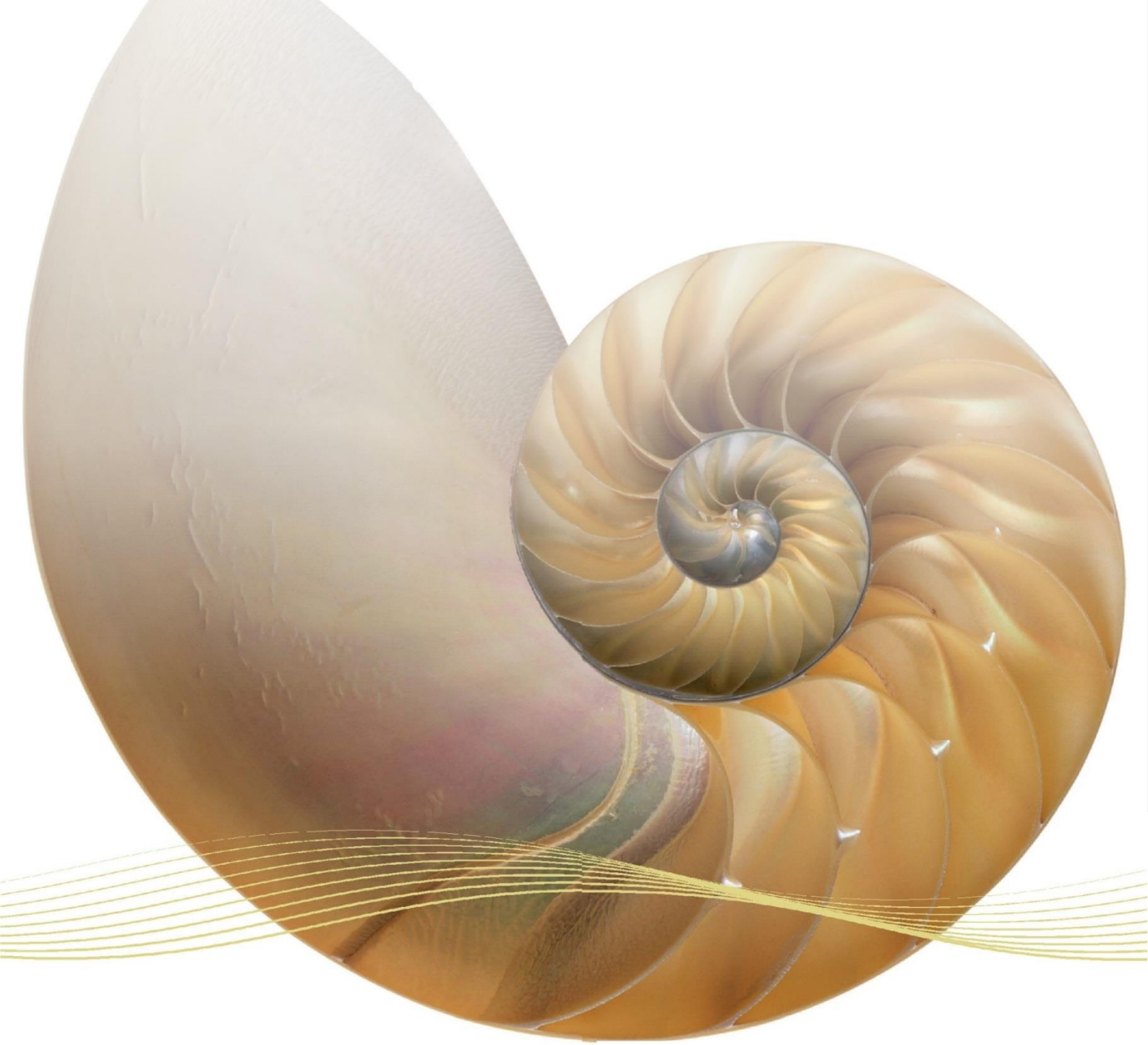

Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling – Investigation, Design and Construction

Contamination Assessment Plan

24 May 2022

Project No.: 0482209

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.0Document details	The document represents the *Contamination Assessment Plan* for the Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling – Investigation, Design and Construction
Document title	Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling – Investigation, Design and Construction
Document subtitle	Contamination Assessment Plan
Project No.	0482209
Date	24 May 2022
Version	6.0
Author	Anthony Ho, Daisy Wong
Client Name	Black & Veatch Hong Kong Limited

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft	1.0a	Anthony Ho, Daisy Wong	Angus Choi	Terence Fong	14.05.2020	
Draft	2.0	Anthony Ho, Daisy Wong	Angus Choi	Terence Fong	28.01.2021	
Draft	3.0	Daisy Wong	Angus Choi	Terence Fong	20.12.2021	
Draft	4.0	Daisy Wong	Angus Choi	Terence Fong	10.03.2022	
Draft	5.0	Daisy Wong	Angus Choi	Terence Fong	04.04.2022	
Draft	6.0	Daisy Wong	Angus Choi	Terence Fong	24.05.2022	

Signature Page

24 May 2022

Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling – Investigation, Design and Construction

Contamination Assessment Plan

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Acronyms and Abbreviations

Name	Description
B&V	Black & Veatch Hong Kong Limited
CAP	Contamination Assessment Plan
CAR/RAP	Contamination Assessment Report / Remediation Action Plan
DEP	Director of Environmental Protection
DG	Dangerous Goods
DSD	Drainage Services Department
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EPD	Environmental Protection Department
FSD	Fire Service Department
GEO	Geotechnical Engineering Office
GI	Ground Investigation
HKPF	Hong Kong Police Force
m bgl	metres below ground level
mPD	metres above the Hong Kong Principal Datum
PCRs	Petroleum Carbon Ranges
RBRGs	Risk Based Remediation Goals
SI	Site Investigation
SVOCs	Semi Volatile Organic Compounds
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
WPCO	Water Pollution Control Ordinance
WDO	Waste Disposal Ordinance

2. INTRODUCTION

2.1 Background

The Drainage Services Department (DSD) is undertaking a project named "Drainage Improvement Works in Ta Kwu Ling – Investigation, Design and Construction" (Agreement No. CE 89/2017 (DS)) (hereinafter referred to as the "Project"). This Project is to alleviate flooding problems in Ping Che / Ta Kwu Ling Area by improving part of the Ping Yuen River in Ta Kwu Ling in accordance with the recommendation of Drainage Master Plan (DMP) Study in the Northern New Territories" which was completed in October 1999. The principal works elements within the Project comprises construction of drainage channels TKL04 and TKL05, construction of associated drainage facilities at Ping Yeung Village and Ping Che Road and re-provision of vehicular crossing and footbridges.

The Project requires an Environmental Permit (EP) from the Hong Kong SAR Government. In relation to this, DSD has prepared a Project Profile for Application for an Environmental Impact Assessment (EIA) Study Brief which has been submitted to Environmental Protection Department (EPD) on 16 September 2019. The EIA Study Brief (No. ESB-322/2019) has been issued by EPD on 28 October 2019.

ERM-Hong Kong, Limited (ERM) was commissioned by Black & Veatch Hong Kong Limited (B&V), the Engineer, for the EIA Study for the proposed Project. In accordance with *Clause 3.4.8* and *Annex F Requirements for Assessment of Land Contamination Assessment* of the Study Brief, land contamination assessment shall be carried out for the Project to investigate the potential land contamination impacts at the suspected contaminative site within the Project Area and its associated works.

As part of the assessment, a Contamination Assessment Plan (CAP) is prepared for submission to Environmental Protection Department (EPD) for agreement. This CAP will form part of the EIA submission for the application of the EP.

2.2 Objectives of the CAP

This CAP reviews the past and present land uses of the Project Area including its associated works to identify any suspected contaminative land uses or activities which may cause potential soil and groundwater contamination. This CAP will also determine the need for an intrusive land contamination site investigation (SI) at the Site to close the data gaps for the desktop review. If it is considered necessary to conduct a SI, this CAP will describe the approach and methodology to identify the nature and extent of on-site contamination (if any).

2.3 Structure of this CAP

Following this introduction section, the subsequent sections of the CAP are structured as follows.

- *Section 2* outlines the statutory requirements and the evaluation criteria for land contamination assessment;
- *Section* 3 presents the findings of the site appraisal, including site survey, information on the past and present land uses;
- *Section 4* proposes the sampling plan to assess the potential land contamination of the Site;
- *Section 5* proposes the proposed sampling methodology; and
- *Section 6* presents the conclusion and recommendations.

This CAP is supplemented with the following Annexes:

Annex A *Letter from Government Departments on Relevant Information*

3. STATUTORY REQUIREMENTS AND EVALUATION CRITERIA

The following EPD's guiding documents are referenced for this land contamination assessment:

- *Annex 19 of the Technical Memorandum on Environmental Impact Assessment Process* (Annex 19 of EIAO-TM);
- *Guidance Note for Contaminated Land Assessment and Remediation* (the RBRGs Guidance Note);
- *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management* (the RBRGs Guidance Manual); and
- *Practice Guide for Investigation and Remediation of Contaminated L*and (the Practice Guide).

The following legislation, documents and guidelines may cover or have some bearing upon the assessment of contamination and the handling, treatment and disposal of contaminated materials for this Project:

- *Dangerous Goods Ordinance* (Cap 295);
- *Water Pollution Control Ordinance* (WPCO) (Cap 358);
- *Waste Disposal Ordinance* (WDO) (Cap 354);
- *Waste Disposal (Chemical Waste) (General) Regulation* (Cap 354C)
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.

4. DESCRIPTION OF THE PROPOSED PROJECT

The Project comprises the improvement works to tributary sections TKL04 and TKL05 of Ping Yuen River (River Ganges) in Ta Kwu Ling as illustrated in *Figure 1*. The Project Area comprises:

(i). Improvement works, including river widening and deepening, construction of embankments / floodwall, construction of bank gradient and bank design, and revitalizing water bodies, to tributary sections of Ping Yuen River (River Ganges)
   - TKL04 (about 1.4km long, 5-9m width, 3-3.5m average depth);
   - TKL05 (about 2.1km long, 10-21m width, 3 -3.5m average depth); and

(ii). Associated drainage facilities, including:
   - Drainage improvement works at Ping Yeung Village (about 1050m long);
   - Construction of road drainage system at Ping Che Road (about 1150m long); and
   - Re-provision of vehicular crossing and footbridges.

5. FUTURE LAND USE

In accordance with Section 2 of the RBRGs Guidance Manual, the Project Area's future land use and the appropriate set of RBRGs corresponding to the land use scenarios should be determined prior to the site appraisal. The Hong Kong RBRGs are developed for four different post-restoration land use scenarios, namely urban residential, rural residential, industrial, and public parks.

The Project involves drainage improvement works. The future land uses in the Project Area comprises various public drainage utilities, including drainage channels, u-channels, drain pipes and vehicular crossing and footbridges. According to Section 2.2.2 and Section 3.1 of the RBRGs Guidance Manual, the RBRGs conceptual site model under "Industrial" land use scenario shall be adopted for public utilities.

6. SITE APPRAISAL

The site appraisal comprises a description of general site setting, review of historical spillage and leakage records, (hydro) geology and underground soil profile, current and past land uses, historical aerial photographs and maps at the Project Area and the adjacent areas.

As most of the private lots within the Project Area were still in-use and not accessible during the CAP preparation, the site walkover was conducted by visual inspection from the entrance and / or boundary of the private lots. The current and historical land uses were verified by review of historical aerial photographs.

6.1 General Site Setting

The surrounding areas of TKL04 and TKL05 are mainly agricultural land and village type development over the years, while light industrial use and open storage were developed in the Project Area in recent years.

6.2 Review of Past Land Use

Review of past land uses of the Project Area were conducted by reviewing the aerial photographs in the years of 1982, 1994, 2004, 2008 and 2020. The aerial photographs were obtained from the Surveys and Mapping Office of the Lands Department. Key changes of site setting observed within these areas are summarised in *Table 6.1* using the 'Standard Form 3.1 – Past Use' in accordance with the RBRGs Guidance Manual. The referenced aerial photographs are attached in *Annex D*.

