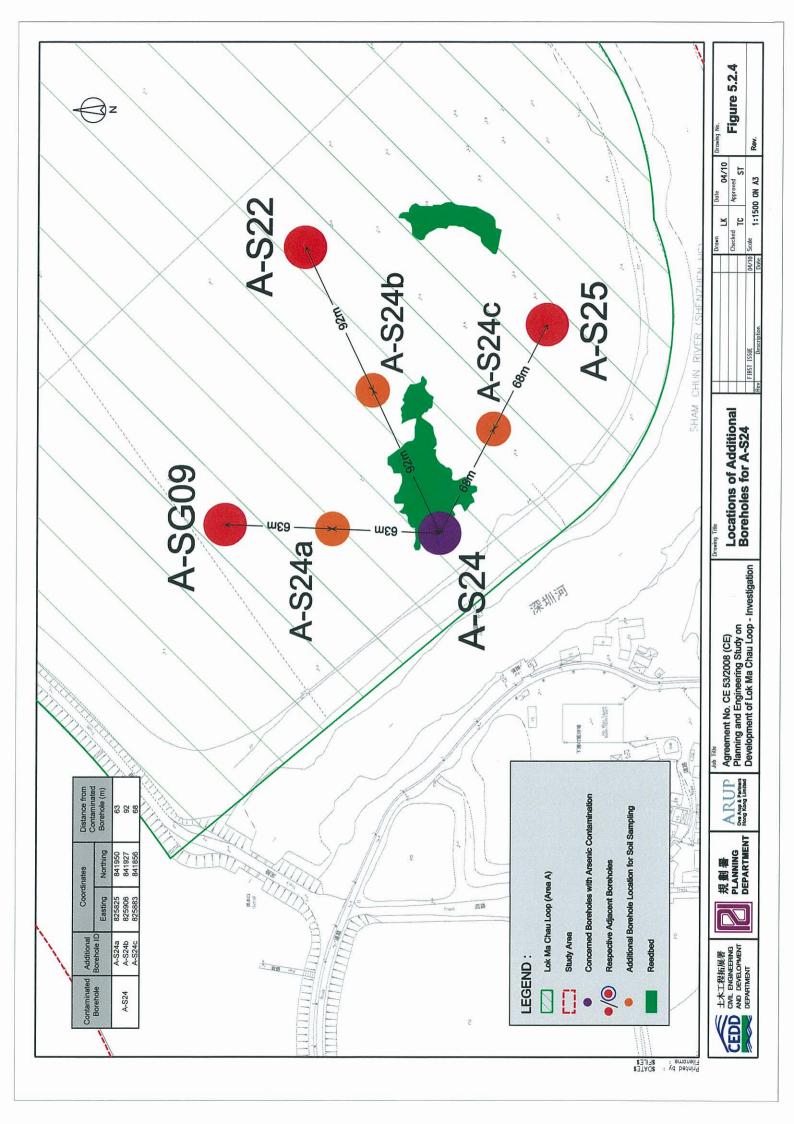


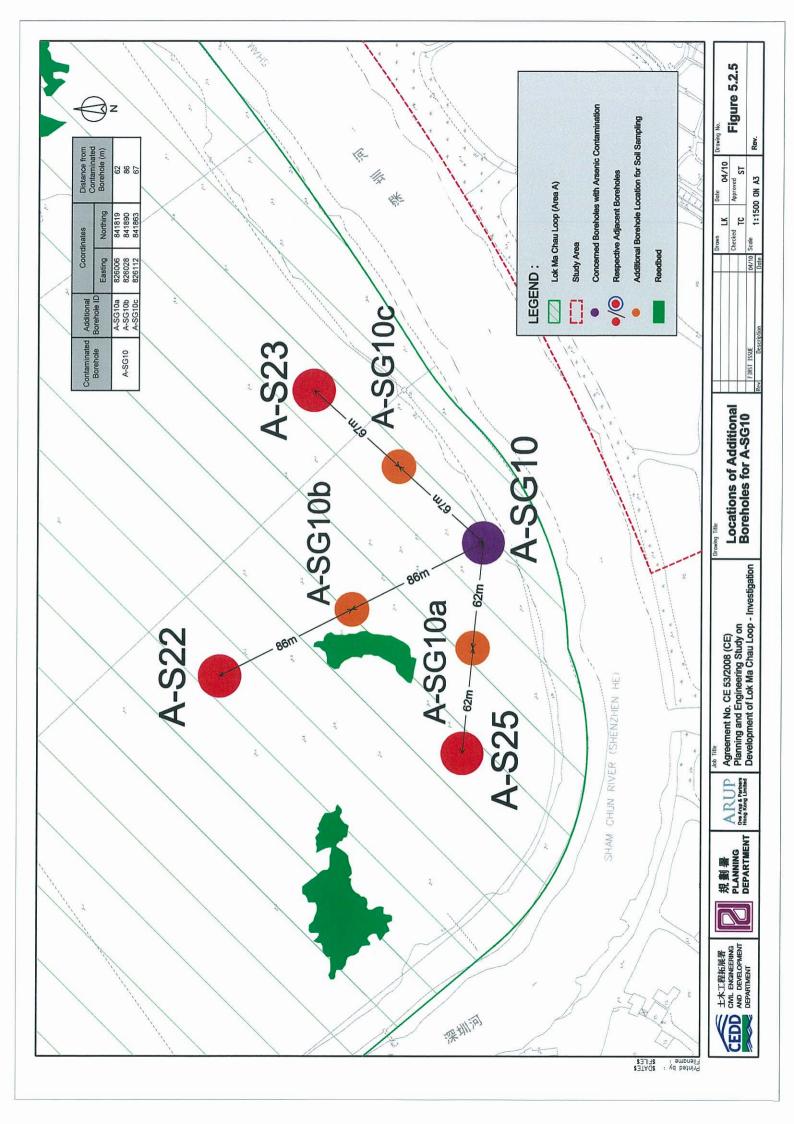


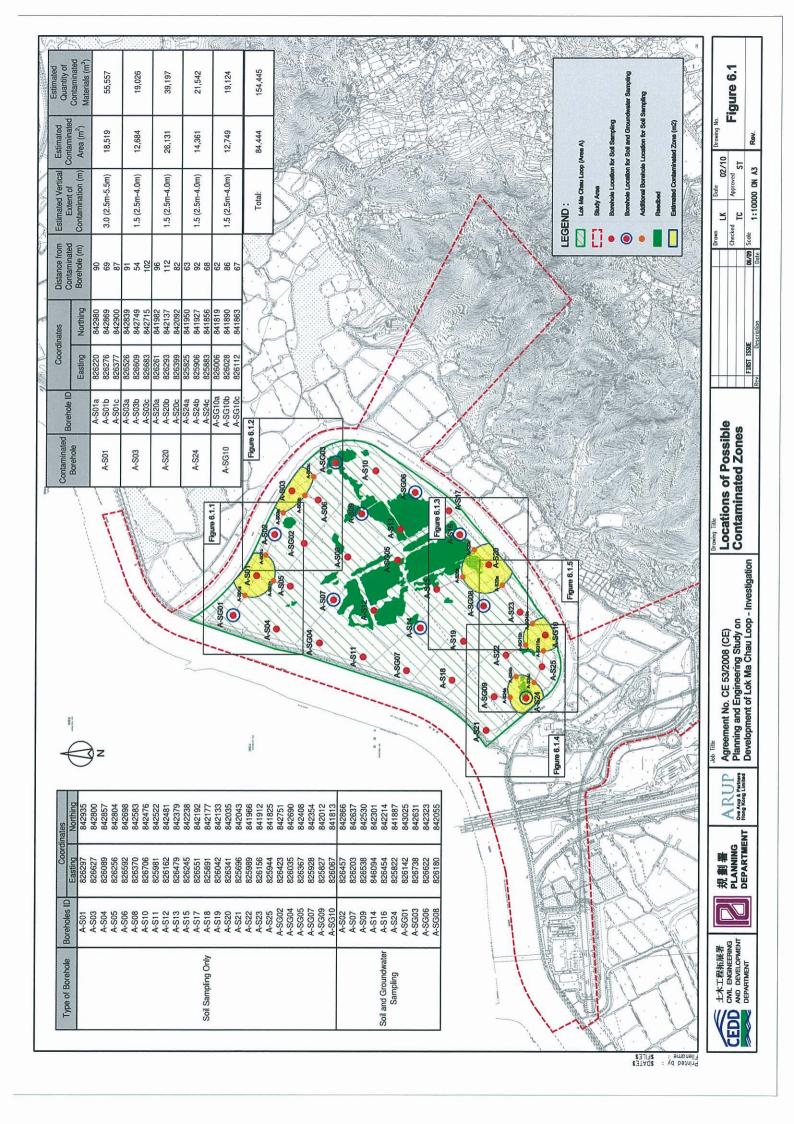


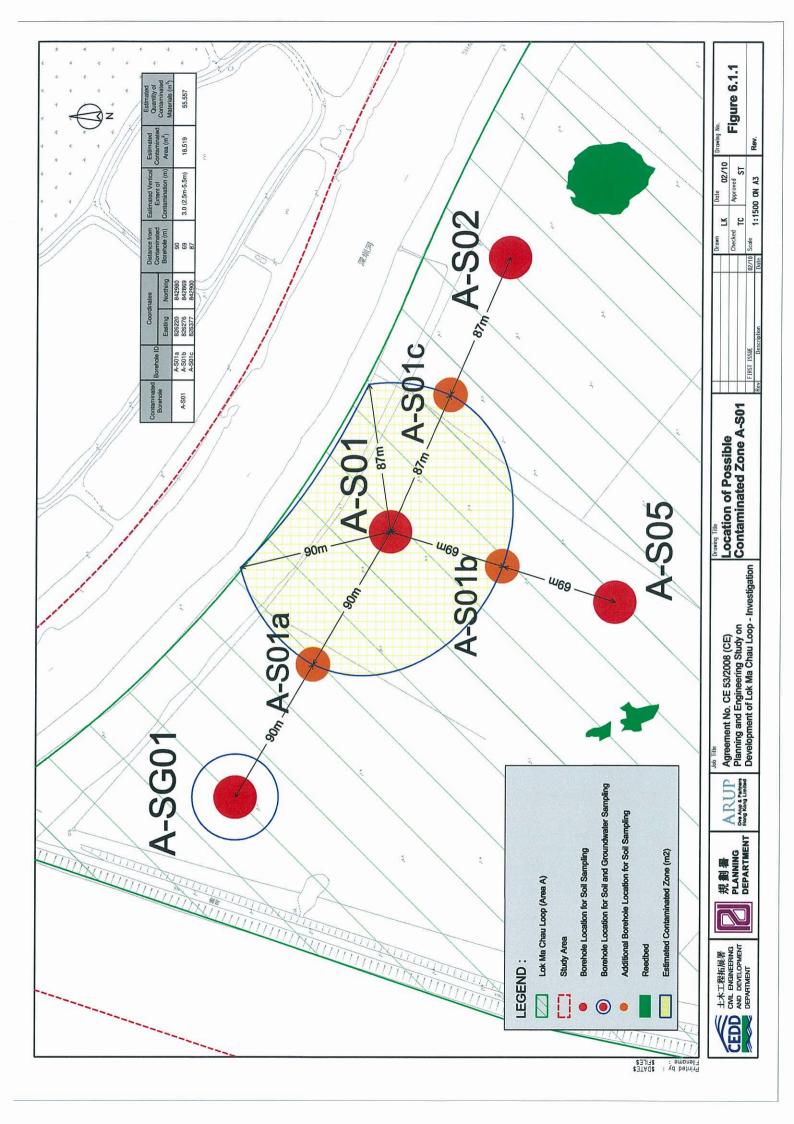


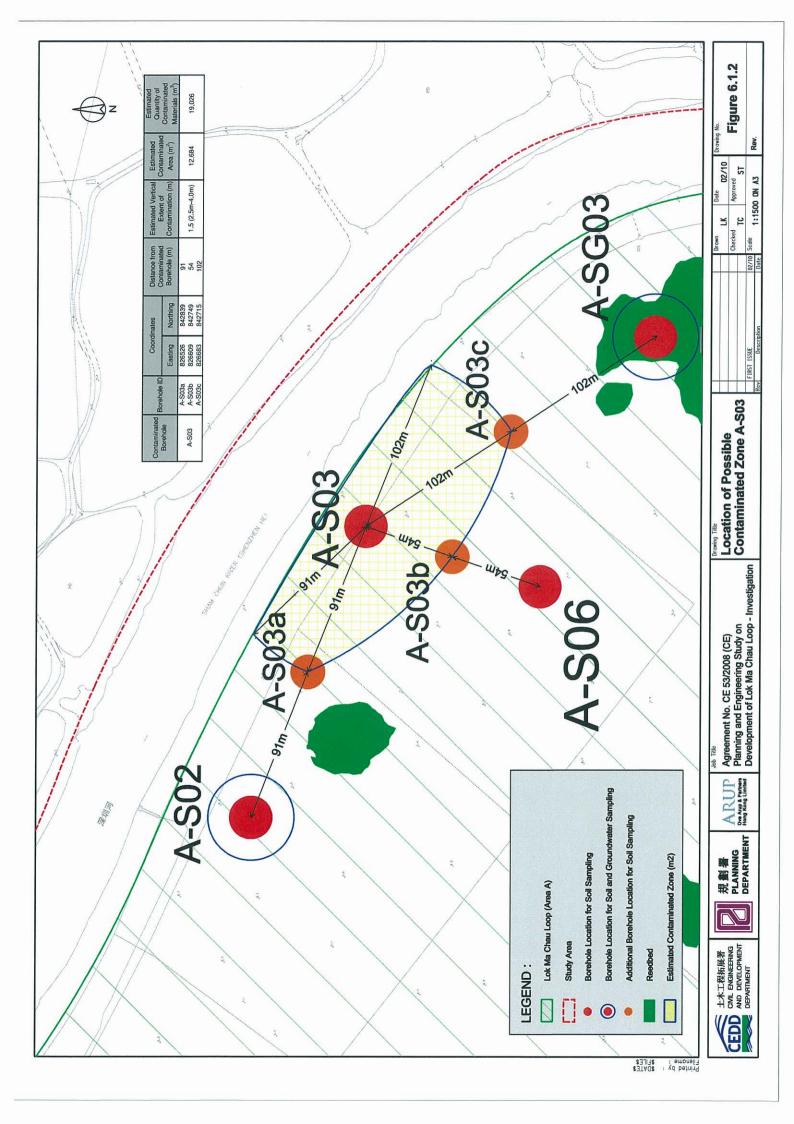


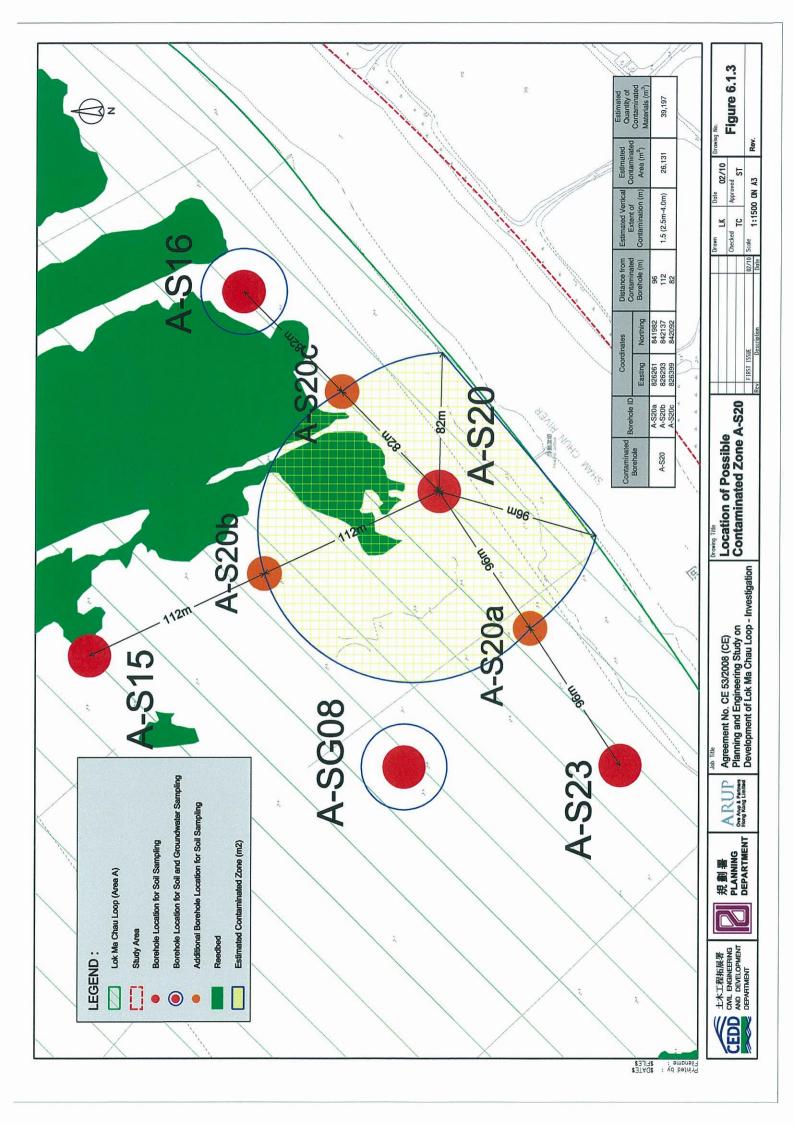


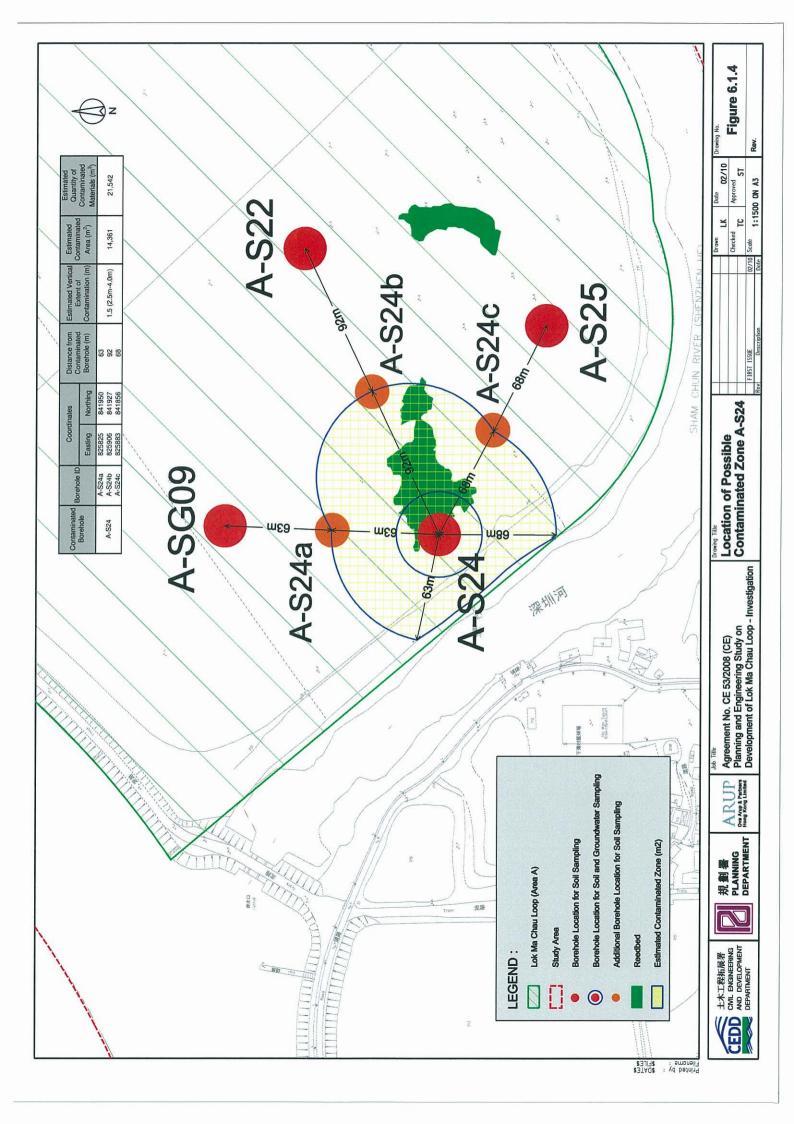


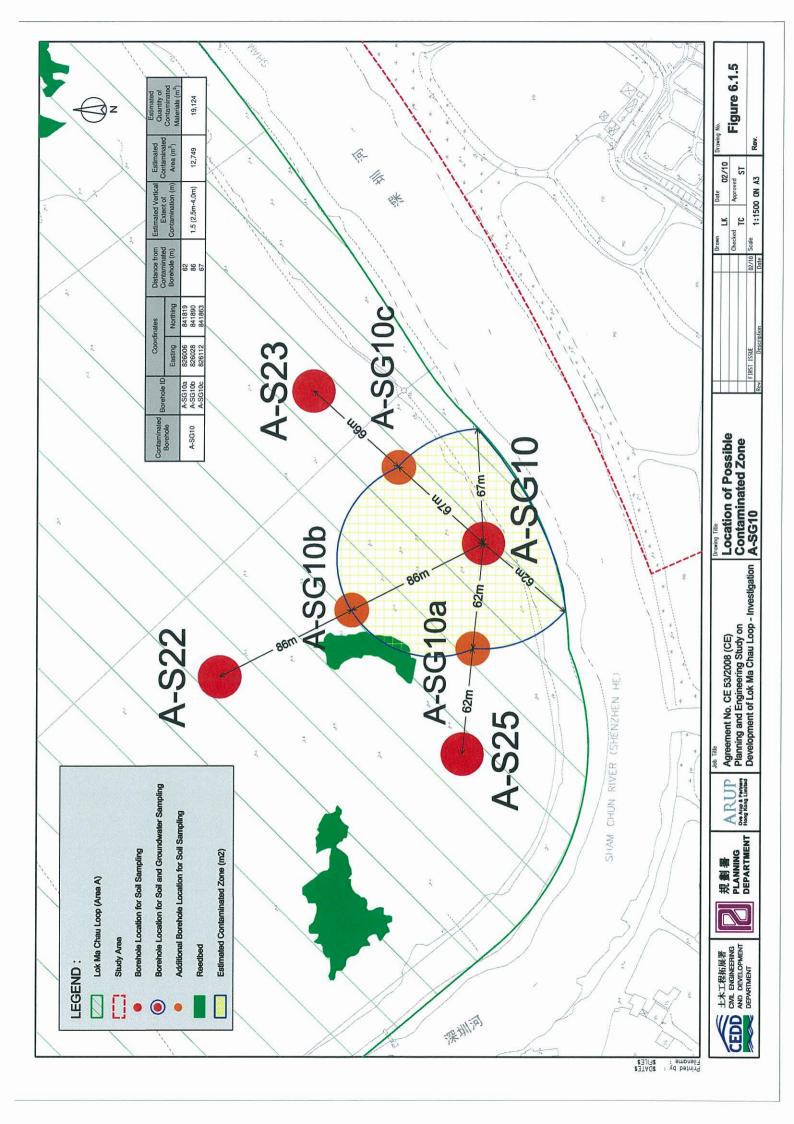












### Appendices

Appendix A
Strata Log Records of
Boreholes

### DRILLHOLE RECORD

HOLE No. A-S01 SHEET 3 of

**PROJECT** Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A CO-ORDINATÉS JOB No. **METHOD** RC J0911S26 (TFL) E 826,297,03 MACHINE / No. LY38/DR08 DATE from 14.12.09 to 19.12.09 N 842,935.13 FLUSHING MEDIUM AIR / WATER **ORIENTATION** Vertical **GROUND LEVEL** +5.83 mP.D. Reduced Level (mPD) level (m) Shift start/ Water
Recovery %
Total core
Recovery 9
Recovery 9
Solid core
Recovery 9 Casing depth/size Samples Description R.O.D. Legend Depth (III) Tests Loose, brown and grey, silty fine to coarse SAND with some gravel sized rock and brick fragments. (FILL) 14 12 09 0,95 1.00 Loose, yellowish brown, fine to coarse SAND. (FILL) 100 21 No Stiff, yellowish brown to yellowish grey, sandy CLAY / SILT. (SWAMP DEPOSIT) 100 35 bl€ Dry at 18:00 Dry at 08:00 Stiff, dark grey, CLAY / SILT. (SWAMP DEPOSIT) 100 12 bis DRILLHOLE LOG J0911526(TFL) LOK MA CHAU LOOP GPJ TYSAN 25032005 GDT 21.4.10 100 6,50 6,60 6,70 Medium dense, dark yellowish brown, fine to coarse SAND. (ALLUVIUM) (1,2,5,9,8, 8) N=30 0 2.70m at 18:00 3.20m 100 at 08:00 9 (2) Soft, light white, CLAY / SILT. (ALLUVIUM) 14 15 Small Disturbed Sample Water Sample DRILLER LOGGING GEOLOGIST GEOTECHNICAL ENGINEER P.T. Fong S.O. CHAN EDWARD CHENG Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE DATE SPT Liner Sample Standard Penetration Test 28.12.09 K.W. Leung 27.12.09 U76 Undisturbed Sample Permeability Test REMARKS U100 Undisturbed Sample Impression Packer Test Inspection pit excavaled from 0.00m-1.50m,
 A constant head permeability test was carried out at 7,50m-9.00m depth.
 Flushing medium for first 5m is air. Mazier Sample Standpipe/Piezometer Tip ŧ, Piston Sample In-situ Vane Shear Test X Point Load Test

### DRILLHOLE RECORD

HOLE No. A-S01

SHEET 2 of 3

泰昇地基工程有限公司 Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A **PROJECT** CO-ORDINATES JOB No. J0911S26 (TFL) METHOD RC. E 826,297.03 DATE from 14.12.09 to 19.12.09 MACHINE / No. LY38/DR08 N 842,935.13 **GROUND LEVEL** +5.83 mP.D. **FLUSHING MEDIUM** AIR / WATER ORIENTATION Vertical Reduced Level (mPD) Water
Recovery %
Total core
Recovery %
Solid core
Recovery % Casing depth/size level (m) Shift Drilling Progress Samples Description Legend R.O.D. Depth (m) Tests end As Sheet 1 of 3. 2.90n at 18:00 10.60 4.77 16.12.09 17.12.09 Medium dense, light yellowish brown, fine to coarse SAND with some subrounded gravel sized quartz fragments. (ALLUVIUM) 3,40m at 08:00 100 11.70 Medium dense, light yellowish brown, very silty fine SAND. (ALLUVIUM) (1, 2, 2, 3, 4, 4) N= 13 18 100 Very dense, yellowish brown, fine to coarse SAND with much rounded gravel and cobble sized quartz fragments. (ALLUVIUM) (4, 4, 8, 11, 14, 17) N=50 22 Ö, 0.60m at 18:00 - 17,12,09 - 18,12,09 14.00 3.10m at 08:00 0 ٥ò 100 25 16.20 PW HW FIL) LOK MA CHAU LOOP, GPJ TYSAN 25032005, GDT 21.4.10 16.20 -10.37 Dense, yellowish brown, very silty fine to medium SAND. (ALLUVIUM) 2,20m at 18:00 F.17.00 18.12.09 -11.1717,00 Extremely weak, pinkish brown spotted green, completely decomposed coarse grained GRANITE. (Silty fine to coarse SAND) 50 18.06 HW Moderately strong to strong, brownish pink spotted green, moderately to slightly decomposed coarse grained GRANITE. Joints are closely to medium spaced, rough planar, very narrow to narrow, iron stained, calcite infilled, dipping at 20°-30°, 40°-50° and + T2101 100 100 73 + 5.6 III/II 70°-75° + + + 19.56 100 100 52 T2101 LOGGING GEOLOGIST GEOTECHNICAL ENGINEER Small Disturbed Sample DRILLER S.O. CHAN EDWARD CHENG P.T. Fong Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE DATE Standard Penetration Test SPT Liner Sample 27.12.09 28.12.09 K.W. Leung U76 Undisturbed Sample I Permeability Test REMARKS U100 Undisturbed Sample Ī Impression Packer Test Standpipe/Piezometer Tip Mazier Sample å Piston Sample In-situ Vane Shear Test X Point Load Test

### DRILLHOLE RECORD

HOLE No. A-S01 SHEET 3 3 of

泰昇地基工程有限公司 Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A CO-ORDINATES JOB No. J0911S26 (TFL) **METHOD** RC E 826,297.03 MACHINE / No. LY38/DR08 DATE from 14.12.09 to 19.12.09 N 842,935.13 +5.83 mP.D. **GROUND LEVEL** FLUSHING MEDIUM AIR / WATER ORIENTATION Vertical Reduced Level (mPD) level (m) Shift start/ end Casing depth/size R.Q.D. Fracture Index F.I. / Test Depth Samples Legend Description Depth (m) Grade Tests <del>-</del> + + + + As Sheet 2 of 3. 100 100 52 72101 5.6 21.11 +++ 100 100 85 T2101 2.0 100 100 88 T2101 +,-19.12.09 End of drillhole at 23,55m. GEOTECHNICAL ENGINEER LOGGING GEOLOGIST DRILLER Small Disturbed Sample Water Sample EDWARD CHENG S.O. CHAN P.T. Fong Water Level Large Disturbed Sample GEOTECHNICAL FIELD TECHNICIAN DATE DATE Standard Penetration Test SPT Liner Sample 27.12.09 28.12.09 K.W. Leung U76 Undisturbed Sample Permeability Test I Impression Packer Test REMARKS U100 Undisturbed Sample Mazier Sample å Standpipe/Piezometer Tip In-situ Vane Shear Test Piston Sample

HOLE No. A-S01a

	ATION LIMITED	DRILLHOLE REC	SHEET	1 of 1
	工程有限公司	Development of Lok Ma Chau Loop		
- racting and	angineering etady off t			
METHOD RC	C	O-ORDINATES	JOB No.	J0911S26 (TFL)
MACHINE / No. LY38/DR	RO9	E 826,220.14 N 842,980.13	DATE from 3	30.01.10 to 30.01.10
FLUSHING MEDIUM A	AIR O	RIENTATION Vertical	GROUND LEV	VEL +7.00 mP.D.
Progress Casing depth/size put gig) and appendent with the control of the control	Solid Core Recovery % R.Q.D. Fracture Fracture FI. / Test Depth	Samples Reduced Level (mPD) Depth (m)	Grade Grade	Description
30.01.10 PW			Loose, light brown, fi	ne to medium SAND with o subangular fine to medium
- 100 - 100 - 100 - 100 30.01.10 PW 18:00	27 bis	3.00 3.00 4.3.45 3.50 4.50 4.50	gravel sized rock frag Firm, brown locally re slightly fine sandy SI subangular fine to m fragments. (FILL)	gments. (FILL) eddish brown and motiled orange LT with occasional angular to edium gravel sized rock and bric
Small Disturbed Sample Large Disturbed Sample SPT Liner Sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample	Water Sample     Water Level     Standard Penetration ↑     Permeability Test     Impression Packer Tes     Standpipe/Piezometer	K.W. Leung  REMARKS  1 Inspection oil exceptated from 0.00m	LOGGING GEOLOGIST S.O. CHAN DATE 09.02.10	GEOTECHNICAL ENGINEER EDWARD CHENG DATE 10.02.10

### DRILLHOLE RECORD

HOLE No. **A-S01b**SHEET 1 of 1

Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A **PROJECT** METHOD RC **CO-ORDINATES** JOB No. J0911S26 (TFL) E 826,276.05 MACHINE / No. XY2B/CCL-3 DATE from 30.01.10 to 30.01.10 N 842,869.07 ORIENTATION Vertical **GROUND LEVEL** +5.87 mP.D. FLUSHING MEDIUM AIR Reduced Level (mPD) level Casing depth/size Samples (m) Shift Description Legend R.Q.D. Grade Tests Depth (m) start/ end Firm, brown, slightly sandy SILT with rootlets. (FILL) 0.50 +5.37 Firm, reddish brown locally moltled white and brown, slightly sandy SILT. (FILL) 1.45 1.50 100 100 11 bis Loose, grey to dark grey, slightly silty fine to coarse SAND. (SWAMP DEPOSIT) 4.42m 5.00 30.01.10 PW 100 28 bis at 18:00 +0.87 End of drillhole at 5.00m. DRILLHOLE LOG JOST 1528(TFL) LOK MA CHAU LOOP, GPJ TYSAN 25032005, GDT 21.4.10 LOGGING GEOLOGIST GEOTECHNICAL ENGINEER DRILLER Small Disturbed Sample Water Sample S.O. CHAN EDWARD CHENG C.L. Chung Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE DATE SPT Liner Sample Standard Penetration Test 09.02.10 10.02.10 K.W. Leung U76 Undisturbed Sample Permeability Test REMARKS U100 Undisturbed Sample Ι Impression Packer Test 1. Inspection pit excavated from 0.00m-1.50m. Mazier Sample Standpipe/Piezometer Tip Piston Sample In-situ Vane Shear Test

HOLE No. A-S01c

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P	ROJ	ECT	Plan	ning	and	Eng	inee	ring	Study	y on De	velopn	nent	of Lo	k Ma C	Chau	Loo	p Grou	ind In	vestigation Works for Area	A		
N	1ETH	OD	RC							co	-ORDI	NAT	res						JOB No. J	91182	.6 (TFL	.)
N	1ACF	IINE /	No.	XY2	B/C	CL-1	1				E 82 N 84								DATE from 30.01.1	0 to	30.01.	10
F	LUS	HING	MEDI	UM		AIR				OR	IENTA	TIO	N	Verti					GROUND LEVEL		+5.77	mP.D.
Deilling	Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth	(m)	Legend	Grade	Des	cription		
- 30	.01,10	PW									1.	_	0.45	+5,27	c - 0	50			Loose, light brown, fine to m			
31 11 11 11 11 11 11 11 11 11 11 11 11 1	0.01.10	5.00	4.66m at 18:00		100					19 bls 8 bls 13 bls	- 14 WEIGHER	A 8 C 1 2 3 4 5 6	0.45 0.50 0.95 1.00 1.45 1.50 2.00 3.45 3.50 4.50 4.50	"	4	50	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1		Firm, reddish brown, slightly occasional angular to subar rock fragments. (FILL)  Soft, grey, CLAY / SILT with DEPOSIT) End of drillhole at 5.00m.	sandy ( gular fin	CLAY / S le grave	SILT with I sized
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3															السي							
111111																						
11.1	Sm	all Distu	rbed Sa	mple	<u> </u>		Wat	er Sa	mple			ILLEF			F				SGING GEOLOGIST			ENGINEER
1	Large Disturbed Sample										st GE		HNIC	AL FIELD	TEC	NICL	AN	DA	), CHAN EDWARD CHENG TE DATE			
	☐ U76 Undisturbed Sample ☐ Permeability 7										<u>K.\</u>	V. Le		•				_09	.02.10	10.02.1	10	
	U1 Ma	00 Undi: zier San		əamp	ле	đ	Sta	ndpipe	/Piezo	meter Tip	4 7			t excavat	ed fro	n 0.00	0m-1.50r	n.				
	Pis	ton Søn	ple			×			ne She d Test	rar Test												

### DRILLHOLE RECORD

HOLE No. A-S02 SHEET 1 of

泰昇地基工程有限公司 Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A CO-ORDINATES JOB No. J0911S26 (TFL) **METHOD** RC E 826,457.16 DATE from 17.12.09 to 18.12.09 MACHINE / No. LY38/DR09 N 842,866.08 **GROUND LEVEL** +6.22 mP.D. ORIENTATION FLUSHING MEDIUM AIR Vertical Reduced Level (mPD) level (m) Shift Casing depth/size Drilling Progress Samples Description R.Q.D. Legend (m) Tests start end Loose, yellowish brown to light yellowish brown, fine to coarse SAND. (FILL) 17.12.09 0.45 0.50 100 53 bis Loose, yellowish grey to grey, silty fine to medium SAND. (SWAMP DEPOSIT) 100 45 bis Soft, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT) 3.75m 100 10 bis 5.00 PW at 18:00 18,12.09 End of drillhole at 5,00m. J0911S26(TFL) LOK MA CHAU LOOP. GPJ TYSAN Z5032005.GDT 21.4.10 GEOTECHNICAL ENGINEER LOGGING GEOLOGIST DRILLER Small Disturbed Sample S.O. CHAN EDWARD CHENG P.S. Tam Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE DATE Standard Penetration Test SPT Liner Sample 28,12,09 KW. Leung 27.12.09 U76 Undisturbed Sample Permeability Test REMARKS Impression Packer Test U100 Undisturbed Sample T Inspection pit excavated from 0.00m-1.50m.
 A water sample was taken at 5.00m depth. å Standpipe/Piezometer Tip Mazier Sample ✓ In-situ Vane Shear Test Piston Sample X Point Load Test

HOLE No. A-S03

FOUNDATION LIMITED 泰昇地基工程有限公司	DRILLHOLE RECORD	SHEET 1 of 1
	n Development of Lok Ma Chau Loop Ground Investi	gation Works for Area A
METHOD RC	CO-ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. LY38/DR05	E 826,627.15 N 842,800.15	DATE from 21.12.09 to 23.12.09
FLUSHING MEDIUM AIR		GROUND LEVEL +3.98 mP.D.
Progress Casing depth/size put (3) put (4) put (5) put (5) put (6) put (7) put	Tests Samples Reduced Level (mPD) Depth (m) Legend Grade	Description
-21.12.09 PW -21.12.09 -22.12.09 100 11 -22.12.09 -22.12.09 4.03m -22.12.09 4.03m	9 bis 2.00 Fin	se, brown and grey, very slity fine to coarse SAND.  L)  n, grey to dark grey, CLAY / SILT. (SWAMP
Small Disturbed Sample  Large Disturbed Sample  Water Samplo  Water Level	DRILLER LOGGIN	
Large Distribed Sample  SPT Liner Sample  U76 Undisturbed Sample  U100 Undisturbed Sample  U100 Undisturbed Sample  Mazier Sample  Impression Packer  Standpipe/Piezome  Timpression Packer  Standpipe/Piezome  In-situ Vane Shear	r Test REMARKS 1. Inspection pit excavated from 0.00m-1.50m.	DATE 10 21.01.10

### DRILLHOLE RECORD

HOLE No. A-S03a
SHEET 1 of 1

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PRO	OJECT Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Ir  THOD RC CO-ORDINATES  E 826,526.03  CHINE / No. LY38/DR08															Inves	stigation Work	s for Ar	ea A		~-~-		
METI	HOD	RC							CO-	ORD	INA:	TES						JOB No.		J091	1826 (	TFL)	
MACI	HINE .	/ No.	LY38	/DF	R08							326.0 339.0						DATE from	30.01	1.10	to 30	.01.10	)
FLUS	HING	MED	1UM		AIR				ORIE				Verti	cal				GROUND L	.EVEL		+5.	70 г	nP.D
	1									7				 									
Drifling Progress	Casing depth/size	(m) Shift start/ end	Water Recovery % Total core	Recovery	Solid core	R.Q.D.	Fracture Index	F.l. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade			De	escript	ion		
30.01.10										1.	_	0.45	+5.20	0.50			000	it, brown and gr asional fine gra flets. (FILL)	ey, sligi avel size	htly cla ed rock	yey SIL fragme	T with ints an	ıd
-										A 0.45 0.50 0.50 0.50 0.95				- - - - - - -			Loc		rey, slig	ey, slightly silty fine to medium			
										c 1.45			+4.20	1.50	<b>XX</b>		Sol	t to firm, grey k	ocally m	ottled i	orown, (	CLAY	SILT
-				00					8 bls	-	2	1.95 2.00			<del> </del>     - 		(5)	VAMP ĎĒPÕS	11)				
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	5.00	Dry al	11	00					18 bis		5	4.50		-									
30.01.10		18:00		_	_				4.95 +0.70 - 5.00								End	d of drillhole at	5,00m.				
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Sm. Lar. SPI U76														Ē									
• Sma	Small Disturbed Sample										LLER			<u> </u>	<u> </u>			G GEOLOGIST			TECHNIC		SINEE
lang	Large Disturbed Sample Water Level  SPT Liner Sample Standard Penel																						
<b>1</b> U76	Ondista O Undis				<u></u>			ily Tes n Pack	Packer Test REMARKS						U	<del>-</del>	10.0	2.10		_			
U76	zior Sam	ple			â	Stan	dpipe	/Piazo	meter Tip 1. Inspection plt excavated from 0.00m-1.50m.														
Pist	on Sam	ple						ne She d Test	ear Test	163(													

### DRILLHOLE RECORD

A-S03b HOLE No. of 1 SHEET

泰昇地基工程有限公司 Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A **PROJECT** J0911S26 (TFL) **CO-ORDINATES** JOB No. METHOD RC E 826,609.09 DATE from 29.01.10 to 29.01.10 MACHINE / No. XY2B/CCL-1 N 842,749.10 **GROUND LEVEL** +6.09 mP.D. ORIENTATION Vertical FLUSHING MEDIUM AIR Reduced Level (mPD) Casing depth/size leve! Water
Recovery %
Recovery %
Solid core
Recovery % (m) Shift Samples Description Legend Depth (m) Grade Tests start/ end Loose, light brown locally mottled brown, fine to medium SAND. (FILL) 29.01.10 5.09 В Soft to firm, grey locally dark grey, SILT / CLAY. (SWAMP DEPOSIT) 100 1,95 2,00 100 10 bla 4.50 4.78m 5.00 -29.01.10 PW 100 14 bis at 18:00 End of drillhole at 5,00m. J0911526(TFL) LOK MA CHAU LOOP. GPJ TYSAN 25032005, GDT 21.4.10 GEOTECHNICAL ENGINEER DRILLER LOGGING GEOLOGIST Small Disturbed Sample Water Sample EDWARD CHENG T.H. Wong S.O. CHAN Water Level Large Disturbed Sample GEOTECHNICAL FIELD TECHNICIAN DATE DATE SPT Liner Sample Standard Penetration Test 10,02.10 K.W. Leung 09.02.10 Permeability Test U76 Undisturbed Sample REMARKS U100 Undisturbed Sample Ι Impression Packer Test 1, Inspection pit excavated from 0.00m-1.50m. Mazier Sample Standpipe/Piezometer Tip In-situ Vane Shear Test Piston Sample

A-S03c HOLE No.

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PRO	JECT	Plar	nning a	nd Er	ngine	ering	Stud	ly on Dev	/elopn	nent :	of Lo	ok Ma C	hau Lo	op Gro	und Ir	ives	tigation Work	s for Ar	ea A			
METI	HOD	RC						CO-4	ORDI	NAT	ES						JOB No.		J0911	S26 (T	FL)	
MAC	HINE.	No.	XY2B	/CCL	-1				E 82								DATE from	29.01	i.10 t	o 29.	01.10	
FLUS	SHING	MED	IUM	All	₹			ORII	ENTA	TIO	N.	Vertic	cal				GROUND I	.EVEL		+5.2	7 mP.l	D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery % Total core	Solid core	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade				scripti			
SZSG(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10	5.00 PW	4.80m at 18:00	10 10 10 mple	00	Wal	er Sa	mple	19 bls 23 bls	1	A B C 1 2 3 4	0.45 0.50 0.95 1.00 1.45 1.50 3.00 3.45 3.50		2.00		LOO	Very	se, light brown se SAND with to coarse gra  v soft, grey, Cl  of drillhole at	occasio	GEO	UAMP E	SUBANGUIE  S. (FILL)	
251905   Sb.	Large Disturbed Sample								T.H.	Wong TECH	NICA	L FIELD T	ECHNICI	AN	<u>S.O</u>	O. CH. re	CHAN EDWARD CHENG E DATE					
CHOLE LOG J.	U76 Undisturbed Sample														,		10.0	2.10				
Ma Pis	zier San Ion Sam	pie		<u>*</u>	Star			meter Tip ar Test	1. In:	spectio	on pil	excavated	160m 0,00	ım-1,50n	L							
이_				×	Poir	it Load	d Test															

	NDATION LIMITED 也基工程有限公司	SHEET 1 of 1	
PROJECT Planning a	ind Engineering Study on	Development of Lok Ma Chau Loop	Ground Investigation Works for Area A
METHOD RC	C	CO-ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. LY38	/DR06	E 826,089.12 N 842,857.26	DATE from 14.12.09 to 15.12.09
FLUSHING MEDIUM		ORIENTATION Vertical	GROUND LEVEL +6.06 mP.D.
Progress Casing depth/size Author Water Water Water Water Total core	Recovery % Solid core Recovery % R.Q.D. Fracture FIJ/Test Depth	Samples Reduced Level (mPD) Depth (m)	Description Description
-14.12.09 PW		A 0.45	Loose, brown, silty fine to coarse SAND with some gravel sized rock and brick fragments. (FILL)
11.12.09 - 15.12.09 - 15.12.09		1.00 c 1.45 1.50 2 1.95 2 2.00	Firm, yellowish brown mottled grey, sandy SILT. (FILI
- - - - - - - - - - - - - - - - - - -	00 12.64	3 3,45 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Firm, grey to dark grey, sandy CLAY / SILT. (SWAMI DEPOSIT)
Small Disturbed Sample Large Disturbed Sample Large Disturbed Sample U100 Undisturbed Sample U100 Undisturbed Sample Wazier Sample Disturbed Sample U100 Undisturbed Sample Disturbed Sample Piston Sample	▲ Water Sample  ▼ Water Level	DRILLER K.M. Lee	LOGGING GEOLOGIST GEOTECHNICAL ENGINEER S.O. CHAN EDWARD CHENG
Large Disturbed Sample SPT Liner Sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample Piston Sample	Slandard Penetration Permeability Test Impression Packer Test Slandpipe/Piezometer In-situ Vane Shear Test	Test GEOTECHNICAL FIELD TECHNICIAN K.W. Leung  REMARKS 1. Inspection pit excavated from 0.00m-	DATE DATE 17.12.09 18.12.09

### DRILLHOLE RECORD

HOLE No. A-S05 of

泰昇地基工程有限公司 SHEET Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A **METHOD** RC CO-ORDINATES JOB No. J0911S26 (TFL) E 826,256.07 MACHINE / No. LY38/DR06 DATE from 16.12.09 to 17.12.09 N 842,804.20 FLUSHING MEDIUM ORIENTATION Vertical GROUND LEVEL +5.40 mP.D. Water
Recovery %
Total core
Recovery %
Solid core
Recovery % Reduced Level (mPD) level (m) Shift Casing depth/size Samples Legend R.Q.D. Description Depth (m) end - 16.12.09 ΡŴ Loose, brown mottled grey and black, silty fine to coarse SAND with some gravel sized rock fragments. (FILL) 16.12.09 17.12.09 0.95 1,00 100 11 Ns 100 13 bla +0.90 4.55m at 18:00 Firm, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT) 100 5.00 PW 7 bis 17.12.09 End of drillhole at 5.00m. J0911826[TFL) LOK MA CHAU LOOP. GPJ TYSAN 25032005. GDT 21.4.10 DRILLER LOGGING GEOLOGIST GEOTECHNICAL ENGINEER Small Disturbed Sample ▲ Water Sample EDWARD CHENG Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN SPT Liner Sample Standard Penetration Test DATE DATE KW, Leung 27.12.09 28.12.09 U76 Undisturbed Sample Permeability Test REMARKS Impression Packer Test U100 Undisturbed Sample 1. Inspection pit excavated from 0.00m-1.50m. Standpipe/Piezometer Tip Mazier Sample Piston Sample In-situ Vane Shear Test

X Point Load Test

JRILLHOLE LOG

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PROJE	ECT	Planr	ning	and	Eng	inee	ring	Study	on Deve	elopm	ent of	Loi	Ma Ci	nau Loc	p Gro	ınd İn	vestigation Works for Area A		
METHO	OD	RC							CO-C	RDI	NATE	s					JOB No. J0911S26	6 (TFL)	
MACHI	INE / I	No. L	_Y38	3/DF	R09				1		6,592 2,698						DATE from 22.12.09 to	23.12.09	
FLUSH	ING N	/EDII	UM	,	AIR				ORIE	NTA	TION		Vertic	al	-		GROUND LEVEL +	+5.15 m	P.D.
Drilling Progress	asing pth/size	Vater level (m) Shift start/ end	Water Recovery %	Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade	Description		
-22.12.09 	PW	3.43m		100					2 bis 50 bis 69 bis	· junioner · · · · · · · · · · · · · · · · · · ·	B 0 1 1 1 2 1 2 2 3 3 4 3 3	.45 .50 .95 .50 .45 .50 .95 .50	+2.15	3.00			Loose, yellowish brown, fine to coars some gravel sized quartz fragments.  Dense, yellowish grey to grey, silty fine SAND. (SWAMP DEPOSIT)	(FILL)	
23.12.09									5.00				+0.15	5.00			End of drillhole at 5.00m.		
■ Small Disturbed Sample Large Disturbed Sample SPT Liner Sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample Standard Peni Permeability T Impression Pa Standpipe/Pie Standpipe/Pie Piston Sample In-situ Vane S								vel Penetra ility Test on Packa e/Piezon	t er Test neter Tip	P.S GEO K.W	/. Leun	9 S	L FIELD 1		·	S.C DA 20		CHNICAL EN ED CHENG O	GINEER

### DRILLHOLE RECORD

HOLE No. A-S07 SHEET of 3

Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A **PROJECT** CO-ORDINATES JOB No. J0911S26 (TFL) **METHOD** E 826,203.10 MACHINE / No. XY2B/CCL-3 DATE from 11.12.09 to 17.12.09 N 842,637.20 GROUND LEVEL +5.14 mP.D. AIR / WATER ORIENTATION Vertical FLUSHING MEDIUM Reduced Level (mPD) Casing depth/size level (m) Shift Samples Legend Description R.Q.D, Depth (m) Tests start/ Loose, yellowish grey to yellowish brown, fine to coarse SAND. (FILL) 0.45 0,50 0.95 1.00 1.45 1.50 100 40 bla 1,95 2.00 Very soft, yellowish brown to yellowish grey, CLAY. (SWAMP DEPOSIT) 100 84 Ms 3,45 3,50 +0.64 Medium dense, yellowish grey to grey, silly fine to medium SAND with oyster fragments. (SWAMP 100 9 bis DEPOSIT) - 11.12.09 - 12.12.09 5.50 **1.38**m at 08:00 MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10 85 6.50 6.60 6.70 Sliff, grey to dark grey, CLAY / SILT with oyster fragments. (SWAMP DEPOSIT) (1, 1, 2, 3, 5, 5) N = 15 7.00 7.05 7.50 100 13 14 2.10m al 18:00 3.20m 85 08:00 LOGGING GEOLOGIST GEOTECHNICAL ENGINEER DRILLER Small Disturbed Sample Water Sample C.L. Chung S.O. CHAN EDWARD CHENG Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE SPT Liner Sample Standard Penetration Test 28,12,09 K.W. Leung 27.12.09 Ī Permeability Test U76 Undisturbed Sample REMARKS U100 Undisturbed Sample impression Packer Test N. Inspection pit excavated from 0.00m-1.50m.

1. Inspection pit excavated from 0.00m-1.50m.

2. Falling head permeability tests were carried out at 7.10m-8.60m, 13.50m-15.00m and 16.50m-18.00m depth.

3. A vane shear test was carried out at 11.55m depth.

4. A water sample was taken at 5.00m depth.

5. Flushing medium for first 5m is eir. Mazier Sample Standpipe/Piezometer Tip Piston Sample In-situ Vane Shear Test

X Point Load Test

J0911S26(TFL) LOK

DRILLHOLE LOG

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PRO.	JECT	Planr	ning	and	Eng	inee	ring	Stud	y on Dev	elopr	nent	of Lo	k Ma C	hau Loc	p Gro	ınd İn	vestigation Works for	Area A		
METI	HOD	RC							CO-0	ORDI	NA	res					JOB No.	J0911	S26 (TF	FL)
МАС	HINE /	No. >	(Y2	B/C	CL-3	3						03.10 37.20					DATE from 11	1.12.09 t	o 17.1	2.09
FLUS	HING	MEDI	UM		AIR	/ W.	ATE	R	ORIE		-		Vertic	cal			GROUND LEV	EL	+5.14	mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade		Descripti	ion	
		Cila		85	,-						15			-	7 TH		As Sheet 1 of 3.	··		
					Language Control of the Control of t			11.55	(1, 1, 0, 1, 1 1) N = 3		15 17 16	10,50 10,60 10,70 11,00 11,05	-5.46	- 10.60 		The Part of the Pa	Very stiff, yellowish bri (ALLUVIUM)	own mottled	d red, CL	AY/SILT.
				100	, and the second				(1, 1, 1, 2, 1 2) N=8	. [	20 21 22	12.50 12.60 12.70 13.00 13.05	-8.36	13.50						OANO
	9	100	WARAT II			15.00	136 Ms (10, 15, 18, 16, 16, 18) N = 68 (2, 4, 5, 4, 1		23 24 25 26 27 28 29 30	14.50 14.60 15.05 15.15 15.45 15.50 15.60 15.90		بطليبيني يهيان بييييي فاليبيي	0 0 0		Very dense, yellowish with some rounded gr (ALLUVIUM)					
	16.50 PW HW			- PANAMATANA	18.00	- The second sec	N	21 22		THE PARTY OF THE P			>	Extremely weak, pinki decomposed coarse of coarse SAND)	ish brown, grained GR	complete ANITE. (	ly Silty fine to			
- 15.12.0 - 16.12.0		80	80		5.6	18.60	(35, 15/60n 100/45/nm) 100tis/45/n	12	33	18.30 18.40 18.53 18.58 18.60	13.46	18.60	0+++++++	ıv/ı	Weak, brownish pink, grained GRANITE. (s fragments) Moderately weak to rr highly to moderately of GRANITE with closely	ubangular ( noderately s decompose	GRAVEL strong, pli d coarse	sized rock		
i la	1 Di Later Campie 1 Cierrasia i an								est	DF C.I GE K.Y	N. Le	R ung CHNICA sung	1 -14.66	F 20.00 TECHNICI	<u>  4-                                   </u>	LO S.C	GEORGE GEOLOGIST   GEOTECHNICAL ENGINEER			
51 <u>2</u> M	100 Undi: lazier San iston San	I å ×	Ster	ndpip itu Va	e/Piez	ker Test ometer Tip sear Test t	er Tip													

### DRILLHOLE RECORD

HOLE No. A-S07 SHEET of 3

Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A **PROJECT** J0911S26 (TFL) CO-ORDINATES JOB No. **METHOD** RC E 826,203.10 DATE from 11.12.09 to 17.12.09 MACHINE / No. XY2B/CCL-3 N 842,637.20 ORIENTATION Vertical GROUND LEVEL +5.14 mP.D. FLUSHING MEDIUM AIR / WATER Reduced Level (mPD) level (m) Shift Water
Recovery %
Total core
Recovery %
Solid core
Recovery % Legend Description R.Q.D. Grade (m) Tests start/ IV/III As Sheet 2 of 3. -15.06 63 63 82 Moderately strong to strong, pinkish brown, + moderately strong to strong, printer blown, moderately to slightly decomposed coarse grained GRANITE. Joints are closely spaced, rough planar, narrow, iron stained, dipping at 10°-20°, 30°-40° and 50°-60°. 20,47 + + E07(E 2.40m >20 + 100 30 T2101 100 at 18:00 + Strong, dark pink, slightly decomposed coarse grained GRANITE. Joints are closely to medium spaced, rough planar, narrow, iron stained, chlorite coated, dipping at 20°-30°, 50°-60° and vertical joint from 24.00-24.60m. -15.95 -16.12.09 -17.12.09 4.50m at 08:00 -++1 100 100 86 T2101 22.66 85 100 100 23 20 5.5 100 100 36 T210 + 24.69 ++ + 3.50m 100 100 20 12101 >20 at 18:00 17.12.09 End of drillhole at 25.53m. DRILLHOLE LOG J0911826(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005,GDT 21.4.10 DRILLER LOGGING GEOLOGIST GEOTECHNICAL ENGINEER Small Disturbed Sample Water Sample C.L. Chung S.O. CHAN EDWARD CHENG Large Disturbed Sample ¥ Water Level GEOTECHNICAL FIELD TECHNICIAN DATE DATE SPT Liner Sample Standard Penetration Test K.W. Leung 27,12,09 28.12.09 U76 Undisturbed Sample Permeability Test REMARKS U100 Undisturbed Sample Impression Packer Test Standpipe/Piezometer Tip Mazier Sample Piston Sample In-situ Vane Shear Test 

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PRO	JECT	Plani	ning a	nd E	ngine	ering	Stud	ly on De	velopr	nent	of Lo	ok Ma C	Chau Lo	op Gro	und In	vestigation Works for Area A				
MET	HOD	RC						co-	ORD							JOB No. J0911S26 (TFL)	)			
MAC	HINE /	No. I	LY38.	/DRO	)6					-	70.1 83.1					DATE from 18.12.09 to 19.12.0	09			
FLU	SHING		UM	Al	R			ORI	ENTA	\TIC	N	Verti	cal			GROUND LEVEL +5.67	mP.D.			
Drilling Progress	Casing depth/size	Water level (m) Shift start/	Water Recovery % Total core	Recovery % Solid core	Recovery %	racture ndex	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade	Description				
_ 18.12.0 _	Wq e	end	> EI	.E. 07						T			-			Loose, brown, silty fine to medium SAND. (F	ILL)			
- 18.12.0 - 19.12.0	호 연								Н МОЖОМИ НЕ	^	0.45 0.50		0.50			Firm, brown and grey, sandy SILT. (FILL)				
Ē									χ.	B	0.95 1.00		1.50			Loose, yellowish brown, fine to coarse SANE	D. (FILL)			
تستنين التستنين البديه فيتال			1	00				20 bis			1.45 1.50		- 1.50			Very sliff, grey and white, sandy CLAY / SILT (SWAMP DEPOSIT)	r			
										J 2	1.95 2.00		=							
											3,00	+2.67	3.00	<u> </u>						
E E			1	00				11 bls		3	3,45 3,50					Firm, grey to dark grey. CLAY / SILT. (SWAI DEPOSIT)	MP			
E											3,50									
1.1		4.40								<b>-</b>	4.50	+1.17	4,50	<u> </u>	_	Loose, black, clayey fine to coarse SAND wi	ih some			
19.12.0	5.00 9 PW	4.40m at 18:00	1	00		ļ		14 bis		5	4.95 5,00	+0.67	5.00			roots. (SWAMP DEPOSIT)  End of drillhole at 5.00m.	uii sonte			
											5,00									
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	mall Dist. arge Dist.					aler Sa ater Le				RILLEF M. Le						GEORGIST GEOTECHNICAL I CHAN EDWARD CHEN				
51 <u>2</u>	PT Liner	] Sta	andard	i Pene	Iralion Tes	•	OTEC		AL FIELD	TECHNIC	NAI		ATE DATE 77.12.09 28.12.09							
41 <del></del>	176 Undisl 1100 Undi				<del>-</del>		on Pac	st ker Test	R	EMAF	RKS			no e-						
	lazier Sar iston San	nple						ometer Tip near Test	•											
ju r	iston odli	ίλια			X Po				4											

METHOD RC CO-ORDINATES JOB No. J0911S26 (TF  MACHINE / No. LY38/DR06 E 826,538.05  N 842,530.10 DATE from 21.12.09 to 22.12	1		SHEET stigation Works for Are					ok Ma C				司	AITEI 限公 	有	工程	基	界地	泰列	_	JECT	PRO			
## PW HISSING MEDIUM AIR ORIENTATION Vertical GROUND LEVEL +4.22    Comparison of the property																								
## PROPRIES   No. LY38/DR06								5				-												
Description   Description	2.09	21.12.09 to 22.12.09	DATE from 21.12							-					)6	RO	38/D	LY	No.	HINE	MACI			
21.12.09 PW  100  100  11 bs  12 bs  1	mP.D.	VEL +4.22 n	GROUND LEVEL				al		N	TIC	ENTA	ORI			IR	AIF	Ji			HING	FLUS			
21.12.09 PW  100  11bs  12bs  12bs  11cs  100  11cs  12bs  11cs  100  11cs  11		Description	De		6	Legend	Depth (m)	Reduced Level (mPD)		Samples		Tests	Index F.I. / Test Depth	Fracture	Recovery %	Solid core	Total core	Water Becomen %	Water level (m) Shift start/ end	Casing depth/slze	Drilling Progress			
100 11 bis 2 1.55 1.50 1.50 1.50 1.50 1.50 1.50 1.50			ry soft, yellowish brown	Lo			1.00		0.95		HTNORN M													
Loose, yellowish brown, fine to coarse SAN much gravel sized rock and shell fragments  11 bis 3  1 3.45  22.12.09  Dry al 18:00  15 bis 5  4.50  22.12.09 PW 18:00  To be a size of coarse SAN much gravel sized rock and shell fragments  Firm, yellowish brown to black, CLAY / SILT DEPOSIT)  End of drillhole at 5.00m.				(6)						,		12 bis												
-22.12.09 Dry al 100 15 bis 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	ID with s. (FILL)	vn, fine to coarse SAND v ck and shell fragments. (F	ose, yellowish brown, fin ch gravel sized rock and	Loc			3.00	+1.22		3 4		11 b/s	Address the same of the same o			-	100							
End of drillhole at 5.00m.	T. (SWAM	to black, CLAY/SILT. (S			×  -  -	<u>                                   </u>	111			5		15 bls					100		Dry at 18:00	5,00	2.12.09			
		UM.	or aniinole at 5.00m.	En		THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TO THE PERSON NAMED IN COLUMN T			5.0	,						AND AND THE PROPERTY AN								
Small Disturbed Sample     Water Sample     DRILLER     LOGGING GEOLOGIST GEOTECHNICAL     Large Disturbed Sample     Water Level     K.M. Lee     S.O. CHAN     EDWARD CHEN		GEOTECHNICAL ENG EDWARD CHENG			1.	1	<del></del>				1		•					-						
SPT Liner Sample   Standard Penetration Test   GEOTECHNICAL FIELD TECHNICIAN DATE   DATE			0			AN	ECHNICI	L FIELD T			1		i Penet	prepu	Sta	1			ample	ΓLiner S	SP			
U76 Undisturbed Sample  I hyperssion Packer Test  Mazier Sample  I hyperssion Packer Test Standpipe/Piezometer Tip Piston Sample  V In-situ Vane Shear Test					iom. oth.	Om-1.5 Om dep	from 0,0 en at 5.00	excavated e was take	KS ion pit e	VAR specti	REN	ker Test ometer Tip	U76 Undisturbed Sample  U100 Undisturbed Sample  I Impression Pac Maxier Sample  Standpipe/Piez											

### DRILLHOLE RECORD

HOLE No. **A-S10**SHEET 1 of 1

								公司	]							SHEET 1 of 1
PRO	IECT	Plan	ning	and	Eng	jinee	ring	Stud	y on Deve	lopmen	t of Lo	k Ma C	hau Loc	p Grou	and inv	vestigation Works for Area A
METH	HOD	RC							CO-0	RDINA	TES					JOB No. J0911S26 (TFL)
MACI	HINE /	No.	XY2	B/C	CL-:	3			1	E 826, N 842,						DATE from 21.12.09 to 21.12.09
FLUS	HING	MEDI	UM		AIR				ORIE	NTATI	ОМ	Vertic	al			GROUND LEVEL +4.63 mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift stan/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samular	Octubrica	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
21.02.09	PW			100						A B C 2	0.45 0.50 0.95 1.00 1.45 1.50		1.50		1.00	Loose, brown to brownish grey, silty fine to coarse SAND. (FILL)  Very stiff, yellowish grey to grey, CLAY. (SWAMP DEPOSIT)
<u></u>			Phytians	100				-7-36-47		3,4	3.00 3.45 3.50	+1,63	3.00		1	Loose, grey, clayey fine to medium SAND with some roots. (SWAMP DEPOSIT)
- - - - - 21 12 05	5.00 PW	4.10m at 18:00		100						<b>=</b> 5	4,50	+0.13	4,50 - - - - 5.00		]	Firm, grey to dark grey, CLAY / SILT. (SWAMP DEPOSIT)
	21.12.09 PW 18:00 100									DRILLE		40.3)			LOG	GRING GEOLOGIST GEOTECHNICAL ENGINEER
La SF	rge Dist T Liner '6 Undis 100 Undi	urbed Sa Sample turbed S	ample ampl	÷	I I	Sta	meabi	Penet	ralion Test st ker Test	K.W. L	CHNICA eung RKS	AL FIELD?	_		DATI 27.1	D. CHAN EDWARD CHENG TE DATE .12.09 28.12.09
	azier Sar ston San	npte	-		å	Sta	ndpipe	e/Piezo	ometer Tip ear Test	1. Inspi	action pi	t excavate	a from 0.0	ານສາ-1.50r	m.	

A-S11 HOLE No.

		H					MITEI 限公	'	DΚ	ILL	HOL	E KI	として	λKΓ	SHEET	1	of	3
-	PRO	JECT	<b>.</b>				•		elopm	ent of	Lok Ma	Chau Lo	op Gro	und Ir	nvestigation Work	s for Area A		
	METH	HOD	RC			·		co-c	RDI	VATE	3				JOB No.	J091	11S26 (T	FL)
-	MACI	IINE /	No.	LY38/	DR09					5,981					DATE from	08.12.09	to 16.	12.09
-			•							2,522 TION		tical			GROUND L	EVEL		5 mP.D.
-	FLUS	HING				/WA	IER	ORIE	T	HON			1	ГТ	GROUND		+0.0	
	Drilling Progress	Casing depth/size	level (m) Shift start/ end	Water Recovery % Total core	Recovery Solid core Recovery	R.Q.D. Fracture	Index F.L. / Test Depth	Tests		Samples	Reduced	Depth (m)	Legend	Grade		Descrip		
	0.12.09	sw							hareston fit	л б. б. в б.		- - - - - - - - - - - - - - - - - - -			Loose, brown, slity gravel sized rock f	r fine to coars ragments. (Fi	e SAND v ILL)	with some
يبينيوليين يبيييا				10	00			18 화호		e 1.	45 50				Stiff, yellowish bro some gravel sized	wn mottled gi rock fragmei	ey, sandy its. (FILL)	SILT with
				10	00			16 bis		3.3 3 4 3.3 3.3				the plants and the second				
تألتين ليستست	0.12.09 1.12.09	5.00 SW PW	Dry at 18:00	10	8			17 bis		4. s s 4. 5.	25	5 - 5.50			Loose, grey to yell	owish grey, c	layey fine	to medium
25032005.GDT 21.4.10			a( 08:00	10	<u>o</u>			(1, 0, 1, 1, 2, 3) N=7	O O	8 6, 6, 9 10 7,	50 70 30 35	7.50		State of the state	SAND. (SWAMP I	DEPOSIT)		
DRILLHOLE LOG J0911S26(TFL) LOK MA CHAU LOOP, GPJ TYSAN 25032005, GI				8	0		, , , , , , , , , , , , , , , , , , ,	(0, 1, 0, 1, 0, 1) N=2	Ū.	7; 11 12 8, 8, 8, 13 14 9,	50 50 70				Firm, grey to dark fragments. (SWAN	grey, CLAY /	SILT with )	oyster
햝				10	10					9.	Į							
3 J0911S26(TF	Lan	all Distu ge Distu I Liner S	rbed Sa	-	* !	Water t Water t	Level	tration Test	1	Tam TECHNA	-3.95 CAL FIELD	TECHNIC	17 1 7 1 IAN	S.C		<u>ED</u>	WARD CHI	AL ENGINEER ENG
LE LOG	U76	S Undista XV Undis			$\frac{\mathbb{I}}{\mathbb{I}}$		ability Te sion Pac	sl ker Test	REM	Leung					12.09	18	3.12.09	
DRILLHOLE LOG JC	Ma Pist	zier Sam ton Sam			* *	in-situ '		ometer Tip ear Test t	2. A p 3. A f 4. A v	slezomei alling he rane she	er installe ad perme ar test wa	ted from 0.0 d at 12.00m ability test w s carried ou first 5m is a	i depih. ras carried it at 13.10:		15,60m-17,10m depth. 1.			

