Annex A2

Contamination Assessment Report (CAR)

Contamination Assessment Report for Decommissioning of the Co-Combustion Pilot Plant at Tap Shek Kok

Green Island Cement Company Limited

11 April 2008

Submitted by
Environmental Resources Management
21/F Lincoln House
Taikoo Place, 979 King's Road
Island East, Hong Kong
Telephone 2271 3000
Facsimile 2723 5660

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CONTAMINATION ASSESSMENT REPORT

Green Island Cement Company Limited

Decommissioning of the Co-Combustion Pilot Plant at Tap Shek Kok

April 2008

Reference 0071019

For and on behalf of
ERM-Hong Kong, Limited

Approved by: Dr. Andrew Jackson

Signed:

Position: Managing Director

Date: 11th April 2008

CONTENTS

ANNEXES

ABBREVIATIONS

As	Arsenic
Ba	Barium
BTEX	Benzene, toluene, ethyl benzene, and xylene
CAP	Contamination Assessment Plan
CAR	Contamination Assessment Report
CCPP	Co-Combustion Pilot Plant
Cd	Cadmium
Co	Cobalt
Cr III and Cr VI	Chromium III and VI
Csat	Soil Saturation Limits
Cu	Copper
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EPD	Environmental Protection Department
GICP	Green Island Cement Plant
Hg	Mercury
HKUST	Hong Kong University of Science and Technology
HOKLAS	Hong Kong Laboratory Accreditation Scheme
LOR	Limit of Reporting
Mn	Manganese
Mo	Molybdenum
MRRF	Materials Recovery and Recycling Facility
MSW	Municipal Solid Waste
Ni	Nickel
Pb	Lead
QA	Quality Assurance
QC	Quality Control
RBRG Guidance Manual	Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management
RBRGs	Risk-based Remediation Goals for Contaminated Land
Sb	Antimony
SI	Site Investigation
Sn	Tin
TPH	Total Petroleum Hydrocarbons

USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
Zn	Zinc

1 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

As part of the research programme, in collaboration with the Hong Kong University of Science and Technology (HKUST), to develop a new thermal treatment process for municipal solid waste (MSW), the Co-Combustion Pilot Plant (CCPP, the Site) was constructed in a designated area inside the Green Island Cement Plant site (GICP). For the purposes of this report, the designated area in which the CCPP was constructed will be referred to as the Site. The GICP is located at Tap Shek Kok, Tuen Mun. The CCPP was constructed in 2004 and has been permanently shutdown since the completion of the pilot plant study in December 2005. Green Island Cement Company Limited (the Client) has now initiated a project to demolish the existing CCPP, to remove the disused equipment and to dispose of any waste materials so generated (the Project).

The Project is a Designated Project under Schedule 3, Item of Part II, Schedule 2 of the *Environmental Impact Assessment Ordinance* (EIAO): "Decommissioning Projects: A municipal, chemical or clinical waste incinerator". An environmental impact assessment (EIA) Study Brief was issued for the Project by the Environmental Protection Department (EPD) in June 2007 (EIA Study Brief *No. ESB-164/2007*).

In compliance with one of the EIA requirements, a contamination impact assessment was required to be conducted to evaluate the land contamination impact due to the past land uses at the Site. In accordance with the EIA Study Brief, a Contamination Assessment Plan (CAP) prepared by ERM, and was submitted to and approved by the EPD in January 2008. A copy of the CAP is presented in *Annex A*.

The land contamination assessment site investigation (SI) was conducted in February 2008 in accordance with the approved CAP and based on the guidelines set out in the EPD's *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management* (RBRG Guidance Manual) and the associated Guidance Notes, and the EPD's *Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshop*.

1.2 OBJECTIVES OF THE ASSESSMENT

This Contamination Assessment Report (CAR) presents the results obtained during the land contamination investigation at the Site. As mentioned in the CAP, no soil excavation or groundwater extraction will be required for the Project and no potentially contaminated materials requiring disposal will be generated from the Site. Human exposure to potentially contaminated

material will be limited to possible worker contact during the excavation of the foundations and substructures.

The site investigation programme was proposed to provide additional information for the Site area to offer a level of confidence on the presence and (if found) the concentrations of contaminants in the underlying soil materials and to help in the formulation of a site-specific health and safety plan.

The objectives of contamination sampling are to:

- identify whether the soil below the ground surface within the Project site is contaminated; and
- if contaminants are present, to determine their concentrations.

This CAR provides a detailed description of the methodology used, the results of the soil sampling investigation, and field observations and findings noted during the investigation programme.

1.3 SCOPE OF THE ASSESSMENT

The scope of the study, as outlined in the CAP (*Annex A*), was to undertake an investigative assessment of the site and included the following elements:

- Provision of an account of the present use of the land and the relevant past land use history in relation to possible land contamination;
- Excavation of six trial pits down to a maximum of 1.5 m below ground level (m bgl), with two trial pits (S1/S2 and S3/S4) located adjacent to the wastewater underground storage tank (UST) and four trial pits (S5/S6, S7/S8, S9/S10 and S11/S12) located around the CCPP area to determine any soil contamination;
- To determine the presence and extent of contamination from the surface soil and in the fill materials, two (2) soil samples were taken from each sampling location at just below the concrete pavement and at between 1.0 to 1.5 m bgl for laboratory analysis;
- Laboratory analysis of soil and groundwater samples for heavy metals (Antimony (Sb), Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium III and VI (Cr III and Cr VI), Cobalt (Co), Nickel (Ni), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Tin (Sn), and Zinc (Zn)); total petroleum hydrocarbons (TPH); and benzene, toluene, ethyl benzene, and xylene (BTEX);
- Assess the extent and level of soil contamination by comparing against Hong Kong's *Risk-based Remediation Goals for Contaminated Land (RBRGs*); and

- Provide recommendations for mitigation measures during the demolition of the CCPP as required and appropriate.

1.4 STRUCTURE OF THE CAR

The remainder of this report is structured as follows:

Section 2 summarises the site background conditions;

Section 3 summarises the site investigation programme and analytical results from soil sampling;

Section 4 outlines the conclusions and recommendations of the CAR.

The report is accompanied by the following set of annexes:

Annex A presents the CAP;

Annex B contains the laboratory analytical report

Annex C contains the RBRG standards;

Annex D contains site investigation report by the civil contractor; and

Annex E presents the selected photographs from the Site Investigation.

2 THE SITE

2.1 SITE DESCRIPTION

The CCPP was built within the GICP site at Tap Shek Kok, Tuen Mun. The Site is surrounded by the remaining areas of the GICP. The immediate uses of the area surrounding the CCPP included:

- *North*: a lawn beyond which was an LPG storage to the northwest and a container office to the northeast;
- *South*: an internal road, beyond which is the PFA Grinding & Classification System;
- *East*: the operating cement kiln of GICP; and
- *West*: an internal road, beyond which was a Pack House and cement silos to the northwest and fuel underground storage tanks and dispensing station to the southwest.

The neighbours of the GICP are the Castle Peak Power Station of CLP Power Limited to the west, the Shiu Wing Steel Company steel manufacturing plant to the east, Lung Mun Road to the north and the sea shore to the south. The site layout plan and an aerial photograph showing the current site conditions are attached in the CAP (see *Annex A*).

The Site occupies an area of about 4,000 m^2. It consists of a waste sorting facility or materials recovery and recycling facility (MRRF) at the front-end followed by a thermal treatment system for the integrated treatment of MSW utilizing the Co-combustion Process patented by the Client.

2.2 PROPOSED DECOMMISSIONING OF CCPP

The proposed decommissioning of the CCPP will involve the demolition of the existing structures and concrete slab and asphalt hard surface, removal of used equipment, the removal of the concrete foundations supporting the equipment and the disposal of waste materials generated by the demolition. It is understood that the Site will then be left as an area of open space for possible future industrial use associated with the surrounding cement plant operations.

2.3 ENVIRONMENTAL SETTING

The whole of the GICP Site was formed through reclamation in the late 70's. The fill materials used were mainly from the nearby hillsides. Some sand materials were also reportedly imported to the area. Based on the review of the site history and historical pictures of the site, in particular during the site formation (see *CAP*), the shallow geology underlying the site is anticipated to

comprise homogeneous fill materials (consisting of decomposed granites, rocks, boulders from nearby hills mixed with imported sand materials).

2.4 *SITE HISTORY*

The construction of the GICP commenced in 1978 and the operations of the GICP commenced in 1982. The GICP site was approved for the purpose of manufacture of cement and cement-related products. The Site of the pilot plant is an open area reserved for a second cement kiln. Following start up of the GICP in 1982, the Site was used as an emergency stockpile for cement clinker until 1985. The Site was also used as emergency open stock pile of natural limestone imported from Japan between 1990 and 1994. The stockpile area was not paved initially. A propane store was reportedly built in the late 1980s but was never commissioned, and was removed in March 1992.

The CCPP was constructed in June 2004 after receiving approval from the Lands Department, EPD and the Buildings Department. The continuous pilot operation commenced in October 2005 and finished in December 2005. Of note is that the combined total operating time of the pilot plant from the commissioning to the end of the operation was only 11 weeks.

Tables 2.4a to *2.4c* [1], respectively, present the historical, current and anticipated future land uses of the CCPP Site. *Table 2.4d* shows the historical development of the CCPP and the GICP. Historical photographs showing the site development are presented in the CAP (see *Annex A*).

Table 2.4a Summary of Historical On Site Land Use

Type of Facility	On Site Property Land Use	Date Began	Description	Owner or Occupier	Approx Site Area	Off Site Property Affected
None	Reclaimed land	Late 1970	Site reclamation	GIC	4,000 m²	No
Industrial	Storage area of cement clinker	1982	Reserved for storage of propane but used for cement clinker stockpiling	GIC	As above	No
Industrial	Reserved storage area	1984-1990	Not used	GIC	As above	No
Industrial	Storage area	1990-1994	Storage of limestone	GIC	As above	No
Industrial	Grassed area	1994-June 2004	Used as kiln lawn	GIC	As above	No
Industrial	Construction site	June 2004	Construction of foundations	GIC	4,000 m²	No

(1) The tables are prepared in accordance with *Standard form 3.1 from the RBRG guidance*

Type of Facility	On Site Property Land Use	Date Began	Description	Owner or Occupier	Approx Site Area	Off Site Property Affected
Industrial	CCPP	Oct 2005 – Dec 2005	11 week trial operation	GIC	As above	No

Table 2.4b Summary of Current On Site Land Use

Type of Facility	On Site Property Land Use	Date Began	Description	Owner or Occupier	Approx Site Area	Off Site Property Affected
Industrial	Disused trial co-combustion pilot plant	From Jan 2006 to present	Trial CCPP	GIC	4,000 m^2	No

Table 2.4c Summary of Anticipated Future On Site Land Use

Type of Facility	On Site Property Land Use	Date Began	Description	Owner or Occupier	Approx Site Area	Off Site Property Affected
Industrial	Open space	2008	Site to be left as open grassed area in the immediate term	GIC	4,000 m^2	No

Table 2.4d Site Historical information for the GICP and CCPP Site

Time	GICP	CCPP Site
late 1970s	Site reclamation	-
Before 1982	Construction of the cement plant	-
1982	Operation of the GICP cement kiln began	Reserved for propane storage and used as emergency stock pile of cement clinker until 1985
1984-1990	Operation of the cement kiln suspended	Reserved for propane storage and left vacant
1990-1994	Operation of the cement kiln restarted	Reserved for propane storage and used as emergency storage of limestone imported from Japan
1992	Continuous operation of the GICP	Propane storage was built but never commissioned. It was removed in March 1992.
After 1994	Continuous operation of the GICP	Rehabilitated as a kiln lawn until the construction of CCPP
Dec 2001	Clinker production was suspended	Rehabilitated as a kiln lawn until the construction of CCPP
Jun 2004	Clinker production was suspended	Construction of the CCPP foundation
Apr 2005	Clinker production was suspended	First load commissioning test of the CCPP
Jul 2005	Clinker production was suspended	Second load commissioning test of the CCPP
Oct 2005	Clinker production was suspended	Continuous operation of the CCPP
Dec 2005	Clinker production was suspended	Operation ceased after all operation data has been collected
Jan 2006	Clinker production resumed	-

3 SITE INVESTIGATION PROGRAMME

This section presents the summary of the contamination assessment programme and includes the methodology used during the soil sampling work, details of field observations such as visual observations made during the investigation programme, results of field screening and analytical results from soil and ground water sample analyses.

3.1 SITE INVESTIGATION PROGRAMME

A limited intrusive contamination investigation was conducted at the site. The site investigation (SI) program included excavation of six trial-pits, sampling of soil materials at different depths, and laboratory analysis of soil samples for potential contaminants. The SI program was designed in accordance with the EPD's *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management* (RBRG Guidance Manual) and the associated Guidance Notes, and the EPD's *Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car Repair/Dismantling Workshop*. The details of the SI program are presented in the following sections.

3.1.1 Soil Sampling

The SI was conducted during 21 to 22 February 2008. Six 1.0 m x 1.0 m trial pits were excavated down to maximum depth of 1.5 m bgl.

Soil samplings were undertaken at two locations (S1/S2 and S3/S4) adjacent to the UST to identify whether soil surrounding the UST is contaminated. Two (2) soil samples are taken at each sampling location using trial pits at below the concrete slab and asphalt hard surface and at the bottom of the UST (ie at 1.5 m below ground level, m bgl) [1].

Four (4) subsurface soil sampling locations (S5/S6, S7/S8, S9/S10 and S11/S12) were located around the CCPP area to provide information on the level of contaminants in the subsurface soil around the CCPP. The sampling locations were located along the CCPP structure focussing where foundations are located and at similar intervals to provide coverage of the proposed area where underground subsurface disturbance will occur during the demolition. To determine the presence and extent of contamination from the surface soil [2] and in the fill materials [3], two (2) soil samples were taken from each sampling

(1) The UST dimension is (1 m (wide) x 4 m (Length) x 1.5 m (depth).

(2) It is anticipated that any contamination from the CCPP operations will have entered the underlying soils from the surface as no subsurface pipelines or channels were located within the CCPP.

(3) It was reported that the original fill material was excavated from the site for the foundation construction during the construction of the CCPP which was then backfilled on site. The Site was used for storage of materials prior to the CCPP construction.

location at just below the concrete pavement and asphalt hard surface and at 1.5 m bgl.

Soil samples were collected using a stainless steel scoop and were placed immediately into laboratory supplied bottles. The sample bottles were then labelled and placed directly into the cooler with ice packs for shipment to the laboratory for analysis.

The sampling methodologies applied were based on methods developed by the US Environmental Protection Agency (US EPA) and included sample preparation and preservation and chain-of-custody documentation. All of the sampling equipment were cleaned with water and phosphate-free detergent, and then rinsed with tap water. The cleaning procedure was repeated after each sample to avoid potential cross contamination.

The sampling locations are shown in *Figure 3.1a* and a summary of the above soil sampling programs is presented in *Table 3.1a*.