Table 6.1 Standard Form 3.1 Summary of On-Site Land Use – Past Use

Project Area / Concerned Area	Type of Facility/ Business	On-site Property Land Use	Date Began/ Period	Description of Site History	Owner or Occupier	Approximate Size of On-site Property (m^2)	Off-site Property Affected?
Project Area (Except the Concerned Area)	Mixed-type with Farmland, roads, utilities, and residential	Agricultural, Rods, Utilities and Residential	1980s to present	Based on review of historical aerial photograph from year 1982 indicated that the land where the Project Area (Except the Concerned Area) located was used as farmland, vegetation, road, existing drainage facilities and village houses.	Unknown	~93,080 m^2	No
Area A	Farmland	Agricultural	1980s	Based on review of historical aerial photo from year 1982 indicated that Area A was a farmland.	Unknown	~5,815 m^2	No

Project Area / Concerned Area	Type of Facility/ Business	On-site Property Land Use	Date Began/ Period	Description of Site History	Owner or Occupier	Approximate Size of On-site Property (m^2)	Off-site Property Affected?
	Contractor Storage Yard	Industrial	Early 1990s to present	Based on review of historical aerial photo from year 1994, 2004 and 2008, the Area has become as a contractor storage yard until present.	Unknown	~5,815 m^2	No
Area B1	Farmland	Agricultural	1980s	Based on review of historical aerial photograph from year 1982 indicated that the land where the Area located was used as a farmland.	Unknown	~700 m^2	No
	Open Storage Area	Industrial	Early 1990s to present	Based on review of historical aerial photos from year 1994, 2004 and 2008, the Area has become an open storage area since 1994 until present.	Unknown	~700 m^2	No
Area B2	Farmland	Agricultural	1980s	Based on review of historical aerial photograph from year 1982 indicated that the land where the Area located was used as a farmland.	Unknown	~4,060 m^2	No
	Temporary Office Buildings and Warehouse	Industrial	Early 1990s to present	Based on review of historical aerial photo from year 1994, 2004 and 2008, temporary office buildings and warehouse structures were gradually built on Area B2 from early 1990s until present.	Unknown	~4,060 m^2	No

Based on the review of past land uses of the entire Project Area, three (3) suspected contaminative sites (hereafter referred to as 'Concerned Area') within and in the vicinity of the Project Area were identified, including Area A, Area B1 and Area B2. The location of the three (3) Concerned Areas are shown in *Figure 1*.

6.3 Review of Current Land Use

Site walkover was conducted on 26 October 2018 at the time of Project Profile preparation to identify the potential contaminative land use & site conditions within the Project Area. As the Area A, B1 and B2 were still in operation and not accessible for site walkover and interview with the current land users at the time of CAP, site observation could only be made at the peripheral of the Area A, B1 and B2. In addition, interview with the current land users could not be arranged at the time of CAP preparation, therefore site walkover checklists could not be completed. Once the Concerned Areas will be handed over to DSD for development, the future project proponent's land contamination specialist shall prepare the site walkover checklist for submission once the sites will be accessible.

Further request was made in 4th quarter 2020 for asking permission to enter Concerned Areas for follow-up site inspection. However, permission could not be obtained from the site owners as the Area A, B1 and B2 were still in operation.

The site condition and the land uses did not have any changes since the Oct 2018 according to the latest site walk conducted on 25 November 2021. Therefore, the information of current land use of the Project Area and the Concerned Areas were obtained by review of the latest aerial photos in year 2020 available from the Surveys and Mapping Office of the Lands Department.

"Standard Form 3.1 – Current Use" in accordance with the RBRGs Guidance Manual is included as *Table 6.2*. *Annex C* presents the selected site walkover photos.

Table 6.2 Standard Form 3.1 Summary of On-Site Land Use – Current Use

Project Area / Concerned Area	Type of Existing Facility/ Business	On-site Property Land Use	Date Began/ Period	Description of Appraisal Findings	Owner or Occupier	Approximate Size of On-site Property (m^2)	Off-site Property Affected?
Project Area (Except the Concerned Area)	Mixed-type with Farmland, roads, utilities, and residential	Agricultural, Roads, Utilities and Residential	1980s	Based on review of historical aerial photograph from year 1982 indicated that the land where the Project Area (Except the Concerned Area) located was used as farmland, vegetation, road, existing drainage facilities and village houses.	Unknown	~93,080 m^2	No
Area A	Contractor Storage Yard	Industrial	Early 1990s	No site walkover and interview were conducted in Area A due to limited site access. The current land use information was based on publicly available information. Review of historical aerial photo taken in 2020 indicated that the Area A was occupied by a contractor storage yard. According to the CWPs records from EPD, Area A has been occupied by a contractor namely Triangular Force Construction Engineering Limited. Based on review of aerial photos, it is appeared that the goods stored onsite potentially include drums, containers, and miscellaneous equipment.	Triangular Force Construction Engineering Limited	~5,815 m^2 Size within the Project Area : 128 m^2	To be verified after re-appraisal
Area B1	Open Storage Area / Waste Electric & Metal	Industrial	Early 1990s	No site walkover and interview were conducted in Area B1 due to limited site access. The current land use information was based on publicly available information.	Ping Nam Trading LTD	~700 m^2	To be verified

Project Area / Concerned Area	Type of Existing Facility/ Business	On-site Property Land Use	Date Began/ Period	Description of Appraisal Findings	Owner or Occupier	Approximate Size of On-site Property (m^2)	Off-site Property Affected?
	Products Recycler			Review of historical aerial photo taken in 2020 showed that the boundary of Area B1 was an open storage area with small sheds along the tree canopy. According to the CWPs records from EPD, Area B1 has been occupied by a waste electric & metal products recycler namely Ping Nam Trading LTD. These electronic wastes stored onsite may possess a potential land contamination impact.		Size within the Project Area : 383 m^2	after re-appraisal
Area B2	Temporary Office Buildings and Warehouse	Industrial	Early 1990s	No site walkover and interview were conducted in Area B2 due to limited site access. The current land use information was based on publicly available information. Review of latest aerial photo taken in 2020 showed that the Area B2 has been occupied by temporary office buildings and warehouses. No signs of industrial activities were noted.	Unknown	~4,060 m^2 Size within the Project Area : 674 m^2	To be verified during re-appraisal

Among the three (3) Concerned Area (i.e. Area A, B1 and B2) identified in the site appraisal, all are located within the Project Area and are considered to have the potential of land contamination impact to the development.

6.4 General Site Setting of Concerned Area

As three (3) Concerned Areas with suspected contaminative land uses were identified within the Project Area, i.e. the general site setting will focus on these three (3) Concerned Areas, i.e. Area A, B1 and B2.

Areas A, B1 and B2 are located at approximately 200-300m southeast of Lei Uk Village. The surrounding land uses of the neighbouring environment are summarised as follow:

Area A: Contractor Storage Yard

North: Immediate to the north is a greenfield area overgrown with trees and shrubs.

East: Immediate to the east is a contractor storage yard. Further east is Ping Che Road.

South: Immediate to the south is an unknown road. Further south is Area B1 and the office of Lam Geotechnics Limited.

West: Immediate to the west is a greenfield area overgrown with trees and shrubs.

Area B: B1 – Open Storage Area / Waste Electric & Metal Products Recycler; B2 – Temporary Office Buildings and Warehouse Structures

Since Areas B1 and B2 are adjacent to each other, the review of surrounding land uses will be combined as below.

North: Immediate to the north is an unknown road. Further south is Area A and a greenfield area overgrown with trees and shrubs.

East: Immediate to the east is the office of Lam Geotechnics Limited.

South: Immediate to the south is a greenfield area overgrown with trees and shrubs.

West: Immediate to the west is a greenfield area overgrown with trees and shrubs.

6.5 Review of Historical Spillage and Leakage Record

A visit to the Chemical Waste Collection Licensing Section of the EPD Territorial Control Office was arranged on 3 Dec 2019 and 21 Dec 2021, and information related to Chemical Waste Producers (CWPs) registered within the Project Area was extracted.

As of the latest available record from EPD at the time of preparing this CAP, two (2) valid CWPs registered within the Project Area were found in EPD's CWP register record. Both CWPs were located inside the Concerned Areas. Based on the nature of business of the two (2) valid CWPs, potential chemical waste streams may include waste fuel, lubricant oil, waste printed circuit boards, waste batteries and metal scraps. As these Concerned Areas were not accessible, the actual locations of chemical waste storages shall be reviewed by the project proponent in the future when available.

Details of the CWP registered is listed in *Table 6.3*.

Table 6.3 Details of Chemical Waste Producer Registers

Concerned Area	Licensee Name	Registered Address	Nature of Business
Area A	Triangular Force Construction Engineering Limited	DD82, Lot 1344, Ping Che, Fanling, North District, NT	Construction & Engineering
Area B1	Ping Nam Trading LTD	DD82, Lot 1355, Flat 504, Tai Po Tin, North District, NT	Recycling & Wholesale of Electric & Metal Products

An information request was sent to the FSD regarding the records of any historical spillages, fire incidents and Dangerous Goods (DG) storage within the Areas. According to the information provided

by the FSD on 13 Apr 2022, six (6) incidents were recorded at and around the Project Area. Details of the recorded incidents are listed in *Table 6.4*.

Table 6.4 Details of Incident Record

Incident ID.	Date	Type of Incident	Address
1	20 Apr 2020	Vegetation Fire	Near lamp post V8575, Farmland Lei Uk
2	11 Aug 2020	Vegetation Fire	Ping Yuen Road, near Sam Heung Pavilion
3	11 Aug 2020	Vegetation Fire	Ping Yuen Road, near DD77 Lot 70 Open Ground
4	27 Sep 2020	Vegetation Fire	Near lamp post VA6869, Ping Yuen Ho
5	28 Jan 2021	Vegetation Fire	Near lamp post VA6487, Lei Uk
6	3 Jul 2021	Traffic Accident	Near lamp post EB7394, near Ping Che Road

Further checking with the incident locations, incident records 2 and 3 locate outside the Project Area. Moreover, the remaining incidents for incident records 1 and 4 to 5 are vegetation fire and traffic accident which are not consider as source of potential land contamination. Therefore, it is believed that no potential contamination issue is arisen from the abovementioned incidents within the Project Area. The locations of the incident records are presented in *Figure 2*.

An information request was sent to the EPD regarding the records of any chemical spillage, leakage record within the Areas. According to the information provided by the EPD, no chemical spillage / leakage record / incident record was found.

Information provided by FSD and EPD are attached in *Annex A*.

6.6 (Hydro) Geology and Underground Soil Profile

Previous Ground Investigation (GI) records in the vicinity of the Concerned Areas were obtained from the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD).

According to the nearby drillhole records for *Drainage Improvement in Northern New Territories – Package C, Investigation, Design and Construction, Additional Services – Investigation, Design and Construction of Drainage Channel TKL05* and *Agreement No. CE 61/2007 (CE), North East New Territories New Development Areas Planning and Engineering Study – Investigation (Batch 2)*, the geological strata encountered were in general a fill material of silty fine to coarse with some angular to subangular fine gravel (from 0 to 1.5m bgl). The fill material layer was underlain by alluvium in a matrix of sandy clayey silt with subangular to subrounded fine to coarse gravel (from 1.5 to 6.6 m bgl). The groundwater level was approximately 1.20 to 3.62 m bgl.

A copy of the previous borehole records is attached in Annex B. The locations of the previous drillholes are presented in *Figure 3*.

7. SAMPLING AND TESTING PLAN

7.1 Proposed Sampling Locations

Based on the site appraisal findings presented in *Section 5*, the following locations of the Concerned Areas are identified as potential land contamination hotspots. As these Concerned Areas are inaccessible for conducting sampling and analysis during the course of EIA SI is recommended at these Concerned Areas for the future proponent to access potential land contamination impacts to the Project after the land resumption.

7.2 Concerned Areas within the Project Boundary

Area A: Contractor Storage Yard

Review of aerial photo taken in 2020 showed that the entire Area A was used as a container contractor storage yard. According to the CWPs records from EPD, Area A has been occupied by a contractor namely Triangular Force Construction Engineering Limited. Based on review of historical aerial photos, it is appeared that the Contractor Storage Yard has been storing drums, containers, and miscellaneous equipment since early 1990s.

Based on available sources, the possibility of historical land contamination cannot be ruled out. The potential onsite chemical storage may possess a potential land contamination impact. Nevertheless, SI is recommended to verify the ground condition as a conservative approach.

According to the engineering design provided, the size of Area A within the Project Area is 128 m^2. Three (3) sampling grids of 6m x 6m have been proposed in Area A within the Project Area with reference to Table 2.1 of the Practice Guide for Investigation and Remediation of Contaminated Land (PG) to conduct soil and groundwater sampling. The proposed testing parameters are metals, petroleum carbon ranges (PCRs), volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs).

Area B1: Open Storage Area / Waste Electric & Metal Products Recycler

Review of aerial photo taken in 2020 showed that the boundary of Area B1 was an open storage area with small sheds along the tree canopy. According to the CWPs records from EPD, Area B1 has been occupied by a waste electric & metal products recycler namely Ping Nam Trading LTD. These electronic wastes stored onsite may possess a potential land contamination impact. SI is recommended to assess the ground condition of the electronic and metal waste storage areas.