			FOUND/ : 昇地基		1 LIN		1	DRIL	LH	OLE	: RE	:CO	RL	SHEET	2	of	3
PRO	JECT	<u> </u>						elopment	of Lo	k Ma C	hau Loo	р Сго	ınd in	 vestigation Works for	Area A		
MET	HOD	RC					CO-C	RDINA	res					JOB No.	J0911	526 (TF	FL)
MAC	HINE /	No 1	_Y38/DF	209				E 825,9						DATE from 08	.12.09 to	16.1	2.09
								N 842,5							<u>.</u>		
FLU	SHING			AIR /	WAT	TER	ORIE	NTATIC	אנ	Vertic	a1			GROUND LEVI	=L 	+0.05	mP.D.
Drilling Progress	Casing depth/size	level (m) Shift start/ end	Water Recovery % Total core Recovery %	Solid core	Fracture	Index F.I. / Test Depth	Tests	Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade		Description	on	
-		-	100					"			, , ,	<u>-   -</u>		As Sheet 1 of 3.			
							(0,0,0,1,1, 1) N=3	15 17 18	10.50 10.60 10.70 11.00 11.05						,		
-									11.50	-5.45	11.50		-	Firm, grey to dark grey	, CLAY / S	ILT. (SW	/AMP
			100			12.00	5	19						,			
1		Dry at						<b>₩</b> 20	12.50 12.60								
- 11.12.0 - 12.12.0		18:00 2.60m at				13.10	(0, 1, 2, 2, 1, 2) N=7	21	13.05 13.10 13.20	-7,05	13.10			Soft, yellowish brown to SILT. (ALLUVIUM)	o dark yelic	wish bro	own, CLAY /
-		08:00					N=7		13.50 13.55 13,60					Old F. B. LLO Floring			
<u>-</u>		1.10m	100					24									
- <u>12.12.</u> - 14.12.		at 18:00 2.35m					(1, 1, 1, 1, 2, 2) N = 6	Z 25	14.60 14.70 14.80								
		at 08:00					ที≃ธ	25 27	15.10 15.15		- - -						
				-			-		15.60	- <del>9.55</del>	15.60 -	-  -  -  -		Firm, black mottled ye SILT with some round	ed aravel a	nd cobbi	y CLAY / e sized
24.4			100					23			Ē			quartz fragments. (SV	AMP DEP	OSIT)	
005.GDT							(5, 7, 3, 3, 7, 6) N=21		16.60 16.70 16.80	-10,65	F 16,70	[6] 	-	Medium dense, yellow SAND with some roun			
25032						17.10	N=21	14 21	17.10 17.15		-	)  -  -		quartz fragments. (AL			
TYSAN									17.60			 					
OP.GP.			0								<u> </u>	-0					
DRILLHOLE LOG J0911528(TF.) LOK MA CHAU LOOP. GPJ TYSAN 25032005. GDJ CJ			100				33 bis	32	18.60 18.70		Ē.	-03					
OK MAC	19.65	1.40m at 18:00					(3, 5, 6, 9, 13 17) N = 45	, F	19.15 19.20 19.30	-13,15	<u>  19.20  </u>  -			Extremely weak, brow completely decompos	ed coarse g		
15,12.		4.44m at	90				•		19.60 19,65	-13.95	E 20.00			(Very silty fine to coan			
911526	imati Distu arge Distu		•		Vater ( Vater I	Sample Level		P.S. Tar			_			GGING GEOLOGIST D. CHAN		TECHNICA IARD CHE	AL ENGINEER ENG
	PT Liner	Sample		1 8	Standa	ırd Penet	ration Test	GEOTEC K.W. Le		L FIELD	rechnici.	AN	DA 17	TE .12.09	DATE 18.1	E 2,09	
	176 Undist 1100 Undis		•	-1-		ability Tea sion Paci		REMAR			<del>_</del>						
RILLHOLE LOG	лоо она: fazier Sал		-ample	-	-		meter Tip	1									
	iston Sam	ple				Vane Sh											
_				_ X	-oint L	oad Test											

	1	<b>M.</b>	泰昇	地基		程	有限	公	, 司				·				SHEET	3		of	3	
PR	OJECT	Plai	ning	and	Eng	jinee	ering	Stud	dy on Dev	elopme	ent of L	ok Ma C	Chau Lo	op Gro	und I	Inves	stigation Works	for Area	a A			
МЕ	THOD	RC							co-c	ORDIN	ATES						JOB No.	J	0911	S26 (T	FL)	
МА	CHINE	/ No.	LY3	B/DF	R09					E 825 N 842	•						DATE from	08.12.0	09 t	o 16.1	2.09	
FLU	JSHING	MED	IUM		AIR.	/W	ATE	:R	ORIE	NTAT	ION	Vertic	cal		**		GROUND L	EVEL		+6.0	5 mP.D.	
Drilling	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade			Des	cripti	on		
0914S2E(TFL)LOKMA CHAULOOP.GPU TYSAN_2503205.GDT 21.4.10  1	24.10 HW	2.10m at 18:00 4.45m 08:00	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	90 85 85 666 100 1	100	0 100 86 78	3.4	29.54 nple	(2, 7, 24, 35, 41/50mm) (100Hs/200mm) (100Hs/200mm) (100Hs/200mm) (100Hs/200mm) (100Hs/200mm) (100Hs/200mm)	12101 T2101 T2101 T2101 T2101	20.65 20.75 21.15 21.50 21.15 21.50 21.15 21.50 21.15 21.50 21.15 21.50 21.15 21.50 21.15 21.50 21.15 21.50 21.15 21.50 21.15	-18,05	24.10	\(\frac{1}{2}\)\(\fra	LO S.C DA	Stra sligs are narryer		d coarse un dipping 8,00-28.5	grain, ed, rot, p at 20 p. The control of the contr	ed GRA ugh plan "-30", 5	NITE. Joints ar, very ar-60° and	
ELOG ELOG	176 Undisto 1100 Undis			İ	Permi	eabili	ly Tes		K.W. L			<del>-</del>		<u>17</u>	.12.0	9	-	18.12	2.09			
	Mazier Sam Piston Sam	ple	• • •		å 8	Stand	pipel	Piezo	meter Tip ear Test													
								Test														

### TYSAN FOUNDATION LIN 泰昇地基工程有

### DRILLHOLE RECORD

HOLE No. **A-S12**SHEET 1 of 1

			·阿克						1							SHEET	1	of	1
PRO	JECT	Plan	ning	and	Eng	inec	ring	Stud	ly on Deve	opment	of Lo	ok Ma C	hau Loc	ор Gro	ınd lı	nvestigation Works fo	or Area A		
MET	HOD	RC								RDINA						JOB No.	J091	1S26 (T	FL)
МАС	CHINE /	No.	LY38	3/SE	305					E 826,1 N 842,4						DATE from (	8.12.09	to 10.1	12.09
FLU	SHING		UM	,	AIR				ORIE	VTATIO	N	Vertic	al	·		GROUND LE	VEL	+4.4	2 mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade		Descrip	tion	
- 08.12.										* PEROENTER D	0.45 0.50 0.95		1.00			Stiff, yellowish grey,			
- 08.12. - 10.12. - 1. 10.12. 			-	100	- 1885				4 bis	¢ c 1 1 2	1.00 1.45 1.50 1.95 2.00		3,00			Loose, grey and yelle coarse SAND with se (FILL)	ome gravel	sized roc	k fragments.
-				100					8 bis	3	3.45 3.50	-0.08	4.50			Firm, grey to yellowis some roots. (SWAM	P DEPOSIT	Γ)	
10.12.	5,00 9 PW	4,37m at 18:00		100					3 bls	<b>1</b> 5	4.95	-0.58_	- - - - 5.00	 		Soft, grey to dark gre DEPOSIT)		SILT. (SV	VAMP
											5.00		constant de la consta	Transfer -		End of drillhole at 5.0	oum.		
1	Small Distu ærge Distu				*	Wal	er Sa er Le	vel		DRILLER M.S. Le	e				<u>\$.</u>	O. CHAN	ED	WARD CH	EAL ENGINEER IENG
31 <b>=</b>	SPT Liner J76 Undist		ample		+			Penel lity Te	Iralion Test st	K.W. Le		AL FIELD 1	EUHNICI —	WIA		ATE 7.12.09	DA` _18	.12.09	
	J100 Undi	sturbed			Ī	Imp	ressio	n Pac	ker Test	REMAI		t excavate	d from 0.0	Om-1.50r	n.				
	Mazier Sar Piston San				<b>Å</b>				ometer Tip ear Test										
آسا					×			d Tes											

PROJ	ECT	泰	OUND 昇地却 ing and	基工程	呈有阿	艮公司						hau Loc			SHEET 1 of 1  Ivestigation Works for Area A
															JOB No. J0911S26 (TFL)
METH		RC			<del></del>	<del></del>	CO-0			79.39	9				
MACH	IINE / N	40. L	/38/SI	305 ——				N 84	12,3	78.72	2				DATE from 21.12.09 to 21.12.09
FLUSI	HING N	Vater		AIR	_	1-1-	ORIE	ENTA	OIT	N	Vertic	al	· · · · · ·	<del></del>	GROUND LEVEL +4.55 mP.D.
Drilling Progress	Casing depth/size	level (m) Shift start/ end	Recovery % Total core Recovery %	Solid core Recovery 9	K.Q.D. Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Гедепа	Grade	Description
-21.12.09	PW							Microson	A	0.45 0.50 0.95 1.00	+3,05	1.50			Firm, grey and brown, sandy SILT. (FILL)
			100		The state of the s		10 bis		1 2	1.50 1.95 2.09	_+1.55	3.00			Firm, light yellowish brown mottled red, clayey SILT. (FILL)
21,12,09	5.00	i.94m at 18:00	100	A STATE OF THE PARTY OF THE PAR			12 bis		3 4	3.45 3.50 4.50	-0.45	5.00			Stiff, yellowish brown and dark grey, CLAY / SILT. (SWAMP DEPOSIT)
991/S26(TFL) LOK MA CHAU LOOP, GPJ TYSAN 25032005. GDT 21.4.10	all Disturbe	ed Samp		¥ V	Vater Sa Vater Le	vel		M.S	LLER LLER			ECHNICK	AN	Loc	GGING GEOLOGIST GEOTECHNICAL ENGINEER EDWARD CHENG TE DATE
DESILIHOLE LOG JC 1000 DESILIHOLE LOG JC 1000	Liner Sar Undisturt O Undisturier Sample on Sample	bed Sam irbed Sai le		I n A s	enneabi npressio itandpipo	ility Test on Packe e/Piezon ane Shea	er Test neter Tip	K.V RE	/. Leu MAR	ing KS		1 from 0.04	······	20.	01.10 21.01.10

ı	H						JIMI 有限	TED 公司		רום.	. 1	L-1		I \1		/ I \L	_	SHEET	1	of	1	
PRO	JECT	Plan	ning	and	Eng	inee	ering	Stud	y on De	/elopm	ent	of Lo	k Ma C	hau Lo	op Gro	und li	nves	stigation Works for Ar	ea A			
MET	HOD	RC							co-	ORDII	NAT	ES						JOB No.	J0911	S26 (T	FL)	
MAC	HINE /	No.	LY3	8/SE	305					E 82 N 84								DATE from 07.12	2.09 t	0 07.1	2.09	
FLU	SHING	MEDI	UM		AIR				ORI	ENTA	TIO	N	Vertic	al		, <u> </u>		GROUND LEVEL		+5.3	7 m	P.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade		De	escript	ion		
- 07.12.0		0114							•	•		0,45 0,50	+4,87	0.50			siz	ff, yellowish brown, sar ed rock fragments. (Fil	_L)			
Ē Ē										NAMECTON MI	В	0.50 0.95 1.00					Lo	ose, yellowish brown to th some gravel sized ro	brown, ck fragi	, fine to c nents. (F	coarse FILL)	SAND
											c	1.45										
				100	1				39 bls		2	1.95 2.00										
				100					8 bls		3	3.00	+2.37	3.00		<b>V</b>	Ve	ery soft, dark grey, CLA EPOSIT)	Y/SILT	Г. (SWAI	MP	
											1 4	3.45 3.50			1 - 1							
- - - 07,12.0	5.00 9 PW	Dry at 18:00		100					3 bla		6	4,50 4,95 5,00		5.00			_					
											7	5,00					EΠ	nd of drillhole at 5.00m.				
														-								
-																			•	•		
1 1 1														E								
		}												-								
														E E								
	***************************************													<u>-</u>								
11 t .	mall Distu arge Dist	A F		ter Sa ter Le	-		<u>M.S</u>	LLEF S. Lec	3				<u>s</u>	.O. C	ING GEOLOGIST CHAN	ED\	OTECHNIC WARD CH		SINEER			
11 🖺	SPT Liner 176 Undis	-		B	1			Penel lity Te	ration Tes st		OTEC V. Le		AL FIELD	TECHNI	CIAN		ATE 0,12	.09	DAT _11.	'E 12.09		
	lmp	ressio	я Рас	ker Tesl		MAF		t excavate	ed from N	.00m-1.5	)m.											
	å				ometer Tîp ear Tost	2. 4	wate	er sam	t excavate ple was ta	ken at 5.	00m depl	h.										
il '	Piston San			×			d Tesi															

	ATION LIMITED 工程有限公司	DRILLHOLE	RECORD	SHEET 1	of 1
PROJECT Planning and	Engineering Study on I	Development of Lok Ma Cha	u Loop Ground Inve	stigation Works for Area A	
METHOD RC	С	O-ORDINATES		JOB No. J09 <sup>4</sup>	11S26 (TFL)
MACHINE / No. XY2B/CO	CL-1	E 826,245.98 N 842,238.57		DATE from 08.12.09	to 09.12.09
FLUSHING MEDIUM A	AIR O	RIENTATION Vertical		GROUND LEVEL	+4.60 mP.D.
Drilling Progress Casing depth/size pupt (4) and pupt (4) and pupt (5) and pupt (6) and pupt (7)	R.Q.D. Fracture Index F.I. / Test Depth	Samples Reduced Level (mPD)	(m) Legend Grade	Descrip	otion
-08.12.09 PW		A 0.45	Loo Lo	ose, brown, silly fine to coars avel sized rock and brick frag ose, yellowish grey to yellow	ments. (FILL)
- 08.12.09	22 bia	2 1.95	coi	arse SAND with some shell f	ragments. (FILL)
100 100 1.20m 1.20m 2.5.00 at 100 100	19 bis	3 3 4 3.45 3.50 4.50 5	First   First	m, grey, sandy CLAY / SILT.	(SWAMP DEPOSIT)
Small Disturbed Sample Large Disturbed Sample	▲ Water Sample  * Water Level	DRILLER T.H. Wong	LOGGI S.O. CI	HAN ED	OTECHNICAL ENGINEER DWARD CHENG
SPT Liner Sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample Piston Sample	Standard Penetration T Permeability Test Impression Packer Test Standpipe/Piezometer T  In-situ Vane Shear Test X Point Load Test	K.W. Leung  REMARKS  1. Inspection pit excavated from	<u>17.12.</u>		TE .12.09

	TYSAN
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	FOUNDATION LIMITED
<b>-</b>   -	泰昇地基工程有限公司

### DRILLHOLE RECORD

	H	3	FOUI F昇						1	ما	. 11	<del></del> J	,0		_   \}_				SHEET		1	of	4	
PROJ	JECT	Plan	nîng a	and !	Engi	inee	ring	Stud	y on Dev	velo	pme	nt of L	ok M	a Ci	hau Loc	op Gro	und l	nves	tigation Work	s for A	теа А			
METH	HOD	RC							CO-	or	DIN	ATES							JOB No.		J091	1S26 (T	FL)	
MACI	HINE /	No.	XY2E	3/CC	CL-1			·				,454.1 ,214.1							DATE from	11.1	12.09	to 23.1	12.09	
FLUS	HING	MEDI	UM	F	NR.	/W	ATE	R	ORII	EN	ΓΑΤ	ION	Ve	ertic	al				GROUND	LEVE	<u>_</u>	+4.5	5 m	P.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Recovery %	Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests			Samples	Reduced	Level (mPD)	Depth (m)	Legend	Grade				escrip			
_ 11.12.09      	PW									Ja Kuthan		0.5		55	- 1.00				ose, grey, silty			SAND. (F	TLL)	
11.02.09		Dry at 18:00										1,0	5 +3.	05	1.50				ft, grey, CLAY				OL 43	,,
- 12.12.09 		0.98m at 08:00	1	00					22 bis		1	1.5 2 1.9 2.0							m, reddish bro .T. (FILL)	wn moi	tled Whi	te, sandy	CLAY	<i>4 1</i>
- 12.12.09 - 14.12.09	1,02m at 18:00 14.12.09 1.10m at 100 08:00 100 08:00 11.00m at 08:00 15 bis 3.50 15 bis 3.50 15 bis 3.50 15 bis 3.50 15 bis 3.50 15 bis 3.50 16 bis 3.50 17 bis 3.50 18 bis 3.50 18 bis 3.50 18 bis 3.50 18 bis 3.50 19 bis 3.50 10 bis 3.																							
14.12.09 1.10m at 100 15 bts 3																								
			1	00				·	16 bis		<b>]</b>	4.5		05	4.50				m, grey to dari :POSIT)	k grey,	sandy C	LAY/SIL	LT. <b>(S</b> '	WAMP
- 14.12.09 - 15.12.09		3,55m at 18:00 2,82m									* ;	4.9 5.0 5.5												
21.4.10		at 08:00		00								7												
2005.GDT								6.50	(1, 0, 1, 1, 2 3) N=7	2		6.5 6.6 6.7 7.0 7.0	0	05	- 6.60 -			Loc	ose, grey, clay POSIT)	ey fine	to medi	um SANI	D. (SV	VAMP
3AN 2503										F	7	7.5												
T CAS'		1.21m at	1 1	90								11												
0 - 15.12.09 - 16.12.09		18:00 0.98m at 08:00	1				i		(1, 1, 2, 2, 3) N=0	2,		12 8.5 8.6 8.7 13 9.0	0											
LOKMAC				100							7	9.0 9.5	5				2							
Secretary Secret	U Di-tu	4-45-		Mate	Ca	mala			) DRILL	FR .	5.	45	10.00			OGGIN	NG GEOLOGIST		GF	OTECHNIC	AL EN	GINEER		
10911S2	nall Distu rge Distu	rbed Sa				Wate	er Lev	/el		]	Γ.H. V	Vong	AL EIG		 FECHNICI	iΔN	<u>s</u>	OGGIII O. CH		_		WARD CH		
SP 0 07	T Liner S 6 Undist	-	ample		Ī			Penet lity Te	ration Test st	ļ	K.W. I	eung	W1⊾ FIC					30.12.0	09			.12.09		
되를 Ma	00 Undis azier San aton Sam	nple	Sample	•	Ĭ	Stan In-si	dpipe lu Va	e/Piezo	ker Test ometer Tip ear Test	3 4 5	I. Insp 2. A fa 3. A co 4. A ris 5. A ve	iling hea onstant i sing hea one shoo	ed pem nead po d pem ar test v	neabi erme lesbii vas c	ability test lity test wa carried out	as came t was can as carried t at 13.55	d out a ned ou l out a im des	ut at 18 it 11.50	m-6,50m depth, 8,10m-19,60m de 0m-13,00m depth.	pth.				
F76-06	31125									7	7. Flu	<del>aicr san</del> shing m	ipio via edium 1	or fir	<del>ron at 5.00</del> rot 5m is a	o <del>nraepih</del> iir.								

	FOUND 泰昇地	ATION LI 基工程有		'	וואט	_ <b>L</b> _[	IULI	= r\c		עאי	SHEET	2	of	4
PROJECT I	Planning and	Engineer	ing Study	on Deve	elopmen	t of L.c	k Ma C	hau Lo	op Gro	und Inve	estigation Works	for Area A		
METHOD I	RC			co-o	RDINA	TES					JOB No.	J091	1S26 (T	FL)
MACHINE / N	o. XY2B/C	CL-1			E 826,4 N 842,2						DATE from	11.12.09	to 23.1	12.09
FLUSHING M	EDIUM	AIR / WA	TER	ORIE	NTATIO	ON	Vertic	al			GROUND LE	EVEL	+4,5	5 mP.D.
illing ogress asing spth/size	purity (3 para 1	Solid core Recovery % R.Q.D.	Flacture Index F.I. / Test Depth	Tests	Samoles		Reduced Level (mPD)	Depth (m)	Legend	Grade		Descrip	tion	
	100							<u>-</u>	Ī		s Sheet 1 of 4.			
				1, 1, 1, 2, 2, } {=8	16	10,50 10,60 10,70 11,00 11,05	<u>-6.05</u>	- 10.60 - - -		Lo (S	oose, yellowish gr SWAMP DEPOSIT	ey, silty fine t Γ)	o coarse	SAND.
-	0					11,50	<u>-6.95</u>	11.50	; -   -   -   -   -   -   -   -   -   -	Fi	irm, dark grey, CL	AY / SILT. (8	WAMP D	EPOSIT)
	100 35m at	***************************************	13.00	5 bis	21	12.50 12.60 13.05 13.10								
18.12.09 18 - 17.12.09 2.1	3:00 24m at 3:00 0		13,55		· n	13.50 13.55 13.60								
- 17.12.09 18 - 18.12.09 2.1	at 3:00 84m at 100 3:00		6	i bis	23	14.60 14.70 15.15 15.20	10.15	14.70 - - - - -			irm, grey to dark g EPOSIT)	rey, sandy C	LAY / SIL	.T. (SWAMP
	85				25	15.60		<u>, , , , , , , , , , , , , , , , , , , </u>						
			3	1, 1, 2, 2, 3, ) } } = 10	25 29	16,60 16,70 16,80 17,10 17,15	-12.15	<u> </u>		Lo Si	oose, yellowish gr AND. (SWAMP D	ey to grey, ve EPOSIT)	ery silty fir	e to medium
	0		-			:	-14,15	18.70						
19.60 PW  Small Disturbed Large Disturbed SPT Liner Sam	0			16 błs 8, 8, 3, 4, 3, V= 14	**************************************	18.60 18.70 19.15 19.20 19.55	-15.05	19.60	0.0	St (A	ledium dense, yell ubrounded gravel ALLUVIUM)	sized quartz	fragment	s.
HW	80	100	19.60			19,60		- - 20,00	000	m	ellowish brown, ar oderately decomp	oosed granite	fragmen	ls.
Small Disturbed     Large Disturbed     SPT Liner Sam     U76 Undisturbed	d Sample iple	<u>+</u>		on Test	DRILLER T.H. Wo GEOTEG K.W. Le	ng CHNICA	L FIELD 1	ECHNICI	AN	S.O. C DATE 30.12	-	. <u>ED'</u>	WARD CHI	AL ENGINEER ENG
SPT Liner Sam U76 Undisturbe U100 Undisturb U100 Undisturb Mazier Sample Piston Sample	bed Sample	I Impres	ssion Packer pipe/Piezome Vane Shear	ter Tip	REMA	RKS								

	H		OUN 昇地									_LI			` <u></u>	_	· •	. <b>\ L</b>	SHEET 3 of 4
PROJ	ECT	Planni	ng a	nd E	Engi	neer	ring	Stud	y on Dev	elopi	men	it of Lo	ok Ma C	hau	Loop	Gr	ou	nd Ir	nvestigation Works for Area A
METH	HOD	RC							CO-0	ORD	INA	TES							JOB No. J0911S26 (TFL)
MACH	HINE /	No. X	Y2B	CC	L-1						_	454.1 214.1							DATE from 11.12.09 to 23.12.09
FLUS	HING	MEDIU	M	Α	JR/	W	ATE	R	ORIE	ENT	ΑΤΙ	ON	Verti	cal					GROUND LEVEL +4.55 mP.D.
Drilling Progress	ing h/size	Water level (m) Shift start/ end ≤	Recovery % Total core	Recovery %	Recovery %	R.Q.D.	racture Index	F.I. / Test Depth	Tests		المسان	odulpies	Reduced Level (mPD)	Depth	(m)	Legend		Grade	Description
-		2,35m at	$\neg$	0							7*			E	ĺ	0 0	74		(ALLÜVIUM) As Sheet 2 of 4.
18,12.09 - 19.12.09		18:00 3.32m at 08:00 at							(3, 6, 5, 5, 5 9) N=24		] 34	20.70 20,80 5		F 20	0.70	<i>)</i>	4		Medium dense, yellowish brown, fine to coarse SAND (ALLUVIUM)
- 19.12.09 - 21.12.09		18:00 3.15m at 08:00	10	00					] (4, 5, 3, 5, 6	77777		8 22.60 22.70 22.80		- 21	.60				Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT)
			AMERICAN TO THE PROPERTY OF TH						(4, 5, 3, 5, 6 a) N = 22		ا 4	9	1					V	
			1	00								25.6				000	3	١٧	Weak, yellowish grey, highly decomposed meta-SILTSTONE. (COBBLE sized rock fragments)
	26,50 HW		L		79	30	>20 NI	26,80		_	AT3	26.3 26.4 - 27.1	-22.2	<u> </u>	6.40 6.80 7.20		Ì	V/III	Moderately weak to moderately strong, yellowish brown to yellowish grey, highly to moderately decomposed meta-SILTSTONE.  26.80- 27.20m; Non intact. Recovered as angular
		2.91m at			100	0	>20	27.20		-	AT3	- 27.3	22.6		/_30***			BIAR	Qravel. (FAULT ZONE)  Moderately strong to strong, light grey, moderately to slightly decomposed meta-SILTSTONE. Joints are closely spaced, rough planar, very narrow, iron stained, dipping at 20°-30° and vertical joint from 28.70-29.40m.
21.12.0 - 22.12.0 	9	18:00 2.84m at 08:00			100			29.40		-	AT3	- 28.7 - 28.8	-24.8	- - - 5 - 2	9.40				Strong, grey, slightly decomposed meta-SILTSTONE
							5.0	<u> </u>		1			-25.4	5 F 3				11	Joints are closely to medium locally very closely spaced, rough planar, very narrow to narrow, iron  OGGING GEOLOGIST GEOTECHNICAL ENGINEER
l La	mæli Distu arge Distu PT Liner :	irbed Sar	-			Wat	ler Le		atration Tes	<u> </u>	EQT	Nong ECHNIC	AL FIEL	O TEC	HNICI	λN		<u>S</u>	O. CHAN EDWARD CHENG DATE
U M	76 Undisl 100 Undi lazier Sar islon San	urbed Sa sturbed S nple	•	,	Ĭ	lmp Star In-s	nessi ndpip itu Va	e/Pie: ane Si	cker Test zometer Tip hear Test	F		ARKS							30.12.09 31.12.09
1					X	Poli	ni Lo	ad Te	st	⊥.									

		T T	<b></b> 昇	地:	基工	程	有限	TEI 及公	司	DRIL							SHEET	4		of	4
PROJ	EGI	Plan	ning	g and	ı En	gine	ering	y Stu	ay on Dev	/elopment	Of LC	OK IVIB C	nau Loc	op Gro	ouna i	nves	stigation Works f	or Area A	<u> </u>		
METH	łOD	RC							co-	ORDINAT	ES						JOB No.	J09	)11S	26 (TF	L)
MACI	INE /	No.	XY2	2B/C	CL-	-1				E 826,49 N 842,21							DATE from	11.12.09	to	23.12	2.09
FLUS	HING	MEDI	138/		AIR	/16	/ATI		ORI	ENTATIO		Vertic		•			GROUND LE	VEL.		+4.55	mP.D
FLU3							//\.	-,\ [	OK	T			) 		T		OROGINO EL	* h-h-		17.00	
Drilling Progress	Casing depth/size	level (m) Shift start/	Vater Recovery %	Total core Recovery %	solid core Recovery	R.Q.D.	racture	F.I. / Test Depth	Tests	Samples		Reduced Level (mPD)	Depth	Legend	Grade			Descr	iptior	n	
<u> </u>		end	<b>ν</b> π.		100					ETA	30.25		E	愐	9	sta	ined, dipping at 1	0°-20° an	d 30°-	-40°.	
				100	100	100	1			ETA			Ē		.						
		2.77m at 18:00		100	100	100	5.0			AT3	30.80		<u>-</u>		1						
23.12.09		2.85m at 08:00					L.	31.55			31.20		_ _ 31,55								
_		00.00		100	100	78	NI	31.75		AT3		-27.20	- 31.75 -			31. rec	55-31.75m: Mod overed as angula	erately de r gravel a	comp	osed, r bble. (F	on intac
23.12.09		3.19m at 18:00					3.0					-28.05	32.60		ll l	ZO	NE)				
								32.60			32.60		E			En	d of drillhole at 32	.60m.			
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Smill Larg							ŧ						<u> </u>								
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♦ Sma Î Larg	all Distur ge Distur				¥		er Sa er Le			T.H. Won			_		<u>s.</u>	0, CI	IG GEOLOGIST IAN	<u>E</u>	DWAF	CHNICAL RD CHEL	. ENGINEE VG
SP1	F Liner S Undistu		mple	<b>:</b>	! I			Penei lity Te	ration Test st	GEOTECH K.W. Leu		L FIELD	TECHNIC!	W.		TE ),12.0	9		ATE 31.12.0	09	
U76	0 Undist	turbed S			İ	Impi	ressio	n Pac	ker Test ometer Tip	REMARI	KS										
	പരാവണി	שוק																			

FOUNDATIO 泰昇地基工	į.	DRILLHULE	RECORD	SHEET 1 of 1
PROJECT Planning and Eng	ineering Study on De	evelopment of Lok Ma Ci	hau Loop Ground Inve	estigation Works for Area A
METHOD RC	co	-ORDINATES		JOB No. J0911S26 (TFL)
MACHINE / No. LY38/DR05		E 826,551.16 N 842,192.10		DATE from 17.12.09 to 19.12.09
FLUSHING MEDIUM AIR	OR	IENTATION Vertic	al	GROUND LEVEL +4.78 mP.D.
Drilling Progress Casing depth/size depth/size puses (A) Authority Recovery % Solid core Solid core Recovery % Recovery %	R.Q.D. Fracture Index F.I. / Test Depth Tests	Samples Reduced Level (mPD)	(m) Legend Grade	Description
17.12.09 PW	30 bis 11 bis 4.50 📩	A 0.45 0.50 0.50 0.95 1.00 0 1.45 1.50 1 2.00 2 1.05 2.00 3.00 +1.78	-1111111111111-	cose to medium dense, yellowish brown, fine to coarse SAND with some gravel sized quartz ragments. (FILL)
	Water Sample	0. 495 -0.22 5.00		End of drillhole at 5.00m.
Large Disturbed Sample  SPT Liner Sample  U76 Undisturbed Sample  U100 Undisturbed Sample  Mazier Sample  Piston Sample	Water Level Standard Penetration Ter Permeability Test Impression Packer Test	F.K. Yiu  GEOTECHNICAL FIELD  K.W. Leung  REMARKS	S.O. TECHNICIAN DATE 27.1 d from 0.00m-1.50m.	CHAN EDWARD CHENG

_		4 B						TED	1	ואט	LLI	1ULI	= KE	-CC	)KL	SHEET 1 of 1	
DBA	IECT.							公司		elonmo	nt of t	nk Ma C	houle	on Gro	und t	nvestigation Works for Area A	
PRO.	JEC 1	Plan	ning	and	Eng	jinee	enng	Stud	y on Dev	еюрте	ni oi L	ok wa C	nau co	op Gro	uriu 11	Ivestigation volvs to Nea A	
METH	HOD	RC							CO-C	ORDIN	ATES					JOB No. J0911S26 (TFL)	
MACI	HINE	/ No.	LY3	8/DI	R09					E 825 N 842	•					DATE from 04.12.09 to 04.12.09	}
FLUS	HING	MEDI	UM		AIR				ORIE		····		al			GROUND LEVEL +5.52 n	nP.D.
		Water		-S	۰					T		(g)					
Drilling Progress	Casing depth/siz	(m) Shift start/ end	Water	Recover	Solld con Recovery	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	Reduced Level (m	Depth (m)	Legend	Grade	Description	
	PW										0.45				- The state of the	Loose, brown, fine to coarse SAND with some sized rock fragments. (FILL)	gravel
_				Ì						MOLCOOM	. 0,95	+4.52	1.00	$\bowtie$		Firm how CLAV/SHTuilb some graval size	od.
	Ē.										1.45		1.50			siltstone fragments. (FILL)	
				100					22 bis		1,50		-			Loose, brown and yellowish brown, silty fine to SAND with some gravel sized rock fragments.	coarse (FILL)
-											2.00		<u> </u>				
													E	$\bowtie$			
				100					20 Ne		3,00	+2.52	3.00_			Firm, grey, sandy SILT with locally sand matrix	. (FILL
			-						20 643				Ē				
													<u> </u>				
Water level (m) Shift start/ start/ end PW PW PW PW PW PW PW PW PW PW PW PW PW																	
04.12.09	5,00 PW			100					13 bis		<b>i</b>		5.00			Firm, dark grey to black, CLAY / SILT with som (SWAMP DEPOSIT)	e roots
											5.00					End of drillhole at 5.00m.	
													<u>}-</u> 				
-	į												<u>-</u> - -				
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◆ Sm Lar																	
_ ^						167-1	30.00	note		DRILLI	≐R	<u> </u>	<u> </u>	<u> </u>	10	GGING GEOLOGIST GEOTECHNICAL EN	SINEFR
♦ Sm Lan	ge Distu	rbed Sar rbed Sar				Wate	er Sar er Lev	el		P.S. T	am	AL FIELD 1		AN		D. CHAN EDWARD CHENG	
ш т	T Liner S 6 Undist	Sample urbed Se	ample		<u>1</u>			Penetr ily Tes	ation Test t	<u>K.W. 1</u>	.eung	AL FIELD				.12.09 11.12.09	
=	00 Undis zier San	iturbed S note	Sample	в	I				er Test meter Tip	REM/ 1. Insp		excavale	d from 0.0	0m-1,50n	1.		
Pis	ton Sam				~	in-si		e She	ar Test								

		1.	FOU. 琴昇:	NDA		NL	IMI			DR	IL.	LH	OLE	ERE	:CO	RD	SHEET	1	of	3
PRO.	JECT	Plan	ning	and 1	Engi	inee	ning	Stud	y on Deve	lopm	ent	of L.o	k Ma Cl	hau Loc	p Grou	ınd inv	estigation Works for	r Area A		
METI	HOD	RC							co-o	RDII	TAN	ES					JOB No.	J0911	S26 (TF	L)
MAC	HINE /	No.	XY2I	B/CC	CL-3	3				E 82 N 84	-						DATE from 30	0.11.09 1	o 05.12	2,09
FLUS	HING					/ W.	ATE	R	ORIE	NTA	TIO	N	Vertic	al 	Υ .		GROUND LEV	EL	+5.77	mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Recovery %	Recovery %	R.Q.D.	Fracture	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade		Descript		
30.11.05	PW	Dry at 18:00 1.44m at 08:00		100					21 bis	* ASSESSION TO	A B C 1 2	0,45 0,50 0,95 1,00 1,45 1,50 1,95 2,00 3,45 3,50	+1.27	4.50		LS	oose, yellowish brow ome gravel sized qua	artz fragme	nts. (Fil.L.)	
		THE TABLE THE TA		100					11 bis  (1. 1, 1, 1, 2, 3)  N=7		5 6 7 8 9	4.95 5.00 5.50 5.50 6.60 6.70 7.00 7.05		7.50		- Linear agent	SWAMP DEPOSIT)			
0. 01.12.0 0. 02.12.0	9 9	1,00m at 18:00 1.70m at 08:00		90	•	Wat	er Sa	mple	(1, 1, 1, 2, 2, 2) N=7	DRII	11 12 13 14	8.50 8.60 8.70 9.00 9.05	]	10.00	-   -   -   -   -   -   -   -   -   -	LOGG	Firm, dark grey, CLA	GEC	DTECHNICA	L ENGINEER
	orge Disto PT Liner 76 Undist 100 Undi azier San iston San	abed Sample Sample surbed S sturbed nple	ample ample		¥   I fi	Wat Star Pem Impi Star In-si	er Len ndard meabi ressio ndpipe itu Va	ve! Penel lity Te on Pac e/Piez	ker Test ometer Tip ear Test	GEO K.W	Leu VAR	HNICA Ing	L FIELD T excavater i permeab drum for fir			DATE 17.1	CHAN ± 2.09 .00m-10.50m depth.	DAT	VARD CHE E 12.09	NG

HOLE No. A-S19

<b>I</b>	H			JND. 地基					'	DRI	LLF	1OLI	E RE	:CC	RL	SHEET 2 of 3
PROJE	СТ	Plan	ning	and	Eng	jinee	ering	Stu	dy on Dev	elopme	nt of L	ok Ma C	Chau Loc	op Gro	und In	vestigation Works for Area A
METHO	DD	RC							CO-C	ORDIN	ATES		·			JOB No. J0911S26 (TFL)
MACHI	NE/	No.	XY2	B/C	CL-	3				E 826 N 842						DATE from 30.11.09 to 05.12.09
FLUSH	IING					/ W	ATE	ER	ORIE	NTAT	ION	Vertion	cal			GROUND LEVEL +5.77 mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
-02.12.09	7.50 PW	1.20m at 18:00 1.66m at 08:00	Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annua	100		The state of the s		10.50	1		10.50	9.73 10.63 12.63 13.33	15.50	0.0     0.0 <td>V</td> <td>Firm, grey, sandy CLAY / SILT. (SWAMP DEPOSIT)  Medium dense, yellowish brown, fine to coarse SAND with some gravel sized quartz fragments. (ALLUVIUM)  Very dense, yellowish brown, fine to coarse SAND. (ALLUVIUM)  Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Stiff, SILT)  Extremely weak to very weak, yellowish brown, completely decomposed meta-SILTSTONE.</td>	V	Firm, grey, sandy CLAY / SILT. (SWAMP DEPOSIT)  Medium dense, yellowish brown, fine to coarse SAND with some gravel sized quartz fragments. (ALLUVIUM)  Very dense, yellowish brown, fine to coarse SAND. (ALLUVIUM)  Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Stiff, SILT)  Extremely weak to very weak, yellowish brown, completely decomposed meta-SILTSTONE.
Small Large SPT L	Disturi iner S Indistu Undist r Samp	rbed Sa urbed S ole	nple mple	1	i I i	Perri Impri Stan	er Lev dard i seabil ession dpipe	rel Penel lity Te: n Paci r/Piezo	ration T'est st ker T'est ometer Tip ear T'est	DRILLI C.L. C GEOTI K.W. I	hung ECHNICA eung	-14.23 L FIELD T	ECHNICIA	1111111	LOG S.O.	(Very stiff, sandy Sil. T with some gravel and cobble GING GEOLOGIST GEOTECHNICAL ENGINEER CHAN EDWARD CHENG

DRILHOLE LOG JO911528(TFL) LOK MA CHAU LOOP. GPJ TYSAN\_25032005.GDT 21.4.10

HOLE No. A-S19

-	H			NDA		NI	ımı	TED 公章		DRIL	LH.	IOLE	ERE	.CC	RI	SHEET	3	of	3
PRO.	IECT	L								opment	of Lo	k Ma C	hau Loo	p Gro	und li	nvestigation Works f	or Area A	····	<u> </u>
									00.0	DINIA.	TES					JOB No.	.ina1	1S26 (T	FL)
METI		RC	~~~	D/C	OL -					RDINA E 826,0		0				DATE from			· · · · · · · · · · · ·
MAC	HINE /	NO.	XY2	R/C	UL-3					N 842,1			·						
FLUS	HING				AIR.	/ W	ATE	R	ORIE	NTATIC	N N	Vertic	al		T	GROUND LE	VEL	+5.7	7 mP.D.
Drilling Progress	Casing depth/size	level (m) Shift start/ end	Water Recovery %	Total core Recovery 9	Solid core Recovery 9	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade		Descrip	tion	
- 03.12.09 - 04.12.09		1.82m at 18:00 5.40m at 08:00		90				21,17	(18, 34, 37, 42, 21730mm) 100t/s/180mm		20,50 20,60 20,68 20,93 21,17		- - - - - 21.17		VIV	sized rock fragment			
				100	100	0	>20	.		T2101	21,53	15.93	21.70		10,700	Moderately strong to slightly decomposed	l meta-SILT	STONE.	
				89	89	30	6,0	21.70		T2101	22.44					Strong, light grey to meta-SILTSTONE. spaced, rough plans chlorite coated, dipp	grey, slight! Joints are cl ir, very nam ing at 10°-2	y decomp osely to r ow, iron s o°, 30°-4	oosed nedium tained, 0° and
-				100	100	20		22.47		T2101	22.97	 	-  -  -			50°-60°.			
<u>-</u>				100	100	0				T2101	23.27		[- - -						
				100	100	20	>20	24.74		T2101	24.74	-18.63	23.95 24.40	A THE RESERVE OF THE PERSON OF	11	23.95- 24.40m: With	ı interlamlna	ation of q	uartz
E				100	100	50				T2101			1						
04.12.0 - 05.12.0			ниничено	100	100	53	9.7			T2101	26.22								
05.12.0												-21.93	E - - 27.70						
								27.70			27.70		E			End of drillhole at 2	7.70m.		
												Walter Britain	E E						
					1								E						
- S	mall Distr							mple	l	DRILLE C.L. Ch		<u> </u>	<u> </u>	<u>.l</u>		OGGING GEOLOGIST .O. CHAN		OTECHNIC	CAL ENGINEER HENG
ទី៣ s	irge Disli PT Liner	Sample			1	Sta		Pens	tration Test		CHNIC	AL FIELD	TECHNIC	AN	0	ATE 17.12.09	DA	TE 3.12.09	
0 N	76 Undis 100 Undi iazier Sai iston Sar	sturbed mple			Ī	lmp Sta	xessio ndpip	e/Piez	est oker Test ometer Tip near Test	REMA							The state of the s		

X Point Load Test

### DRILLHOLE RECORD

HOLE No. **A-S20**SHEET 1 of 1

	<b>1</b>	H	•	FOU 泰昇					ITEL 《公	´	יוט	NI L	-1-1	IOLI	L., 1 \L		/ I \ I		SHEET		1	of	1
	PRO	JECT	Plar	nning	and	l Eng	jine	ering	Stu	dy on Deve	elopn	neni	t of L	ok Ma C	Chau Lo	ор Gro	und l	nves	tigation Worl	s for A	геа А		
	METH	HOD	RC							CO-C	RDI	NΑ	TES						JOB No.	<u> </u>	J0911	IS26 (T	FL)
	MACI	HINE	/ No.	XY2	B/C	CL-	i					_	41.0 35.1						DATE from	10.1	2.09	to 11.	12.09
	FLUS	HING	MED	IUM		AIR				ORIE	NTA	TIC	N	Vertic	cai				GROUND	LEVEL	-	+4.5	7 mP.D.
	Drilling Progress	Casing depth/size	Water level (m) Shift stant/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	-	Reduced Level (mPD)	Depth (m)	Legend	Grade			ם	escript	ion	
1,111111	0.12.09										HOTECTON PIT	^	0.45 0.50					Loo	se, grey and y rse SAND. (F	/ellowis ILL)	h brown	, very sili	ty fine to
						1					٧.	В	0,95 1,00		- 1,00 - - - 1,50		}	Ver	y soft, dark gr	ey to ye	ellowish l	brown, C	LAY. (FILL?)
-					100					2 bis		1 2	1.45 1.50 1.95 2.00		E			Sof	t, grey to dark POSIT)	grey. C	LAYIS	ILT. (SV	/AMP
F	:											-	2,00						•				
												}	3.00										
1111					100					4 bis		3	3.45 3.50										
-1	1.12.09	5.00	18:00 0.62m at		100					11 bis		5	4.50			<del> </del>							
<u>-1</u>	1.12.09	PW	08:00									<u>r</u>	4.05 5,00	-0.43	F 5.00.			End	of drillhole at	5,00m.	•		
잔																							
2005.GD																							
AN 2503																							
ST LAS															سليد								
).00P.																							
MA CHAL																							
100																							
11826[T			rbed Sa rbed Sa		!			er Sa er Lev	-		DRII T.H.				<u>.                                    </u>	L		GGIN	G GEOLOGIST AN			TECHNIC/	AL ENGINEER ENG
180 5	SP	Γ Liner €	Sample			1	Stan	dard	Penel	ration Test		TEC	HNICA	L FIELD	LECHNICI	AN		TE 7.12.0	9		DATI 18.1	≝ 12.09	
HOLE LOG	U76		urbed Sa turbed S		•				lity Te n Pac	st ker Test	REI	VIAR	KS	Aug1-		Sm f Pr-							
윘		zier San ton Sam								ometer Tip ear Test	1.IN	spec	uon pit	excavate:	0,0 mont is	#N-1.5UN	1,						
뛰	J . 13		e						d Tesi														

HOLE No. A-S20a

FOUNDATIO 泰昇地基工				SHEET 1 of 1
PROJECT Planning and Eng	ineering Study on D	L Development of Lok Ma Chau Loop (	Ground Investi	gation Works for Area A
METHOD RC	Co	O-ORDINATES		JOB No. J0911S26 (TFL)
MACHINE / No. XY2B/CCL-1	i	E 826,261.21 N 841,982.05		DATE from 28.01.10 to 28.01.10
FLUSHING MEDIUM AIR		RIENTATION Vertical		GROUND LEVEL +4.88 mP.D.
Drülling Progress Casing depth/size pu st st st st st st st st st st st st st	R.Q.D. Fracture Index F.I. / Test Depth Tests	Samples Reduced Level (mPD) Depth (m)	Grade	Description
-28.01.10 PW		A 0.45 E 0.50 E 0.50 F 1.00		e, brown, slightly silly fine to medium SAND. .)
100	3 bis	\$ 0.95 +3.88 1.00 \$ 1.0	Very	soft, grey, CLAY / SILT. (SWAMP DEPOSIT)
100	3 blz	3.00		
2,97m 2,97m 5,00 at 100 18:00	11 bis	4.50 - 12 - 5.00 - 1	1 - 1 - 1 - 1 - 1 - 1 - 1	
Small Disturbed Sample Large Disturbed Sample	Water Sample Water Level Standard Penetration To	S.00		DATE
U100 Undisturbed Sample I Mazier Sample  Piston Sample	Impression Packer Test Standpipe/Piezometer I In-situ Vane Shear Test Point Load Test	Tip 1. Inspection pit excavated from 0.00m-1	.50m.	



HOLE No. A-S20b

		<b>=</b> ,	FOUN					1	IJħ	(IL	.LF	10L	EK	=00	ואנ	ע	SHEET			1	of	1	
PR	JECT		泰昇地 						elopn	nent	t of L	ok Ma C	Chau Lo	on Gro	und i	invest	igation Wo		for Are				
								1															
ME	THOD	RC						CO-0				•					JOB No.			J0911	\$26 (T	FL)	
MA	CHINE	/ No.	XY2B	/CCL	-1						93.0 37.1						DATE fro	m	27.01	.10 t	o 27.0	01.10	
FLU	ISHING	MED	IUM	All	₹			ORIE	ENTA	TIC	N	Vertic	cal				GROUNI	D LE	VEL		+4.8	9 m	P.D.
Drilling	Casing depth/size	Water level (m) Shift start/ end	Water Recovery % Total core	Recovery % Solid core	R.Q.D.	Fracture	F.I. / Test Depth	Tests		Samples	,	Reduced Level (mPD)	Depth (m)	Legend	Grade				De	scripti	on		
27.01.		Cita											-			Soft	, brown, sli	ghtly	sandy	SILT. (	FILL)		
	-								Partena ti	8	0.45 0.50 0.95 1.00	+4.39	0.50			Soft	, grey, CLA	Y/S	ILT. (S	SWAMF	P DEPO	SIT)	
	A PARAMETER PROPERTY AND A SECOND PROPERTY A		10	0				14 Ns		1 2	1.45 1.50 1.95 2.00	+3.39	1.50			Loos	se, grey, sil er fragmen	lty find ts. (S	e to co	arse S/ P DEP(	AND wit OSIT)	h occa	sional
			10	0	;			9 bls		3	3.00												
										1	3.45 3.50												
	5,00	3.05m at	10	0				15 bis		5	4.50	+0,39	4.50			Soft	grey, CLA	Y/S	ILT. (S	WAMF	DEPO	SIT)	
- 27.01.		18:00		╁	├-				_		4.95 5.00	-0,11	5.00			End	of drillhole	at 5.6	DOm.				
[] L	mall Distu				Wat				<u>T.H.</u>	LER Won	ıg				<u>8,0</u>	O. CH/	GEOLOGIST	т 		EDW	ECHNICA ARD CHE		NEER
805 500 1 1	PT Liner ( 176 Undist	Sample		1	Star	ndard (		ation Test	GEC		HNICA	L FIELD T	ECHNICIA	AN.	DA					DATE 10.02			
	100 Undis lazier San	turbed S		İ	Impr	ressio	n Pack	er Test neter Tip		/IAR specti		excavated	from 0.00	m-1.50n	1.			•					
P	iston Sam	ple		×			ne Shei d Test	ar Test															

HOLE No. A-S20c

H			NDA	ATIC	ON L	IMI'			DR	αL	LH	IOLE	: KI	=CC	)KL	נ	SHEET	1	of	1
JECT	Plan	ning	and	Engi	inee	ring	Stud	y on Dev	elopn	nent	of Lo	k Ma C	hau Lo	op Gro	und Ir	nves	tigation Works for A	Area A		
HOD	RC							CO-(									JOB No.	J09115		L)
HINE /	No.	XY2	B/C	CL-1	1												DATE from 26.	01.10 to	26.01	.10
HING								ORI	ENTA	TIO	N		al	- <del> </del>			GROUND LEVE	L	+5.35	mP.D.
Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade					
5.00 PW	3.32m at 18:00	ample	100	<b>★</b> ¥ →  + +	Wat Wat Star Impr	er Sa er Le ndard neabi	mple vel Penei	3 bla 9 bls 9 bls ker Test	T.I- GE K.V RE	ILLER 1. WO OTEC W. Lee	3.00 3.45 3.50 4.50 4.95 5.00	+3.85 +0.35	1.50	-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		Sol DE	ft, grey to dark grey, POSIT)  d of drillhole at 5.00r	GEO** OATE	TECHNICA ARD CHE	AMP LENGINEER
ston San	npie																			
	PW Gestude PW Gestude	JECT Plan HOD RC HINE / No. HING MEDI SHING MEDI SHING MEDI SHIP Shift start/ end PW  sal 3.32m start/ PW  sal 18:00	表列 IECT Planning HOD RC HINE / No. XY2 HING MEDIUM Shift start/ (m) PW  Shift start/ end Nample For Disturbed Sample To Undisturbed Sample To Undisturbed Sample To Undisturbed Sample To Undisturbed Sample	FOUNDA 泰昇地基 FOUNDA 泰昇地基 FOUNDA 泰昇地基 FOUNDA 泰昇地基 FOUNDA 泰昇地基 FOUNDA 泰昇地基 FOUNDA 泰昇地基 FOUNDA 泰昇地基 FOUNDA 泰昇地基 FOUNDA 泰昇地基 FOUNDA 泰月地基 FOUNDA FOUN	FOUNDATION	FOUNDATION IA 泰昇地基工程和 AIR AIR AIR AIR AIR AIR AIR AIR AIR AIR	泰昇地基工程有限 ACCT Planning and Engineering HOD RC HINE / No. XY2B/CCL-1  HING MEDIUM AIR  Water level (m) Jale (m) Shift start / Maje end 100  100  100  100  100  100  100  100	FOUNDATION LIMITED 泰昇地基工程有限公司 Student All All All All All All All All All Al	FOUNDATION LIMITED 泰昇地基工程有限公司  DECT Planning and Engineering Study on Devine AID RC CO-d  HINE / No. XY2B/CCL-1  CHINE / No. XY2B/CCL-1  CHINE MEDIUM AIR ORIE  CHINE / No. XY2B/CCL-1  CHINE MEDIUM AIR ORIE  CHINE / No. XY2B/CCL-1  CHINE / No. XY	FOUNDATION LIMITED 泰昇地基工程有限公司  JECT Planning and Engineering Study on Developm  HOD RC CO-ORDI  HINE / No. XY2B/CCL-1  CHINE	FOUNDATION LIMITED  泰邦地基工程有限公司  IECT Planning and Engineering Study on Development  AOD RC CO-ORDINAT  E 826,33	FOUNDATION LIMITED 泰界地基工程有限公司  IECT Planning and Engineering Study on Development of Lot of	FOUNDATION LIMITED 秦界地基工程有限公司  IECT Planning and Engineering Study on Development of Lok Ma Co  IDD RC CO-ORDINATES E 826,399.08 N 842,092.09  IHING MEDIUM AIR ORIENTATION Vertice  INTERPORT OF THE PROPERTY OF THE PROPERT	FOUNDATION LIMITED	FOUNDATION LIMITED 表界地基工程有限公司  FOUNDATION LIMITED 表界地基工程有限公司  FOUNDATION LIMITED 表界地基工程有限公司  FOUNDATION LIMITED 表界地基工程有限公司  FOUNDATION LIMITED 表界地基工程有限公司  FOUNDATION LIMITED 表别地基于是有限公司   FOUNDATION LIMITED 表别地基于是有限公司。  FOUNDATION LIMITED 表别地基于是有限的公司。  FOUNDATION LIMITED AND LIMITED LIMI	FOUNDATION LIMITED	FOUNDATION LIMITED 要果他甚工程有限公司  FOUNDATION LIMITED 要果他甚工程有限公司  FOUNDATION LIMITED 要果他甚工程有限公司  FOUNDATION LIMITED 要果他甚至是有限公司  FOUNDATION LIMITED 要果他甚至是有限公司  FOUNDATION LIMITED EXPLAINED TO THE PROPERTY OF TH	FOUNDATION LIMITED 秦	FOUNDATION IMMITED SPIRE T 1	FOUNDATION LIMITED 表 Fundament of Lok Ma Chau Loop Ground Investigation Works for Area A  FINE / No. XYZB/CCL-1

	F			NDAI 地基:				j	DΚ	ILL	H	JLE	: KE	:00	'KL	SHEET 1	0	f	4
PRO.	JECT	<u> </u>							elopme	ent of	Lok	Ma C	hau Lo	p Gro	and In	l restigation Works for Area	A		
METI	HOD	RC						co-c	RDIN	IATE:	s					JOB No. JO	91182	6 (TFL	_)
MACI	INE /	No.	LY38	3/DR0	9			1	E 825 N 842	-						DATE from 25.11.0	9 to	01.12	.09
FLUS	HING	MEDI	UM	Al	₹/₩	/ATE	:R	ORIE	NTAT	ION		Vertic	al			GROUND LEVEL	4	<b>-4.5</b> 5	mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Becovery %	Recovery % Solid core	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade	Desc	cription		
25,11.09		Cita						<u> </u>	HATCHON RT	A 0.	45					oose, yellowish brown to br SAND with some gravel size	own, silty d rock fr	y fine to agmen	o coarse its. (FILL)
25.11.09 -27.11.09		Dry at 18:00 Dry at 08:00		100					-	c 1.	95 00 45 50 95	+3,55	1.00			/ery icose to loose, grey and coarse SAND with occasions prick fragments. (FILL)	d brown, al gravel	silty cl sized i	ayey fine to ock and
				78						3	00 45 50		•••••••••••••••••••••••••••••••••••••••						
- 27,11.09 - 28,11.09		2.81m at 08:00		90						5 6 4. 5.	95 90 50	+0.05	4.50			Firm, grey to dark grey, CLA ragments. (SWAMP DEPO:	Y/SILT SIT)	with so	ome oyster
Sn Lau	7.50 SW PW			- Company - Comp	7.7.7.		***************************************	(0, 0, 1, 2, 1, 2) N = 6		6. 6. 10 7. 7.	.50 .60 .70 .05								
-				85				(1, 0, 1, 1, 1, 2) N≈S	Q Q	13 14 9.	.50 .50 .70 .00				and the state of t				
				100						9	.50	-5.45	10.00	1-4-1 1-4-1 1-1-1-1					
• Sm Lau SP	I nall Distu rge Distu T Liner S 6 Undist	rbed Sa Sample	mple		₽ Wa		/el	dion Test		Tam		FIELDT	ECHNICI	AN	S.C	GING GEOLOGIST CHAN E I2.09	GEOTEC EDWARI DATE 04.12.09	D CHEN	ENGINEER IG
U7	00 Undis nzier San slon Sarr	sturbed S aple			[ lmp 5 Sta - In-s	oressio ndpipe	n Packe /Piezon ne Shea	er Test neter Tip	1. Ins	MARKS spection ushing r	pit ex	xcavatec im for fir	i from 0.0 st 5m is a	0m-2.00r ir.	n.				

### DRILL HOLF RECORD

1	忖			NDA 地基				TED 公章			<b></b>		_ 1 \1_			SHEET	2	of	4
PRO	JECT	Plan	ning	and	Engi	inee	ring	Stud	y on Deve	elopmei	nt of Lo	k Ma C	hau Loc	p Grou	ind Inv	restigation Works for A	rea A		
MET	HOD	RC							CO-C	RDIN	ATES					JOB No.	J0911	S26 (T	FL)
MAC	HINE /	No.	LY3	8/DF	R09		·			E 825, N 842						DATE from 25.1	1.09 t	0 01.1	2.09
FLU	SHING	MEDI	UM	,	AIR	/ W.	ATE	R	ORIE	NTAT	ON	Vertic	al			GROUND LEVEL	-	+4.55	5 mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.a.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade		escript	ìon	
28.11.		Dry at 18:00 0.60m at 08:00		100	S & C	ec l			(0, 0, 0, 1, 1, 1, 1) N = 3  (0, 1, 0, 1, 1, 1, 1) N = 3		0 10.50 10.60 10.60 10.70 7 11.00 11.05 11.05 11.50 11.50 11.50 12.70 12.70 12.70 12.70 12.70 13.50 13.50 13.50 13.50 13.50 15.50 15.50	-6.05 -10.05	10.60			As Sheet 1 of 4.  Firm, yellowish grey to g some oyster fragments.  Loose, yellowish grey, v (SWAMP DEPOSIT)  Medium dense, yellowish fine to coarse SAND wit gravel sized quartz fragi	ery silty f	and yelld	arse SAND.
		Address Address of the Control of th	William in the control of the contro			Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual Annual	- 110 Aug - 110	And the second s	(1, 2, 2, 3, 2 0) N = 13 N = 13 (3, 18, 17. 19, 20, 77		28 17.01 17.10 29 17.55 17.55 18.67 30 30 19.0	0 5 0 0 14.05		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Very dense, yellowish b SAND with some fine gi (ALLUVIUM)	rown, sil avel size	ty fine to ed quartz	coarse fragments.
41.	Small Dist				A ¥		ter Sa Ier Le			DRILL P.S.				, r <del>.</del> .		GGING GEOLOGIST D. CHAN		OTECHNIC WARD CH	AL ENGINEER IENG
İ	SPT Liner	Sample			ļ	Sta	ndard	Pene	Iration Test		ECHNIC	AL FIELD	TECHNIC	IAN	DA <sup>-</sup>	TE .12.09	DA 04.	TE .12.09	
1 53	U76 Undis U100 Und				İ			ility Te on Pad	est oker Test		ARKS								
	Mazier Sa	mple		•	ð	Sta	ndpip	e/Piez	ometer Tip										
	Piston Sa	nple			×			ane St ad Tes	near Test il										

						imite 可限公		L	וואכ	_L[	iULI	= KE		)KL	SHEET 3 of 4
PROJE	ECT I	Plannin	g and	i Eng	jineei	ring St	udy on D	eve	lopmer	t of Lo	ok Ma C	hau Loc	p Gro	und Ir	nvestigation Works for Area A
метно	DD (	RC			<del></del>		cc	D-OI	RDINA	TES					JOB No. J0911S26 (TFL)
масні	INE / N	o. LY	38/D	R09					E 825, N 842,						DATE from 25.11.09 to 01.12.09
FLUSH	iing M	EDIUN	1	AIR	/WA	ATER	OF	RIE!	NTATI	ON	Vertic	al			GROUND LEVEL +4.55 mP.D.
Drilling Progress	asing apth/size	later evel 3 m) hitt and A	Total core Recovery %	Solid core Recovery %	R.Q.D.	ndex F.I. / Test	Tests		Camples	Campio	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
2	25.50 PW HW	Ory at 3:00 6fm at 3:00	90		1		(4, 10, 1) 55/Your 10084/2	ē, 14,	33 33 34 35 35 37	20.50 20.52 20.92 20.97 21.50 22.50 22.50 23.05 25.50 25.50	-16.05	2060		VIV	Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Stiff, sandy SILT)  Extremely weak to very weak, yellowish brown mottled grey, completely to highly decomposed meta-SILTSTONE. (Very stiff, sandy SILT with some gravel and cobble sized rock fragments)
2	29.90 HW		100			29.9		- 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	29,80 29.90	-25.35	- 			OCONO OFFICIONES OFFICIALISM FINANCIA
Small Parith Ole Cog 1091182   Small	l Disturbed e Disturbed Liner Sam Undisturbed Undisturber er Sample n Sample	d Sample nple ed Sampl bed Samp	e	工工工品。	Water Stand Perme Impres Stand In-situ	ard Per eability i ssion Pa pipe/Pic	etration Te Test acker Test Izometer Ti ihear Test	st	P.S. Ta GEOTE K.W. Le	m CHNICA RUNG	L FIELD T	— ECHNICIA —	NN .	S.C	GGING GEOLOGIST GEOTECHNICAL ENGINEER O. CHAN EDWARD CHENG ITE DATE 3.12,09 04.12.09

### DRILLHOLE RECORD

HOLE No. A-S21
SHEET 4 of 4

			100		地畫				公司	<b>1</b>							SHEET 4 of 4
Р	ROJ	ECT	Plan	ning	and	Eng	jinee	ring	Stud	ly on Deve	lopment of L	ok Ma	Chau I	-oot	Gro	und	Investigation Works for Area A
м	ETH	OD	RC							co-o	RDINATES						JOB No. J0911S26 (TFL)
M	ACI	IINE /	No.	LY3	8/DF	₹09					E 825,696.0 N 842,042.1						DATE from 25.11.09 to 01.12.09
F	LUSI	HING	MEDI	UM	,	AIR	/W	ATE	ER.	ORIE	NTATION	Vert				· · · · · ·	GROUND LEVEL +4.55 mP.D.
Drilling	Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth	(m)	Legend	Grade	Description
-					100	100	82	7.5					11111				Strong, light grey to grey, slightly decomposed meta-SILTSTONE. Joints are closely to medium locally very closely spaced, rough planar, very narrow
		:			100	100	82				T2101						to narrow, chlorite coated, dipping at 20°-30°, 40°-50' and subvertical from 33.80-34.10m.
											31.2	4	E				
					100	100	70	7.5			T2101		Edum.				
						-					32.7	3				11	
					100	100	71				12101		11:11:				
								>20	34.20 34.34		34.2	0					
					100	100	80	6.0			12101						34.30- 34.50m; Quartz veins infilling.
01	.12.09			-			<u> </u>		35:22		95.2	-30.6	7 E 35.:	22			End of drillhole at 35.22m.
E												ļ					
1111																	
11111111																	
									in the same		The second secon						
													- - -				
KUN K																	
THE COLUMN CHANCE CONTROL																	
97			urbed Sa			     			ample	1	DRILLER P.S. Tam		<u></u>				LOGGING GEOLOGIST GEOTECHNICAL ENGINEER S.O. CHAN EDWARD CHENG
		T Liner	urbed Sample			1	Sta		l Pend	etration Test	GEOTECHNIC	CAL FIEL	D TECH	VICIA	W	i	DATE DATE 03,12,09 04.12,09
ALCHOLE LOG JU	บ7 U1		turbed S isturbed			Ī			oility To on Pa	est cker Test	REMARKS					<u> </u>	
	Ma	zier Sal	mple	•		å	Sla	ndpip	e/Pie	zometer Tip hear Test							
됩니	Pis	ton Sar	npie				.,,		ane Si ad Te:								

### DRILLHOLE RECORD

HOLE No. **A-S22**SHEET 1 of 1

		h		FOU 家昇	地表	基工	程~	有限	公:	司					L 1 \L				SHEET		1	of	1
P	ROJ	JECT	Plar	ning	and	l Eng	ginee	ering	Stud	dy on De	evelo	pmen	t of L	ok Ma C	Chau Lo	op Gro	und l	nve	stigation Works	for Are	a A		
M	IETH	dOb	RC							СО	-ORI	DINA	TES						JOB No.	,	J0911	S26 (TI	FL)
M	IACI	IINE /	No.	XY2	в/С	CL-	1					-	989.0 966.2						DATE from	24.11	.09 t	o 25.1	1.09
F	LUS	HING	MED.	IUM		AIR				OR	IENT	FATIO	ON	Verti	cal				GROUND LE	VEL		+4.08	3 mP.D.
Drilling	Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	3	Reduced Level (mPD)	Depth (m)	Legend	Grade			De	scripti	on	
- 24.	11.09 11.09	PW			100					•	TITIES TO THE STATE OF THE STAT	• A	0.45 0.50 0.95 1.00 1.45 1.50 2.00	•	3.00		)	an (FI	ry loose to loose, gualr gravel and LL)	cobble	sized r	ock fragr	nents.
- - - - - - - - - - - - - - - - - - -	11.09	5,00 PW	1.45m at 18:00		100							3,4	3.45 3.50 4.50 4.50	-0.92	5.00			(8)	Wamp Deposi1	")		w	
DRILLHOLE LOG J0911SZB(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 21.4.10			-bed Sa	-			Water		•			RILLEE.	₹		المستقيلة والمستقيلة والمستقيد والمستقيدة والمستقيدة والمستقيدة والمستقيدة والمستقيدة والمستقيدة والمستقيدة والمستقيدة والمستقيدة والمستقيدة والمستقيدة والمستقيد والمستقيدة والمستقيدة والمستقيدة والمستقيدة والمستقيدة وال				d of drillhole at 5.			rechnica ARD CHE	L ENGINEER ING
LHOLE LOG JO91	SP1 U76 U10	CLiner S Undist	elqma? urbed Sa turbed \$	ample	<b>:</b>	Ţ	Stan Perm Impre	dard I reabil ession	Peneli ity Tei n Pacl	ration Test st ker Test xmeter Tip	G K	EOTE .W. Le	CHNICA RUNG RKS		TECHNICL		DA 10				DATE 11.1		
		on Sam				~	in-sit	u Var		ear Test													

### **TYSAN** FOUNDATION LIMITED

HOLE No. A-S23 of 5

DRILLHOLE RECORD SHEET 泰昇地基工程有限公司 Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A PROJECT METHOD RC **CO-ORDINATES** JOB No. J0911S26 (TFL) E 826,156.16 MACHINE / No. XY2B/CCL-1 DATE from 26.11.09 to 04.12.09 N 841,912.01 AIR / WATER ORIENTATION **GROUND LEVEL** +5.33 mP.D. FLUSHING MEDIUM Vertical Reduced Level (mPD) level Casing depth/size Solid core Recovery Water Recovery Total core (m) Shift Samples Legend Description R.Q.D. Depth (m) Tests start/ end Loose, brown, fine to coarse SAND with some gravel sized rock fragments. (FILL) Firm, grey and brown, CLAY / SILT with sand matrix. (FILL) 1.45 1.50 +3.83 Loose, brown, fine to coarse SAND. (FILL) 100 1.95 2.00 100 100 5,50 Soft to firm, dark grey, CLAY / SILT with oyster and shell fragments. (SWAMP DEPOSIT) 85 (1, 0, 0, 1, 0, 1) N=2 100 Loose, yellowish grey, silly fine to medium SAND. (SWAMP DEPOSIT) 9.50 Firm, dark grey, CLAY / SILT with decayed roots. (SWAMP DEPOSIT) 100 DRILLER LOGGING GEOLOGIST GEOTECHNICAL ENGINEER Small Disturbed Sample Water Sample EDWARD CHENG T.H. Wong S.O. CHAN Water Level Large Disturbed Sample GEOTECHNICAL FIELD TECHNICIAN SPT Liner Sample Standard Penetration Test K.W. Leung 10,12,09 11.12.09 Permeability Test U76 Undisturbed Sample REMARKS ă Impression Packer Test U100 Undisturbed Sample Inspection pit excavated from 0,00m-1.50m.
 Flushing medium for first 5m is air. Mazier Sample Standpipe/Piezometer Tip In-situ Vane Shear Test Piston Sample 

X Point Load Test

	TION LIMITED 工程有限公司	DRILLH	OLE RECU	JKD	SHEET	2	of	5
- ML - ML	Engineering Study on D	l Development of Lo	ik Ma Chau Loop Gro	und Inves		for Area A		
			MATTER TOTAL		,μ			· · · · · ·
METHOD RC	CC	O-ORDINATES E 826,156.16	•	-	JOB No.	J0911S	26 (TFI	_)
MACHINE / No. XY2B/CC	L-1	N 841,912.01			DATE from	26.11.09 to	04.12.	.09
FLUSHING MEDIUM A	IR/WATER OF	RIENTATION	Vertical		GROUND LE	EVEL	+5.33	mP.D.
Drilling Progress Casing depth/size depth/size Nation Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery Recovery	R.Q.D. Fracture Index F.I. / Test Depth Tests	Samples	Reduced Level (mPD) Depth (m)	Grade		Descriptio	n	
3.12m at 18:00 2.30m at 08:00	(1, 1, 1, 1, 1, 1)	1. 2 15 10.50 10.70 11.05 11.05 11.05 11.05 11.05 11.05 11.05 11.05 11.05 11.05 11.05 11.05 12.05 12.70 20 12.70 21 13.05 13.05 13.50 22 14.50 25 15.50 25 15.55		As:	Sheet 1 of 5. dium dense, yell ND with some gi LUVIUM)			
19.00 PW HW 1.22m at	(5, 0, 0, 16) N= 34	7, 9, 16,70 26 17,00 17,05	-11.27   16.60   1   8   6   6   6   6   6   6   6   6   6	son	nse, yellowish br ne gravel and co LUVIUM)			
19.00 PW HW HW 1.22m at	(6, 10, 60, 10, 10, 10, 10, 10, 10, 10, 10, 10, 1	25 18.50 50mm 25 18.75 18.50 19.00	-13.27   18.60   G	con (Ve	remely weak to npietely to highly ry stiff, SILT with k fragments)	decomposed n	neta-SIL1	ISTONE.
Small Disturbed Sample Large Disturbed Sample	▲ Water Sample  * Water Level	DRILLER T.H. Wong		LOGGIN	G GEOLOGIST IAN		CHNICAL I	ENGINEER G
Large Disturbed Sample SPT Liner Sample	Standard Penetration Te		L FIELD TECHNICIAN	DATE 10.12.0		DATE 11.12.		<del></del>
SPT Liner Sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample Piston Sample	Permeability Test Impression Packer Test					4 2 2 3 4 4 2 4		
Mazier Sample	Standpipe/Piezometer Ti	īp						
Piston Sample	<ul> <li>✓ In-situ Vane Shear Test</li> <li>X Point Load Test</li> </ul>							