Table 3.1a Sampling Locations and Parameters for Site Investigation

Sample	Sampling Location	Depth of Sampling	Sampling Parameters	No of Samples to be taken
S1/S2	Located to the north of the UST.	Underneath concrete pavement and at 1.5 m	Heavy metals, TPH, BTEX	2
S3/S4	Located to the south of the UST.	Underneath concrete pavement and at 1.5 m	Heavy metals, TPH, BTEX	2
S5/S6	Located to the east of the rotary kiln.	Underneath concrete pavement and at 1.5 m	Heavy metals, TPH, BTEX	2
S7/S8	Located to the west of the cyclones.	Underneath concrete pavement and at 1.5 m	Heavy metals, TPH, BTEX	2
S9/S10	Located to the south of the CCPP and north of the overhead fuel pipelines connecting the fuel oil storage tank (located approximately 100 m to the southwest of the CCPP).	Underneath concrete pavement and at 1.5 m	Heavy metals, TPH, BTEX	2
S11/S12	Located to the northwest of the reception hall and to the southeast of the fuel underground storage tanks and dispensing station.	Underneath concrete pavement and at 1.0 m	Heavy metals, TPH, BTEX	2
QC	Collected from S7/S8	Underneath concrete pavement	Heavy metals, TPH, BTEX	1
			Total no. of samples	**13**

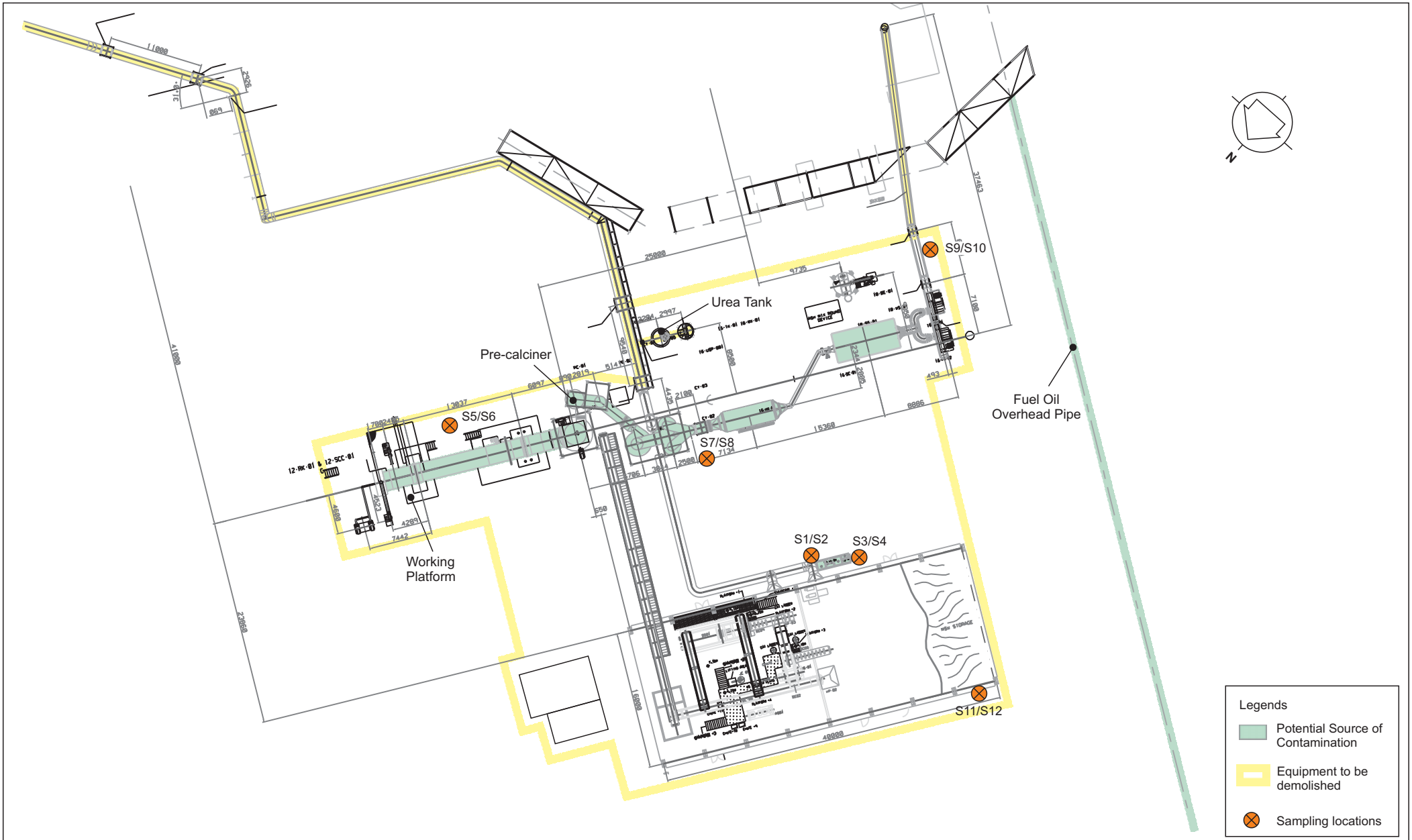

Figure 3.1a

Soil Sampling Locations

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3.1.2 Sample Duplication

One field duplicate soil sample was collected during the land contamination investigation. The duplicate sample was collected on a random basis and has been submitted to the HOKLAS accredited laboratory for the purpose of quality control (QC)/quality assurance (QA).

3.1.3 Laboratory Analytical Programme

The analysis of soil samples was carried out by the ALS Technichem (HK) Pty Ltd Laboratory, based in Hong Kong. ALS is a Hong Kong Laboratory Accreditation Scheme (HOKLAS) certified laboratory and performs analyses to US EPA protocols and Quality Assurance (QA) guidelines. Samples were collected by the ALS Laboratory courier in a sealed cooler with chain-of-custody documentation. All soil samples were analysed for the following parameters:

- Total Petroleum Hydrocarbons (TPH) fractions including C6-C8, C9-C16 and C17-C35 by USEPA Method 8015;
- Simple Aromatics (eg benzene, toluene, ethyl benzene, and xylenes) (BTEX) by USEPA Method 8260; and
- Heavy metals including antimony (Sb), arsenic (As), barium (Ba), cadmium (Cd), chromium III and VI (Cr III and Cr VI), cobalt (Co), nickel (Ni), copper (Cu), lead (Pb), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), tin (Sn), and zinc (Zn) by USEPA Method 6020A/7000 ICPMS.

3.1.4 Field Observations

During the trial pit excavation and sampling activities, it was observed that the soil materials encountered during the trial pit excavations (to 1.5 m bgl) comprised mainly of fill materials.

No evidence of contamination, such as staining, discoloration or odour, was observed during excavation. No water was encountered in any of the trial pit.

3.2 ANALYTICAL RESULTS

3.2.1 Criteria for Assessment

The assessment of land contamination sources and the potential impacts associated with development projects are undertaken under the direction of EPD. EPD's *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management* (the *RBRG Guidance Manual*), the associated *Guidance Note for Contaminated Land Assessment and Remediation* (the *RBRG Guidance Note*), and the EPD's *Guidance Notes for Investigation and Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards, and Car*

Repair/Dismantling Workshop (the *EPD's Guidance Notes*) are the key sets of guidelines to which reference are made.

The existing soil results have been compared against the RBRGs and the associated Soil Saturation Limits (C_{sat}). RBRGs were developed for four different post-restoration land use scenarios (ie Urban Residential, Rural Residential, Industrial and Public Parks). For the purposes of this CAP, the Site has been given a preliminary classification as an Industrial Site, as defined in the *RBRs Guidance Manual*. The RBRG values are present in the *RBRGs Guidance Manual* and are also attached in *Annex C*.

3.2.2 Soil Analytical results

The results of the laboratory analysis of the soil samples are presented in *Tables 3.2a*.

Levels of TPH analysed for all three carbon ranges were below the reported detection limits for all samples. Concentrations of BTEX were also below the reported detection limits at all locations. Levels of all metals analysed in all samples were well below the RBRG values.

The detailed results of the laboratory analysis of the samples with the QA/QC information are presented in *Annex B.*

Table 3.2a Soil Analytical Results (all results in mg/kg dry weight)

Parameters	*LOR[a]*	*S1*	*S2*	*S3*	*S4*	*S5*	*S6*	*S7*	*S8*	*S9*	*S10*	*S11*	*S12*	*S13[b]*	*RBRG Industrial*	*Csat*
% Moisture Content	0.1	15.3	8.1	10.6	9.8	10.3	9.8	9.4	10.6	7.4	7.5	9.5	10.6	7.6	-	-
TPH																
• C6-C8 Fraction	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	1.00E+04	1.00E+03
• C9-C16 Fraction	200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	1.00E+04	3.00E+03
• C17-C35 Fraction	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	1.00E+04	5.00E+03
Benzene	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	9.12E+00	3.36E+02
Toluene	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	1.00E+04	2.35E+02
Ethyl-benzene	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	8.24E+03	1.38E+02
m,p-Xylene	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	1.23E+03[c]	1.50E+02[c]
o-Xylene	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	1.23E+03[c]	1.50E+02[c]
Priority Metal																
• Antimony (Sb)	1	7	<1	5	<1	2	<1	1	<1	<1	<1	2	1	<1	2.61E+02	-
• Arsenic (As)	1	25	<1	25	<1	2	<1	1	<1	<1	<1	4	1	2	1.96E+02	-
• Barium (Ba)	0.5	110	30.4	109	23.1	53.4	23.1	41.5	29.4	22.8	21.1	60.4	35.8	24.5	1.00E+04	-
• Cadmium (Cd)	0.2	2.2	0.2	0.7	<0.2	0.6	<0.2	0.5	<0.2	<0.2	<0.2	0.6	0.7	<0.2	6.53E+02	-
• Chromium III (Cr III)	0.5	35.3	8.8	28.2	2.3	14.2	3	12.1	4.2	8.5	3.2	15.7	21.5	24.5	1.00E+04	-
• Chromium VI (Cr VI)	0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	1.96E+03	-
• Cobalt (Co)	0.5	11.5	3.2	14.6	2.7	3.9	3.4	5.2	2.6	2.3	1.4	4.3	3.7	3.5	1.00E+04	-
• Copper (Cu)	1	226	22	103	2	35	2	20	3	17	2	57	32	30	1.00E+04	-
• Lead (Pb)	1	85	42	35	61	54	59	46	42	51	42	49	42	47	2.29E+03	-
• Manganese (Mn)	0.5	152	452	447	296	279	265	339	254	364	316	298	221	344	1.00E+04	-
• Mercury (Hg)	0.05	0.24	<0.05	0.08	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	3.84E+01	-
• Molybdenum (Mo)	1	77	3	33	5	19	2	7	2	2	2	21	12	4	3.26E+03	-
• Nickel (Ni)	1	21	3	22	1	<1	<1	3	<1	2	<1	2	<1	13	1.00E+04	-
• Tin (Sn)	0.5	45.7	5.4	8.2	4.2	7.4	4.3	5.5	4	4.2	2.6	7.6	5.8	6.9	1.00E+04	-
• Zinc (Zn)	1	523	72	387	31	116	31	114	34	92	32	142	162	228	1.00E+04	-

Notes:

(a) LOR = Limit of reporting

(b) The duplicate sample taken from S7.

(c) The RBRG Industrial values for Total Xylenes

3.3 CONCEPTUAL MODEL OF POTENTIAL POLLUTANT LINKAGE

The potential pollutant linkages that could be present at the Site due to the on site activities of the CCPP are summarised in the *Table 3.3a*. It is considered that the only potential receptors at risk might be site workers involved in decommissioning and demolition works, which was discussed in the *CAP* (see *Annex A*).

As the contaminants analysed were either not detected or with concentrations well below the RBRGs, it is not considered that the activities of the CCPP pose risks to any receptor.

Table 3.3a Conceptual Model of Potential Pollutant Linkage at the CCPP site

Source	Pathway	Receptor	Risk
Historical storage of cement and limestone/ foundation construction	Ingestion, inhalation and skin contact	Site workers involved in the decommissioning and demolition work	None – The concentrations in the soil samples were well below the RBRGs. The demolition work will be limited to the top 1.5 m and hence will not touch these materials.
	Soil pore migration	Ground and surface waters	None – The concentrations in the soil samples were well below the RBRGs. The storage occurred over 10 years ago.
Municipal waste feedstock (MSW)	Ingestion, inhalation and skin contact	Humans (eg Site workers during decommissioning and demolition works)	None – The concentrations in the soil samples were well below the RBRGs. No MSW remains on site at the time of the site visit.
Ash residue from the thermal treatment trial	Ingestion, inhalation and skin contact	Humans (eg Site workers during decommissioning and demolition works)	None – The concentrations in the soil samples were well below the RBRGs. No ash residues were left on the ground at the time of the site visit.
Liquid runoff from MSW/ash	Ingestion, inhalation and skin contacts	Humans (eg Site workers during decommissioning and demolition works)	None – The concentrations in the soil samples were well below the RBRGs.
Liquid runoff from MSW/ash	Soil pore water	Groundwater/ surface water	None – The concentrations in the soil samples were well below the RBRGs. Impermeable hardstanding and enclosed drainage system. No leakage of the wastewater collection UST reported.
Off site contamination	Migration on to	Humans - Site	None – The concentrations in the

Source	Pathway	Receptor	Risk
sources	the CCPP site via soil pore water or air borne dust	workers during decommissioning Groundwater under the Site	soil samples were well below the RBRGs. There was no evidence to suggest any spillages or leaks have occurred off site to such an extent as to impact the soils or groundwater underlying the Site.

3.4 EVALUATION OF IMPACTS

As all the detected concentrations of potential contaminants in the soil samples were well below the referenced RBRGs and soil saturation limits (Csat) no potential land contamination impact is anticipated during the CCPP demolition or thereafter.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

The assessment activities were performed in accordance with internationally recognized practices. The results of the site investigation works determined that:

- TPH/BTEX were not detected in any of the soil samples collected.
- Concentrations of priority pollutant metals were detected were well below the RBRG standards.

As the result of the above, no potential impact from the contaminated soil is anticipated.

4.2 RECOMMENDATIONS

Based on the above investigation results, no further investigation is warranted and no mitigation measures are required.

Annex A

The CAP

Please refer to Annex A1 of the EIA Report

Annex B

Site Investigation Report by the Civil Contractor

Site Investigation Works

for

Green Island Cement Plant, Tap Shek Kwok, Tuen Mun

GROUND INVESTIGATION REPORT

13 March 2008

CONSULTANT ENGINEER

Environmental Resources Management

CONTRACTOR

CITY GEO 城市土力工程有限公司
City Geotechnical Engineering Ltd
Unit 3016, New Tech Plaza, 34 Tai Yau Street, San Po Kong, Kowloon
Telephone : (852) 2997 7288 Fax : (852) 2997 6766

Certificate of Compliance/Certificate of Supervision

(for inclusion in ground investigation report)

Project name & location : Green Island Cement Plant, Tap Shek Kwok, Tuen Mun.

CGEL Contract No. : C577

Consultant Engineer : Environmental Resources Management

Part 1 : Certificate of Compliance *(to be completed by Authorized Signatory)*

I, the person appointed to act for the registered specialist contractor (ground investigation field works category) **WOO Kwong Yeung (胡廣楊)** , certify that : -

(i) we are responsible for the works stated in the report and that the works have been conducted according to GEOGUIDE 2 and 3;

(ii) the works have been carried out under our supervision in accordance with the requirements stipulated and the Quality Supervision Plan for Ground Investigation Field Works submitted to the Buildings Department;

(iii) the logging of samples and preparation of borehole logs in accordance with GEOGUIDE 3 have been carried out by a Competent Person; and

(iv) the field density tests and other tests of samples have been conducted by a HOKLAS accredited laboratory. (*)

Name of the RSC (GIFW) : **City Geotechnical Engineering Ltd.**

Certificate of Registration No. : **SC(GI) 5 /2001**

Date of expiry of registration : **1 July 2010**

Signature of Authorized Signatory :

Date : **13 March 2008**

Part 2 : Certificate of Supervision *(to be completed by Registered Geotechnical Engineer)*

I, the Registered Geotechnical Engineer (name in full) _____ (Chinese)_____,

certify that I have provided supervision in accordance with the requirement stipulated and the Quality Supervision Plan for Ground Investigation Field Works submitted to the Buildings Department.