According to the engineering design provided, the size of Area B1 within the Project Area is 383 m^2. Three (3) sampling grids of 13m x 13m have been proposed in Area B1 within the Project Area with reference to Table 2.1 of the Practice Guide for Investigation and Remediation of Contaminated Land (PG) to within the Project Area to conduct soil and groundwater sampling. The proposed testing parameters are metals, PCRs, VOCs and SVOCs.

Area B2: Temporary Office Buildings and Warehouse

Review of aerial photo taken in 2020 showed that the Area B2 were used as a temporary office buildings and warehouse. Based on review of historical aerial photos, there is no significant change of the land use since early 1990s. No signs of industrial activities were noted.

Based on available sources, the possibility of historical land contamination cannot be ruled out. Nevertheless, SI is recommended to verify the ground condition as a conservative approach.

According to the engineering design provided, the size of Area B2 within the Project Area is 674 m^2. Four (4) sampling grids of 13m x 13m have been proposed in Area B2 within the Project Area with reference to Table 2.1 of the Practice Guide for Investigation and Remediation of Contaminated Land (PG) to conduct soil and groundwater sampling. The proposed testing parameters are metals, PCRs, VOCs and SVOCs.

7.3 Re-appraisal and Supplementary CAP

Area A, Area B1 and Area B2 are still in operation could not be accessed for visual inspection at the time of preparing this CAP. Although the Project Area, excluding the Concerned Areas, is not identified as potentially contaminated sites during the course of this CAP study, the site is still in use. Change in land use could take place on this site, which may cause potential land contamination. Site re-appraisal for Project Area shall be conducted by future project proponent's land contamination specialists to identify the potential land contamination issues after land resumption.

For Area A, Area B1 and Area B2, the land contamination specialist shall conduct a review of this CAP to confirm whether the proposed SI works are still valid and provide fine adjustment of the sampling locations and number of boreholes according to the actual site condition.

The land contamination specialist shall also observe and document any potential off-site land contamination impacts during the re-appraisal site walkover. New potential land contamination sources in the Project Area that occur after the course of this CAP shall also inspected during the re-appraisal.

A supplementary CAP shall be prepared by land contamination specialists to document the abovementioned re-appraisal, review the proposed sampling location(s) and outline the proposed sampling arrangement as well as testing parameters. The supplementary CAP shall be submitted to EPD for review and agreement. After the agreement of the supplementary CAP and upon completion of SI, the land contamination specialists shall prepare a CAR to present findings of the SI works.

If contamination is confirmed, the CAR will be accompanied by a Remediation Action Plan (RAP). The CAR and RAP will be a combined report for EPD's agreement.

Upon completion of remediation works (if necessary), a Remediation Report (RR) will be prepared and submitted to EPD for endorsement prior to commencement of any proposed construction works for subsequent developments.

7.4 Sampling and Analysis Plan

Considering the information presented in *Section 3* and *Section 4.1*, a SI plan for Area A, B1 and B2 is presented in this section. *Table 7.1* summarises the details of the sampling plan, including number of sampling locations, the sampling methods, the number of samples, the selected RBRGs land use scenario, and the parameters that will be analysed. The proposed sampling locations are presented in *Figure 3.*

Table 7.2 presents the laboratory analytical methods and reporting limits proposed for the soil and groundwater samples.

Table 7.1 Proposed Sampling and Analysis Plan

Potentially Contaminated Area	Sampling Location ID	Proposed Coordinates[a]	Soil Sampling Depths (m bgl)	Groundwater Sampling Depths (m bgl)	RBRGs Land Use Scenario	Proposed Testing Parameters
Area A: Contractor Storage Yard	BH1	E: 833589.40 N: 843825.62	Manual excavation of Inspection Pit (0-1.5 m bgl): ■ To collect disturbed sample at 0.5 m bgl Rotary Drilling of boreholes (1.5-7.0 m bgl): ■ Continuous drilling and retrieving of soil materials for visual inspection at every 1m from the bottom of inspection pit to a maximum depth of 7 m bgl or 2 m below static groundwater level, whichever shallower. ■ To collect undisturbed soil samples at 3.0 m and 4.0 m bgl	Collect one (1) groundwater sample at static groundwater level.	Industrial	Metals [b], PCRs [c], VOCs [d], SVOCs [e]
	BH2	E: 833595.08 N: 843819.94				
	BH3	E: 833601.17 N: 843813.98				
Area B1: Open Storage Area / Waste Electric & Metal Products Recycler	BH4	E: 833565.93 N: 843691.95				
	BH5	E: 833568.59 N: 843683.24				
	BH6	E: 833570.53 N: 843674.03				
Area B2: Temporary Office Buildings and Warehouse	BH7	E: 833548.66 N: 843689.50				
	BH8	E: 833535.11 N: 843689.43				
	BH9	E: 833547.79 N: 843675.46				
	BH10	E: 833537.47 N: 843675.33				

Potentially Contaminated Area	Sampling Location ID	Proposed Coordinates[(a)]	Soil Sampling	Groundwater	RBRGs Land Use Scenario	Proposed Testing Parameters
			Depths (m bgl)	Sampling Depths (m bgl)		

Notes:

m bgl = meter below ground level.

(a) By experience, the exact sampling locations will be determined by on-site land contamination specialist and subject to adjustment due to site-specific conditions/ constraints (e.g. presence of underground utilities, foundations, insufficient headroom, spaces occupied by vehicles, etc) during the actual SI.

(b) Metals: For soil: Antimony, Arsenic, Barium, Cadmium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Tin, Zinc, Mercury, Chromium (III) and Chromium (VI); For groundwater: Mercury

(c) PCRs: C6 – C8, C9 – C16 and C17 – C35

(d) VOCs: For soil and groundwater: Acetone, Benzene, Bromodichloromethane, 2-Butanone, Chloroform, Ethylbenzene, Methyl tert-Butyl Ether, Methylene Chloride, Styrene, Tetrachloroethene, Toluene, Trichloroethene and Xylenes (Total)

(e) SVOCs: Acenaphthene, Acenphthylene, 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, and Pyrene

Table 7.2 Laboratory Testing Methods and Reporting Limits

Test Parameter	Soil		Groundwater	
	Reference Method	Reporting Limit (mg/kg)	Reference Method	Reporting Limit (µg/L)
Metals [(b)]				
Lead	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Antimony	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Arsenic	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Barium	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Cadmium	USEPA 6020	0.2	USEPA 6020	Not to be tested [(a)]
Cobalt	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Copper	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Manganese	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Molybdenum	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Nickel	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Tin	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Zinc	USEPA 6020	1	USEPA 6020	Not to be tested [(a)]
Chromium III	By Calculation	1	By Calculation	Not to be tested [(a)]
Chromium VI	USEPA3060	1	APHA3500 Cr:D	Not to be tested [(a)]
Mercury	APHA3500Cr:D	0.05	APHA3112B	0.5
Petroleum Carbon Ranges [(b)]				
C6-C8	USEPA 8015	5	USEPA 8015	20
C9-C16	USEPA 8015	200	USEPA 8015	500
C17-C35	USEPA 8015	500	USEPA 8015	500
VOCs [(b)]				
Benzene	USEPA 8260	0.2	USEPA 8260	5
Toluene	USEPA 8260	0.5	USEPA 8260	5
Ethylbenzene	USEPA 8260	0.5	USEPA 8260	5
Stryene	USEPA 8260	0.5	USEPA 8260	5
Xylenes (Total)	USEPA 8260	2	USEPA 8260	20
Acetone	USEPA 8260	50	USEPA 8260	500
2-Butanone	USEPA 8260	5	USEPA 8260	50
Methylene chloride	USEPA 8260	0.5	USEPA 8260	50
Trichloroethene	USEPA 8260	0.1	USEPA 8260	5
Tetrachloroethene	USEPA 8260	0.04	USEPA 8260	5
Chloroform	USEPA 8260	0.04	USEPA 8260	5
Bromodichloromethane	USEPA 8260	0.1	USEPA 8260	5
Methyl tert-Butyl Ether	USEPA 8260	0.5	USEPA 8260	5
SVOCs [(b)]				
Acenaphthene	USEPA 8270	0.5	USEPA 8270	2
Acenaphthylene	USEPA 8270	0.5	USEPA 8270	2
Anthracene	USEPA 8270	0.5	USEPA 8270	2
Benzo(a)anthracene	USEPA 8270	0.5	USEPA 8270	Not to be tested [(a)]
Benzo(a)pyrene	USEPA 8270	0.5	USEPA 8270	Not to be tested[(a)]
Benzo(b)fluoranthene	USEPA 8270	0.5	USEPA 8270	1
Benzo(k)fluoranthene	USEPA 8270	0.5	USEPA 8270	Not to be tested [(a)]

Test Parameter	Soil		Groundwater	
	Reference Method	Reporting Limit (mg/kg)	Reference Method	Reporting Limit (µg/L)
Benzo(g,h,i)perylene	USEPA 8270	0.5	USEPA 8270	Not to be tested [(a)]
Bis-(2-Ethylhexyl)phthalate	USEPA 8270	5	USEPA 8270	Not to be tested [(a)]
Chrysene	USEPA 8270	0.5	USEPA 8270	1
Dibenzo(a,h)anthracene	USEPA 8270	0.5	USEPA 8270	Not to be tested [(a)]
Fluoranthene	USEPA 8270	0.5	USEPA 8270	2
Fluorene	USEPA 8270	0.5	USEPA 8270	2
Hexachlorobenzene	USEPA 8270	0.2	USEPA 8270	4
Indeno(1,2,3-cd)pyrene	USEPA 8270	0.5	USEPA 8270	Not to be tested [(a)]
Napththalene	USEPA 8270	0.5	USEPA 8270	2
Phenanthrene	USEPA 8270	0.5	USEPA 8270	2
Pyrene	USEPA 8270	0.5	USEPA 8270	2

Notes:

(a) Not to be tested – No corresponding RBRGs was established for groundwater.

(b) All analysis shall be conducted according to the reference test methods accredited by HOKLAS or one of its Mutual Recognition Arrangement partners, along with laboratory internal Quality Assurance/Quality Control (QA/QC) procedures.

8. SAMPLING METHODOLOGY

8.1 Overview

Borehole drilling is proposed as the means of sampling to investigate and determine the presence of potential soil and groundwater contamination. The drilling works and soil and groundwater sampling will be supervised by the future project proponent's land contamination specialist. The soil sampling methodologies are based on the RBRGs Practice Guide. These methods include decontamination procedures, sample collection, preparation and preservation, and chain-of-custody documentation as described in the following sections.

8.2 Role of Land Contamination Specialist during the Site Investigation

The land contamination specialist will be responsible for management and oversight of the SI and sampling works. The land contamination specialist shall:

- Provide full-time onsite supervision and management of the whole SI and sampling works;
- Conduct adequate soil and groundwater sampling and arrange laboratory testing in accordance with the agreed CAP; and
- Prepare on-site records (e.g. photo records, site field records) to demonstrate the SI works and sampling works meet the requirements stated in agreed CAP and the land contamination guidelines published by EPD.

8.3 Borehole Drilling

The borehole will be advanced by means of dry rotary drilling method to avoid cross-contamination, i.e. without the use of a flushing medium, as far as practicable. Adjustment of sampling locations will be considered in order to facilitate the drilling if rocks/ large boulders are encountered during the drilling.

For safety reasons and to inspect for underground utilities, utility scanning will be performed at all proposed borehole locations to ensure sufficient clearance from underground utilities prior to excavation. In addition, an inspection pit will be excavated down manually to about 1.5 m bgl to perform underground utility clearance at each of the borehole locations before drilling commences.

Disturbed soil samples will be collected at the depth of 0.5 m from the inspection pits. Soil boring using rotary drill rigs will then be performed from 1.5 m bgl to a maximum depth of 7.0m bgl or 2 m below static groundwater level, whichever shallower.

Soil samples will be retrieved at approximately 1.0 m intervals for inspection of geological characteristics and for visual inspection for potential contamination (such as visual evidence of discolouration, staining, presence of non-aqueous liquid phase and abnormal odour). The soil profile with evidence of contamination (if any) will be recorded in the drilling log by a qualified geologist. The log will also include the general stratigraphic description, depth of sampling, sample notation, and level of groundwater (where encountered).

Undisturbed soil samples will be collected at depths of 3.0 m and 4.0 m bgl using the U76 / U100 core. Where there are suspected signs of contamination, extra samples will be taken for laboratory analysis.