		1 100					LIMI 有限		1	L	)KIL	.LI <sup>-</sup>	IUL		٠.	, (	νΓ	SHEET 3 of 5
PRO	JECT	Plan	ning	and	Eng	ine	ering	Stud	dy on De	vel	opment	of Lo	ok Ma C	hau Loo	p C	3ro	und I	nvestigation Works for Area A
METI	HOD	RC							co-	-OF	RDINA	res						JOB No. J0911S26 (TFL)
MACI	HINE /	No.	XY2	B/C	CL-	1					E 826,1 N 841,9							DATE from 26.11.09 to 04.12.09
FLUS	HING	MEDI	UM		AIR	/W	ATE	R	ORI		NTATIC		Vertic	;al				GROUND LEVEL +5.33 mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	70 000	regeria	Grade	Description
<del>- 38:11:</del> 89 - -		18:00 3:65m at 08:00		100	10	0		20.10			T2101	20.00	-15.27	20.10 - - 20.60		-		As Sheet 2 of 5.  Moderately weak to moderately strong, light yellowish brown to yellowish brown, highly to moderately decomposed meta-SILTSTONE. (FAULT ZONE)
				100	20	0	NI	21.55			T2101	21.55	-15.67 -15.97	21.00 21.30			IV/III	20.10- 20.60m: Non intact, recovered as angular gravel.  21.00- 21.30m: Non intact, recovered as angular gravel.
				63	50	0	>20	21.33			T2101		47.02	22,35				<b>9.</b> —
								22.35	(5, 8, 12, 1 10, 20) N = 65	15,	32 33	22.50 22.50 22.80 22.85 23.00	·				V/IV	Extremely weak to very weak, yellowish brown, completely to highly decomposed meta-SILTSTONE. (Very sliff, SILT with some gravel sized rock fragments)
-				100				23.60			34	23.50 23.60	-18.27	23,60		ļ		
<u>-</u> -				100	30	0	NI	24.20			T2:101	24.20	-18,67	24.00				Moderately strong, yellowish brown to yellowish grey, moderately decomposed meta-SILTSTONE. Joints are closely to very closely spaced, rough planar, very narrow to narrow, iron stained, dipping at 20°-30°. (FAULT ZONE)
		1.42m at 18:00		100	100	0	>20				T2101		-19,47	24.80			913	23.60- 24.00m: Non Intact, recovered as angular gravel and cobble.  24.80- 25,92m: Highly fractured.
30.11.09 - 01.12.09		3.52m at 08:00		62	62	0		25.02			T2101	25,31	-20.59	25.92				Falance du voel de voer voel volleviels broke
E							NR	26.32				28:36	-20.99	26.32	Î	c		Extremely weak to very weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel sized rock fragments) 25.92-26.32m; No core recovered, assumed to be
				100							35				9		V/IV	completely to highly decomposed.
							>20	27,60	(50/20mm 1 100/30mm 100t/s/30	i n) mai	37	27,40 27,50 27,55 27,60	-22.27	27.60		 		Moderately weak to moderately strong, yellowish
				72	20	0	NI	28.00			172101		-22.67 -23.24	28,00				brown, highly to moderately decomposed meta-SiLTSTONE. (FAULT ZONE)  28.00- 28.57m; Non intact, recovered as angular
				74	74	0	>20				T2101	28.57	72.67				iV/ili	gravel and cobble.
E				100	0	0	NI	29.20 29.60			T2101	29.20 29.60	04.07	29.60	} <b>0</b>			29.20- 29.60m: Non intact, recovered as angular gravel and cobble.
- • Sл	nall Distu	bed Sa	mole	85		Wai	ter Sa	mple		Т	DRILLER		-24.67	F30.00	j	<u> </u>	L/IV	Extremely weak to very weak, yellowish brown,  OGGING GEOLOGIST GEOTECHNICAL ENGINEER
] La	rge Distu 'T Liner (	rbed Sa	•		*	Wat	ter Le	vel	Iration Tes		T.H. Wo		AL FIELD	 TECHNICIA	٩N		D.	O, CHAN EDWARD CHENG ATE DATE
U7	'6 Undist	urbed S			Ţ	Реп	meabi	lity Te	est		K.W. Le						_1	0,12,09 11.12,09
Ma Ma	00 Undis zier San	ple	sena	не	Ţ	Sta	ndpipe	/Piez	cker Test cometer Tip	,	i virriahur.							
Pi	Piston Sample Standpler economic In-situ Vane Shear X Point Load Test																	

### DRILLHOLE RECORD

HOLE No. A-S23

SHEET 4 of 5

PROJECT   Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A		11	H	iii X						ITEC 【公	- 1	L	/	-1-1	IOLI	_		<b>21 (</b> )	SHEET 4 of 5	
## ACHINE / No. XYZBICCL-1    E 825, 156.16   N 841,512.01   DATE from 26,11.09 to 04.12.09	F	PRO.	IECT	Plar	ıning	and	f Eng	gine	ering	Stud	dy on De	evelo	pmen	t of L	ok Ma C	Chau Lo	op Gro	und l	Investigation Works for Area A	
MACHINE / No. XY2B/CCL-1  FLUSHING MEDIUM AIR / WATER ORIENTATION Vertical GROUND LEVEL +5.33 mP.D.  Description  Descript	N	/ETH	1OD	RC							co	-OF	RDINA	TES					JOB No. J0911S26 (TFL)	
FLUSHING MEDIUM AIR / WATER ORIENTATION Vertical GROUND LEVEL +5.33 mP.D. Description    Section	N	//ACI	IINE /	No.	XY2	B/C	CL-	1		·····			•						DATE from 26.11.09 to 04.12.09	
100   100   100   72   100   100   100   72   100	F	LUS	HING	MEDI	IUM		AIR	./W	ATE	ĒR	OR					cal			GROUND LEVEL +5.33 mP.	D.
100   100   100   72   100   100   100   72   100	-	ress	ing th/size	Water level (m) Shift	er overy %	al core	d core	Ġ.	e truce	/ Test th	₹ 		noles		luced el (mPD)	ŧ	end	de	Description	
100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   100   72   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   72   100   100   100   72   100	-	Pro	Cas	start/ end	Wat	Rect	Rec	R.Q	돌	F.I.	Tes				Le Re	- <u>8</u> E		Gra		
Strong, light white, slightly decomposed QUARTZITE.   Strong, light white, slightly decomposed QUARTZITE.   Joints are closely to medium spaced, rough planar, narrow, iron stained, dipping at 20°-30° and 40°-50°.   III   Strong, light white, slightly decomposed QUARTZITE.   Joints are closely to medium spaced, rough planar, narrow, iron stained, dipping at 10°-20° and 30°-40°.   III   Strong, light white, slightly decomposed QUARTZITE.   Joints are closely to medium spaced, rough planar, narrow, iron stained, dipping at 10°-20° and 30°-40°.   III   35.70 - 36.00m: Moderately decomposed.   Strong, light white, slightly decomposed QUARTZITE.   Joints are closely to medium spaced, rough planar, narrow, iron stained, dipping at 10°-20° and 30°-40°.   III   35.70 - 36.00m: Moderately decomposed meta-SillTSTONE. (Corp. stiff, Tail of the strong planar)   Strong, light white, slightly decomposed QUARTZITE.   Joints are closely to medium spaced, rough planar, narrow, iron stained, dipping at 10°-20° and 30°-40°.   III   35.70 - 36.00m: Moderately decomposed.   Strong, light white, slightly decomposed QUARTZITE.   Joints are closely to medium spaced, rough planar, narrow, iron stained, dipping at 10°-20° and 30°-40°.   III   35.70 - 36.00m: Moderately decomposed meta-SillTSTONE. (Corp. stiff, strong white strong, vellowish brown, completely decomposed meta-SillTSTONE with very closely spaced planar.   Strong white strong, vellowish grey, moderately decomposed meta-SillTSTONE with very closely spaced planar.   Strong white strong, vellowish grey, moderately decomposed meta-SillTSTONE with very closely spaced planar.   Strong white strong, vellowish grey, moderately decomposed meta-SillTSTONE with very closely spaced planar.   Strong white strong, vellowish grey, moderately decomposed meta-SillTSTONE with very closely spaced planar.   Strong white strong white strong white strong white strong white strong white strong white strong white strong white strong white strong white strong white strong white strong white strong		12.00	32.65	at		85					(10, 13, 21 40, 31/20; 100Hs/17	9, mm) Ocnen	T 41	30,97 31,02		3260	11111	V/IV		
100   100   72   12   12   13   14   15   15   15   15   16   16   16   16			HW	3.48m at		99	99	70	>20				72101					111	decomposed meta-SILTSTONE. Joints are closely medium spaced, rough planar, narrow, iron stained	
Small Disturbed Sample   Standard Penetration Test   Sta	وليسيسيين					100	100	72	4.6				T2101	34.04	-29.67	- - - - - - - - 35,00			Strong, light white, slightly decomposed QUARTZI	TE.
91   91   33   35.00   35.70   36.00   10.0   30.50   36.00   10.0   37.20   76   25   25   NI   36.00   37.20   38.00   31.87   37.20   38.00   31.87   37.20   38.00   31.87   37.20   38.00   31.87   37.20   38.00   31.87   37.20   38.00   31.87   37.20   38.00   31.87   37.20   38.00   31.87   37.20   38.00   31.87   37.20   38.00   31.87   37.20   38.00   31.87   38.00   31.	E											-	+	35.44	1	- - - 35.70			Joints are closely to medium spaced, rough planar, narrow, iron stained, dipping at 10°-20° and 30°-40	)°_
100 100 0 >20 36.90 10.0 37.20 76 25 25 NI 72:101 36.90 36.90 31.87 37.20 Extremely weak to very weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel sized rock fragments) (FAULT ZONE)  2.12m at 100 36.90 38.70 38.09 100 80 0 38.75 38.09 100 80 0 NI 39.40 38.75 38.75 38.75 38.90 100 80 0 NI 39.40 38.75 38.95 3	1.4.10					91	91	33					T2101		-30.67	36,00			35.70- 36.00m: Moderately decomposed.	
38.90 39.90 30.90	냚					100	100	0	>20			-	T2101					11		
Table 1	335 - - -								10.0	1		ľ	<b>†</b>	36.90	1	- - 37.20			Extremalización to venzace vellouish hrown	
38.09 37.78 38.09 Weak, yellowish grey, moderately decomposed meta-SILTSTONE. (COBBLE sized rock fragments)  18:00 38.75	TYSAN 28					76	25	25	NI				T2101		00.70			V/IV	completely decomposed meta-SILTSTONE. (Very stilf, SILT with some gravel sized rock fragments)	
OZ. 12.09  OZ. 12.09	90P.GP.			al		100				38,09			4	38.10			000	IV		s)
Small Disturbed Sample Large Disturbed Sample Large Disturbed Sample Standard Penetration Test U76 Undisturbed Sample U76 Undisturbed Sample  I U76 Undisturbed Sample	AA CHAU 1	.12.09 .12.09		3.54m at		100	90	•	>20				T2105	38,75				lπ	decomposed meta-SILTSTONE with very closely	
Small Disturbed Sample Large Disturbed Sample Large Disturbed Sample Standard Penetration Test U76 Undisturbed Sample  Water Level Standard Penetration Test VW. Leung DRILLER T.H. Wong S.O. CHAN EDWARD CHENG EDWARD CHENG SEOTECHNICAL ENGINEER T.H. Wong GEOTECHNICAL FIELD TECHNICIAN KW. Leung 10.12.09 11.12.09	왌					100	60	ŭ		39,60				39.87	-34.27	- 39.60 -		1	decomposed meta-SILTSTONE. (SILT) (FAULT	
Large Disturbed Sample Water Level  Standard Penetration Test U76 Undisturbed Sample  Vater Level  Standard Penetration Test VW. Leung  DATE  LOTE U1.12.09  11.12.09	1826	Sm	all Distu		-							T	DRILLER	t	1 -04.01	1.40.00	111111			ER
U76 Undislurbed Sample Termeability Test V.VV. Leung 10.12.09	26 D	Lan SP1	ge Distu F Liner S		mple		!				ration Tes	,   ;	GEOTEC	HNIC	AL FIELD 1	TECHNICI	AN	DA	ATE DATE	·····
回冒 U100 Undisturbed Sample I Impression Packer Yest REMARKS	DRILLHOLE LOG				-					-		F						_1!	51.12.09	
U100 Undisturbed Sample I Impression Packer Test REMARKS  REMARKS  Mazier Sample   The standard Plezometer Tip	뢰륍				oam))	U		•												
Piston Sample Vin-situ Vane Shear Test  X Point Load Test		Pist	on Sam	ple												•				

### DRILLHOLE RECORD

HOLE No. **A-S23**SHEET 5 of 5

		-	昇地				公司				·			SHEET	5	of	5
PROJ	IECT	Planni	ng and	Eng	inee	ering	Study	on Deve	lopment of Lo	k Ma C	hau Loc	p Gro	und In	vestigation Works for /	\геа A	<u> </u>	
METH		RC No. X	Y2B/C	CL-	1				RDINATES E 826,156.1					JOB No.  DATE from 26.		1S26 (T	<u> </u>
							ъ		N 841,912.0					GROUND LEVE		±5.3°	3 mP.D
FLUS	<u> </u>	MEDIU Water		AIR		AIE	:K	ORIE	NTATION	Vertic			П	GROOND LEVE	<u> </u>		
Drilling Progress	Casing depth/size	level (m) Shift start/ end	Recovery % Total core Recovery %	Solid core Recovery	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade		Descript		
				100						:				Strong, light grey to gre meta-SILTSTONE. Joir spaced, rough planar, v dipping at 10°-20° and	ite ano cid	osely to n	nedilim
			100	100	50	12.5			T2:01		<u> </u>			dipping at 10°-20° and	10°-40°.		
			100	100	0	>20	41,28 41,48		12101 41.48								
-																	
			100	100	69	6.6			T2101								
- -						>20	43.10		42.93		-		11				
			100	100	73		43.18		T2101								
03.12.09		2.26m at 18:00				>20	43,95 44,25		44.25		<u> </u>						
04.12.09	į	3,15m at 08:00					# <del>#</del> .23				<u> </u>		1				
	J	2.53m at 18:00	100	100	75	9.0			T2:01	40.06	E						
04.12.09							45:39		<del>V 45,3</del> 8		-			End of drillhole at 45,39	im.		
<u>.</u> - :					•						-						
											1 1 1 1						
<u>-</u>																	
											Ē						
<u>-</u>	ļ																
: :	- Avadamenta								<del>ттебатыла</del> ты.		<u>, , , , , , , , , , , , , , , , , , , </u>						
-											<u>}</u>						
• Sm					<u> </u>						<u> </u>						
Srr La	rge Dist	urbed Sam urbed Sam		¥	Wa	ter Sa ter Le	vel		T.H. Wong	41 parent s		, A L I	S.	GGING GEOLOGIST O. CHAN		WARD CH	EAL ENGINE
U7		lurbed San		1	Per	meab	lity Tes		KW. Leung	AL FIELD	ECHNIC	IAN		),12.09		.12.09	
U1 Ma	azier Sa		ımple	I	Sta	ndpip		meter Tip	REMARKS								
Pis	ston San	nple		×			ine She id Test	ar Test									

### DRILLHOLE RECORD

HOLE No. A-S24
SHEET 1 of 3

		TION LIM 工程有限	<b>I</b>	DIVILLI	IOLL IVE		SHEET	1	of	3
PROJECT Plan	nning and I	Engineering	Study on Deve	elopment of L	ok Ma Chau Lo	op Ground Inv	estigation Works	for Area A		_,
METHOD RC			co-c	ORDINATES			JOB No.	J09118	526 (TFL	.)
MACHINE / No.	LY38/DR	:08		E 825,822.2 N 841,887.0			DATE from	30.11.09 to	07.12.	.09
FLUSHING MED	IUM A	IR/WATI		NTATION	Vertical		GROUND LI	EVEL	+3.55	mP.D.
Drilling Progress Casing Casing Hirly Start/ Casing	Water Recovery % Total core Recovery %	R.Q.D.	F.I. Test Depth Tests	Samples	Reduced Level (mPD) Depth (m)	Legend		Descriptio	on	
1.08m   1.08	100		0 bis  2 bis  47 bis  47 bis  (3,4,4,7,12,13), N= 36	A 0.450 0.50 1.00 1.00 1.00 1.00 1.00 1.00 1.	-0.95 - 4.50		Dense, yellowish groatse SAND with FILL)	rey to yellowish fine gravel sized	brown, find a quartz fr	agments.
<u>i</u>	90			9.50	-6.45 10.00	[ - 15   - 15   - 15				
Small Disturbed Sa	•	▲ Water Sa ▼ Water Le	vel	P.T. Fong	I CICI O TEOURO	<u>s.o.</u> (	SING GEOLOGIST CHAN		RD CHEN	
SPT Liner Sample U76 Undisturbed S	ampie	Standard Permeabi	Penetration Test lity Test	K.W. Leung	L FIELD TECHNICL	AN DATE 		18,12.	.09	
SPT Liner Sample U76 Undisturbed S U100 Undisturbed S Mazier Sample Piston Sample		≜ Standpipe	on Packer Test e/Piezometer Tip une Shear Test d Test	2. A vane shear 3. A water samp	excavaled from 0.0 lest was carried out le was taken at 5.00 lium for first 5m is a	at 11,55m depth. m depth.				

	H		FOUI F昇 J							DΚ	ΙL	LF	IOL	: RE	:C	U	KL	SHEET 2 of 3
PROJ	ECT								i	elopm	ent	of Lo	k Ma C	hau Lo	p G	rou	ınd în	vestigation Works for Area A
METH	lOD	RC							co-c	RDI	TAI	ΓES						JOB No. J0911S26 (TFL)
MACI	HINE /	No. I	LY38	/DR	808				- 1	E 82 N 84								DATE from 30.11.09 to 07.12.09
FLUS	HING	MEDI	UM		AIR	/ W	ATE	ER	ORIE				Vertic	al				GROUND LEVEL +3.55 mP,D.
Drilling Progress	Casing depth/size	Water tevel (m) Shift start/ end	Water Recovery %	Recovery %	Solid core	R.Q.D.	-racture ndex	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	<b>,</b>	Grade	Description
- - - 03.12.09 - 04.12.09		0.50m at 18:00 1.51m at 08:00		90		4		11.55	(0, 0, 1, 0, 0, 0) N = 1	<u> </u>	14 15 16 17	10.50 10.60 10.70 11.00 11.05		11.60	1-7-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		0	As Sheet 1 of 3.
		2.90m at 18:00 1.60m at 08:00		100				3	(1, 0, 1, 1, 0, 1) 1) N = 3		197 200 21 222 233	12.60 12.70 12.80 13.10 13.15	-41 15	14.70				Stiff, grey to dark grey, CLAY / SiLT. (SWAMP DEPOSIT)
	15.60 PW HW			100					(1, 1, 2, 1, 1, 1) N=5		25 26 27 28	14.70 14.80 15.10 15.15 15.60 16.60 16.70	in the state of th	16,70			V	Extremely weak, greenish grey and white, completely decomposed meta-SILTSTONE. (Stiff, SILT)
				95	and property of the state of th		5 - A PARTY CONTROL OF THE PAR		(7, 8, 11, 13, 17, 19) N = 60  (17, 33/45mm) 100/55/70mm		25 30 31 32 33	18,70 16,80 17,19 17,15 17,60 18,60 18,70 18,82 19,60	- Control of the Cont	10,00			V	Extremely weak, yellowish brown, completely decomposed meta-SILTSTONE. (Very stiff, SILT)
Lai SP U7	rall Disturge Distu T Liner : 6 Undist 00 Undist zier Sanston Sam	irbed Sa Sample urbed Sa sturbed S nple	mple ample	<u>.</u>	*	Wat Star Pen Imp: Star	er Le ndard neab ressio ndpip	Pene liity Te on Pac e/Piez	tration Test est exer Test cometer Tip mear Test	DRILL P.T. GEO K.W	Fon TEC	ung HNIC/	-16.45	Е 20.00			S.C	GGING GEOLOGIST GEOTECHNICAL ENGINEER D. CHAN EDWARD CHENG TE DATE 1.12.09 18.12.09

### DRILLHOLE RECORD

HOLE No. A-S24 3 SHEET 3 οf

Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A **PROJECT** JOB No. J0911S26 (TFL) CO-ORDINATES **METHOD** E 825,822.22 DATE from 30.11.09 to 07.12.09 MACHINE / No. LY38/DR08 N 841,887.09 AIR / WATER ORIENTATION Vertical **GROUND LEVEL** +3.55 mP.D. FLUSHING MEDIUM Reduced Level (mPD) Water
Recovery %
Total core
Recovery %
Solid core
Recovery % leve! (m) Shift Samples Description Legend R.Q.D. Grade Depth (m) Tests start/ end As Sheet 2 of 3. -17,15 35 36 Weak, grey and white, highly decomposed meta-SiLTSTONE. (Angular GRAVEL sized siltstone 21.01 HW ິດ <u>-17.46 21.01</u> NI 21.01 27.7 -17.65 21.20 and quartz fragments) 1.70m 93 63 10 12101 21.01- 21.20m: Non intact, recovered as angular gravel. at 18:00 Moderately strong to strong, grey to greenish grey, moderately to slightly decomposed meta-SILTSTONE. am 18.35 21,90 1.59m at 08:00 9.4 Joints are closely to medium spaced, rough planar, very narrow, iron stained, quartz vein infilled, dipping -18.75 - 22.30 -18.90 - 22.45 100 100 30 12101 at 10°-20° and 30°-40°. hin 21,90-22,30m: With interlamination of quartz. -19.45 - 23.00 -19.65 - 23.20 23.00 22,45-23,00m: Moderately weak, moderately to highly 100 100 o T2101 decomposed. - 23,75 - 23,80 23,20-23.75m: Locally highly fractured. Strong, grey, slightly decomposed meta-SILTSTONE, Joints are closely to medium spaced, rough planar, very narrow, iron stained, quartz vein infilled, dipping at 10°-20°, 30°-40° and 50°-60°. 100 100 ٥ T2101 -20 23,80- 26,45m: With interlamination of quartz. 25.00 П 0 100 100 T2101 -22.90 26.45 J0911SZ6(TFL) LOK MA CHAU LOOP.GPJ TYSAN 25032005.GDT 100 100 50 15.0 72101 2.00m at 18:00 27.18 07.12.09 -23 63 End of drillhole at 27,18m. DRILLER LOGGING GEOLOGIST GEOTECHNICAL ENGINEER Small Disturbed Sample Water Sample EDWARD CHENG P.T. Fong S.O. CHAN Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE DATE SPT Liner Sample Standard Penetration Test 18.12.09 K.W. Leung 17,12.09 Permeability Test U76 Undisturbed Sample REMARKS U100 Undisturbed Sample Impression Packer Test Mazier Sample ↑ Standpipe/Piezometer Tip Piston Sample In-situ Vane Shear Test

X Point Load Test

90

### DRILLHOLE RECORD

HOLE No. **A-S24a**SHEET 1 of 1

		\$	を昇	地差	ŧΙ	程(	有限	公司	1							SHEET 1		of	1
PRO	JECT	Plan	ning	and	Eng	inee	ring	Stuc	ly on Deve	lopmer	nt of Lo	ok Ma C	hau Loc	p Grou	und Inv	estigation Works for Area	ı A		
MET	HOD	RC							co-o	RDINA	\TES			_		JOB No. JO	0911S	26 (TFL	.)
MAC	HINE /	No.	XY2	B/C	CL-	3				E 825, N 841,						DATE from 27.01.1	10 to	27.01.	.10
FLU	SHING				AIR				ORIE	NTATI	ON	Vertic	al	·		GROUND LEVEL		+3.88	mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade		criptio		
- 27.01.1 - -										ACCOUNT.	0.45 0.50		7		1	Firm, grey mottled brown, si coollets. (FILL)	lightly s	andy SIL	Twith
-											1,00		1.00			Loose, grey, slightly silty fine			ID with
				100					12 bla		1.50		- 1.50 - - -			Very soft, grey, CLAY / SILT	T. (FILL	)	
											1.95 2.00		- - - -						
1.1.1.1.											3,00		- -						
Ē				100			,		1 bis	目	3.45 3,50	1							
عطيي				88						T2:01	3.80 4.23	0.00	- 3.80 - - 4.23		1	CONCRETE.	F (0111		
	5.00	4.06m at		100					10 bis		4.50	i i				Very soft, grey, CLAY / SILT	ı. (SW)	AMP DEI	rusii)
27.01.1		18:00									4.95 5.00	-1.12	<u>- 5,00                                   </u>	<u>  7 </u>		End of drillhole at 5.00m.			
1																			
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51 2	erge Dist SPT Liner			:	1		ter Le ndard		tration Test		ECHNIC	AL FIELD	TECHNICI	IAN	DAT		DATE 10.02		10
기무	176 Undis 1100 Undi				Ŧ			llity Te on Pac	est oker Test		ARKS					02.10	10.02		
	Aazier Sar	nple	با ۱۱۵	-10	å	Sta	ndpip	e/Piez	ometer Tip			il excavate	od from 0.0	X0m-1.50r	m.				
i F	islon San	nple						ine Sh id Tes	near Test It										A

HOLE No. A-S24b

PRO.	JECT	<b>.</b>	泰昇	地名	基工	程	有阿		司				··	Chau Lo				EET on Works	s for A	1 rea A	of	1
METI	HOD	RC							CO-	ORDI	ΝA	TES					JOE	No.		J091	1826 (TF	·L)
MAC	HINE	No.	LY3	8/DI	R09					E 82							DAT	E from	26.0	1.10	to 27.0	1.10
FLUS	HING	MED	IUM		AIR				ORI	ENTA			Verti	cal			GRO	DUND L	EVEL		+3.43	mP.D
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	,	Reduced Level (mPD)	Depth (m)	Legend	Grade			D	escript	ion	
26.01.10 26.01.10 27.01.10	PW								· ·	* PATICITY II	A B	0.45 0.50 0.95 1.00	+1.93	- 1.50			Firm, green DEPOSITI	)				
				100					G bis		3	1,95 2.00 3.00		<u> </u>				3.07,				<b>,</b>
7.01.10	5.00 PW	2.83m at 18:00		100					1 bis		5	3,45 3,50 4,50 4,95 5,00	1.57	5.00			End of dri	llhole at :	5 00m			
							TO THE CONTRACT OF THE CONTRAC													CEO	TECHNICA II	Chyclinic
Lar	all Distur ge Distur F Liner S S Undistu 30 Undis zier Sam ton Sam	rbed Sar Sample urbed Sar Lurbed S ple	mple ample	9	I I I	Wate Stan Perrr Impre Stan	neabil essior dpipe	ei Peneli ity Tes 1 Pac) (Piezo	ration Test st ker Test kmeter Tip ear Test	REA	Tan TEC Leu MAR	n HNICA Ing KS		ECHNICI		S.C DA1	EGING GEOR D. CHAN FE 02,10	OGIST		EDW DATE	TECHNICAL /ARD CHE E 2.10	

## TYSAN FOUNDATION LIMITED 泰昇地基工程有限公司

## DRILLHOLE RECORD

HOLE No. A-S24c
SHEET 1 of 1

		1 2						TED 公言	ı   '	\	, s . <del></del> .			、				SHEET	1	of	1	
PRO	JECT	Plan	ning	and	Eng	jinee	ring	Stud	y on Deve	lopm	ent	of Lo	k Ma C	hau Loo	p Gro	and Ir	nvest	igation Works fo	ог Агеа А			
MET	HOD	RC						······································	co-o	RDII	TAV	ES	·					JOB No.	J091	11S26 (T	FL)	
мас	HINE /	No.	XY2	B/C	CL-	3			ŀ	E 82 N 84	-							DATE from 2	5.01.10	to 26.	01.10	
FLUS	HING	MEDI	UM	,	AIR				ORIE	NTA	TIO	N	Vertic	al				GROUND LEV	/EL	+3.4	i3 mP.I	D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade			Descrip	otion		
- 25.01.10 -		GIIG			-			==				0.45	+2.93	0.50			Loo	se, brown, fine to	coarse S/	AND. (FIL	L)	
										National III	a	0.50 0.95 1.00	-12.30	-				n, dark grey, CLA VAMP DEPOSIT)		ith much	roots.	
25.01.1 25.01.1	2			100					10 bis		c 1	1.45 1.50 1.95 2.00	+1.93	1.50	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1		Soft	t, grey to dark gre POSIT)	y. CLAY /	SILT. (SV	VAMP	<del></del>
يغيينا والمتعادية والم												2.00										
				100					9 bis		3	3,00										
											4	3,45 3,50										
Ė	5,00	2,40m at		100					11 Ns		5	4.50										
26.01.1	PW	18:00										. <u>4.95</u> 5.00	1.57_	- <u>5.00</u>			End	of drillhole at 5.0	00m.			
								1						<u> </u>								
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<1 *	rge Distu PT Liner	Sample	-		1	Sta	ndard	Penet	ration Test	GEC		HNICA	AL FIELD	TECHNIC	IAN	DA	ATE 19.02.1		D,	ATE 0.02.10		_
	76 Undist 100 Undi				Ī			lity Te n Pac	st ker Test	RE	MAR	KS	Laure: 1		10m 4 55				4-1			_
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# TYSAN FOUNDATION LIMITED 泰昇地基工程有限公司

## DRILLHOLE RECORD

HOLE No. A-S25

SHEET 1 of 1

泰昇地基工程有限公司 Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A JOB No. J0911S26 (TFL) CO-ORDINATES **METHOD** RC E 825,944.13 MACHINE / No. XY2B/CCL-3 DATE from 07.12.09 to 08.12.09 N 841,825.13 FLUSHING MEDIUM **AIR** ORIENTATION Vertical **GROUND LEVEL** +4.29 mP.D. Reduced Level (mPD) level (m) Shift start/ Water
Recovery %
Total core
Recovery %
Solid core
Recovery % Casing depth/size Drilling Progress Samples Description R.Q.D. Legend Depth (m) Tests end Loose, brown, silty fine to coarse SAND with some gravel sized rock fragments. (FILL) - 07,12.09 ΡW 0.45 0.50 Loose to medium dense, yellowish brown, fine to coarse SAND with some gravel sized rock fragments. (FILL) +3.29 1.45 1.50 100 в Ыз +1.29 - 07.12.09 - 08.12.09 Firm, grey to dark grey, sandy CLAY / SILT. (SWAMP DEPOSIT) 100 13 Ыs 4.13m 100 5.00 PW at 18:00 14 bis 08,12.09 5.00 End of drillhole at 5.00m. 10911S26(TFL) LOK MA CHAU LOOP. GPJ TYSAN Z5032005. GDT 21.4.10 GEOTECHNICAL ENGINEER LOGGING GEOLOGIST Small Disturbed Sample Water Sample DRILLER EDWARD CHENG C.L. Chung S.O. CHAN Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE DATE Standard Penetration Test SPT Liner Sample 18.12.09 17.12.09 K.W. Leung U76 Undisturbed Sample Permeability Test U100 Undisturbed Sample Impression Packer Test inspection pit excavated from 0.00m-1.50m.
 A water sample was taken at 5.00m depth. 🛔 Standpipe/Piezometer Tip Mazier Sample Piston Sample In-situ Vane Shear Test X Point Load Test

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PROJ	ECT								velopn	nent o	of Lo	k Ma Cl	hau Loc	op Gro	ınd İn	nvestigation Works for Area A	
METH	IOD	RC						co-	-ORDI	NATI	ES			<del>-,</del>		JOB No. J0911S26 (TFL)	_
MACH	IINE /	No. 1	_Y38/[	OR08	}					6,14 13,02						DATE from 10.12.09 to 11.12.09	
FLUS	HING	MEDI	UM	AIR	₹			ORI	IENTA			Vertic	al			GROUND LEVEL +6.12 mP.D.	
Drilling Progress	Casing depth/size	Water level (m) Shift start/	Water Recovery % Total core	solid core	R.Q.D.	Fracture Index	t.l. / Test Septh	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade	Description	
10.12.09 11.12.09 11.12.09	PW 5.00	Dry at 18:00	10 10 10 10 10 10 10 10 10 10 10 10 10 1		RA	Frai Frai Inde	F.1. Dep	18 bis 17 bis 53 bis	junggar.	A	0.45 0.50 0.95 1.00 1.45 1.50 1.95 2.00 3.00 3.45 3.50 4.50 4.85 5.00	+5.12 +3.12 +1.62 +1.12	(iii) 1.00	[69]		Loose, yellowish brown, fine to medium SAND. (FILL)  Stiff, dark brown to yellowish brown, very sandy SILT with gravel sized rock and brick fragments. (FILL)  Firm, grey to yellowish brown, sandy SILT. (SWAMP DEPOSIT)  Dense, light grey, silty fine to medium SAND. (SWAMP DEPOSIT)  End of drillhole at 5.00m.	
La SP U7	ge Distu T Liner : 6 Undist	urbed Sa turbed S iple	mple ample	I I I	Star Star Pen Imp Star	neabi ressio ndpipe itu Va	vel Penetri lity Tes in Pack a/Piezoi	ation Tes t er Test meter Tip ar Test	P.T GE K.V RE	V. Leur MARI	INICA	excavate	 d from 0.0	00m-1.50	S.C DA 17	DOGING GEOLOGIST O. CHAN EDWARD CHENG  ATE DATE 7,12.09 18.12.09	

HOLE No. A-SG02

FOUNDATION LIMITED 泰昇地基工程有限公司 PROJECT Planning and Engineering Study of	ORILLHOLE RECORD on Development of Lok Ma Chau Loop Ground In	SHEET 1 of 1
METHOD RC	CO-ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. LY38/DR09	E 826,423.14 N 842,751.05	DATE from 21.12.09 to 21.12.09
FLUSHING MEDIUM AIR	ORIENTATION Vertical	GROUND LEVEL +6.64 mP.D.
Progress Casing depth/size depth/size by this water water water by the progress of the progres	Samples Samples Reduced Level (mPD) Depth (m) Legend Grade	Description
100 24	A 0.45 0.50	Loose, yellowish brown, fine to coarse SAND with some gravel sized rock and brick fragments. (FILL)  Firm, brown and grey, sandy CLAY / SILT with some gravel sized rock fragments. (FILL)
● Small Disturbed Sample  Large Disturbed Sample  ▼ Water Sample	DRILLER LOGG	GING GEOLOGIST GEOTECHNICAL ENGINEER CHAN EDWARD CHENG EDWARD CHENG
SPT Liner Sample Standard Penetratio.  U76 Undisturbed Sample Penmeability Test U100 Undisturbed Sample Impression Packer T  Mazier Sample Standpipe/Piezomet In-situ Vane Shear T	Test REMARKS 1. Inspection pit excavated from 0.00m-1.50m.	

X Point Load Test

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PRO	JECT	Plann	ing	and	Eng	inee	ering	Stud	ly on De	velop	ment	of Lo	k Ma C	hau Loc	p Grou	ınd in	vestigation Works for Area A
MET	HOD	RC							СО	-ORD	INA	ΓES					JOB No. J0911S26 (TFL)
MAC	HINE /	No. L	_Y38	3/DF	₹08		*					38.1° 31.0°					DATE from 22.12.09 to 22.12.09
FLUS	SHING	MEDI	UM	-	AIR				OR	IENT.			Vertic	al			GROUND LEVEL +3.16 mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
- 22.12.0												0.45	+2.66	- 0.50			Firm, brown, sandy SILT with some gravel sized rock fragments. (FILL)
			- Leading and a second							NEWSTERN PIL	8	0,50 0,95 1.00				,	Very soft, grey to yellowish brown, CLAY. (SWAMP DEPOSIT)
		A Paris		100					1 bls		; ;	1.45 1.50 1.95 2.00	+1,66	1.50			Firm, yellowish grey to grey, CLAY / SILT. (SWAMP DEPOSIT)
	- Polat bottererer			100					6 bis		3 4	3.00 3.45 3.50	1				
		2.43m						4,50	å		=	4.50	-1.34	- - - 4.50		ļ.	Loose, yellowish brown, fine to coarse SAND.
22,12,0	5,00 9 PW	at 18:00		100					47 bis		<b>3</b> 5	4.95 5,00	-1.84	5.00	* *		(ALLUVIUM)  End of drillhole at 5.00m.
		To the state of th	A TABLE AND AND AND AND AND AND AND AND AND AND			- Leave - Leav	The state of the s	The state of the s					The state of the s			- Andrews - Andr	
	Small Distr arge Dist				Ŧ	Wa	ter Le			<u>P</u>	RILLE .T. Fo	ng	at Fire			<u>s.</u>	OCCHAN GEOLOGIST GEOTECHNICAL ENGINEER DESCRIPTION OF CHENG DATE DATE
	SPT Liner 176 Undis		amak	<b>?</b>	Ţ			l Pene ility Te	etration Te est	- L	.W. Le		AL PIELD	TECHNIC	I/AIN		ATE DATE 7.12.09 28.12.09
	J100 Undi Mazier Sa	isturbed mple	-		Ĭ	lm; Sta	oressi Indpip	on Pa e/Pie:	cker Test zometer Ti	1 1	EMA Inspe	ction o	it excavate installed t	ed from 0.0 o 4.50m d iken at 5.0	00m-1,50 epth.	m. 1.	
₫∐ F	Piston Sar	nple			×			ane Si ad Te:	hear Test st		. 13 376	, a, a, a, iii	_,o .,uo t6				

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PRO	JECT	<u> </u>							velopme	nt of Lo	ok Ma C	hau Lo	p Gro	und In	nvestigation Works for Area A	
MET	HOD	RC						CO-	ORDIN/	ATES	•				JOB No. J0911S26 (TFL)	
MAC	HINE /	No.	LY38/	DRO	6				E 826, N 842,						DATE from 10.12.09 to 12.12.09	
FLU	SHING	MEDI	UM	ΑI	R			ORII	ENTATI		Vertic	al			GROUND LEVEL +5.74 mP.E	D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery % Total core	Recovery % Solid core	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description	
DRILLHOLE LOG J091/1826(TFL) LOK MA CHAU LOOP GPJ TYSAN 25032005.GDT 21.4.10    International Control of Con	9 PW	4.77m at 18:00	38	00	<u> </u>	FT INC.	F.I	25 bis 13 bis	2 A A A A A A A A A A A A A A A A A A A	0.45 0.50 1.00 1.45 1.50 2.00 3.00 3.45 3.50	+2.74	3.00	a1		Stiff, brown to brownish grey, sandy SILT with some gravel sized rock and brick fragments. (FILL)  Firm, grey to dark grey, sandy SILT. (SWAMP DEPOSIT)  Loose, yellowish grey, clayey fine to medium SAND (SWAMP DEPOSIT)  End of drillhole at 5.00m.	
1911S26T.	i mali Distu arge Distu		•		. Wa ≭ Wa		-		DRILLE K.M. L	ee		<u>.                                    </u>		<u>s.o</u>	GGING GEOLOGIST GEOTECHNICAL ENGINEE  D. CHAN EDWARD CHENG	R -
S [] Si	PT Liner S 76 Undist		mpie		<u>.</u>		Penetr lity Tes	ation Test t	GEOTE K.W. L		L FIELD 1	ECHNICU	W.	DAT 17.	YE DATE 7.12.09 18.12.09	
RILLHOLE LOC	100 Undis azier Sarr	turbed S			[ Imp	ressio	n Pack	er Test meter Tip	REMA 1. Inspe		excavaled	d from 0.00	lm-1.50m	١.		
Pi	ston Sam			`	_	îtu Va	ne She	ar Test								

## **TYSAN** FOUNDATION LIMITED

## DRILLHOLE RECORD

HOLE No. A-SG05 SHEET 1 of 4

泰昇地基工程有限公司 Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A J0911S26 (TFL) CO-ORDINATES JOB No. **METHOD** RC E 826,367.93 DATE from 12.12.09 to 18.12.09 MACHINE / No. LY38/SB05 N 842,408.08 **GROUND LEVEL** +4.05 mP.D. FLUSHING MEDIUM AIR / WATER ORIENTATION Vertical Wate Reduced Level (mPD) level (m) Shift start/ Water
Recovery %
Total core
Recovery 9
Solid core
Recovery 9 Casing depth/size Drilling Progress Samples Legend Description R.Q.D. (m) Grade Tests Firm, grey and yellowish brown, sandy SILT with some gravel sized brick fragments. (FILL) 12.12.09 SW 0.95 1.00 100 77 bis 100 26 bis 3,45 3,50 0.45 Very soft, grey to black, CLAY / SILT with some gravel and cobble sized granite fragments. (FILL) 4.25m 4.60 at 18:00 100 17 bis at 08:00 0 LOK MA CHAU LOOP GPJ TYSAN 25032005.GDT 6,50 6,60 2,70m 0 al 08:00 102 bis -3.05 Medium dense, light grey to grey, clayey fine to medium SAND with some gravel sized rock and shell fragments. (SWAMP DEPOSIT) SW D 8,60 8.70 47 9,15 9,20 9,30 (2,2,2,4,2 3) N=11 13 Firm, grey to dark grey, CLAY / SILT. (SWAMP J0911SZ6(TFL) 92 GEOTECHNICAL ENGINEER DRILLER LOGGING GEOLOGIST Water Sample Small Disturbed Sample EDWARD CHENG M.S. Lee S.O. CHAN Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE DATE SPT Liner Sample Standard Penetration Test K.W. Leung 21.12.09 22.12.09 U76 Undisturbed Sample Permeability Test REMARKS U100 Undisturbed Sample Impression Packer Test NEIVENTAGE

1. Inspection pil excavated from 0.00m-1.50m.

2. A falling head permeability test was carried out at 3.10m-4.80m depth.

3. A constant head permeability test was carried out at 13.50m-15.00m depth.

4. A yane shear test was carried out at 11.80m depth.

5. Flushing medium for first 5m is air. Mazier Sample In-situ Vane Shear Test Piston Sample X Point Load Test

	F	OUNDA	ATION	LIM	ITED		DKIL	_L_	IULI			ハイド	J
	1 44	昇地基											SHEET 2 of 4
PROJECT	Plann	ning and	Engine	ering	Study	on Dev	elopmen	t of Lo	k Ma C	hau Loc	op Gro	und Ir	nvestigation Works for Area A
METHOD	RC					CO-C	ORDINA	TES					JOB No. J0911S26 (TFL)
MACHINE	/No. L	Y38/SE	305				E 826,3 N 842,4						DATE from 12.12.09 to 18.12.09
FLUSHING	MEDIL	JM A	AIR/V	VATE	ER	ORIE	NTATIO		Vertic	al			GROUND LEVEL +4.05 mP.D.
Dritling Progress Casing depth/size	Water level (m) Shift start/st	Recovery % Total core Recovery %	Solid core Recovery % R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
		92					15			-	<u>-</u>   <u>-</u>   <u>-</u>   -		DEPOSIT)
-					11.80	(1, 1, 1, 2, 2, 2) N=7	15 17 18	10.70 10.80 10.90 11.20 11.25	-6,75	10.80	-1 -1 -1		Firm, dark yellowish brown, CLAY / SILT. (ALLUVIU)
-		93				(1, 2 3, 4, 6, 5) N= 18	19 20 21	13.00 13.10 13.20	<i>-</i> 7.95	- 12.00	0.0.0		Medium dense, yellowish brown, fine to coarse SANI with some rounded gravel sized quartz fragments. (ALLUVIUM)
15.12.09 16.12.09	2.73m at 08:00	0	NAME AND ADDRESS OF THE PARTY O		15.00		2 2	13.50 13.55 14.00	-9.95	14.00			Grey and greyish brown, subrounded GRAVEL and COBBLE sized quartz fragments. (ALLUVIUM)
6.12.09 7.12.09	2.69m at 08:00	93			11	139 bis (7, 10, 6, 4, 3, 3) N = 16	24 25 25 26 27	15.60 15.65 15.70 16.00 16.05 16.10	<u>-11,55</u>	15.60			Very stiff, yellowish brown to dark yellowish brown, CLAY / SILT. (ALLUVIUM)
-						(1, 1, 2, 3, 3, 5) N=13	30	17.10 17.20 17.30 17.60 17.65	-14,05				
		96			1		31	19.10 19.20			Φ	V/IV	Extremely weak to very weak, grey, completely to highly decomposed meta-SILTSTONE. (Very stiff, SILT with some gravel sized rock fragments)
20.10						(1, 1, 3, 3, 3, 5) N = 14	33	19,30 19,60 19,65	4===				
Small Distu Large Distu SPT Liner:	irbed Samp irbed Samp Sample	ple	¥ Wal			on Test	DRILLER M.S. Lee GEOTEC K.W. Lei	HNICAL	-15.95 L FIELD T	  ECHNICIA	/N	S.O DAT	GGING GEOLOGIST         GEOTECHNICAL ENGINEER           D. CHAN         EDWARD CHENG           TE         DATE           .12.09         22.12.09
20.10  Small Distu Large Distu SPT Liner U176 Undist U1700 Undist Mazier San Piston San	sturbed Sa nple		I Imp	ressio: ndpipe ilu Var	n Packer /Piezome ne Shear	eter Tip	REMAR	KS					

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PF	ROJE	CT									elopme	nt of Lo	ok Ma C	hau Loc	p Gro	ound f	nvestigation Works for Area A	١	· · · · · · · · · · · · · · · · · · ·
MI	ETHO	<u>.</u> DD	RC							co-c	RDIN	ATES					JOB No. JOS	911S26 (T	FL)
M	ACHI	NE/	No. I	LY3	8/SI	305						,367.9 ,408.0					DATE from 12.12.09	to 18.1	12.09
FL	.USH	ing i	MEDI	UM		AIR	/ W	ATE	:R	ORIE	NTAT		Vertic	cal			GROUND LEVEL	+4.0	5 mP.D.
Dritting	Progress	ng h/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Descr	iption	
TYSAN 25032005.GDT 21.4.10	12.09	28.60 HW	GILU		100				28.60	(4, 13, 8, 9, 12) N = 38  (7, 43, 100/20mm) 10000ss/20mm		20.10 20.10 35 21.10 21.20 21.30 37 21.65 21.65 24.10 39 40 25.20 41 25.32 25.37	-20.05	24.10		>	As Sheet 2 of 4. Extremely weak, yellowish bro decomposed meta-SILTSTON  Extremely weak to very weak grey, completely to highly decometa-SILTSTONE. (Very stiff sized rock fragments)	, yellowish t omposed , SILT with s	orown and some gravel
CHAUL		.,,,			100	100	20	NI	28.60 29.00		12101		-24.95	ļ.		IV/III	Moderately weak to moderate brown, highly to moderately d meta-SILTSTONE. (Recovery	ecomposed ed as angul	i ar gravei)       /
L) LOK MA					98 100	98 100	98 85	7.2			T2101					11	Strong, grey to dark grey, slig meta-SILTSTONE. Joints are spaced, rough planar, very no vein infilled, dipping at 20°-30	htly decomp closely to a arrow, Iron s	posed medium
1826(TF			bed Sa	-	<u> </u>		Wat	ler Sa			DRILL M.S.		-25.95	<u> </u>	ШЦ			GEOTECHNIC	AL ENGINEER
1001	SPT	Liner S	,			1	Star		Pene	tration Test	GEO1	ECHNIC	AL FIELD	TECHNICI	AN	D/	ATE I	DATE 22.12.09	
E LOC			irbed S turbed S			Ī			ility Te on Pac	st ker Test		Leung ARKS		<del></del>			1,12,09	22.12.03	300000000000000000000000000000000000000
RILLHOLE LOG	Mazi	er Sam	ple			å	Star	ndpipa	e/Piez	ometer Tip lear Tost									
	risto	n Sam	hie						d Tes										

## **TYSAN** FOUNDATION LIMITED 泰昇地基工程有限公司

## DRILLHOLE RECORD

A-SG05 HOLE No. SHEET of 4

Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A **PROJECT** CO-ORDINATES JOB No. J0911S26 (TFL) **METHOD** RC E 826,367.93 DATE from 12.12.09 to 18.12.09 MACHINE / No. LY38/SB05 N 842,408.08 ORIENTATION Vertical **GROUND LEVEL** +4.05 mP.D. FLUSHING MEDIUM AIR / WATER Water Reduced Level (mPD) level (m) Shift Water
Recovery %
Total core
Recovery %
Solid core
Recovery % Samples Legend Description R.Q.D. Depth (m) Tests start/ end As Sheet 3 of 4. 100 100 85 100 100 80 32.18 7.2 100 100 70 100 100 75 100 100 85 18.12.09 End of drillhole at 34.60m. DRILLHOLE LOG JO911826(TFL) LOKA DRILLER LOGGING GEOLOGIST GEOTECHNICAL ENGINEER Water Sample Small Disturbed Sample M.S. Lee S.O. CHAN EDWARD CHENG Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE SPT Liner Sample Standard Penetration Test K.W. Leung 21.12.09 22.12.09 U76 Undisturbed Sample Permeability Test REMARKS U100 Undisturbed Sample I Impression Packer Test Å Standpipe/Piezometer Tip Mazier Sample ✓ In-situ Vane Shear Test Piston Sample

X Point Load Test

# TVCAN

 	H		FOUNT 译昇地·		I NC	ımı		1	DRIL	LH	OLE	ERE	CO	RD	SHEET	1	of	1
PROJ	JECT								lopment	of Lo	k Ma C	hau Loc	p Grou	ınd Ir	vestigation Works for Are	ea A		
METH	HOD	RC						CO-O	RDINAT	ES					JOB No.	J0911S	326 (TI	FL)
MACI	HINE /	No.	XY2B/0	CCL-	3			1	E 826,62 N 842,32						DATE from 19.12	2.09 to	21.1	2,09
FLUS	HING			AIR				ORIE	OITATIO	N	Vertic	al			GROUND LEVEL		+4.82	mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery % Total core	solid core Recovery %	R.Q.D.	Fracture Index	: J. / Test Jepth	Tests	Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade	Dε	escriptio	on	
- 19.12.09			100					45 bis 22 bis	Linearity B	0.45 0.50 0.95 1.00 1.45 1.50 1.95 2.00	+4.32	- 0.50			Firm, grey, SILT with som Loose, yellowish brown, fi Firm, yellowish grey, CLA (SWAMP DEPOSIT)	ne to coa	arse SA	
21.12.05	5.00	3.18m at 18:00	10:	<b>D</b>	Timply, at			9 blp	5 5 7	3.450 4.50 4.50	+0.32 -0.18	5.00	-1111111111		Firm, dark grey, CLAY / S End of drillhole at 5.00m.	SILT. (SV	VAMP E	DEPOSIT)
SI UI	mali Distrarge Distrarge Distraction Condition (1997) and the condition Condition (1997) and the condition Condition	urbed Sa Sample turbed S isturbed mple	ample Sample	A ¥	Wa Sta Per Imp Sta	iter Le indard meab oressi indpip silu Vi	l Penet ility Te on Pac e/Piezo	ker Test ometer Tip ear Test	REMAR	ung CHNIC eung RKS	AL FIELD Lexcavate ple was ta	TECHNIC	20m-1.50	<u>S.</u> D, <u>2</u> m.	OGGING GEOLOGIST O. CHAN ATE 7.12.09	EDW	ARD CH	AL ENGINEE ENG

PDC			泰昇	地	基工	程	有阿	ITEC 【公	司				TUL.					SHEET	1	c	of	1
PRO	JECT	Mai	ITHING	ano	ı EN(	yine:	enng	- STUC	ay on De	velopr	nen	L Of L	ok Ma (	onau LO	ob GLO	un <b>u l</b>	iive	stigation Works fo	i Med M			
METH	4OD	RC							co-	-ORDI								JOB No.	J091	182	6 (TFI	_)
MAC	HINE .	No.	LY3	8/D	R09							928.0 354.1						DATE from 0	7.12.09	to	07.12	.09
FLUS	HING	MED	IUM		AIR				ORI	ENTA			Verti	cal			-	GROUND LEV	/EL	-	+5.84	mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade			Descrip	tion		
-07.12.09 -07.12.09 -07.12.09 -07.12.09 -07.12.09 -07.12.09 -07.12.09 -07.12.09 -07.12.09	5.00	4.89m at 18:00		100	Section 1997	F			26 bis 18 bis	PHOTOGRAPH -	A B C ; 2	0.4:1 0.5:0 0.9:1 1.0:0 1.4:1 1.5:2 2.00 3.00 3.4:3 3.5:0 4.5:0	+2.84	3.00	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	9	Fin Sill frag	ose, brown, silty finavel and cobble size LL)  m, reddish brown n T with completely ogments. (FILL)  m, grey to dark grey ts. (SWAMP DEPO	nottled whi decompos y, sandy C OSIT)	ite and b	rick fra d grey, itstone	gments.
• Sma	all Distu ge Distu	rbed Sa			Ŧ	Wate	er Sar er Lev	rel		P.S.	LLER Tar	n	M SIELD?	<u>-</u>	1	<u>s.</u> 0	), Cl	IG GEOLOGIST FAN		WARE	-INICAL (	ENGINEER G
U76	T Liner S 3 Undist		amp!e		İ	Pem	neabil	ity Tes		K.W	/. Le	ung	AL FIELD 1	—	นท	DA 10	1E .12.0	09		12.09		
SP1 U76 U10 Maz	X) Undis zier Sam		Sampl	9					er Test meter Tip		MAF spec		ł excavale	d from 0.00	)m-1.50n	<b>5.</b>						
Pist	on Sam	pie						ne She 3 Test	ear Test													

# TYSAN FOUNDATION LIMITED 泰昇地基工程有限公司

## DRILLHOLE RECORD

HOLE No. A-SG08

SHEET 1 of 1

			<b>F</b> 昇				<b></b>										SHEET		1	of	1	
PRO	DJECT	Plan	ning	and	Eng	inee	ring S	Study o	on Deve	iopment	of Lo	ok Ma C	hau Loc	op Grot	ınd I	Investig	ation Work	s for Are	ea A			
ME	THOD	RC							CO-O	RDINA	TES					J	IOB No.		J0911	S26 (T	FL)	
MA	CHINE	No.	XY2	B/C	CL-1	1				E 826,1 N 842,0						C	DATE from	05.12	2.09 to	07.1	2.09	
FLU	ISHING		IUM	,	AIR				ORIE	NTATIO	N	Vertic	al		, ,		GROUND L	EVEL		+5.7	9 mP	.D.
Drilling	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	Depth	Tests	Samples	•	Reduced Level (mPD)	Depth (m)	Legend	Grade				escripti			
-05.12 - - - -										WENCH MI	0.45 0.50		- - - - - -			Loose	e, yellowish t	orown, fi	ne to m	edium S	AND. (F	FILL)
<u> </u>		A PROPERTY AND A CAMPAGE AND A	A CALLED TO THE PARTY OF THE PA	100					15 bia	2 · 8	1,45 1,50 1,95 2,00		- 1.00 			claye	um dense, ye y fine to coai nents. (FILL)	ellowish rse SAN	grey to ID with s	yellowis some sh	h brown ell	i,
		1,45m at 18;00		100					44 bis		3,45 3,50		- 3.00 			(FILL						
-05.12 -07.12	5,00	1.45m at 08:00	1	100		i			15 bis		4.50		5.00			Stiff, DEP	grey to yello OSIT)	wish gre	y, CLAY	//SILT	(SWAN	MP .
ZOLIELLAN MINISTERIO LOGICIONE DE LA CONTROLLA						- Large Control of th				The second secon	4.955.00	(Authority) (1914)			And the second s	End	of drillhole at	. 5.00m.				
₫ .	Small Dist Large Dist				7		er San ter Lev	-		DRILLE T.H. W	ong		_		<u>s</u>	S.O. CHA	GEOLOGIST N		EDV	TECHNIC VARD CI		NEER
_1 U	SPT Liner U76 Undia	-		9	Ī			Penetrat ty Test	tion Test	GEOTE K.W. Le		AL FIELD	TECHN(C	IAN		DATE 17.12.09	<u>,,</u>	·	DAT 17.	E 12.09	<u></u>	
	U100 Und Mazier Sa Piston Sa	isturbed mple			Ĭ å	Imp Star	ressior ndpipe	Packer Piezom e Shea	eter Tip	REMA 1. Inspe 2. A wat	ction of	il excavate ple was ta	ed from 0.6 ken at 5.0	00m-1.50 00m dept?	m. ).							

# TYSAN FOUNDATION LIMITED 泰界地基工程有限公司

## DRILLHOLF RECORD

HOLE No. A-SG09

SHEET 1 of 5

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PRO	JECT	Plar	nning a	nd En	gine	ering	Study	y on Dev	elopme	nt of L	ok Ma C	hau Lo	op Gro	und i	invest	igation Wo	rks fo	or Are	ea A				
мет	HOD	RC						co-c	ORDIN	ATES						JOB No.			J091	1826	S (TP	L)	
MAC	HINE	/ No.	LY38/	SB05	;				E 825 N 842	•						DATE fro	m 2	6.11	.09	to (	04.12	2.09	
FLUS	SHING	MED	IUM	AIF	2 / W	/ATE	ER		NTAT		Vertic	cal				GROUNE	) LE\	/EL		+	4.94		P.D.
w	92	Water level	% g.°	8 8 8 8				<u> </u>			7 <u>6</u>		T										
Drilling Progress	Casing depth/size	(m) Shift start/ end	Water Recovery % Total core	Solid Solid	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade				De	script	ion			
28.11.09 - 28.11.09 - 27.11.09 - 27.11.09 - 28.11.09	SW	The first countries and the first countries are a second countries and the first countries are a second countries	100						- September 1	0.50 1.00 1.45 1.50		;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;				, grey and b cobble size							
			100	2						3,00 3,45 3,50	+1.94				Firm grav	, yellowish I el sized roc	brown k frag	, san	dy SIL s. (FIL	T wit L)	h son	ne ar	ngular
- - - - - - - - - - - - - - - - - - -			100						5	4.50 4.95 5.00 5.50	+0.44 -0.56	- 4.50        5.50			roots	, grey to bro s. (SWAMP	DEP	OSIT)	)				
30.11,09			90						7	6,50 6,60	-1.66	- - - - - - - - - - - - - - - - - - -			DEP	e, grey, cla OSIT)	-					•	
Sm. Sp. U100 Mazara	7.50 SW PW		100				!	(1, 1, 1, 1, 1, 1, 2) N=5		6.70 7.00 7.05 7.50				***************************************	fragn	, grey to dai nents and r	rk gre ools. 1	y CLA (SWA	AY/SI	EPO	AIN SC	ome c	oyster
			70			T T T T T T T T T T T T T T T T T T T		(t, 1, 2, 1, 2, 2) N=7		8,60 8,70	-3.66 -5.06	8.60				, grey to dar fragments.					vith o	ccasi	onal
● Sm   Larg		rbed Sar rbed Sar	-	*	Wate Wate				DRILLE M.S. L						GGING D. CHA	geologist N				TECH! /ARD			NEER
SP1	T Liner S	Sample		ļ	Stan	dard I	Penetral	lion Test	GEOTE K.W. L		L FIELD T	ECHNICIA	dN .	DA <sup>*</sup>	TE 1.12.09				DATE 11.1				
U76			-	I å ×	impre Stan	essior dpipe u Var	e Shea	r Test neter Tip	REMA	RKS ction pit	excavated permeabil um for firs	ity tost wa	s carried	out st	26,25n	)-27.75m depl	h.						

	1111	H							TED 公司		DΚ	. 1	L∏	OLE		.00	·INL	SHEET	2	of	5
	PROJ	ECT	Plan	ning	and	Eng	jinee	ering	Stud	ly on Dev	elopm	ent	of Lo	k Ma C	hau Loc	р Gго	ınd In	vestigation Works for	r Area A		
	METH	IOD	RC							co-c	ORDII	TAP	ΓES					JOB No.	J091 <sup>-</sup>	1S26 (TF	FL)
	MAC	line/	No.	LY3	8/SE	305					E 82 N 84							DATE from 26	3.11.09	to 04.1	2.09
	FLUS	HING	MEDI	UM		AIR	/ W	ATE	R	ORIE	ENTA	TIO	N	Vertic	cal		•	GROUND LEV	EL	+4.94	mP,D.
	Drilling Progress	Casing depth/size	Water level (m) Shift start/	Nater Recovery %	Total core Recovery %	Solid core	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade		Descript	ion	
	30.11.09 01.12.09		end		70 100 100 0	SC SC SC SC SC SC SC SC SC SC SC SC SC S	R.	THE PERSON NAMED OF THE PE	F.1	(1, 4, 3, 4, 4, 4, 5) N = 16 (2, 4, 4, 6, 6, 6) N = 26 (3, 3, 5, 5, 5, 5) N = 18		20 15 16 17 18 19 20 22 23 24 25 27 25 29	10.50 11.60 11.70 12.15 12.60 13.70 14.10 14.15 14.60 15.70 16.15 16.20 16.95 17.70	-10.76 11.26	15.70	al 1 - 3 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		Medium dense, grey to medium SAND. (SWA)  Very dense, yellowish subangular GRAVEL (ALLUVIUM)  Medium dense, yellow fine to coarse SAND.	i brown to sized quar wish brown (ALLUVIU	yellowish tz fragme to yellowi M)	grey, nts. ish grey, silty
										(5, 18, 25, 2 19, 25) N = 95		- 30	19,70 19,80	-15.06	20.00		V	Extremely weak, yello			
200	Lau SP U7	Small Disturbed Sample  Large Disturbed Sample  SPT Liner Sample  U76 Undisturbed Sample  U100 Undisturbed Sample  Mazier Sample  Mazier Sample  Water Sample  Standard Pen  Permeability T  Impression Pa						vel Pene lity Te on Pac	st :ker Test	M.S GEO K.W	LLER LEG OTEC LEG MAF	HNIC/ ung	NL FIELD	TECHNIC	MAN .	<u>S.C</u> DA	GGING GEOLOGIST  D. CHAN  TE  1.12.09	<u>ED</u>	WARD CH	AL ENGINEER ENG	
أإذ		ton San						itu Va	ine Sh	ear Test											

## DRILLHOLF RECORD

PROJ	JECT	<u> </u>	FOUN 泰昇地 nning a	基	工程	有限	艮公	司			ok Ma C				SHEET 3 of 5 Investigation Works for Area A	
METH	HOD	RC						co-c	ORDIN	NATES					JOB No. J0911S26 (TFL)	
MACH	INE /	No.	LY38/	SB	)5					5,826.5 2,012.3					DATE from 26.11.09 to 04.12.09	
FLUS	HING	MED	UM	Α	IR/V	VATI	ER		NTA		Vertic	cal			GROUND LEVEL +4.94 mP.I	 D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery % Total core	Recovery % Solid core	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples	Reduced Level (mPD)	Depth (m)	Legend	Grade	Description	
	20.60 PW HW		9	-	77.11.11.11.11.11.11.11.11.11.11.11.11.1					31 20.10 20.15 20.60		21.70		<b>v</b>	decomposed meta-SILTSTONE. (Very stiff, SILT) As Sheet 2 of 5.	P
					74. 17. 18. 18. 18. 18. 18. 18. 18. 18. 18. 18			(50/70nm) 100/70nm) 100/de/70nm		33 21.60 21.70 34 21.78 21.84	-10,70		\$ 0 0 0 0 8	V/IV	Extremely weak to very weak, yellowish brown to yellowish grey, completely to highly decomposed meta-SILTSTONE. (Very stiff, sandy SILT with son gravel and cobble sized rock fragments)	JE
			88	3				(4, 17, 16, 16,		24,60 35 35 25,60 25,70 25,80	-20.76	25.70	9 0 8 0 8		Extremely weak, yellowish brown, completely	
- 01.12.09 - 02.12.09 - 03.12.09 - 03.12.09 - Sma - Larg - U10 - U10 - Maz - Piste					To the state of th		27.75	(4, 17, 16, 16, 24, 40) N = 96	Ų	36 26.10 26.15				٧	decomposed meta-SILTSTONE. (Very stiff, SILT)	
01.12.09 02.12.09 - 02.12.09 - 02.12.09 - 03.12.09			40	)				(50/70กาก 1 100/10กาก) 100ปะ/10กาก		28.60 39 40 29.60 41 29.70 29.73	-25.06	30.00				
Small Large U76 U10 Maz	je Distur Liner S Undistu O Undist ier Sam	Disturbed Sample Disturbed Sample Liner Sample Undisturbed Sample Undisturbed Sample T Sample Undisturbed Sample T Sample Undisturbed Sample T Sample T Sample T Sample T Sample T Sample T Sample T Sample T Sample T Standpipe/Piezome In-situ Vane Shear Y Point Load Test					st ker Test ometer Tip ear Test	<u>K.W.1</u>	.ee ECHNICA	AL FIELD T	 ECHNICIA	N	S.C	GGING GEOLOGIST GEOTECHNICAL ENGINEE D. CHAN EDWARD CHENG TE DATE 1.12.09 11.12.09	R	

	H	•					IMI 有限			אט	(IL	.L.I	IOLI	= K			JΚ		5
PRO	JECT	Plan	ning	and	Eng	inee	ring	Stuc	iy on Dev	/elopn	nent	of Lo	k Ma C	hau l	100.	Gro	und	vestigation Works for Area A	
MET	HOD	RC		*					CO-	ORDI	NA	res						JOB No. J0911S26 (TFL)	)
MACI	HINE /	No.	LY3	8/SE	305					E 82		26.5 12.3						DATE from 26.11.09 to 04.12.0	09
FLUS	HING	MEDI	UM		AIR	/W	ATE	R	ORI	ENTA	TIC	N	Verti	cal				GROUND LEVEL +4.94	mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth	fun	Legend	Grade	Description	
3.12.0 S L S U U M	37.56 HW	rbed Sa rbed Sample urbed S sturbed	ımple	75 100 78 100 100	0 100 100 100 1 100	0 20 40 68 Wat Star Pen Imp Star In-s	NI 8.0 ler Sa ter Lev ndard meabi	mple vel Pene lily Te	tration Test test cometer Tip near Test	12 12 12 12 12 12 12 12 12 12 12 12 12 1	43 44 45 1001	32.60 33.70 33.70 33.80 34.15 37.53 37.53 37.53 37.53 37.53 37.53 37.53 37.53	-32.85	35.6	29		V LS E	Weak, yellowish grey, highly decomposed meta-SILTSTONE. (Subangular GRAVEL a COBBLE sized rock fragments)  Strong, light grey to grey, slightly decomposimeta-SILTSTONE. Joints are closely to met locally very closely spaced, rough planar, ve calcite and quartz vein infilled, dipping at 10 30°-40° and 50°-60°.  GGING GEOLOGIST GEOTECHNICAL D. CHAN EDWARD CHEN ITE DATE  J.12.09 11.12.09	ed dium ny narrow, °-20°,

## **TYSAN** FOUNDATION LIMITED

## DRILLHOLE RECORD

HOLE No. A-SG09 SHEET 5 5 of

泰昇地基工程有限公司 Planning and Engineering Study on Development of Lok Ma Chau Loop Ground Investigation Works for Area A PROJECT METHOD CO-ORDINATES JOB No. J0911S26 (TFL) E 825,826.50 MACHINE / No. LY38/SB05 DATE from 26.11.09 to 04.12.09 N 842,012.38 AIR / WATER ORIENTATION GROUND LEVEL +4.94 mP.D. FLUSHING MEDIUM Vertical Water level (m) Shift Reduced Level (mPD) Water
Recovery %
Total core
Recovery 9
Solid core
Recovery 9 Samples Legend Description R.O.D. Grade Depth (m) start/ end As Sheet 4 of 5. 100 100 68 T2101 40.26 8.0 100 100 82 T2 101 41.11 97 0 72101 97 >20 41.76 95 95 20 T2101 9.3 100 100 70 72101 04.12.09 End of drillhole at 43,32m. DRILLER LOGGING GEOLOGIST GEOTECHNICAL ENGINEER Small Disturbed Sample Water Sample EDWARD CHENG S.O. CHAN M.S. Lee Large Disturbed Sample Water Level GEOTECHNICAL FIELD TECHNICIAN DATE SPT Liner Sample Standard Penetration Test K.W. Leung 10.12.09 11.12.09 U76 Undisturbed Sample Permeability Test REMARKS U100 Undisturbed Sample Impression Packer Test å Standpipe/Piezometer Tip Mazier Sample Piston Sample In-situ Vane Shear Test X Point Load Test

# TYSAN FOUNDATION LIMITED 泰昇地基工程有限公司

## DRILLHOLE RECORD

HOLE No. A-SG10
SHEET 1 of 1

	基工程有限公司		SHEET 1 of 1
PROJECT Planning and	Engineering Study on Dev	relopment of Lok Ma Chau Loop Gro	ound Investigation Works for Area A
METHOD RC	CO-C	ORDINATES	JOB No. J0911S26 (TFL)
MACHINE / No. XY2B/C	CL-3	E 826,067.23 N 841,813.16	DATE from 09.12.09 to 09.12.09
FLUSHING MEDIUM	AIR ORIE	ENTATION Vertical	GROUND LEVEL +5.14 mP.D.
Drilling Progress Casing depth/size a st G S S S S S S S S S S S S S S S S S S	Solid core Recovery % R.Q.D. Fracture Fracture F.I. / Test Depth	Samples Reduced Level (mPD) Depth (m) Legend	Description
-09.12.09 PW   100	19 bis	A 0.45 0.50 0.50 0.95 0.95 1.00 1.00 1.50 1.50 1.50 1.50 1.50 1.5	Loose, reddish brown, silty fine to coarse SAND with some gravel sized rock and brick fragments. (FILL)  Firm, grey to dark grey and yellowish brown, sandy CLAY / SILT. (SWAMP DEPOSIT)
Small Disturbed Sample Large Disturbed Sample SPT Liner Sample U100 Undisturbed Sample Mazier Sample Piston Sample	Water Sample  ▼ Water Level  Standard Penetration Test  Permeability Test  Impression Packer Test  Standpipe/Piezometer Tip  In-situ Vane Shear Test	DRILLER C.L. Chung GEOTECHNICAL FIELD TECHNICIAN K.W. Leung REMARKS 1. Issued in pic excavaled from 9.00m-1.5	LOGGING GEOLOGIST S.O. CHAN DATE 17.12.09 GEOTECHNICAL ENGINEER EDWARD CHENG DATE 18.12.09 GEOTECHNICAL ENGINEER EDWARD CHENG DATE 18.12.09

HOLE No. A-SG10a

o.		<b>=</b> 7						ITED 【公		DKII	L I i	IOLI	_ 1\	_00	טאוי	SHEET 1 of 1
PRO	IECT	Plar	าทเกต	j and	I Eng	gine	ering	Stud	dy on De	velopmer	nt of Le	ok Ma C	hau Lo	op Gro	und Inv	restigation Works for Area A
METH	10D	RC							CO-	ORDINA	TES					JOB No. J0911S26 (TFL)
MACI	HINE /	No.	LYS	18/D1	R09	1				E 826, N 841,						DATE from 27.01.10 to 29.01.10
FLUS	HING	MED	IUM		AIR	:			ORI	ENTATI	ON	Vertic	al			GROUND LEVEL +3.30 mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/	Nater Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests	30	Camplica	Reduced Level (mPD)	Depth (π)	Legend	Grade	Description
27.01.10 27.01.10 29.01.10	FW 5.00	1.90m al 18:00		100	SS R	cr.	년 대		2 bis 4 bis 2 bis	LINGUISER - 1 1 2	0.45 0.50 0.95 1.00 1.45 1.50 3.60 4.50 4.50		4.50		Fo	Firm, grey mottled brown, slightly sandy SILT with occasional rootlets. (FILL)  /ery soft, grey, CLAY / SILT. (SWAMP DEPOSIT)  cose, brownish grey, slightly slity fine to coarse sAND. (SWAMP DEPOSIT)  and of drillhole at 5.00m.
• Sma										DRILLE			-			SING GEOLOGIST GEOTECHNICAL ENGINEER
SPT U76	Small Disturbed Sample Large Disturbed Sample SPT Liner Sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample Mazier Sample Piston Sample  Maxier Sample I Impression Pa Standpipe/Piez In-situ Vane Sl						Peneli ily Tes n Pack l/Piezo	st ker Test omeler Tip	K.W. Le	CHNICA Sung RKS	L FIELD T	_		DATE 09,02		

HOLE No. A-SG10b

	H	130	FOUI 萨昇 f					TED 公司	,	L);	V11.		IOLL	_ 1\L	.00	/ I \ L	SHEET 1 of 1
PROJ	ECT	Plan	ıning :	and	Eng	inee	ering	Study	on Dev	elop	men	t of Lo	ok Ma C	hau Loc	p Grou	l bnu	Investigation Works for Area A
METH	OD	RC							CO-	ORD	INA	TES					JOB No. J0911S26 (TFL)
MACH	IINE /	No.	XY2E	3/C	CL-3	3						028.1 390.0					DATE from 28.01.10 to 28.01.10
FLUS	HING				AIR				ORII	ENT.	ATIO	NC	Vertic	cal			GROUND LEVEL +3.18 mP.D.
Drilling Progress	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade	Description
- 28.01.10										ACPECTION ME	, 8	0.45 0.50 0.95 1.00	+2,18	1.00			Firm, greyish brown, CLAY / SILT. (SWAMP DEPOSIT)  Very soft, grey to dark grey, CLAY / SILT. (SWAMP
			1	100	•				6 bis	=======================================	- C - 1 1 2	1.45 1.50 1.95 2.00					DEPOSIT
	1			100	i di con			***************************************	8 bis		];	3.45 3.50	1	<u></u>			
- - - - - 28,01,10	5.00 PW	1,86m at 18:00		100					13 bis		5	4.50		4.50 5.00			Loose, grey, slightly silty fine to coarse SAND. (SWAMP DEPOSIT)
SZB(TE)	all Distu	rbed Sa					er Sa er Le	•		•	RILLE L. Ch		-1.92				End of drillhole at 5.00m.  LOGGING GEOLOGIST GEOTECHNICAL ENGINEER S.O. CHAN EDWARD CHENG
HOLE COG JOST	T Liner Sample   Standard Penet 6 Undisturbed Sample   Permeability Ter 00 Undisturbed Sample   Impression Pad						t er Test	GI K	EOTE W. L	CHNIC eung RKS		TECHNICI		D.	DATE DATE 09.02.10 10.02.10		
Ma Pis		=								"							

## TYSAN FOUNDATION LIMITED 泰昇地基工程有限公司

## DRILLHOLE RECORD

HOLE No. A-SG10c
SHEET 1 of 1

			泰昇					irei {公										SHEET		1	of	1
PR	OJECT	Pla	nning	and	I Eng	ginee	ering	Stud	iy on De	velopn	nent	of Lo	ok Ma C	hau Lo	op Gro	und l	nve	stigation Works	for Are	a A		
МЕ	THOD	RC							CO-	ORDI	FAN	res						JOB No.	ل ا	J09118	326 (TF	FL)
МА	CHINE	/ No.	XY2	B/C	CL-	3				E 82								DATE from	29.01.	.10 to	29.0	1.10
FL	JSHING	MED	IUM		AIR				ORI	ENTA	OIT	N	Vertic	al				GROUND LE	VEL		+5.21	mP.D.
Drilling	Casing depth/size	Water level (m) Shift start/ end	Water Recovery %	Total core Recovery %	Solid core Recovery %	R.Q.D.	Fracture Index	F.I. / Test Depth	Tests		Samples		Reduced Level (mPD)	Depth (m)	Legend	Grade				criptic		
S26(TFL) LOK MA CHAU LOOP GPJ TYSAN 25032005.6DT 21.4.10	5.00 PW	2.34m at 18:00	mple	100	To the state of th	Wate	er San	nple	24 bla 13 bis	DRILL DRILL	A B C 1 2 3 4	0.45 0.50 0.95 1.00 1.45 1.50 1.95 2.00 3.45 3.50	+0.71	4.50	7)	LO	Soil DE End	ft, greyish brown, casional angular ided rock fragment from the fragment ft, grey mottled bit in POSIT) dof drillhole at 5.	o subar s. (FILL	ELAY/S	SILT. (SV	WAMP
OG 3091.	SPT Liner S	ge Disturbed Sample							GEO	Chun TECF Leur	INICA	L FIELD TI	— ECHNICIA	N	DA	D. CI- TE 1.02.1			DATE 10.02.	<u>RD CHE</u>	NG	
DRILLHOLE LOC		ner Sample   Standard Penetrali ndisturbed Sample   Permeability Test Indisturbed Sample   Impression Packer Sample   Standplpe/Piezome						er Test neter Tip		MARI specie		excavated	from 0.00	m-1,50m	).							