Certificate of Registration No. : _____

Date of expiry of registration : _____

Signature :

_____

Date :

_____

* Delete where appropriate

CITY GEOTECHNICAL ENGINEERING LTD

CONTRACT NO. C577

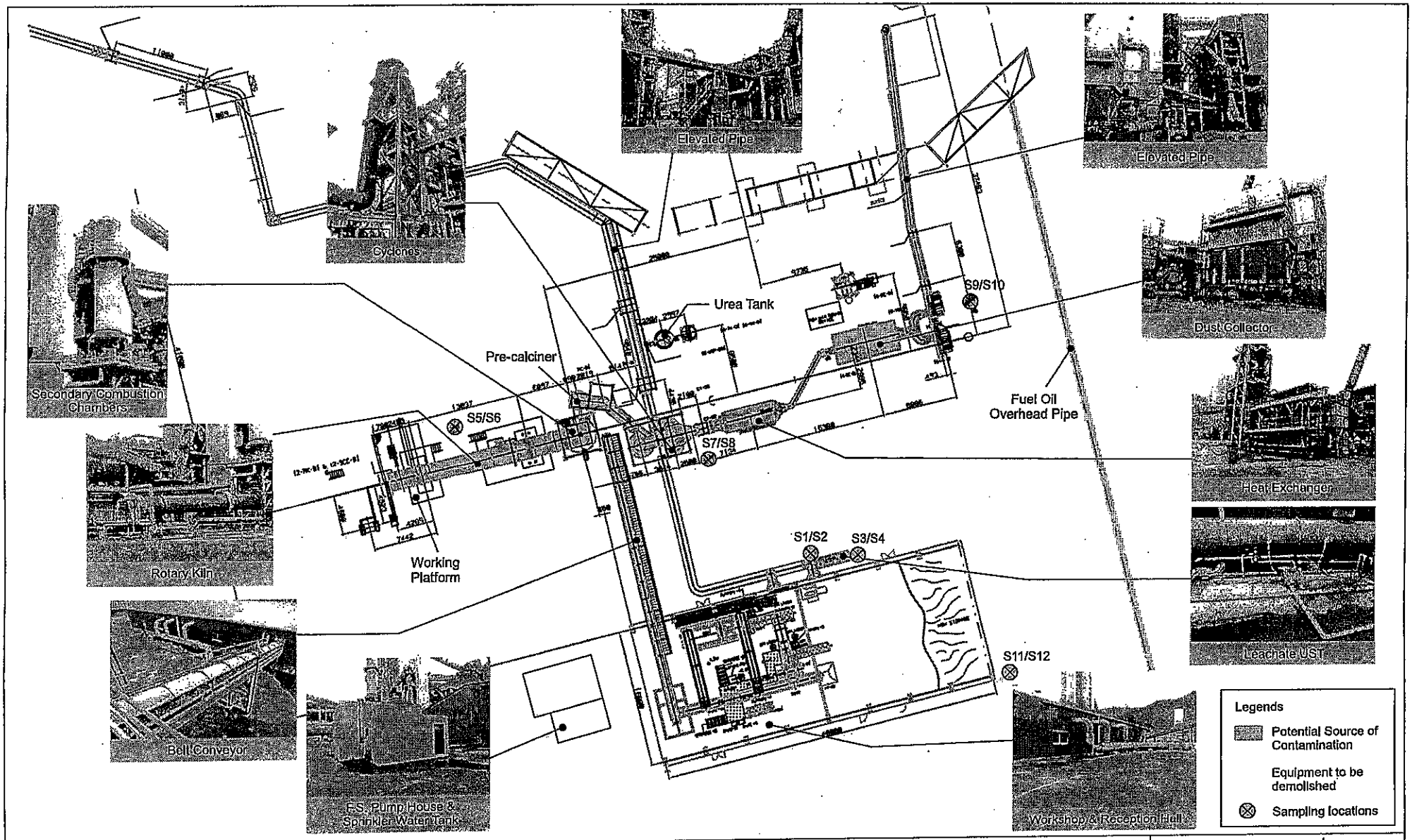
Site Investigation Works

for

Green Island Cement Plant, Tap Shek Kwok, Tuen Mun

CONTENTS

Site Investigation Works Layout Plan



Green Island Cement Plant, Tap Shek Kwok, Tuen Mun

Site Investigation Layout Plan

Environmental Resources Management

ERM

Survey Record

CITY GEOTECHNICAL ENGINEERING LTD

Site Investigation Works

for

Green Island Cement Plant, Tap Shek Kwok, Tuen Mun

Survey Records

Trial Pit No.	Level (m.P.D.)
S1/S2	+6.95
S3/S4	+6.92
S5/S6	+7.10
S7/S8	+6.90
S9/S10	+7.05
S11/S12	+6.94

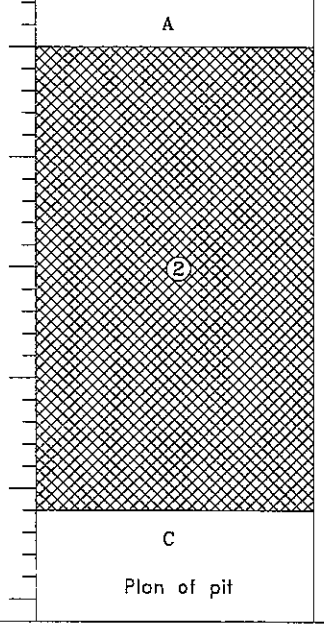
Trial Pit Log

City Geotechnical Engineering Ltd.

Location: Green Island Cement Plant, Tap Shek Kwok, Tuen Mun Ground Investigation Works	Trial pit No.: S1/S2	Sheet 1 of 1

Logged by: LKM Checked by: AW Excavation method: HAND DUG Excavated: 22/2/08
Date: 22/2/08 Backfilled: 22/2/08

Samples & Test	Depth (m)	Face A: width: 1.70 m	Face B: width: 2.10 m	Face C: width: 1.70 m	Face D: width: 2.10 m
		Datum line +6.95 mPD			
	0.00	①	①	①	①
•	0.50	②	②	②	②
•	1.00				
	1.20				



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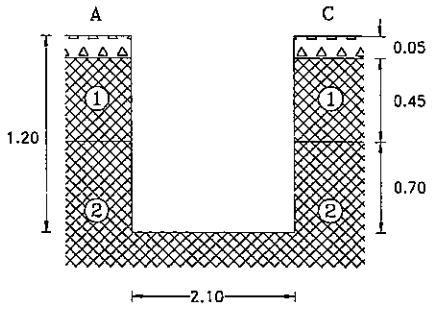
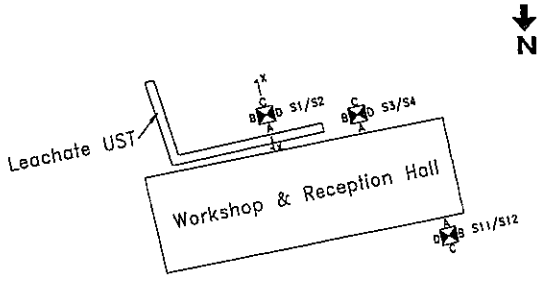


Remarks:

Legend	Description	Grade
△△△△△ △△△△△ △△△△△	Grey, CONCRETE	
①	Grey and black, silty SAND with some fine to medium gravels. (FILL)	
②	Greyish brown, silty SAND with some fine to medium gravels. (FILL)	

Plan (not to scale)



⊥ Plate bearing test	● Small disturbed sample
Ψ Insitu density test	◆ Large disturbed sample
m Moisture content test	Water sample
Photograph	Seepage
Undisturbed sample hor.	Block sample
Undisturbed sample ver.	

City Geotechnical Engineering Ltd.

Location: Green Island Cement Plant, Tap Shek Kwok, Tuen Mun
Ground Investigation Works

Trial pit No.: S3/S4

Sheet 1 of 1

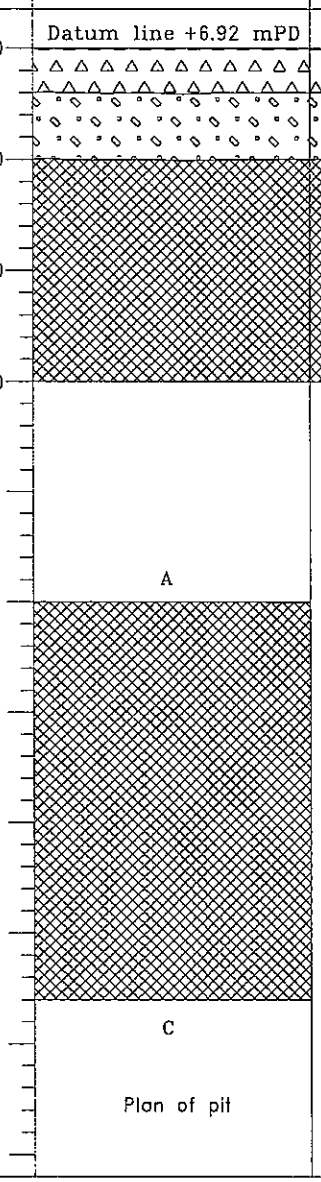
Logged by: LKM Checked by: AW Excavation method: HAND DUG

Date: 22/2/08

Excavated: 22/2/08

Backfilled: 22/2/08

Samples & Test	Depth (m)	Face A: width: 1.90 m	Face B: width: 1.80 m	Face C: width: 1.90 m	Face D: width: 1.80 m
		Datum line +6.92 mPD			
	0.00				
•	0.50				
	1.00				
•	1.50				



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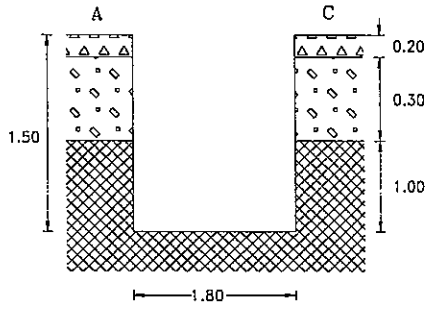
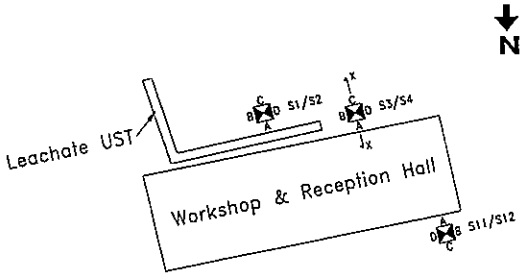


Remarks:

Legend	Description	Grade
	Grey, CONCRETE	
	Black, ASPHALT.	
	Yellowish brown, silty SAND with some fine to medium gravels. (FILL)	

Plan (not to scale)



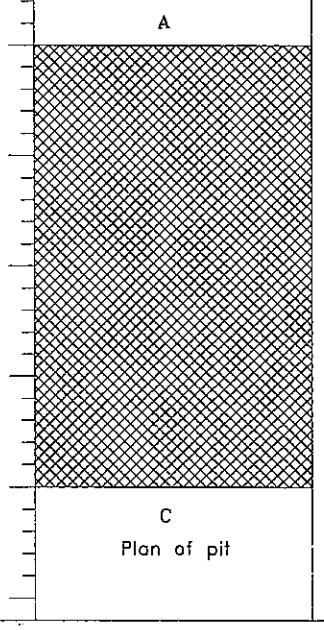
⊥	Plate bearing test	●	Small disturbed sample
⊔	Insitu density test	◆	Large disturbed sample
m	Moisture content test	⧗	Water sample
	Photograph		Seepage
	Undisturbed sample hor.		Block sample
	Undisturbed sample ver.		

City Geotechnical Engineering Ltd.

Location: Green Island Cement Plant, Tap Shek Kwok, Tuen Mun Ground Investigation Works	Trial pit No.: S5/S6	Sheet 1 of 1

Logged by: LKM Checked by: AW Excavation method: HAND DUG Excavated: 22/2/08
Date: 22/2/08 Backfilled: 22/2/08

Samples & Test	Depth (m)	Face A: width: 1.50 m	Face B: width: 2.00 m	Face C: width: 1.50 m	Face D: width: 2.00 m
		Datum line +7.10 mPD			
	0.00				
•	0.50				
	1.00				
•	1.50				



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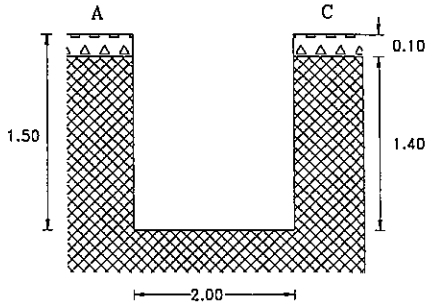


Remarks:

Legend	Description	Grade
	Grey, CONCRETE	
	Yellowish brown, silty SAND with some fine to medium gravels, occasional red bricks and granite fragments. (FILL)	

Plan (not to scale)

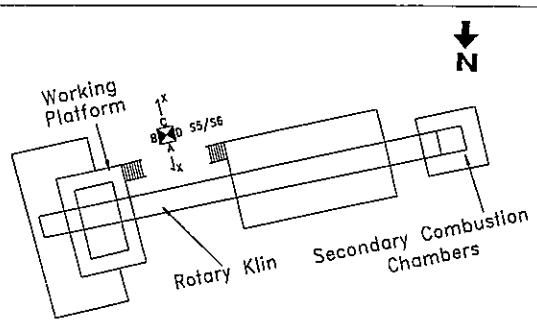
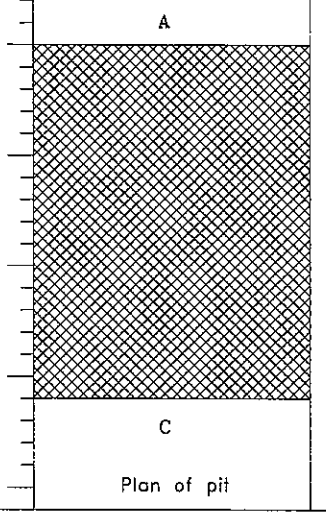


Plate bearing test	Small disturbed sample
Insitu density test	Large disturbed sample
Moisture content test	Water sample
Photograph	Seepage
Undisturbed sample hor.	Block sample
Undisturbed sample ver.	

City Geotechnical Engineering Ltd.

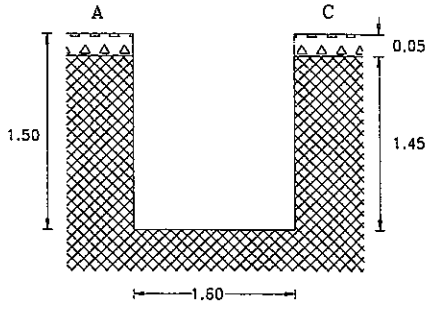
Location: Green Island Cement Plant, Tap Shek Kwok, Tuen Mun Ground Investigation Works	Trial pit No.: S7/S8	Sheet 1 of 1
Logged by: LKM Checked by: AW Excavation method: HAND DUG Date: 22/2/08	Excavated: 22/2/08 Backfilled: 22/2/08	

Samples & Test	Depth (m)	Face A: width: 1.80 m	Face B: width: 1.60 m	Face C: width: 1.80 m	Face D: width: 1.60 m
		Datum line +6.90 mPD			
	0.00				
•	0.50				
	1.00				
•	1.50				



Plan of pit

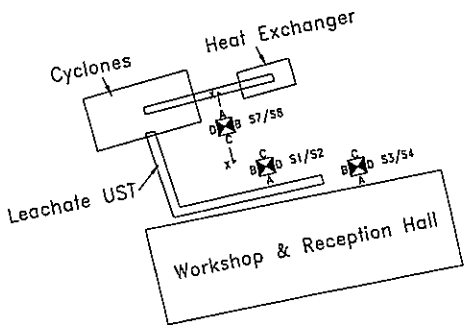
Section X – X (not to scale)



Remarks:

Legend	Description	Grade
△△△△△ △△△△△ △△△△△ △△△△△	Grey, CONCRETE	
	Yellowish brown, silty SAND with some fine to medium grovels. (FILL)	

Plan (not to scale)



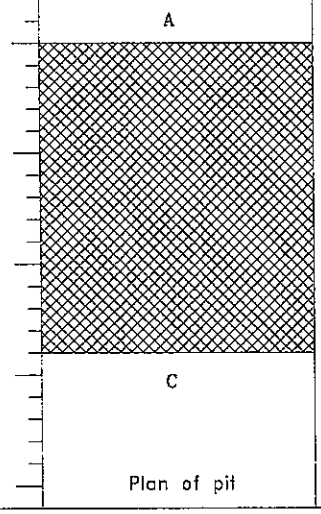
⊥ Plate bearing test	● Small disturbed sample
Insitu density test	◆ Large disturbed sample
m Moisture content test	Water sample
Photograph	Seepage
Undisturbed sample hor.	Block sample
Undisturbed sample ver.	

City Geotechnical Engineering Ltd.