8.4 Soil Sampling

The sampling programme will be undertaken with strict adherence to appropriate protocols to minimise the potential for cross-contamination between sampling locations. The following will be implemented while sampling:

- A ceramic spoon shall be used to collect disturbed soil sampling, which will be cleaned between sampling;

- Where possible, a new set of sampling equipment will be used for each sampling event. If this is not possible, the equipment will be cleaned with a non-phosphate detergent between each sampling event. Larger equipment such as drilling rigs, drill rods, casings, will be steam cleaned where possible, or at a minimum pressure jet washed with water from the mains;
- The ceramic sampling spoon, sampling cores and other sampling equipment that come into direct contact with the samples will be decontaminated first with fresh water and Decon 90 detergent; rinsed with distilled water and air dried prior to the sampling and between samples;
- Clean latex gloves will be worn during sample collection and changed before each sample is collected to prevent cross contamination;
- The presence of VOCs from the samples shall be screened by using a Photo-ionisation Detection (PID) meter at each 1.0m interval. Where PID readings over 20 ppm are recorded by land contamination specialist or where significant visual or olfactory evidence of contamination is present, additional soil samples will be collected at that depth. Further laboratory analysis may be necessary; and
- The thickness of any free product and groundwater if present at locations shall be measured with an interface probe.

8.5 Groundwater Sampling

Groundwater samples will be collected if groundwater is encountered in the boreholes. Groundwater monitoring wells shall be installed in accordance with the instructions given by the land contamination specialist. *Annex E* presents a schematic drawing of groundwater monitoring well for reference.

In general, groundwater monitoring should generally be installed to a minimum depth of two metres below the water table and/or to suspected contamination depth. Suitable well casing and screen materials shall be selected. Well casing and screen materials should maintain their structural integrity and durability in the environment in which they are used over their operating life. The monitoring wells should be resistant to chemical and microbiological corrosion and degradation in contaminated and uncontaminated waters. Wells should also not react and interfere with the chemical characteristics of the groundwater. Well materials should be decontaminated prior to installation. Well sections should be connected together using appropriate methods such as pre-fabricated threaded joints or rivets and not connected using solvent based glues. Empty voids between the well pipe and the borehole may be packed with clean gravels and sand. Wells should be secured to prevent contamination from the surface, typically bentonite and cement are used to fill the top of the void and well caps are used to close the pipe.

After the installation of the monitoring wells, the depth of water table at all monitoring wells will be measured in order to delineate the local groundwater table contours at the subject site. Well developments (approximately five well volumes) will be carried out to remove silt and drilling fluid residing from the wells. The wells will then be allowed to stand for a day to permit groundwater conditions to stabilise.

Groundwater levels and thickness of any free product layer, if present, will be measured at each well before groundwater samples are taken. One (1) groundwater sample will be collected from each well, using a disposable Teflon bailer. Screening criteria (soil saturation limits, C_{sat}, developed for Non-aqueous Phase Liquid (NAPL) in soil and water solubility limits for NAPL in groundwater) for the mobile organic chemicals must be considered to determine whether a site requires further action.

8.6 Sample Size

Prior to sampling, the laboratory responsible for chemical analysis will be consulted on the particular sample size and preservation procedures that are necessary for each chemical analysis. *Table 8.1* lists the recommended sample container types, sizes and preservation method.

Table 8.1 Summary of Sample Container Type, Sizes and Preservation Method

Test Parameters	Container Type, Size and Preservation Method
Soil	
Metals	1 x 250 ml glass jar with teflon-lined cap
VOCs / PCRs	1 x 250 ml glass jar with teflon-lined cap
SVOCs	1 x 250 ml glass jar with teflon-lined cap
Groundwater	
Metals (Mercury)	1 x 250 ml plastic (no preserve)
VOCs / PCRs	2 x 40 ml amber glass vials (hydrochloric acid)
PCRs / SVOCs	1 x 1,000 ml amber glass (no preserve)

8.7 Sample Handling and Laboratory Analysis

All samples will be directly collected in pre-cleaned sample bottles provided by the laboratory. Chain-of-custody documentation will be initiated immediately after samples are collected. Containers will be labelled in the field with the date, well designation, project name, time of collection and analysis to be performed. If the field work is expected to take several days, soil samples will be kept chilled with ice (at approximately 4°C) on-site and during transport. Samples will be delivered to a HOKLAS accredited laboratory for chemical analyses. All analysis will be conducted according to the test methods accredited by HOKLAS or one of its Mutual Recognition Arrangement partners, along with laboratory internal QA/QC procedures.

8.8 QA/QC Samples

QA/QC samples will be collected to allow an assessment of the quality of data collected. The QA/QC samples are listed in *Table 8.2*.

Based on the proposed sampling and analysis plan as outlined in *Table 7.1*, there would be at least 30 soil samples (10 sampling locations x 3 samples per location) and 10 groundwater samples (subject to site specific conditions). The numbers of QA/QC samples are summarised in *Table 8.2*.

The exact number of the QA/QC samples will be subjected to the site condition and the SI program. If the sampling work of the 10 sampling locations may not be carried out at the same period of time, additional set of QA/QC samples will be taken.

Table 8.2 Summary of QA/QC Samples

Sampling Type	No. of Samples for Soil Sampling	No. of Samples for Groundwater Sampling	Proposed Testing Parameters
Duplicate Sample	One (1) soil sample per twenty (20) soil samples, i.e. two (2) duplicate samples required	One (1) groundwater sample per twenty (20) groundwater samples, i.e. one (1) duplicate sample required	Metals [(a)], PCRs [(b)], VOCs [(c)], SVOCs [(d)]
Field Blank	One (1) field blank sample each for Concerned Areas A, B1 and B2		Metals [(a)], PCRs [(b)], VOCs [(c)], SVOCs [(d)]
Equipment Blank	One (1) per each set of drilling tools and rig	One (1) per twenty (20) groundwater samples, i.e. one (1) equipment blank sample required	Metals [(a)]
Trip Blank	One (1) per trip, i.e. ten (10) trips for soil sampling as per location and one (1) trip for groundwater sampling for all sampling location		VOCs [(c)]

Sampling Type	No. of Samples for Soil Sampling	No. of Samples for Groundwater Sampling	Proposed Testing Parameters
	Notes: (a) Metals: For soil: Antimony, Arsenic, Barium, Cadmium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Tin, Zinc, Mercury, Chromium (III) and Chromium (VI); For groundwater: Mercury (b) PCRs: C6 – C8, C9 – C16 and C17 – C35 (c) VOCs: For soil and groundwater: Acetone, Benzene, Bromodichloromethane, 2-Butanone, Chloroform, Ethylbenzene, Methyl tert-Butyl Ether, Methylene Chloride, Styrene, Tetrachloroethene, Toluene, Trichloroethene and Xylenes (Total) (d) SVOCs: Acenaphthene, Acenphthylene, 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, and Pyrene		

8.9 Health and Safety

A site Health and Safety Plan (H&SP) will be prepared before any site work is performed at the Assessment Area. The H&SP will include:

- Instruction of works on work procedures, safe practices, emergency duties, and applicable regulations;
- Regularly scheduled meetings for the workers in which the possible hazards, problems of the job, and related safe practices are emphasised and discussed;
- Good housekeeping practices; and
- Availability of and instruction in the location, use and maintenance of personal protective equipment.

The specific safety measures to be implemented during the site work will depend on the nature and content of contamination, the site conditions and the regulations related to site safety requirements. In general, the site work will be performed with the following safety measures:

- Conduct underground utility survey before excavation of inspection pit;
- Only hand digging tool would be allowed during the formation of inspection pit;
- Prohibit on-site waste disposal and all waste generated will be disposed and treated in accordance with regulation;
- Maintain proper safety devices, barriers to minimise hazards during the SI;
- Prohibit smoking and open flames;
- Develop and maintain a written emergency plan applicable to the land contamination SI;
- Maintain equipment related to drilling activities in good operating condition and have emergency and first aid equipment ready for immediate use, where applicable;
- Conduct equipment tests to ensure that equipment used for drilling is properly placed and in good operating condition, and that workers are able to respond to emergency situations;
- Require all workers employed or retained by the Contractor, or a subcontractor, to at all times wear clothing suitable for the works, weather and environmental conditions; and
- The personnel are required to wear respirator and gloves for vapour exposure protection, if necessary. Safety helmet and protective boots should be worn.

9. POTENTIAL REMEDIATION METHODS

Based on the site appraisal, the identified COCs include metals, VOCs, SVOCs and PCRs. Remediation methods that have demonstrated to effectively treat the aforementioned soil and groundwater contaminants include biological treatment and physical / chemical treatment.

The criteria listed below would be used as basis on which to address soil remediation options applicable to the subject contaminants in the Project Area :

- Nature and level of contamination;
- Extent of contamination;
- Site characteristic, e.g. site hydrogeology, soil and groundwater chemical characteristics;
- Site constraints, e.g. available space, surrounding area; and
- Time available for remediation.

9.1 Common Remediation Methods for Contaminated Soil

Table 9.1 presents the common *in-situ* and *ex-situ* remediation methods that were screened for the contaminated soil. The methods are classified into biological treatment, physical / chemical treatment and removal, and grouped under *in-situ* and *ex-situ* methods.

Table 9.1 Remediation Methods for Contaminated Soil

Methods	Remediation Effectiveness
***In-situ* Treatment**	
Soil Venting	PCRs, VOCs and SVOCs
Electrokinetic Separation	Metals
Thermal Desorption	PCRs, VOCs and SVOCs
***Ex-situ* Treatment**	
Biopiling	PCRs, VOCs and SVOCs
Solidification/Stabilization	Metals
Soil Washing	Metals, PCRs and SVOCs
Excavation and Landfill Disposal	Metals, PCRs, VOCs and SVOCs
Incineration	PCRs, VOCs and SVOCs

9.2 Common Remediation Methods for Contaminated Groundwater

Table 9.2 presents the common remediation methods that were screened for the contaminated groundwater.

Table 9.2 Remediation Methods for Contaminated Groundwater

Methods	Remediation Effectiveness
Vapour Extraction / Groundwater Extraction	PCRs
Dual phase (liquid and vapour) recovery	PCRs, VOCs and SVOCs
Skimming Systems	PCRs
Free Product Recovery with Water Table Depression	PCRs
Permeable Reactive Barriers	Metals, PCRs, VOCs and SVOCs

9.3 Notable Local Remediation Projects in Hong Kong

The soil contaminated with the identified COCs had successfully been remediated in Hong Kong using proven remediation techniques. Notable local remediation projects include the followings:

- Decommissioning of Kai Tak Airport North Apron;
- Decontamination works at the Cheoy Lee Shipyard;
- Reclamation works at North Tsing Yi Shipyard site;
- Decommissioning of Kwai Chung Incinerator; and
- Isolated sites in the Deep Bay Link project.

10. CONCLUSION AND RECOMMENDATIONS

10.1 Conclusion

The Section 7 of the EIA report covered the entire Project Area and focus on the Concerned Area to identify potential land contamination issues in accordance with the Annex 19 of EIAO-TM. According to the Section 7 of the EIA report, three (3) Concerned Areas with suspected contaminative land uses were identified within the Project Area, including a Container Yard (Area A), an Open Storage Area / Waste Electric & Metal Products Recycler (Area B1), and Temporary Office Buildings and Warehouse Structures (Area B2).

Based on a review of historical information and current land uses, the potential contamination hotspots in Concerned Area A, B1 and B2 were identified and 10 sampling locations were proposed for further SI. Sampling and analysis plan, sampling methods, arrangement of sample handling and storage, the QA/QC programme and a Health and Safety Plan were proposed. As the Concerned Areas were still in operation and not accessible for detailed site inspection and SI, further works including site re-appraisal for Project Area and supplementary CAP shall be conducted after land resumption.

10.2 Re-appraisal and Supplementary CAP

As discussed in *Section 6.2*, Area A, Area B1 and Area B2 are still in operation could not be accessed for visual inspection at the time of preparing this CAP. The Project Area, excluding the Concerned Areas, is not identified as potentially contaminated sites during the course of this CAP study, however the site is still in use. Change in land use could take place on this site, which may cause potential land contamination. Site re-appraisal for Project Area shall be conducted by future project proponent's land contamination specialists to identify the potential land contamination issues after land resumption. The land contamination specialist shall conduct a review of this CAP to confirm whether the proposed SI works are still valid and provide fine adjustment of the sampling locations according to the actual site condition. If new potential sources of contamination will be identified within the Concerned Areas and/or Project Area during the re-appraisal, extra sampling points shall be proposed by the future project proponent's land contamination specialist. The land contamination specialist shall also observe and document any potential off-site land contamination impacts during the re-appraisal site walkover.