Аp	pe	enc	lix l	В		

**RBRGs Criteria** 

## Risk-Based Remediation Goals (RBRGs) for Soil & Soil Saturation Limit

	Risi	-Based Remediation	n Goals (RBRGs) fo	or Soil	
Chemical	Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)	Soil Saturation Limit (C <sub>sat</sub> ) (mg/kg)
VOCs		7 3 3	1 9 9/		3 3 3
Acetone	9,590	4,260	10,000	10,000	***
Benzene	0.704	0,279	9,21	42,2	336
Bromodichloromethane	0.317	0.129	2.85	13,40	1,030
2-Butanone	10,000	10,000	10,000	10,000	***
Chloroform	0.132	0.0529	1.54	253	1,100
Ethylbenzene	709	298	8,240	10,000	138
Methyl tert-Butyl Ether	6,88	2.80	70.1	505	2,380
Methylene Chloride	1.30	0.529	13.9	128	921
Styrene	3,220	1,540	10,000	10,000	497
Tetrachioroethene	0,101	0,0444	0,78	1.84	97.1
Toluene	1,440	705	10,000	10,000	235
Trichloroethene	0.523	0.211	5.68	69.4	488
Xylenes (Total)	95.0	36.8	1,230	10,000	150
SVOCs	33.0	30,0	1,230	10,000	130
Асепарhthene	3,510	3,280	10,000	10,000	60.2
Acenaphthylene	2,340	1,510	10,000	10,000	19.8
Anthracene	10,000	10.000	10,000	10,000	2.56
	<del>}</del>	11.4	91.8	38,3	2.30
Benzo(a)anthracene	12.0 1,20	1,14	91.8	38.3	
Benzo(a)pyrene Benzo(b)fluoranthene	<del></del>				
	9.88	10.1	17.8	20.4	
Benzo(g,h,i)perylene	1,800	1,710	10,000	5,740	
Benzo(k)fluoranthene	120	114	918	383	
Bis-(2-Ethylhexyl)phthalate	30.0	28.0	91.8	94.2	
Chrysene	871	919	1,140	1,540	
Dibenzo(a,h)anthracene	1.20	1.14	9.18	3.83	
Fluoranthene	2,400	2,270	10,000	7,620	
Fluorene	2,380	2,250	10,000	7,450	54,7
Hexachlorobenzene	0.243	0.220	0.582	0.713	
Indeno(1,2,3-cd)pyrene	12,0	11.4	91.8	38,3	
Naphthalene	182	85.6	453	914	125
Phenanthrene	10,000	10,000	10,000	10,000	28.0
Phenol	10,000	10,000	10,000	10,000	7,260
Pyrene Metals	1,800	1,710	10,000	5,720	
Antimony	29.5	29.1	261	97.9	
Arsenic	22.1	21,8	196	73,5	
Barium	10,000	10,000	10,000	10,000	
Cadmium	73,8	72.8	653	245	
Chromium III	10,000	10,000	10,000	10,000	
Chromium VI	221	218	1,960	735	
Cobalt	1,480	1,460	10,000	4,900	
Copper	2,950	2,910	10,000	9,790	
Lead	258	255	2,290	857	
Manganese	10,000	10,000	10,000	10,000	
Mercury	11.0	6.52	38.4	45.6	
Molybdenum	369	364	3,260	1,220	
Nickel	1,480	1,460	10,000	4,900	
Tin	10,000	10,000	10,000	10,000	
Zinc	10,000	10,000	10,000	10,000	
Dioxins / PCBs					
Dioxins (I-TEQ)	0.001	0.001	0.005	0.001	
PCBs	0,236	0,223	0.748	0.756	
Petroleum Carbon Ranges					
C6 - C8	1,410	545	10,000	10,000	1,000
C9 - C16	2,240	1,330	10,000	10,000	3,000
C17 - C35	10,000	10,000	10,000	10,000	5,000
Other Inorganic Compounds		12,223	-1	, , , , , , , , , , , , , , , , , , , ,	-,
Cyanide, free	1,480	1,460	10,000	4,900	
Organometallics					
TBTO	22.1	21.8	196	73.5	

## Notes:

<sup>(1)</sup> For Dioxins, the cleanup levels in USEPA Office of Solid Waste and Emergency Response (OSWER) Directive of 1998 have been adopted. The OSWER Directive value of 1 ppb for residential use has been applied to the scenarios of "Urban Residential", "Rural Residential", and "Public Parks", while the low end of the range of values for industrial, 5 ppb, has been applied to the scenario of "industrial".

<sup>(2)</sup> Soil saturation limits for petroleum carbon ranges taken from the Canada-Wide Standards for Petroleum Hydrocarbons in Soil, CCME 2000.

<sup>(3) \*</sup> indicates a 'ceiling limit' concentration.

<sup>(4) \*\*\*</sup> indicates that the  $C_{\rm sat}$  value exceeds the 'ceiling limit' therefore the RBRG applies.

Risk-Based Remediation Goals (RBRGs) for Groundwater and Solubility Limit

Chemical  VOCs  Acetone Benzene Bromodichloromethane 2-Butanone Chloroform Ethylbenzene Methyl tert-Butyl Ether Methylene Chloride Styrene Tetrachloroethene Toluene Trichloroethene	Urban Residential (mg/L)  9,590 0.704 0.317 10,000 0.132 709 6.88 1.30 3,220 0.101 1,440 0.523	ediation Goals (RBRGs) for Rural Residential (mg/L)  4,260 0.279 0.129 10,000 0.0529 298 2.80 0.529 1,540 0.0444	10,000 9.21 2.85 10,000 1.54 8,240 70.1 13.9	Solubility Limit (mg/L)  ***  336  1,030  ***  1,100  138  2,380
Acetone Benzene Bromodichloromethane 2-Butanone Chloroform Ethylbenzene Methyl tert-Butyl Ether Methylene Chloride Styrene Tetrachloroethene Toluene	0.704 0.317 10,000 0.132 709 6.88 1.30 3,220 0.101 1,440	4,260 0.279 0.129 10,000 0.0529 298 2.80 0.529 1,540	9.21 2.85 10,000 1.54 8,240 70.1	336 1,030 *** 1,100 138
Benzene Bromodichloromethane 2-Butanone Chloroform Ethylbenzene Methyl tert-Butyl Ether Methylene Chloride Styrene Tetrachloroethene Toluene	0.704 0.317 10,000 0.132 709 6.88 1.30 3,220 0.101 1,440	0.279 0.129 10,000 0.0529 298 2.80 0.529 1,540	9.21 2.85 10,000 1.54 8,240 70.1	336 1,030 *** 1,100 138
Bromodichloromethane 2-Butanone Chloroform Ethylbenzene Methyl tert-Butyl Ether Methylene Chloride Styrene Tetrachloroethene Toluene	0.317 10,000 0.132 709 6.88 1.30 3,220 0.101 1,440	0,129 10,000 0.0529 298 2.80 0.529 1,540	2.85 10,000 1.54 8,240 70.1	1,030 *** 1,100 138
2-Butanone Chloroform Ethylbenzene Methyl tert-Butyl Ether Methylene Chloride Styrene Tetrachloroethene Toluene	10,000 0.132 709 6.88 1.30 3,220 0.101 1,440	10,000 0.0529 298 2.80 0.529 1,540	10,000 1.54 8,240 70.1	1,100 138
Chloroform Ethylbenzene Methyl tert-Butyl Ether Methylene Chloride Styrene Tetrachloroethene Toluene	0.132 709 6.88 1.30 3,220 0.101 1,440	0.0529 298 2.80 0.529 1,540	1.54 8,240 70.1	1,100 138
Ethylbenzene Methyl tert-Butyl Ether Methylene Chloride Styrene Tetrachloroethene Toluene	709 6.88 1.30 3,220 0.101 1,440	298 2.80 0.529 1,540	8,240 70.1	138
Methyl tert-Butyl Ether Methylene Chloride Styrene Tetrachloroethene Toluene	6.88 1.30 3,220 0.101 1,440	2.80 0.529 1,540	70.1	<del></del>
Methylene Chloride Styrene Tetrachloroethene Toluene	1.30 3,220 0.101 1,440	0.529 1,540	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2,380
Styrene Tetrachloroethene Toluene	3,220 0.101 1,440	1,540	13.9	
Tetrachloroethene Toluene	0.101 1,440			921
Toluene	1,440	0.0444	10,000	497
	<del></del>		0.78	97.1
Trichloroethene	0.523	705	10,000	235
	71749	0.211	5.68	488
Xylenes (Total)	95.0	36.8	1,230	150
SVOCs				
Acenaphthene	10,000	7,090	10,000	4.24
Acenaphthylene	1,410	542	10,000	3.93
Anthracene	10,000	10,000	10,000	0.0434
Benzo(a)anthracene				
Benzo(a)pyrene			· · · · · · · · · · · · · · · · · · ·	
Benzo(b)fluoranthene	0.539	0.203	7.53	0.0015
Benzo(g,h,i)perylene	0.000	0.200	1.00	0.0010
Benzo(k)fluoranthene			····	
Bis-(2-Ethylhexyl)phthalate				
Chrysene	58.1	21.9	812	0.0016
Dibenzo(a,h)anthracene	30.1	21.5	012	0.0010
Fluoranthene	10,000	10,000	10,000	0.206
	10,000		10,000	<del></del>
Fluorene	······································	10,000		1.98
Hexachlorobenzene	0.0589	0.0234	0.695	6.20
Indeno(1,2,3-cd)pyrene				
Naphthalene	61.7	23.7	862	31.0
Phenanthrene	10,000	10,000	10,000	1.00
Phenol				
Pyrene	10,000 ]	10,000	10,000	0.135
Metals		<del></del> ,-		
Antimony				
Arsenic				
Barium				
Cadmium				
Chromium III			***	
Chromium VI				
Cobalt			~~~~	
Copper				
Lead				
Manganese				
Mercury	0.486	0.184	6.79	
Molybdenum				
Nickel				
Tin				
Zinc				
PCBs				
Dioxins (I-TEQ)	1			
PCBs	0.433	0.171	5.11	0,031
Petroleum Carbon Ranges				,
C6 - C8	1,410	545	10,000	1,000
C9 - C16	2,240	1,330	10,000	3,000
C17 - C35	10,000	10,000	10,000	5,000
Other Inorganic Compounds	.0,000	.0,000	10,000	0,000
Cyanide, free	The state of the s			
Organometallics				
TBTO	T			
Notes:	l			<u> </u>

## Notes:

- (1) Blank indicates that RBRG could not be calculated because the toxicity or physical/chemical values were unavailable, or the condition of Henry's Law Constant>0.00005 was not met for the inhalation pathway.
- (2) Where solubilities for Petroleum Carbon Range aliphatic C9-C16 and greater than C16 generally are considered to be effectively zero and therefore the aromatic solubility for C9-C16 is used.
- (3) \* indicates a 'ceiling limit' concentration.
- (4) \*\*\* indicates that the solubility limit exceeds the 'ceiling limit' therefore the RBRG applies.

## Appendix C

Intervention Value downloaded from the website of Ministry of Housing, Spatial Planning and Environment, Netherland Table 1a: Target values and soil remediation intervention values and background concentrations soil/sediment and groundwater for metals. Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	EARTH/SEDIN	MENT		GROUNDWA	TER		
	(mg/kg dry ma	tter)		(μg/l in solut	ion)		
	national background concentration	target value	Intervention value	target value shallow	national background concentratio n deep		intervention value
	(BC)	(incl. BC)			(BC)	(incl. BC)	
i Metals							
antimony	3	3	15	-	0.09	0.15	20
arsenic	29	29	55	10	7	7.2	60
barium	160	160	625	50	200	200	625
cadmium	8.0	0.8	12	0.4	0.06	0.06	6
chromium	100	100	380	1	2.4	2.5	30
cobalt	9	9	240	20	0.6	0.7	100
copper	36	36	190	15	1.3	1.3	75
mercury	0.3	0.3	10	0.05	-	0.01	0.3
lead	85	85	530	15	1.6	1.7	75
molybdenum	0.5	3	200	5	0.7	3.6	300
nickel	35	35	210		2.1	2.1	75
zinc	140	140	720	65	24	24	800

Table 1b: Target values and intervention values for soil remediation soil/sediment and groundwater for inorganic compounds, aromatic compounds, PAH, chlorinated hydrocarbons, pesticides and other contaminants. Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	EARTH/SEDIMEN	T	GROUNDWATER	
	(mg/kg dry matter)	)	(µg/l in solution)	
	target	intervention	target	intervention
	value	value	value	value
Il Inorganic compounds				
cyanides-free	1	20	5	1500
cyanides-complex (pH<5)1	5	650	10	1500
cyanides-complex (pH ≥5)	5	50	10	1500
thiocyanates (sum)	1	20	-	1500
bromide (mg Br/l)	20	-	0.3 mg/l <sup>2</sup>	-
chloride (mg Cl/l)	-	-	100 mg/i <sup>2</sup>	-
fluoride (mg F/I)	500 <sup>3</sup>	-	0.5 mg/l <sup>2</sup>	-
III Aromatic compounds				
benzene	0.01	1	0.2	
ethyl benzene	0.03	50	4	150
toluene	0.01	130	7	1000
xylenes	0.1	25	0.2	70
styrene (vinyl benzene)	0.3	100	6	300
phenol	0.05	40	0.2	2000
cresols (sum)	0.05	5	0.2	200
catechol(o-dihydroxybenzene)	0.05	20	0.2	1250
resorcinol(m-dihydroxybenzene)	0.05	10	0.2	600
hydroquinone(p-dihydroxybenzene)	0,05	10	0.2	800
IV Polycyclic aromatic hydrocarbo	ns (PAH)			
PAH (sum 10) 4,14	1	40	•	-
naphthalene			0.01	70
anthracene			0.0007*	5
phenatrene			0.003*	5
fluoranthene			0.003	1
benzo(a)anthracene			0.0001*	0.5
chrysene			0.003*	0.2
benzo(a)pyrene			0.0005*	0.05
benzo(ghi)perylene			0.0003	0.05
benzo(k)fluoranthene			0.0004*	0.05
indeno(1,2,3-cd)pyrene		_	0.0004*	0.05

Table 1b(continued): Target values and intervention values for soil remediation soil/sediment and groundwater for inorganic compounds, aromatic compounds, PAH, chlorinated hydrocarbons, pesticides and other contaminants. Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	<b>EARTH/SEDIMEN</b>	Т	GROUNDWATER						
	(mg/kg dry matter	)	(μg/l in solution)						
1	target	intervention	target	intervention					
	value	value	value	value					
V Chlorinated hydrocarbons									
vinyl chloride	0.01	0.1	0.01	5					
dichloromethane	0.4	10	0.01	1000					
1,1-dichloroethane	0.02	15	7	900					
1,2-dichloroethane	0.02	4	7	400					
1,1-dichloroethene	0.1	0.3	0.01	10					
1,2-dichloroethene (cis and trans)??	0.2	1	0.01	20					
dichloropropane	0.002#	2	0.8	80					
trichloromethane (chloroform)	0.02	10	6	400					
1,1,1-trichloroethane	0.07	15	0.01	300					
1,1,2-trichloroethane	0.4	10	0.01	130					
trichloroethene (Tri)	0.1	60	24	500					
tetrachioromethane (Tetra)	0.4	1	0.01	10					
tetrachloroethene (Per)	0.002	4	0.01	40					
chlorobenzenes (sum) <sup>5,14</sup>	0.03	30	-	-					
monochlorobenzene			7	180					
dichlorobenzenes			3	50					
trichlorobenzeries			0.01	10					
tetrachlorobenzenes			0.01	2.5					
pentachlorobenzene			0.003	1					
hexachlorobenzene			0.00009*	0.5					
chlorophenols (sum) <sup>6,14</sup>	0.01	10	_	-					
monochlorophenois (sum)			0.3	100					
dichlorophenols			0.2	30					
trichlorophenols			0.03*	10					
tetrachlorophenols			0,01*	10					
pentachlorophenol			0.04*	3					
chloronaphthalene		10		6					
monochloroaniline	0.005	50		30					
polychlorobiphenyls (sum 7)	0.02	1	0.01*	0.01					
EOX	0.3		· ·						

Table 1b(continued): Target values and intervention values for soil remediation soil/sediment and groundwater for inorganic compounds, aromatic compounds, PAH, chlorinated hydrocarbons, pesticides and other contaminants. Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	EARTH/SEDIMEN	T	GROUNDWATER						
	(mg/kg dry matter)	)	(μg/l in solution)						
	target value	intervention value	target value	intervention value					
VI Pesticides									
DDT/DDE/DDD <sup>8</sup>	0.01	4	0.004 ng/i *	0.01					
drins <sup>9</sup>	0.005	4	-	0.1					
aldrin	0,00006		0,009 ng/l*						
dieldrin	0.0005		0.1 ng/l						
endrin	0.00004		0.04 ng/l						
HCH-compounds <sup>10</sup>	0.01/	2	0.05	1					
α-НСН	0.003		33 ng/l						
β-HCH	. 0.009		8 ng/l						
γ-HCH	0.00005		9 ng/l						
atrazine	0.0002	6	29 ng/l	150					
carbaryl	0.00003	5	2 ng/i*	50					
carbofuran	0.00002	2	9 ng/l	100					
chlorodane	0.00003	4	0.02 ng/l*	0.2					
endosulfan	0.00001	4	0.2 ng/i*	5					
heptachloro	0,0007	4	0.005 ng/l*	0.3					
heptachloro-epoxide	0.0000002	4	0.005 ng/l*	3					
maneb	0.002	35	0.05 ng/i*	0.1					
MCPA	0.00005#	4	0.02	50					
organotin compounds11	0.001	2.5	0.05*-16 ng/l	0.7					
VII Other contaminants									
cyclohexanone	0.1	45	0.5	15000					
phthalates (sum)12	0.1	60	0.5	5					
mineral oil <sup>13</sup>	50	5000	50	600					
pyridine	0.1	0.5	0.5	30					
tetrahydrofuran	0.1	2	0.5	300					
tetrahydrothiophene	0.1	90	0.5	5000					
tribromomethane	-	75	-	630					

Notes to table 1:

- Acidity: pH (0.01 M CaCl<sub>2</sub>). In order to determine whether pH is greater than or equal to 5, or less than 5, the 90 percentile of the measured values is taken.
- 2. In areas subject to marine influence higher values occur naturally (salt and brackish water).
- Differentiation by clay content: (F) = 175 = 13L (L = % clay).
- 4. PAH (sum of 10) here means the total of anthracene, benzo(a)anthracene, benzo(k)fluoroanthene, benzo(a)pyrene, chrysene, phenantrene, fluoroanthene, indeno(1,2,3-cd)pyrene, naphthalene and benzo(ghi)perylene.
- 'Chlorobenzenes (sum)' here means the total of all chlorobenzenes (mono-, di-, tri-, tetra-, penta- and hexachlorobenzene).
- 'Chlorophenols (sum)' here means the total of all chlorophenols (mono-, di-, trī-, tetra- and pentachlorophenol).
- In the case of the intervention value, 'polychlorobiphenyls (sum)' means the total of PCB 28, 52, 101, 118, 138, 153 and 180. For the target value it refers to the total excluding PCB 118.

- 8. 'DDT/DDD/DDE' above means the sum of DDT, DDD and DDE.
- 'Drins' above means the sum of aldrin, dieldrin and endrin.
- 10. 'HCH compounds' above means the sum of á-HCH, â-HCH, ā-HCH and ā-HCH.
- 11. The intervention value applies to the sum of the concentrations of organotin compounds encountered.
- 12. 'Phthalates (sum)' above means the total of all phthalates,
- 13. 'Mineral oil' is defined in the analysis standard. Where the contamination is due to mixtures (e.g. gasoline or domestic heating oil), then not only the alkane content but also the content of aromatic and/or polycyclic aromatic hydrocarbons must be determined. This aggregate parameter has been adopted for practical reasons. Further toxicological and chemical disaggregation is under study.
- 14. The values for the sum of polycyclic aromatic hydrocarbons, the sum of chlorophenols and the sum of chlorobenzenes in earth/sedlment apply to the total concentration of the compounds belonging to the relevant category. If the contamination is due to only one compound of a category, the value used is the value for that compound. Where there are two or more compounds the value for the total of these compounds applies, etc. For earth/sediment, effects are directly additive (i.e. 1 mg of substance A has the same effect as 1 mg of substance B) and can be tested against an aggregate standard by summing the concentrations of the substances involved. In the case of groundwater, effects are indirectly additive and are expressed as a fraction of the individual intervention values (i.e. 0.5 of the intervention value of substance A has the same effect as 0.5 of the intervention value of substance B). This means that an addition formula must be used to determine whether an intervention value is exceeded. The intervention value for the sum of a group of substances is exceeded if:

 $\{ \dot{o}(\dot{q})/l_i \geq 1,$ 

where:  $C_i$  = measured concentration of a substance in the group of substances in question  $l_i$  = intervention value for the group.

\*numeric value below the detection level/quantification level or measurement method is lacking
# These target values have not been tested in HANS. All the other values have been tested in HANS.
^ The individual standards in INS are given in the Fourth Policy Document on Water Management along with the sum standards marked ^.

Table 2a: Target values, indicative levels for serious soil contamination and background concentrations soil/sediment and groundwater for metals. Values for soil/sediment have been expressed as the concentration in a standard soil (10% organic matter and 25% clay).

	EARTH/SEDI (mg/kg dry m			GROUNDWATER (µg/l in solution)								
	concentratio n	target values	indicative level serious contaminat-	target values shallow	national background concentratio n deep	values deep	indicative level serious contaminat-					
	(BC)	(incl. BC)	ion		(BC)	(incl. BC)	ion					
l Metals												
beryllium	1.1	1.1	30	-	0.05*	0.05*	15					
selenium	0.7	0.7	100	-	0.02	0.07	160					
tellurium	-	-	600	-	_	-	70					
thallium	1	1	15	-	<2*	2*	7					
tin	19	-	900	-	<2*	2.2*	50					
vanadium	42	42	250	-	1.2	1.2	70					
silver	-	-	15	-	**	-	40					

Appendix D

Analytical Results of Soil Samples

Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Land Contamination Assessment for Area A

Soil Samples : Boreholes A-S01 to A-S05

Here is a second of the second														Drillhole No.									
	Reporting Limit		Risk-Based Re	mediation Goals	s (RBRGs) for Soi	l.	A-S01				A-S02			A-S03			A-S04		A-S05				
Chemical		Urban	Rural			Soil Saturation	Sam	pling Date and Dep	oth (m)	Sam	pling Date and Dept	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	oth (m)		
		Residential	Residential	Industrial	Public Park	Limit (C <sub>sat</sub> )	14-Dec-09	14-Dec-09	15-Dec-09	18-Dec-09	18-Dec-09	18-Dec-09	22-Dec-09	22-Dec-09	23-Dec-09	15-Dec-09	15-Dec-09	15-Dec-09	17-Dec-09	17-Dec-09	17-Dec-09		
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95		
SVOCs	7 05	0.510	Andrew State of						<del></del>														
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83	ļ	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
lexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
ndeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
henanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
henol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
yrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Metals																							
Intimony	0.05	29.5	29.1	261	97.9		0.28	0.72	0.81	<0.05	<0.05	<0.05	0.36	0.89	0.62	0.46	0.41	0.29	0.25	0.42	0.19		
rsenic	0.5	22.1	21.8	196	73.5		4.3	22.2	24.0	1.0	0.8	8.4	5.4	26.8	17.0	11.0	7.0	16.0	7.9	9.0	6.3		
larium	0.05	10,000	10,000	10,000	10,000		28.7	55.0	67.1	<0.05	<0.05	<0.05	46.7	77.3	57.8	51.5	45.8	43.1	26.3	47.7	22.0		
admium	0.02	73.8	72.8	653	245		0.11	0.11	0.21	<0.02	0.02	0.4	0.05	0.18	0.12	0.07	0.06	0.04	0.07	0.13	0.06		
thromium III	0.5	10,000	10,000	10,000	10,000		13.9	42.4	43.9	<0.5	<0.5	27.0	16.5	33.1	41.3	25.6	23.7	28.0	17.0	21.0	13.0		
thromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
obalt	0.5	1,480	1,460	10,000	4,900		3.6	14.5	13.7	<0.5	<0.5	<0.5	2.8	9.3	13.7	5.0	5.6	3.6	2,1	6.2	6.6		
copper	0.05	2,950	2,910	10,000	9,790		9.93	21.2	22.9	1.93	3.35	38.4	11.1	40.3	21.8	10.8	11.5	10.6	7.09	18.5	22.2		
ead	0.05	258	255	2,290	857		24.8	50.9	62.1	4	4	62	25.8	57.3	53.6	25.8	27.0	32.1	23.1	31.7	13.5		
langanese	0.5	10,000	10,000	10,000	10,000		136	446	693	<0.5	<0.5	<0.5	118	617	1250	201	164	92.0	46,4	123	44.9		
lercury	0.02	11.0	6.52	38.4	45.6		0.02	0.08	0.11	<0.02	<0.02	0.10	0.06	0.06	0.09	0.06	0.05	0.03	0.06	0.06	0.05		
lolybdenum	0.05	369	364	3,260	1,220		0.74	3.61	2.31	<0.05	<0.05	<0.05	1.10	1.93	1.95	1.62	2.48	2.47	1.40	1.59	0.91		
lickel	0.05	1,480	1,460	10,000	4,900		7.27	25.1	20.8	2	3	20	5.72	18.9	23.5	9.34	10.7	10.4	4.87	10,1	10.4		
in	0.05	10,000	10,000	10,000	10,000		1.66	4.57	4.8	<0.05	<0.05	<0.05	2.65	7.87	4.97	2.37	2.41	2.25	2.07	3.00	1.58		
inc	1	10,000	10,000	10,000	10,000		392	358	106	39	17.4	1980	45.2	148	95.5	45.1	52.3	520	74.3	106	85.7		
ioxins / PCBs							CIONETTO VIAIN								USE ULLEVA					una lineas			
ioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		6.73	10.99	14.32	5.84	6.40	10.37	8.17	15.05	13.57	6.77	9.34	9.21	7.35	8.64	6.69		
CBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10		
ther Inorganic Compounds									·														
yanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
hlorinated Pesticides																							
pha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
eta-BHC	0.05			174			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
amma-BHC	0.05			4 ***			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
elta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
p'-DDD	0.05			2 ***			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
p'-DDT	0.2			100			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.2	<0.2		
otal Organic Carbon							-U.Z	-0.2	-0.2	-0,2	-0.2	70.2	VU.2	-0.2	VU.2	<b>~0.2</b>	<b>-0.2</b>	VU.2	<b>VU.Z</b>	\U.Z	\U.Z		
OC Carbon	0.05%			Not Applicable		Transfer to the second	<0.05	0.68	1.11	<0.05	<0.05	0.39	0,14	0.57	0.75	0.24	0.62	0.66	0.00	0.00	0.00		
rain Size	0.0070			itot Applicable			~U.U3	0.00	1,11	\U.U5	\U.U5	0.39	0.14	0.57	0.75	0.34	0.62	0.66	0.20	0.63	0.39		
lay (%)	1%		- marina marina mana				21	17	47	. 1	2	20	22	20		00					DATE DESCRIPTION OF THE		
It (%)	1%								~	3	2	39	23	29	58	20	21	28	29	25	13		
n (%) and (%)	1%			Not Applicable		-	24	15	49	2	3	58	28	57	41	29	34	55	25	31	11		
anu (70)							43 12	49 19	4	69	68	3	38	14	1	39	42	15	43	38	59 17		
ravel (%)								19	0	26	27	0	11		0		3			6			
ravel (%)	1%							10						<u> </u>		12			3		1/		

<sup>\* 1</sup> pg/g = 0.000001 mg/kg

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i.e. the column of "I-TEF" in the laboratory reports) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in the laboratory report))" or \( \sum\_{\column} \iff(LOR x \cdot I-TEF) \) The reporting limits of each dioxin/furan compound could be found in the laboratory report (i.e. the column of "LOR" in the laboratory report).

Result exceed the RBRG of "Rural & Urban Residential"

The total I-TEQ was computed by "Summation of (Concentration of each dioxin/furan compound (i.e. the column of "Conc" in laboratory report))" or \( \sum\_{\cup(Conc} \times \text{I-TEF}\) \)

The footnote explanation "I-TEQ(LOR) calculated treating <LOR as LOR concentration (pg/g)" in the laboratory report means if the computation of "I-TEQ3" however, multiplication of the I-TEQ3. However, multiplication of the I-TEQ3. However, multiplication of the I-TEQ3.

<sup>\*\*</sup> Assessment Criteria extracted from "Intervention Value for Soil Remediation, Netherlands"

Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Land Contamination Assessment for Area A

Soil Samples : Boreholes A-S06 to A-S010

														Drillhole No.		v						
	Reporting Limit		Risk-Based R	emediation Goal	s (RBRGs) for Soil	1		A-S06			A-S07			A-S08			A-S09		A-S10			
Chemical		Urban	Rural	F	T	Soil Saturation	Sam	pling Date and Dep	oth (m)	Samp	oling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	
		Residential	Residential	Industrial	Public Park	Limit (C <sub>sat</sub> )	23-Dec-09	23-Dec-09	23-Dec-09	11-Dec-09	11-Dec-09	11-Dec-09	19-Dec-09	19-Dec-09	19-Dec-09	21-Dec-09	21-Dec-09	22-Dec-09	21-Dec-09	21-Dec-09	21-Dec-09	
verseve allegation and a second	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	
VOCs																		1				
cenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
cenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(a)pyrene	0.5 0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Benzo(b)fluoranthene		9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
lenzo(g,h,i)perylene lenzo(k)fluoranthene	0.5 0.5	1,800	1,710 114	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	918 91.8	383 94.2		<0.5 <2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	0.5	871	919		*			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	5.8	<0.5	<2.0	<2.0	<2.0	<2.0	
Chrysene Dibenzo(a,h)anthracene	0.5	1.20	1.14	1,140 9,18	1,540 3.83		<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5	<0.5 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluoranthene	0.5	2,400	2,270	10,000	7,620						<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
luorene	0.5	2,400	2,270	10,000	7,620	54.7	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5	<0.5 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
lexachlorobenzene	0.05	0.243	0.220	0.582	0.713	34./	<0.05	<0.5	<0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	<0.5 <0.05	
ndeno(1,2,3-cd)pyrene	0.05	12.0	11.4	91.8	38.3		<0.5	<0.05	<0.05	<0.5	<0.05	<0.5	<0.05	<0.05	<0.05	<0.05 <0.5	<0.5	1			1	
laphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	
Phenanthrene	0.5	10.000	10.000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5 <0.5	<0.5	
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5	<0.5	<0.5 <0.5	<0.5	<0.5	
Pyrene	0.5	1,800	1,710	10,000	5,720	7,200	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5	<0.5	
letals						- 1000 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 -	10.0		10.0	70.5	40.5		10.5	VO.5	1 40.5	<b>VO.3</b>	<b>~0.3</b>	70.5	<b>VO.3</b>	10,5	<b>-0.5</b>	
ntimony	0.05	29.5	29.1	261	97.9		0.15	0.14	1.41	0.06	0.33	0.36	0.28	0.49	0.50	2.46	0.76	0.54	0.36	0.18	0.19	
rsenic	0.5	22.1	21.8	196	73.5		0.7	0.9	14.0	<0.5	7.0	13.4	7.0	9,1	9.2	19.7	18.9	9.3	15.4	3.0	3.0	
arium	0.05	10,000	10,000	10,000	10,000		12.5	9.16	132	6.06	22.3	52.2	36.3	71.4	42.6	163	68.0	58.6	34.1	13.0	9.71	
admium	0.02	73.8	72.8	653	245		<0.02	0.06	0.44	<0.02	0.05	0.04	0.35	0.04	0.11	0.67	0.11	0.03	0.11	0.03	0.02	
hromium III	0.5	10,000	10,000	10,000	10,000		1.7	3.3	53.0	1.7	15.3	28.0	21.2	26.9	28.0	76.0	38.9	34.8	23.0	5.4	7.2	
hromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
obalt	0.5	1,480	1,460	10,000	4,900		0.6	0.9	9.6	<0.5	4.1	5,4	6.6	8.6	9,8	12.9	9.5	5.7	9.5	1.8	1.5	
opper	0.05	2,950	2,910	10,000	9,790		1.93	7.96	108	2.20	14.4	23.9	11.2	24.1	14.6	142	22.1	15.0	11.6	5.99	4.37	
ead	0.05	258	255	2,290	857		4.92	5.94	61.3	4.49	22.2	43.2	38.0	32.1	32.8	86.1	104	47.8	39.4	9.89	8.54	
langanese	0.5	10,000	10,000	10,000	10,000		22.5	22.3	311	7.9	79.1	122	156	221	178	340	160	118	386	56.9	61.9	
lercury	0.02	11.0	6.52	38.4	45.6		<0.02	<0.02	0.23	<0.02	0.02	0.04	0.07	0.04	0.03	0.25	0.05	0.10	0.04	0.02	<0.02	
lolybdenum	0.05	369	364	3,260	1,220		0.10	0.17	2.15	0.24	0.92	3.61	1.48	2.76	2.69	3.11	3.34	2.48	1.18	0.31	0.35	
ickel	0.05	1,480	1,460	10,000	4,900		1.05	2.74	36.0	0.90	6.81	12.5	9.78	13.4	16.2	43.8	16.3	13.9	11.4	3.11	2.52	
in	0.05	10,000	10,000	10,000	10,000		0.43	0.68	6.68	0.28	1.58	3.4	2.51	2.99	2.30	10.4	4.73	4.68	2.83	0.98	0.84	
inc	1	10,000	10,000	10,000	10,000		10.1	21.7	342	49.8	473	826	167	120	443	578	170	62.5	116	44.2	97.4	
ioxins / PCBs																						
ioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		6.55	8.42	5.51	7.79	5.96	11.84	10.82	9.41	7.67	23.65	11.48	12.41	10.68	6.26	5.87	
CBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
ther Inorganic Compounds	7																					
yanide, free	1 1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
hlorinated Pesticides						XX-11 A DATE OF THE STATE OF TH																
pha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
eta-BHC	0.05			4 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
amma-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
elta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
p'-DDD	0.05			2 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
otal Organic Carbon	1	E EWIN 198								-		No. of the last										
OC .	0.05%			Not Applicable			<0.05	0.12	0.76	<0.05	0.07	1.33	0.42	0.59	0.72	1.99	1.19	1.04	0.61	0.06	0.06	
rain Size	T										- 1											
ay (%)	1%						2	3	18	2	22	34	26	13	39	50	41	40	19	5	15	
lt (%)	1%			Not Applicable			1	3	22	3	33	28	30	44	54	49	51	56	37	6	13	
and (%)	1%			1247			87	87	56	71	36	33	38	30	6	1	5	4	40	80	65	
ravel (%)	1%						10	7	4	24	9	5	6	13	1	0	3	0	4	9	7	
ositure Content																						
pisture Content (%)	0.1%			Not Applicable			9.7	11.9	33.1	14.4	22.0	32.9	14.7	20.8	25.7	41.9	30.7	28.1	34.5	11.0	16.1	

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i.e. the column of "LOR" in the laboratory reports) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in the laboratory report))" or \( \sum\_{(LOR x I-TEF)} \) The reporting limits of each dioxin/furan compound could be found in the laboratory report (i.e. the column of "LOR" in the laboratory report).

The total I-TEQ was computed by "Summation of (Concentration of each dioxin/furan compound (i.e. the column of "I-TEF" in laboratory report.))" or \( \sum\_{CConc} \times I-TEF\) (i.e. the column of "I-TEF" in laboratory report.)\)" or \( \sum\_{CConc} \times I-TEF\) (i.e. the column of "I-TEF" in laboratory report.)\)" or \( \sum\_{CConc} \times I-TEF\)

The footnote explanation "I-TEQ(LOR) calculated treating <LOR as LOR concentration (pg/g)" in the laboratory report means if the concentration of the dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the respective dioxin/furan compound would be used for the computation of the I-TEQ3. However, multiplication of the LOR with their respective I-TEF is still required during the computation of "I-TEQ3"

<sup>\*\*</sup> Assessment Criteria extracted from "Intervention Value for Soil Remediation, Netherlands"

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A

Soil Samples : Boreholes A-S11 to A-S15

														Drillhole No.							
	Reporting Limit		Risk-Based Re	emediation Goal	s (RBRGs) for Soi		A-S11 A-S12							A-S13			A-S14		A-S15		
Chemical					* *		Sam	pling Date and Dep	th (m)	Sam	pling Date and Dept	h (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	oth (m)	Sam	pling Date and Dep	th (m)
Oncomban		Urban Residential	Rural Residential	Industrial	Public Park	Soil Saturation Limit (C <sub>sat</sub> )	10-Dec-09	10-Dec-09	10-Dec-09	10-Dec-09	10-Dec-09	10-Dec-09	21-Dec-09	21-Dec-09	21-Dec-09	07-Dec-09	07-Dec-09	07-Dec-09	09-Dec-09	09-Dec-09	09-Dec-09
SVOCs	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<del> </del>	<0.5
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5 <0.5
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5.740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713	941	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ndeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	0.5	1,800	1,710	10,000	5,720	7,250	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals					0,720									10.0		10.0		40.0	10.0		10.0
Antimony	0.05	29.5	29.1	261	97.9		1.01	0.31	0.26	0.32	0.43	0.64	0.38	0.38	0.36	0.13	0.48	0,75	0.26	1.81	0.47
Arsenic	0.5	22.1	21.8	196	73.5		9.9	8.3	5.5	8.7	6.3	13.0	16.2	9.3	8.1	1.3	14.7	16.5	7.4	7.0	20.0
Barium	0.05	10,000	10,000	10,000	10,000		48.6	45.0	41.2	48.5	33.1	67.1	34.5	33.2	47.6	15.8	48.20	57.80	27.8	53.2	52.8
Cadmium	0.02	73.8	72.8	653	245		0.08	0.06	<0.02	0.03	0.03	0.35	0.06	0.05	0.05	0.03	0.15	0.19	0.12	0.07	0.16
Chromium III	0.5	10,000	10,000	10,000	10,000		21.5	21.1	22.9	22.1	19.4	35.6	27.5	17.0	30.3	6.2	33.8	36.8	9.1	23.9	37.9
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		3.4	6.4	2.6	4.1	4.0	7.8	2.6	4.7	8.8	1.1	11.6	9.9	4.3	5.3	14.3
Copper	0.05	2,950	2,910	10,000	9,790		44.6	12.3	6.48	13.7	8.38	61.1	15.5	30.6	13.4	5.76	17.2	23.3	6.76	15.9	17.3
.ead	0.05	258	255	2,290	857		18.5	26.4	13.2	25.9	21.0	47.1	30.9	27.8	45.6	9.03	43.9	56.5	18.9	26.5	43.6
Manganese	0.5	10,000	10,000	10,000	10,000		141	161	106	111	106	113	134	131	178	33.9	427	142	175	214	231
Mercury	0.02	11.0	6.52	38.4	45.6		0.03	0.07	0.07	0.04	0.03	0.05	0.07	0.07	0.03	<0.02	0.04	0.08	<0.02	0.04	0.05
Molybdenum	0.05	369	364	3,260	1,220		1.21	0.89	1.15	2.97	2.20	4.50	1.88	1.34	2.76	0.31	2.75	4.78	1.03	1.43	1.89
lickel	0.05	1,480	1,460	10,000	4,900		7.46	11.0	7.86	9.50	9.07	18.2	5.75	7.26	16.2	1.89	19.1	18.8	5.47	11.3	22.6
in	0.05	10,000	10,000	10,000	10,000		4.60	2.30	2.44	2.51	1.74	4.74	2.98	2.67	3.89	0.58	3.11	4.32	1.45	2.56	3.52
inc	1	10,000	10,000	10,000	10,000		101	52.8	68.4	304	318	251	36.4	52.5	76.4	55.0	155	358	464	206	133
Dioxins / PCBs	Assessment of the					nna York Santa															A DESCRIPTION OF
Dioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		7.49	10.03	6.97	10.86	22.97	93.14	7.34	7.64	12.53	16.75	11.87	13.22	6.70	8.12	10.96
CBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Other Inorganic Compounds																					
yanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
hlorinated Pesticides																					
lpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
eta-BHC	0.05			4 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
amma-BHC	0.05			N. 17. (2.0)			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
elta-BHC	0.05				III-01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
,p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
,p'-DDD	0.05			2 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
,p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
otal Organic Carbon																					
ос	0.05%			Not Applicable			0.14	0.06	<0.05	0.23	0.50	0.99	0.31	0.35	0.77	0.06	0.98	1.93	0.13	0.22	1.38
irain Size																					
lay (%)	1%						14	37	28	21	23	21	31	24	39	3	30	35	3	13	24
ilt (%)	1%			Not Applicable			26	45	11	32	35	28	24	29	56	5	41	38	5	17	29
and (%)	1%			Not Applicable			46	14	60	41	39	45	37	33	5	84	29	7	84	60	44
ravel (%)	1%					and the state of t	14	4	1	6	3	6	8	14	0	8	0	0	8	10	3
lositure Content																					
loisture Content (%)	0.1%			Not Applicable			12.9	18.7	32.3	24.4	23.9	27.7	17.0	16,3	31.2	12.1	35.5	35.6	21.8	19.6	36.4

<sup>\* 1</sup> pg/g = 0.000001 mg/kg

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i.e. the column of "LOR" in the laboratory reports) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in the laboratory report))" or \( \sum\_{(LOR x I-TEF)} \) The reporting limits of each dioxin/furan compound could be found in the laboratory report (i.e. the column of "LOR" in the laboratory report).

The total I-TEQ was computed by "Summation of (Concentration of each dioxin/furan compound (i.e. the column of "Conc" in laboratory report ) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in laboratory report))" or \( \sum\_{CCOnc} \times I-TEF\)

The footnote explanation "I-TEQ(LOR) calculated treating <LOR as LOR concentration (pg/g)" in the laboratory report means if the concentration of the local during the computation of the local during the computation of the local during the computation of "I-TEQ3". However, multiplication of the LOR with their respective local during the computation of "I-TEQ3" in the laboratory report means if the concentration (pg/g)" in the laboratory report means if the concentration of the local during the computation of the I-TEQ3. However, multiplication of the LOR with their respective local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the computation of the local during the local during the computation of the local during

<sup>\*\*</sup> Assessment Criteria extracted from "Intervention Value for Soil Remediation, Netherlands"

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A

Soil Samples : Boreholes A-S16 to A-S20

														Drillhole No.							
			Risk-Based Re	mediation Goals	(RBRGs) for Soil	ti i		A-S16			A-S17			A-S18			A-S19			A-S20	
Chemical					,		Sam	pling Date and Dep	oth (m)	Samp	oling Date and Dept	h (m)	Samp	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)
	Reporting Limit	Urban Residential	Rural Residential	Industrial	Public Park	Soil Saturation Limit (C <sub>sat</sub> )	12-Dec-09	14-Dec-09	14-Dec-09	19-Dec-09	19-Dec-09	19-Dec-09	04-Dec-09	04-Dec-09	04-Dec-09	01-Dec-09	01-Dec-09	01-Dec-09	10-Dec-09	10-Dec-09	11-Dec-09
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95
VOCs														dadina kanalista							
cenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene Benzo(b)fluoranthene	0,5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	0.5	9.88 1,800	10.1 1,710	17.8 10,000	20.4 5,740	i .	<0.5 <0.5	<0.5	<0.5 <0.5	<0.5 <0.5	<0.5	<0.5 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	0.5	120	1,710	918	383		<0.5	<0.5 <0.5	<0.5	<0.5	<0.5 <0.5	<0.5	<0.5 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	7.4	<2.0	<2.0	<2.0	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0 <0.5	<2.0 <0.5	<2.0 <0.5	<2.0 <0.5	<2.0 <0.5	<2.0 <0.5	2.4 <0.5	<2.0 <0.5
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
luoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
luorene	0.5	2.380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
lexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ndeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
laphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
henanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
henol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
yrene	0.5	1,800	1,710	10,000	5,720	The state of the s	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
letals														A Committee of the		W-200					
ntimony	0.05	29.5	29.1	261	97.9		0.53	0.66	3.39	0.19	0.22	0.54	0.36	0.52	0.57	0.07	0.08	0.09	0.53	1.26	0.52
rsenic	0.5	22.1	21.8	196	73.5		18.4	1.3	8.4	1.4	8.3	19.0	8.7	18.6	14.2	1.1	2.0	2.5	13.9	23.0	20.1
arium	0.05	10,000	10,000	10,000	10,000		46.5	72.0	366	12.5	28.8	60.8	42.9	42.1	52.3	7.75	6.69	9.26	37.2	49.9	61.0
admium	0.02	73.8	72.8	653	245		0.16	0.25	2.52	0.04	0.08	0.12	0.03	<0.02	0.09	<0.02	<0.02	0.02	0.14	0.25	0.16
hromium III	0.5	10,000	10,000	10,000	10,000		32.3	64.3	64.7	5.1	17.7	39.9	20.5	32.6	30.2	2.5	2.9	5.1	24.9	67.5	39.7
hromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
obalt	0.5	1,480	1,460	10,000	4,900		10.7	3,6	15.5	2.7	6.3	14.6	3,7	3.7	7.4	0.5	0.8	1.3	6.6	13.9	13.8
opper	0.05	2,950	2,910	10,000	9,790		20.8	47.6	436	3.36	10.9	19.1	11.40	13.4	17.4	8.01	3.48	5.03	15.9	57.9	19.0
ead	0.05	258	255	2,290	857		48.3	17.4	90.0	8.01	25.4	53.9	28.1	35.0	36.2	5.45	28.4	6.82	33.9	67.3	59.9
anganese	0.5	10,000	10,000	10,000	10,000		458	154	474	43.6	186	251	94.7	77.4	154	15.4	19.7	51.6	370	494	325
ercury	0.02	11.0	6.52	38.4	45.6		0.06	0.05	0.25	<0.02	0.04	0.04	0.02	<0.02	0.05	<0.02	<0.02	<0.02	0.05	0.08	0.06
olybdenum	0.05	369	364	3,260	1,220	remain ann ann ann an ann an ann an ann an an	1.4	1.01	3.31	0.32	1.55	1.73	1.08	1.33	3.29	0.33	0.36	0.45	1.16	2.37	1.69
ickel	0.05	1,480	1,460	10,000	4,900		18.6	28.4	44.8	2.81	9.73	24	8.21	10.3	13.8	0.83	1.05	2.17	11.0	18.8	22.7
Π	0.05	10,000	10,000	10,000	10,000		3.59	5.28	44.3	0.40	1.59	4.90	2.27	2.84	3.99	0.43	0.31	0.43	2.51	6.79	4.39
nc	1	10,000	10,000	10,000	10,000		478	350	611	91.3	59.4	120	59.5	93.0	249	21.4	36.0	315	70.7	278	151
ioxins / PCBs	504	0.004							r en												
oxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		24.91	6.37	19.19	5.56	7.48	11.75	8.29	25.13	9.76	6.97	6.42	6.04	8.02	20.19	13.43
CBs ther Inorganic Compounds	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
yanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1								
hlorinated Pesticides		1,480	1,460	10,000	4,900			<1 	<u> </u>	<1	<u> </u>	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
pha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	40.05	<0.05	40.0F	40.05	+0.05	10.05
ta-BHC	0.05					-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05 <0.05	<0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05
imma-BHC	0.05			4 ***		-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05		<u> </u>
lta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05 <0.05
p'-DDE	0.05				15-2010 - 10-3101		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05 <0.05	<0.05 <0.05	<0.05
p'-DDD	0.05			2 **		-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p'-DDT	0.2			88.77			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.2	<0.2	<0.05	<0.2	<0.05
otal Organic Carbon									-5.2		-0,2	-0.2	70,2	70.2	CONTRACTOR OF THE PARTY OF	70,2	WALLES THE PARTY OF THE PARTY O	70.2	-0.2	THE REPORT OF THE PERSON	-0.2
oc	0.05%			Not Applicable			0.76	0.25	1.79	<0.05	0.40	0.94	0.16	<0.05	0,83	<0.05	<0.05	<0.05	1.12	0.66	0.94
rain Size										-0.00	أحدد الأثار والا	0.04	0.10	-0.00	0,00	10,00	10.05	-0.03		0.00	0.54
ay (%)	1%						35	16	43	4	34	50	31	32	34	1	1	6	26	40	45
It (%)	1%			220002000000000000000000000000000000000			28	19	52	5	33	46	41	35	43	4	2	9	58	49	48
and (%)	1%			Not Applicable		1	34	62	5	62	32	4	26	30	18	82	82	75	16	11	7
avel (%)	1%					-	3	3	0	29	1	0	20	3	5	13	15	10	0	0	0
ositure Content																أحجي أيسي			PROGRAM WINDSHIP	AND DESCRIPTION OF THE	STEEL STREET
	0.1%			Not Applicable			41.3	18.0	34.0	17.5	21.3	39.5	13.1	19.2	21.0	5.1	8.1	14.2			33,4

<sup>\* 1</sup> pg/g = 0.000001 mg/kg

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i.e. the column of "LOR" in the laboratory reports) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in the laboratory report))" or \( \sum\_{(LOR \times I-TEF)} \) The reporting limits of each dioxin/furan compound could be found in the laboratory report (i.e. the column of "LOR" in the laboratory report).

The total I-TEQ was computed by "Summation of (Concentration of each dioxin/furan compound (i.e. the column of "I-TEF" in laboratory report))" or \( \sum\_{\text{Conc}} \text{Conc} \text{x I-TEF} \)

The foreign to constant of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the laboratory report of the column of "I-TEF" in laboratory report) in the laboratory report of the labor

22.2 Result exceed the RBRG of "Rural & Urban Residential"

The footnote explanation "I-TEQ(LOR) calculated treating <LOR as LOR concentration (pg/g)" in the laboratory report means if the computation of the dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting Limit (L

<sup>\*\*</sup> Assessment Criteria extracted from "Intervention Value for Soil Remediation, Netherlands"

Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Land Contamination Assessment for Area A

Soil Samples : Boreholes A-S21 to A-S25

			Dist. D.	and all all										Drillhole No.		Ť	75/07/2005			Same as	
			Risk-Based Re	mediation Goals	s (RBRGs) for Soi	L		A-S21			A-S22	**************************************		A-S23		1000	A-S24			A-S25	
Chemical	Reporting	Urban	Rural			Soil Saturation	Sam	pling Date and Dep		Sam	oling Date and Dep	h (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)
	Limit	Residential	Residential	Industrial	Public Park	Limit (C <sub>sat</sub> )	27-Nov-09	27-Nov-09	28-Nov-09	25-Nov-09	25-Nov-09	25-Nov-09	26-Nov-09	27-Nov-09	27-Nov-09	01-Dec-09	01-Dec-09	01-Dec-09	07-Dec-09	08-Dec-09	08-Dec-09
SVOCs	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	40 E	10.5	105	-0.5	10.5	-0.5									particular production
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	60.2 19.8	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3	2,30	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20,4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	2.4	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ndeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals			Santana Har				NAMES OF TAXABLE														
Antimony	0.05	29.5	29.1	261	97.9		0.74	0.16	1.44	0.29	0.64	0.46	0.12	80.0	0.12	0.45	1.12	0.18	0.16	0.54	0.33
Arsenic	0.5	22.1	21.8	196	73.5		16.3	3.1	8.1	5.9	16.3	19.3	2.6	1.1	1.4	17.9	27.7	8.4	2.2	14.4	14.8
Barium	0.05	10,000	10,000	10,000	10,000		47.2	9.30	58.4	44.0	74.4	58.7	15.8	22.6	21.2	63.6	72.0	29.8	8.5	51.2	36.8
Cadmium	0.02	73.8	72.8	653	245		0.20	0.04	0.09	0.04	0.17	0.14	0.03	0.03	0.04	0.16	0.22	0.07	0.06	0.18	0.08
Chromium III	0.5	10,000	10,000	10,000	10,000		27.5	4.4	23.2	18.1	40.4	34.7	9.1	12.5	20.2	40.8	58.4	14.3	5.5	33.9	23.0
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		8.4	1.3	5,5	3.8	12.5	12.0	2.5	2.7	3.2	12.5	15.3	5.1	1.9	10.5	7.7
Copper	0.05 0.05	2,950	2,910	10,000	9,790		16.4	6.51	24.2	9.00	18.0	14.8	4.36	12.4	18.2	18.0	29.4	7.00	3.16	23.6	11.4
.ead	0.05	258 10,000	255	2,290	857		45.6	10.2	31,0	25.4	55.2	45.9	9.07	6.63	7.50	50.6	71.8	23.0	12.2	47.6	37.5
Manganese Mercury	0.02	11.0	10,000 6.52	10,000	10,000		703	38.3	189	111	462	267	69.8	73.6	100	396	658	172	39.7	360	232
Molybdenum	0.02	369	364	38.4 3,260	45.6		0.07	<0.02	0.05	0.05	0.04	0.04	<0.02	<0.02	<0.02	0.03	0.12	<0.02	<0.02	0.05	0.04
lickel	0.05	1,480	1,460	10,000	1,220 4,900		1.33 15.7	0.41 1.52	1.70	1.29	2.53	1.81	0.56	1,50	2.58	1.98	2.09	0.81	0.46	2.02	1.01
in	0.05	10,000	10,000	10,000	10,000		3.43	0.55	10.3 3.63	7.74 2.82	20.6 4.39	19.4 3.65	3.58 0.61	3.81	5.25	20.8	27.4	7.35	3.44	18.6	12.2
inc	1	10,000	10,000	10,000	10,000		79.7	27.0	114	45.0	100	410		0.75	0.89	3.88	5.66	1.43	0.43	3.58	2.96
Dioxins / PCBs		10,000	70,000	10,000	10,000		79.7	27.0		45.0	100	410	25.1	55.9	220	246	479	742	37.8	386	1870
Dioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		9.37	7.58	9.29	9.40	15.23	16.64	7.81	8.27	6.13	26.05	22.72	15.73	9.56	8,89	17,28
CBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Other Inorganic Compounds	The state of the s			NEW THE REAL PROPERTY.					10:10	10.10	40.10	40.10	40.10	V0.10	<b>~0.10</b>	V0.10	V0.10	<b>40.10</b>	V0,10	<b>~0.10</b>	V0.10
yanide, free	1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
hlorinated Pesticides										THE WEST WAS TO SERVE											
lpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
eta-BHC	0.05			4 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
amma-BHC	0.05			4			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
elta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
,p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p'-DDD	0.05			2 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
otal Organic Carbon																				Anna Maria	
ос	0.05%			Not Applicable			0.64	0.10	0.43	0.28	1.04	1.47	<0.05	<0.05	<0.05	1.03	0.94	0.64	<0.05	0.99	0.64
rain Size																		Lista, Alfand			
lay (%)	1%						9	7	7	21	51	49	21	3	3	29	49	8	5	44	41
ilt (%)	1%			Not Applicable			6	6	7	26	48	44	21	4	5	51	43	10	7	48	37
and (%)	1%						66	67	57	32	1	7	37	76	78	20	8	80	70	7	22
ravel (%)	1%						19	20	29	21	0	0	21	17	14	0	0	2	18	1	0
ositure Content																					
oisture Content (%)	0.1%			Not Applicable			253	16,1	18.4	19.1	44.4	36.2	10.1	9.2	12.1	44.2	39.7	26.3	9.0	35.6	31.5

<sup>\* 1</sup> pg/g = 0.000001 mg/kg

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i.e. the column of "I-TEF" in the laboratory reports) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in the laboratory report)" or \( \sum\_{\column} \iff(LOR x \cdot I-TEF\) The reporting limits of each dioxin/furan compound could be found in the laboratory report (i.e. the column of "LOR" in the laboratory report).

The total I-TEQ was computed by "Summation of (Concentration of each dioxin/furan compound (i.e. the column of "Conc" in laboratory report))" or \(\sum\_{CConc} \times \text{I-TEF}\) in laboratory report) or \(\sum\_{CConc} \times \text{I-TEF}\)

The footnote explanation "I-TEQ(LOR) calculated treating <LOR as LOR concentration (pg/g)" in the laboratory report means if the concentration of the dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the respective dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the I-TEQ3.

22.2 Result exceed the RBRG of "Rural & Urban Residential"

<sup>\*\*</sup> Assessment Criteria extracted from "Intervention Value for Soil Remediation, Netherlands"

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A

Soil Samples : Boreholes A-SG01 to A-SG05

					TIA TOTAL									Drillhole No.							
			Risk-Based Re	mediation Goals	s (RBRGs) for Soil			A-SG01			A-SG02			A-SG03			A-SG04			A-SG05	
Chemical							Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	h (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Samp	oling Date and Dep	th (m)
	Reporting Limit	Urban Residential	Rural Residential	Industrial	Public Park	Soil Saturation Limit (C <sub>sat</sub> )	10-Dec-09	11-Dec-09	11-Dec-09	21-Dec-09	21-Dec-09	21-Dec-09	22-Dec-09	22-Dec-09	22-Dec-09	11-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95
SVOCs										March Commission Commi											
Acenaphthene	0.5	3,510 2,340	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene Anthracene	0.5	10,000	1,510 10,000	10,000 10,000	10,000 2.56	19.8 2.56	<0.5	<0.5 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3	2.50	<0.5 <0.5	<0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<0.5	<0.5	<2.0	<2.0	<2.0	3.6	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ndeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	0.5	1,800	1,710	10,000	5,720		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	0.05	20.5	20.4	204	07.0										HE EGENERAL				TAXABLE SERVICES		
Antimony Arsenic	0.05	29.5 22.1	29.1 21.8	261 196	97.9 73.5		0.39	0.4	0.29	0.08	0.08	0.10	1.21	0.73	0.12	0.50	0.39	0.15	0.45	0.33	0.62
Barium	0.05	10,000	10,000	10,000	10,000		10.7 55.8	8.8 39.5	10.7 52.1	1.3 6.08	1.9	1.9	16.8	16.2 59.7	3.2	8,9	14.1	4.4	5.2	6.2	12.4
Cadmium	0.02	73.8	72.8	653	245		0.29	0.08	0.02	<0.02	6.50 <0.02	8.11 <0.02	117 0.64	0,10	7.31	56.2 0.07	47.8 0.08	12.4	33.8 0.09	37.2 0.04	43.1 0.12
Chromium III	0.5	10,000	10,000	10,000	10,000		30.0	19.1	21.7	2.2	2.1	4.2	61.8	39.5	3.9	27.9	28.8	11.4	12.0	15.3	22.3
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		9.0	4.1	4.7	0.7	0.8	0.9	12.4	13.0	1.6	4.1	7.4	1.1	4.4	4.2	15.9
Copper	0.05	2,950	2,910	10,000	9,790		17.3	17.1	11.2	1.27	1.34	2.99	87.4	22.8	1.71	19.6	13.5	5.12	39.7	16.4	30.4
ead	0.05	258	255	2,290	857		83.4	29.4	30.0	3.93	4.81	6.36	76.3	56.1	6.60	25.4	39.0	18.7	16.5	21.9	29.6
Manganese	0.5	10,000	10,000	10,000	10,000		167	112	73.3	19.0	17.5	25.9	552	283	31.5	220	105	28.1	128	127	469
Mercury	0.02	11.0	6.52	38.4	45.6		0.06	0.04	0.04	0.02	<0.02	0.04	0.17	0.06	<0.02	0.20	0.05	<0.02	<0.02	0.06	0.03
Molybdenum	0.05	369	364	3,260	1,220		2.28	1.80	2.28	0.15	0.25	0.26	2.75	2.16	0.41	1.36	3.84	2.96	1.24	1.57	1.65
lickel	0.05	1,480	1,460	10,000	4,900		14.1	7.94	10.3	1.19	1.24	2.87	34.4	23.3	1.92	6.36	18.0	3.68	7.67	7.93	17.7
in	0.05	10,000	10,000	10,000	10,000		3.27	2.4	2.64	0.39	0.42	0.66	8.60	5.71	0.65	3.04	3.19	0.88	2.02	2.30	2.36
linc	1 1	10,000	10,000	10,000	10,000		129	57.4	252	20.7	15.5	59.0	322	135	29.7	78.5	167	113	265	258	685
Dioxins / PCBs																					
Dioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		27.93	29.27	24.45	5.85	6.73	5.64	11.05	13.28	5.72	21.97	24.40	7.56	7.29	39.47	13.54
CBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Other Inorganic Compound	IS 1	4 400	4 444																		
Cyanide, free	- Land Community	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
lpha-BHC	0.05				ARTIVARIES III RANGOLE		<0.05	<0.0F	<0.0F	40.0E	×0.05	×0.05	40.05	*0.05	40.05	40.05	*0.05	10.05	40.05	10.05	10.05
eta-BHC	0.05					-	<0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05
amma-BHC	0.05			4 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
elta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p'-DDE	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p'-DDD	0.05			2 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
,p'-DDT	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
otal Organic Carbon																					
ос	0.05%			Not Applicable			0.32	0.45	0.50	<0.05	<0.05	<0.05	1.13	0.99	0.13	0.58	0.77	0.41	0.26	0.28	2.75
Irain Size																					
lay (%)	1%						34	19	21	2	2	11	44	46	36	21	36	20	18	19	13
ilt (%)	1%			Not Applicable			44	24	22	2	2	8	45	51	29	38	48	23	25	18	22
and (%)	1%			эт гършовые			21	50	46	75	80	69	1	3	33	30	14	55	53	58	51
ravel (%)	1%						1	7	11	21	16	12	0	0	2	11	2	2	4	5	14
lositure Content																					
loisture Content (%)	0.1%			Not Applicable			18.9	16.1	16.2	11.2	14.2	10.2	36.0	38.7	10.9	13.6	21.2	17.4	19.6	21.1	39.1

<sup>\* 1</sup> pg/g = 0.000001 mg/kg

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i.e. the column of "LOR" in the laboratory reports) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in the laboratory report))" or \( \sum\_{(LOR \times I-TEF)} \)
The reporting limits of each dioxin/furan compound could be found in the laboratory report (i.e. the column of "LOR" in the laboratory report).