Location: Green Island Cement Plant, Tap Shek Kwok, Tuen Mun Ground Investigation Works	Trial pit No.: S9/S10	Sheet 1 of 1

Logged by: LKM Checked by: AW Excavation method: HAND DUG Excavated: 22/2/08
Date: 22/2/08 Backfilled: 22/2/08

Samples & Test	Depth (m)	Face A: width: 1.80 m	Face B: width: 1.40 m	Face C: width: 1.80 m	Face D: width: 1.40 m
		Datum line +7.05 mPD			
	0.00				
•	0.50				
	1.00				
•	1.50				



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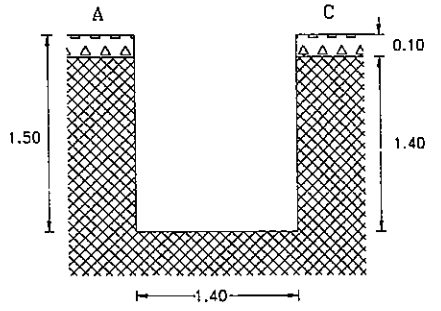


Remarks:

Legend	Description	Grade
	Grey, CONCRETE	
	Brown, silty SAND with some fine to medium gravels. (FILL)	

Plan (not to scale)

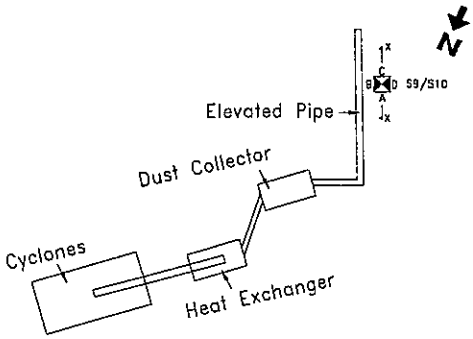


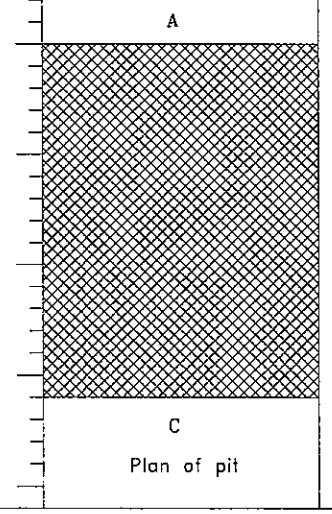
Plate bearing test	Small disturbed sample
Insitu density test	Large disturbed sample
Moisture content test	Water sample
Photograph	Seepage
Undisturbed sample hor.	Block sample
Undisturbed sample ver.	

City Geotechnical Engineering Ltd.

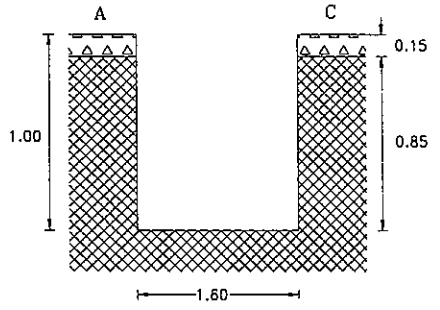
Location: Green Island Cement Plant, Tap Shek Kwok, Tuen Mun Ground Investigation Works	Trial pit No.: S11/S12	Sheet 1 of 1

Logged by: LKM Checked by: AW Excavation method: HAND DUG Excavated: 22/2/08
Date: 22/2/08 Backfilled: 22/2/08

Samples & Test	Depth (m)	Face A: width: 1.80 m	Face B: width: 1.60 m	Face C: width: 1.80 m	Face D: width: 1.60 m
		Datum line +6.94 mPD			
	0.00				
•	0.50				
•	1.00				
	1.50				



Section X – X (not to scale)



Remarks:

Legend	Description	Grade
	Grey, CONCRETE	
	Greyish brown, silty SAND with some fine to medium gravels. (FILL)	

Plan (not to scale)

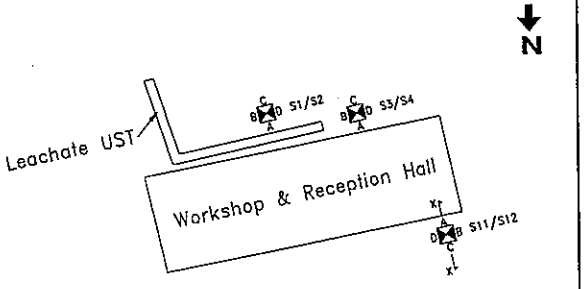
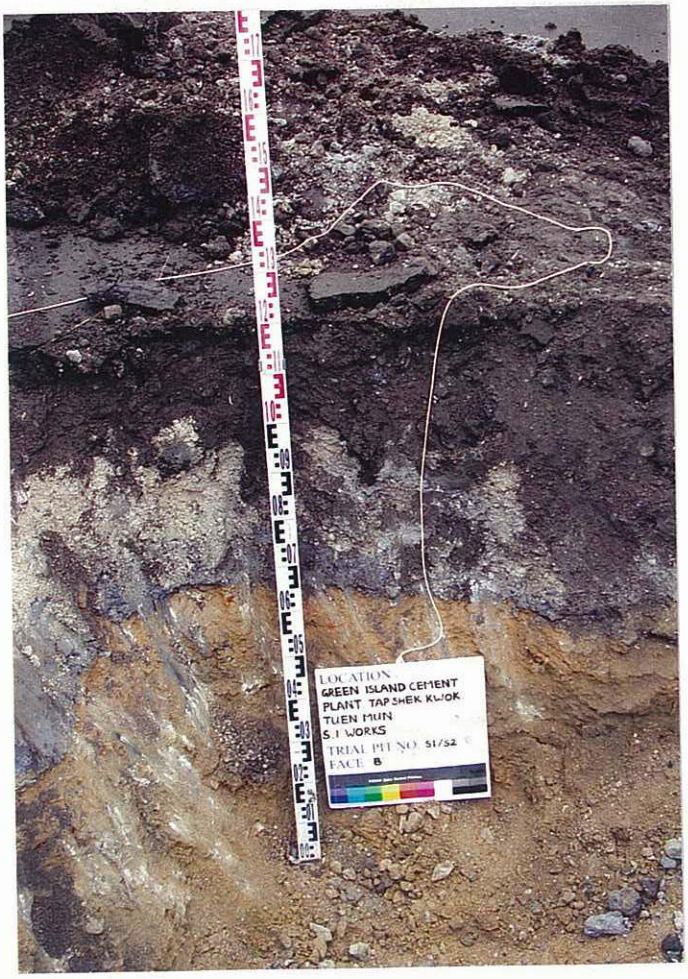


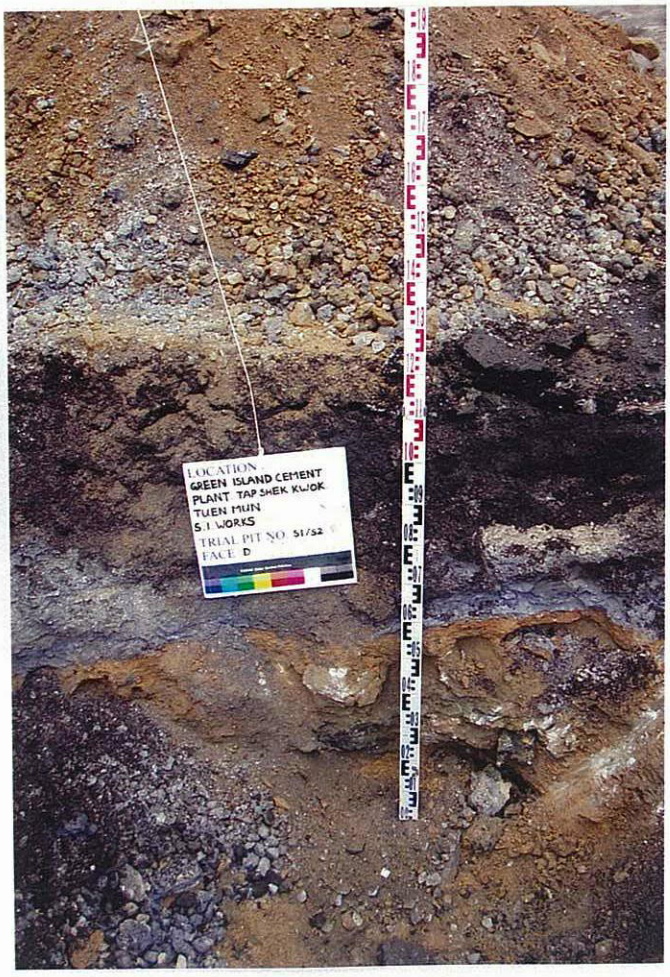
Plate bearing test	Small disturbed sample
Insitu density test	Large disturbed sample
Moisture content test	Water sample
Photograph	Seepage
Undisturbed sample hor.	Block sample
Undisturbed sample ver.	

Photograph


LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
TRIAL PIT NO. S1/S2
FACE A


LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
TRIAL PIT NO. S1/S2
FACE C

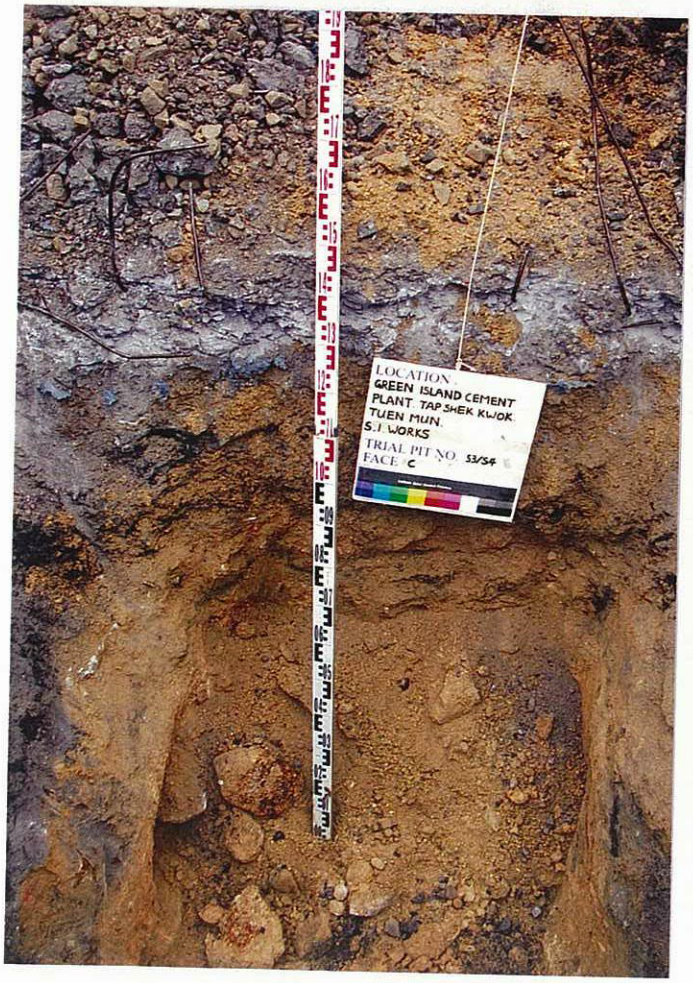

LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
TRIAL PIT NO. S1/S2
FACE B


LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
TRIAL PIT NO. S1/S2
FACE D


GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.T. WORKS
BOTTOM

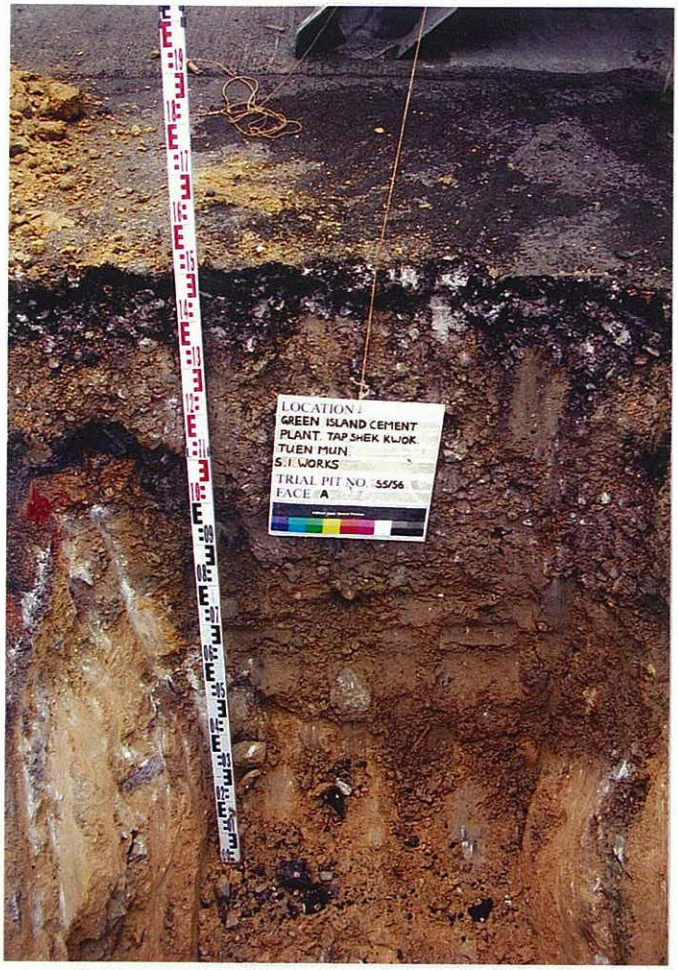

LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
TRIAL PIT NO. S3/S4
FACE A

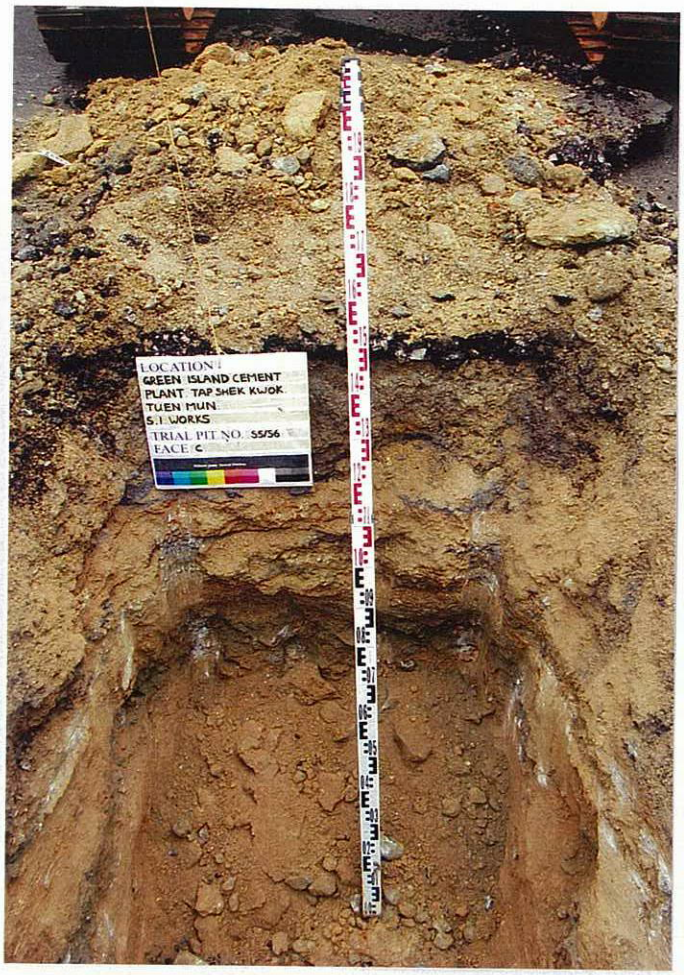

LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
TRIAL PIT NO. S3/S4
FACE B