A supplementary CAP shall be prepared by land contamination specialists to document the abovementioned re-appraisal, review the proposed sampling location(s) and outline the proposed sampling arrangement as well as testing parameters. The supplementary CAP shall be submitted to EPD for review and agreement. After the agreement of the supplementary CAP and upon completion of SI, the land contamination specialists shall prepare a CAR to present findings of the SI works.

If contamination is confirmed, the CAR will be accompanied by a Remediation Action Plan (RAP). The CAR and RAP will be a combined report for EPD's agreement.

Upon completion of remediation works (if necessary), a Remediation Report (RR) will be prepared and submitted to EPD for endorsement prior to commencement of any proposed construction works for subsequent developments.

10.3 Submission Schedule

At this stage, the land resumption program has not been confirmed. The contamination assessment programme is expected to be related to the resumption programme. The assessment will comprise the following activities:

- Preparation and submission of supplementary CAP to EPD for approval;
- SI work (including soil and groundwater sampling and testing);
- Assessment of results and reporting in a CAR, including a RAP if required; and
- Preparation and submission of a RR after the completion of remediation works.

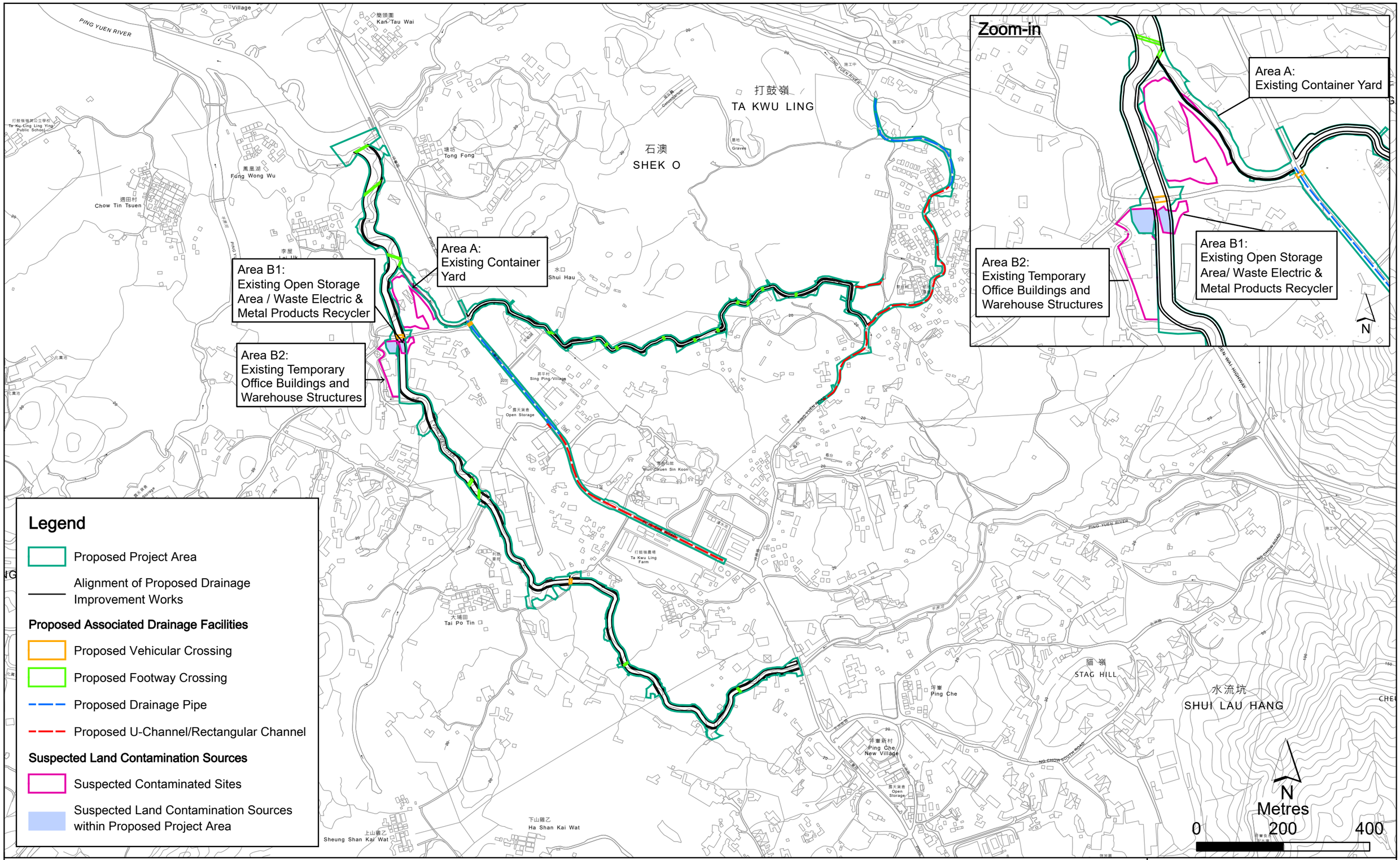


Figure 1

Proposed Project Area and Suspected Contaminative Sites within the Project Area

File: T:\GIS\CONTRACT\0482209\mxd\0482209_Suspected_Land_Contamination_Sites_Project_Area.mxd
Date: 7/1/2022

Environmental Resources Management

ERM

Legend

Proposed Project Area

Alignment of Proposed Drainage Improvement Works

Proposed Associated Drainage Facilities

Proposed Vehicular Crossing

Proposed Footway Crossing

Proposed Drainage Pipe

Proposed U-Channel/Rectangular Channel

Incidents and Fire Records

Vegetation Fire

1 - Near Lamp Post V8575, Farmland Lei Uk

2 - Ping Yuen Road, Near Sam Heung Pavillion

3 - Ping Yuen Road, Near DD77 LOT 70 Open Ground

4 - Near Lamp Post VA6869, Ping Yuen Ho

5 - Near Lamp Post VA6487, Lei Uk

Traffic Accident

6 - Near Lamp Post EB7394, Near Ping Che Road

N

Metres

0 200 400

Figure 2

Locations of Incident Records

File: T:\GIS\CONTRACT\0482209\mxd\0482209_Incidents_and_Fire_Records.mxd
Date: 24/5/2022

Environmental Resources Management

ERM

Borehole No.	Coordination	
PBH 1	E 833528.36	N 843686.00
PBH 2	E 833515.41	N 843599.66
PC/TKL-BH03	E 833767.32	N 843667.06

Area A:
Existing
Container
Yard

Area B1:
Existed Open Storage Area /
Waste Electric & Metal
Products Recycler

Area B2:
Existing Temporary
Office Buildings and
Warehouse Structures

打鼓嶺
TA KWU LING

石澳
SHEK O

水口
Shui Hau

昇平村
Sing Ping Village

大埔田
Tai Po Tin

下山雞乙
Ha Shan Kai Wat

上山雞乙
Sheung Shan Kai Wat

坪輋
Ping Che

坪輋新村
Ping Che
New Village

貓嶺
STAG HILL

水流坑
SHUI LAU HANG

PING YUEN RIVER

NG CHOW ROAD

NG CHOW SOUTH ROAD

TAI WAI HIGHWAY

Zoom-in

Area A:
Existing
Container
Yard

Area B1:
Existed Open
Storage Area
/ Waste Electric
& Metal Products
Recycler

Area B2:
Existing Temporary
Office Buildings
and Warehouse
Structures

PBH 1

PBH 2

PC/TKL-
BH03

N

Legend

- Previous GI Borehole
- Proposed Project Area
- Alignment of Proposed Drainage Improvement Works

Proposed Associated Drainage Facilities

- Proposed Vehicular Crossing
- Proposed Footway Crossing
- Proposed Drainage Pipe
- Proposed U-Channel/Rectangular Channel

Suspected Land Contamination Sources

- Suspected Contaminated Sites
- Suspected Land Contamination Sources within Proposed Project Area

N
Metres
0 200 400

Figure 3

Previous Boreholes Location

File: T:\GIS\CONTRACT\0482209\mxd\0482209_Previous_Boreholes_Location.mxd
Date: 24/5/2022

Environmental
Resources
Management

ERM

Legend

- Proposed Sampling Location
- Proposed Sampling Grid
- Proposed Project Area
- Alignment of Proposed Drainage Improvement Works

Proposed Associated Drainage Facilities

- Proposed Vehicular Crossing
- Proposed Footway Crossing
- Proposed Drainage Pipe

Suspected Land Contamination Sources

- Suspected Contaminated Area
- Suspected Land Contamination Sources within Proposed Project Area

Site	Size within the Project Area (m^2)	Sampling Grid Size (m)
A	128	6
B1	383	6
B2	674	13

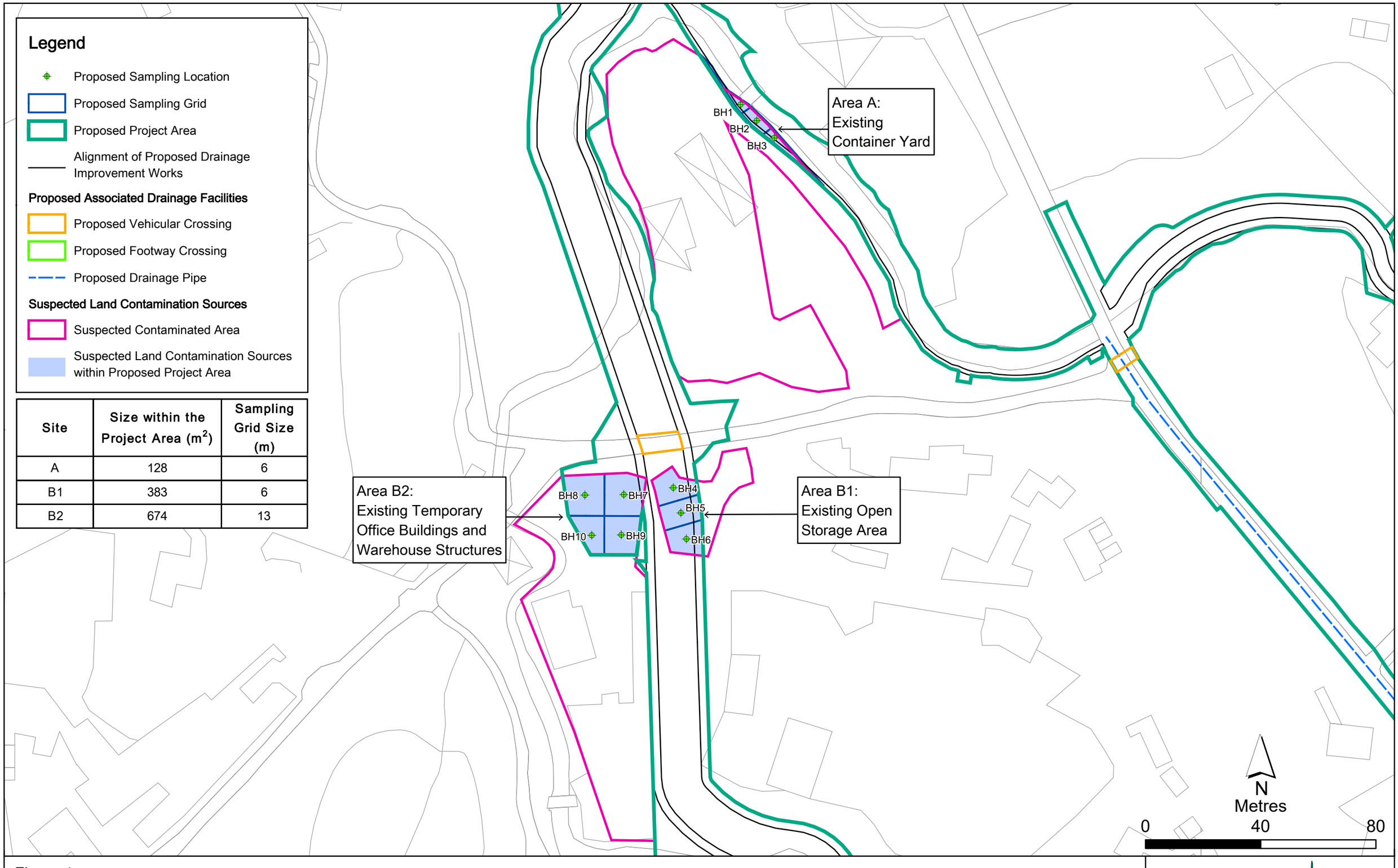


Figure 4

Proposed Sampling Locations

File: T:\GIS\CONTRACT\0482209\mxd\0482209_Proposed_Sampling_Location.mxd
Date: 7/1/2022