The total I-TEQ was computed by "Summation of (Concentration of each dioxin/furan compound (i.e. the column of "Conc" in laboratory report))" or \(\sum\_{Conc} x \cdot I-TEF\)

The footnote explanation "I-TEQ(LOR) calculated treating <LOR as LOR concentration (pg/g)" in the laboratory report means if the concentration of the dioxin/furan compounds was below the respective dioxin/furan compound would be used for the computation of the I-TEQ. However, multiplication of the LOR with their respective I-TEF is still required during the computation of "I-TEQ."

<sup>\*\*</sup> Assessment Criteria extracted from "Intervention Value for Soil Remediation, Netherlands"

Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Land Contamination Assessment for Area A

Soil Samples : Boreholes A-SG06 to A-SG10

														Drillhole No.							
			Risk-Based Re	mediation Goals	s (RBRGs) for Soi	I,		A-SG06			A-SG07			A-SG08			A-SG09			A-SG10	
Chemical							Sam	pling Date and Dep	th (m)	Sam	pling Date and Dept	h (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	oth (m)	Sam	pling Date and Dep	th (m)
	Reporting Limit	Urban Residential	Rural Residential	Industrial	Public Park	Soil Saturation Limit (C <sub>sat</sub> )	19-Dec-09	19-Dec-09	21-Dec-09	07-Dec-09	07-Dec-09	07-Dec-09	05-Dec-09	05-Dec-09	07-Dec-09	28-Nov-09	28-Nov-09	28-Nov-09	09-Dec-09	09-Dec-09	09-Dec-09
SVOCs	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95
Acenaphthene	0.5	3,510	3,280	10,000	10,000	60.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	0.5	2,340	1,510	10,000	10,000	19.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	0.5	10,000	10,000	10,000	2.56	2.56	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	0.5	9.88	10.1	17.8	20.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	0.5	1,800	1,710	10,000	5,740		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	0.5	120	114	918	383		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis-(2-Ethylhexyl)phthalate	2.0	30.0	28.0	91.8	94.2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chrysene	0.5	871	919	1,140	1,540		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo(a,h)anthracene	0.5	1.20	1.14	9.18	3.83		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	0.5	2,400	2,270	10,000	7,620		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	0.5	2,380	2,250	10,000	7,450	54.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	0.05	0.243	0.220	0.582	0.713		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ndeno(1,2,3-cd)pyrene	0.5	12.0	11.4	91.8	38.3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	0.5	182	85.6	453	914	125	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0,5	<0.5	<0.5
Phenanthrene	0.5	10,000	10,000	10,000	10,000	28.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenol	0.5	10,000	10,000	10,000	10,000	7,260	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene Metals	0.5	1,800	1,710	10,000	5,720	AND RECEIPTION OF THE RESIDENCE	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Antimony	0.05	29.5	29.1	261	97.9		0.09	0.30	0.40	0.67	0.34	0,24	0.15	0.21	0.68	0.39	0.42	0.77	0.29	0.39	0.79
Arsenic	0.5	29.5	21.8	196	73.5				19.5	6.6						9.7		-			SATURATION AND ADDRESS OF THE PARTY OF THE P
Barium	0.05	10,000	10,000	10,000	10,000		1.4 8.3	11.8 35.8	19.5 52.8	50.1	7.3 47.4	12.6 44.5	3.6 8.39	4.8 15.0	21.2 59.3	32.5	4.4 34.5	13.6 68.2	5.4 67.4	9.3 48.8	27.3 60.7
Cadmium	0.02	73.8	72.8	653	245		0.07	0.04	0.11	0.08	0.03	<0.02	0.03	0.05	0.14	0.08	0.04	0.24	0.06	0.08	0.17
Chromium III	0.5	10,000	10.000	10.000	10,000		3.6	23.8	33.0	21.2	19.4	20.2	7.6	4.4	42.7	18.2	13.0	34.6	17.2	21.0	42.1
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		3.6	5.2	13.2	5.4	5.2	2.3	1.6	3.7	12.4	5.4	2.7	8.1	6.3	5.4	15.8
Copper	0.05	2,950	2,910	10,000	9,790		4.44	12.3	15.4	18.7	7.73	5.42	2.99	4.65	21.8	15.8	10.3	71.3	10.2	13.0	23.6
ead	0.05	258	255	2,290	857		12.0	39.3	49.2	26.0	28.1	25.4	7.67	9.38	59.8	22.3	12.9	42.0	17.0	43.6	86.5
Manganese	0.5	10,000	10,000	10,000	10,000		41.3	102	258	240	92.4	41.8	65.4	214	204	151	136	224	241	175	236
Mercury	0.02	11.0	6.52	38.4	45.6		<0.02	0.03	0.05	<0.02	0.03	0.07	<0.02	<0.02	0.09	0.02	0.03	0.09	0.02	0.05	0.09
folybdenum	0.05	369	364	3,260	1,220		0.29	1.96	1.36	0.87	1.33	0.87	0.46	0.49	2.97	1.15	0.94	1.71	0.71	1.85	3,35
lickel	0.05	1,480	1,460	10,000	4,900		3.18	11.3	21.4	12.2	9.41	6.03	4.08	2.63	22.6	9.82	3.97	18.8	7.31	9.79	25.7
in	0.05	10,000	10,000	10,000	10,000		0.48	2.62	4.12	2.90	2.21	2.08	0.58	0.64	5.56	2.06	2.99	4.76	1.69	3.16	4.90
inc	1	10,000	10,000	10,000	10,000		52.3	171	215	49.9	110	498	31.5	159	194	84.4	272	160	58.3	73.4	376
lioxins / PCBs	- Y																				
lioxins (I-TEQ) *	5.01 pg/g	0.001	0.001	0.005	0.001		5.18	9.89	12.37	10.46	8.87	7.55	6.24	5.79	41.47	8.84	7.64	7.73	8,30	10.46	17.85
CBs	0.10	0.236	0.223	0.748	0.756		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
ther Inorganic Compound							SIKEDARK SETS														
yanide, free	1 1	1,480	1,460	10,000	4,900		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
hlorinated Pesticides																					
lpha-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
eta-BHC	0.05			4 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
amma-BHC	0.05					-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
elta-BHC	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p'-DDE p'-DDD	0.05			2 **			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
p'-DDT	-			2		-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
otal Organic Carbon	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
OC Carbon	0.05%			Not Applicable			<0.05	0.56	0.99	0.26	0.17	0.08	<0.05	0.06	0.90	0.52	0.29	1.11	0.10	0.46	0.76
rain Size	0.05%			NOT Applicable			<0.05	U.36	0.99	0.26	0.17	80.0	<0.05	0.06	0.90	0.52	0.29	1.11	0.10	U.46	U./6
lay (%)	1%						2	17	47	21	24	36	5	5	42	23	16	30	19	45	53
ilt (%)	1%					-	4	22	51	21	31	35	5	5	39	23	18	29	19 34	45	43
and (%)	1%			Not Applicable			79	50	2	39	40	28	77	84	17	44	37	39	36	9	43
ravel (%)	1%						15	11	0	12		1	13	6	2	9	29	2	11	3	0
ositure Content							13			12			15				25		regarding work		
oisture Content (%)	0,1%			Not Applicable			12.1	20.0	39.0	16.1	17.6	17,1	13.9	11.1	29.5	18.0	15.4	26.5	14.8	16.6	31.3

<sup>\* 1</sup> pg/g = 0.000001 mg/kg

The reporting limit of Dioxins (I-TEQ) was computed by "Summation of (Reporting Limits of each dioxin/furan compound (i.e. the column of "I-DE" in the laboratory reports))" or \( \sum\_{LOR'x} \) in the laboratory reports) times their respective International Toxic Equivalency Factor (i.e. the column of "I-TEF" in the laboratory report))" or \( \sum\_{LOR'x} \) In the laboratory reports (i.e. the column of "I-TEF") in the laboratory reports (i.e. th The reporting limits of each dioxin/furan compound could be found in the laboratory report (i.e. the column of "LOR" in the laboratory report).

The total I-TEQ was computed by "Summation of (Concentration of each dioxin/furan compound (i.e. the column of "Conc" in laboratory report))" or \(\sum\_{C}\)(Conc \times I-TEF"\) in laboratory report))" or \(\sum\_{C}\)(Conc \times I-TEF)\)
The footnote explanation "I-TEQ(LOR) calculated treating <LOR as LOR concentration (pg/g)" in the laboratory report means if the concentration of the dioxin/furan compounds was below the reporting limit, the value of Reporting Limit (LOR) of the respective dioxin/furan compounds would be used for the computation of the I-TEQ3. However, multiplication of the LOR with their respective I-TEF is still required during the computation of "I-TEQ3"

22.2 Result exceed the RBRG of "Rural & Urban Residential"

<sup>\*\*</sup> Assessment Criteria extracted from "Intervention Value for Soil Remediation, Netherlands"

Appendix E

Analytical Results of Soil Samples of 15 Additional Boreholes Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A

Soil Samples : Additional 15 Boreholes

														Drillhole No.							
			Risk-Based Re	mediation Goals	(RBRGs) for Soil			A-S01a			A-S01b			A-S01c			A-S03a			A-S03b	
Chemical	1						Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dept	th (m)	Sam	pling Date and Dep	th (m)
oncomour	Reporting Limit	Urban Residential	Rural Residential	Industrial	Public Park	Soil Saturation Limit (C <sub>sat</sub> )	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	01-Feb-10	29-Jan-10	29-Jan-10	29-Jan-10
energy and the second	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95
Metals	Management of the con-			00-10-00-12-00-1														promoti woma 1450			
Antimony	0.05	29.5	29.1	261	97.9		0.22	0.43	0.34	0.31	0.29	0.23	0.27	0.41	0.41	0.19	2.68	0.56	0.95	0.71	0.46
Arsenic	0.5	22.1	21.8	196	73.5		4.8	6.8	6.2	9.5	10.5	6.7	10.5	18.4	13.6	2.9	16.1	16.7	18.7	17.0	10.4
Barium	0.05	10,000	10,000	10,000	10,000		16.4	63.2	37.4	37.4	24.2	30.6	65.2	35.5	37.0	30.0	262	59.1	75.3	75.8	49.6
Cadmium	0.02	73.8	72.8	653	245		0.04	0.05	0.07	0.02	0.02	0.12	0.03	0.03	0.06	0.10	1.10	0.09	0.30	0.18	0.04
Chromium III	0.5	10,000	10,000	10,000	10,000		7.9	21.6	21.2	23.4	27.0	21.2	28.4	40.7	36.8	7.7	109	39.4	45.2	39.1	28.1
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		1.7	4.6	3.4	1.9	1.3	2.2	1.7	2.1	4.8	6.0	12.0	11.4	10.8	7,8	5.6
Copper	0.05	2,950	2,910	10,000	9,790		6.32	48.2	30.2	37.9	13.2	14.2	9.13	14.0	14.1	12.9	194	19.3	32.5	42.1	13.4
.ead	0.05	258	255	2,290	857		13.2	18.7	21.2	19.0	24.2	21.3	24.6	30.8	32.5	13.8	81.2	47.6	86.9	65.4	46.8
Manganese	0.5	10,000	10,000	10,000	10,000		62.3	154	104	46.6	29.6	29.9	47.2	67.2	274	74.7	352	765	461	166	108
Mercury	0.02	11.0	6,52	38.4	45.6		0.02	<0.02	0.04	0.05	0.04	0.09	0.05	0.06	0.04	0.03	0.57	0.04	0.11	0.11	0.06
folybdenum	0.05	369	364	3,260	1,220		0.92	1.72	1.87	1.82	1.92	1,18	1,46	2.35	1.63	0.54	5.16	1,61	2.43	3,19	3.10
lickel	0.05	1,480	1,460	10,000	4,900		3.50	7.7	6.91	4.43	5.64	6.24	5.79	6.48	11.3	9.30	80.9	21.2	20.2	20.4	12.8
in	0.05	10,000	10,000	10,000	10,000	Caracteristic and control	1.58	2.74	2.55	2.71	2.39	2.42	2.25	2.71	3.12	1.02	15.9	4.70	5.00	4.47	3.30
inc	1	10,000	10,000	10,000	10,000		42.8	76.6	89.5	197	249	688	170	45.8	467	151	1460	330	245	252	72.8
Mositure Content								Miccol Danie													ATTENDED TO THE PARTY OF THE PA
Moisture Content (%)	0.1%			Not Applicable			14.3	14.7	14.9	13.1	17.7	16.1	17.9	19.1	31.0	22.4	44.1	40.0	39.8	27.1	24.0

														Drillhole No.							
			Risk-Based Re	mediation Goals	(RBRGs) for Soil	i I		A-S03c			A-S20a			A-S20b			A-S20c			A-S24a	
Chemical							Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)
	Reporting Limit	Urban Residential	Rural Residential	Industrial	Public Park	Soil Saturation Limit (C <sub>sat</sub> )	29-Jan-10	29-Jan-10	29-Jan-10	28-Jan-10	28-Jan-10	28-Jan-10	27-Jan-10	27-Jan-10	27-Jan-10	26-Jan-10	26-Jan-10	26-Jan-10	27-Jan-10	27-Jan-10	27-Jan-10
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95
Metals																					
Antimony	0.05	29.5	29.1	261	97.9		0.20	1.88	4.22	0.65	1.11	0.46	0.47	0.14	0.72	0.73	0.62	1.43	0.25	0.38	0.72
Arsenic	0.5	22.1	21.8	196	73.5		1.3	8.3	17.7	18.3	20.4	17.1	16.7	4.3	11.5	20.4	18.2	12.5	10,0	15.7	18.9
Barium	0.05	10,000	10,000	10,000	10,000		22.7	142	214	32.7	83.6	57.9	44.5	10.4	51.6	76.7	68.9	99.6	22,3	26.7	57.5
Cadmium	0.02	73.8	72.8	653	245		0.03	0.63	1.33	0.16	0.34	0.17	0.17	0.03	0.19	0.24	0.21	1.05	0.08	0.14	0.15
Chromium III	0.5	10,000	10,000	10,000	10,000		11.0	53.1	96.3	22.6	60.7	42.1	29.4	6.7	30.0	48.0	42.3	47.0	13.6	17.7	35.7
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		2.7	7.0	15.2	6.9	15.7	19.9	8.4	2.3	7.1	12.7	11.5	12.7	4.4	5.8	10.9
Copper	0.05	2,950	2,910	10,000	9,790		5.90	101	209	16.6	44.6	18.3	18.1	3.63	30.7	31.4	24.9	69.4	6.78	9.67	47.6
Lead	0.05	258	255	2,290	857		19.6	54.0	90.6	38.7	82.5	51.6	40.3	8.51	40.1	60.5	56.2	61.5	22.7	27.7	49.0
Manganese	0.5	10,000	10,000	10,000	10,000		67.1	210	343	410	826	321	412	108	330	555	536	342.0	174	223	270
Mercury	0.02	11.0	6.52	38.4	45.6		<0.02	0.34	0.56	0.05	0.10	0.04	0.06	<0.02	0.07	0.07	0.06	0.12	0.02	0.04	0.06
Molybdenum	0.05	369	364	3,260	1,220		0.55	2.79	9.71	1.29	2.13	5.43	1.41	0.36	1.32	1.62	1.41	2.74	1.25	2.08	2.43
Nickel	0.05	1,480	1,460	10,000	4,900		6.84	41.3	88.4	10.4	32.8	27.7	15.0	2.75	15.2	24.9	21.5	22.8	6.83	8.54	19.5
Tin	0.05	10,000	10,000	10,000	10,000		1.75	8.15	16.8	3.01	6.51	3.88	3.16	0,63	3.24	5.33	4.58	10.6	1.33	1.70	4.02
Zinc	1	10,000	10,000	10,000	10,000		37	454	892	86.6	213	139	110	47.2	140	158	161	296	99.7	72.8	142
Mositure Content																					
Moisture Content (%)	0.1%			Not Applicable			13.7	32.0	48.9	32.0	52.6	30.8	40.4	24.3	35.9	44.4	43.2	35.1	21.7	40.4	35,4

														Drillhole No.							
			Risk-Based Re	mediation Goals	(RBRGs) for Soil			A-S24b			A-S24c			A-SG10a			A-SG10b			A-SG10c	
Chemical							Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)	Sam	pling Date and Dep	th (m)
one in the same	Reporting Limit	Urban Residential	Rural Residential	Industrial	Public Park	Soil Saturation Limit (C <sub>sat</sub> )	27-Jan-10	27-Jan-10	27-Jan-10	26-Jan-10	26-Jan-10	26-Jan-10	29-Jan-10	29-Jan-10	29-Jan-10	28-Jan-10	28-Jan-10	28-Jan-10	29-Jan-10	29-Jan-10	29-Jan-10
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95
Metals																					
Antimony	0.05	29.5	29.1	261	97.9		0.63	0.32	0.44	0.50	0.44	0.40	0.45	0.56	0.35	0.50	0.56	0.10	0.16	0.26	0.86
Arsenic	0.5	22.1	21.8	196	73.5		18.1	16.0	18.3	18.2	17.1	14.7	14.4	10.7	9.6	17.8	17.6	5.3	3.1	5.3	13.8
Barium	0.05	10,000	10,000	10,000	10,000		54.7	37.4	61.3	36.7	41.4	59,6	54.0	50.4	37.4	56.3	53.8	13.8	18.8	33.9	77.0
Cadmium	0.02	73.8	72.8	653	245		0.09	0.07	0.09	0.11	0.12	0.12	0.14	0.06	0.07	0.17	0.16	0.03	0.04	0.06	0.28
Chromium III	0.5	10,000	10,000	10,000	10,000		33.1	23.5	32.8	39.7	28.5	38.2	37.3	34.6	22.8	41.4	39.0	7.7	9.7	15.6	40.2
Chromium VI	0.5	221	218	1,960	735		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	0.5	1,480	1,460	10,000	4,900		10.4	7.4	10.3	8.4	10.1	11.9	10.5	10.0	6.8	12.3	15.3	2.8	3.2	4.5	9.4
Copper	0.05	2,950	2,910	10,000	9,790		20.7	11.0	15.4	18.3	13.3	15.8	20.5	16.5	11.0	18.8	21.0	3.57	5.87	11.5	39.5
Lead	0.05	258	255	2,290	857		47.0	32.8	49.1	53.1	37.7	45.1	51.8	47.2	33.1	49.3	50.2	12.1	12.5	18,1	69.5
Manganese	0.5	10,000	10,000	10,000	10,000		309	191	298	283	194	424	380	362	546	425	272	47.9	105	146	290
Mercury	0.02	11.0	6.52	38.4	45.6		0.04	0.03	0.05	0.05	0.04	0.04	0.05	0.05	0.04	0.04	0.05	<0.02	<0.02	0.24	0.10
Molybdenum	0.05	369	364	3,260	1,220		2.65	1.54	1.74	2.08	1.98	1.47	2.16	1.15	1.07	2.49	5.34	0.43	0.58	0.92	2.21
Nickel	0.05	1,480	1,460	10,000	4,900		19.0	12.1	17.5	19.7	15.4	20.4	18.3	18.6	11.9	22.4	25.5	4.05	4.62	6.49	20.7
Tin	0.05	10,000	10,000	10,000	10,000		3.86	2.88	3.72	3.98	3.10	3.87	3.76	4.23	2.77	3.53	3.86	0.79	0.94	1.55	5.24
Zinc	1	10,000	10,000	10,000	10,000		168	66.2	83.7	755	138	129	123	97.2	67.3	355	207	22.3	35.2	67.2	164
Mositure Content																					
Moisture Content (%)	0.1%			Not Applicable			33.5	28.8	36,6	38.2	32.6	37.3	40.9	39.0	33.2	41.0	36.0	20.0	11.5	15.6	34.1

Appendix F

Analytical Results of Groundwater Samples

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A

Groundwater Samples: Boreholes A-SG01 to A-SG10

Name				Risk-Based Re	Risk-Based Remediation Goals (RBRGs) for Groundwater	(RBRGs) for Gro	undwater					Boreholes No. /	Boreholes No. / Sampling Date	200			
	Chemical	9					The second second second	A-S02	A-S07	A-S09	A-S14	A-S16	A-S24	A-SG01	A-5G03	A-SG06	A-SG08
		Reportin	ng Limit	Urban	Recidential	Industrial	Solubility										
Particle   1.0		(µg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ma/L)	19-Dec-09	12-Dec-09	23-Dec-09	09-Dec-09	15-Dec-09	02-Dec-09	12-Dec-09	23-Dec-09	21 Dec na	סט הפט פט
Part	In-situ measurement							The second						2000 41	00-000-04	20-20-17	20-00-00
10   10001   10,000	Hd							6.32	6.25	6.34	6.79	6.73	7.18	6.91	66.7	6.82	6.78
Property   1.0   0.001   10.000   10.	Temp (°C)					NOTE AND PROPERTY.		22.4	23.2	21.7	21.2	22.0	23.8	23.3	22.9	21.2	23.3
10   0.001   10,000   7.590   10,000   2.24   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.	SVOCs												-				
1.0   0.0001   1.4100   0.5424   0.0002   0.0003   0.00	Acenaphthene	1.0	0.001	10,000	7,090	10,000	4.24	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<1.0
10   0.001   10,000	Acenaphthylene	1.0	0.001	1,410	542	10,000	3.93	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10
No	Anthracene	1.0	0.001	10,000	10,000	10,000	0.0434	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	×10
1.0   0.001   58.1   21.9   812   2.0076   4.10	Benzo(b)fluoranthene	1.0	0.001	0.539	0.203	7.53	0.0015	<1.0	<1.0	o.1>	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10
1.0   0.001   10.000   10.00	Chrysene	1.0	0.001	58.1	21.9	812	0.0016	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10
1.0   0.001   10,000   10,000   10,000   1,0	Fluoranthene	1.0	0.001	10,000	10,000	10,000	0.206	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10
Comparison   Com	Fluorene	1.0	0.001	10,000	10,000	10,000	1.98	<1.0	<1.0	×1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10	<10
1.0   0.001   61.7   23.7   86.2   31.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0   <1.0	Hexachlorobenzene	0.5	0.001	0.0589	0.0234	0.695	6.20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1.0   0.001   10,000   10,00	Naphthalene	1.0	0.001	61.7	23.7	862	31.0	۲٠.0 دا ٥	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1.0   0.001   10,000   10,00	Phenanthrene	1.0	0.001	10,000	10,000	10,000	1.00	<1.0	<1.0	<1.0	×1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
red Pesticides         1         0.0005         0.186         0.1871         5.11         0.0015         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.0005         <0.00	Pyrene	1.0	0.001	10,000	10,000	10,000	0.135	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Council Carbon   Coun	Metals															-	
Comparing Carbon   Comparing C	Mercury		0.0005	0.486	0.184	6.79		<0.0005	<0.0005	<0.0005	<0.0005	<0.000>	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Comparison   Com	PCBs																
Comparison   Com	PCBs	-	0.001	0.433	0.171	5.11	0.031	V	₽	۲>	V	<1	۷.	۲۷	- ×	<1	<1
Comparison   Com	Chlorinated Pesticides							THE RESERVE AND ADDRESS OF THE PERSON NAMED IN COLUMN TO PERSON NAMED						THE REAL PROPERTY OF THE PERSON OF THE PERSO			
Comparison	alpha-BHC		0.0005					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0,0005	<0,0005
Comparison	beta-BHC & gamma-BHC	-	0.0010					<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0,0010
Company   Comp	delta-BHC		0.0005	The "Renoting	imit" is adonted as	. prelimnan corea	alon pole	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0,0005	<0.0005	<0.0005
Compose   Comp	p,p'-DDE		0.0005	Rimoden	a nordona or milita	a promining a solo	- Capaga Guini	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
DT         C0.0020         C0.	ggg-,d'd		0.0005					<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Organic Carbon 17 7 29 ct 15 15 15 15 15 15 15 15 15 15 15 15 15	p,p'-DDT		0.0020		\$			<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
1 Not Applicable <1 20 17 7 29 c1 7 45 1	Total Organic Carbon										Name and Address of the Party o						
	T0C		-		Not Applic	able		<b>.</b>	20	- 17	7	29	•	7	15	7	2

Appendix G

Analytical Results of Elutriate Samples

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A

Latin Containmation Assessment for Area A.
Elutriate Samples: Boreholes A-S02, A-S07, A-S09, A-S14 & A-S16

											Dolerioles (40.) Campling Date						
Chemical	ć	1000		A-S02			A-S07			A-S09			A-S14			A-S16	
	кероп	Reporting Limit		18-Dec-09			11-Dec-09			22-Dec-09	6		08-Dec-09	6		14-Dec-09	σ.
	(µg/L)	(mg/L)	Blank Test	Elutriate	Elutriate Potential (%)	Blank Test	Elutriate	Elutriate Potential (%)	Blank Test	Elutriate	Elutriate	Blank Test	Elutriate	Elutriate	Blank Test	Elutriate	Elutriate
n-situ measurement			STATE OF THE PARTY									A CONTRACTOR OF THE	1001	Cocinian (78)		1631	roteiltiai //e
Hd			6.53	-	-	6.02			6.70	-	-	6.25	-	-	6.84		
Temp (°C)			21.4	-	-	23.6	1		21.6	1		19.8	-		23.0		
SVOCs					***************************************										200		
Acenaphthene	1.0	0.001	<1.0	<1.0	Z	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	ĒŽ	<1.0	<1.0	Z
Acenaphthylene	1.0	0.001	<1.0	<1.0	Ē	<1.0	<1.0	ΞΞ	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Z
Anthracene	1.0	0.001	<1.0	<1.0	Ē	<1.0	<1.0	ĒŽ	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Z
Benzo(b)fluoranthene	1.0	0.001	<1.0	×1.0	ž	<1.0	<1.0	ĒŽ	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē
Chrysene	1.0	0.001	<1.0	<1.0	Z	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē
Fluoranthene	1.0	0.001	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē
Fluorene	1.0	0.001	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē
Hexachlorobenzene	0.5	0.0005	<0.5	<0.5	Ē	<0.5	<0.5	쿨	<0.5	<0.5	Ē	<0.5	<0.5	Ē	<0.5	<0.5	₹
Naphthalene	1.0	0.001	<1.0	<1.0	ΞŻ	<1.0	o.1.o	Ē	×1.0	<1.0	₹	<1.0	41.0	Ē	41.0	×1.0	Ξ
Phenanthrene Phenanthrene	1.0	0.001	<1.0	<1.0	Ē	×1,0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	×1.0	₹
Pyrene	1.0	0.001	<1.0	<1.0	ĪŽ	<1.0	<1.0	Ē	<1.0	<1.0	Z	<1.0	<1.0	Ē	<1.0	41.0	īZ
Metals															***************************************	-	
Mercury		0.0005	<0.0005	<0.0005	ΞŻ	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Z	<0.0005	<0.0005	Z	<0.0005	<0.0005	Z
PCBs																	
PCBs	-	0.001	٧	٧	ïŻ	۲	۲۰	Ē	7	7	Z	٧	۲	Z	-	V	Z
Chlorinated Pesticides																	
alpha-BHC		0.0005	<0.0005	<0.0005	ΞŻ	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Z
beta-BHC & gamma-BHC		0.0010	<0.0010	<0.0010	Ē	<0.0010	<0.0010	ΞŽ	<0.0010	<0.0010	Ē	<0.0010	<0.0010	Z	<0.0010	<0.0010	₹
delta-BHC		0.0005	<0.0005	<0.0005	Ē	<0.0005	<0.0005	₹	<0.0005	<0.0005	Ē	<0.0005	<0.0005	₹	<0.0005	<0.0005	Ē
p,p'-DDE		0.0005	<0.0005	<0.0005	Ν̈́	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	₹
DDC-,d'd	1	0.0005	<0.0005	<0.0005	ž	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Z
DO-'a,q		0.002	<0.0020	<0.0020	Z	<0.0000	00000	EN.	טטטטט יי	00000	EN.	00000	00000	EIV.	0000	0000	

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A

Elutriate Samples: Boreholes A-S24, A-SG01, A-SG03, A-SG06 & A-SG08

Chemical	ć			A-S24			A-SG01			A-SG03			A-SG06			A-SG08	
	подеж	Reporting Limit		01-Dec-09			11-Dec-09	6		22-Dec-09	ø		21-Dec-09	6		07-Dec-09	60
	(µg/L)	(mg/L)	Blank Test	Elutriate Test	Elutriate Potential (%)	Blank Test	Elutriate	Elutriate Potential (%)	Blank Test	Elutriate	Elutriate Potential (%)	Blank Test	Elutriate	Elutriate	Blank Test	Elutriate	Elutriate
in-situ measurement	No. of the last										(6/)	100000000000000000000000000000000000000	1631	r Oteritian (10)		1691	Potential (%
PH			6.96	ı	-	6.79	-	-	5.92	-	-	6.75	-	-	661		***************************************
Temp (°C)			22.9	1	-	24.0	1	-	21.7	1		20.4			7.00		
SVOCs																	
Acenaphthene	1.0	0.001	<1.0	<1.0	Ē	<1.0	<1.0	ΝΞΙ	<1.0	<1.0	Z	<1.0	<1.0	Ē	<1.0	<1,0	Ī
Acenaphthylene	1.0	0.001	<1.0	<1.0	ĪŽ	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ž
Anthracene	1.0	0.001	<1.0	×1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Z	<1.0	<1.0	Z
Benzo(b)fluoranthene	1.0	0.001	<1.0	0.12	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ž
Chrysene	1.0	0.001	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē
Fluoranthene	1.0	0.001	<1.0	<1.0	Ē	<1.0	<1.0	ĪŽ	0.1>	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē
Fluorene	1.0	0.001	<1.0	<1.0	ΞŻ	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	<1.0	₹
Hexachlorobenzene	0.5	0.001	<0.5	<0.5	Ē	<0.5	<0.5	Ē	<0.5	<0.5	Ē	<0.5	<0.5	ΞŻ	<0.5	<0.5	Z
Naphthalene	1.0	0.001	×1.0	<1.0	Ē	<1.0	<1.0	Ē	<1.0	0.1>	₹	<1.0	<1.0	Ē	<1.0	<1.0	Ē
Phenanthrene	1.0	0.001	<1.0	<1.0	Ē	<1.0	0.15	Ē	<1.0	<1.0	Ē	<1.0	<1.0	Ē	×1.0	<1.0	₹
Pyrene	1.0	0.001	<1.0	<1.0	Ē	<1.0	<1.0	ΪŻ	<1.0	<1.0	Ē	<1.0	<1.0	īZ	<1.0	<1.0	Z
Metals																	
Mercury		0.0005	<0.0005	<0.0005	Ē	<0.0005	<0.0005	ΞZ	<0.0005	<0.0005	Z	<0.0005	<0.0005	ΙΝ̈́	<0.0005	<0.0005	Z
PCBs																	
PCBs	-	0.001	۲	۷.	Ē	٧	٧	Ē	۲	۲	Z	٧	۲	ijŽ	۲×	V	Z
Chlorinated Pesticides																	
alpha-BHC		0.0005	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	īZ	<0.0005	<0.0005	Z
beta-BHC & gamma-BHC		0.0010	<0.0010	<0.0010	Ē	<0.0010	<0.0010	Ē	<0.0010	<0.0010	Ē	<0.0010	<0.0010	ΞZ	<0.0010	<0.0010	Z
delta-BHC		0.0005	<0.0005	<0.0005	Ī	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Nii	<0.0005	<0.0005	Ē
p,p'-DDE		0.0005	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ē
p,p'-DDD	***************************************	0.0005	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Ī	<0.0005	<0.0005	Ē	<0.0005	<0.0005	Nil	<0.0005	<0.0005	Ē
DO-'0.0		00000	00000	0000								The state of the s	· Secretarian Contraction Cont	***********	mental property of the contract of the contrac	Processing secure processing	Consequence or consequences

## Appendix H

Laboratory Testing
Reports of Soil
Samples, Groundwter
Samples and Elutriate
Samples

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A
Laboratory Testing Report No.

Report No.	Lab Works Order No.
1	HK0925295
2	HK0925301
3	HK0925302
4	HK0925303
5	HK0926115
6	HK0926309
7	HK0926317
8	HK0926336
9	HK0926383
10	HK0926386
11	HK0926533
12	HK0926548
13	HK0926564
14	HK0926566
15	HK0926568
16	HK0926571
17	HK0926669
18	HK0926670
19	HK0926740
20	HK0926774
21	HK0926802
22	HK0926826
23	HK0927313
24	HK0927322
25	HK0927342
26	HK0927346
27	HK0927362
28	HK0927374
29	HK0927379
30	HK0927388
31	HK0927390
32	HK0927397
33	HK0927405
34	HK0927407

Agreement No. CE 53/2008 (CE) preming and Expensering Study on Development of Lok Ma Chau Loop - Investigation Land Containmation Assessment for Area A Laboratory Testing Report No.

Soil Samples : Boreholes A-S01 to A-S15

		100000						Drillhole No.							
		A-S01			A-S02			A-S03			A-S04			A-S05	
hemical	Samp 14 Dec 09	Sampling Date and Depth (m)	th (m)	Sam 40 Day 00	Sampling Date and Depth (m)	th (m)	Samp	Sampling Date and Depth (m)	h (m)	Samp	Sampling Date and Depth (m)	h (m)	Samp	Sampling Date and Depth (m)	(m)
	1 50 - 1 95	3.00 3.95	15-Dec-09	18-Dec-09	18-Dec-09	18-Dec-09	22-Dec-09	22-Dec-09	23-Dec-09	15-Dec-09	15-Dec-09	15-Dec-09	17-Dec-09	17-Dec-09	17-Dec-09
ctais yande, free also Organic Carbon solture Content upbine (50,7) upbine (50,7) VS VS CBS CBS ANOCS CBS	1.50 - 1.95 3.00 - 3.95 Report No.20 (HK0926774)	3.00 - 3.95 (HK0926774)	4.50 -4.95 Report No. 22 (HK0926806)	1.60 - 1.95 Repo	Report No.24 (HK0927322)	450 -4.95	1.50 - 1.35 3.00 - 3.95 Report No.32 (HK0927397)	3.00 - 3.95 (HK0927397)	4.50 - 4.95 4.50 - 4.95 Report No. 34 (HK0927407)	1.50 - 1.95 Repor	Report No.22 (HK0926826)	4.50 - 4.95	1.50 - 1.95 Report	Seport No.23 (HK0927313)	4.50 - 4.95
								Drillhole No.							
		A-S06	1		A-S07			A-S08		3	A-S09			A-S10	
hemical	Samp	Sampling Date and Depth (m)	(m)	Sam	Sampling Date and Depth (m)	(m)	Sampl	Sampling Date and Depth (m)	h (m)	Samp	Sampling Date and Depth (m)	h (m)	Samp	Sampling Date and Depth (m)	(E)
	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	11-Dec-09 4.50 - 4.95	19-Dec-09	19-Dec-09 3.00 - 3.95	19-Dec-09 4,50 - 4,95	21-Dec-09	21-Dec-09	22-Dec-09 4.50 - 4.95	21-Dec-09	21-Dec-09	21-Dec-09
etals. yanide, free yanide, free ositure Carbon ositure Carbon japaine (So,7) jap	Repo	Report No.34 (HK0927407)	7407)	Repo	Report No.16 (HK0926571)	5571)	Repor	Report No.27 (HK0927362)	.362)	Report No.28 (HK0927374)	(HK0927374)	Report No.32 (HK0927397)	Repor	Report No.28 (HK0927374)	174)
								Drillhole No.							
		A-S11			A-S12			A-S13			A-S14			A-S15	
emical	10-Dec-09	Sampling Date and Depth (m)	th (m) 10-Dec-09	10-Dec-09	Sampling Date and Depth (m)	th (m)	Sample Sa	Sampling Date and Depth (m)	h (m)	Sampl	Sampling Date and Depth (m)	(m) t	Samp	Sampling Date and Depth (m)	(m)
	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4 50 - 4 95	1 50 - 1 95	3 00 - 3 as	09-Dec-09
retals yenide, free yenide, free yenide, free yenide, free aphite (So. <sup>2</sup> ) aphite (So. <sup>2</sup> ) aphite (So. <sup>2</sup> ) yes your yes yes yes yes yes yes yes yes yes yes	Repor	Report No.10 (HK0926386)	(9869	Repo	Report No.10 (HK0926386)	(986)	Report	Report No.28 (HK0927374)	374)	Repor	Report No.12 (HK0926548)	548)	Repo	Report No.9 (HK0926383)	69

Agreement No. CE 59,2008 (CE)
Planning and Enginement Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A
Laboratory Testing Report No.

Soil Samples : Boreholes A-S16 to A-S25

		10.1						Drillhole No.							
		A-S16			A-S17			A-S18			A-S19			A-S20	
Chemical	Sam	Sampling Date and Depth (m)	h (m)	Samp	Sampling Date and Depth	h (m)	Samp	Sampling Date and Depth (m)	h (m)	Sam	Sampling Date and Depth (m)	h (m)	Sampl	Sampling Date and Depth (m)	(m)
	12-Dec-09	14-Dec-09	14-Dec-09	19-Dec-09	19-Dec-09	19-Dec-09	04-Dec-09	04-Dec-09	04-Dec-09	01-Dec-09	01-Dec-09	01-Dec-09	10-Dec-09	10-Dec-09	11-Dec-09
	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3,00 - 3,95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1,50 - 1,95	3.00 - 3.95	4.50 - 4.95
Metals Cyanide, free Cyanide, free Total Organic Carbon Mostluro Content Sulphite (SO <sub>4</sub> <sup>2</sup> ) Sulphide (SO <sub>4</sub> <sup>2</sup> ) Sulphide (S <sup>2</sup> ) Sulphide (S <sup>2</sup> ) Sulphide (S <sup>2</sup> ) Sulphide (S <sup>2</sup> ) Sulphide (S <sup>2</sup> ) Doors Dioxins Ghormanical Pesticides Chlorinatical Fise Chlorinatical Signature Grain Signatu	Reprt No. 19 (HK0926740)	Report No.20 (HK0926774)	(HK0926774)	Repor	Report No.27 (HK0927362)	.362)	Repo	Report No.7 (HK0926317)	317)	Rep	Report No.11 (HK0926533)	(5533)	Report o.10 (HK0926386)	-K0926386)	Report No.16 (HK0926571)

								Drillhole No.							
		A-S21			A-S22			A-S23			A-S24			A-S25	
Chemical	Sam	Sampling Date and Depth (m)	th (m)	Sam	Sampling Date and Depth	oth (m)	Samp	Sampling Date and Depth (m)	th (m)	Samp	Sampling Date and Depth (m)	th (m)	Sami	Sampling Date and Depth (m)	h (m)
	27-Nov-09	27-Nov-09	28-Nov-09	25-Nov-09	25-Nov-09	25-Nov-09	26-Nov-09	27-Nov-09	27-Nov-09	01-Dec-09	01-Dec-09	01-Dec-09	07-Dec-09	08-Dec-09	08-Dec-09
	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4 50 - 4 95
Metals															201
Cyanide, free															
Total Organic Carbon															
Mositure Content															
Sulphite (SO <sub>1</sub> <sup>2</sup> )															
Sulphate (SO <sub>4</sub> <sup>2</sup> )															
Sulphide (S <sup>2</sup> )	Report No.3	Report No.3 (HK0925302)	Report No.4	G	Penort No. 1 (HK0025205)	5205)	Report No.2	C old touch	TOO SESSOON	Ċ	200071111111111111111111111111111111111		Report No.12		
AVS		(100020007)	(HK0925303)	de la	ישטעון וייטיין	0590)	(HK0925301)	Report No.3	Report No.3 (HKU9Z33UZ)	меро	Keport No.11 (HK0926533)	6533)	(HK0926548)		Report No. 14 (HK0926566)
SVOCs															
PCBs															
Chlorinated Pesticides															
Sulphur (Total S)															
Dioxins															

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Laboratory Testing Report No.

Soil Samples: Boreholes A-SG01 to A-SG10

								Drillhole No.							
		A-SG01			A-SG02			A-SG03			A-SG04			A-SG05	
Chemical	Sam	Sampling Date and Depth (m)	th (m)	Sam	Sampling Date and Depth	th (m)	Samp	Sampling Date and Depth (m)	th (m)	Sam	Sampling Date and Depth (m)	h (m)	Samp	Sampling Date and Depth (m)	h (m)
	10-Dec-09	11-Dec-09	11-Dec-09	21-Dec-09	21-Dec-09	21-Dec-09	22-Dec-09	22-Dec-09	22-Dec-09	11-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09	12-Dec-09
	1.50 - 1.95	3,00 - 3,95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	300-395	450-495
Metals															201
Cyanide, free															
Total Organic Carbon															
Mositure Content															
Sulphite (SO <sub>3</sub> <sup>2</sup> )															
Sulphate (SO <sub>4</sub> 2)															
Sulphide (S²)	Report No.10	Donort No 16	Donort No 16 /UK00365741	0	** 7 0 7 00 VIII) OC - IN HOUSE	18.007	Ċ	10000		Report No.16					
AVS	(HK0926386)		(1.10020011)	ndbu	260ALI) 02.0VI ) II	(†)	oday	Report No.30 (PRUSZ/388)	(388)	(HK0926571)		Report No.19 (HKU926/40)	Kepo	Report No. 19 (HK0926740)	6740)
SVOCs															
PCBs															
Chlorinated Pesticides						_									
Sulphur (Total S)															
Dioxins	1														
Grain Size															
								Drillhole No.							
		A.S.C.A			A CC07			0000							

								Drillhole No.							
		A-SG06			A-SG07			A-SG08			A-SG09			A-SG10	
Chemical	Samp	Sampling Date and Depth (m)	th (m)	Sam	Sampling Date and Depth	h (m)	Samp	Sampling Date and Depth (m)	h (m)	Samp	Sampling Date and Depth (m)	h (m)	Samp	Sampling Date and Depth (m)	h (m)
	19-Dec-09	19-Dec-09	21-Dec-09	07-Dec-09	07-Dec-09	07-Dec-09	05-Dec-09	05-Dec-09	07-Dec-09	28-Nov-09	28-Nov-09	28-Nov-09	09-Dec-09	09-Dec-09	09-Dec-09
	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4,50 - 4.95
Metals Cyanida free Cyanida free Total Organic Carbon Mostlure Cornent Sulphite (SQ,*) Sulphide (S^*) Sulphide (S^*) Sulphide (S^*) Colorinated Pesticides Chlorinated Pesticides Sulphire (Total S) Dioxis	Report No.26 (HK0927346)	(HK0927346)	Report No. 28 (HK0927374)	Repo	Report No.12 (HK0926548)	5548)	Report No. 8	Report No. 8 (HK0926336)	Report No.12 (HK0926548)	Repc	Report No.4 (HK0925303)	303)	Repo	Report No. 9 (HK0926383)	(3983)

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A
Laboratory Testing Report No.

Groundwater Samples : Boreholes A-S02, A-S07, A-S09, A-S14, A-S16, A-S24, A-SG01, A-SG03, A-SG06& A-SG08

Chemiral					Boreholes No. /	Boreholes No. / Sampling Date			=	
	A-S02	A-S07	A-S09	A-S14	A-S16	A-S24	A-SG01	A-SG03	A-SG06	A-SG08
	19-Dec-09	12-Dec-09	23-Dec-09	09-Dec-09	15-Dec-09	02-Dec-09	12-Dec-09	23-Dec-09	21-Dec-09	08-Dec-09
SVOCs										
Mercury		Report No.19								
PCBs		(HK0926740)								
Chlorinated Pesticides	Report No.27	∞	Report No.34	Report No.9	Report No.22	Report No.6	Report No.19	Report No.34	Report No.28	Report No.14
Total Organic Carbon	(HK0927362)	Report No.27	(HK0927407)	(HK0926383)	(HK0926826)	(HK0926309)	(HK0926740)	(HK0927407)	(HK0927374)	(HK0926566)
Sulphur (Total S)		(HK0927362)							io.	Д
Sulphite (SO <sub>3</sub> <sup>2</sup> )										
Sulphate (SO <sub>4</sub> <sup>2</sup> )									-	
Sulphide (S <sup>2</sup> )										

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A
Laboratory Testing Report No.

Elutriate Samples : Boreholes A-S02, A-S07, A-S09, A-S14, A-S16, A-S24, A-SG01, A-SG03, A-SG06& A-SG08

					Boreholes No. /	Boreholes No. / Sampling Date				
Chemical	8-A	A-S02	A-S07	207	A-S09	600	3-A	A-S14	A-8	A-S16
	18-De	18-Dec-09	11-Dec-09	60-06	22-De	22-Dec-09	08-D	08-Dec-09	14-D(	14-Dec-09
	Blank Test	Blank Test Elutriate Test	Blank Test	Elutriate Test	Blank Test	Elutriate Test	Blank Test	Elutriate Test	Blank Test	Elutriate Test
SVOCs										
Mercury	Report No.25	Report No.25 (HK0927342)	Report No 18 (HK0926670)	(HK0926670)	Report No 33	Renort No 33 (HK0927405)	Report No. 15 (HK0026568)	(HK0008568)	Donort No 24 (LIKO026902)	(UKO036802)
PCBs		()		(2.222)		(001.700)	Con No.	(100020000)	1 Z.ONI JIOGENI	(HNU32000Z)
Chlorinated Pesticides										

					Boreholes No. / Sampling Date	Sampling Date				
Chemical	A	A-S24	A-SG01	301	A-SG03	303	A-S	A-SG06	A-S	A-SG08
	01-D	01-Dec-09	11-Dec-09	60-06	22-Dec-09	60-20	21-De	21-Dec-09	Q-70	07-Dec-09
	Blank Test	Elutriate Test	Blank Test	Elutriate Test	Blank Test	Elutriate Test	Blank Test	Elutriate Test	Blank Test	Elutriate Test
SVOCs										
Mercury	Report No 5	Report No 5 (HK0926115)	Report No 17	No 17 (HK0926669)	Penort No 31 /HK0027300/	(HK0027300)	oc oly trough	(0767000/ILI) OC ON HOROG	to N	(11/0000011)
PCBs		(011070011)		(00000000000)	CON HODE	(Dec 1260VIII)	Nepoli No.29	(HRU321319)	Report No. 13 (PINU920304)	(HNU9Z0204)
Chlorinated Pesticides										

## Appendix I

Laboratory Testing
Reports of Soil
Samples of 15
Additional Boreholes

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A
Laboratory Testing Report No. (Additional Boreholes)

Report No.	Lab Works Order No.
А	HK1002030
В	HK1002074
С	HK1002122
D	HK1002220
E	HK1002332
F	HK1002333

Soil Samples: 15 Additional Boreholes

								Drillhole No.							
		A-S01a			A-S01b			A-S01c			A-S03a			A-S03b	
Chemical	Sampl	Sampling Date and Depth (m)	apth (m)	Sampl	Sampling Date and Depth	oth (m)	Sampli	Sampling Date and Depth (m)	ith (m)	Samp	Sampling Date and Depth (m)	th (m)	Sampli	Sampling Date and Depth (m)	offi (m)
	30-Jan-10	30~Jan-10	30-Jan-10 30-Jan-10 30-Jan-10 30-Jan-10 30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10	30-Jan-10 30-Jan-10 30-Jan-10	30-Jan-10	30~Jan-10	30-Jan-10	30-Jan-10 01-Feb-10 29-Jan-10 29-Jan-10 29-Jan-10	29-Jan-10	29-lan-10	29. Jan. 10
	1.50 - 1.95	3.00 - 3.95	1.50 - 1.95 3.00 - 3.95 4.50 - 4.95 1.50 - 1.95 3.00 - 3.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	4,60-4,95 1,50-1,95 3,00-3,95 4,50-4,95 1,50-1,95 3,00-3,95 4,50-4,95 1,50-1,95	3.00 - 3.95	4 50 - 4 95	1 50 - 1 95	3 00 - 3 95	A 50 A 95
												Report No.F		200	20.4
Metals	Repo	Report No.E (HK100233;	02332)	Repor	Report No. E (HK100233	02332)	Repor	Report No. E (HK1002332)	(2332)	Report No. E	Report No. E (HK1002332)	(HK1002333)	Repor	Report No.D (HK1002220)	12220)

Chemical         A-S03c         A-S20a         A-S20									Drillhole No.							
Sampling Date and Depth (m)   Sampling Date and Depth (m)   Sampling Date and Depth (m)   Sampling Date and Depth (m)   29-Jan-10   29-Jan-10   28-Jan-10		A-S03c			A-S20a			A-S20b			A-S20c			A-S24a		
	Chemical	Sampl	ling Date and De	ipth (m)	Sampli	ing Date and De	-	Sampl	ling Date and De	pth (m)	Samp	Sampling Date and Depth (m)	oth (m)	Sampl	Sampling Date and Depth (m)	oth (m)
		29-Jan-10	29-Jan-10	29-Jan-10	28~Jan-10	28-Jan-10	28-Jan-10	27~Jan-10	27-Jan-10	27-Jan-10	26-Jar	26-Jan-10	26-Jan-10 27-Jan-10 27-Jan-10 27-Jan-10	27-Jan-10	27-Jan-10	27-Jan-10
Report No.C (HK1002		1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	1.50 - 1.95	3.00 - 3.95	4 50 - 4 95
Keport No.C (HK1002122) Report No.B (HK1002074)		C	1	10000	ď			ı	1							
	Metais	Repo	IL NO.D (HKIO	02220	Kepor	T NO.C (HK10)	02122)	Kepo	rt No.B (HK100	12074)	Repo	Report No.A (HK1002030)	2030)	Repor	Report No.B (HK1002074)	2074)

								Drillhole No.							
		A-S24b			A-S24c			A-SG10a			A-SG10b			A-SG10c	
Chemical	Sampl	Sampling Date and Depth (m)	pth (m)	Sampli	Sampling Date and Dep	pth (m)	Sampli	Sampling Date and Depth (m)	th (m)	Sampli	Sampling Date and Depth (m)	th (m)	Samoli	Sampling Date and Depth (m)	oth (m)
	27-Jan-10	27-Jan-10	27-Jan-10 27-Jan-10 26-Jan-10 26-Jan-10	26-Jan-10	26-Jan-10	26~Jan-10	29-Jan-10	29-Jan-10	29-Jan-10	26-Jan-10 29-Jan-10 29-Jan-10 28-Jan-10 28-Jan-10 28-Jan-10 28-Jan-10 28-Jan-10 29-Jan	28-Jan-10	28- lan-10	29- Jan-40	29- Ian-40	20 Jan 40
	1.50 - 1.95	3.00 - 3.95	1.50 - 1.95 3.00 - 3.95 4.50 - 4.95 1.50 - 1.95 3.00 - 3.95	1.50 - 1.95	3.00 - 3.95		1.50 - 1.95	3.00 - 3.95	4.50 - 4.95	4.50 4.95 1.50 1.95 3.00 3.95 4.50 4.95 1.51 1.95 3.00 3.95 4.50 4.95 1.50 1.95	300-395	4 50 - 4 95	1 KD - 1 QE	3 00 3 0F	4 FO 4 OF
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Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Land Contamination Assessment for Area A
Laboratory Testing Report No.

Agreement No. CE 53/2008 (CE)

# PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - I N V E S T I G A T I O N

# Supplementary Contamination Assessment Report and Remediation Action Plan for Area A October 2011









Planning Department and Civil Engineering and Development Department

Agreement No. CE 53/2008 (CE) Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation

Supplementary Contamination Assessment Report and Remediation Action Plan for Area A

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#### 1 Introduction

#### 1.1 Background

On 26 May 2009, Planning Department (PlanD) in association with Civil Engineering and Development Department (CEDD) commissioned Ove Arup & Partners Hong Kong Limited (Arup) as the Consultant for undertaking the "Planning and Engineering Study on Development of Lok Ma Chau Loop – Investigation" (the Study).

Section 3.4.9.4 of the EIA Study Brief No.: ESB-201/2008 for the LMC Loop Development project dated January 2009 issued by the EPD specified that a land contamination assessment shall be undertaken and that a Contamination Assessment Plan (CAP) shall be submitted to the EPD prior to conducting the assessment.

The CAP for Area A has been prepared and submitted to EPD in July 2009. EPD indicated no further comments on the CAP for Area A in October 2009. Environmental site investigation (SI) works were carried out between 25 November 2009 and 1 February 2010.

# 1.2 Contamination Assessment Report and Remediation Action Plan for Area A

A Contamination Assessment Report (CAR) and Remediation Action Plan (RAP) for Area A was submitted to and endorsed by EPD in July 2010 summarising the analytical results of the SI works and providing recommendations on the appropriate remediation actions for the contaminated areas found.

According to the testing results, out of the 105 soil samples collected, 6 soil samples from 5 of the boreholes (A-S01, A-S03, A-S20, A-S24, and A-SG10 as shown in **Figure 5.1** in **Appendix A**) contain concentrations of Arsenic that marginally exceeded the RBRGs of Rural Residential and Urban Residential land uses. The laboratory results exceeding the RBRGs are given in **Table 1.1**.

Table 1.1 Summary of soil samples exceeding RBRGs

Borehole No.	Depth of Soil Sampling (mbgl)	Contaminant	Concentration (mg/kg dry soil)	RBRGs of Arsenic (mg/kg dry soil)
A CO1	3.0 - 3.45	Arsenic	22.2	
A-S01	4.5 – 4.95	Arsenic	24.0	Rural Residential RBRG : 21.8
A-S03	3.0 – 3.45	Arsenic	26.8	Urban Residential RBRG : <b>22.1</b>
A-S20	3.0 – 3.45	Arsenic	23.0	Public Parks RBRG : 73.5
A-S24	3.0 – 3.45	Arsenic	27.7	Industrial RBRG : <b>196</b>
A-SG10	4.5 – 4.95	Arsenic	27.3	

In order to further ascertain the extent of contamination at these 5 locations, 3 additional boreholes near each of the 5 contaminated boreholes were drilled (i.e. a total of 15 additional boreholes were drilled) for additional soil sampling and testing. The locations of the additional boreholes were roughly mid-way between the contaminated boreholes and their respective adjacent boreholes, as shown in **Figure 5.2** and **Figures 5.2.1** to **5.2.5** in **Appendix A**. The laboratory testing results of the additional soil samples show compliance with the RBRG for Rural Residential (i.e. the most stringent set of RBRGs).

Based on the results from the SI works, an estimate of the quantity order of contaminated soil is summarised in **Table 1.2**. The extents of 5 estimated plan areas in which the contaminated zones lie are depicted in **Figure 6.1** and **Figures 6.1.1** to **6.1.5** in **Appendix A**.

Table 1.2 Estimation of the order of quantity of contaminated soil by conservative approach

Contaminated Borehole (Contaminated Zone ID)	Additional Borehole ID	Distance from Contaminated Borehole to the Additional Borehole (m)	Estimated Vertical Extent of Contamination (m)	Estimated Plan Area in which Contaminated Area Lies (m²)	Estimated of Order of Quantity of Contaminated Materials (m³)
	A-S01a	90	3.0		
A-S01	A-S01b	69	(2.5m-5.5m)	18,519	55,557
	A-S01c	87	, ,		
	A-S03a	91			
A-S03	A-S03b	54	1.5 (2.5m-4.0m)	12,684	19,026
	A-S03c	102	(2.5111 1.0111)		
	A-S20a	96			
A-S20	A-S20b	112	1.5 (2.5m-4.0m)	26,131	39,197
	A-S20c	82	(2.311-4.011)		
	A-S24a	63			
A-S24	A-S24b	92	1.5 (2.5m-4.0m)	14,361	21,542
	A-S24c	68	(2.311-4.011)		
	A-SG10a	62			
A-SG10	A-SG10b	86	1.5 (4.0m-5.5m)	12,749	19,124
	A-SG10c	67	(4.0111-3.3111)		
			Total (2):	84,444	154,446

#### Note:

- (1) The "Estimated Plan Area in which the Horizontal Contaminated Area (m²) Lies" was computed by a software call "MicroStation". (i.e. common graphical software similar to "AutoCad")
- (2) The data presented based on the conservative approach are subject to variation after the completion of further investigation to confirm the actual horizontal extent of contamination.

Since the 5 contaminated boreholes only marginally exceeded the RBRG, the estimation of the horizontal extent of contamination is considered conservative. As the estimated quantity of contaminated soil is highly sensitive to how the plan area (in which the actual horizontal extent of contaminated lies) is estimated,

further SI is carried out to further ascertain the horizontal extent of contamination prior to the commencement of remediation works on site in order to avoid over-remediation.

For easy reference, the initial SI work conducted between 25 November 2009 and 1 February 2010 will be referred as "Stage 1 SI"; whereas the further SI work will be referred as "Stage 2 SI".

#### 1.3 Objective

This Supplementary Contamination Assessment Report (CAR) for Area A is prepared to present findings of the investigation and provide an update on the estimation of the quantity of contaminated soil based on the results of the Stage 2 SI to seek approval/agreement by EPD prior to the commencement of remediation work. This Supplementary CAR shall be read in conjunction with the endorsed CAR/RAP for Area A.

#### 1.4 Statutory Legislation and Evaluation Criteria

This Supplementary CAR is prepared in accordance with the following Technical Memorandum and Guidance Notes:

- Annex 19 of the Technical Memorandum on Environmental Impact Assessment Process (TM-EIA), Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts (Section 3: Potential Contaminated Land Issues);
- Guidance Notes for Investigation Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repairing/Dismantling Workshops, EPD, 1999;
- Guidance Notes for Contaminated Land Assessment and Remediation; and
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management, EPD, 2007.

## 2 Site Investigation Works

# 2.1 Further Investigation into the Extent of Contamination

According to Section 6.2.2 of the endorsed CAR/RAP for Area A, the Stage 2 SI should include the drilling of new boreholes at such locations between the contaminated boreholes and their respective adjacent additional uncontaminated boreholes within the possible plan area conservatively estimated (as shown in Figures 6.1.1 to 6.1.5 in Appendix A) so as to confirm the horizontal extent of contamination. In the endorsed CAR/RAP for Area A, it was recommended that soil samples should be collected in the new boreholes at the respective depths of contamination detected in the 5 contaminated boreholes (as summarised in Table 1.1), and tested for Arsenic. But in order to also confirm the vertical extent of Arsenic contamination, it was later decided that soil samples should be collected at the same depth intervals as in Stage 1 SI i.e. 1.5-1.95mbgl, 3.0-3.45mbgl and 4.5-4.95mbgl.

#### 2.2 Soil Sampling

#### 2.2.1 Borehole locations

The Stage 2 SI was conducted strictly in compliance with the technical procedures in the approved CAP/RAP for Area A such as dry drilling of boreholes, decontamination requirements, soil sampling procedures and the analytical methodologies etc.

The Stage 2 SI works were carried out by Fugro Geotechnical Services (HK) Ltd. between 27 May and 2 July 2011. 15 boreholes were drilled for the soil sampling. The borehole locations and depth for soil sampling are summarised in **Table 2.1** and are shown in **Figure 2.1**. The entire SI programme was supervised by the onsite Land Contamination Specialist.

<b>Table 2.1</b> Sampling locations and drilling
--

Borehole	•	Proposed Borehole Locations		Actual Borehole Locations		Ground Level
ID	Easting	Northing	Easting	Northing	Sampling (mbgl)	(mPD)
A-S01a1	826258	842958	826258	842957		+6.23
A-S01b1	826287	842902	826287	842902		+5.97
A-S01c1	826337	842918	826338	842918		+5.68
A-S03a1	826585	842816	826587	842815		+5.94
A-S03b1	826618	842775	826618	842774	5	+5.59
A-S03c1	826655	842757	826655	842757	3	+4.86
A-S20a1	826301	842008	826321	842024		+5.26
A-S20b1	826295	842067	826304	842069		+4.90
A-S20c1	826370	842064	826370	842064		+4.63
A-S24a1	825798	841907	825798	841907		+3.91

Borehole	Proposed Borehole Locations		Actual Borehole Locations		Termination Level of	Ground Level
ID	Easting	Northing	Easting	Northing	Sampling (mbgl)	(mPD)
A-S24b1	825851	841923	825851	841923		+3.62
A-S24c1	825841	841858	825841	841857		+4.44
A-SG10a1	826036	841816	826037	841813	5	+3.75
A-SG10b1	825048	841851	825048	841852		+3.46
A-SG10c1	826089	841838	826088	841837		3.64

Boreholes A-S20b1 and A-S20c1 have been shifted from the original proposed locations due to the actual site situation and constrain e.g. to avoid damage of reedbed. Deviation from the original proposed boreholes locations are summarised in **Table 2.2**.

Table 2.2 Change of borehole locations due to site constraints

Borehole ID	Deviation from Original Location	Justification
A-S20a1	26m north-east of the original location	To avoid damage of vegetation owned by a villager
A-S20b1	10m north-east of the original location	Avoid damage to reedbed

#### 2.2.1 Soil Sampling

Inspection pits from ground surface to 1.5 meter below ground level (mbgl) were excavated at each borehole location before drilling in order to determine the thickness of the top soil (i.e. Area A was capped by a layer of clean top soil after the disposal of dredged mud from Shenzhen River). Three U-100 undisturbed soil samples were then collected from each borehole at the depths of 1.5m (1.5-1.95mbgl), 3.0m (3.0-3.45mbgl) and 4.5m (4.5-4.95mbgl).

#### 2.2.2 Decontamination procedures

Before drilling / excavation, the sampler and all equipment in contact with the ground were thoroughly decontaminated by phosphate-free detergent between each sampling event to minimize potential cross contamination. All drilling machines were decontaminated by phosphate-free detergent and high pressure hot water jet before mobilization to site. During sampling and decontamination activities, disposable latex gloves were worn to prevent the transfer of contaminants from other sources.

Moreover, dry drilling method was adopted for the entire environmental SI in order to prevent any influence of flushing medium to the soil testing results.

### 2.3 Analytical Parameters & Assessment Criteria

The soil samples collected were analysed for Arsenic. The RBRGs for Arsenic found in soil are given in **Table 2.3**. Similar to the endorsed CAR/RAP for Area A, "Rural Residential" RBRG was adopted for the interpretation of the soil testing results.

Table 2.3 Risk-Based Remediation Goals (RBRGs) of Arsenic

	Risk-Based Remediation Goals (RBRGs) for soil						
Chemical	Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Park (mg/kg)			
Arsenic	22.1	21.8	196	73.5			

#### 2.4 HOKLAS Accredited Laboratory

A testing laboratory "ALS Technichem (HK) Pty Ltd", accredited under Hong Kong Laboratory Accreditation Scheme (HOKLAS) was appointed to conduct chemical testing for the soil samples. The laboratory testing method was accredited by the HOKLAS.

### 2.5 Strata Logging

Strata logging for boreholes was undertaken during the course of drilling and sampling by qualified geologist. The logs included the general stratigraphic descriptions, depth of soil sampling, and sample notation etc. The strata logs of boreholes are given in **Appendix B**.

# 3 Interpretation of Laboratory Testing Results

#### 3.1 Soil Contamination

A total of 45 soil samples were collected from the 15 boreholes between 27 May 2011 and 2 July 2011. At the sampling depths where Arsenic contamination was detected previously in Stage I SI (refer to **Table 1.1**), no Arsenic exceedances were found according to the laboratory testing results. However, among the depths where Arsenic contamination were not previously detected, marginal exceedances of the RBRG (Rural Residential) Arsenic limit were found in the samples collected at A-S03a1 (4.5-4.95 mbgl) and A-S03c1 (1.5-1.95 mbgl). The laboratory testing results exceeding the RBRGs are given in **Table 3.1**. All the laboratory testing results are summarised in **Appendix C**. The laboratory testing reports are given in **Appendix D**.

Table 3.1 Summary of soil samples exceeding RBRGs

Borehole No.	Depth of Soil Sampling (mbgl)	Contaminant	Concentration (mg/kg dry soil)	RBRGs (Rural Residential) for Arsenic (mg/kg dry soil)
A-S03a1	4.50-4.95		23	21.8
A-S03c1	1.50-1.95	Arsenic	24	21.0

#### 4 Possible Soil Contamination Extent

# 4.1 Update on the Possible Soil Contamination Extent

Based on the results from the Stage 2 SI works, the possible vertical and horizontal extents of soil contamination present within Area A has been estimated using the same method as stipulated in Section 6.1.1 and 6.1.2 in the endorsed CAR/RAP for Area A which is summarised in **Sections 4.1.1** and **4.1.2** below.

#### 4.1.1 Estimation of Horizontal Extent of Contamination

The horizontal contamination extent is estimated by the curvilinear area formed by taking the contaminated borehole at the centre and the boundary joining the adjacent additional boreholes (i.e. which reveal no contamination), or along site boundary (i.e. Shenzhen meander). A software called "MicroStation" (i.e. common graphical software similar to "AutoCad") was used to draw the curvilinear plan area in which the horizontal extent of contamination lies.

#### 4.1.2 Estimation of Vertical Extent of Contamination

For such sample with contaminated laboratory testing results, the full depth of soil sampling is taken as contaminated. Besides, a depth of 0.5m above and below that sampling depth respectively will be taken as contaminated as a conservative estimate. For example, for the sampling depth of 3.0–3.5mgbl with contaminated laboratory testing finding, the vertical extent of contamination will be estimated from 2.5mgbl (i.e. 3mbgl - 0.5m) to 4mbgl (i.e. 3.5mbgl + 0.5m), and the vertical extent of contamination is therefore estimated as 1.5m.

#### 4.1.3 Possible Soil Contamination Extent

Based on the methodology described in **Section 4.1.1**, the updated extents of the 5 plan areas in which the contaminated zones lie are shown in **Figure 4.1** and **Figures 4.1.1** to **4.1.5**.

According to the testing results, no updates on the vertical extents of soil contamination will be required except for boreholes A-S03a1 and A-S03c1 where Arsenic exceedances were detected at 4.5-4.95 mbgl and 1.5-1.95 mbgl respectively. The vertical extents of the soil contamination at these two boreholes have been estimated to be 4.0-5.5m at A-S03a1 and 1.0-2.5m at A-S03c1 with reference to the method described in **Section 4.1.2**. A-S03a1 and A-S03c1 have been considered as two additional contaminated boreholes and their respective estimated plan areas are shown in **Figures 4.1.2a** and **4.1.2b**.

Based on the soil contamination extent estimated, the updated order of quantity of contaminated soil, including those from A-S03a1 (4.5-4.95 mbgl) and A-S03c1 (1.5-1.95 mbgl) is summarised in **Table 4.1**.

Estimation of the order of quantity of contaminated soil based on Stage 2 SI results Table 4.1

Contaminated Borehole/	Borehole ID (Stage	rehole ID (Stage Coordinates		Estimated Distance Estimated Vertical Extent	Estimated Vertical Extent of	Estimated Contaminated	<b>Estimated Quantity</b>
Concerned Area ID		Easting	Northing	from Contaminated Borehole (m)  Contamination (m) [1]		Area (m <sup>2</sup> ) [2]	of Contaminated Materials (m³)
	A-S01a1	826258	842957	45			
A-S01	A-S01b1	826287	842902	35	3.0 (2.5m-5.5m)	5,576	16,728
A-S01c1	826338	842918	44	]			
	A-S03a1	826587	842815	43			
A-S03	A-S03b1	826618	842774	27	1.5 (2.5m-4.0m)	4,580	6,870
	A-S03c1	826655	842757	51			
	A-S20a1	826321	842024	23	1.5 (2.5m-4.0m)	4,989	7,484
A-S20	A-S20b1	826304	842069	50			
	A-S20c1	826370	842064	41	1		
	A-S24a1	825798	841907	32	1.5 (2.5m-4.0m) 4,001	6,002	
A-S24	A-S24b1	825851	841923	46			
	A-S24c1	825841	841857	34	1	-	-
	A-SG10a1	826037	841813	31			
A-SG10	A-SG10b1	825048	841852	43	1.5 (4.0m-5.5m) 3,520	3,520	5,280
A-SG10c1	A-SG10c1	826088	841837	34	1		
					Sub-Total:	22,666	42,364

Contaminated Borehole/ Concerned Area ID	Borehole ID (Stage 1/2 SI)	Coordinates		<b>Estimated Distance</b>	Estimated Vertical Extent of	Estimated Contaminated	Estimated Quantity
		Easting	Northing	from Contaminated Borehole (m)	Contamination (m)	Area (m²) [1]	of Contaminated Materials (m³)
A-S03a1	A-S03a	526526	542839	48	1.5 (4.0-5.5m)	4,452	6,678
	A-S03b1	826618	842774	51			
	A-S03	826627	842800	43			
A-S03c1	A-S03c	826683	842715	50	1.5 (1.0-2.5m)	5,601	8,402
	A-S03b1	826618	842774	41			
	A-S03	826627	842800	51			
					Sub-Total:	10,053	15,080
					Total:		57,444

#### Note:

- [1] For such sample with contamination detected, the full depth of soil sampling is taken as contaminated. Besides, a depth of 0.5m above and below that sampling depth respectively will be taken as contaminated as a conservative estimate. For example, for the sampling depth of 3.0-3.5 mgbl with contaminated laboratory testing finding, the vertical extent of contamination will be estimated from 2.5mgbl (i.e. 3mbgl - 0.5m) to 4mbgl (i.e. 3.5mbgl + 0.5m), and the vertical extent of contamination is therefore estimated as 1.5m.
- [2] The "Estimated Plan Area in which the Horizontal Contaminated Area (m<sup>2</sup>) Lies" was computed by a software call "MicroStation". (i.e. common graphical software similar to "AutoCad") as described in Section 6.1.1 in the endorsed CAR/RAP for Area A

#### 4.2 Remediation Method

For the detailed remediation method for treating arsenic contaminated soil, please refer to Section 7 in the endorsed CAR/RAP for Area A.