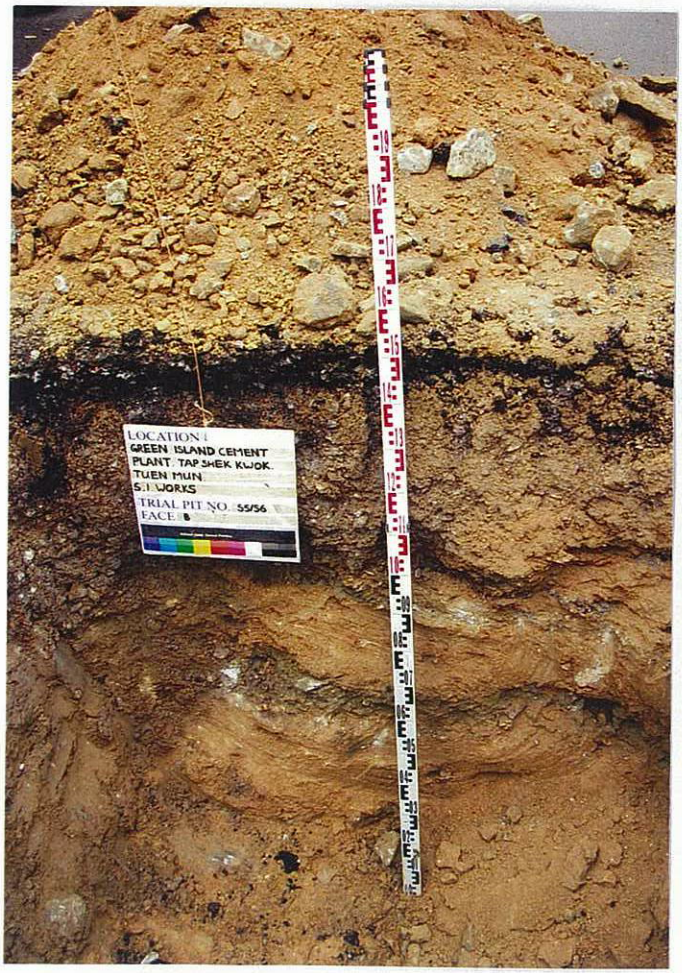

LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
TRIAL PIT NO. S3/S4
FACE C


LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
TRIAL PIT NO. S3/S4
FACE D


LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
BOTTOM


LOCATION :
GREEN ISLAND CEMENT
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.F. WORKS
TRIAL PIT NO. 55/56
FACE : A


LOCATION :
GREEN ISLAND CEMENT
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.F. WORKS
TRIAL PIT NO. 55/56
FACE : C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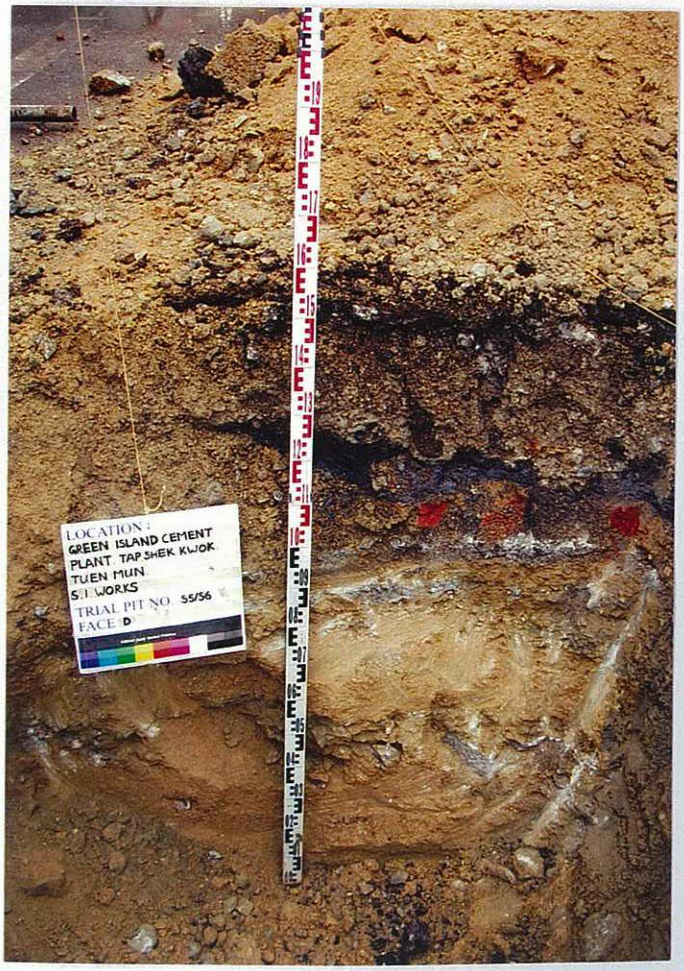
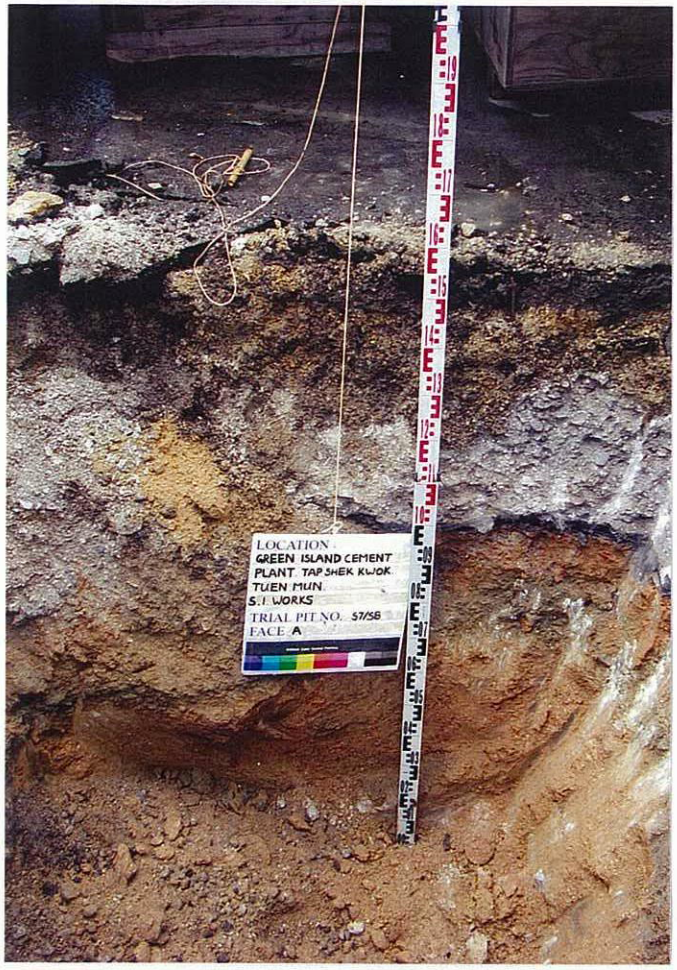
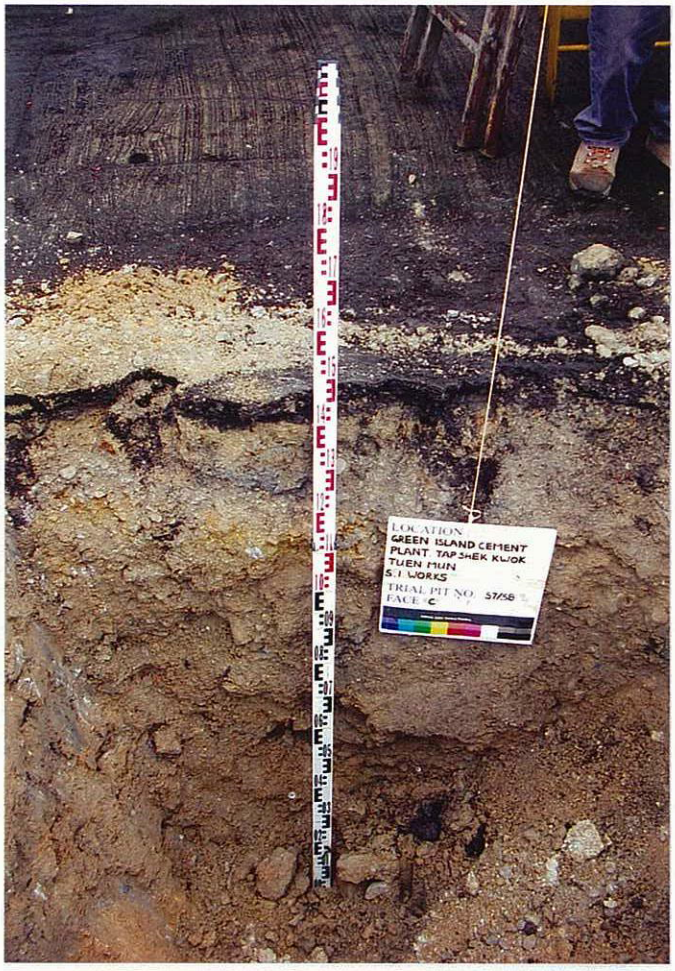
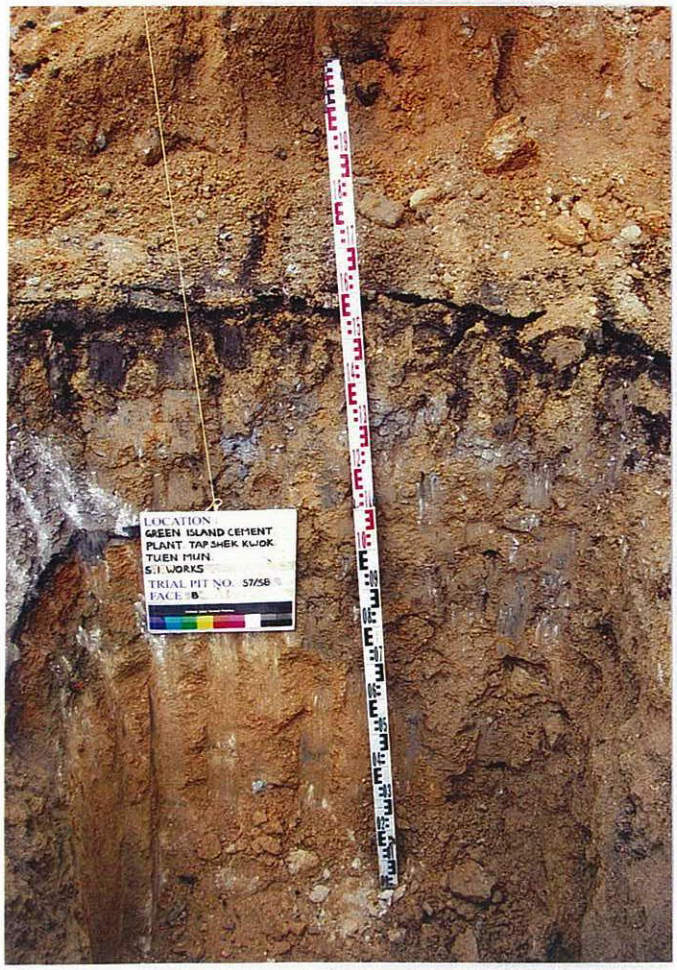
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.F. WORKS
TRIAL PIT NO. 55/56
FACE : B

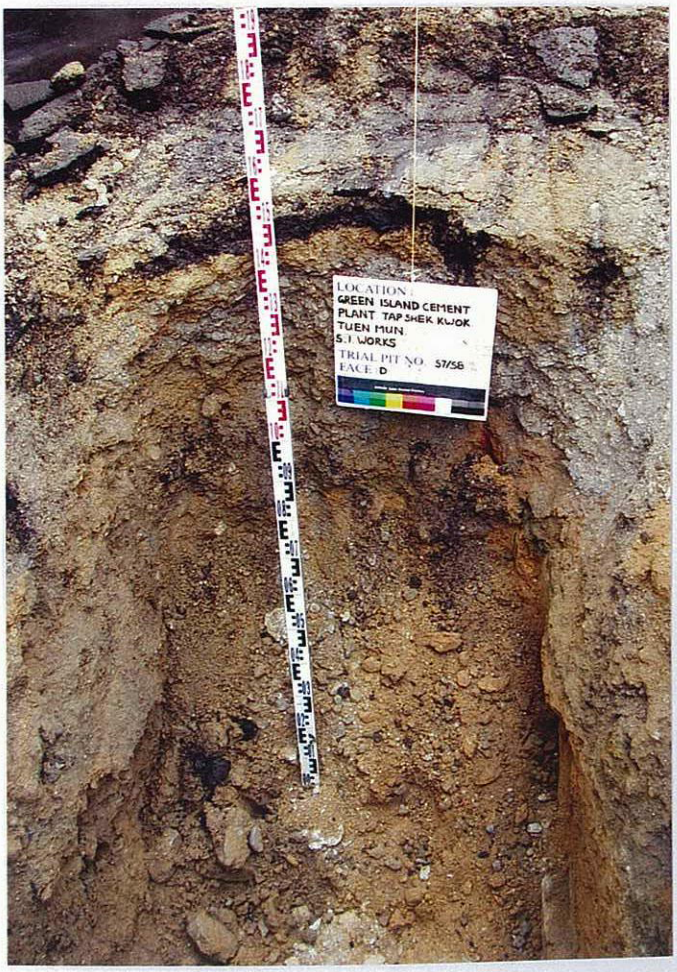

LOCATION :
GREEN ISLAND CEMENT
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.F. WORKS
TRIAL PIT NO. 55/56
FACE : D

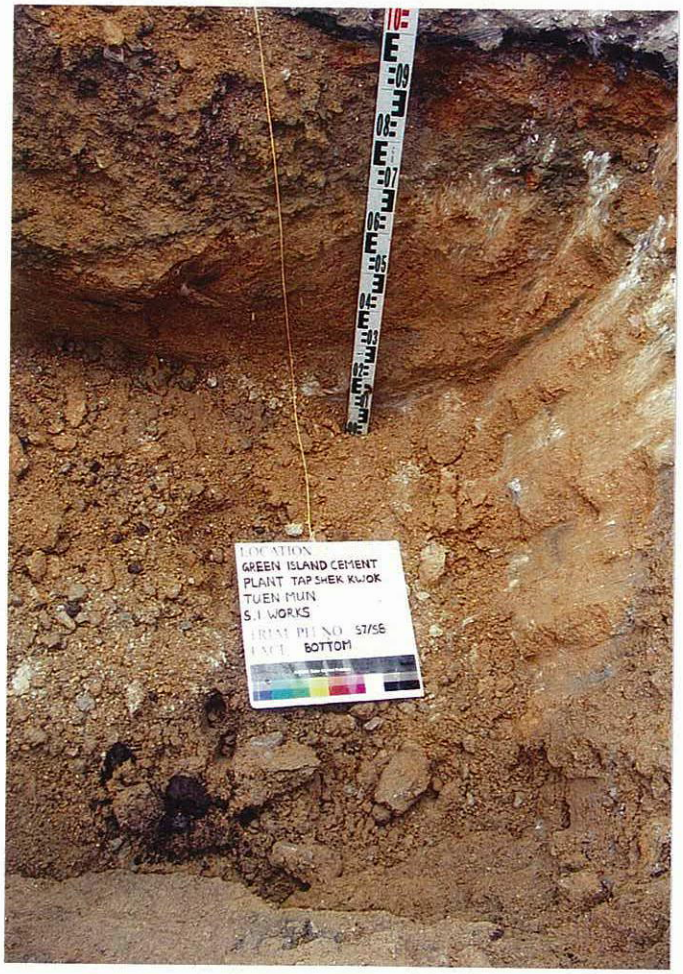

LOCATION :
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN.
S.I. WORKS
TRIAL PIT NO. S5/S6
EXCT. BOTTOM

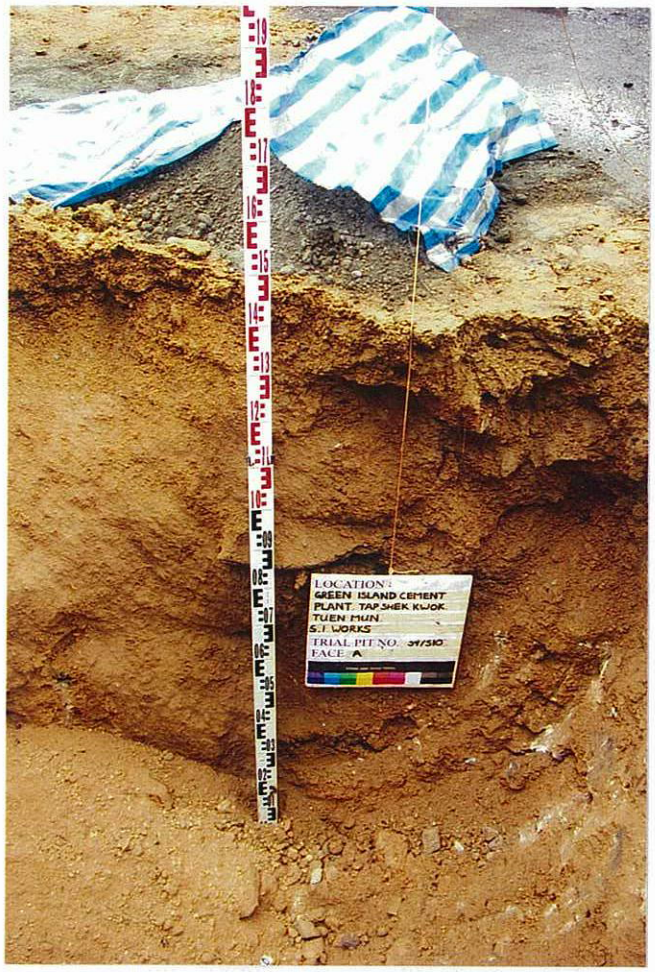

LOCATION :
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I. WORKS
TRIAL PIT NO. S7/SB
FACE : A