Environmental Resources Management

ERM

ANNEX A LETTER FROM GOVERNMENT DEPARTMENTS ON RELEVANT INFORMATION

Request of Information to FSD

Addresser: Ms. Yvonne Chan from ERM HK

Addressee: Mr. NG Wing Chit from FSD

Date: 16 March 2022

Request for Information of Dangerous Goods, Spillage / Leakage Incidents and Fire Records at Ping Che / Ta Kwu Ling area

Dear Mr. Ng,

We are appointed by Black & Veatch Hong Kong Limited (Joint Venture) for the captioned project of Environmental Impact Assessment for Drainage Improvement Works in Ta Kwu Ling – Investigation, Design and Construction. As part of the Environmental Impact Assessment, we are required to review the historical and present land use within and around the area and evaluate any potential land contamination issues in the project area (i.e. green area in Figure 1 attached). We would appreciate it if you could kindly provide the following information for our land contamination assessment:

1. Past and present Dangerous Goods Records;
2. Past and present spillage / leakage record / incident of the project area; and
3. Past and present fire record of the project area

for the following address:

1. Ping Che Area, Ta Kwu Ling

   DD82: Lot 646, 649, 651, 652, 653, 654, 655, B681, 683 S.B, 683 S.C, 683 S.D, 981 RP, 985 RP, 963 S.A RP, 963 S.B RP, 964 RP, 967, 968, 969, 970, 971, 974, 979, 1346 RP, 1350 RP, 1099 S.B, 1100, 1117 RP, 1298 S.B, 1298 S.D, 1344, 1345, 1349RP, 1351RP, 1352RP, 1353RP, 1355, 1356RP

   DD79: Lot 60, 125, 126, 127, 135, 222, 226 RP, 228, 229, 230, 231, 232, 233, 253

   DD84: Lot 2, 3, 4 S.A, 4 S.B, 4 S.C, 6 S.B, 9 S.B, 11, 12, 24, 25, 26 S.A RP, 75, 76, 111, 383, 384, 398

   DD77: Lot 577, 578RP, 603, 629 RP, 646

   GLA-TDN 79, GLA-TDN 199, GLA-TDN-2136, GLA-TDN 2319, GLA-TDN 4034, GLA-TDN 4665

Please see the attached drawing showing the project area. The period of investigation would be starting from 1985 to present.

The applicant name will be Ms. Yvonne Chan from ERM HK, you can contact me via my direct line 2271 3029 or fax 2723 5660.

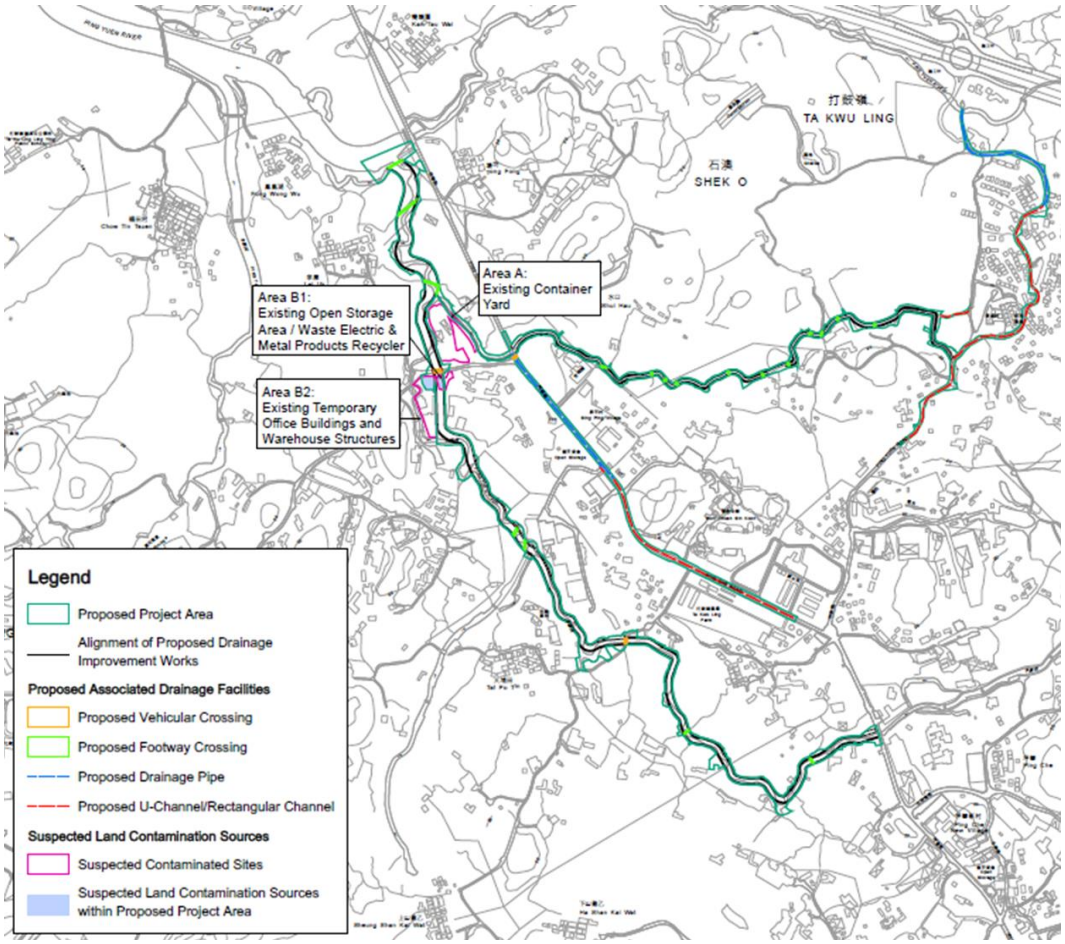
Can you please advise approximately how long will it take to process the application?

Thanks and Regards,

Yvonne Chan
Consultant
T: +852 2271 3029 (Direct) or +852 2271 3000 (Main)

Figure 1 Site Location

1. Ping Che Area, Ta Kwu Ling



消 防 處
香港九龍尖沙咀東部康莊道 1 號
消防處總部大廈

FIRE SERVICES DEPARTMENT
FIRE SERVICES HEADQUARTERS BUILDING,
No.1 Hong Chong Road,
Tsim Sha Tsui East, Kowloon,
Hong Kong.

本處檔號 **OUR REF.** : (126) in FSD GR 6-5/4 R Pt. 39
來函檔號 **YOUR REF.** :
電子郵件 **E-mail** : hkfsdenq@hkfsd.gov.hk
圖文傳真 **FAX NO.** : 2739 5879
電　　話 **TEL NO.** : 2733 7741

24 March 2022

Environmental Resources Management
2509, 25/F, One Harbourfront,
18 Tak Fung Street, Hung Hom,
Kowloon, Hong Kong.
(Attn: Ms. Yvonne CHAN, Consultant)

By fax (2723 5660) only

Dear Ms. CHAN,

Incidents and Fire Recoreds at Ping Che/ Ta Kwu Ling area
Request for Information of Dangerous Goods & Incident Records

I refer to your email of 16.3.2022 regarding the captioned subject.

Your case is being handled, and a reply will be furnished to you as soon as possible. Please be advised that due to time lapse, this Department can only provide the following information for your requested information:

(i) Dangerous Goods Licence Record: from the year of 1990 to present moment.

(ii) Incident Record: Past three years of fire and special services incidents.

If you have further questions, please feel free to contact the undersigned.

Yours sincerely,

(NG Wing-chit)
for Director of Fire Services

消 防 處
香港九龍尖沙咀東部康莊道 1 號
消防處總部大廈

FIRE SERVICES DEPARTMENT
FIRE SERVICES HEADQUARTERS BUILDING,
No.1 Hong Chong Road,
Tsim Sha Tsui East, Kowloon,
Hong Kong.

本處檔號 OUR REF. : (48) in FSD GR 6-5/4 R Pt. 40
來函檔號 YOUR REF. :
電子郵件 E-mail : hkfsdenq@hkfsd.gov.hk
圖文傳真 FAX NO. : 2739 5879
電 話 TEL NO. : 2733 7741

13 April 2022

Environmental Resources Management
2509, 25/F, One Harbourfront,
18 Tak Fung Street, Hung Hom,
Kowloon, Hong Kong.
(Attn: Ms. Yvonne CHAN, Consultant)

Dear Ms. CHAN,

Incidents and Fire Records at Ping Che/ Ta Kwu Ling area
Request for Information of Dangerous Goods & Incident Records

I refer to your letter of 16.3.2022 regarding the captioned request and reply below in response to your questions:-

1. No Dangerous Goods Licence was issued in respect of the captioned address.

2. A total of six incident records were found at the subject location. Please refer to **Appendix A** for details.

If you have further questions, please feel free to contact the undersigned.

Yours sincerely,

(NG Wing-chit)
for Director of Fire Services

Appendix A

Incidents and Fire Records at Ping Che/ Ta Kwu Ling area

Request for Information of Dangerous Goods & Incident Records

No.	Date	Type of Incident	Address
1	20.4.2020	Vegetation Fire	NEAR LAMP POST V8575, FARMLAND LEI UK
2	11.8.2020	Vegetation Fire	PING YUEN ROAD, NEAR SAM HEUNG PAVILLION
3	11.8.2020	Vegetation Fire	PING YUEN ROAD, NEAR DD77 LOT 70 OPEN GROUND
4	27.12.2020	Vegetation Fire	NEAR LAM POST VA6869, PING YUEN HO
5	28.1.2021	Vegetation Fire	NEAR LAMP POST VA6487, LEI UK
6	3.7.2021	Traffic Accident	NEAR LAMP POST EB7394, NEAR PING CHE ROAD

Request of Information to EPD

Addresser: Ms. Yvonne Chan from ERM HK

Addressee: Mr. CHU Shun Hang from EPD

Date: 16 March 2022

Request for Information of Spillage / Leakage Incident at Ping Che / Ta Kwu Ling area

Dear Mr. Chu,

We are appointed by Black & Veatch Hong Kong Limited (Joint Venture) for the captioned project of Environmental Impact Assessment for Drainage Improvement Works in Ta Kwu Ling – Investigation, Design and Construction. As part of the Environmental Impact Assessment, we are required to review the historical and present land use within and around the area and evaluate any potential land contamination issues in the project area (i.e. green area in Figure 1 attached). We would appreciate it if you could kindly provide the following information for our land contamination assessment:

1. Past and present chemical spillage / leakage record / incident of the project area

for the following address:

1. Ping Che Area, Ta Kwu Ling

   DD82: Lot 646, 649, 651, 652, 653, 654, 655, B681, 683 S.B, 683 S.C, 683 S.D, 981 RP, 985 RP, 963 S.A RP, 963 S.B RP, 964 RP, 967, 968, 969, 970, 971, 974, 979, 1346 RP, 1350 RP, 1099 S.B, 1100, 1117 RP, 1298 S.B, 1298 S.D, 1344, 1345, 1349RP, 1351RP, 1352RP, 1353RP, 1355, 1356RP

   DD79: Lot 60, 125, 126, 127, 135, 222, 226 RP, 228, 229, 230, 231, 232, 233, 253

   DD84: Lot 2, 3, 4 S.A, 4 S.B, 4 S.C, 6 S.B, 9 S.B, 11, 12, 24, 25, 26 S.A RP, 75, 76, 111, 383, 384, 398

   DD77: Lot 577, 578RP, 603, 629 RP, 646

   GLA-TDN 79, GLA-TDN 199, GLA-TDN-2136, GLA-TDN 2319, GLA-TDN 4034, GLA-TDN 4665

Please see the attached drawing showing the project area. The period of investigation would be starting from 1985 to present.

The applicant name will be Ms. Yvonne Chan from ERM HK, you can contact me via my direct line 2271 3029 or fax 2723 5660.

Can you please advise approximately how long will it take to process the application?