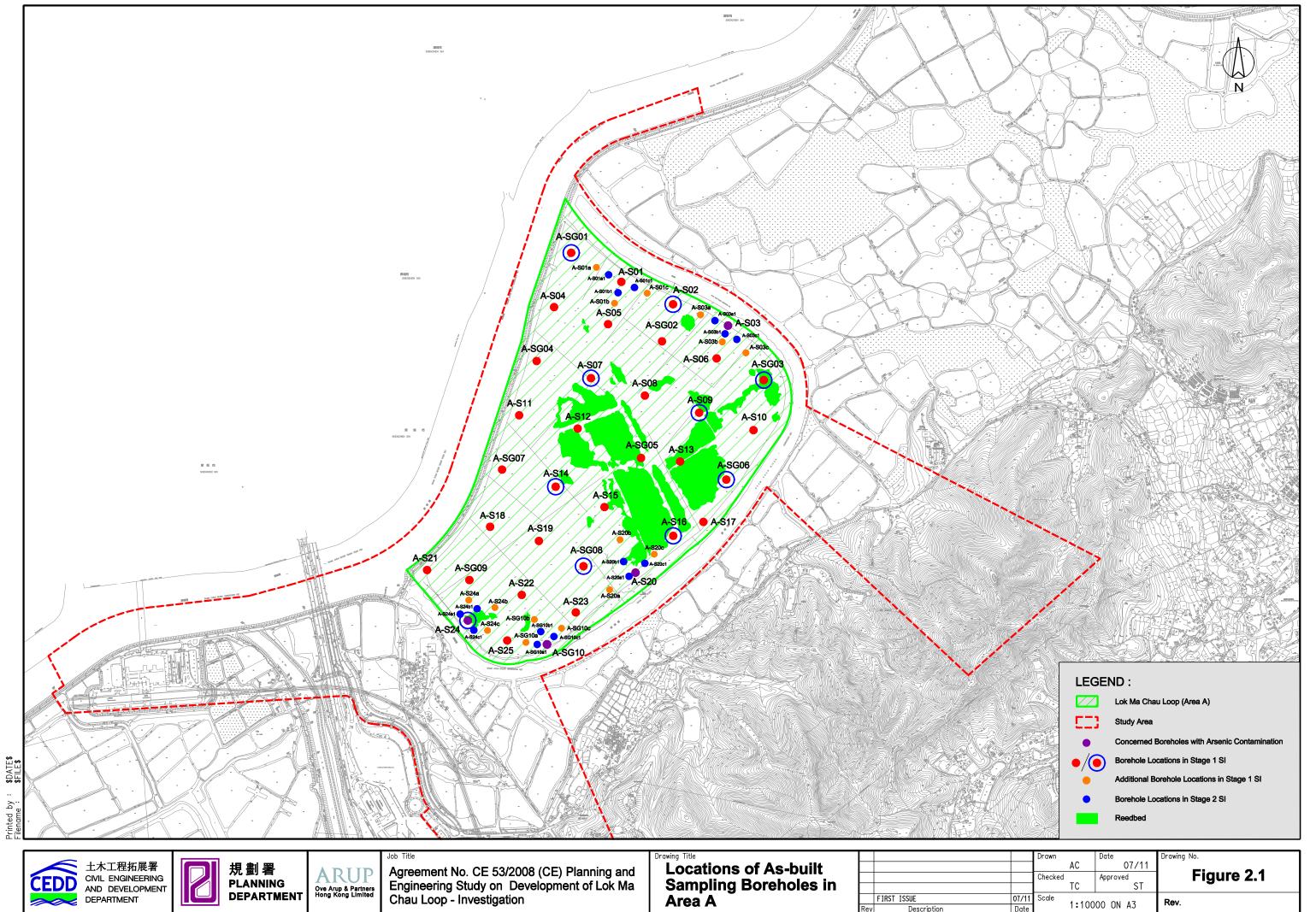
### **5** Conclusion and Recommendation

To confirm the possible soil contamination extent within Area A, a Stage 2 SI were conducted between 27 May 2011 and 2 July 2011 which involved sampling and testing of soil samples from 15 boreholes at the same sampling depth intervals (i.e. 1.5m, 3.0m, and 4.5m) as in Stage 1 SI.

According to the testing results, no further Arsenic exceedances were found at the sampling depths where such contamination was detected previously in Stage I SI. However, Arsenic concentrations in the soil samples collected from A-S03a1 at 4.5-4.95 mbgl and from A-S03c1 at 1.5-1.95 mgbl have marginally exceeded the RBRGs of Rural Residential land uses. These two boreholes were considered as two additional contaminated boreholes and their respective possible contamination zones have been estimated.

Based on the Stage 2 SI results, the possible soil contamination extent within Area A have been updated and the quantity of contaminated soil was estimated to be 57,443 m³ (including those from A-S03a1 and A-S03c1). Remediation of the contaminated soil will be conducted as stipulated in the endorsed CAR/RAP for Area A.

## **Figures**

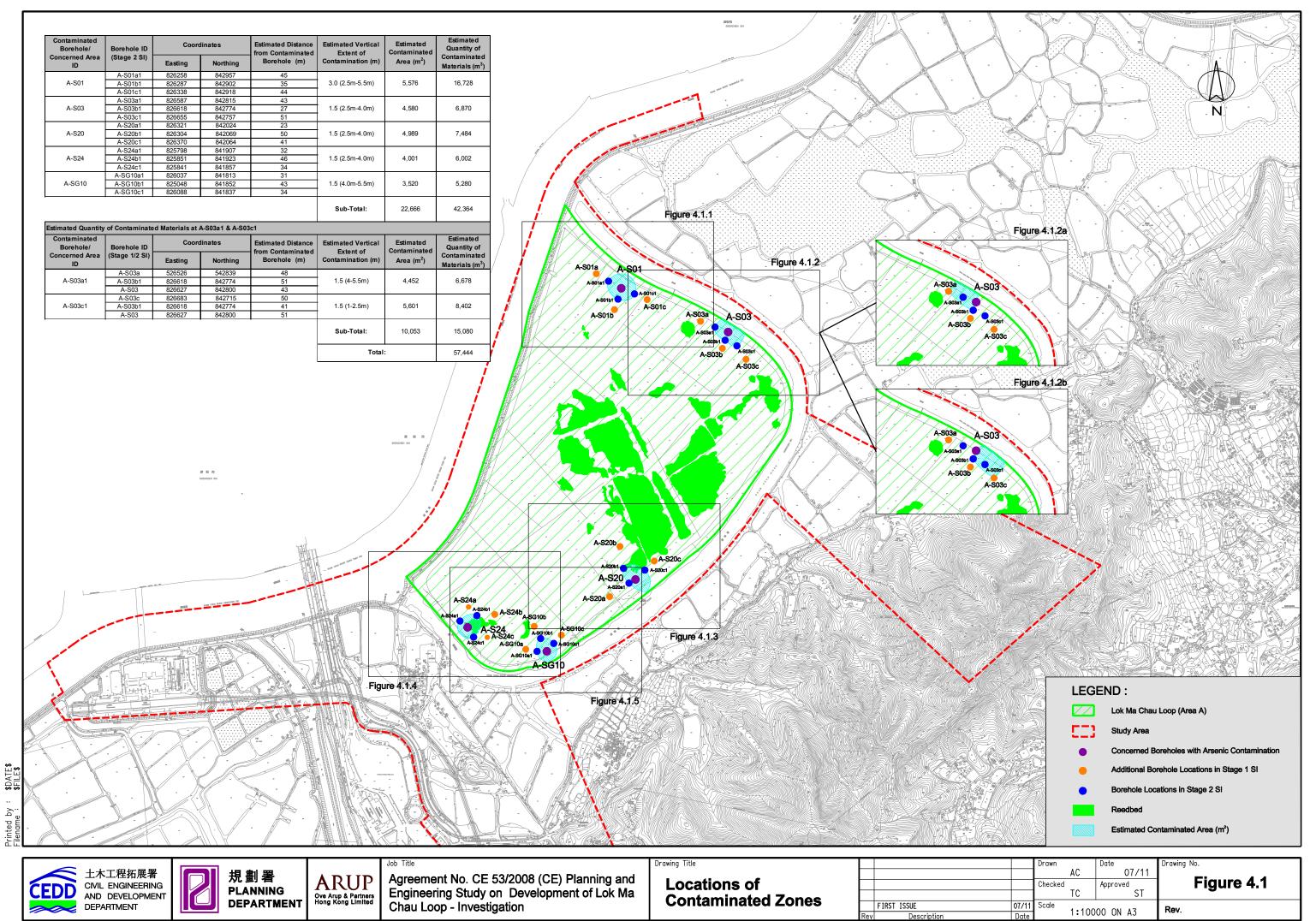




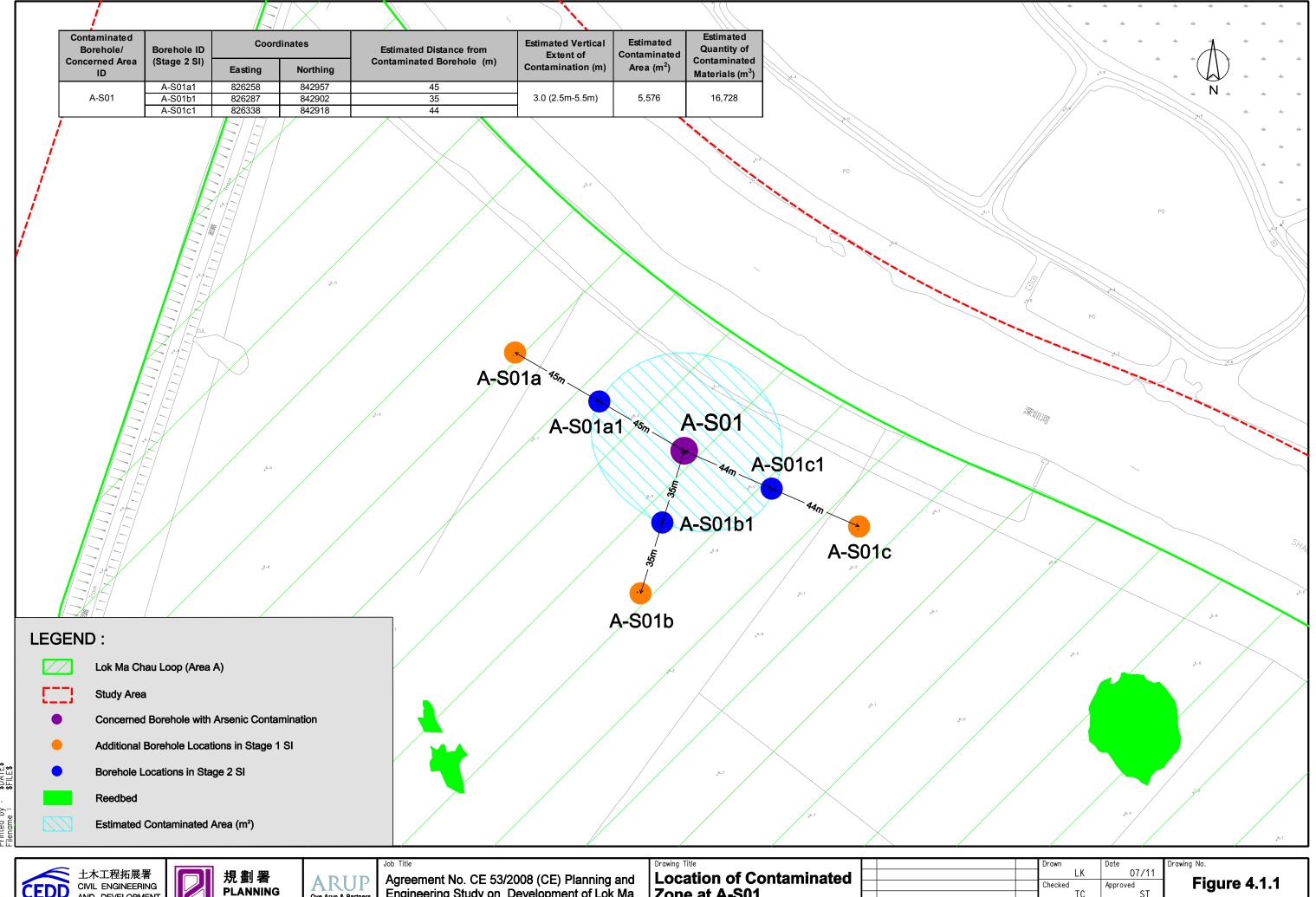
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Chau Loop - Investigation

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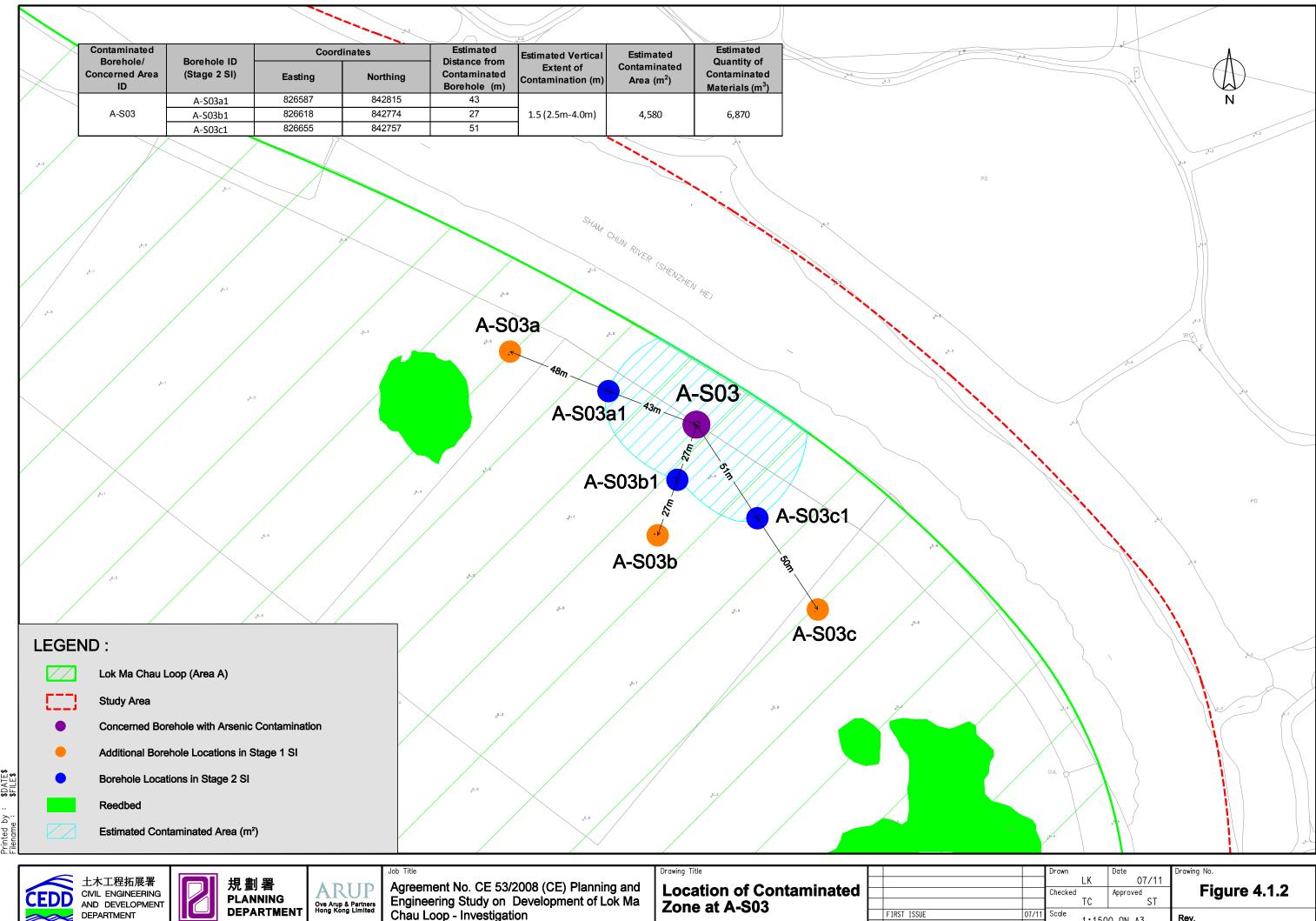


Ove Arup & Partners Hong Kong Limited

Engineering Study on Development of Lok Ma Chau Loop - Investigation

Locat	ion of Contaminated
Zone	at A-S01

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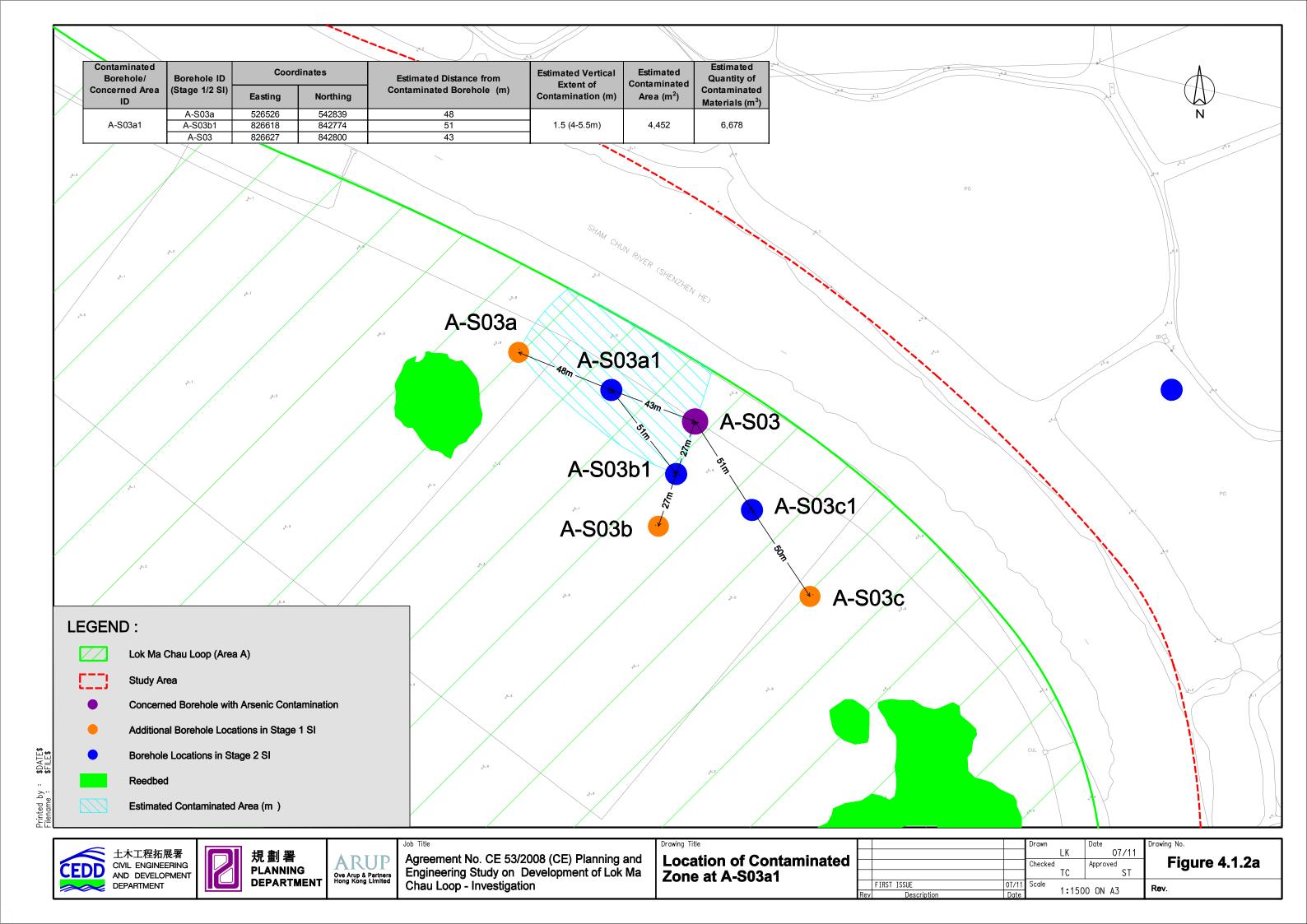
DEPARTMENT

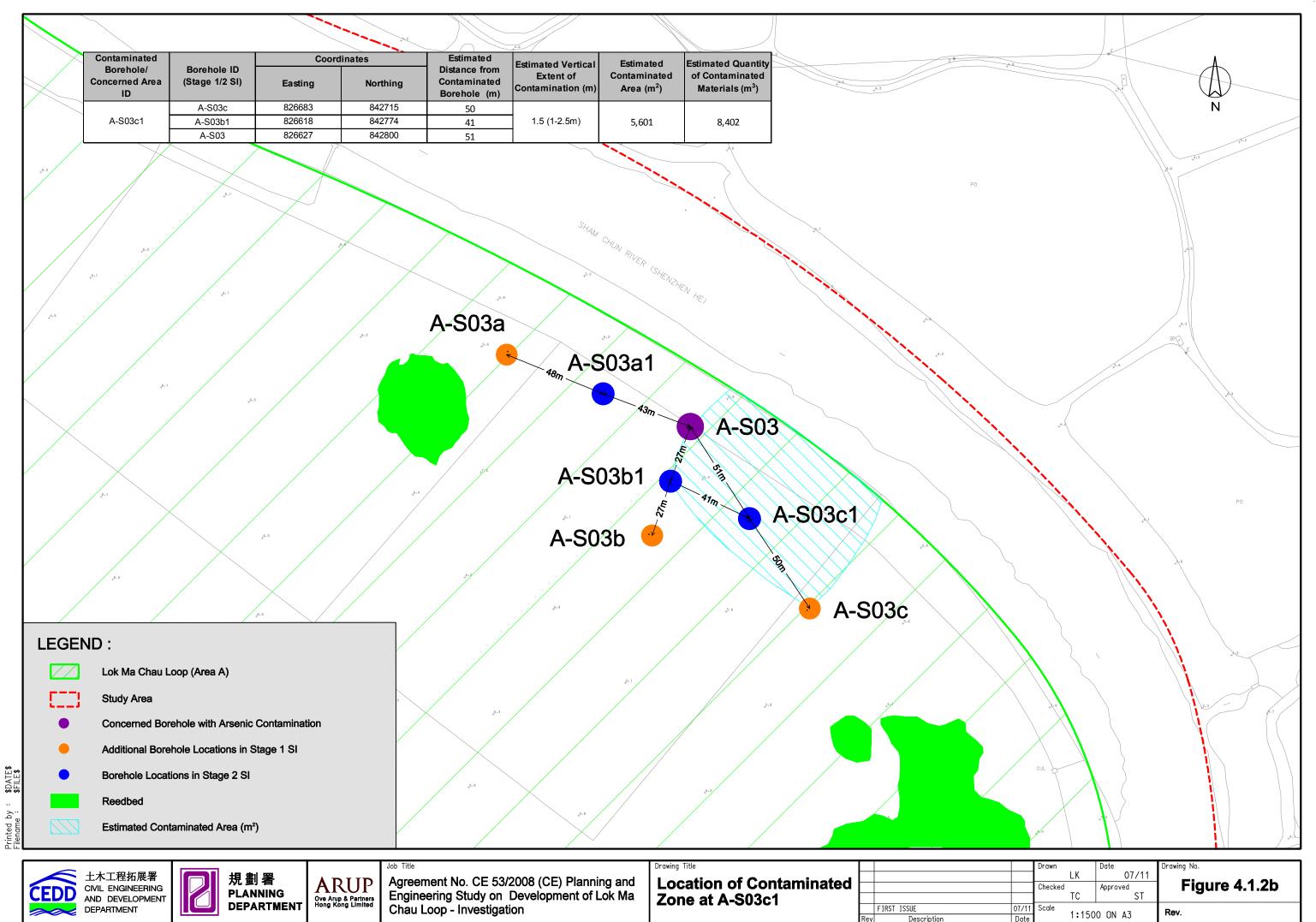
**DEPARTMENT** 

Ove Arup & Partners Hong Kong Limited

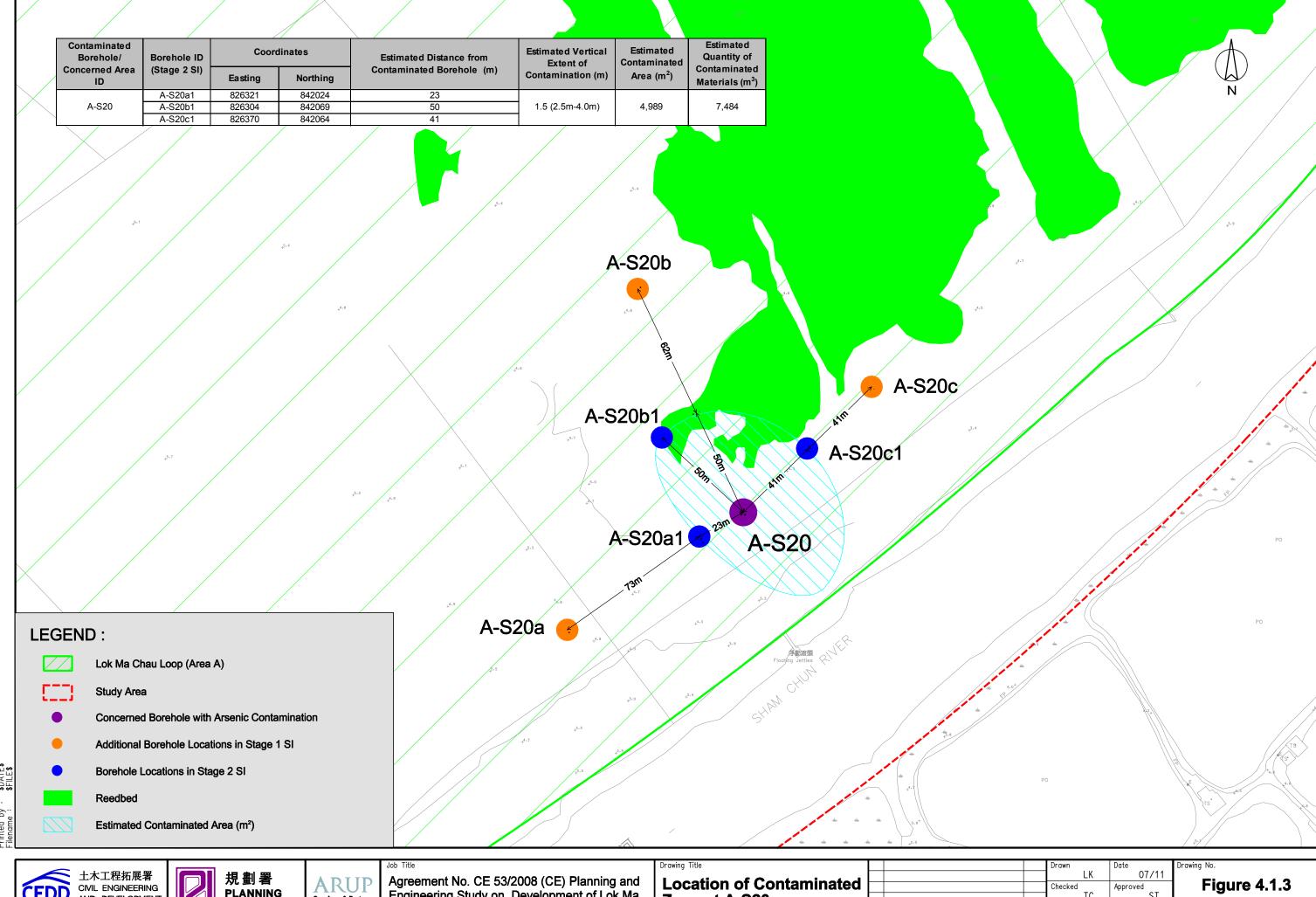
Chau Loop - Investigation

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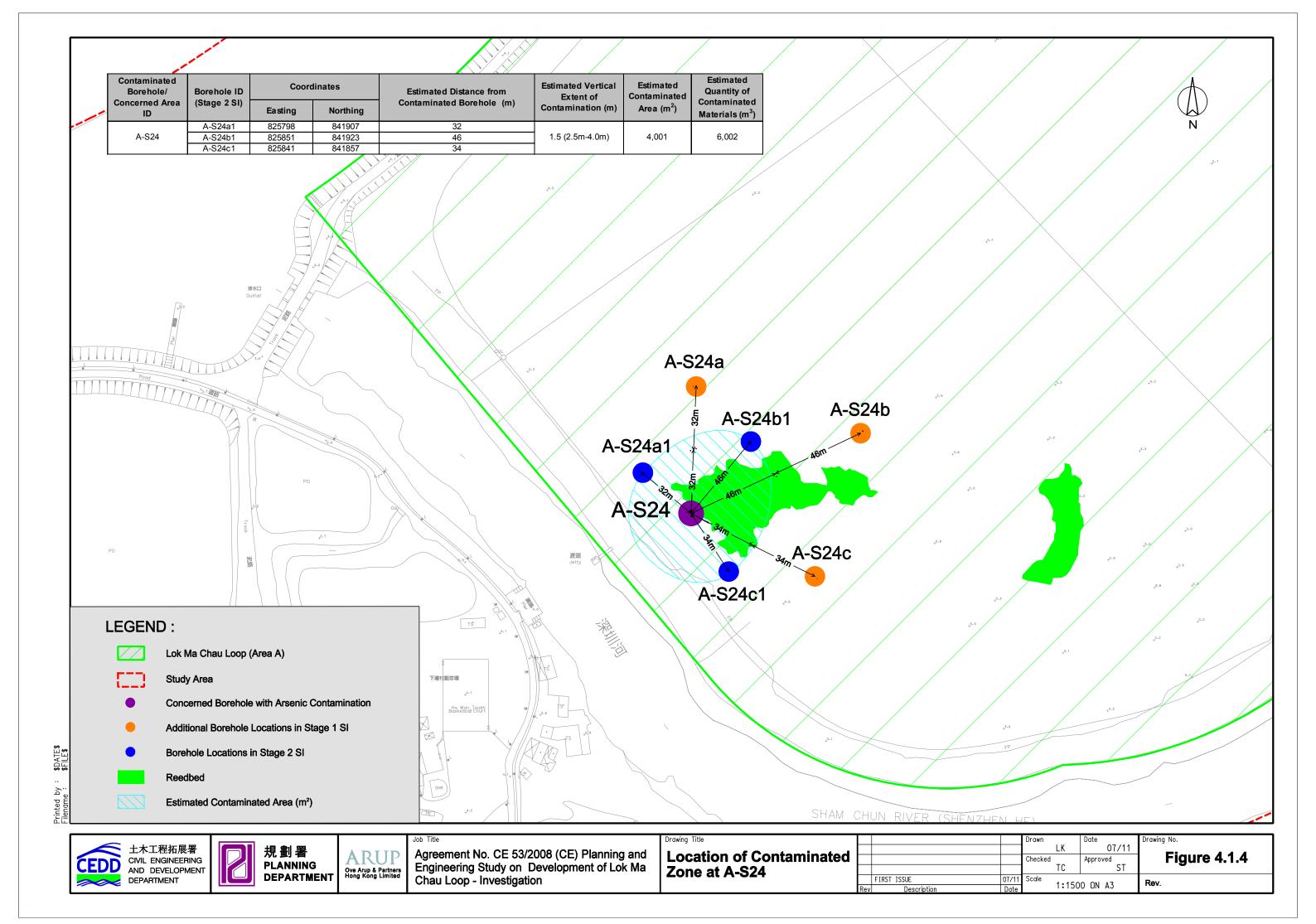
**PLANNING DEPARTMENT** 

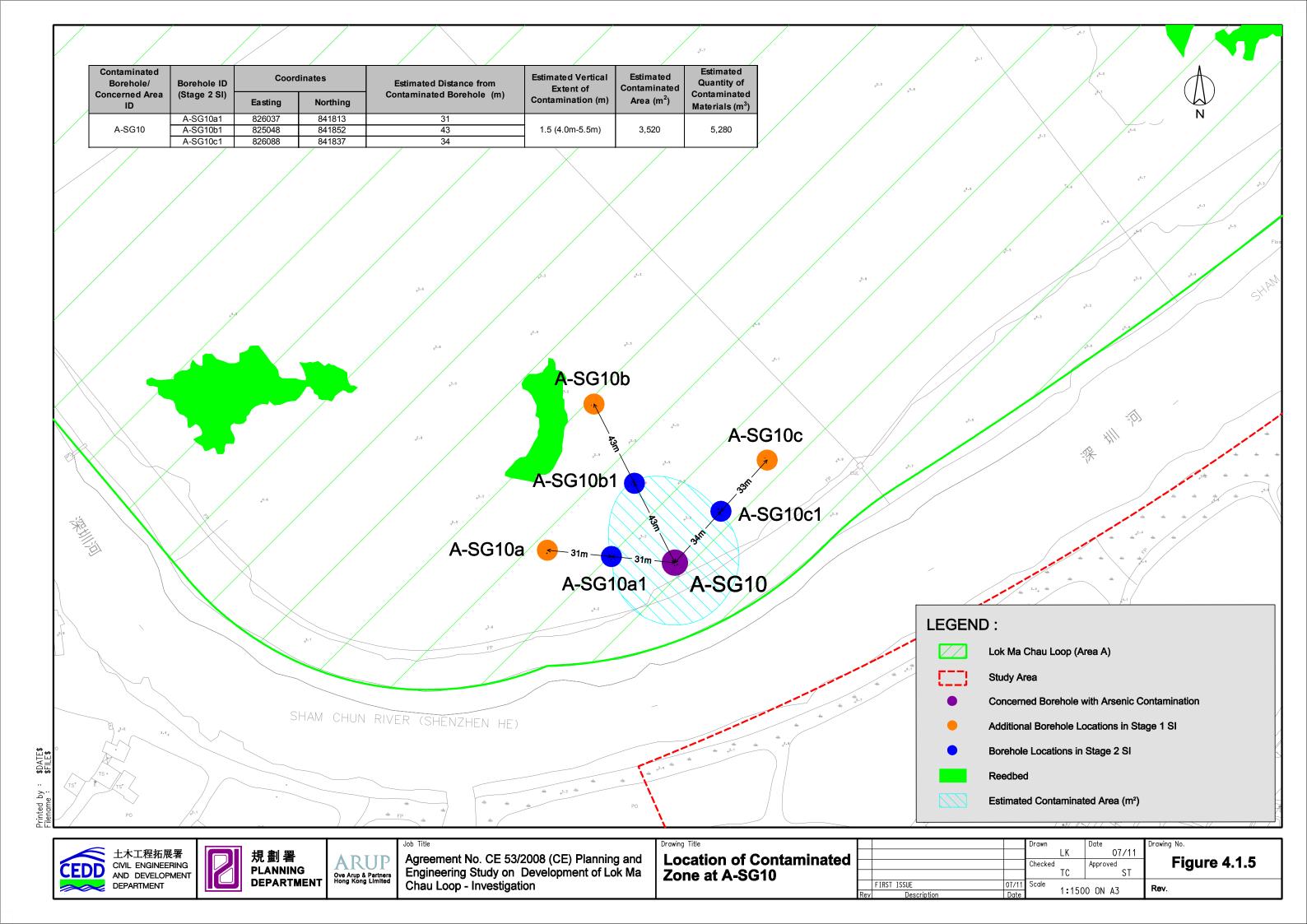
Ove Arup & Partners Hong Kong Limited

Engineering Study on Development of Lok Ma Chau Loop - Investigation

Zone at A-S20

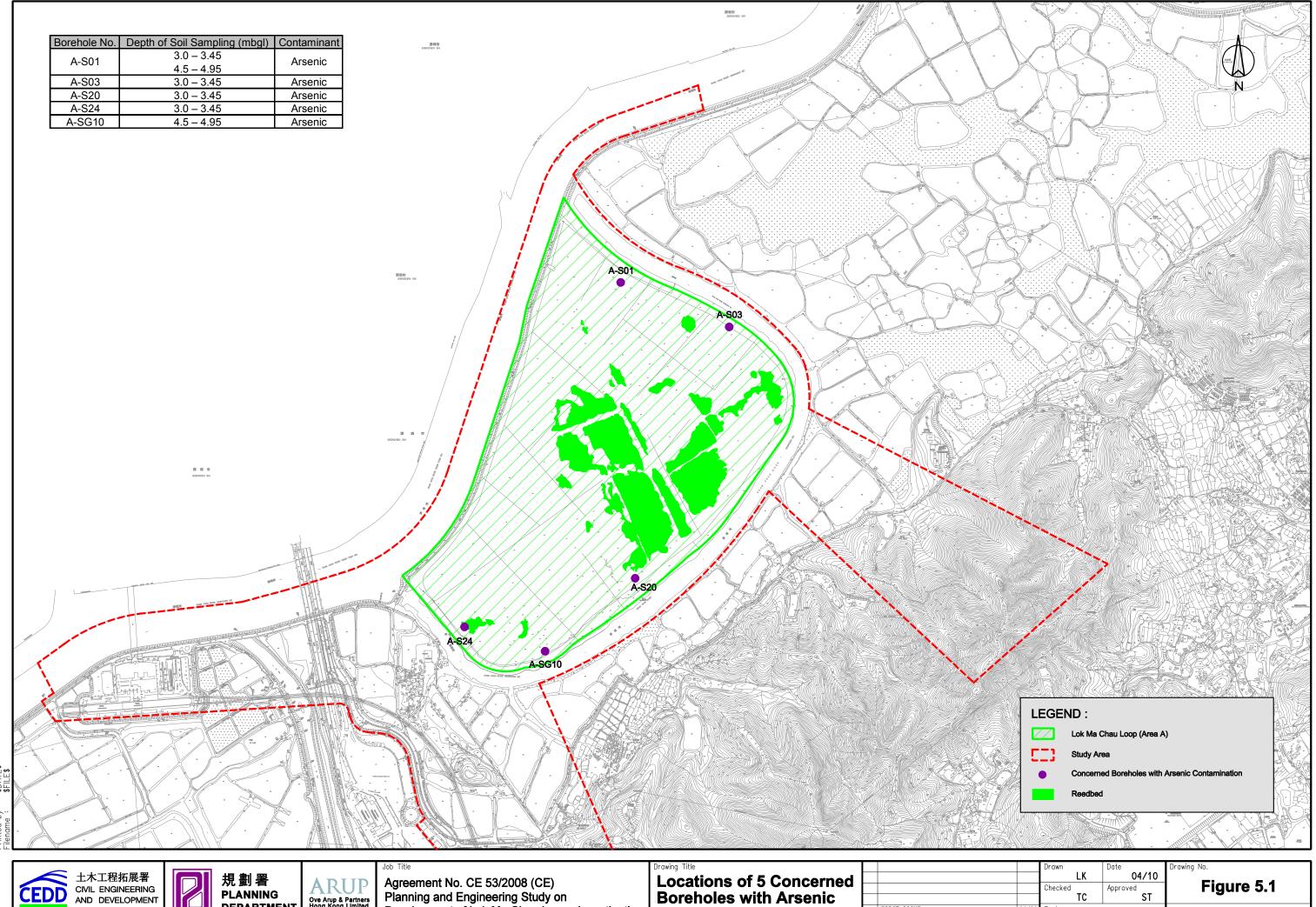
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### **Appendix A**

Figures Extracted from Contamination Assessment Report and Remediation Action Plan for Area A July 2010



AND DEVELOPMENT DEPARTMENT

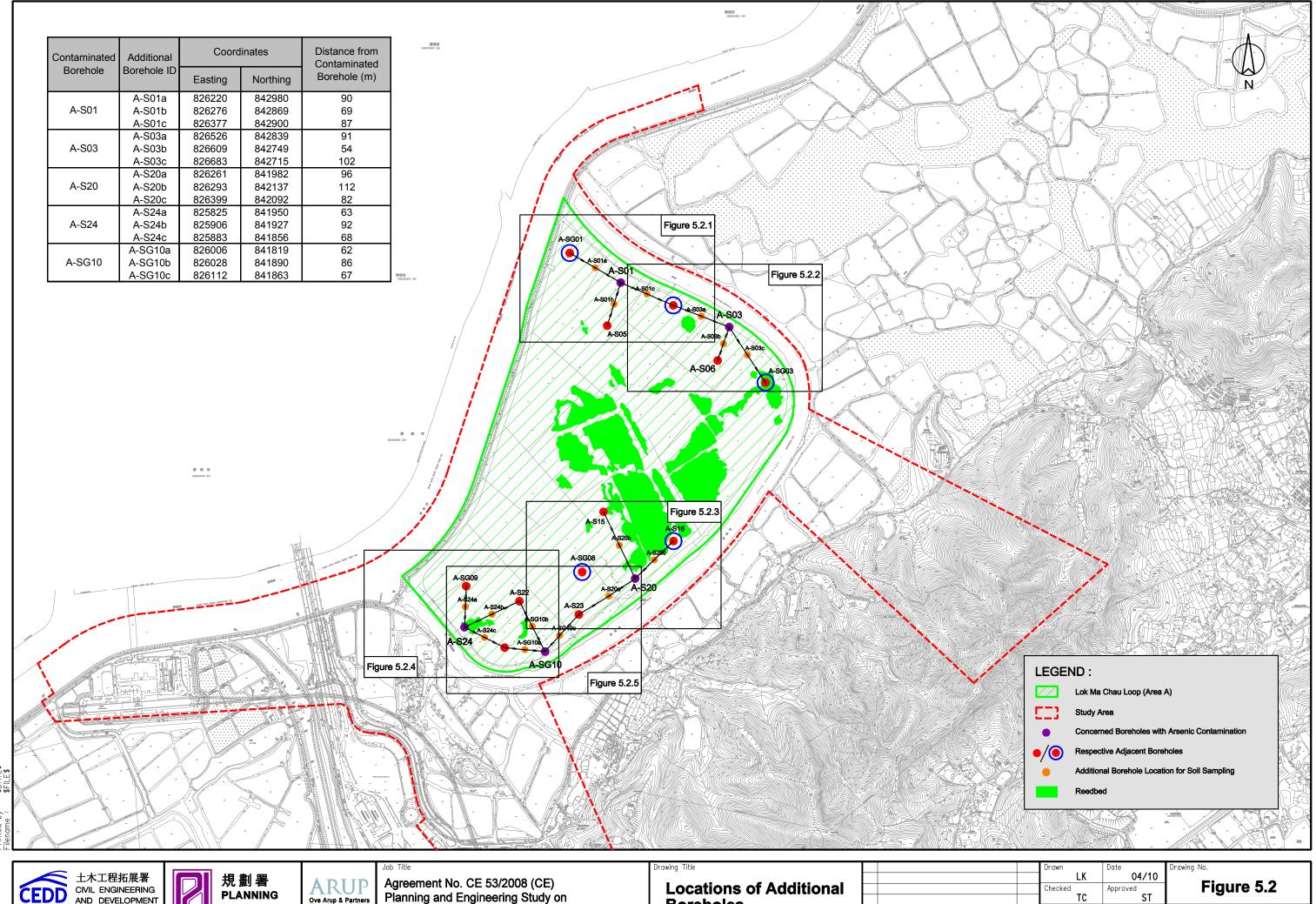
規劃署 PLANNING **DEPARTMENT** 

Ove Arup & Partners Hong Kong Limited

Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation **Boreholes with Arsenic** Contamination

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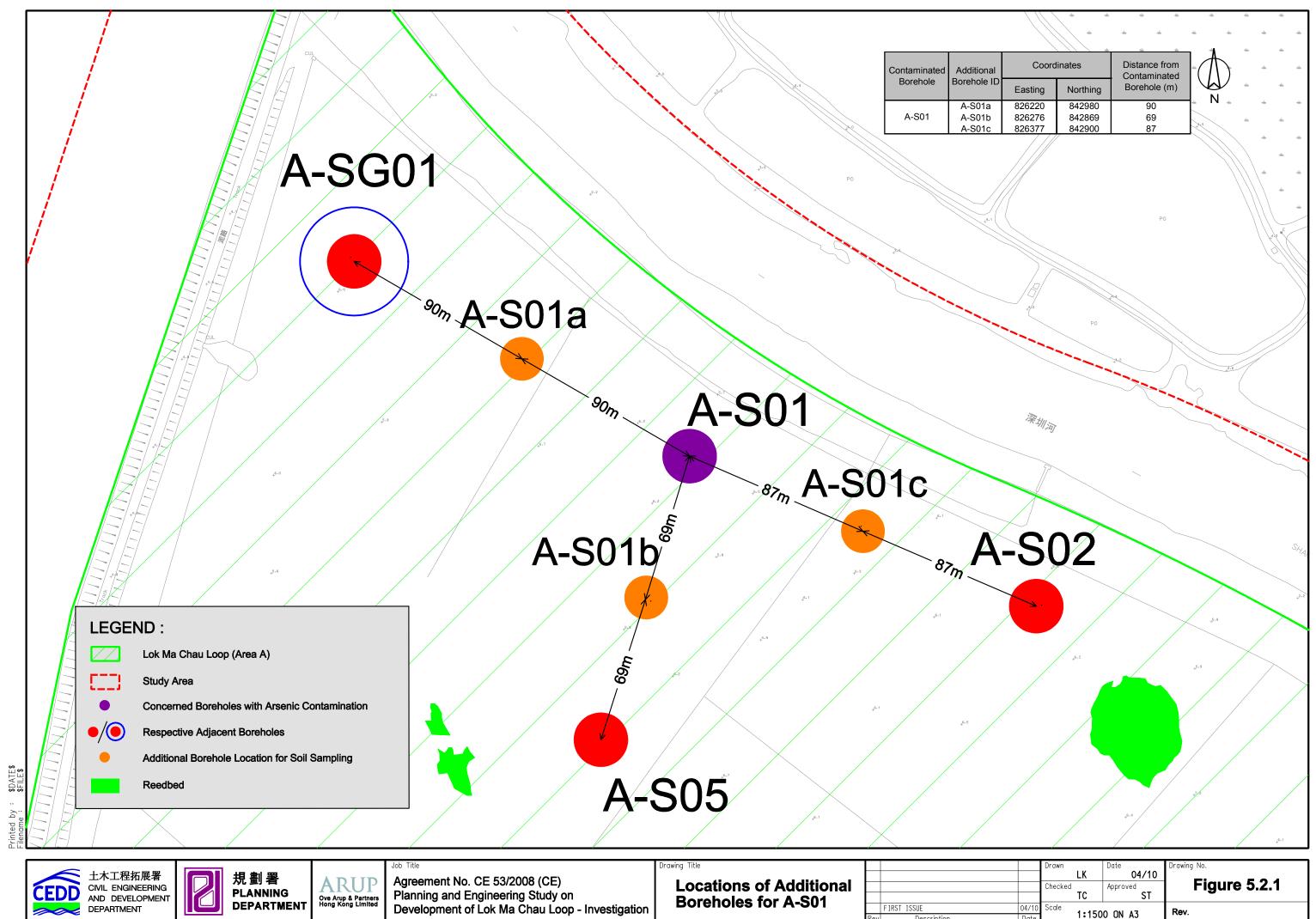


Ove Arup & Partners Hong Kong Limited

Development of Lok Ma Chau Loop - Investigation

**Boreholes** 

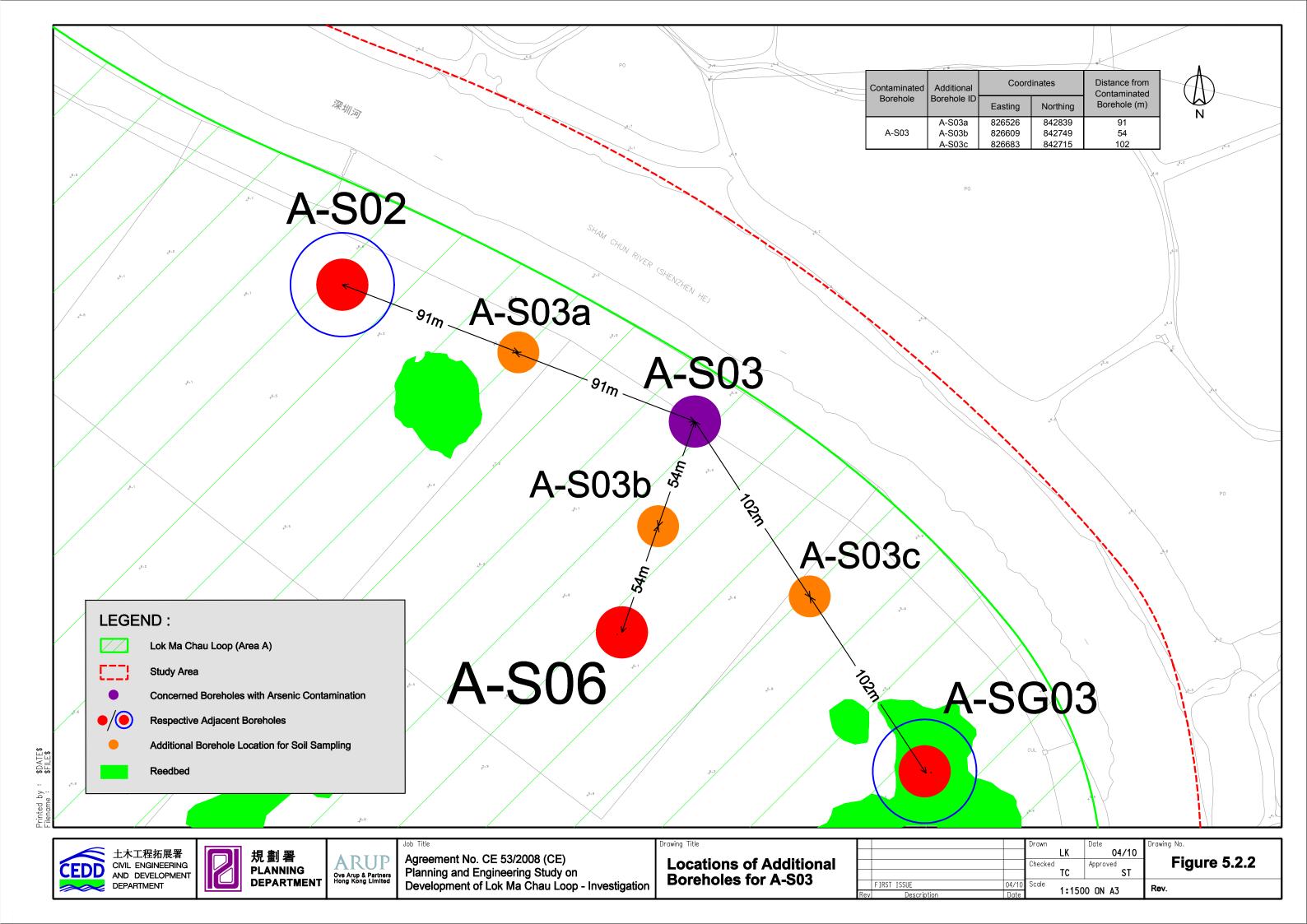
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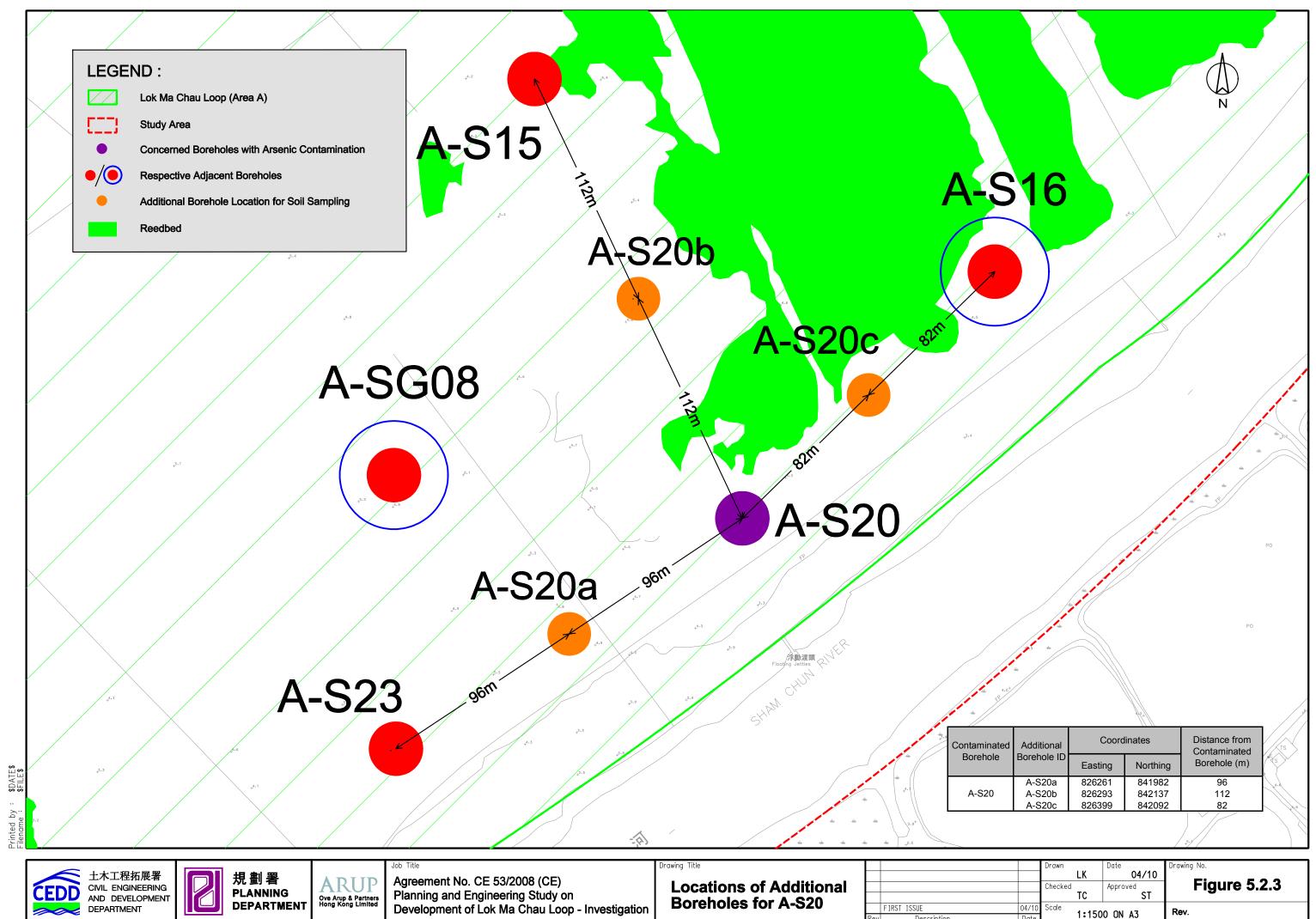




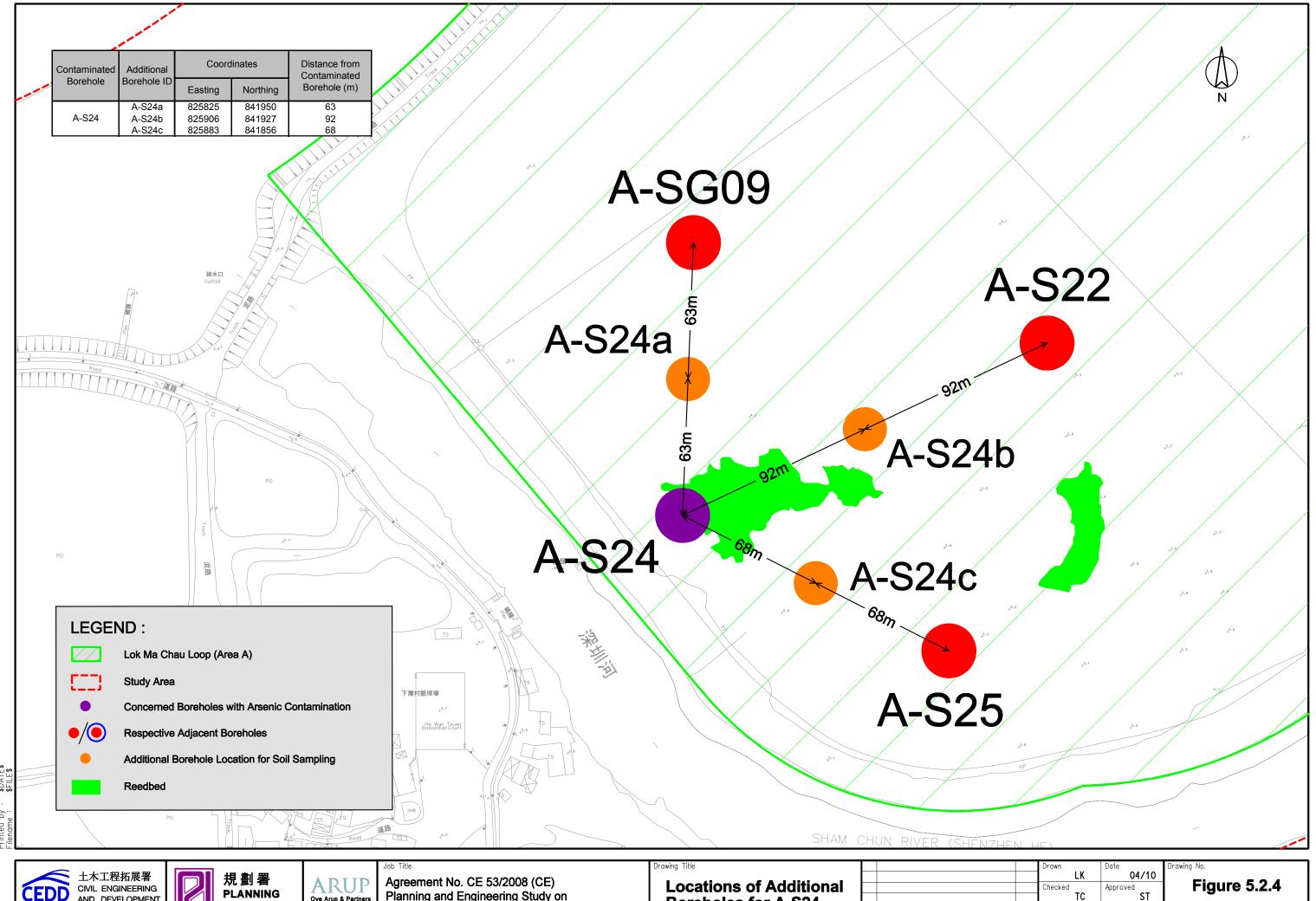
Development of Lok Ma Chau Loop - Investigation

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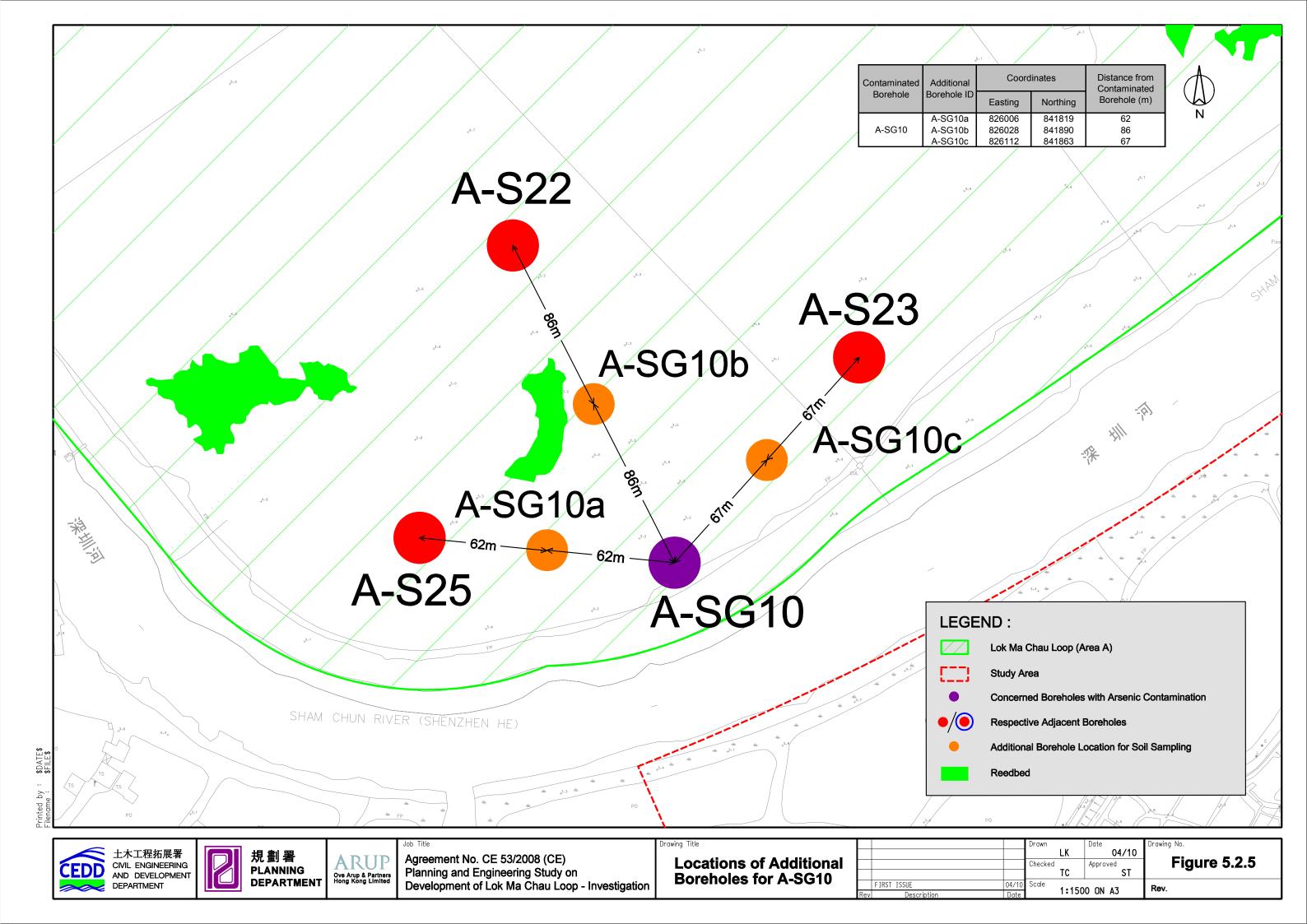
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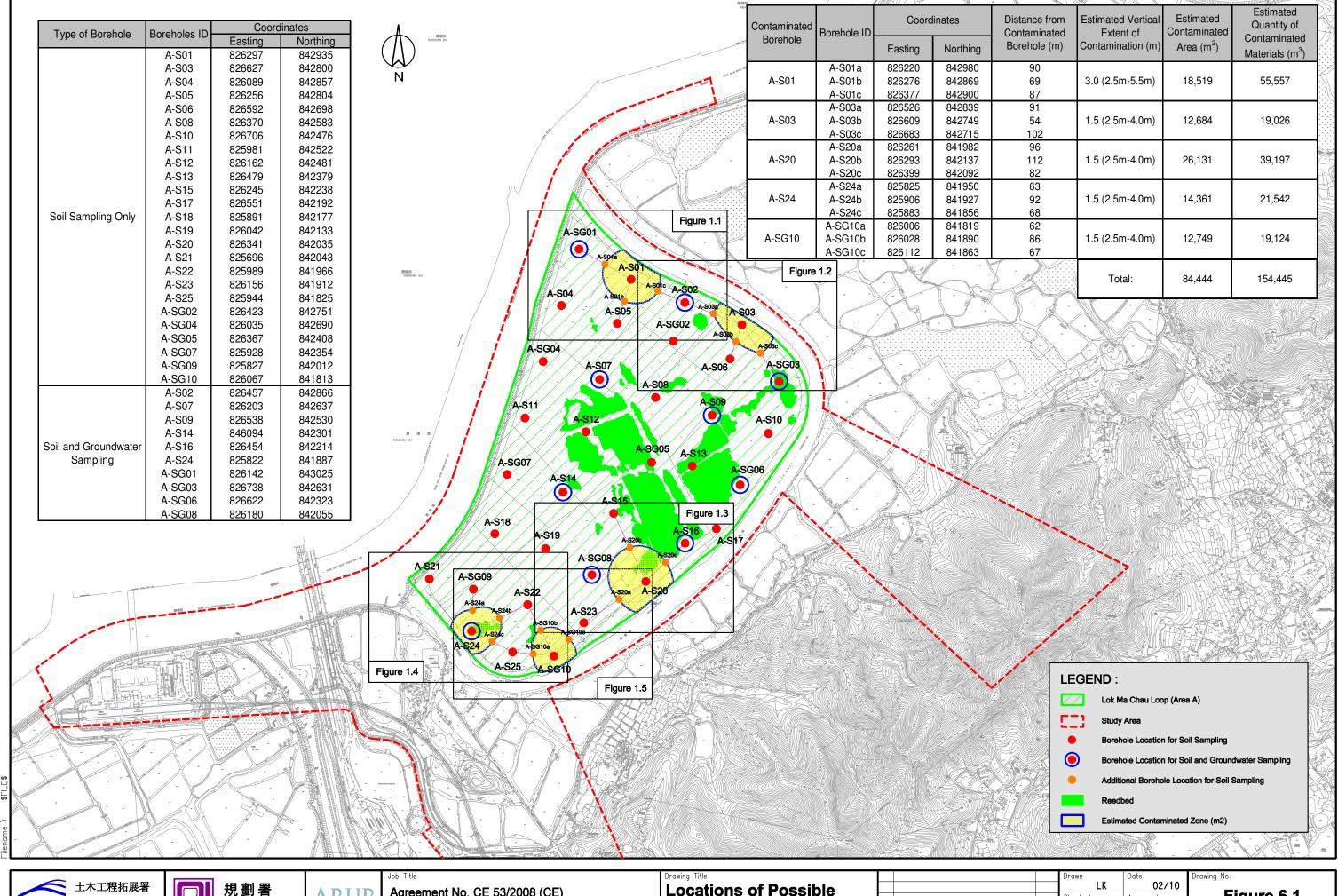
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Ove Arup & Partners Hong Kong Limited

Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation **Boreholes for A-S24** 