LOCATION :
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I. WORKS
TRIAL PIT NO. S7/SB
FACE : C


LOCATION :
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I. WORKS
TRIAL PIT NO. S7/SB
FACE : B


LOCATION :
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I. WORKS
TRIAL PIT NO. S7/SB
FACE : D


LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
FILM PLNO. S7/S6
FACE BOTTOM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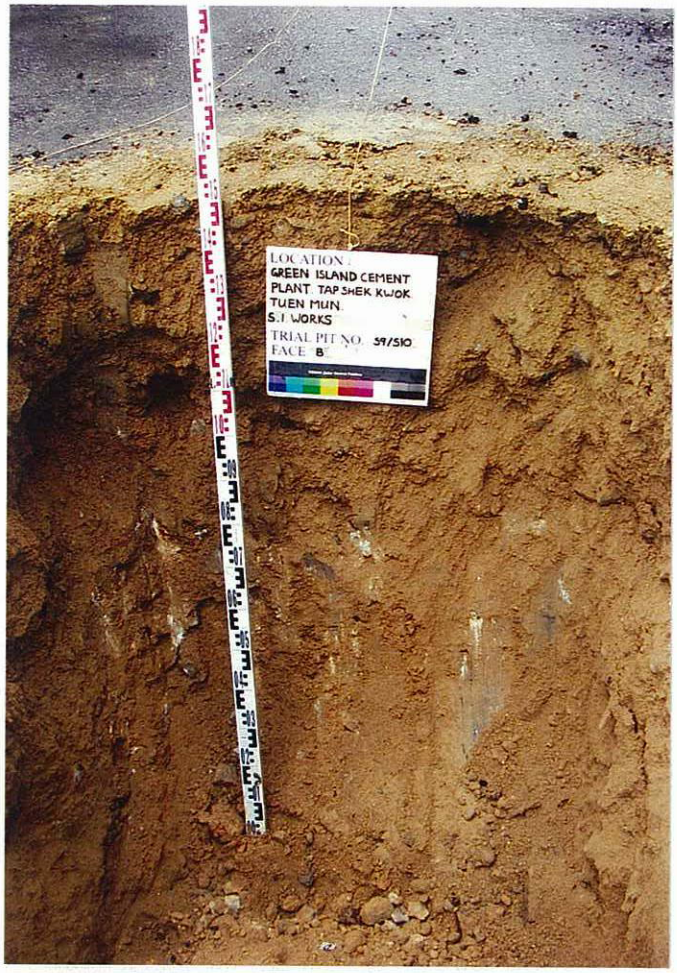
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.I. WORKS
TRIAL PIT NO. 59/510
FACE: A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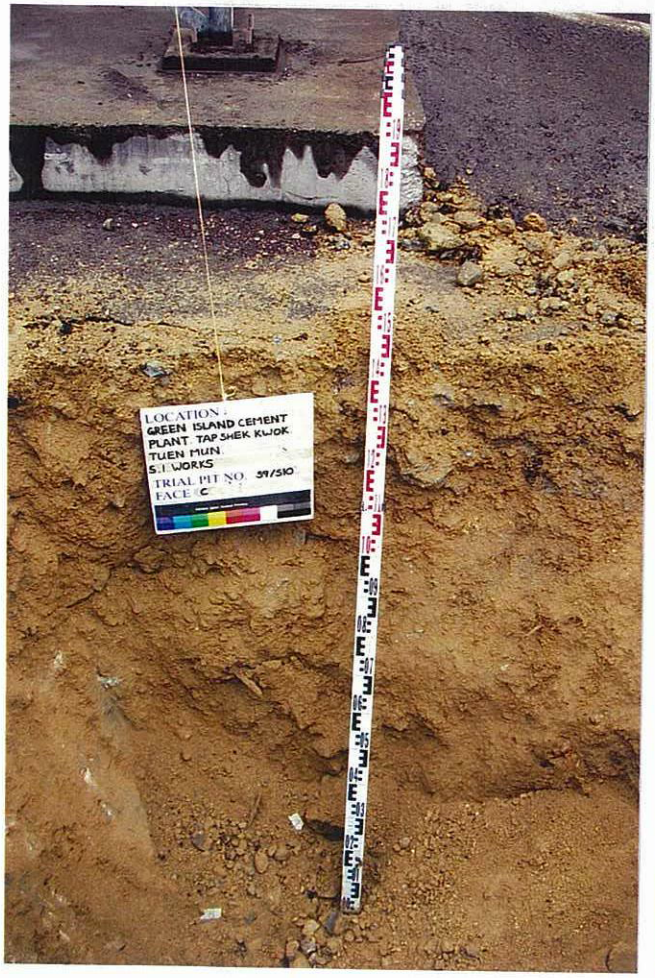
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.I. WORKS
TRIAL PIT NO. 59/510
FACE: B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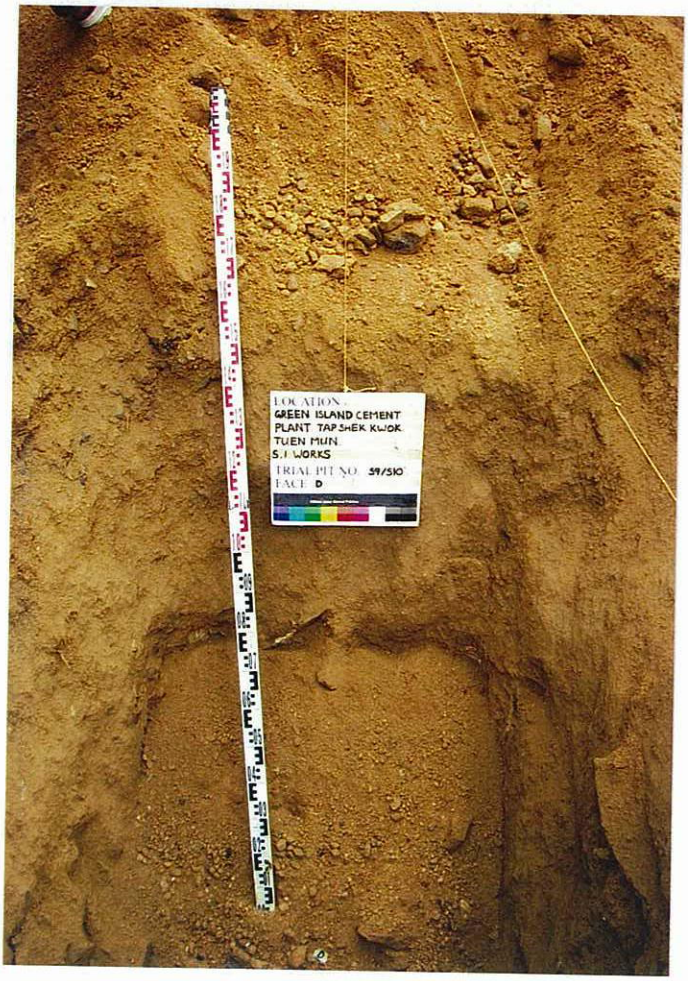
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.I. WORKS
TRIAL PIT NO. 59/510
FACE: C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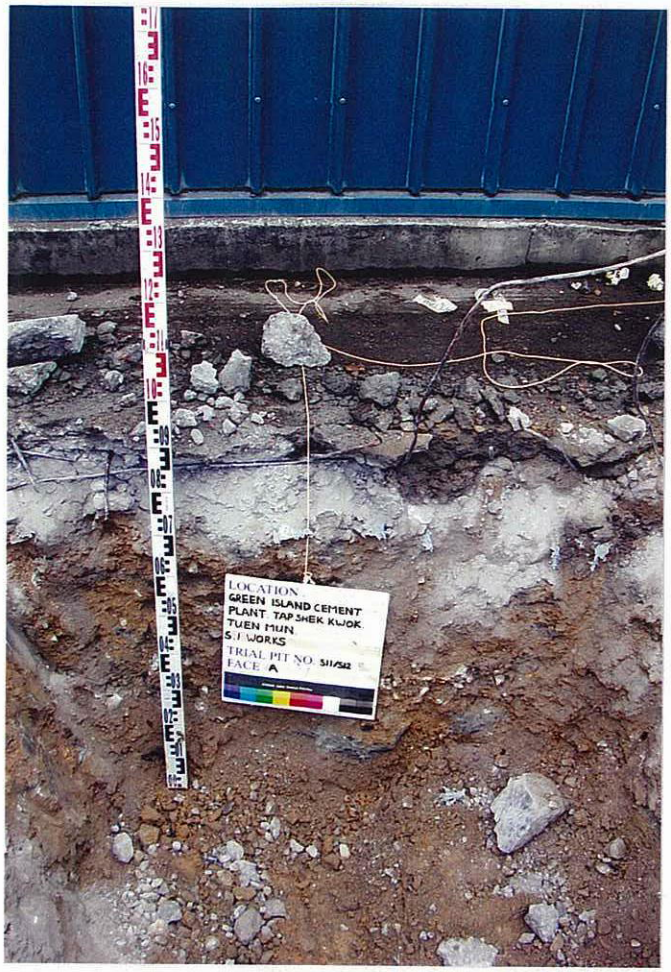
GREEN ISLAND CEMENT
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.I. WORKS
TRIAL PIT NO. 59/510
FACE: D


GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
59/510
BOTTOM


LOCATION:
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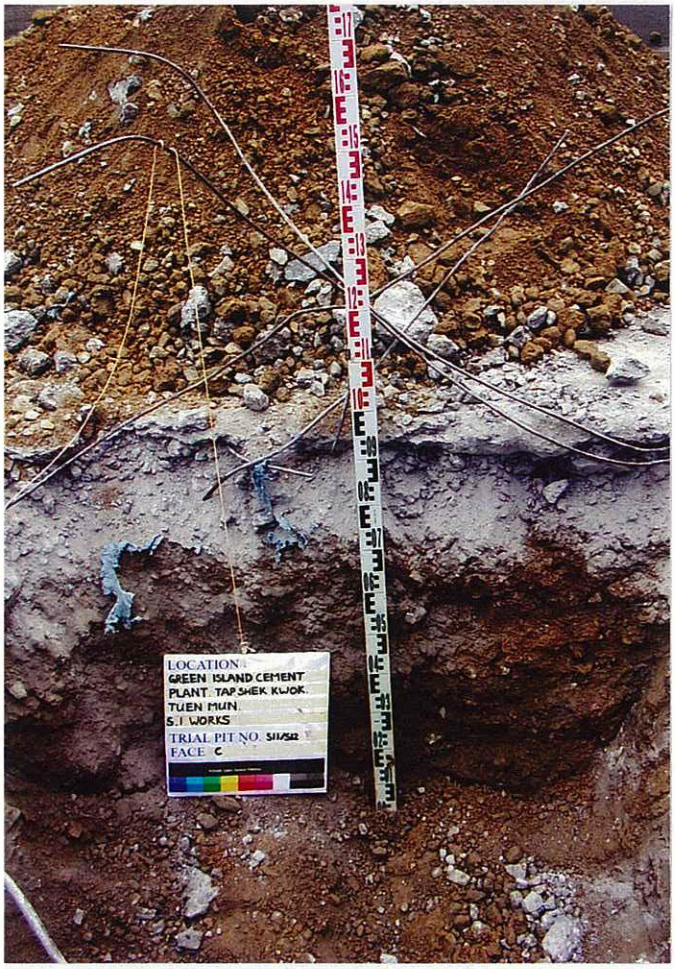
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.I WORKS
TRIAL PIT NO. S11/SI2
FACE A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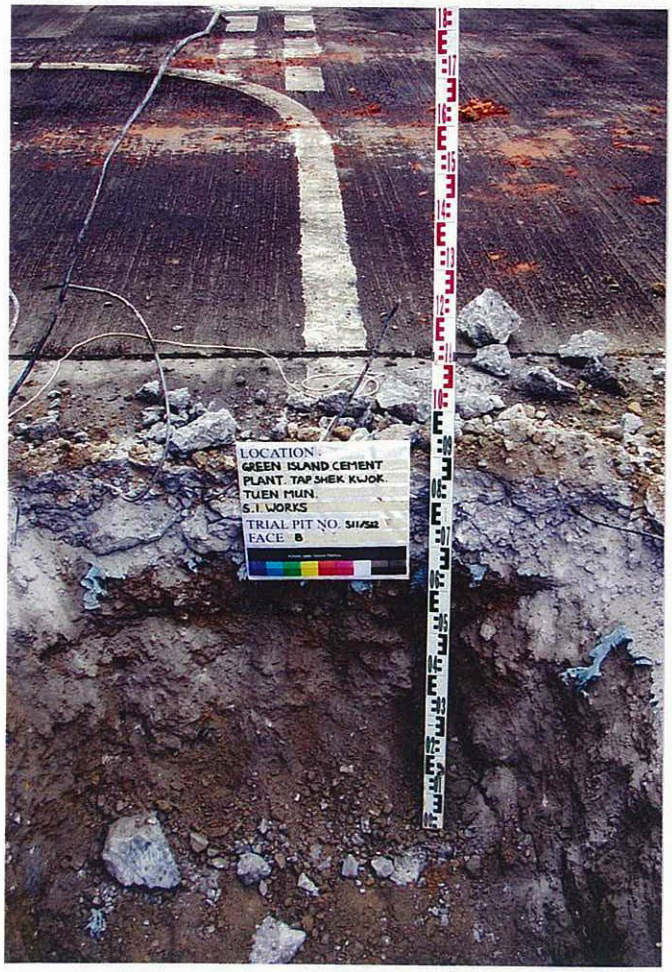
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.I WORKS
TRIAL PIT NO. S11/SI2
FACE C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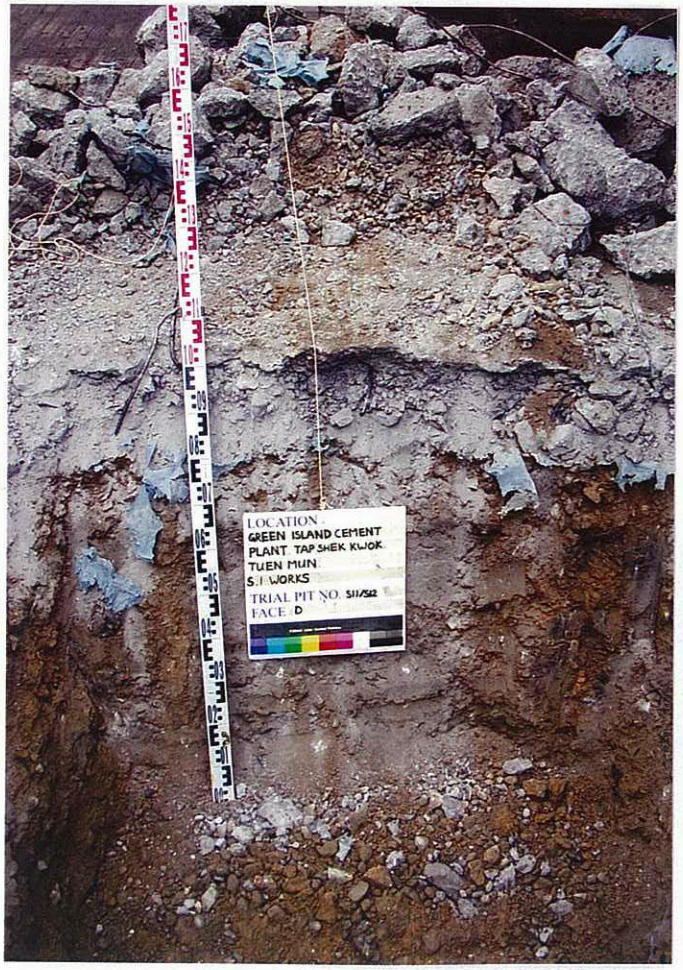
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.I WORKS
TRIAL PIT NO. S11/SI2
FACE B