Thanks and Regards,

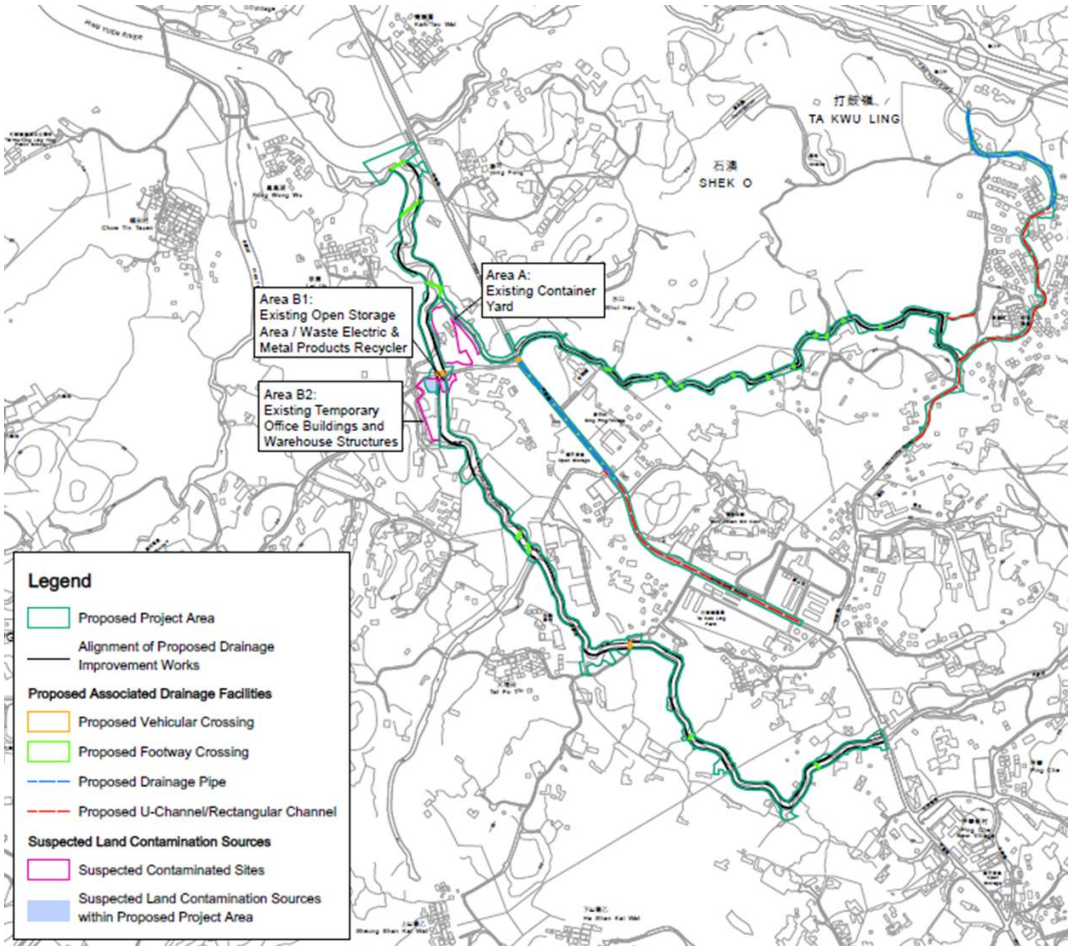
Yvonne Chan

Consultant

T: +852 2271 3029 (Direct) or +852 2271 3000 (Main)

Figure 1 Site Location

1. Ping Che Area, Ta Kwu Ling



Yvonne Chan

From: herrickho@epd.gov.hk
Sent: Wednesday, May 18, 2022 2:38 PM
To: Yvonne Chan
Cc: shchu@epd.gov.hk
Subject: Re: Fw: Request for Information: Chemical Spillage / Leakage Record at Ping Che / Ta Kwu Ling area (EPD)
Attachments: Figure1_Project Area.pdf; Request of Information (EPD).pdf

Dear Yvonne,

No chemical spillage record was found in concerned area.

Thanks & Regards,
Herrick HO / EPD
2158 5831

From: SH CHU/EPD/HKSARG
To: CI[RN]32
Date: 16/05/2022 10:32
Subject: Fw: Request for Information: Chemical Spillage / Leakage Record at Ping Che / Ta Kwu Ling area (EPD)

Dear Herrick,

Would you please help to check and reply to Yvonne Chan.

Regards,
CHU Shun-hang
AE(RN)33
2158 5832

----- Forwarded by SH CHU/EPD/HKSARG on 16/05/2022 10:30 -----

From: Yvonne Chan <Yvonne.Chan@erm.com>
To: "shchu@epd.gov.hk" <shchu@epd.gov.hk>
Cc: Mandy To <Mandy.To@erm.com>, Pako Yu <Pako.Yu@erm.com>
Date: 16/05/2022 10:30
Subject: FW: Request for Information: Chemical Spillage / Leakage Record at Ping Che / Ta Kwu Ling area (EPD)

Dear Mr. Chu,

Re. our enquiry sent on 16 March 2022, grateful if you could advise the progress of this request for information. Should you have any questions, please feel free to contact me. Many thanks for your help!!

Best Regards,
Yvonne Chan

Consultant

ERM
2509, 25/F, One Harbourfront | 18 Tak Fung Street | Hung Hom | Hong Kong
T +852 2271 3029
E Yvonne.Chan@erm.com | **W** www.erm.com

From: Yvonne Chan
Sent: Wednesday, March 16, 2022 10:17 AM
To: shchu@epd.gov.hk
Cc: Daisy Wong <Daisy.Wong@erm.com>; Pako Yu <Pako.Yu@erm.com>
Subject: Request for Information: Chemical Spillage / Leakage Record at Ping Che / Ta Kwu Ling area (EPD)

Dear Mr. Chu,

Further to our enquiry on 22 Dec 2021, since the project boundary has changed, we would like to request for information of spillage/leakage incident for the addresses listed on the inquiry letter. The drawing showing the project area is also attached for your perusal please.

Should you have any questions, please feel free to contact me. We look forward to your reply soon. Thanks.

Best Regards,
Yvonne Chan
Consultant

ERM
2509, 25/F, One Harbourfront | 18 Tak Fung Street | Hung Hom | Hong Kong
T +852 2271 3029
E Yvonne.Chan@erm.com | **W** www.erm.com

From: herrickho@epd.gov.hk <herrickho@epd.gov.hk>
Sent: Friday, December 24, 2021 17:12
To: Daisy Wong <Daisy.Wong@erm.com>
Cc: shchu@epd.gov.hk
Subject: Re: Fw: Request for Information: Chemical Spillage / Leakage Record at Ping Che / Ta Kwu Ling area

Dear Ms WONG,

No chemical spillage have been recorded in concerned area since 2019.

Thanks & Regards,
Herrick HO / EPD
2158 5831

From: SH CHU/EPD/HKSARG
To: CI[RN]32
Cc: SI[RN]34
Date: 24/12/2021 15:45
Subject: Fw: Request for Information: Chemical Spillage / Leakage Record at Ping Che / Ta Kwu Ling area

---

Dear Herrick,

For your input please.

Regards,
CHU Shun-hang
AE(RN)33
2158 5832

----- Forwarded by SH CHU/EPD/HKSARG on 24/12/2021 15:43 -----

From: Daisy Wong <Daisy.Wong@erm.com>
To: "shchu@epd.gov.hk" <shchu@epd.gov.hk>
Cc: Pako Yu <Pako.Yu@erm.com>
Date: 22/12/2021 16:20
Subject: Request for Information: Chemical Spillage / Leakage Record at Ping Che / Ta Kwu Ling area

---

Dear Mr. Chu,

Kindly please find the attached inquiry letter regarding Chemical Spillage / Leakage records of the concerned area for your perusal.
We are looking forward to your reply soon.

Best Regards,
Daisy Wong
Consultant

ERM
2509, 25/F One Harbourfront | 18 Tak Fung Street | Hung Hom | Kowloon | Hong Kong
T +852 2271 3112
E daisy.wong@erm.com | **W** www.erm.com

ERM-Hong Kong, Limited

2501, 2507-10, Office Tower One, The Harbourfront, 18 Tak Fung Street, Kowloon.
Telephone: (852) 2271 3000
Facsimile: (852) 2723 5660
Please visit ERM's web site: http://www.erm.com

ANNEX B PREVIOUS GROUND INVESTIGATION RECORD

DRILLHOLE RECORD

CONTRACT NO. GE/2009/15	HOLE NO. PBH 1
	SHEET 1 OF 4

PROJECT Ground Investigation - New Territories East (Term Contract)
Location : Agreement No. CE 6/2002(DS), Drainage Improvement in Northern New Territories – Package C, Investigation, Design and Construction, Additional Services – Investigation, Design and Construction of Drainage Channel TKL05

METHOD	Rotary	CO-ORDINATES	W.O.NO. GE/2009/15.19
MACHINE & NO.	VBM50	E 833528.36 N 843686.00	DATE : 05/03/2011 to 10/03/2011
FLUSHING MEDIUM	Water	ORIENTATION Vertical	GROUND LEVEL + 8.48 mPD

Drilling Progress	Casing Depth/Size	Water Level (m) Shift start / end	Flush Returns %	T C R %	S C R %	R Q D %	FI	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
05/03/2011	SW									+8.48	0.00			
									A 0.50	+7.98	0.50			Firm, dark brown (7.5YR 3/4), sandy SILT with some angular to subangular fine to medium gravel sized moderately decomposed rock fragments. (FILL)
									B 1.00 (INSPECTION PIT)					Firm, dark brown (7.5YR 3/4), slightly sandy SILT with occasional subangular to subrounded fine gravel sized highly decomposed rock fragments. (COLLUVIUM)
									C 1.50					
									D 2.00	+6.48	2.00			
				100				22 bls	1 2.45					Medium dense, light grey, dappled light brown and grey silty fine SAND with some subangular to subrounded fine gravel sized quartz. (ALLUVIUM)
								1,2, 3,4,5,6 N=18	2 2.50					
									3 2.60					
	SW 2.95								4 2.90 2.95					
	PW													
			50	43					5 4.00					
									6 5.00 5.10	+3.38	5.10			
				100				90 bls	7 5.55				V	Extremely weak, pinkish brown, dappled light brown, completely decomposed coarse ash crystal TUFF. (Sandy SILT with occasional angular fine gravel)
								4,6, 7,8,10,14 N=39	8 5.60					
									9 5.70					
									10 6.00 6.05					
										+1.38	7.10			
			50	96					11 7.10				V	Extremely weak, light brown, dappled brown, completely decomposed coarse ash crystal TUFF. (Slightly sandy SILT)
									12 8.10 8.20					
								6,12, 19,21,25,30 N=95	13 8.30					
									14 8.60 8.65					
05/03/2011		1.09m at 18:00												
07/03/2011		2.45m at 08:00												
			50	86					15 9.10					
	PW													

- Disturbed sample
- Piston sample
- U76 undisturbed sample
- U100 undisturbed sample
- Mazier sample
- SPT liner sample
- Water sample
- En Environmental Sample
- Standard penetration test
- V In-situ vane shear test
- Permeability test
- Pressuremeter test
- Packer Test
- Acoustic or optical televiewer survey
- Piezometer tip
- Standpipe

LOGGED	T. C. Yip
DATE	14/03/2011
CHECKED	E. Leung
DATE	15/03/2011

REMARKS
1. An inspection pit was excavated to 2.00m.
2. A piezometer was installed at 29.50m.
3. Piezometer buckets were installed in piezometer from 2.28m to 4.28m depth at 0.50m intervals.