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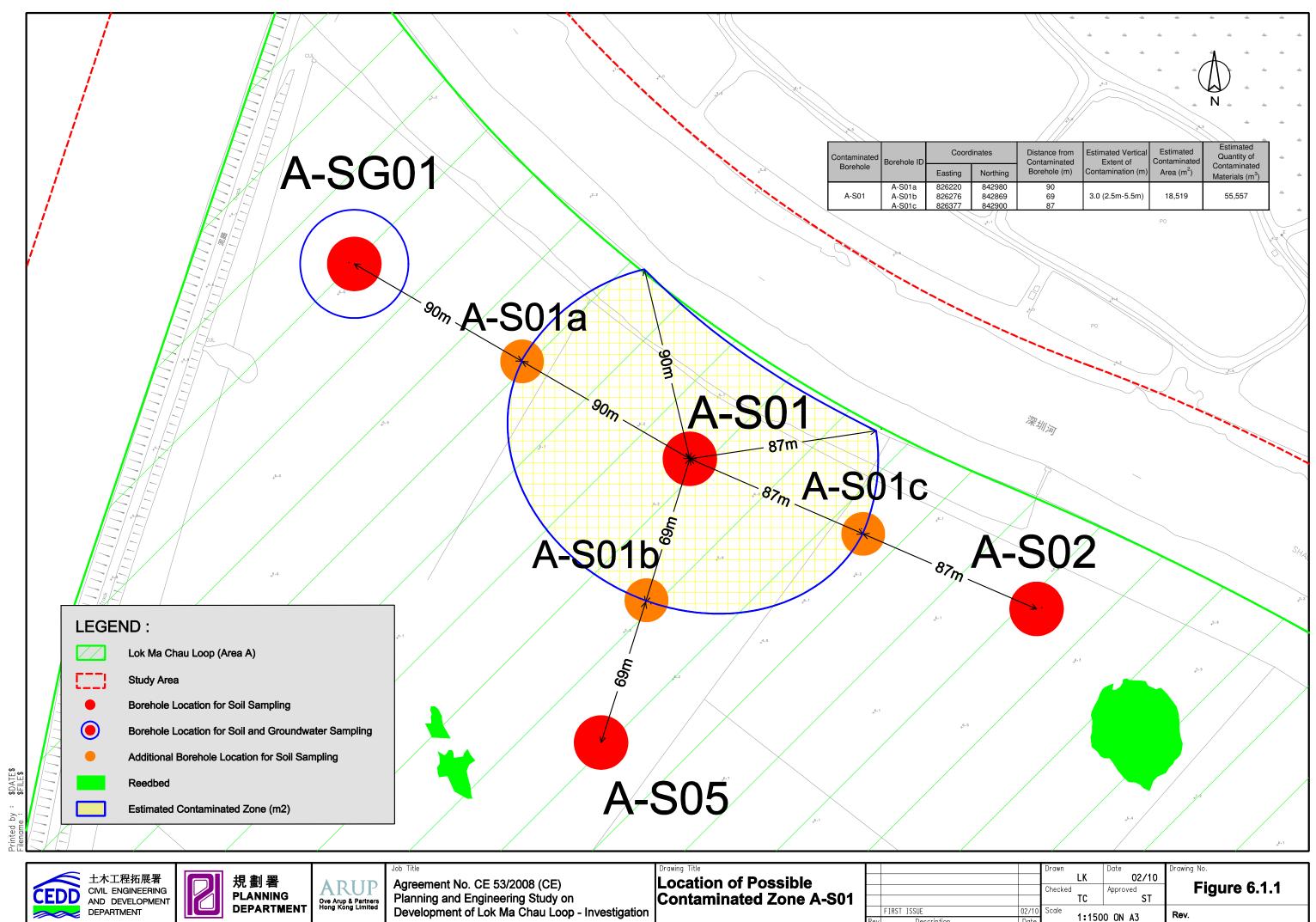
ARUP
Ove Arup & Partners
Hong Kong Limited

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on
Development of Lok Ma Chau Loop - Investigation

Locations of Possible Contaminated Zones

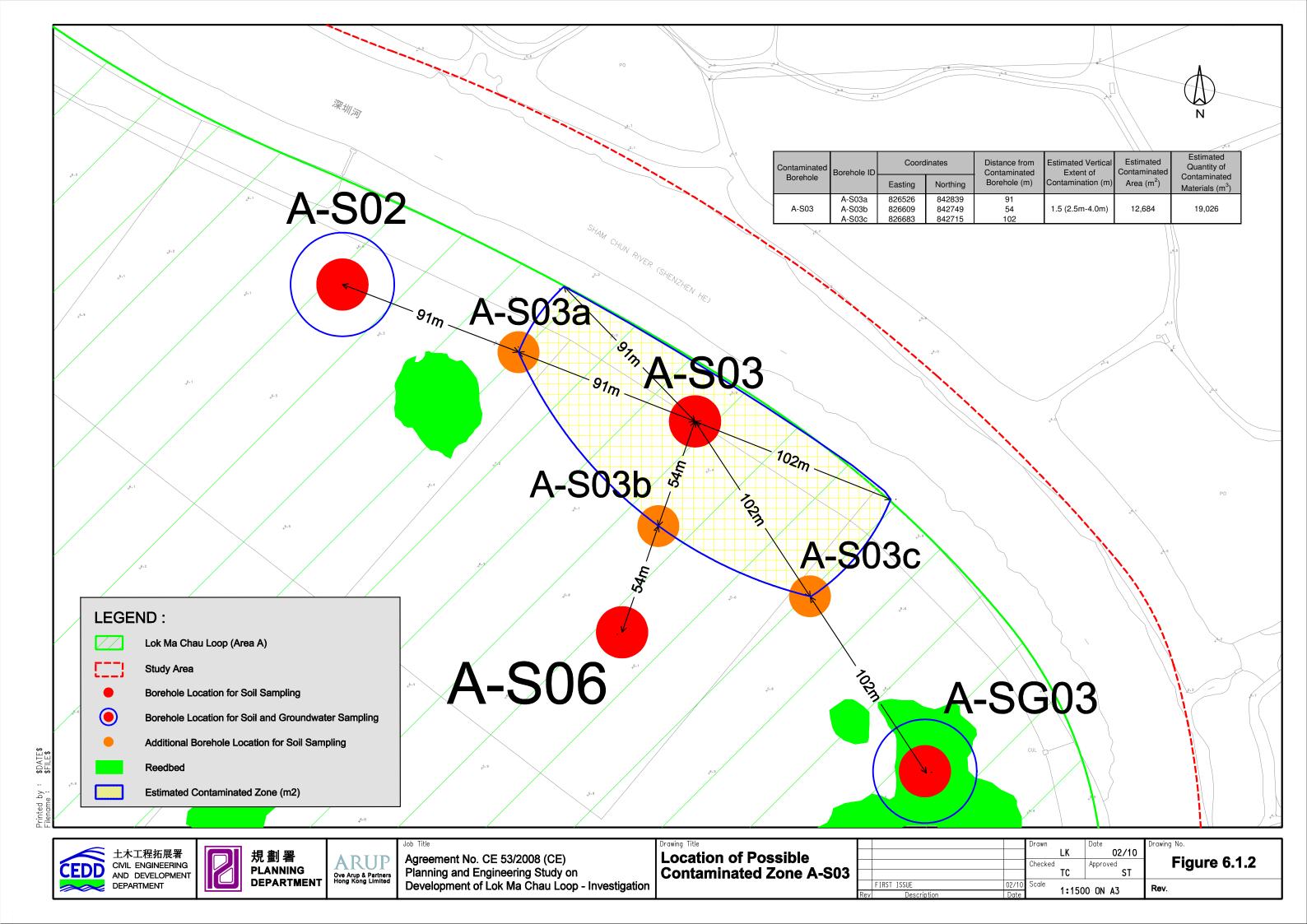
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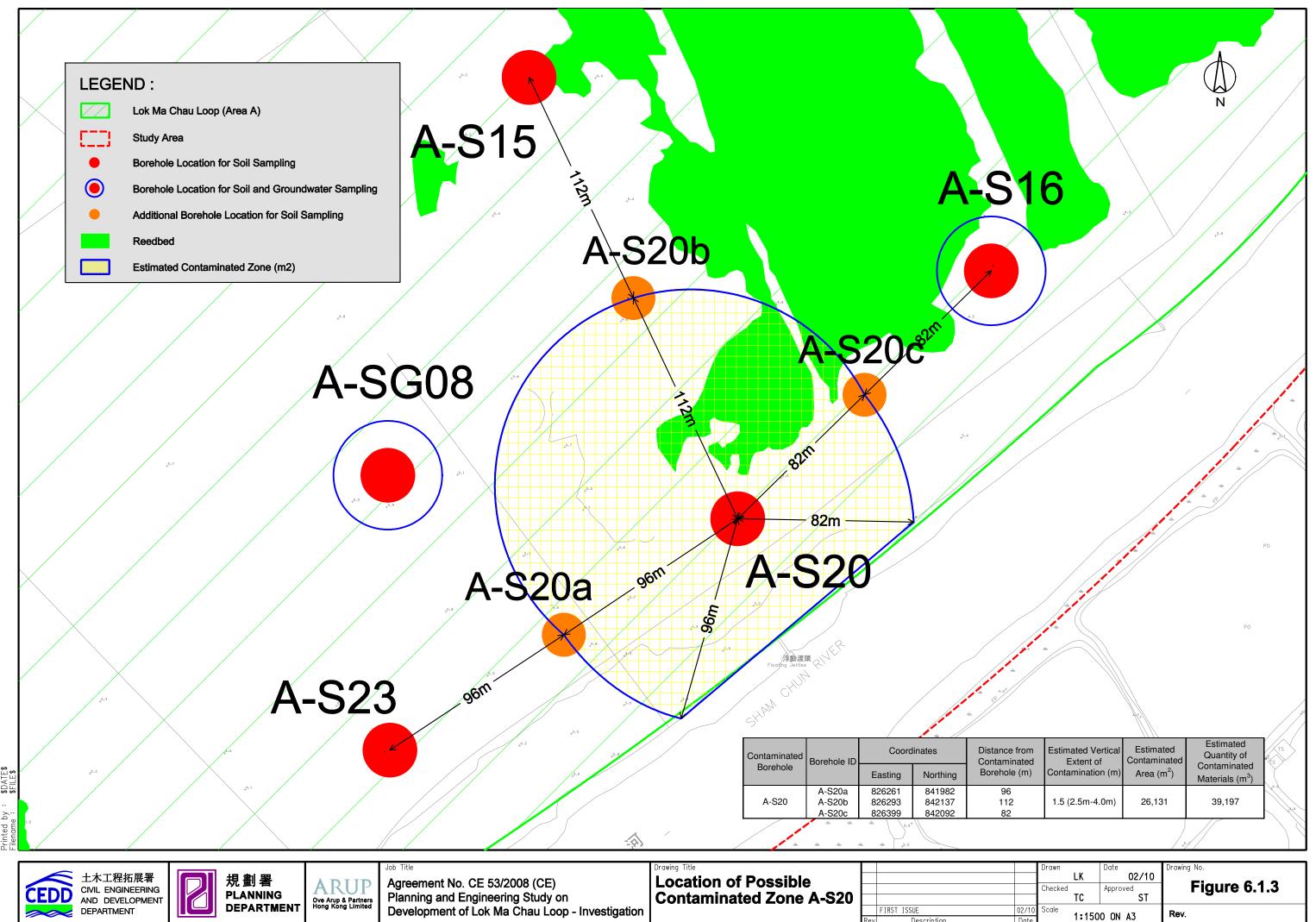
Figure 6.1

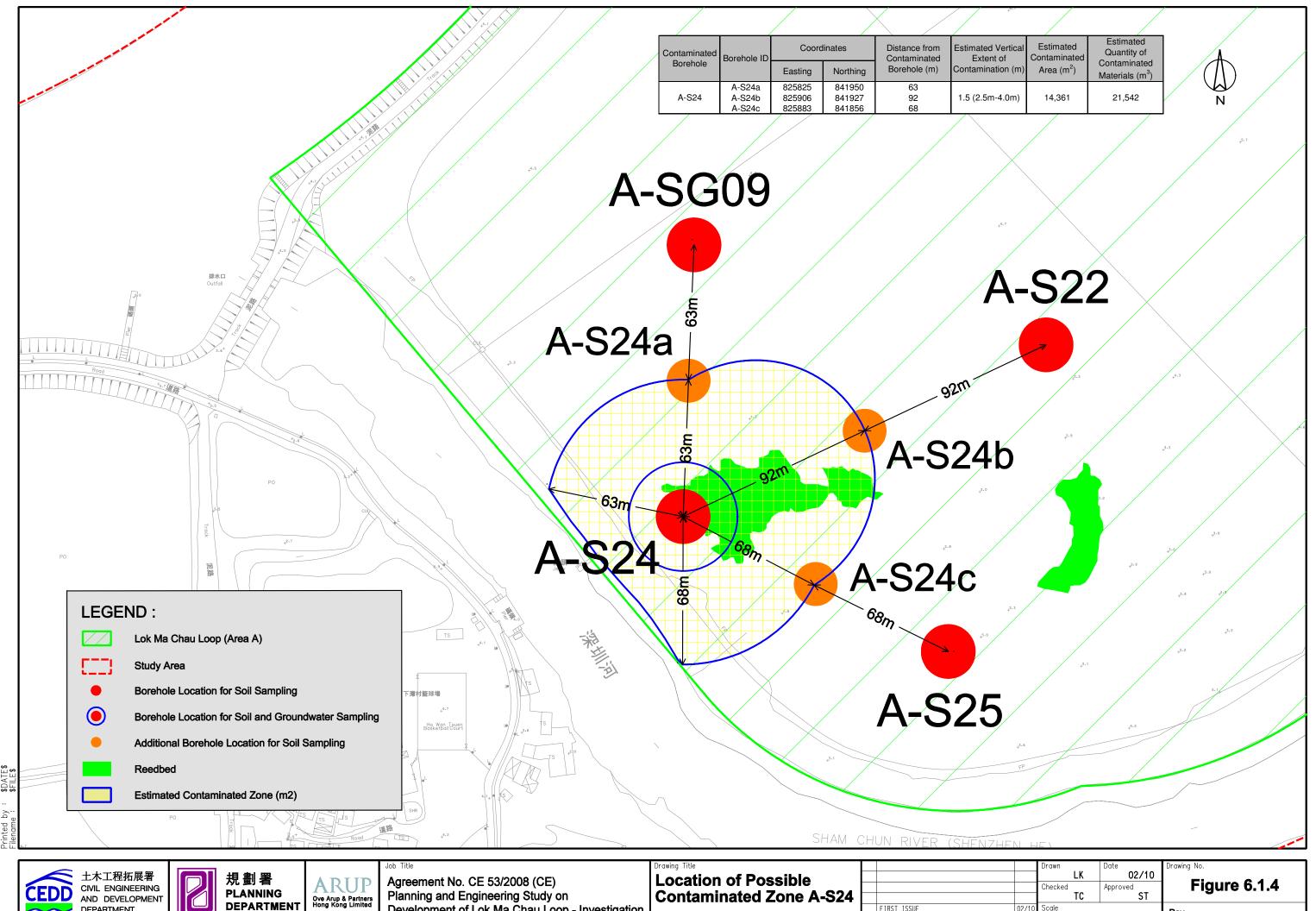




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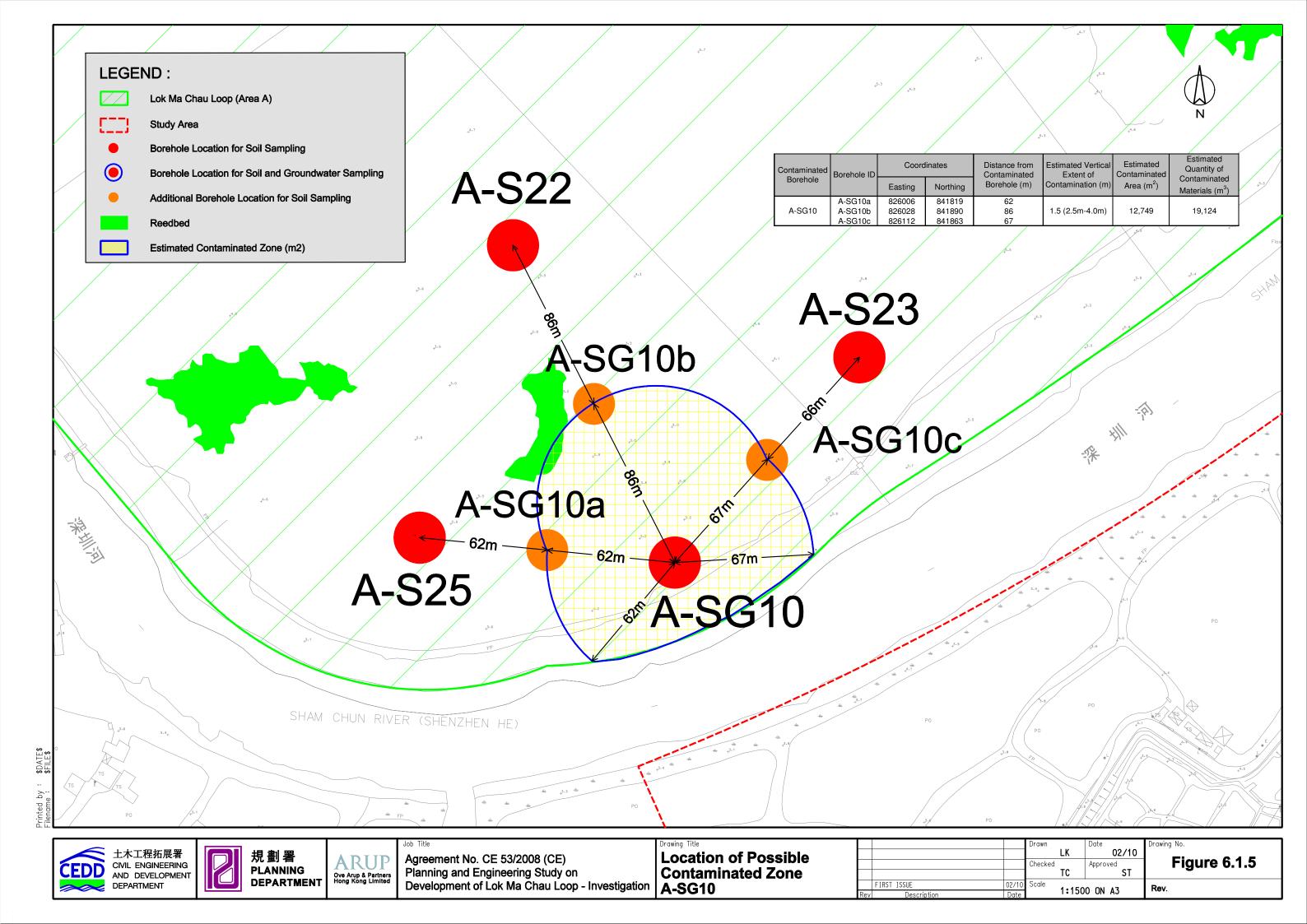




Ove Arup & Partners Hong Kong Limited

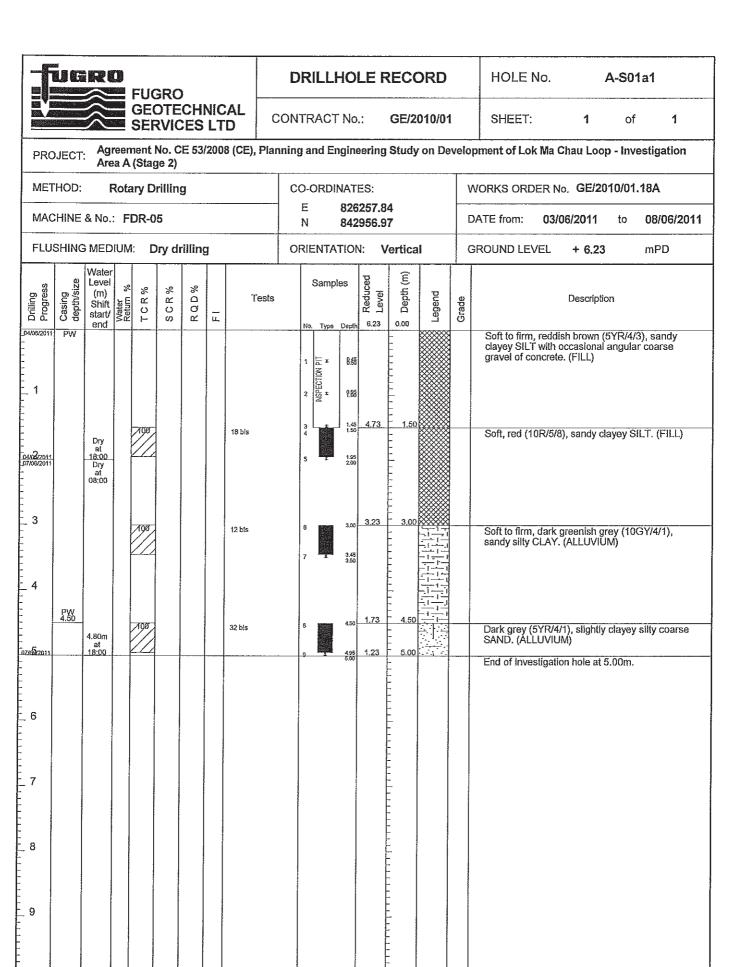
Development of Lok Ma Chau Loop - Investigation

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# **Appendix B**

Strata Log Records



Small Disturbed Sample Piston sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample 76mm Vibrocore Sample 100mm Vibrocore Sample Vibrocore Sub-sample

SPT Liner Sample

Standard Penetration Test In-situ Vane Shear Test Permeability Test Pressuremeter Test Televiewer Survey Packer Test

Impression Packer Test Water Sample

Standpipe

Piezometer Tip

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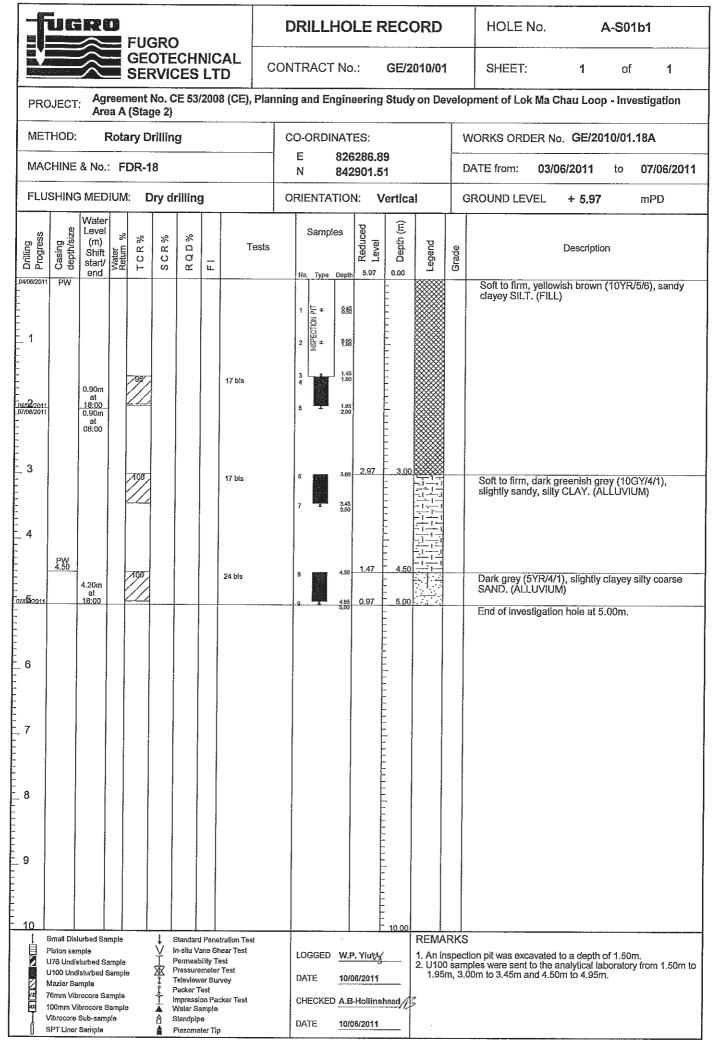
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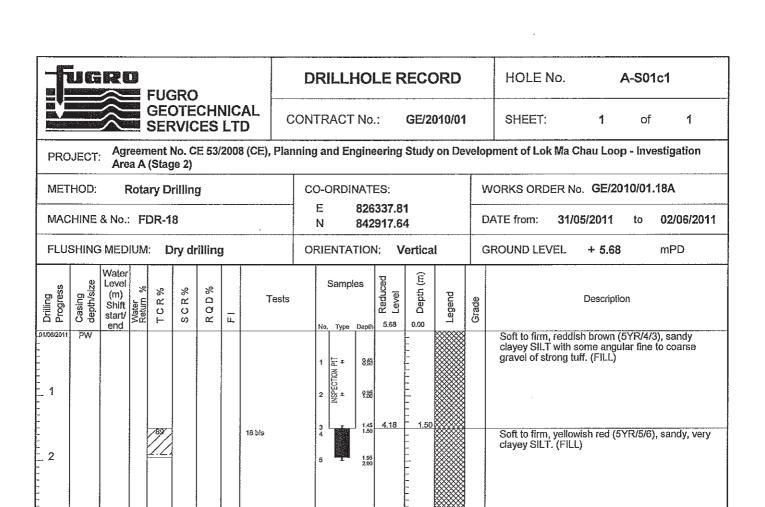
10/06/2011

CHECKED A.B.Hollinshead 10/06/2011

REMARKS

An inspection pit was excavated to a depth of 1.50m.
 U100 samples were sent to the analytical laboratory from 1.50m to 1.95m, 3.00m to 3.45m and 4.50m to 4.95m.





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LOGGED W.P. Yiu

10/06/2011

10/06/2011

DATE

DATE

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02/02/201

6

7

8

9

PW 4.50

700

Dry at 18:00 3,40m at 08:00

Dry at

Small Disturbed Sample

U76 Undisturbed Sample

U100 Undisturbed Sample

76mm Vibrocore Sample

100mm Vibrocore Sample

Vibrocore Sub-sample

SPT Liner Sample

Piston sample

Mazier Sample

8 bls

19 bls

Standard Penetration Test

In-situ Vane Shear Test

Impression Packer Test

Permeability Test Pressuremeter Test

Televiewer Survey

Packer Test

Water Sample

Piezometer Tip

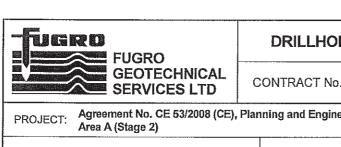
Standpipa

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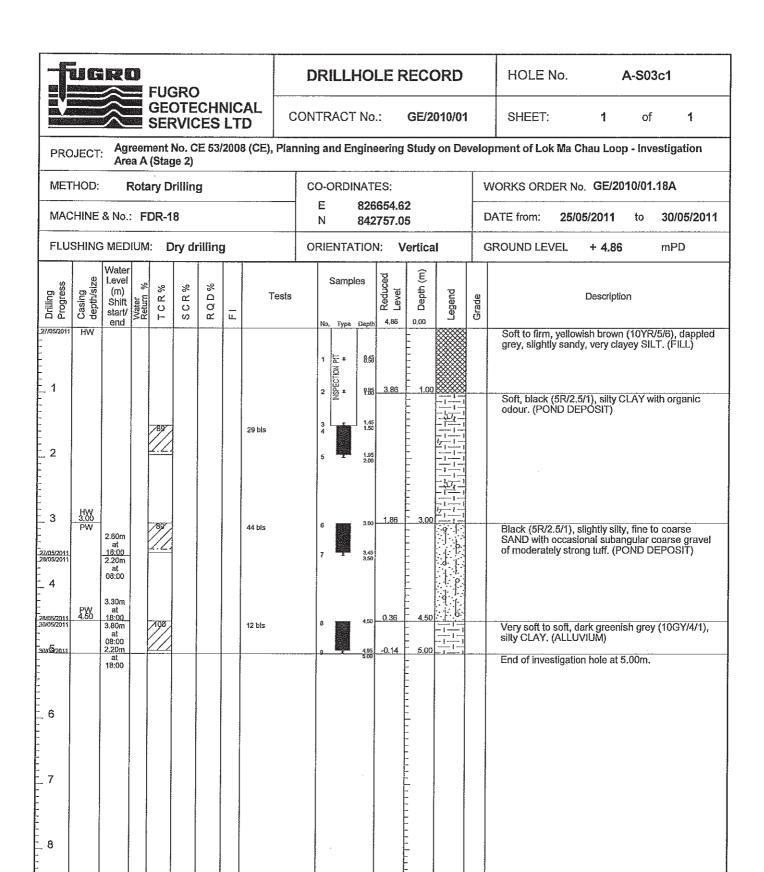


DRILLHOLE	RECORD	HOLE No.		<b>∆-</b> S03a1		
CONTRACT No.:	GE/2010/01	SHEET:	1	of	1	

METHOD:   Rotary Drilling   CO-ORDINATES:   WORKS ORDER No.   GE/2010/01.18A		OLIVIOLO LID																					
## Continues of Part	PROJECT: Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Area A (Stage 2)																						
## ACCHINE & No FDR-05    N	METHOD	: F	Rota	ry Dr	rillin	g										WORKS ORDER No. GE/2010/01.18A							
Tests Samples Sping Spin	MACHINE	. & No.:	: FC	PR-0	5										E	ATE from:	31/05/2011	to	02/06/2011				
Semple   Part	FLUSHIN	G MED	IUM:	D	ry d	rilling	3		OR	IENTA	TIOI	N: V	'ertica	i	(	GROUND LEVEL + 5.94 mPD							
Description   Process	Drilling Progress Casing	Level (m) Shift start/	%	S S	S R	QD	ĪL.	Tests					1	Legend	Grade	စ္ Description							
Small Disturbed Sample Pilson sampla U75 Undisturbed Sample U100 Undisturbed S	01/09/2011 PW	1.02m at 18:00 0.88m 08:00	The National Action 1997 (1997) and the National Action 1997 (1997	108	Ø	Δ.	L	14 bis	1 1 2 3 3 4 5 6 7	NSPECTION PIT	9.55 9.55 1.50 1.55 2.00	1.44	4.50		9	Soft, dark (	greenish grey (10	GY/4/1	), silty CLAY.				
Vibrocore Sub-sample	. 7 . 8 . 9 . 9	sample disturbed S ndisturbed	Sample	***************************************	Ý X	In-situ \ Permea Pressur	/ane S bility T ernete	hear Test 'est r Test						1. An ir 2. U100	nspec O san	ction pit was ex	ccavated to a dept to the analytical and 4.50m to 4.95	n of 1.50 aborato	Om. Dry from 1.50m to				
SPT Liner Sample Piezometer Tip										10/00/2011													
	e e									DATE	10/	06/2011				***************************************			L				



-TUGRO FUGRO								DRILLHOLE RECORD								HOLE	HOLE No. A-S03b1					
SERVICES LID											CONTRACT No.: <b>GE/2010/01</b>								1	of	1	
PRO	DJECT:	Agı Are	reen a A	nent l (Stag	No. ( je 2)	CE 53	/200	3 (CE), F	Planni	ng a	nd En	gine	ering	Study	on De	evelo	pment of Lok	(Ma Cl	hau Loop	- Inve	estigation	
MET	ıry D	rillin	g				<b> </b>								VORKS ORDER No. GE/2010/01.18A							
MACHINE & No.: FDR-05										E 826618.04 N 842774.39							DATE from:	25/0	5/2011	to	30/05/2011	_
FLUSHING MEDIUM: Dry drilling										ORIE	NTA	ΓΙΟΙ	1: V	ertica	d		GROUND LEV	/EL	+ 5.59		mPD	
Drilling Progress	Water Level (m)							sts	Samples Pegin Samples Pegin Pe						Grade	Description						
27/05/2011	PW	2.05m at 15:00 1.93m at 08:00		78/			TO STATE OF THE PROPERTY OF TH	15 bis 27 bis 20 bis		1	Type West Time West Time Time Time Time Time Time Time Time	9.55 9.55 1.50 1.50 3.00	***************************************	3.00			Soft, yellow SILT. (FILL Grey (7.5YF (ALLUVIUM	) R/6/1), f			v, very clayey	A Addition of the Control of the Con
6 7 8 9	THE PARTY AND TH	18:00	TO POLITICATE TO THE POLITICAT			T T T T T T T T T T T T T T T T T T T				O THE PROPERTY OF THE PROPERTY		4.95 5.000	0,59	5.00			End of Inves	stigation	n hole at 5	i.00m.		
Small Disturbed Sample Piston sample U76 Undisturbed Sample U100 Undisturbed Sample Mazier Sample T6mm Vibrocore Sample U100mm Vibrocore Sample Vibrocore Sub-sample SPT Uner Sample  Standard Penetration Test In-situ Vane Shear Test Permeability Test Pressuremeter Test Televiewer Survey Packer Test Impression Packer Test Water Sample Standpipe Standpipe Plezometer Tip								LOGGED W.P. Ylu ( )  DATE 10/06/2011  CHECKED A.B-Hollinshead ( )  DATE 10/06/2011					REMARKS  1. An inspection pit was excavated to a depth of 1.50m.  2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.						I A			



Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
76mm Vibrocore Sample
100mm Vibrocore Sample
Vibrocore Sub-sample

SPT Liner Sample

9

Slandard Penetration Test In-situ Vane Shear Test Permeability Test Pressuremeter Test Televiewer Survey Packer Test Impression Packer Test Water Sample

A

Standpipe

Piezometer Tip

LOGGED W.P. Yiu

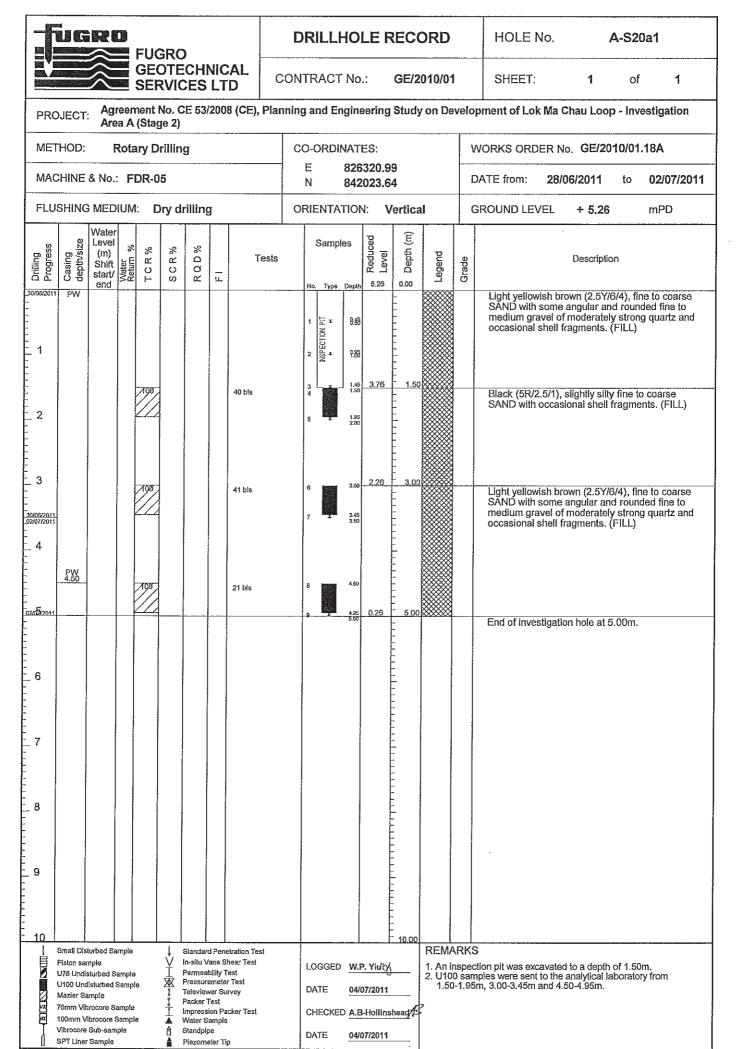
DATE 10/06/2011

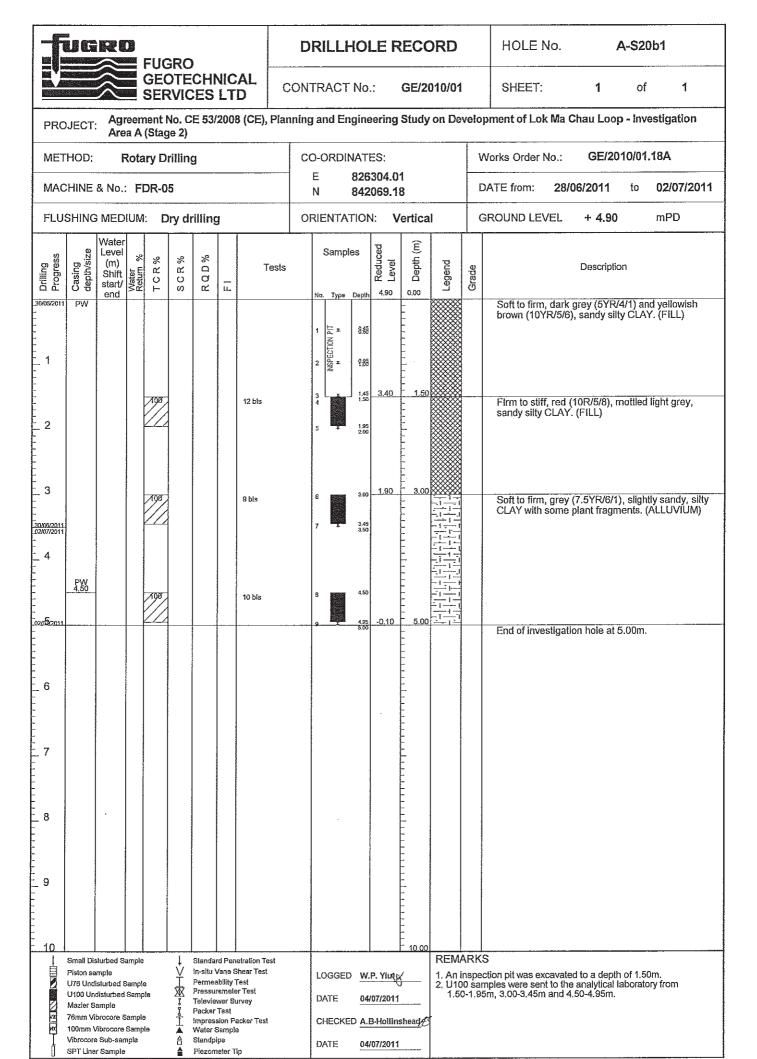
CHECKED A.B.-Hollinshead

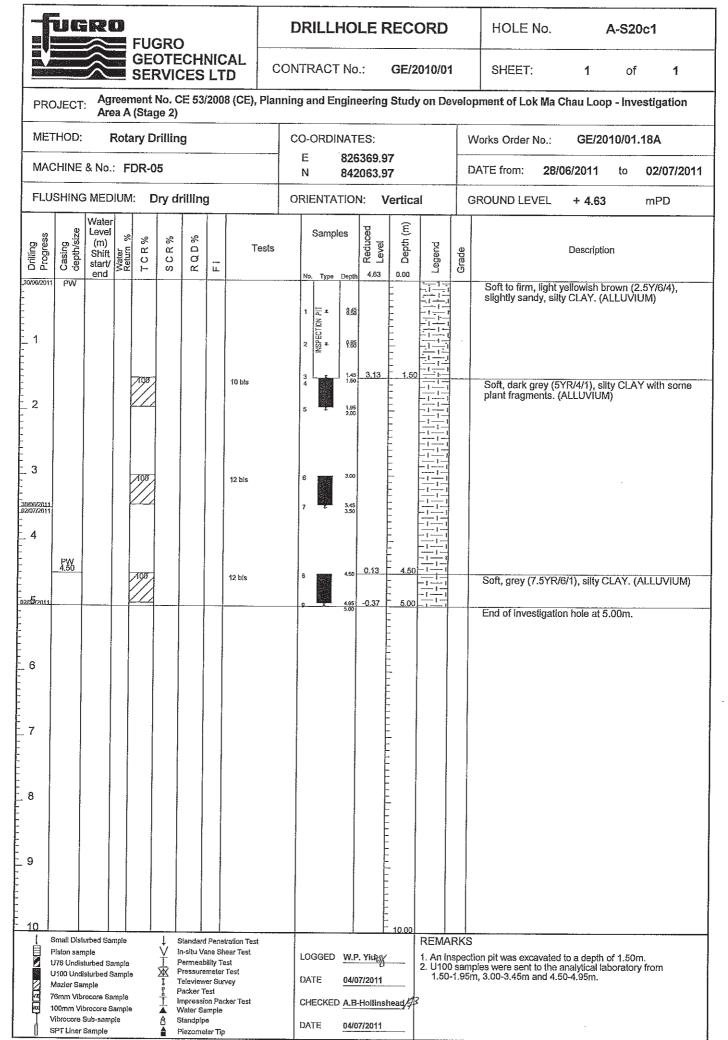
REMARKS

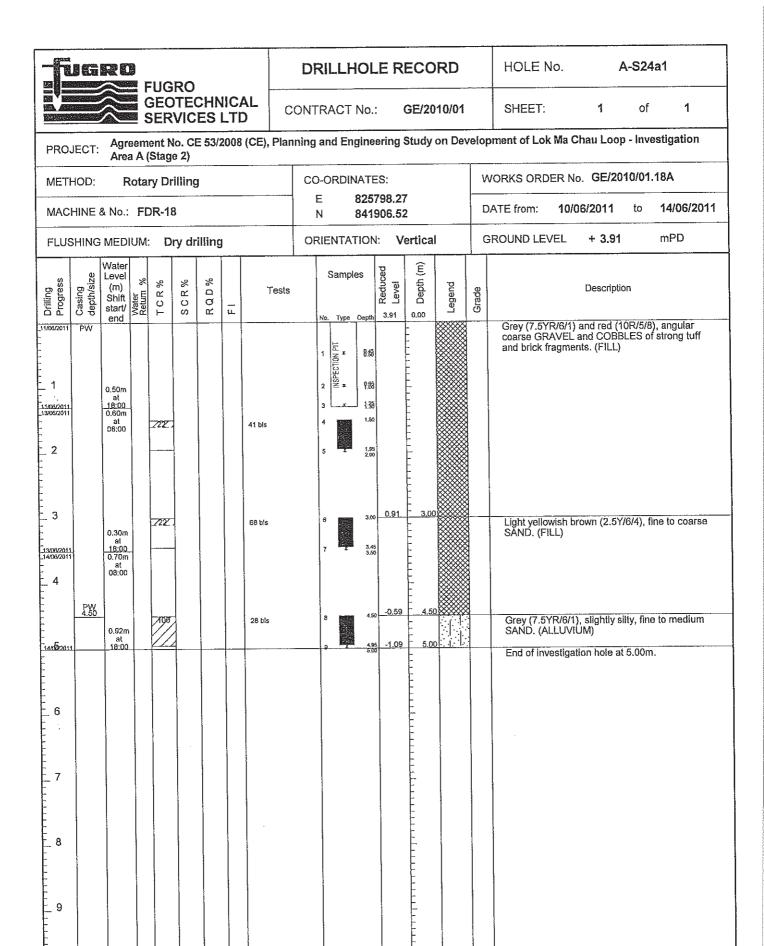
1. An inspection pit was excavated to a depth of 1.50m.

2. U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.









Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
Maxier Sample
100mml Vibrocore Sample

Vibrocore Sub-sample

SPT Liner Sample

Standard Penetration Test

In-situ Vans Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test

Impression Packer Test

Water Sample

Piezometer Tip

Standpipe

LOGGED <u>W.P. Ylunk</u>

DATE 17/06/2011

CHECKED A.B-Hollinshead

18/06/2011

 An Inspection pit was excavated to a depth of 1.30m.
 U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m.

REMARKS



DRILLHOLE	RECORD	HOLE No.		A-S24b1		
CONTRACT No :	GE/2010/01	SHEET:	1	of	1	

ROJECT: Agreement No. CE 53/2008 (CE), F	anning and Engineering Study on Dev	velopment of Lok Ma Chau Loop - Investigation
Area A (Stage 2)  AETHOD: Rotary Drilling	CO-ORDINATES:	WORKS ORDER No. GE/2010/01.18A
	E 825850.74	DATE from: 15/06/2011 to 20/06/2011
MACHINE & No.: FDR-18	N 841923.09	
LUSHING MEDIUM: Dry drilling	ORIENTATION: Vertical	GROUND LEVEL + 3.62 mPD
Progress Casing	Lege   De Lege	ਰੂ Description
9/2011 PW	1 1 = 1 855	Soft, yellowish brown (10YR/5/6), sandy, very clayey SILT. (FILL)
1	2 2 RES 2.62 1.00	Soft, greyish brown (10YR/5/2), sandy clayey SILT with some shell fragments. (FILL) Soft, dark grey (5YR/4/1), silty CLAY.
2 0.00m	5 1.95	(ALĹUVIUM)
32/2011 at 18:00 6 bls 6	6 300	
4 PW 4.50 7 bls	6 450 -0.88 4.50 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	(ALLUVIUM)
6	495 -1.38 5.00 -1.38 5.00 -1.38	End of investigation hole at 5.00m.
7		
8		
9		
Small Disturbed Sample Piston sample U76 Undisturbed Sample U100 Undisturbed Sample Mazler Sample A 76mm Vibrocore Sample M 100mm Vibrocore Sample M 100mm Vibrocore Sample M 200mm Vibrocore Sample M 300mm Vibrocore Sample M 300mm Vibrocore Sample M 300mm Vibrocore Sample M 400mm Vibrocore Sample	LOGGED W.P. Ylung 1. Ar	MARKS in inspection pit was excavated to a depth of 1,50m, 100 samples were sent to the analytical laboratory from 50-1,95m, 3,00-3,45m and 4,50-4,95m.
Packer Test	CHECKED A.B-Hollinsheads  DATE 23/06/2011	FGS Job No.: 09 0461 03 18/



DRILLHOLE RECORD HOLE No. A-S24c1 CONTRACT No.: GE/2010/01 SHEET: 1 of 1

PRO	JECT:			ent N Stag		E 53/	2008	B (CE), Plan	ning	and En	gine	ering	Study	on De	velo	pment of Lok Ma Chau Loop - Investigation
MET	HOD:	F	₹ota	ry Dr	illing	3			CC	O-ORDII	ITA	ES:			V	NORKS ORDER No. GE/2010/01.18A
MAC	HINE	& No.:	F	DR-0	5			30000				840.69 856.9			E	DATE from: 10/06/2011 to 14/06/2011
FLUS	SHING	MED	IUM	D	ry di	illing	1		OF	RIENTA	101	4: V	ertica	1	(	GROUND LEVEL + 4.44 mPD
Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR%	SCR%	RQD%	F.	Tests		Sampl		Reduced R. Level	g Depth (m)	Legend	Grade	Description
11/08/2011	PW	0.75m at 18:00	Walter 1974	,						1 LIA NOLDAN	8.65 P.85		1.50			Soft to firm, reddish brown (5YR/4/3), sandy clayey SILT with some angular fine to coarse gravel of moderately strong tuff. (FILL)
13/06/2011		0.70m at 08:00		108			100 100 100 100 100 100 100 100 100 100	21 bls		5	1.95 2.00	The state of the s	- 1,500			Soft, black (5R/2.5/1), mottled red, sandy slity CLAY with occasional angular fine to coarse gravel of strong tuff and shell fragments. (FILL)
13/08/2011	PW 4.50	0.80m at 18:00 0.65m at 08:00		/3 <b>9</b> //./.				21 bis		7	3.45 3.50					
- - - - - - - - -	4.50			108				32 bls		8	4.50		4,50 - - - - 5,00			Very soft to soft, dark grey (5YR/4/1), silty CLAY. (ALLUVIUM)
6											4.95 5.00		5.00	The state of the s		End of investigation hole at 5.00m.
7												· · · · · · · · · · · · · · · · · · ·	-			
8											•	Addition				
9			**************************************			-										
- <u>10</u>   	Small Disturbed Sample									1000	D 14	P. Mar	10.00	REM		
Z	U76 Undislurbed Sample Permeability Test							Tesl er Tesl		LOGGE		'.P. Yiu\; '/06/2011	,	2. U1	00 sa	ection pit was excavated to a depth of 1.50m. Imples were sent to the analytical laboratory from 55m, 3.00-3.45m and 4.50-4.95m.
(B)(S)(A)	Mazier Sample \$ Televiewer Survey Packer Test Throression Packer Test						acker Test		CHECK	_						
Ĭ	T Impression racker to									DATE	18	3/06/201				FGS Joh No : 09 0461 03 1RA



DRILLHOLE RECORD HOLE No.

> GE/2010/01 SHEET:

A-SG10a1

of

PROJECT:

METHOD:

Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation

Area A (Stage 2)

76mm Vibrocore Sample

100mm Vibrocore Sample

Vibrocore Sub-sample

SPT Liner Sample

Water Sample Standpipe

Piezometer Tip

impression Packer Test

CO-ORDINATES: **Rotary Drilling** 

WORKS ORDER No. GE/2010/01.18A

1

MACHINE & No.: FDR-05

Ε 826036.89 N 841812.57

CONTRACT No.:

DATE from: 21/06/2011

23/06/2011 to

1

FLU	SHING	MED	IUM	: D	ry dr	ʻillinç	3		OF	RIENTA	ATIO	N: <b>V</b>	ertica		(	GROUND LEVEL + 3.75 mPD
Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end		TCR%	SCR%	RQD%	_ L	Tests		Samş No. Type		Reduced Level	S Depth (π)	Legend	Grade	Description
21/05/2011	PW		Andrews							1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		5	1,00	-1-1		Soft to firm, red (10R/5/8), sandy clayey SILT. (FILL)  Soft to firm, light greyish brown (2.5Y/6/2), slightly sandy, very clayey SILT. (ALLUVIUM)
21/03/2011			TO A TO A TO A TO A TO A TO A TO A TO A	79 <sup>8</sup> /		- Addition of the state of the	AT	30 bls		3 4 5 1	1.1		1,50			Soft, dark grey (5YR/4/1), silty CLAY. (ALLUVIUM)
3				108				10 bls		7 -	3. 3. 3.		3,00			Soft, dark grey (5YR/4/1), sandy silty CLAY. (ALLUVIUM)
	PW 4.50			Z198 //				13 bis		B	4.	20 25 -1.25	5,00	-1 1 -1 1 -1 1 -1 1 -1 1 -1 1		End of investigation hole at 5.00m.
6				de mail de verrer e 4,400 de ja				and the second of the second o						- (14.4 - 14.4 -		
7			A PROPERTY AND A	*******			- Control of the Cont							A sub-section .		
8 9		i Latinita (n. 1907).				with the same of t	reference and the second secon	The state of the s								
10 — 🛭			Samp	e	<u></u>								10.00	REM		
	Small Disturbed Sample  Piston sample  U76 Undisturbed Sample  U100 Undisturbed Sample  Mazier Sample  Mazier Sample  Agents Mitrogras Sample  Sample  Page 16 17 17 16 17 17 16 17 16 17 16 17 16 17 16 17 16 17 16 17 16 17 16 17 16 17 17 16						y Test ster Test Survey		LOGG		W.P. Yiu: 23/06/201		2, U1	00 s	ection pit was excavated to a depth of 1.50m. amples were sent to the analytical laboratory from 95m, 3.00-3.45m and 4.50-4.95m.	

CHECKED A.B-Hollinshead

DATE

23/06/2011



DRILLHOLE RECORD

HOLE No.

A-SG10b1

	en i Spiritario Spiritario de Palista Spiritario (Spiritario	$\hat{\approx}$				CHI ES			CON-	ΓRΑ	.CT	No.	:	GE/2(	010/01		SHEET: 1 of 1
PRO	JECT:			ent N (Stag		E 53/	2008	(CE), Plai	nning	and	i Enç	gine	ering	Study	on De	velor	oment of Lok Ma Chau Loop - Investigation
MET	HOD:	F	₹ota	ry Dı	illing	g			C	D-OF	RDIN	ATE	ES:			V	VORKS ORDER No. GE/2010/01.18A
MAC	HINE	& No.:	FI	DR-1	В				1	E N			047.7 852.4			D	ATE from: 21/06/2011 to 23/06/2011
FLU:	SHING	MED	IUM:	D	ry dı	rilling	9	<b>P</b>	OI	RIEN	ITAT	101	1: V	ertica	l	G	ROUND LEVEL + 3.46 mPD
Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	TCR%	SCR%	RQD%	<u></u>	Tests			ample		% Reduced % Level	S Depth (m)	Legend	Grade	Description
21/06/2011	PW									1 Id NOLDERSNI	I	8.55	2,46	1.00			Firm, light brown (7.5YR/6/3), slightly sandy, very clayey SILT. (ALLUVIUM)
23,022031	108 12 bls					12 bls		34 5		1.45 1.50	0.46	- 3.00			Firm, grey (7.5YR/6/1), dappled yellowish brown, slightly sandy, very clayey SILT. (ALLUVIUM)		
4	DIM			108		a juni di manana		12 bls		7		3.45 3.50					Soft, dark grey (5YR/4/1), silty CLAY. (ALLUVIUM)
				/108				13 bls		8		4.50	-1,04	4.50			Soft, dark grey (5YR/4/1), sandy silty CLAY. (ALLUVIUM)
				1 1 1							EXECUTE:	4.95 5.00	-1.54	5,00	1 -1 -1		End of investigation hole at 5.00m.
6															- Para di Antonio - Para del Para de Para de Para de Para de Para de Para de Para de Para de Para de Para de P		
8													-				
10	Small Disturbed Sample Standard Penetration Test											- - - - - - - - - - - - - - - - - - -		;			
	Small Disturbed Sample Piston sample VI76 Undisturbed Sample U100 Undisturbed Sample U100 Undisturbed Sample Mazier Sampla VI76 T6mm Vibrocore Sample U100 mm Vibrocore Sample VI 100mm Vibrocore Sample VI 100mm Vibrocore Sample VI 100mm Vibrocore Sample VI 100mm Vibrocore Sample VI 100mm Vibrocore Sample					DAT	ΓE	23	P. Yiu <sub>\l</sub> /06/2011 B-Hollin	<del>'                                    </del>	2. U14 1.5	inspe 00 sar	S ction pit was excavated to a depth of 1.50m. nples were sent to the analytical laboratory from 5m, 3.00-3.45m and 4.50-4.95m.				
	Vibroco	e Sub-sa er Sample	mple		8	Standi Piezor	olpe			DAT	ΓE	23	/06/2011				



U76 Undisturbed Sample

Mazier Sample

U100 Undisturbed Sample

76mm Vibrocore Sample

100mm Vibrocore Sample

Vibrocore Sub-sample

SPT Liner Sample

漱

â

Pressuremeter Test

Televiewer Survey

Impression Packer Test

Packer Test

Water Sample

Piezometer Tip

Standpipa

DATE

DATE

23/06/2011

23/08/2011

CHECKED A.B-Hollinshead

DRILLHOLE RECORD

HOLE No.

A-SG10c1

CONTRACT No.:

GE/2010/01

SHEET:

of

1

1

Agreement No. CE 53/2008 (CE), Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation PROJECT: Area A (Stage 2) WORKS ORDER No. GE/2010/01.18A **Rotary Drilling** CO-ORDINATES: METHOD: 826088.48 Ε 18/06/2011 MACHINE & No.: FDR-05 DATE from: 15/06/2011 841837.26 Ν ORIENTATION: Vertical **GROUND LEVEL** + 3.64 mPD FLUSHING MEDIUM: Dry drilling Water  $\widehat{\mathbf{E}}$ Reduced Casing depth/size Leve Samples Drilling Progress % Depth Level (m) Legend Tests Description TCR Water Return ď Grade Shiff SC S O start/ Ĭ. 3.64 0.00 end Турв Depti Soft to firm, light brown (7.5YR/6/3), slightly sandy, very clayey SILT. (ALLUVIUM) 18/08/201 D\A/ ± ± B.55 ₫ 1 2 0.85 11 bls Soft, dark grey (5YR/4/1), silty CLAY. -1-(ALLUVIUM) 2 3 12 bls 0.20m 8t 18:00 0.10m 18/06/2011 20/06/2011 at 08:00 4 PW 4.50 Soft, dark grey (5YR/4/1), sandy, silty CLAY. (ALLUVIUM) 798 9 bls T. End of investigation hole at 5.00m. 6 7 8 9 REMARKS Small Disturbed Sample Standard Penetration Test In-silu Vane Shear Test An inspection pit was excavated to a depth of 1.50m.
 U100 samples were sent to the analytical laboratory from 1.50-1.95m, 3.00-3.45m and 4.50-4.95m. Piston sample LOGGED W.P. Ylung Permeability Test

# **Appendix C**

**Laboratory Testing Results** 

Agreement No. CE 53/2008 (CE) Ove Arup & Partners Hong Kong Limited

Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation Land Contamination Assessment for Area A

Soil Samples: Stage 2 SI Works (45 soil samples)

										Drillhole No.				
		Risk-Bas	sed Remediation	Goals (RBRGs) f	for Soil		A-S01a1			A-S01b1			A-S01c1	
Chemical										Sampling Date	and Depth (m)			
Chemical	Reporting Limit Urban Residential Rural Residential Industrial Public F					04-Jun-11	07-Jun-11	07-Jun-11	04-Jun-11	07-Jun-11	07-Jun-11	01-Jun-11	01-Jun-11	02-Jun-11
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	5	14	2	11	8	4	6	8	16
<b>Mositure Content</b>														
Moisture Content (%)	0.1%		Not Applicable			15.2	17.1	14.6	18.9	18.1	16.7	14.6	19	31.8

										Drillhole No.				
		Risk-Bas	sed Remediation	Goals (RBRGs) f	or Soil		A-S03a1			A-S03b1			A-S03c1	
Chemical									Sam	pling Date and Dept	th (m)			
Offerfical	Reporting	Urban Residential												
	Limit		Residential	Industrial	Public Park	01-Jun-11	02-Jun-11	02-Jun-11	27-May-11	27-May-11	30-May-11	27-May-11	27-May-11	30-May-11
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	4	1	23	8	2	3	24	2	18
Mositure Content														
Moisture Content (%)	0.1%		Not App	licable		17.8	14.5	36.8	25.0	14.0	12.0	45.4	9.5	40.6

										Drillhole No.				
		Risk-Bas	ed Remediation	Goals (RBRGs) f	or Soil		A-S20a1			A-S20b1			A-S20c1	
Chemical									Sam	pling Date and Dept	th (m)			
Offernical	Reporting	Urban Residential												
	Limit		Residential	Industrial	Public Park	30-Jun-11	01-Jul-11	02-Jul-11	30-Jun-11	01-Jul-11	02-Jul-11	30-Jun-11	01-Jul-11	02-Jul-11
	(mg/kg)	(mg/kg)					3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	4.0	3.0	3	7	17	16.0	21	12	13.0
Mositure Content														
Moisture Content (%)	0.1%		Not Applicable			17.7	14.4	18.6	19.6	27.2	28.6	36.9	30.1	40.9

										Drillhole No.				
		Risk-Bas	sed Remediation	Goals (RBRGs) f	for Soil		A-S24a1			A-S24b1			A-S24c1	
Chemical									Sam	pling Date and Dept	th (m)			
Offernical	Reporting	Urban Residential												
	Limit		Residential	Industrial	Public Park	13-Jun-11	13-Jun-11	14-Jun-11	18-Jun-11	20-Jun-11	20-Jun-11	13-Jun-11	13-Jun-11	14-Jun-11
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	16	4	18	15	15	11	6	6	8
Mositure Content														
Moisture Content (%)	0.1%		Not App	licable		27.0	14.7	33.9	41.7	44.5	36.0	11.8	17.2	21.4

										Drillhole No.				
		Risk-Bas	ed Remediation	Goals (RBRGs) f	for Soil		A-SG10a1			A-SG10b1			A-SG10c1	
Chemical									Sam	pling Date and Dept	th (m)			
Oneillicai	Reporting	Urban Residential	Rural											
	Limit Residential Industrial Pub					21-Jun-11	22-Jun-11	22-Jun-11	21-Jun-11	22-Jun-11	22-Jun-11	18-Jun-11	18-Jun-11	20-Jun-11
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95	1.50 - 1.95	3.00 - 3.45	4.50 - 4.95
Metals														
Arsenic	1.0	22.1	21.8	196	73.5	18	9	14	12	17	13	15	16	17
Mositure Content														
Moisture Content (%)	0.1%		Not Applicable				34.2	38.9	31.6	37.9	36.7	39.0	30.0	35.6

# **Appendix D**

**Laboratory Testing Reports** 

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

: Chan Kwok Fai, Godfrey

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR SAMMY C Y WONG Contact

: GEOTECHNICAL PROJECTS DIVISION,

GEOTECHNICAL ENGINEERING OFFICE,

23/F., KWUN TONG VIEW,

410 KWUN TONG ROAD, KOWLOON, HONG

KONG

E-mail : chiyuenwong@cedd.gov.hk

Telephone : +852 2158 5611 Facsimile : +852 2693 2918

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016751

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

Yip Street,

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Work Order

Page

: HK1112124

: 1 of 3

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

**Date Samples Received** 

: 27-MAY-2011

Issue Date

: 03-JUN-2011

No. of samples received No. of samples analysed : 1 : 1

#### General Comments

Address

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 31-MAY-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112124

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

This report may not be reproduced except with prior written approval from the testing laboratory.

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.

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112124



•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S03C1		
				1.50M-1.95M		
	Ci	lient samplii	ng date / time	27-MAY-2011 10:30		
Compound	CAS Number	LOR	Unit	HK1112124-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	45.4		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	24		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112124



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL					Labo	ratory Duplicate (DUP) F	Report	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1811262)						
HK1112112-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	11.6	11.7	1.4
EG: Metals and Major	Cations (QC Lot: 1813135)							
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	0.0

#### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RP	D (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1813	135)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8		85	115			

Matrix: SOIL				ate (MSD) Re	eport					
			Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPL	D (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1813135)									
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

: Chan Kwok Fai, Godfrey

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR SAMMY C Y WONG Contact

: GEOTECHNICAL PROJECTS DIVISION,

GEOTECHNICAL ENGINEERING OFFICE,

23/F., KWUN TONG VIEW,

410 KWUN TONG ROAD, KOWLOON, HONG

KONG

E-mail : chiyuenwong@cedd.gov.hk

Telephone : +852 2158 5611 Facsimile : +852 2693 2918

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016752

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

Page

: 1 of 3

Work Order

: HK1112139

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com

: +852 2610 1044

Facsimile : +852 2610 2021

**Date Samples Received** 

: 27-MAY-2011

Issue Date

: 03-JUN-2011

No. of samples received No. of samples analysed : 1 : 1

General Comments

Address

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 02-JUN-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112139

Contact

Address

E-mail

Telephone

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112139



· ····································						
Sub-Matrix: SOIL		Cli	ent sample ID	A-S03B1		
				1.50M-1.95M		
	CI	lient sampl	ing date / time	27-MAY-2011 10:40		
Compound	CAS Number	LOR	Unit	HK1112139-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	25.0		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	8		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112139



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	d Aggregate Properties	(QC Lot: 1813132)									
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	7.3	7.2	1.6			
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	9.2	9.0	1.8			
EG: Metals and Majo	or Cations (QC Lot: 18	13135)									
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2			
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

• //		. ,		· ·	· · · · · · · · · · · · · · · · · · ·	· , ,					
Matrix: SOIL			Method Blank (MB) Report			Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplica	te (DCS) Report	
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RP	D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1813	135)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8		85	115		

Matrix: SOIL				port						
	Client completD				Spike Re	covery (%)	Recovery	Limits (%)	RPD (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1813135)									
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR SAMMY C Y WONG

: GEOTECHNICAL PROJECTS DIVISION,

GEOTECHNICAL ENGINEERING OFFICE,

23/F., KWUN TONG VIEW,

410 KWUN TONG ROAD, KOWLOON, HONG

KONG

E-mail : chiyuenwong@cedd.gov.hk

Telephone : +852 2158 5611 Facsimile : +852 2693 2918

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016754

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

Work Order

Page

: HK1112141

: 1 of 3

: Godfrey.Chan@alsenviro.com

: +852 2610 1044

Facsimile : +852 2610 2021

**Date Samples Received** 

: 27-MAY-2011

Issue Date : 03-JUN-2011

No. of samples received

: 1 No. of samples analysed : 1

#### General Comments

Contact

Address

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 02-JUN-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112141

Contact

Address

E-mail

Telephone

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112141

# ALS

, <b>, ,</b>						
Sub-Matrix: <b>SOIL</b>		Cli	ent sample ID	A-S03C1		
				3.00M-3.45M		
	Ci	ient sampl	ing date / time	27-MAY-2011 16:15		
Compound	CAS Number	LOR	Unit	HK1112141-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	9.5		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	2		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112141



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	d Aggregate Properties	(QC Lot: 1813132)									
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	7.3	7.2	1.6			
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	9.2	9.0	1.8			
EG: Metals and Majo	or Cations (QC Lot: 18	13135)									
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2			
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB	3) Report		Laboratory Control	Spike (LCS) and Labor	atory Control	Spike Duplica	te (DCS) Report	
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RP	D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 18	13135)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8		85	115		

Matrix: SOIL				port						
			Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPD	) (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1813135)									
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

### ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

**DEPARTMENT** 

: MS LOUISA CHEUNG Contact

Address

E-mail : louisa.cheung@arup.com

Telephone

Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016753

: LMC LOOP AREA A

Laboratory

Address

E-mail

: ALS Technichem HK Pty Ltd

Contact : Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com

Telephone : +852 2610 1044 Facsimile : +852 2610 2021

Quote number

Page

Work Order

: 1 of 6

: HK1112142

Date Samples Received : 27-MAY-2011

Issue Date

: 04-JUN-2011

No. of samples received No. of samples analysed

: 4 : 4

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Signatories Position Authorised results for

Fung Lim Chee, Richard

General Manager

Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112142



#### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 02-JUN-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1112142** 

Sample(s) were received 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 sample(s) 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.

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112142

# ALS

Sub-Matrix: <b>SOIL</b>		Clie	ent sample ID	A-S03B1 3.00M-3.45M	A-S03B1 3.00M-3.45M DUPLICATE		
	Cli	ient samplii	ng date / time	27-MAY-2011 16:00	27-MAY-2011 16:00		
Compound	CAS Number	LOR	Unit	HK1112142-001	HK1112142-002		
EA/ED: Physical and Aggregate Properties					•		
EA055: Moisture Content (dried @ 103°C)		0.1	%	14.0	14.8		
EG: Metals and Major Cations							
EG020: Arsenic	7440-38-2	1	mg/kg	2	2		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112142



Sub-Matrix: WATER	Client sample ID			A-S03B1	A-S03B1		
			EQUIPMENT BLANK	FIELD BLANK			
			27-MAY-2011 16:00	27-MAY-2011 16:00			
Compound	CAS Number	LOR	Unit	HK1112142-003	HK1112142-004		
EG: Metals and Major Cations - Filtered							
EG020: Arsenic	7440-38-2	10	μg/L	<10	<10		

Page Number

: 5 of 6

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112142



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical and	Aggregate Properties (QC	Lot: 1813132)								
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	7.3	7.2	1.6		
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	9.2	9.0	1.8		
EG: Metals and Majo	r Cations (QC Lot: 181313	5)								
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2		
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	0.0		
Matrix: WATER					Lab	oratory Duplicate (DUP)	Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EG: Metals and Majo	r Cations - Filtered (QC Lo	t: 1813442)								
HK1112142-004	A-S03B1 FIELD BLANK	EG020: Arsenic	7440-38-2	10	μg/L	<10	<10	0.0		

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (Mi	B) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RP	D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1	1813135)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8		85	115		
	Г			D) D			0 " " 00" 11 1	-4	o '' o '' '		
Matrix: WATER			Method Blank (MI	в) кероп		Laboratory Control	Spike (LCS) and Labor	atory Control	<b>Spike Duplicat</b>	te (DCS) Report	
Matrix: WATER			Method Blank (MI	в) кероп	Spike	•	covery (%)	•	Spike Duplicat Limits (%)	. , ,	D (%)
Matrix: WATER  Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	•		•		. , ,	D (%) Control Limit
		LOR			-l ' -	Spike Red	covery (%)	Recovery	Limits (%)	RP	. ,

Matrix: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Majo	or Cations (QC Lot: 1813135)									
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					
Matrix: WATER					Matrix Spi	ike (MS) and Matrix	x Spike Duplic	ate (MSD) Rej	port	
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Majo	or Cations - Filtered (QC Lot: 18	313442)								
HK1112142-003	A-S03B1 EQUIPMENT BLANK	EG020: Arsenic	7440-38-2	100 μg/L	88.4		75	125		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112142



## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

: Chan Kwok Fai, Godfrey

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR SAMMY C Y WONG Contact

: GEOTECHNICAL PROJECTS DIVISION,

GEOTECHNICAL ENGINEERING OFFICE,

23/F., KWUN TONG VIEW,

410 KWUN TONG ROAD, KOWLOON, HONG

KONG

E-mail : chiyuenwong@cedd.gov.hk

Telephone : +852 2158 5611 Facsimile : +852 2693 2918

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016756

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd Page

: 1 of 3

Work Order

: HK1112183

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com

: +852 2610 1044

Facsimile : +852 2610 2021

**Date Samples Received** 

: 30-MAY-2011

Issue Date

: 03-JUN-2011

No. of samples received No. of samples analysed

: 1 : 1

#### General Comments

Address

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 02-JUN-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112183

Contact

Address

E-mail

Telephone

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112183



•						
Sub-Matrix: SOIL	Client sample ID			A-S03C1		
				4.50M-4.95M		
	Ci	lient samplii	ng date / time	30-MAY-2011 14:30		
Compound	CAS Number	LOR	Unit	HK1112183-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	40.6		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	18		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112183



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1813132)									
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	7.3	7.2	1.6			
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	9.2	9.0	1.8			
EG: Metals and Major	Cations (QC Lot: 1813135)										
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2			
HK1112183-001	A-S03C1 4.50M-4.95M	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

• //		. ,		· ·	· · · · · · · · · · · · · · · · · · ·	· , ,					
Matrix: SOIL			Method Blank (ME	B) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RP	D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1813	135)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8		85	115		

Matrix: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
					Spike Re	covery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1813135)									
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR SAMMY C Y WONG

: GEOTECHNICAL PROJECTS DIVISION,

GEOTECHNICAL ENGINEERING OFFICE,

23/F., KWUN TONG VIEW,

410 KWUN TONG ROAD, KOWLOON, HONG

KONG

E-mail : chiyuenwong@cedd.gov.hk

Telephone : +852 2158 5611 Facsimile : +852 2693 2918

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016757

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd Page

: 1 of 3

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Work Order

: HK1112184

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com

: +852 2610 1044

Facsimile : +852 2610 2021

**Date Samples Received** 

: 30-MAY-2011

Issue Date

: 03-JUN-2011

No. of samples received No. of samples analysed : 1 : 1

#### General Comments

Contact

Address

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 02-JUN-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112184

Contact

Address

E-mail

Telephone

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112184

# ALS

, <b>, ,</b>						
Sub-Matrix: SOIL	Client sample ID			A-S03B1		
				4.50M-4.95M		
	CI	ient sampli	ing date / time	30-MAY-2011 14:40		
Compound	CAS Number	LOR	Unit	HK1112184-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	12.0		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	3		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112184



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1813132)									
HK1112062-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	7.3	7.2	1.6			
HK1112063-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	9.2	9.0	1.8			
EG: Metals and Major	r Cations (QC Lot: 1813135)										
HK1112112-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	22	18	17.2			
HK1112183-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	18	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

• //		. ,		· ·	· · · · · · · · · · · · · · · · · · ·	· , ,					
Matrix: SOIL			Method Blank (ME	B) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RP	D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1813	135)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	92.8		85	115		

Matrix: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
					Spike Re	covery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1813135)									
HK1112112-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

E-mail : louisa.cheung@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016758

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

**Date Samples Received** 

: 01-JUN-2011

: 13-JUN-2011

: 1 of 3

: HK1112456

Issue Date

Page

Work Order

No. of samples received : 1

No. of samples analysed

: 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112456

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112456

# ALS

, <b>, ,</b>						
Sub-Matrix: SOIL	Client sample ID			A-S03A1		
				1.50M-1.95M		
	CI	lient sampli	ing date / time	[01-JUN-2011]		
Compound	CAS Number	LOR	Unit	HK1112456-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	17.8		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	4		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112456



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL					Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)				
EA/ED: Physical and Aggregate Properties (QC Lot: 1816152)												
HK1112218-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	20.5	20.2	1.4				
EG: Metals and Major	EG: Metals and Major Cations (QC Lot: 1819699)											
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0				
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1				

#### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (ME	B) Report		Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplica	e (DCS) Report	
			Spike	Spike Red	covery (%)	Recovery	Limits (%)	RPI	D (%)		
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1819699)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107		85	115		

Matrix: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report									
			Spike	Spike Recovery (%)		Recovery Limits (%)		RPD (%)				
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control		
ID			Number							Limit		
EG: Metals and Major	Cations (QC Lot: 1819699)											
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125				
					Determined							

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

E-mail : louisa.cheung@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016759

Site : LMC LOOP AREA A

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

Page

: 1 of 3

Work Order

: HK1112460

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Laboratory

Contact

Address

E-mail

Quote number

**Date Samples Received** 

: 01-JUN-2011

Issue Date

: 13-JUN-2011 No. of samples received : 1

No. of samples analysed

: 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112460

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112460

# ALS

•						
Sub-Matrix: SOIL	Client sample ID			A-S01C1		
				1.50M-1.95M		
	Client sampling date / time			[01-JUN-2011]		
Compound	CAS Number	LOR	Unit	HK1112460-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	14.6		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	6		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112460



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL					Laboratory Duplicate (DUP) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)					
EA/ED: Physical and Aggregate Properties (QC Lot: 1816152)													
HK1112218-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	20.5	20.2	1.4					
EG: Metals and Major	EG: Metals and Major Cations (QC Lot: 1819699)												
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0					
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1					

#### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (ME	B) Report		Laboratory Contro	I Spike (LCS) and Labo	ratory Control	Spike Duplicat	e (DCS) Report		
					Spike	Spike Re	ecovery (%)	Recovery Limits (%) RPD (%)			PD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1819699)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107		85	115			

Matrix: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report									
			Spike	Spike Recovery (%)		Recovery Limits (%)		RPD (%)				
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control		
ID			Number							Limit		
EG: Metals and Major	Cations (QC Lot: 1819699)											
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125				
					Determined							

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

: louisa.cheung@arup.com

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

E-mail

Telephone

Facsimile

Project : PLANNING AND ENGINEERING STUDY ON **DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016760

: LMC LOOP AREA A

Laboratory

Contact

Address

E-mail

Quote number

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 01-JUN-2011

: 13-JUN-2011

: 1 of 3

: HK1112461

Issue Date

Page

Work Order

No. of samples received : 1

: 1

No. of samples analysed

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112461

Sample(s) were received in a chilled condition.