LOCATION:
GREEN ISLAND CEMENT
PLANT, TAP SHEK KWOK,
TUEN MUN.
S.I WORKS
TRIAL PIT NO. S11/SI2
FACE D


LOCATION
GREEN ISLAND CEMENT
PLANT TAP SHEK KWOK
TUEN MUN
S.I WORKS
TRIAL PIT NO. S11/S12
FACE BOTTOM

Annex C

Laboratory Analytical Report

CERTIFICATE OF ANALYSIS

Client	: **GREEN ISLAND CEMENT LIMITED**	*Laboratory*	: **ALS Technichem (HK) Pty Ltd**	*Page*	: **1 of 8**		
Contact	: **MS LAURENCE GENEE**	*Contact*	: **Alice Wong**	*Work Order*	: **HK0802860**		
Address	:	*Address*	: **11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong**				
E-mail	: **laurence.genee@erm.com**	*E-mail*	: **Alice.Wong@alsenviro.com**				
Telephone	: **----**	*Telephone*	: **+852 2610 1044**				
Facsimile	: **----**	*Facsimile*	: **+852 2610 2021**				
Project	: **(ERM 0071019)**	*Quote number*	: **----**	*Date received*	: **22 Feb 2008**		
Order number	: **----**			*Date of issue*	: **13 Mar 2008**		
C-O-C number	: **H002505-H002506**			*No. of samples*	- *Received*	:	**13**
Site	: **GIC**				- *Analysed*	:	**13**

Report Comments

This report for ALS Technichem (HK) Pty Ltd work order reference HK0802860 supersedes any previous reports with this reference. The completion date of analysis is 29 Feb 2008. Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number. LOR = Limit of reporting.

Specific comments for Work Order HK0802860 :

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.
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 document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in the 'Electronic Transactions Ordinance' of Hong Kong. Chapter 553, Section 6.

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

Analytical Results

Submatrix: SOIL

Method: Analysis Description	CAS number	LOR	Units	Client Sample ID : S1 / Laboratory Sample ID : HK0802860-001 / Sample Date / Time : 22 Feb 2008 11:00	S2 / HK0802860-002 / 22 Feb 2008 11:15	S3 / HK0802860-003 / 22 Feb 2008 11:30	S4 / HK0802860-004 / 22 Feb 2008 11:45	S5 / HK0802860-005 / 22 Feb 2008 13:30
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	**15.3**	**8.1**	**10.6**	**9.8**	**10.3**
EG: Metals and Major Cations								
EG020: Antimony	7440-36-0	1	mg/kg	**7**	<1	**5**	<1	**2**
EG020: Arsenic	7440-38-2	1	mg/kg	**25**	<1	**25**	<1	**2**
EG020: Barium	7440-39-3	0.5	mg/kg	**110**	**30.4**	**109**	**23.1**	**53.4**
EG020: Cadmium	7440-43-9	0.2	mg/kg	**2.2**	**0.2**	**0.7**	<0.2	**0.6**
EG020: Cobalt	7440-48-4	0.5	mg/kg	**11.5**	**3.2**	**14.6**	**2.7**	**3.9**
EG020: Copper	7440-50-8	1	mg/kg	**226**	**22**	**103**	**2**	**35**
EG020: Lead	7439-92-1	1	mg/kg	**85**	**42**	**35**	**61**	**54**
EG020: Manganese	7439-96-5	0.5	mg/kg	**152**	**452**	**447**	**296**	**279**
EG020: Mercury	7439-97-6	0.05	mg/kg	**0.24**	<0.05	**0.08**	<0.05	<0.05
EG020: Molybdenum	7439-98-7	1	mg/kg	**77**	**3**	**33**	**5**	**19**
EG020: Nickel	7440-02-0	1	mg/kg	**21**	**3**	**22**	**1**	<1
EG020: Tin	7440-31-5	0.5	mg/kg	**45.7**	**5.4**	**8.2**	**4.2**	**7.4**
EG020: Zinc	7440-66-6	1	mg/kg	**523**	**72**	**387**	**31**	**116**
EG049: Trivalent Chromium	16065-83-1	0.5	mg/kg	**35.3**	**8.8**	**28.2**	**2.3**	**14.2**
EG050: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	**0.8**	<0.5	<0.5
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BTEX								
C6 - C8 Fraction	----	5	mg/kg	<5	<5	<5	<5	<5
EP-071: Total Petroleum Hydrocarbons (TPH)								
C9 - C16 Fraction	----	200	mg/kg	<200	<200	<200	<200	<200
C17 - C35 Fraction	----	500	mg/kg	<500	<500	<500	<500	<500
EP-080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	108-90-7	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
meta- & para-Xylene	108-38-3 106-42-3	0.4	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EP-080S: TPH(Volatile)/BTEX Surrogate							Surrogate control limits listed at end of this report.	
Dibromofluoromethane	1868-53-7	0.1	%	**89.5**	**87.4**	**85.8**	**88.0**	**86.6**
Toluene-D8	2037-26-5	0.1	%	**97.5**	**96.8**	**98.2**	**96.8**	**97.4**
4-Bromofluorobenzene	460-00-4	0.1	%	**93.0**	**92.5**	**94.9**	**94.4**	**94.6**

Analytical Results

Submatrix: SOIL

Method: Analysis Description	CAS number	LOR	Units	Client Sample ID : S6	S7	S8	S9	S10
				Laboratory Sample ID : HK0802860-006	HK0802860-007	HK0802860-008	HK0802860-009	HK0802860-010
				Sample Date / Time : 22 Feb 2008 13:45	22 Feb 2008 14:15	22 Feb 2008 14:30	22 Feb 2008 10:15	22 Feb 2008 10:30
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	**9.8**	**9.4**	**10.6**	**7.4**	**7.5**
EG: Metals and Major Cations								
EG020: Antimony	7440-36-0	1	mg/kg	<1	**1**	<1	<1	<1
EG020: Arsenic	7440-38-2	1	mg/kg	<1	**1**	<1	<1	<1
EG020: Barium	7440-39-3	0.5	mg/kg	**23.1**	**41.5**	**29.4**	**22.8**	**21.1**
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	**0.5**	<0.2	<0.2	<0.2
EG020: Cobalt	7440-48-4	0.5	mg/kg	**3.4**	**5.2**	**2.6**	**2.3**	**1.4**
EG020: Copper	7440-50-8	1	mg/kg	**2**	**20**	**3**	**17**	**2**
EG020: Lead	7439-92-1	1	mg/kg	**59**	**46**	**42**	**51**	**42**
EG020: Manganese	7439-96-5	0.5	mg/kg	**265**	**339**	**254**	**364**	**316**
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	**0.05**	<0.05	<0.05	<0.05
EG020: Molybdenum	7439-98-7	1	mg/kg	**2**	**7**	**2**	**2**	**2**
EG020: Nickel	7440-02-0	1	mg/kg	<1	**3**	<1	**2**	<1
EG020: Tin	7440-31-5	0.5	mg/kg	**4.3**	**5.5**	**4.0**	**4.2**	**2.6**
EG020: Zinc	7440-66-6	1	mg/kg	**31**	**114**	**34**	**92**	**32**
EG049: Trivalent Chromium	16065-83-1	0.5	mg/kg	**3.0**	**12.1**	**4.2**	**8.5**	**3.2**
EG050: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BTEX								
C6 - C8 Fraction	----	5	mg/kg	<5	<5	<5	<5	<5
EP-071: Total Petroleum Hydrocarbons (TPH)								
C9 - C16 Fraction	----	200	mg/kg	<200	<200	<200	<200	<200
C17 - C35 Fraction	----	500	mg/kg	<500	<500	<500	<500	<500
EP-080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	108-90-7	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
meta- & para-Xylene	108-38-3 106-42-3	0.4	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EP-080S: TPH(Volatile)/BTEX Surrogate							Surrogate control limits listed at end of this report.	
Dibromofluoromethane	1868-53-7	0.1	%	**86.0**	**85.8**	**85.4**	**84.0**	**80.4**
Toluene-D8	2037-26-5	0.1	%	**96.8**	**97.8**	**97.1**	**97.0**	**96.6**
4-Bromofluorobenzene	460-00-4	0.1	%	**94.2**	**95.2**	**92.5**	**92.6**	**94.4**

Analytical Results

Submatrix: SOIL

Method: Analysis Description	CAS number	LOR	Units	Client Sample ID : S11 Laboratory Sample ID : HK0802860-011 Sample Date / Time : 22 Feb 2008 10:30	S12 HK0802860-012 22 Feb 2008 10:45	S13 HK0802860-013 [22 Feb 2008]		
EA/ED: Physical and Aggregate Properties								
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	**9.5**	**10.6**	**7.6**		
EG: Metals and Major Cations								
EG020: Antimony	7440-36-0	1	mg/kg	**2**	**1**	<1		
EG020: Arsenic	7440-38-2	1	mg/kg	**4**	**1**	**2**		
EG020: Barium	7440-39-3	0.5	mg/kg	**60.4**	**35.8**	**24.5**		
EG020: Cadmium	7440-43-9	0.2	mg/kg	**0.6**	**0.7**	<0.2		
EG020: Cobalt	7440-48-4	0.5	mg/kg	**4.3**	**3.7**	**3.5**		
EG020: Copper	7440-50-8	1	mg/kg	**57**	**32**	**30**		
EG020: Lead	7439-92-1	1	mg/kg	**49**	**42**	**47**		
EG020: Manganese	7439-96-5	0.5	mg/kg	**298**	**221**	**344**		
EG020: Mercury	7439-97-6	0.05	mg/kg	**0.05**	<0.05	<0.05		
EG020: Molybdenum	7439-98-7	1	mg/kg	**21**	**12**	**4**		
EG020: Nickel	7440-02-0	1	mg/kg	**2**	<1	**13**		
EG020: Tin	7440-31-5	0.5	mg/kg	**7.6**	**5.8**	**6.9**		
EG020: Zinc	7440-66-6	1	mg/kg	**142**	**162**	**228**		
EG049: Trivalent Chromium	16065-83-1	0.5	mg/kg	**15.7**	**21.5**	**24.5**		
EG050: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	**1.2**		
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BTEX								
C6 - C8 Fraction	----	5	mg/kg	<5	<5	<5		
EP-071: Total Petroleum Hydrocarbons (TPH)								
C9 - C16 Fraction	----	200	mg/kg	<200	<200	<200		
C17 - C35 Fraction	----	500	mg/kg	<500	<500	<500		
EP-080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2		
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	<0.2		
Chlorobenzene	108-90-7	0.2	mg/kg	<0.2	<0.2	<0.2		
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	<0.2		
meta- & para-Xylene	108-38-3 106-42-3	0.4	mg/kg	<0.4	<0.4	<0.4		
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	<0.2		
EP-080S: TPH(Volatile)/BTEX Surrogate							Surrogate control limits listed at end of this report.	
Dibromofluoromethane	1868-53-7	0.1	%	**87.5**	**82.9**	**93.6**		
Toluene-D8	2037-26-5	0.1	%	**97.6**	**96.8**	**97.4**		
4-Bromofluorobenzene	460-00-4	0.1	%	**92.8**	**93.6**	**92.4**		

Quality Control - Laboratory Duplicate (DUP) Results

Matrix Type: SOIL

Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	Duplicate (DUP) Results				
				LOR	Units	Original Result	Duplicate Result	RPD (%)
EA/ED: Physical and Aggregate Properties (QC Lot: 604570)								
HK0802860-001	S1	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	15.3	15.5	1.1
HK0802860-011	S11	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	9.5	9.9	3.5
EG: Metals and Major Cations (QC Lot: 607686)								
HK0802860-002	S2	EG020: Antimony	7440-36-0	1	mg/kg	<1	<1	0.0
		EG020: Lead	7439-92-1	1	mg/kg	42	50	18.2
		EG020: Manganese	7439-96-5	0.5	mg/kg	452	494	8.8
		EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	<0.05	0.0
		EG020: Molybdenum	7439-98-7	1	mg/kg	3	4	0.0
		EG020: Nickel	7440-02-0	1	mg/kg	3	4	0.0
		EG020: Tin	7440-31-5	0.5	mg/kg	5.4	6.1	12.7
		EG020: Arsenic	7440-38-2	1	mg/kg	<1	1	0.0
		EG020: Zinc	7440-66-6	1	mg/kg	72	80	11.6
		EG020: Barium	7440-39-3	0.5	mg/kg	30.4	29.4	3.6
		EG020: Cadmium	7440-43-9	0.2	mg/kg	0.2	0.2	0.0
		EG020: Cobalt	7440-48-4	0.5	mg/kg	3.2	2.7	20.0
		EG020: Copper	7440-50-8	1	mg/kg	22	19	13.3
HK0803455-007	Anonymous	EG020: Antimony	7440-36-0	1	mg/kg	1	1	0.0
		EG020: Lead	7439-92-1	0.5	mg/kg	12.0	12.8	5.8
		EG020: Manganese	7439-96-5	0.5	mg/kg	33.3	33.4	0.5
		EG020: Mercury	7439-97-6	0.5	mg/kg	0.7	0.6	0.0
		EG020: Molybdenum	7439-98-7	1	mg/kg	5	6	0.0
		EG020: Nickel	7440-02-0	0.5	mg/kg	11.8	12.5	5.6
		EG020: Tin	7440-31-5	0.5	mg/kg	16.3	15.6	4.6
		EG020: Arsenic	7440-38-2	0.5	mg/kg	2.6	2.8	7.2
		EG020: Zinc	7440-66-6	0.5	mg/kg	640	653	1.9
		EG020: Barium	7440-39-3	0.5	mg/kg	75.6	75.6	0.0
		EG020: Cadmium	7440-43-9	0.5	mg/kg	0.6	0.6	0.0
		EG020: Cobalt	7440-48-4	0.5	mg/kg	1.1	1.1	0.0
		EG020: Copper	7440-50-8	0.5	mg/kg	104	104	1.0
EG: Metals and Major Cations (QC Lot: 609390)								
HK0802860-002	S2	EG050: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.0
HK0802860-011	S11	EG050: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.0
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QC Lot: 604500)								
HK0802860-001	S1	C6 - C8 Fraction	----	5	mg/kg	<5	<5	0.0
EP-071: Total Petroleum Hydrocarbons (TPH) (QC Lot: 604502)								
HK0802860-001	S1	C9 - C16 Fraction	----	200	mg/kg	<200	<200	0.0
		C17 - C35 Fraction	----	500	mg/kg	<500	<500	0.0

Matrix Type: SOIL				Duplicate (DUP) Results				
Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	LOR	Units	Original Result	Duplicate Result	RPD (%)
EP-080: BTEX (QC Lot: 604500)								
HK0802860-001	S1	Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0
		Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.0
		Chlorobenzene	108-90-7	0.2	mg/kg	<0.2	<0.2	0.0
		Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.0
		meta- & para-Xylene	108-38-3 106-42-3	0.4	mg/kg	<0.4	<0.4	0.0
		ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.0