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

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.

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Signatories	Position	Authorised results for
Fung Lim Chee, Richard	General Manager	Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112461

# ALS

•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S01C1		
				3.00M-3.45M		
	Client sampling date / time			[01-JUN-2011]		
Compound	CAS Number	LOR	Unit	HK1112461-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	19.0		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	8		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112461



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1816152)						
HK1112218-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	20.5	20.2	1.4
EG: Metals and Major	Cations (QC Lot: 1819699)							
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1

#### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (ME	B) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RPI	D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1819	EG: Metals and Major Cations (QC Lot: 1819699)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107		85	115		

Matrix: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPL	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1819699)									
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

E-mail : louisa.cheung@arup.com

Telephone Facsimile

Project

: PLANNING AND ENGINEERING STUDY ON **DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016761

Site : LMC LOOP AREA A

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

Page

: 1 of 3

Work Order

: HK1112560

Yip Street,

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com

Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 02-JUN-2011

Issue Date

: 13-JUN-2011 No. of samples received : 1

No. of samples analysed

: 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112560

Laboratory

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112560



•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S01C1		
				4.50M-4.95M		
	Client sampling date / time			02-JUN-2011 10:15		
Compound	CAS Number	LOR	Unit	HK1112560-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	31.8		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	16		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112560



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL					Labo	oratory Duplicate (DUP) F	Report	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and	d Aggregate Properties	(QC Lot: 1819722)						
HK1112387-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	14.1	13.4	4.9
HK1112562-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	36.8	36.1	1.7
EG: Metals and Majo	or Cations (QC Lot: 18	19699)						
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RPI	D (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1819699)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107		85	115			

Matrix: SOIL					port					
			Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPD	) (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1819699)									
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

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E-mail

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15 C-O-C number : H016762

Site : LMC LOOP AREA A Laboratory

Contact

Address

E-mail

Telephone

Quote number

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 02-JUN-2011

: 13-JUN-2011

: 1 of 3

: HK1112561

Issue Date

Page

Work Order

No. of samples received : 1

No. of samples analysed : 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112561

Sample(s) were received in a chilled condition.

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

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.

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Signatories	Position	Authorised results for
Fung Lim Chee, Richard	General Manager	Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112561

# ALS

, <b>, ,</b>						
Sub-Matrix: SOIL		Cli	ent sample ID	A-S03A1		
				3.00M-3.45M		
	Client sampling date / time			02-JUN-2011 10:45		
Compound	CAS Number	LOR	Unit	HK1112561-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	14.5		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	1		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112561



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	
EA/ED: Physical and	Aggregate Properties (QC	Lot: 1819722)							
HK1112387-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	14.1	13.4	4.9	
HK1112562-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	36.8	36.1	1.7	
EG: Metals and Major	Cations (QC Lot: 1819699)								
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0	
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1	

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

, ,,	•	• •		· ·		· / ·						
Matrix: SOIL			Method Blank (ME	3) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RP	D (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1819	9699)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107		85	115			

Matrix: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1819699)									
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

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: louisa.cheung@arup.com

Telephone

Facsimile

Project : PLANNING AND ENGINEERING STUDY ON **DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016763

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 02-JUN-2011

: 13-JUN-2011

: 1 of 3

: HK1112562

Issue Date

Page

Work Order

No. of samples received

No. of samples analysed

: 1 : 1

#### General Comments

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Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112562

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112562



•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S03A1		
				4.50M-4.95M		
	CI	lient sampli	ng date / time	02-JUN-2011 14:45		
Compound	CAS Number	LOR	Unit	HK1112562-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	36.8		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	23		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112562



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)				
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1819722)										
HK1112387-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	14.1	13.4	4.9				
HK1112562-001	A-S03A1 4.50M-4.95M	EA055: Moisture Content (dried @ 103°C)		0.1	%	36.8	36.1	1.7				
EG: Metals and Major	Cations (QC Lot: 1819699)											
HK1112316-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	42	42	0.0				
HK1112556-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	34	39	14.1				

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MI	3) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report								
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RPI	D (%)		
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit		
EG: Metals and Major Cations (QC Lot: 1819699	9)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	107		85	115				

Matrix: SOIL					oort					
				Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPD	) (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1819699)									
HK1112316-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

E-mail : louisa.cheung@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016764

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com

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Date Samples Received

: 04-JUN-2011

: 15-JUN-2011

: 1 of 3

: HK1112692

Issue Date

Page

Work Order

No. of samples received : 1

No. of samples analysed

: 1

#### General Comments

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Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112692

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112692



Sub-Matrix: SOIL		Cli	ent sample ID	A-S01A1		
				1.50M-1.95M		
	C	lient sampl	ing date / time	04-JUN-2011 10:40		
Compound	CAS Number	LOR	Unit	HK1112692-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	15.2		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	5		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112692



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)				
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1821747)										
HK1112620-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	43.4	43.3	0.0				
HK1112692-001	A-S01A1 1.50M-1.95M	EA055: Moisture Content (dried @ 103°C)		0.1	%	15.2	16.4	7.6				
EG: Metals and Major	Cations (QC Lot: 1825671)											
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0				
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	0.0				

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MI	3) Report		Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplicat	te (DCS) Report	
					Spike	Spike Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 182567	1)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5		85	115		

Matrix: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1825671)									
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0		75	125		

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

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Telephone Facsimile

Project

: PLANNING AND ENGINEERING STUDY ON **DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016765

Site : LMC LOOP AREA A Laboratory

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 04-JUN-2011

: 15-JUN-2011

: 1 of 3

: HK1112693

Issue Date

Page

Work Order

No. of samples received : 1

No. of samples analysed

: 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112693

Contact

Address

E-mail

Telephone

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112693

# ALS

•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S01B1		
				1.50M-1.95M		
	C	lient sampli	ng date / time	04-JUN-2011 10:50		
Compound	CAS Number	LOR	Unit	HK1112693-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	18.9		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	11		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112693



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties	(QC Lot: 1821747)									
HK1112620-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	43.4	43.3	0.0			
HK1112692-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	15.2	16.4	7.6			
EG: Metals and Majo	r Cations (QC Lot: 182	25671)									
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0			
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report								
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RPI	D (%)			
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit			
EG: Metals and Major Cations (QC Lot: 182567	1)													
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5		85	115					

Matrix: SOIL					Matrix Spi	ike (MS) and Matrix	Spike Duplic	ate (MSD) Re	port	
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1825671)									
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0		75	125		

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

: Chan Kwok Fai, Godfrey

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

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Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016769

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

Page

: 1 of 3

Work Order

: HK1112828

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

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Contact

Address

E-mail

Telephone

Quote number

Date Samples Received

: 07-JUN-2011

Issue Date

: 15-JUN-2011 No. of samples received

: 1

No. of samples analysed

: 1

General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112828

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112828



, <b>, ,</b>						
Sub-Matrix: SOIL		Cli	ent sample ID	A-S01A1		
				4.50M-4.95M		
	Ci	lient sampli	ing date / time	07-JUN-2011 14:50		
Compound	CAS Number	LOR	Unit	HK1112828-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	14.6		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	2		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112828



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1825687)									
HK1112820-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	16.4	17.2	4.8			
HK1112903-006	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	18.0	18.8	4.2			
EG: Metals and Major	Cations (QC Lot: 1825671)										
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0			
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report								
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RPI	D (%)			
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit			
EG: Metals and Major Cations (QC Lot: 182567	1)													
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5		85	115					

Matrix: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1825671)									
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0		75	125		

#### ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

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DEPARTMENT

: MS LOUISA CHEUNG Contact

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Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016768

Site : LMC LOOP AREA A Laboratory

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

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Yip Street,

Kwai Chung, N.T., Hong Kong : Godfrey.Chan@alsenviro.com

Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Contact

Address

E-mail

Quote number

Date Samples Received

: 07-JUN-2011

: 15-JUN-2011

: 1 of 3

: HK1112829

Issue Date

Page

Work Order

No. of samples received : 1

No. of samples analysed

: 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112829

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112829



· <b>,</b> · · · · · · · · · · · · · · · · · · ·						
Sub-Matrix: SOIL		Client sample ID		A-S01B1		
				4.50M-4.95M		
	Ci	ient sampl	ing date / time	07-JUN-2011 14:30		
Compound	CAS Number	CAS Number LOR Unit		HK1112829-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	16.7		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	4		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112829



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)				
EA/ED: Physical and	Aggregate Properties	(QC Lot: 1825687)										
HK1112820-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	16.4	17.2	4.8				
HK1112903-006	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	18.0	18.8	4.2				
EG: Metals and Majo	or Cations (QC Lot: 182	25671)										
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0				
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	0.0				

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report								
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RPI	D (%)			
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit			
EG: Metals and Major Cations (QC Lot: 182567	1)													
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5		85	115					

Matrix: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
	Client comple ID			Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1825671)									
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0		75	125		

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

E-mail : louisa.cheung@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON **DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016767

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

Page

Work Order

: 07-JUN-2011

: 1 of 3

: HK1112830

Issue Date

: 15-JUN-2011 No. of samples received : 1

No. of samples analysed

: 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1112830

Contact

Address

E-mail

Telephone

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112830

# ALS

· ····································						
Sub-Matrix: <b>SOIL</b>		Cli	ent sample ID	A-S01A1		
				3.00M-3.45M		
	CI	ient sampl	ing date / time	07-JUN-2011 13:40		
Compound	CAS Number	LOR	Unit	HK1112830-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	17.1		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	14		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112830



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)				
EA/ED: Physical and	Aggregate Properties	(QC Lot: 1825687)										
HK1112820-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	16.4	17.2	4.8				
HK1112903-006	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	18.0	18.8	4.2				
EG: Metals and Majo	or Cations (QC Lot: 182	25671)										
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0				
HK1112831-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	0.0				

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplicat	te (DCS) Report	
					Spike Spike Recovery (%)		covery (%)	Recovery Limits (%)		RPD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 182567	1)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5		85	115		

Matrix: SOIL			[	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPL	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1825671)									
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0		75	125		

## **ALS Laboratory Group**

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### **CERTIFICATE OF ANALYSIS**

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

Laboratory

: ALS Technichem HK Pty Ltd

Page

: 1 of 3

: MS LOUISA CHEUNG

: louisa.cheung@arup.com

Contact

: Chan Kwok Fai, Godfrey

Work Order

: HK1112831

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Project

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: Godfrey.Chan@alsenviro.com

: ----

E-mail Telephone

Quote number

: +852 2610 1044

Facsimile : +852 2610 2021

Facsimile

: PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : **GE/2009/16.15** 

C-O-C number : **H016766** 

Site : LMC LOOP AREA A

Date Samples Received

: 07-JUN-2011

Issue Date

: 15-JUN-2011

No. of samples received

d : **1** 

No. of samples analysed : 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 13-ILIN-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1112831** 

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112831

# ALS

· ····································						
Sub-Matrix: SOIL		Cli	ient sample ID	A-S01B1		
				3.00M-3.45M		
	CI	lient sampl	ing date / time	07-JUN-2011 13:30		
Compound	CAS Number	LOR	Unit	HK1112831-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	18.1		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	8		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1112831



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties (QC	Lot: 1825687)									
HK1112820-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	16.4	17.2	4.8			
HK1112903-006	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	18.0	18.8	4.2			
EG: Metals and Major	Cations (QC Lot: 1825671)										
HK1112687-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	18	19	0.0			
HK1112831-001	A-S01B1 3.00M-3.45M	EG020: Arsenic	7440-38-2	1	mg/kg	8	9	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplicat	te (DCS) Report	
					Spike Spike Recovery (%)		covery (%)	Recovery Limits (%)		RPD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 182567	1)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.5		85	115		

Matrix: SOIL					port					
	Olivert assemble ID			Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1825671)									
HK1112687-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	81.0		75	125		

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

: thomas.chan@arup.com

Laboratory

: ALS Technichem HK Pty Ltd

Page

: 1 of 3

DEPARTMENT : MR THOMAS CHAN

Contact

: Chan Kwok Fai, Godfrey

Work Order

: HK1113338

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: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

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Facsimile Quote number : +852 2610 2021

Facsimile Project

: PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016770

Site : LMC LOOP AREA A Date Samples Received

: 13-JUN-2011

Issue Date

: 21-JUN-2011

No. of samples received

: 1 No. of samples analysed : 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113338

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113338

# ALS

•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S24A1		
				1.50M-1.95M		
	C	lient samplii	ng date / time	13-JUN-2011 10:40		
Compound	CAS Number	LOR	Unit	HK1113338-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	27.0		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	16		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113338



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL			Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical and	d Aggregate Properties (C	QC Lot: 1830343)								
HK1113078-003	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	14.3	13.7	4.8		
HK1113339-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	11.8	12.9	8.7		
EG: Metals and Majo	or Cations (QC Lot: 18311	56)								
HK1113206-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	50	58	14.3		
HK1113338-001	A-S24A1 1.50M-1.95M	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0		

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report								
					Spike Spike Recovery (%)		covery (%)	Recovery Limits (%)		RPD (%)				
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit			
EG: Metals and Major Cations (QC Lot: 1831156	6)													
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	93.8		85	115					

Matrix: SOIL				oort						
				Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1831156)									
HK1113206-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR THOMAS CHAN

Contact

Address

E-mail : thomas.chan@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON **DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016771

Site : LMC LOOP AREA A

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 1 of 3

Work Order

Page

: HK1113339

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

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: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 13-JUN-2011

Issue Date

: 21-JUN-2011

No. of samples received No. of samples analysed

: 1 : 1

General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113339

Laboratory

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113339

# ALS

•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S24C1		
				1.50M-1.95M		
	Ci	lient sampli	ng date / time	13-JUN-2011 10:50		
Compound	CAS Number	LOR	Unit	HK1113339-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	11.8		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	6		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113339



#### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties (QC	Lot: 1830343)									
HK1113078-003	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	14.3	13.7	4.8			
HK1113339-001	A-S24C1 1.50M-1.95M	EA055: Moisture Content (dried @ 103°C)		0.1	%	11.8	12.9	8.7			
EG: Metals and Major	r Cations (QC Lot: 1831156)										
HK1113206-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	50	58	14.3			
HK1113338-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (ME	3) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
						Spike Spike Reco		covery (%) Recover		its (%) RPD (%)		
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1831156)												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	93.8		85	115			

Matrix: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1831156)									
HK1113206-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

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E-mail

Quote number

: MR THOMAS CHAN

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E-mail

Address

: thomas.chan@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON **DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016772

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

**Date Samples Received** 

: 13-JUN-2011

: 1 of 3

: HK1113340

Issue Date

Page

Work Order

: 21-JUN-2011 No. of samples received : 1

No. of samples analysed

: 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113340

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113340



•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S24C1		
				3.00M-3.45M		
	C	lient sampli	ng date / time	13-JUN-2011 14:55		
Compound	CAS Number	LOR	Unit	HK1113340-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	17.2		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	6		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113340



### Laboratory Duplicate (DUP) Report

Matrix: SOIL			Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical and	Aggregate Properties (QC	Lot: 1830343)								
HK1113078-003	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	14.3	13.7	4.8		
HK1113339-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	11.8	12.9	8.7		
EG: Metals and Major	Cations (QC Lot: 1831156)									
HK1113206-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	50	58	14.3		
HK1113338-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0		

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MI	3) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike Spike Recovery (%)			Recovery Limits (%)		RPI	RPD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1831156	6)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	93.8		85	115			

Matrix: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
	Client comple ID			Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPD (%)		
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control	
ID			Number							Limit	
EG: Metals and Major	Cations (QC Lot: 1831156)										
HK1113206-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125			
					Determined						

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR THOMAS CHAN Contact

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E-mail : thomas.chan@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016773

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

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Contact

Address

E-mail

Quote number

Work Order

Page

: HK1113341

: 1 of 3

**Date Samples Received** : 13-JUN-2011

Issue Date

: 21-JUN-2011 No. of samples received : 1

No. of samples analysed : 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113341

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113341

# ALS

•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S24A1		
				3.00M-3.45M		
	Ci	lient sampli	ng date / time	13-JUN-2011 15:10		
Compound	CAS Number	LOR	Unit	HK1113341-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	14.7		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	4		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113341



### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties	(QC Lot: 1830343)									
HK1113078-003	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	14.3	13.7	4.8			
HK1113339-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	11.8	12.9	8.7			
EG: Metals and Majo	r Cations (QC Lot: 183	31156)									
HK1113206-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	50	58	14.3			
HK1113338-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB	) Report	_	Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplica	te (DCS) Report	
					Spike Spike Recovery (%)			Recovery Limits (%)		RP	D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot:	1831156)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	93.8		85	115		

Matrix: SOIL					port					
	Olivet complet ID			Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1831156)									
HK1113206-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	# Not		75	125		
					Determined					

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

: thomas.chan@arup.com

Laboratory : ALS Technichem HK Pty Ltd Page : 1 of 3

DEPARTMENT

: MR THOMAS CHAN Contact

: Chan Kwok Fai, Godfrey

Work Order

: HK1113430

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: +852 2610 2021

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com

Telephone : +852 2610 1044 Facsimile

Facsimile

: PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016774

Site : LMC LOOP AREA A **Date Samples Received** 

: 14-JUN-2011

Issue Date

: 24-JUN-2011

No. of samples received

: 1

No. of samples analysed

: 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113430

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113430



, <b>, ,</b>						
Sub-Matrix: SOIL		Cli	ent sample ID	A-S24A1		
				4.50M-4.95M		
	CI	ient sampli	ing date / time	[14-JUN-2011]		
Compound	CAS Number	LOR	Unit	HK1113430-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	33.9		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	18		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113430



### Laboratory Duplicate (DUP) Report

Matrix: SOIL			Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1834060)								
HK1113552-003	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	15.1	16.1	6.6		
HK1113437-002	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	49.5	49.5	0.0		
EG: Metals and Major	Cations (QC Lot: 1834034)									
HK1113379-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	6	7	0.0		
HK1113436-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	6	5	0.0		

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

· //		' '		<u> </u>		<u> </u>						
Matrix: SOIL			Method Blank (ME	3) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike	Spike Spike Recovery (%)			Recovery Limits (%)		RPD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1834	034)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	88.9		85	115			

Matrix: SOIL	IX: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1834034)									
HK1113379-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.3		75	125		

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR THOMAS CHAN Contact

Address

E-mail : thomas.chan@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON **DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016775

Site : LMC LOOP AREA A

Contact

Address

E-mail

Quote number

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

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**Date Samples Received** 

: 14-JUN-2011

: 1 of 3

: HK1113432

Issue Date

Page

Work Order

: 24-JUN-2011 No. of samples received : 1

No. of samples analysed

: 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113432

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113432



, <b>, ,</b>						
Sub-Matrix: SOIL		Cli	ent sample ID	A-S24C1		
				4.50M-4.95M		
	CI	lient sampli	ing date / time	[14-JUN-2011]		
Compound	CAS Number	LOR	Unit	HK1113432-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	21.4		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	8		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113432



### Laboratory Duplicate (DUP) Report

Matrix: SOIL			Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical and	Aggregate Properties (QC	Lot: 1834060)								
HK1113552-003	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	15.1	16.1	6.6		
HK1113437-002	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	49.5	49.5	0.0		
EG: Metals and Major	r Cations (QC Lot: 1834034)									
HK1113379-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	6	7	0.0		
HK1113436-002	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	6	5	0.0		

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MI	3) Report		Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplicat	te (DCS) Report	
					Spike	Spike Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1834034	4)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	88.9		85	115		

Matrix: SOIL	ix: SOIL					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
					Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)		
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control		
ID			Number							Limit		
EG: Metals and Major	Cations (QC Lot: 1834034)											
HK1113379-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.3		75	125				

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

: thomas.chan@arup.com

DEPARTMENT

Laboratory : ALS Technichem HK Pty Ltd Page

: 1 of 3

: MR THOMAS CHAN

Contact

: Chan Kwok Fai, Godfrey

Work Order

: HK1113967

Address

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E-mail

Project

Address

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

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: PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016776

Site : LMC LOOP AREA A **Date Samples Received** 

: 18-JUN-2011

Issue Date

: 29-JUN-2011

No. of samples received

: 1

No. of samples analysed

: 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113967

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113967



•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-SG10C1		
				1.50M-1.95M		
	C	lient sampli	ng date / time	[18-JUN-2011]		
Compound	CAS Number LOR Unit			HK1113967-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	39.0		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	15		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113967



### Laboratory Duplicate (DUP) Report

Matrix: SOIL			Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical and	Aggregate Properties (QC	Lot: 1842625)								
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	23.0	20.7	10.6		
HK1113967-001	A-SG10C1 1.50M-1.95M	EA055: Moisture Content (dried @ 103°C)		0.1	%	39.0	39.6	1.3		
EG: Metals and Major	Cations (QC Lot: 1844617)									
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9		
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	0.0		

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL		. ,	Method Blank (MB	) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike	Spike Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC I	Lot: 1844617)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4		85	115			

Matrix: SOIL	ix: SOIL					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
					Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	O (%)		
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control		
ID			Number							Limit		
EG: Metals and Major	Cations (QC Lot: 1844617)											
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4		75	125				

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR THOMAS CHAN Contact

Address

E-mail : thomas.chan@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016778

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

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**Date Samples Received** 

: 18-JUN-2011

: 1 of 3

: HK1113968

Issue Date

Page

Work Order

: 29-JUN-2011

No. of samples received No. of samples analysed

: 1 : 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113968

Contact

Address

E-mail

Telephone

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113968



Sub-Matrix: SOIL		Cli	ent sample ID	A-S24B1		
				1.50M-1.95M		
	C	ient sampl	ing date / time	[18-JUN-2011]		
Compound	CAS Number LOR Unit			HK1113968-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	41.7		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	15		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113968



### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	d Aggregate Properties	(QC Lot: 1842625)									
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	23.0	20.7	10.6			
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	39.0	39.6	1.3			
EG: Metals and Majo	or Cations (QC Lot: 18	44617)									
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9			
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplicat	te (DCS) Report	
					Spike	Spike Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1844617	7)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4		85	115		

Matrix: SOIL	x: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
	Olivet counts ID			Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control	
ID			Number							Limit	
EG: Metals and Major	Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4		75	125			

# ALS

### **ALS Laboratory Group**

ANALYTICAL CHEMISTRY & TESTING SERVICES

### **CERTIFICATE OF ANALYSIS**

Client : CIVIL ENGINEERING AND DEVELOPMENT

**DEPARTMENT** 

Contact : MR THOMAS CHAN

Address

E-mail : thomas.chan@arup.com

Telephone : ---

Facsimile : ---

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : **GE/2009/16.15** 

C-O-C number : **H016777** 

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

Contact : Chan Kwok Fai, Godfrey

Address : 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

E-mail : Godfrey.Chan@alsenviro.com
Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Quote number : ----

Date Samples Received

Page

Work Order

Issue Date : 30-JUN-2011

No. of samples received : 4

No. of samples analysed : 4

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Signatories Position Authorised results for

Fung Lim Chee, Richard

**General Manager** 

Inorganics

: 1 of 6

: HK1113969

: 18-JUN-2011

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113969



### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 28-JUN-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1113969** 

Sample(s) were received 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 sample(s) 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.

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113969

# ALS

Sub-Matrix: <b>SOIL</b>		Clie	ent sample ID	A-SG10C1 3.00M-3.45M	A-SG10C1 3.00M-3.45M DUPLICATE		
	Cli	ient samplii	ng date / time	18-JUN-2011 15:00	18-JUN-2011 15:00		
Compound	CAS Number	LOR	Unit	HK1113969-001	HK1113969-002		
EA/ED: Physical and Aggregate Properties							
EA055: Moisture Content (dried @ 103°C)		0.1	%	30.0	34.7		
EG: Metals and Major Cations							
EG020: Arsenic	7440-38-2	1	mg/kg	16	18		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113969



Sub-Matrix: <b>WATER</b>	Client sample ID  Client sampling date / time		A-SG10C1 EQUIPMENT BLANK 18-JUN-2011 15:00	A-SG10C1 FIELD BLANK 18-JUN-2011 15:00		
Compound	CAS Number	LOR	Unit	HK1113969-003	HK1113969-004	
EG: Metals and Major Cations - Filtered						
EG020: Arsenic	7440-38-2	10	μg/L	<10	<10	

Page Number

: 5 of 6

Client

**CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT** 

Work Order HK1113969



### Laboratory Duplicate (DUP) Report

Laboratory Duplicate  Unit Original Re	. , .					
Jnit Original R	Dunlingto Bosult					
	esun Duplicate Result	RPD (%)				
% 23.0	20.7	10.6				
% 39.0	39.6	1.3				
g/kg 14	17	18.9				
g/kg 11	11	0.0				
Laboratory Duplicate (DUP) Report						
Init Original R	Pesult Duplicate Result	RPD (%)				
g/L <10	<10	0.0				
	% 39.0 g/kg 14 g/kg 11  Laboratory Duplicat Unit Original R	% 23.0 20.7 % 39.0 39.6  g/kg 14 17 g/kg 11 11  Laboratory Duplicate (DUP) Report Unit Original Result Duplicate Result				

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MI	B) Report		Laboratory Control	Spike (LCS) and Labor	atory Control	Spike Duplica	te (DCS) Report	
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RP	D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 18446	17)							•			
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4		85	115		
	Г	Method Blank (MB) Report  Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report									
Matrix: WATER			Method Blank (ME	b) Report		Laboratory Control	Spike (LCS) and Labor	atory Control	<b>Spike Duplica</b>	te (DCS) Report	
Matrix: WATER			Method Blank (Mi	ь) кероп	Spike	•	covery (%)	•	Spike Duplicat Limits (%)	· , ,	D (%)
Matrix: WATER  Method: Compound	CAS Number	LOR	Wethod Blank (ME	Result	Spike Concentration	•	. , ,	•		· , ,	D (%) Control Limit
		LOR				Spike Red	covery (%)	Recovery	Limits (%)	RPI	

Matrix: SOIL					Matrix Sp	ike (MS) and Matri	x Spike Duplic	ate (MSD) Re	port	
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Majo	or Cations (QC Lot: 1844	617)								
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4		75	125		
Matrix: WATER					Matrix Sp	ike (MS) and Matri	x Spike Duplic	ate (MSD) Re	port	
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPL	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Majo	or Cations - Filtered (QC	Lot: 1842734)	_		_					
HK1113786-004	Anonymous	EG020: Arsenic	7440-38-2	100 μg/L	92.4		75	125		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113969



## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

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Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

: H016781

Order number : GE/2009/16.15 C-O-C number

Site : LMC LOOP AREA A

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

Page

: 1 of 3

Work Order

: HK1113971

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

**Date Samples Received** 

: 20-JUN-2011

Issue Date

: 29-JUN-2011

No. of samples received No. of samples analysed

: 1 : 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113971

Laboratory

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113971



•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S24B1		
				4.50M-4.95M		
	C	lient sampli	ng date / time	20-JUN-2011 11:45		
Compound	CAS Number	LOR	Unit	HK1113971-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	36.0		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	11		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113971



### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1842625)									
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	23.0	20.7	10.6			
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	39.0	39.6	1.3			
EG: Metals and Major	Cations (QC Lot: 1844617)										
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9			
HK1113971-001	A-S24B1 4.50M-4.95M	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MI	3) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
				Spike	Spike Red	covery (%)	Recovery	Limits (%)	RPI	D (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1844617	EG: Metals and Major Cations (QC Lot: 1844617)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4		85	115		

Matrix: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID		1	Number							Limit
EG: Metals and Major	Cations (QC Lot: 1844617)									
HK1113891-001	Anonymous	EG020: Arsenic 74	140-38-2	5 mg/kg	97.4		75	125		

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR THOMAS CHAN Contact

Address

E-mail : thomas.chan@arup.com

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Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15 C-O-C number : H016780

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com : +852 2610 1044

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Contact

Address

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Quote number

**Date Samples Received** 

: 20-JUN-2011

: 1 of 3

: HK1113973

Issue Date

Page

Work Order

: 29-JUN-2011 No. of samples received : 1

No. of samples analysed

: 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113973

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113973

# ALS

•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-SG10C1		
				4.50M-4.95M		
	C	lient sampli	ng date / time	20-JUN-2011 11:00		
Compound	CAS Number	LOR	Unit	HK1113973-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	35.6		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	17		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113973



### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties	(QC Lot: 1842625)									
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	23.0	20.7	10.6			
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	39.0	39.6	1.3			
EG: Metals and Majo	r Cations (QC Lot: 184	4617)									
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9			
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL		. ,	Method Blank (MB	) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike	Spike Re	covery (%)	Recovery Li	imits (%)	RP	PD (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC I	Lot: 1844617)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4		85	115		

Matrix: SOIL					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPD (%)			
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control		
ID			Number							Limit		
EG: Metals and Major	EG: Metals and Major Cations (QC Lot: 1844617)											
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4		75	125				

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

: Chan Kwok Fai, Godfrey

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR THOMAS CHAN Contact

Address

E-mail

: thomas.chan@arup.com

Telephone

Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016779

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

Page

: 1 of 3

Work Order

: HK1113976

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Contact

Address

E-mail

Quote number

**Date Samples Received** 

: 20-JUN-2011

Issue Date

: 29-JUN-2011

No. of samples received No. of samples analysed

: 1 : 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1113976

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113976



•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-S24B1		
				3.00M-3.45M		
	Client sampling date / time			20-JUN-2011 10:30		
Compound	CAS Number	LOR	Unit	HK1113976-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	44.5		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	15		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1113976



### Laboratory Duplicate (DUP) Report

Matrix: SOIL			Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	
EA/ED: Physical and									
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	23.0	20.7	10.6	
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	39.0	39.6	1.3	
EG: Metals and Major	r Cations (QC Lot: 1844617)								
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9	
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	0.0	

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (ME	B) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report								
				Spike	Spike Spike Recovery (%)		Recovery Limits (%)		RPD (%)				
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit		
EG: Metals and Major Cations (QC Lot: 1844617)													
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4		85	115				

Matrix: SOIL					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPD (%)			
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control		
ID		N	lumber							Limit		
EG: Metals and Major	EG: Metals and Major Cations (QC Lot: 1844617)											
HK1113891-001	Anonymous	EG020: Arsenic 744	10-38-2	5 mg/kg	97.4		75	125				

## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

: thomas.chan@arup.com

Laboratory : ALS Technichem HK Pty Ltd Page

: 1 of 3

DEPARTMENT : MR THOMAS CHAN

Contact

: Chan Kwok Fai, Godfrey

Work Order

: HK1114027

Address

Contact

E-mail

C-O-C number

Site

Address

E-mail

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com

Telephone

Telephone : +852 2610 1044

Facsimile

Facsimile : +852 2610 2021

Project : PLANNING AND ENGINEERING STUDY ON

Quote number

**Date Samples Received** 

: 21-JUN-2011

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

: LMC LOOP AREA A

Order number : GE/2009/16.15

: H016782

Issue Date

: 29-JUN-2011

No. of samples received

: 1

No. of samples analysed

: 1

### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1114027

Sample(s) were received in a chilled condition.

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

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.

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Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114027



- 7						
Sub-Matrix: SOIL		Cli	ent sample ID	A-SG10A1		
				1.50M-1.95M		
	Client sampling date / time			21-JUN-2011 14:55		
Compound	CAS Number	LOR	Unit	HK1114027-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	38.2		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	18		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114027



### Laboratory Duplicate (DUP) Report

Matrix: SOIL	Matrix: SOIL					Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	Method: Compound CAS Number				Duplicate Result	RPD (%)					
EA/ED: Physical and	Aggregate Properties	(QC Lot: 1842625)											
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	23.0	20.7	10.6					
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	39.0	39.6	1.3					
EG: Metals and Majo	r Cations (QC Lot: 184	4617)											
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9					
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	0.0					

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL Method Blank (MB) Report					Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report								
			Spike Spike Recovery (%)			Recovery Limits (%)		RPI	RPD (%)				
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit		
EG: Metals and Major Cations (QC Lot: 1844617)													
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4		85	115				

Matrix: SOIL					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report								
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPL	O (%)			
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control			
ID			Number							Limit			
EG: Metals and Major	EG: Metals and Major Cations (QC Lot: 1844617)												
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4		75	125					

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



## CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MR THOMAS CHAN Contact

Address

E-mail : thomas.chan@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H016783

Site : LMC LOOP AREA A Laboratory

Yip Street,

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

Page : 1 of 3

Work Order

: HK1114028

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Kwai Chung, N.T., Hong Kong : Godfrey.Chan@alsenviro.com

Telephone : +852 2610 1044

Facsimile : +852 2610 2021

**Date Samples Received** 

: 21-JUN-2011

Issue Date

: 29-JUN-2011 No. of samples received

No. of samples analysed

: 1 : 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1114028

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for Fung Lim Chee, Richard General Manager Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114028

# ALS

•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-SG10B1		
				1.50M-1.95M		
	Ci	lient sampli	ng date / time	21-JUN-2011 15:00		
Compound	CAS Number	LOR	Unit	HK1114028-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	31.6		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	12		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114028



## Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)				
EA/ED: Physical and	Aggregate Properties	(QC Lot: 1842625)										
HK1113896-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	23.0	20.7	10.6				
HK1113967-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	39.0	39.6	1.3				
EG: Metals and Majo	r Cations (QC Lot: 184	4617)										
HK1113898-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	14	17	18.9				
HK1113971-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	11	11	0.0				

# Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL		. ,	Method Blank (MB	) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
					Spike	Spike Spike Recovery (%)			Recovery Limits (%)		PD (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC I	Lot: 1844617)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	96.4		85	115		

Matrix: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
	Client completo			Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPL	O (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control	
ID			Number							Limit	
EG: Metals and Major	Cations (QC Lot: 1844617)										
HK1113891-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	97.4		75	125			

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



## CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

E-mail : louisa.cheung@arup.com

Telephone Facsimile

Project

: PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H010647

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 22-JUN-2011

: 04-JUL-2011

: 1 of 3

: HK1114170

Issue Date

Page

Work Order

No. of samples received

No. of samples analysed

: 1 : 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1114170

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for Fung Lim Chee, Richard

General Manager

Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114170



· <b>y</b> · · · · · · · · · · · · · · · · · · ·						
Sub-Matrix: SOIL		Cli	ent sample ID	A-SG10A1		
				4.50M-4.95M		
	CI	ient sampli	ing date / time	22-JUN-2011 11:40		
Compound	CAS Number	LOR	Unit	HK1114170-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	38.9		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	14		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114170



## Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	Aggregate Properties (QC	Lot: 1846857)									
HK1114167-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	22.8	23.3	2.2			
HK1114174-004	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	19.8	21.1	6.5			
EG: Metals and Major	r Cations (QC Lot: 1850829)	)									
HK1114171-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	13	12	0.0			
HK1114550-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	3	3	0.0			

# Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MI	B) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike	Spike Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1850829	9)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.1		85	115			

Matrix: SOIL			[		ort					
	05.4			Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1850829)									
HK1114170-001	A-SG10A1 4.50M-4.95M	EG020: Arsenic	7440-38-2	5 mg/kg	83.8		75	125		

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



## CERTIFICATE OF ANALYSIS

: Chan Kwok Fai, Godfrey

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

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E-mail

Telephone

Facsimile

Project : PLANNING AND ENGINEERING STUDY ON **DEVELOPMENT OF LOK MA CHAU LOOP -**

: louisa.cheung@arup.com

INVESTIGATION

: GE/2009/16.15

Order number C-O-C number : H020437

Site : LMC LOOP AREA A

Laboratory : ALS Technichem HK Pty Ltd

: 1 of 3

Work Order

Page

: HK1114171

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

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: Godfrey.Chan@alsenviro.com : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 22-JUN-2011

Issue Date

: 04-JUL-2011 No. of samples received

: 1

No. of samples analysed

: 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1114171

Contact

Address

E-mail

Telephone

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for Fung Lim Chee, Richard **General Manager** Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114171

# ALS

•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-SG10B1		
				4.50M-4.95M		
	C	lient sampli	ng date / time	22-JUN-2011 11:55		
Compound	CAS Number	LOR	Unit	HK1114171-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	36.7		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	13		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114171



## Laboratory Duplicate (DUP) Report

Matrix: SOIL			Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical and	Aggregate Properties (QC	Lot: 1846857)								
HK1114167-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	22.8	23.3	2.2		
HK1114174-004	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	19.8	21.1	6.5		
EG: Metals and Major	r Cations (QC Lot: 1850829)									
HK1114171-001	A-SG10B1 4.50M-4.95M	EG020: Arsenic	7440-38-2	1	mg/kg	13	12	0.0		
HK1114550-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	3	3	0.0		

# Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (ME	) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike	Spike Spike Recovery (%)		Recovery Limits (%)		RP	PD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC	Lot: 1850829)								·			
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.1		85	115			

Matrix: SOIL	c: SOIL				port					
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1850829)									
HK1114170-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	83.8		75	125		

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



## CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

E-mail : louisa.cheung@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H015189

Site : LMC LOOP AREA A

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

Page

: 1 of 3

Work Order

: HK1114172

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 22-JUN-2011

Issue Date

: 04-JUL-2011

No. of samples received No. of samples analysed

: 1 : 1

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is:

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1114172

Laboratory

Contact

Address

E-mail

Telephone

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for Fung Lim Chee, Richard General Manager Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114172



- 7						
Sub-Matrix: SOIL		Client sample ID		A-SG10A1		
				3.00M-3.45M		
	Ci	ient sampl	ing date / time	22-JUN-2011 10:30		
Compound	CAS Number LOR Unit			HK1114172-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	34.2		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	9		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114172



## Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)				
EA/ED: Physical and	d Aggregate Properties	(QC Lot: 1846857)										
HK1114167-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	22.8	23.3	2.2				
HK1114174-004	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	19.8	21.1	6.5				
EG: Metals and Majo	or Cations (QC Lot: 18	50829)										
HK1114171-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	13	12	0.0				
HK1114550-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	3	3	0.0				

# Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplicat	te (DCS) Report	
					Spike Spike Recovery (%)		covery (%)	Recovery Limits (%)		RPD (%)	
Method: Compound	CAS Number	LOR	LOR Unit Result		Concentration	LCS	DCS	Low High		Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1850829	9)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.1		85	115		

Matrix: SOIL	trix: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Rep						
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control	
ID			Number							Limit	
EG: Metals and Major	Cations (QC Lot: 1850829)										
HK1114170-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	83.8		75	125			

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



## CERTIFICATE OF ANALYSIS

Client : CIVIL ENGINEERING AND DEVELOPMENT

DEPARTMENT

: MS LOUISA CHEUNG Contact

Address

E-mail : louisa.cheung@arup.com

Telephone Facsimile

Project : PLANNING AND ENGINEERING STUDY ON

**DEVELOPMENT OF LOK MA CHAU LOOP -**

INVESTIGATION

Order number : GE/2009/16.15

C-O-C number : H010648

Site : LMC LOOP AREA A

: ALS Technichem HK Pty Ltd

: Chan Kwok Fai, Godfrey

: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing

Yip Street,

Kwai Chung, N.T., Hong Kong

: Godfrey.Chan@alsenviro.com Telephone : +852 2610 1044

Facsimile : +852 2610 2021

Date Samples Received

: 22-JUN-2011

: 1 of 3

: HK1114173

Issue Date

Page

Work Order

: 04-JUL-2011 No. of samples received : 1

No. of samples analysed

: 1

#### General Comments

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Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: HK1114173

Laboratory

Contact

Address

E-mail

Quote number

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for Fung Lim Chee, Richard General Manager Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114173

# ALS

•						
Sub-Matrix: SOIL		Clie	ent sample ID	A-SG10B1		
				3.00M-3.45M		
	C	lient sampli	ng date / time	22-JUN-2011 10:40		
Compound	CAS Number	LOR	Unit	HK1114173-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	37.9		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	17		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114173



## Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)				
EA/ED: Physical and	d Aggregate Properties	(QC Lot: 1846857)										
HK1114167-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	22.8	23.3	2.2				
HK1114174-004	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	19.8	21.1	6.5				
EG: Metals and Majo	or Cations (QC Lot: 18	50829)										
HK1114171-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	13	12	0.0				
HK1114550-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	3	3	0.0				

# Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB) Report			Laboratory Control	Spike (LCS) and Labora	atory Control	Spike Duplicat	te (DCS) Report	
					Spike Spike Recovery (%)		covery (%)	Recovery Limits (%)		RPD (%)	
Method: Compound	CAS Number	LOR	LOR Unit Result		Concentration	LCS	DCS	Low High		Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1850829	9)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.1		85	115		

Matrix: SOIL	trix: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Rep						
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control	
ID			Number							Limit	
EG: Metals and Major	Cations (QC Lot: 1850829)										
HK1114170-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	83.8		75	125			

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### **CERTIFICATE OF ANALYSIS**

Client Page Laboratory : ALS Technichem HK Pty Ltd : CIVIL ENGINEERING AND DEVELOPMENT : 1 of 3 DEPARTMENT Work Order Contact Contact : MS LOUISA CHEUNG : Chan Kwok Fai, Godfrey : HK1114853 Address Address : 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong E-mail : Godfrey.Chan@alsenviro.com : louisa.cheung@arup.com Telephone Telephone : +852 2610 1044 Facsimile Facsimile : +852 2610 2021 Project Quote number Date Samples Received : PLANNING AND ENGINEERING STUDY ON : 30-JUN-2011 **DEVELOPMENT OF LOK MA CHAU LOOP -**INVESTIGATION Order number Issue Date : GE/2009/16.15 : 12-JUL-2011 C-O-C number : H016784 No. of samples received : 1 : LMC LOOP AREA A No. of samples analysed : 1

#### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 08-JUL-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1114853** 

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for

Fung Lim Chee, Richard General Manager Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114853



· · · · · · · · · · · · · · · · · · ·						
Sub-Matrix: SOIL			Client sample ID	A-S20A1		
				1.50M-1.95M		
		Client sa	ampling date / time	30-JUN-2011 11:00		
Compound	CAS Number	LOR	Unit	HK1114853-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	17.7		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	4		

Client CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114853



## Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical an	d Aggregate Properties (Q	C Lot: 1858718)								
HK1114853-001	A-S20A1 1.50M-1.95M	EA055: Moisture Content (dried @ 103°C)		0.1	%	17.7	17.5	1.1		
HK1114929-008	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	12.2	11.0	10.1		
EG: Metals and Maj	or Cations (QC Lot: 186204	(0)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0		
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0		

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB	) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike Spike Recovery (%)		covery (%)	Recovery Limits (%)		RPD (%)		
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1862040												
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8		85	115			

Matrix: SOIL	: SOIL				Matrix Spi	ike (MS) and Matrix	Spike Duplic	ate (MSD) Re	port	
	Client comple ID			Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1862040)									
HK1114853-001	A-S20A1 1.50M-1.95M	EG020: Arsenic	7440-38-2	5 mg/kg	77.6		75	125		

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



Inorganics

#### **CERTIFICATE OF ANALYSIS**

Client Page Laboratory : ALS Technichem HK Pty Ltd : CIVIL ENGINEERING AND DEVELOPMENT : 1 of 3 DEPARTMENT Work Order Contact Contact : MS LOUISA CHEUNG : Chan Kwok Fai, Godfrey : HK1114984 Address Address : 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong E-mail : Godfrey.Chan@alsenviro.com : louisa.cheung@arup.com Telephone Telephone : +852 2610 1044 Facsimile Facsimile : +852 2610 2021 Project Quote number Date Samples Received : PLANNING AND ENGINEERING STUDY ON : 30-JUN-2011 **DEVELOPMENT OF LOK MA CHAU LOOP -**INVESTIGATION Order number Issue Date : GE/2009/16.15 : 12-JUL-2011 C-O-C number : H016785 No. of samples received : 1 No. of samples analysed : LMC LOOP AREA A : 1

#### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 08-JUL-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1114984** 

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for

Fung Lim Chee, Richard General Manager

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114984



Analytical Acounts						
Sub-Matrix: SOIL			Client sample ID	A-S20B1		
				1.50M-1.95M		
		Client sa	ampling date / time	30-JUN-2011 11:15		
Compound	CAS Number	LOR	Unit	HK1114984-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	19.6		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	7		

Client CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114984



## Laboratory Duplicate (DUP) Report

Matrix: SOIL					Lai	boratory Duplicate (DUP) Rep	port	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical an	d Aggregate Properties	(QC Lot: 1858718)						
HK1114853-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	17.7	17.5	1.1
HK1114929-008	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	12.2	11.0	10.1
EG: Metals and Maj	or Cations (QC Lot: 186	62040)						
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB	) Report		Laboratory Cont	trol Spike (LCS) and Labora	atory Control Sp	oike Duplicate (D	CS) Report	
					Spike Spike Recovery (%)			Recovery Limits (%)			D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1862040	))										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8		85	115		

Matrix: SOIL					Matrix Spi	ike (MS) and Matrix	Spike Duplic	ate (MSD) Re	port	
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1862040)									
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6		75	125		

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



Inorganics

#### **CERTIFICATE OF ANALYSIS**

Client Page Laboratory : ALS Technichem HK Pty Ltd : CIVIL ENGINEERING AND DEVELOPMENT : 1 of 3 DEPARTMENT Work Order Contact Contact : MS LOUISA CHEUNG : Chan Kwok Fai, Godfrey : HK1114985 Address Address : 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong E-mail : Godfrey.Chan@alsenviro.com : louisa.cheung@arup.com Telephone Telephone : +852 2610 1044 Facsimile Facsimile : +852 2610 2021 Project Quote number Date Samples Received : PLANNING AND ENGINEERING STUDY ON : 30-JUN-2011 **DEVELOPMENT OF LOK MA CHAU LOOP -**INVESTIGATION Order number Issue Date : GE/2009/16.15 : 12-JUL-2011 C-O-C number : H016786 No. of samples received : 1 No. of samples analysed : LMC LOOP AREA A : 1

#### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 08-JUL-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1114985** 

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for

Fung Lim Chee, Richard General Manager

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114985



, mary trout recounts						
Sub-Matrix: SOIL			Client sample ID	A-S20C1		
				1.50M-1.95M		
		Client sa	ampling date / time	30-JUN-2011 11:20		
Compound	CAS Number	LOR	Unit	HK1114985-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	36.9		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	21		

Client CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114985



## Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical an	d Aggregate Properties	(QC Lot: 1858718)								
HK1114853-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	17.7	17.5	1.1		
HK1114929-008	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	12.2	11.0	10.1		
EG: Metals and Maj	or Cations (QC Lot: 18	62040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0		
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0		

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB	) Report		Laboratory Cont	trol Spike (LCS) and Labora	atory Control Sp	oike Duplicate (D	CS) Report	
					Spike Spike Recovery (%)			Recovery Limits (%)			D (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 1862040	))										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8		85	115		

Matrix: SOIL					Matrix Spi	ike (MS) and Matrix	Spike Duplic	ate (MSD) Rej	port	
				Spike	Spike Re	covery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1862040)									
HK1114853-001	Anonymous	EG020: Arsenic 7	7440-38-2	5 mg/kg	77.6		75	125		

# ALS

# **ALS Laboratory Group**

ANALYTICAL CHEMISTRY & TESTING SERVICES

#### **CERTIFICATE OF ANALYSIS**

Client Laboratory Page : ALS Technichem HK Pty Ltd : CIVIL ENGINEERING AND DEVELOPMENT : 1 of 5 **DEPARTMENT** Work Order Contact Contact : MS LOUISA CHEUNG : Chan Kwok Fai, Godfrey : HK1114986 Address Address : 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Kwai Chung, N.T., Hong Kong E-mail : Godfrey.Chan@alsenviro.com : louisa.cheung@arup.com Telephone Telephone : +852 2610 1044 Facsimile Facsimile : +852 2610 2021 Project Quote number Date Samples Received : PLANNING AND ENGINEERING STUDY ON : 30-JUN-2011 **DEVELOPMENT OF LOK MA CHAU LOOP -**INVESTIGATION Order number Issue Date : GE/2009/16.15 : 12-JUL-2011 C-O-C number : H016787 No. of samples received : 4 No. of samples analysed Site : LMC LOOP AREA A : 4

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Signatories Position Authorised results for

Fung Lim Chee, Richard General Manager Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114986

# ALS

#### General Comments

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 08-JUL-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1114986** 

Sample(s) were received 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 sample(s) 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.

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114986

# ALS

, many mouse recounts							
Sub-Matrix: SOIL			Client sample ID	A-S20A1	A-S20A1		
				3.00M-3.45M	3.00M-3.45M		
					DUPLICATE		
		Client sa	mpling date / time	30-JUN-2011 14:00	30-JUN-2011 14:00		
Compound	CAS Number	LOR	Unit	HK1114986-001	HK1114986-002		
EA/ED: Physical and Aggregate Properties							
EA055: Moisture Content (dried @		0.1	%	12.8	14.4		
103°C)							
EG: Metals and Major Cations							
EG020: Arsenic	7440-38-2	1	mg/kg	2	3		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114986



Sub-Matrix: WATER			Client sample ID	A-S20A1	A-S20A1		
				EQUIPMANT BLANK	FIELD BLANK		
		Client sa	mpling date / time	30-JUN-2011 14:00	30-JUN-2011 14:00		
Compound	CAS Number	LOR	Unit	HK1114986-003	HK1114986-004		
EG: Metals and Major Cations - Filtered							
EG020: Arsenic	7440-38-2	10	μg/L	<10	<10		

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114986



## Laboratory Duplicate (DUP) Report

Matrix: SOIL					La	boratory Duplicate (DUP) Re	port	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical ar	nd Aggregate Properties (Q	C Lot: 1858719)						
HK1114986-001	A-S20A1 3.00M-3.45M	EA055: Moisture Content (dried @ 103°C)		0.1	%	12.8	14.2	10.6
EG: Metals and Ma	jor Cations (QC Lot: 18620	40)						
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0
Matrix: WATER					La	boratory Duplicate (DUP) Re	port	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
EG: Metals and Ma	jor Cations - Filtered (QC L	ot: 1858880)						
HK1114986-004	A-S20A1 FIELD BLANK	EG020: Arsenic	7440-38-2	10	μg/L	<10	<10	0.0

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB	) Report		Laboratory Cont	trol Spike (LCS) and Labo	ratory Control S	oike Duplicate (D	CS) Report	
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RF	PD (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 186	2040)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8		85	115		
Matrix: WATER			Method Blank (MB	) Report		Laboratory Cont	trol Spike (LCS) and Labo	ratory Control S	oike Duplicate (D	CS) Report	
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RF	PD (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations - Filtered (QC	Lot: 1858880)										

Matrix: SOIL	c SOIL				Matrix Spi	ike (MS) and Matri	ix Spike Duplic	ate (MSD) Re	port	
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPD	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1862040)									
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6		75	125		
Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPD	O (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations - Filtered (QC Lot: 18	58880)								
HK1114986-003	A-S20A1 EQUIPMANT BLANK	EG020: Arsenic	7440-38-2	100 μg/L	87.9		75	125		

# **ALS Laboratory Group**

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### **CERTIFICATE OF ANALYSIS**

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	HK1114988
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisa.cheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	:	Telephone	: +852 2610 1044		
Facsimile	:	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	:	Date Samples Received	: 30-JUN-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016788			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 1

#### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 08-JUL-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1114988** 

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for

Fung Lim Chee, Richard General Manager Inorganics

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114988

# ALS

,						
Sub-Matrix: SOIL			Client sample ID	A-S20B1		
				3.00M-3.45M		
		Client sa	mpling date / time	30-JUN-2011 14:20		
Compound	CAS Number	LOR	Unit	HK1114988-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	27.2		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	17		

Client CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114988



## Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical an	A/ED: Physical and Aggregate Properties (QC Lot: 1858719)										
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	12.8	14.2	10.6			
EG: Metals and Ma	or Cations (QC Lot: 18	362040)									
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0			
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0			

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB	) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RF	PD (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1	1862040)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8		85	115			

Matrix: SOIL	utrix: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control	
ID			Number							Limit	
EG: Metals and Major	EG: Metals and Major Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6		75	125			

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



Inorganics

#### **CERTIFICATE OF ANALYSIS**

Client Page Laboratory : ALS Technichem HK Pty Ltd : CIVIL ENGINEERING AND DEVELOPMENT : 1 of 3 DEPARTMENT Work Order Contact Contact : MS LOUISA CHEUNG : Chan Kwok Fai, Godfrey : HK1114989 Address Address : 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong E-mail : Godfrey.Chan@alsenviro.com : louisa.cheung@arup.com Telephone Telephone : +852 2610 1044 Facsimile Facsimile : +852 2610 2021 Project Quote number Date Samples Received : PLANNING AND ENGINEERING STUDY ON : 30-JUN-2011 **DEVELOPMENT OF LOK MA CHAU LOOP -**INVESTIGATION Order number Issue Date : GE/2009/16.15 : 12-JUL-2011 C-O-C number : H016789 No. of samples received : 1 : LMC LOOP AREA A No. of samples analysed : 1

#### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 08-JUL-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1114989** 

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for

Fung Lim Chee, Richard General Manager

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114989



, mary trout recounts								
Sub-Matrix: SOIL			Client sample ID	A-S20C1				
				3.00M-3.45M				
		Client sa	mpling date / time	30-JUN-2011 14:40				
Compound	CAS Number	LOR	Unit	HK1114989-001				
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)		0.1	%	30.1				
G: Metals and Major Cations								
EG020: Arsenic	7440-38-2	1	mg/kg	12				

Client CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114989



## Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)			
EA/ED: Physical and	EA/ED: Physical and Aggregate Properties (QC Lot: 1858719)										
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	12.8	14.2	10.6			
EG: Metals and Majo	r Cations (QC Lot: 1862040)										
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0			
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0			

## Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB)	Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 18	EG: Metals and Major Cations (QC Lot: 1862040)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8		85	115			

Matrix: SOIL	trix: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control	
ID			Number							Limit	
EG: Metals and Major	EG: Metals and Major Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6		75	125			

# **ALS Laboratory Group**

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### **CERTIFICATE OF ANALYSIS**

Client	: CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	Laboratory	: ALS Technichem HK Pty Ltd	Page	: 1 of 3
Contact	: MS LOUISA CHEUNG	Contact	: Chan Kwok Fai, Godfrey	Work Order	HK1114991
Address	:	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: louisa.cheung@arup.com	E-mail	: Godfrey.Chan@alsenviro.com		
Telephone	:	Telephone	: +852 2610 1044		
Facsimile	:	Facsimile	: +852 2610 2021		
Project	: PLANNING AND ENGINEERING STUDY ON DEVELOPMENT OF LOK MA CHAU LOOP - INVESTIGATION	Quote number	:	Date Samples Received	: 02-JUL-2011
Order number	: GE/2009/16.15			Issue Date	: 12-JUL-2011
C-O-C number	: H016790			No. of samples received	: 1
Site	: LMC LOOP AREA A			No. of samples analysed	: 1

#### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 08-JUL-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1114991** 

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for

Fung Lim Chee, Richard General Manager Inorganics

Page Number : 2 of 3

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114991



### Analytical Results

, mary trous recounts						
Sub-Matrix: SOIL	Client sample ID			A-S20A1		
				4.50M-4.95M		
		Client sa	mpling date / time	02-JUL-2011 10:40		
Compound	CAS Number	LOR	Unit	HK1114991-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	18.6		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	3		

Page Number : 3 of 3

Client CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114991



### Laboratory Duplicate (DUP) Report

Matrix: SOIL			Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	
EA/ED: Physical and	Aggregate Properties (QC I	Lot: 1858719)							
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	12.8	14.2	10.6	
EG: Metals and Majo	r Cations (QC Lot: 1862040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0	
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0	

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

atrix: SOIL Method Blank (MB) Report			) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report								
					Spike	Spike Red	covery (%)	Recovery	Limits (%)	RP	D (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 1862040	))											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8		85	115			

## Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: SOIL	x: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control	
ID			Number							Limit	
EG: Metals and Major	Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6		75	125			

# ALS Technichem (HK) Pty Ltd

# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



### **CERTIFICATE OF ANALYSIS**

Client Page Laboratory : ALS Technichem HK Pty Ltd : CIVIL ENGINEERING AND DEVELOPMENT : 1 of 3 DEPARTMENT Work Order Contact Contact : MS LOUISA CHEUNG : Chan Kwok Fai, Godfrey : HK1114994 Address Address : 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong E-mail : Godfrey.Chan@alsenviro.com : louisa.cheung@arup.com Telephone Telephone : +852 2610 1044 Facsimile Facsimile : +852 2610 2021 Project Quote number Date Samples Received : PLANNING AND ENGINEERING STUDY ON : 02-JUL-2011 **DEVELOPMENT OF LOK MA CHAU LOOP -**INVESTIGATION Order number Issue Date : GE/2009/16.15 : 12-JUL-2011 C-O-C number : H016791 No. of samples received : 1 No. of samples analysed : LMC LOOP AREA A : 1

#### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 08-JUL-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1114994** 

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for

Fung Lim Chee, Richard General Manager Inorganics

Page Number : 2 of 3

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114994



### Analytical Results

7 y 7						
Sub-Matrix: SOIL			Client sample ID	A-S20B1		
				4.50M-4.95M		
		Client sa	mpling date / time	02-JUL-2011 10:50		
Compound	CAS Number	LOR	Unit	HK1114994-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	28.6		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	16		

Page Number : 3 of 3

Client CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114994



### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical an	d Aggregate Properties (0	QC Lot: 1858719)								
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	12.8	14.2	10.6		
EG: Metals and Maj	or Cations (QC Lot: 1862)	040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0		
HK1114994-001	A-S20B1 4.50M-4.95M	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0		

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

Matrix: SOIL			Method Blank (MB	) Report	Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report							
					Spike Spike Recovery (%)		Recovery Limits (%)		RF	RPD (%)		
Method: Compound	CAS Number	nber LOR Unit Result			Concentration	LCS	DCS	Low	High	Value	Control Limit	
EG: Metals and Major Cations (QC Lot: 186204	40)											
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8		85	115			

## Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: SOIL	: SOIL				port	ort				
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control
ID			Number							Limit
EG: Metals and Major	Cations (QC Lot: 1862040)									
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6		75	125		

# ALS Technichem (HK) Pty Ltd

# **ALS Laboratory Group**

ANALYTICAL CHEMISTRY & TESTING SERVICES



### **CERTIFICATE OF ANALYSIS**

Client Page Laboratory : ALS Technichem HK Pty Ltd : CIVIL ENGINEERING AND DEVELOPMENT : 1 of 3 DEPARTMENT Work Order Contact Contact : MS LOUISA CHEUNG : Chan Kwok Fai, Godfrey : HK1114997 Address Address : 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong E-mail : Godfrey.Chan@alsenviro.com : louisa.cheung@arup.com Telephone Telephone : +852 2610 1044 Facsimile Facsimile : +852 2610 2021 Project Quote number Date Samples Received : PLANNING AND ENGINEERING STUDY ON : 02-JUL-2011 **DEVELOPMENT OF LOK MA CHAU LOOP -**INVESTIGATION Order number Issue Date : GE/2009/16.15 : 12-JUL-2011 C-O-C number : H016792 No. of samples received : 1 No. of samples analysed : LMC LOOP AREA A : 1

#### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. The completion date of analysis is: 08-JUL-2011

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society. Specific comments for Work Order: **HK1114997** 

Sample(s) were received in a chilled condition.

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

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.

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Signatories Position Authorised results for

Fung Lim Chee, Richard General Manager Inorganics

Page Number : 2 of 3

Client : CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114997



### Analytical Results

7 117 m. y 110 m. 7 10 0 m. 10						
Sub-Matrix: SOIL			Client sample ID	A-S20C1		
				4.50M-4.95M		
		Client sa	ampling date / time	02-JUL-2011 10:59		
Compound	CAS Number	LOR	Unit	HK1114997-001		
EA/ED: Physical and Aggregate Properties						
EA055: Moisture Content (dried @ 103°C)		0.1	%	40.9		
EG: Metals and Major Cations						
EG020: Arsenic	7440-38-2	1	mg/kg	13		

Page Number : 3 of 3

Client CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

Work Order HK1114997



### Laboratory Duplicate (DUP) Report

Matrix: SOIL				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)		
EA/ED: Physical an	d Aggregate Properties	(QC Lot: 1858719)								
HK1114986-001	Anonymous	EA055: Moisture Content (dried @ 103°C)		0.1	%	12.8	14.2	10.6		
EG: Metals and Maj	or Cations (QC Lot: 186	2040)								
HK1114863-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	5	5	0.0		
HK1114994-001	Anonymous	EG020: Arsenic	7440-38-2	1	mg/kg	16	16	0.0		

### Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report

atrix: SOIL Method Blank (MB) Report			) Report		Laboratory Con	trol Spike (LCS) and Labor	atory Control Spi	ke Duplicate (D0	CS) Report		
					Spike	Spike Red	covery (%)	Recovery I	Limits (%)	RI	PD (%)
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QC Lot: 18620	040)										
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	89.8		85	115		

### Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Matrix: SOIL	x: SOIL			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Re	ecovery (%)	Recovery	Limits (%)	RPI	D (%)	
Laboratory sample	Client sample ID	Method: Compound	CAS	Concentration	MS	MSD	Low	High	Value	Control	
ID			Number							Limit	
EG: Metals and Major	Cations (QC Lot: 1862040)										
HK1114853-001	Anonymous	EG020: Arsenic	7440-38-2	5 mg/kg	77.6		75	125			

# **Appendix E**

Responses to Comments

Agreement No. CE 53/2008 (CE)
Planning and Engineering Study on Development of Lok Ma Chau Loop - Investigation
Supplementary Contamination Assessment Report for Area A - Responses to Comments

Comments from Related Departments/Parties	Page No.
Civil Engineering and Development Department, New Territories North and West Development Office	2
Environmental Protection Department, Environmental Assessment Division, Strategic Assessment Group	

### COMMENTS FROM RELATED DEPARTMENTS/PARTIES

No.	Comments	Responses
1.	Civil Engineering and Development Department, New Territories North and West Development Office	
	Emily L. F. Chan, via email dated 09 September 2011	
	I refer to your letter ref. 209840/03/LYPC/TC/00394 dated 18.8.2011 submitting the supplementary CAR/RAP for Area A.	
	Please note that I have no comment on the report except that the summary of test results of Stage 2 SI Works currently bound in Appendix D should be placed in Appendix C.	Noted. The summary of test results of Stage 2 SI Works will be placed in the corresponding appendix accordingly.
	Please also incorporate comments from other departments in the report	Noted.
2.	Environmental Protection Department, Environmental Assessment Division, Strategic Assessment Group	
	Mr. Vincent Lau, via email dated 16 September 2011	
	I refer to the captioned Supplementary Contamination Assessment Report and Remediation Action Plan for Area A dated August 2011.	
	Comments from our specialist colleague on land contamination/waste management (Dr. Jacqueline Wong, ph. 2835 1226) are given below:	

No.		Comments	Responses
	Section 2.1:	The intervals of sampling depth need to be explicitly indicated	The last sentence of <b>Section 2.1</b> has been revised as follow:  "But in order to also confirm the vertical extent of Arsenic contamination, it was later decided that soil samples should be collected at the same depth intervals as in Stage 1 SI i.e. 1.5-1.95mbgl, 3.0-3.45mbgl and 4.5-4.95mbgl."
	Section 3.1:	The consultants need to clarify the contradictory statements regarding any exceedance of RBRGs standard found in the soil samples	Section 3.1 has been revised as follow:  "At the sampling depths where Arsenic contamination was detected previously in Stage I SI (refer to Table 1.1), no Arsenic exceedances were found according to the laboratory testing results. However, among the depths where Arsenic contamination were not previously detected, marginal exceedances of the RBRG (Rural Residential) Arsenic limit were found in the samples collected at A-S03a1 (4.5-4.95 mbgl) and A-S03c1 (1.5-1.95 mbgl)."
	Section 4.1:	The consultants need to justify the estimated vertical extent of contamination of the corresponding borehole (as shown in the referred Table 4.1) wrt the testing results obtained from Stage 2 SI works as per Appendix C.	Sections 4.1.1 and 4.1.2 have been added to provide details on the methodologies for the estimation of the soil contamination extent. A note has also been added to Table 4.1 which states that:  "[1] For such sample with contamination detected, the full depth of soil sampling is taken as contaminated. Besides, a depth of 0.5m above and below that sampling depth respectively will be taken as contaminated as a conservative estimate. For example, for the sampling depth of 3.0–3.5mgbl with contaminated laboratory testing finding, the vertical extent of contamination will be estimated from 2.5mgbl (i.e. 3mbgl - 0.5m) to 4mbgl (i.e. 3.5mbgl + 0.5m), and the vertical extent of contamination is therefore estimated as 1.5m."

No.		Comments	Responses
	Section 5:	The meaning of the first sentence in the second paragraph is unclear.	The second paragraph have been revised as follow:  "According to the testing results, no further Arsenic exceedances were found at the sampling depths where such contamination was detected previously in Stage I SI. However, Arsenic concentrations in the soil samples collected from A-S03a1 at 4.5-4.95 mbgl and from A-S03c1 at 1.5-1.95 mgbl have marginally exceeded the RBRGs of Rural Residential land uses. These two boreholes were considered as two additional contaminated boreholes and their respective possible contamination zones have been estimated."