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

Matrix Type: SOIL		Method Blank (MB) Results			Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results						
					Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Method: Analysis Description	CAS number	LOR	Units	Result	Concentration	SCS	DCS	Low	High	Value	Control Limit
EG: Metals and Major Cations (QCLot: 607686)											
EG020: Antimony	7440-36-0	1	mg/kg	<1	5 mg/kg	85.3	----	85	115	----	----
EG020: Lead	7439-92-1	1	mg/kg	<1	5 mg/kg	87.1	----	85	115	----	----
EG020: Manganese	7439-96-5	1	mg/kg	<0.5	5 mg/kg	99.5	----	85	115	----	----
EG020: Mercury	7439-97-6	0.05	mg/kg	<0.05	0.1 mg/kg	93.6	----	85	115	----	----
EG020: Molybdenum	7439-98-7	1	mg/kg	<1	5 mg/kg	99.4	----	85	115	----	----
EG020: Nickel	7440-02-0	1	mg/kg	<1	5 mg/kg	92.3	----	85	115	----	----
EG020: Tin	7440-31-5	1.0	mg/kg	<1.0	5 mg/kg	97.5	----	85	115	----	----
EG020: Arsenic	7440-38-2	1	mg/kg	<1	5 mg/kg	97.2	----	85	115	----	----
EG020: Zinc	7440-66-6	1	mg/kg	<1	5 mg/kg	100	----	85	115	----	----
EG020: Barium	7440-39-3	1	mg/kg	<0.5	5 mg/kg	104	----	85	115	----	----
EG020: Cadmium	7440-43-9	0.2	mg/kg	<0.2	5 mg/kg	94.8	----	85	115	----	----
EG020: Cobalt	7440-48-4	1	mg/kg	<0.5	5 mg/kg	91.4	----	85	115	----	----
EG020: Copper	7440-50-8	1	mg/kg	<1	5 mg/kg	94.3	----	85	115	----	----
EG: Metals and Major Cations (QCLot: 609390)											
EG050: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	2.5 mg/kg	99.0	----	85	115	----	----
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QCLot: 604500)											
C6 - C8 Fraction	----	5	mg/kg	<5	3 mg/kg	81.1	----	45	106	----	----
EP-071: Total Petroleum Hydrocarbons (TPH) (QCLot: 604502)											
C9 - C16 Fraction	----	200	mg/kg	<200	32 mg/kg	92.6	----	48	108	----	----
C17 - C35 Fraction	----	500	mg/kg	<500	75 mg/kg	102	----	50	110	----	----
EP-080: BTEX (QCLot: 604500)											
Benzene	71-43-2	0.2	mg/kg	<0.2	0.2 mg/kg	88.1	----	57	91	----	----
Toluene	108-88-3	0.2	mg/kg	<0.2	0.2 mg/kg	81.2	----	60	107	----	----
Chlorobenzene	108-90-7	0.2	mg/kg	<0.2	0.2 mg/kg	93.1	----	81	110	----	----
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	0.2 mg/kg	86.2	----	76	105	----	----

Matrix Type: SOIL		Method Blank (MB) Results			Single Control Spike (SCS) and Duplicate Control Spike (DCS) Results						
					Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Method: Analysis Description	CAS number	LOR	Units	Result	Concentration	SCS	DCS	Low	High	Value	Control Limit
EP-080: BTEX (QCLot: 604500) - continued											
meta- & para-Xylene	108-38-3 106-42-3	0.4	mg/kg	<0.4	0.4 mg/kg	86.9	----	74	113	----	----
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	0.2 mg/kg	80.6	----	75	109	----	----

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

Matrix Type: SOIL				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Results						
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory Sample ID	Client Sample ID	Method: Analysis Description	CAS number	Concentration	MS	MSD	Low	High	Value	Control Limit
EG: Metals and Major Cations (QCLot: 607686)										
HK0802860-001	S1	EG020: Antimony	7440-36-0	5 mg/kg	99.2	----	75	125	----	----
		EG020: Lead	7439-92-1	5 mg/kg	Not Determined	----	75	125	----	----
		EG020: Manganese	7439-96-5	5 mg/kg	Not Determined	----	75	125	----	----
		EG020: Mercury	7439-97-6	0.1 mg/kg	Not Determined	----	75	125	----	----
		EG020: Molybdenum	7439-98-7	5 mg/kg	Not Determined	----	75	125	----	----
		EG020: Nickel	7440-02-0	50 mg/kg	87.9	----	75	125	----	----
		EG020: Tin	7440-31-5	5 mg/kg	Not Determined	----	75	125	----	----
		EG020: Arsenic	7440-38-2	5 mg/kg	Not Determined	----	75	125	----	----
		EG020: Zinc	7440-66-6	5 mg/kg	Not Determined	----	75	125	----	----
		EG020: Barium	7440-39-3	5 mg/kg	Not Determined	----	75	125	----	----
		EG020: Cadmium	7440-43-9	5 mg/kg	89.6	----	75	125	----	----
		EG020: Cobalt	7440-48-4	5 mg/kg	76.4	----	75	125	----	----
		EG020: Copper	7440-50-8	5 mg/kg	Not Determined	----	75	125	----	----
EG: Metals and Major Cations (QCLot: 609390)										
HK0802860-001	S1	EG050: Hexavalent Chromium	18540-29-9	2.5 mg/kg	101	----	75	125	----	----
EP-071/080: Total Petroleum Hydrocarbons (TPH Volatile) / BT (QCLot: 604500)										
HK0802860-002	S2	C6 - C8 Fraction	----	3 mg/kg	57.3	----	50	130	----	----
EP-071: Total Petroleum Hydrocarbons (TPH) (QCLot: 604502)										
HK0802860-002	S2	C9 - C16 Fraction	----	32 mg/kg	96.6	----	50	130	----	----
		C17 - C35 Fraction	----	75 mg/kg	82.4	----	50	130	----	----
EP-080: BTEX (QCLot: 604500)										
HK0802860-002	S2	Benzene	71-43-2	0.2 mg/kg	69.4	----	50	130	----	----
		Toluene	108-88-3	0.2 mg/kg	70.6	----	50	130	----	----
		Chlorobenzene	108-90-7	0.2 mg/kg	85.6	----	50	130	----	----
		Ethylbenzene	100-41-4	0.2 mg/kg	76.2	----	50	130	----	----
		meta- & para-Xylene	108-38-3 106-42-3	0.4 mg/kg	77.2	----	50	130	----	----
		ortho-Xylene	95-47-6	0.2 mg/kg	74.4	----	50	130	----	----

Surrogate Control Limits

Submatrix Type: SOIL

Method: Analysis Description	*Units*	*Lower Limit*	*Upper Limit*
EP-080S: TPH(Volatile)/BTEX Surrogate			
Dibromofluoromethane	%	80	120
Toluene-D8	%	81	117
4-Bromofluorobenzene	%	74	121

Annex D

RBRG Standards

Table 2.1
Risk-Based Remediation Goals (RBRGs) for Soil & Soil Saturation Limit

Chemical	Risk-Based Remediation Goals for Soil				
	Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Parks (mg/kg)	Soil Saturation Limit (Csat) (mg/kg)
VOCs					
Acetone	9.59E+03	4.26E+03	1.00E+04*	1.00E+04*	***
Benzene	7.04E-01	2.79E-01	9.21E+00	4.22E+01	3.36E+02
Bromodichloromethane	3.17E-01	1.29E-01	2.85E+00	1.34E+01	1.03E+03
2-Butanone	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	***
Chloroform	1.32E-01	5.29E-02	1.54E+00	2.53E+02	1.10E+03
Ethylbenzene	7.09E+02	2.98E+02	8.24E+03	1.00E+04*	1.38E+02
Methyl tert-Butyl Ether	6.88E+00	2.80E+00	7.01E+01	5.05E+02	2.38E+03
Methylene Chloride	1.30E+00	5.29E-01	1.39E+01	1.28E+02	9.21E+02
Styrene	3.22E+03	1.54E+03	1.00E+04*	1.00E+04*	4.97E+02
Tetrachloroethene	1.01E-01	4.44E-02	7.77E-01	1.84E+00	9.71E+01
Toluene	1.44E+03	7.05E+02	1.00E+04*	1.00E+04*	2.35E+02
Trichloroethene	5.23E-01	2.11E-01	5.68E+00	6.94E+01	4.88E+02
Xylenes (Total)	9.50E+01	3.68E+01	1.23E+03	1.00E+04*	1.50E+02
SVOCs					
Acenaphthene	3.51E+03	3.28E+03	1.00E+04*	1.00E+04*	6.02E+01
Acenaphthylene	2.34E+03	1.51E+03	1.00E+04*	1.00E+04*	1.98E+01
Anthracene	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	2.56E+00
Benzo(a)anthracene	1.20E+01	1.14E+01	9.18E+01	3.83E+01	
Benzo(a)pyrene	1.20E+00	1.14E+00	9.18E+00	3.83E+00	
Benzo(b)fluoranthene	9.88E+00	1.01E+01	1.78E+01	2.04E+01	
Benzo(g,h,i)perylene	1.80E+03	1.71E+03	1.00E+04*	5.74E+03	
Benzo(k)fluoranthene	1.20E+02	1.14E+02	9.18E+02	3.83E+02	
bis-(2-Ethylhexyl)phthalate	3.00E+01	2.80E+01	9.18E+01	9.42E+01	
Chrysene	8.71E+02	9.19E+02	1.14E+03	1.54E+03	
Dibenzo(a,h)anthracene	1.20E+00	1.14E+00	9.18E+00	3.83E+00	
Fluoranthene	2.40E+03	2.27E+03	1.00E+04*	7.62E+03	
Fluorene	2.38E+03	2.25E+03	1.00E+04*	7.45E+03	5.47E+01
Hexachlorobenzene	2.43E-01	2.20E-01	5.82E-01	7.13E-01	
Indeno(1,2,3-cd)pyrene	1.20E+01	1.14E+01	9.18E+01	3.83E+01	
Naphthalene	1.82E+02	8.56E+01	4.53E+02	9.14E+02	1.25E+02
Phenanthrene	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	2.80E+01
Phenol	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	7.26E+03
Pyrene	1.80E+03	1.71E+03	1.00E+04*	5.72E+03	
Metals					
Antimony	2.95E+01	2.91E+01	2.61E+02	9.79E+01	
Arsenic	2.21E+01	2.18E+01	1.96E+02	7.35E+01	
Barium	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Cadmium	7.38E+01	7.28E+01	6.53E+02	2.45E+02	
Chromium III	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Chromium VI	2.21E+02	2.18E+02	1.96E+03	7.35E+02	
Cobalt	1.48E+03	1.46E+03	1.00E+04*	4.90E+03	
Copper	2.95E+03	2.91E+03	1.00E+04*	9.79E+03	
Lead	2.58E+02	2.55E+02	2.29E+03	8.57E+02	
Manganese	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Mercury	1.10E+01	6.52E+00	3.84E+01	4.56E+01	
Molybdenum	3.69E+02	3.64E+02	3.26E+03	1.22E+03	
Nickel	1.48E+03	1.46E+03	1.00E+04*	4.90E+03	
Tin	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Zinc	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	
Dioxins / PCBs					
Dioxins (I-TEQ)	1.00E-03	1.00E-03	5.00E-03	1.00E-03	
PCBs	2.36E-01	2.26E-01	7.48E-01	7.56E-01	
Petroleum Carbon Ranges					
C6 - C8	1.41E+03	5.45E+02	1.00E+04*	1.00E+04*	1.00E+03
C9 - C16	2.24E+03	1.33E+03	1.00E+04*	1.00E+04*	3.00E+03
C17 - C35	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+04*	5.00E+03
Other Inorganic Compounds					
Cyanide, free	1.48E+03	1.46E+03	1.00E+04*	4.90E+03	
Organometallics					
TBTO	2.21E+01	2.18E+01	1.96E+02	7.35E+01	

Notes:

(1) 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".

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

(3) * indicates a 'ceiling limit' concentration.

(4) *** indicates that the Csat value exceeds the 'ceiling limit' therefore the RBRG applies.

Table 2.2
Risk-Based Remediation Goals (RBRGs) for Groundwater and Solubility Limit

Chemical	Risk-Based Remediation Goals for Groundwater			
	Urban Residential (mg/L)	Rural Residential (mg/L)	Industrial (mg/L)	Solubility Limit (mg/L)
VOCs				
Acetone	1.00E+04*	1.00E+04*	1.00E+04*	***
Benzene	3.86E+00	1.49E+00	5.40E+01	1.75E+03
Bromodichloromethane	2.22E+00	8.71E-01	2.62E+01	6.74E+03
2-Butanone	1.00E+04*	1.00E+04*	1.00E+04*	***
Chloroform	9.56E-01	3.82E-01	1.13E+01	7.92E+03
Ethylbenzene	1.02E+03	3.91E+02	1.00E+04*	1.69E+02
Methyl tert-Butyl Ether	1.53E+02	6.11E+01	1.81E+03	***
Methylene Chloride	1.90E+01	7.59E+00	2.24E+02	***
Styrene	3.02E+03	1.16E+03	1.00E+04*	3.10E+02
Tetrachloroethene	2.50E-01	9.96E-02	2.95E+00	2.00E+02
Toluene	5.11E+03	1.97E+03	1.00E+04*	5.26E+02
Trichloroethene	1.21E+00	4.81E-01	1.42E+01	1.10E+03
Xylenes (Total)	1.12E+02	4.33E+01	1.57E+03	1.75E+02
SVOCs				
Acenaphthene	1.00E+04*	7.09E+03	1.00E+04*	4.24E+00
Acenaphthylene	1.41E+03	5.42E+02	1.00E+04*	3.93E+00
Anthracene	1.00E+04*	1.00E+04*	1.00E+04*	4.34E-02
Benzo(a)anthracene				
Benzo(a)pyrene				
Benzo(b)fluoranthene	5.39E-01	2.03E-01	7.53E+00	1.50E-03
Benzo(g,h,i)perylene				
Benzo(k)fluoranthene				
bis-(2-Ethylhexyl)phthalate				
Chrysene	5.81E+01	2.19E+01	8.12E+02	1.60E-03
Dibenzo(a,h)anthracene				
Fluoranthene	1.00E+04*	1.00E+04*	1.00E+04*	2.06E-01
Fluorene	1.00E+04*	1.00E+04*	1.00E+04*	1.98E+00
Hexachlorobenzene	5.89E-02	2.34E-02	6.95E-01	6.20E+00
Indeno(1,2,3-cd)pyrene				
Naphthalene	6.17E+01	2.37E+01	8.62E+02	3.10E+01
Phenanthrene	1.00E+04*	1.00E+04*	1.00E+04*	1.00E+00
Phenol				
Pyrene	1.00E+04*	1.00E+04*	1.00E+04*	1.35E-01
Metals				
Antimony				
Arsenic				
Barium				
Cadmium				
Chromium III				
Chromium VI				
Cobalt				
Copper				
Lead				
Manganese				
Mercury	4.86E-01	1.84E-01	6.79E+00	
Molybdenum				
Nickel				
Tin				
Zinc				
Dioxins / PCBs				
Dioxins (I-TEQ)				
PCBs	4.33E-01	1.71E-01	5.11E+00	3.10E-02
Petroleum Carbon Ranges				
C6 - C8	8.22E+01	3.17E+01	1.15E+03	5.23E+00
C9 - C16	7.14E+02	2.76E+02	9.98E+03	2.80E+00
C17 - C35	1.28E+01	4.93E+00	1.78E+02	2.80E+00
Other Inorganic Compounds				
Cyanide, free				
Organometallics				
TBTO				

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>10^{-5} was not met for the inhalation pathway.

(2) Water 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.

Annex E

Selected Photographs from the Site Investigation

Photo 1 – CCPP

Photo 2 – Conveyor belt connecting the CCPP unit with the material recovery building

Photo 3 – Breaking of concrete surface at S1/S2

Photo 4 – Excavation at S3/S4

Photo 5 – Excavation Pit

Photo 6 – Identification of soil profile by contractor

Photo 7 – Breaking of concrete surface at S11/S12