DRILLHOLE RECORD

VIBRO

CONTRACT NO. GE/2009/15	HOLE NO. PBH 1
	SHEET 2 OF 4

PROJECT Ground Investigation - New Territories East (Term Contract)
Location : Agreement No. CE 6/2002(DS), Drainage Improvement in Northern New Territories – Package C, Investigation, Design and Construction, Additional Services – Investigation, Design and Construction of Drainage Channel TKL05

METHOD	Rotary	CO-ORDINATES	W.O.NO. GE/2009/15.19
MACHINE & NO.	VBM50	E 833528.36 N 843686.00	DATE : 05/03/2011 to 10/03/2011
FLUSHING MEDIUM	Water	ORIENTATION Vertical	GROUND LEVEL + 8.48 mPD

Drilling Progress	Casing Depth/Size	Water Level (m) Shift start / end	Flush Returns %	T C R %	S C R %	R Q D %	FI	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
	10.10 HW								16 10.10 10.20				V	See sheet 1 of 4
								7,10, 12,20,24,29 N=85	17 10.30					
									18 10.60 10.65					
11										-2.62	11.10			
			50	96					19 11.10				V	Extremely weak, brown, dappled light brown, completely decomposed coarse ash crystal TUFF. (Sandy SILT with occasional angular fine to medium gravel)
12									20 12.10 12.20					
								8,10, 13,20,25,31 N=89	21 12.30					
									22 12.60 12.65					
13														
			50	95					23 13.10					
14									24 14.10 14.20					
								8,12, 15,19,24,31 N=89	25 14.30					
									26 14.60 14.65					
15														
			50	96					27 15.10					
16									28 16.10 16.20	-7.72	16.20			
								9,15, 28,39,33/50mm (100/200mm)	29				V	Extremely weak to very weak, light brown, completely decomposed coarse ash crystal TUFF. (Slightly sandy SILT with occasional angular to subangular fine gravel)
									30 16.50 16.55					
17														
			50	96					31 17.10					
18									32 18.10 18.20					
								8,14, 22,40,38/40mm (100/190mm)	33					
									34 18.49 18.54					
19														
			50	90					35 19.10					
20														

Disturbed sample
Piston sample
U76 undisturbed sample
U100 undisturbed sample
Mazier sample
SPT liner sample
Water sample
En Environmental Sample

Standard penetration test
V In-situ vane shear test
Permeability test
Pressuremeter test
Packer Test
Acoustic or optical televiewer survey
Piezometer tip
Standpipe

LOGGED	T. C. Yip
DATE	14/03/2011
CHECKED	E. Leung
DATE	15/03/2011

REMARKS

DRILLHOLE RECORD

VIBRO

CONTRACT NO. GE/2009/15	HOLE NO. PBH 1
	SHEET 3 OF 4

PROJECT Ground Investigation - New Territories East (Term Contract)
Location : Agreement No. CE 6/2002(DS), Drainage Improvement in Northern New Territories – Package C, Investigation, Design and Construction, Additional Services – Investigation, Design and Construction of Drainage Channel TKL05

METHOD	Rotary	CO-ORDINATES	W.O.NO. GE/2009/15.19
MACHINE & NO.	VBM50	E 833528.36 N 843686.00	DATE : 05/03/2011 to 10/03/2011
FLUSHING MEDIUM	Water	ORIENTATION Vertical	GROUND LEVEL + 8.48 mPD

Drilling Progress	Casing Depth/Size	Water Level (m) Shift start / end	Flush Returns %	T C R %	S C R %	R Q D %	FI	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
	HW							9,13, 20,39,41/50mm (100/200mm)	36 20.10 37 20.20 38 20.50 20.55		20.00		V	See sheet 2 of 4
21		1.44m at 18:00								-12.62	21.10			
	07/03/2011 08/03/2011	3.58m at 08:00	50	95					39 21.10				V	Extremely weak to very weak, light grey, dappled light brown, completely decomposed coarse ash crystal TUFF. (Sandy SILT with some angular fine to coarse gravel and angular cobble)
22								12,29, 45,55/55mm (100/130mm)	40 22.10 41 22.20 42 22.43 22.48					
23			50	95					43 23.10					
24		2.13m at 18:00						11,27, 47,53/45mm (100/120mm)	44 24.10 45 24.20 46 24.42 24.47					
	08/03/2011 09/03/2011	3.58m at 08:00												
25			50	96					47 25.10					
26								6,8, 46,54/15mm (100/90mm)	48 26.10 49 26.20 50 26.39 26.44					
27	HW 27.20	1.20m at 18:00	50	0					51 27.10 27.15 27.20	-18.62 -18.72	27.10 27.20		IV	From 27.10m to 27.20m : Weak to moderately weak, highly decomposed TUFF. (Recovered as sandy angular fine to coarse GRAVEL with some angular cobble)
	09/03/2011 10/03/2011	3.05m at 08:00	80	95	73	31	7.5		T2 I O I				III	Moderately strong to strong, grey, dappled light grey, moderately decomposed metamorphosed coarse ash crystal TUFF. Joints are closely spaced, locally very closely spaced, rough planar and rough stepped, extremely narrow to very narrow, clean, locally iron and manganese stained, dipping 20° to 30°, 40° to 50° and 50° to 60°.
28							16.7		27.75					
			80	96	44	11	8.5		T2 I O I					
							>20							
29									29.11					From 28.95m to 29.20m : Quartz vein.
							NI			-21.02	29.50			From 29.40m to 29.50m : Quartz vein.
			80	98	55	49			T2 I O I				II	Strong, grey, dappled light grey, slightly decomposed metamorphosed coarse ash crystal TUFF. Joints are closely to medium spaced, rough planar,
30							5.3							

Disturbed sample
Piston sample
U76 undisturbed sample
U100 undisturbed sample
Mazier sample
SPT liner sample
Water sample
En Environmental Sample

Standard penetration test
V In-situ vane shear test
Permeability test
Pressuremeter test
Packer Test
Acoustic or optical televiewer survey
Piezometer tip
Standpipe

LOGGED	T. C. Yip
DATE	14/03/2011
CHECKED	E. Leung
DATE	15/03/2011

REMARKS

DRILLHOLE RECORD

VIBRO	HOLE NO. PBH 1
CONTRACT NO. GE/2009/15	SHEET 4 OF 4

PROJECT Ground Investigation - New Territories East (Term Contract)
Location : Agreement No. CE 6/2002(DS), Drainage Improvement in Northern New Territories – Package C, Investigation, Design and Construction, Additional Services – Investigation, Design and Construction of Drainage Channel TKL05

METHOD	Rotary	**CO-ORDINATES**	**W.O.NO.** GE/2009/15.19
MACHINE & NO.	VBM50	E 833528.36 N 843686.00	**DATE :** 05/03/2011 to 10/03/2011
FLUSHING MEDIUM	Water	**ORIENTATION** Vertical	**GROUND LEVEL** + 8.48 mPD

Drilling Progress	Casing Depth/Size	Water Level (m) Shift start / end	Flush Returns %	T C R %	S C R %	R Q D %	FI	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
										-21.52	30.00			
10/03/2011		2.05m at 18:00	80	98	55	49	5.3		T2 1 30.34	-21.86	30.34		II	extremely narrow, clean, dipping 20° to 30° and 50° to 60°. See sheet 3 of 4
														End of Investigation Hole at 30.34m.

31 32 33 34 35 36 37 38 39 40

Disturbed sample
Piston sample
U76 undisturbed sample
U100 undisturbed sample
Mazier sample
SPT liner sample
Water sample
En Environmental Sample

Standard penetration test
V In-situ vane shear test
Permeability test
Pressuremeter test
Packer Test
Acoustic or optical televiewer survey
Piezometer tip
Standpipe

LOGGED	T. C. Yip
DATE	14/03/2011
CHECKED	E. Leung
DATE	15/03/2011

REMARKS

DRILLHOLE RECORD

VIBRO	HOLE NO. PBH 2
CONTRACT NO. GE/2009/15	SHEET 1 OF 2

PROJECT Ground Investigation - New Territories East (Term Contract)
Location : Agreement No. CE 6/2002(DS), Drainage Improvement in Northern New Territories – Package C, Investigation, Design and Construction, Additional Services – Investigation, Design and Construction of Drainage Channel TKL05

METHOD	Rotary	CO-ORDINATES	W.O.NO. GE/2009/15.19
MACHINE & NO.	VBM50	E 833515.41 N 843599.66	DATE : 15/03/2011 to 16/03/2011
FLUSHING MEDIUM	Water	ORIENTATION Vertical	GROUND LEVEL + 12.31 mPD

Drilling Progress	Casing Depth/Size	Water Level (m) Shift start / end	Flush Returns %	T C R %	S C R %	R Q D %	FI	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
15/03/2011	PW								A 0.50 INSPECTION PIT; B 1.00; C 1.50	+12.31 / 0.00				Greyish brown (2.5Y 5/2), silty fine to coarse SAND with some angular to subangular fine gravel sized highly decomposed rock fragments. (FILL)
			60	0						+10.81	1.50			Brown (7.5YR 5/4), slightly sandy angular to subangular COBBLE sized moderately decomposed Tuff with some angular fine to coarse gravel sized moderately decomposed rock fragments. (COLLUVIUM)
	PW 2.60								1 2.50					
	HW			89				155 bls	2 2.60	+9.71	2.60			Firm, brown (7.5YR 5/4), slightly sandy clayey SILT with occasional subangular to subrounded fine to coarse gravel sized highly decomposed rock fragments. (COLLUVIUM)
									3 3.05	+9.21	3.10			
								3,5, 8,6,4,5 N=23	3 3.10; 4 3.20; 5 3.50 3.55				V	Extremely weak, grey, dappled light brown, completely decomposed metamorphosed coarse ash crystal TUFF. (Slightly sandy SILT with occasional angular fine gravel)
			60	96					6 4.60					
									7 5.60	+6.61	5.70			
								15,28, 58,42/55mm (100/130mm)	8 5.70; 9 5.93 5.98				V	Extremely weak to very weak, light grey, dappled light brown and brown, completely decomposed metamorphosed coarse ash crystal TUFF. (Sandy SILT with some angular fine to coarse gravel)
									10 6.60					
			60	95					11 7.60					
								50/70mm 100/60mm (100/60mm)	11 7.70; 12 7.83					
	HW 8.48								8.48	+3.83	8.48			
			60	89	34	26	NI		T2 IOI				IV	Moderately strong, purplish grey, dappled grey and light brown, moderately decomposed metamorphosed coarse ash crystal TUFF. Joints are very closely to closely spaced, locally medium spaced, rough planar and rough stepped, extremely narrow, iron and manganese stained, dipping 0° to 10°, 10° to 20° and occasional 70° to 80°. From 8.48m to 9.30m : Weak to moderately weak, highly decomposed TUFF. From 8.70m to 8.85m : With quartz veins 40mm thick,
									9.21	+3.01	9.30			
			60	100	100	81	4.8		T2 IOI				III	
							13.2							

- Disturbed sample
- Piston sample
- U76 undisturbed sample
- U100 undisturbed sample
- Mazier sample
- SPT liner sample
- Water sample
- En Environmental Sample
- Standard penetration test
- V In-situ vane shear test
- Permeability test
- Pressuremeter test
- Packer Test
- Acoustic or optical televiewer survey
- Piezometer tip
- Standpipe

LOGGED	T. C. Yip
DATE	21/03/2011
CHECKED	E. Leung
DATE	22/03/2011

REMARKS
1. An inspection pit was excavated to 1.50m depth.
2. A piezometer was installed at 8.00m depth.
3. Piezometer buckets were installed in piezometer from 2.81m to 4.81m depth at 0.50m intervals.

DRILLHOLE RECORD

VIBRO

CONTRACT NO. GE/2009/15	HOLE NO. PBH 2
	SHEET 2 OF 2

PROJECT Ground Investigation - New Territories East (Term Contract)
Location : Agreement No. CE 6/2002(DS), Drainage Improvement in Northern New Territories – Package C, Investigation, Design and Construction, Additional Services – Investigation, Design and Construction of Drainage Channel TKL05

METHOD Rotary	CO-ORDINATES	W.O.NO. GE/2009/15.19
MACHINE & NO. VBM50	E 833515.41 N 843599.66	DATE : 15/03/2011 to 16/03/2011
FLUSHING MEDIUM Water	ORIENTATION Vertical	GROUND LEVEL + 12.31 mPD

Drilling Progress	Casing Depth/Size	Water Level (m) Shift start / end	Flush Returns %	T C R %	S C R %	R Q D %	FI	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
							13.2		9.98	+2.31	10.00		III	dipping subvertically.
							>20			+2.09	10.22		IV	From 9.00m to 9.16m : With quartz veins 40mm thick, dipping subvertically.
			60	100	52	42	12.0		T2 IOI	+1.79	10.52		III	From 9.50m to 10.30m : With quartz veins 40mm thick, dipping subvertically.
							>20			+1.54	10.77		IV	See sheet 1 of 2
11		0.88m at 18:00								+1.41	10.90		III	From 10.22m to 10.52m : Weak to moderately weak, highly decomposed TUFF.
	15/03/2011 16/03/2011	3.62m at 08:00					5.9		11.18					From 10.77m to 10.90m : Weak to moderately weak, highly decomposed TUFF.
12			60	100	96	71			T2 IOI					Moderately strong, grey, dappled light brown, moderately decomposed metamorphosed coarse ash crystal TUFF. Joints are closely to medium spaced, rough planar and rough stepped, extremely narrow, iron and manganese stained, dipping 10° to 20°, 20° to 30°, 30° to 40°, occasional 50° to 60° and 60° to 70°.
							12.8							From 11.60m to 12.40m : With closely spaced, quartz veins 20mm to 30mm thick, dipping subvertically.
									12.54					
13							5.6							
			60	100	97	76	>20		T2 IOI					From 13.30m to 13.80m : With closely spaced, quartz veins 10mm to 20mm thick, dipping 50° to 60°.
14									14.01					
							3.4							From 14.25m to 14.70m : With closely spaced, quartz veins 5mm to 10mm thick, dipping 70° to 80°.
			60	100	100	100			T2 IOI					
15		5.65m at 18:00												
	16/03/2011						8.0		15.32	-3.01	15.32			End of Investigation Hole at 15.32m.
16														
17														
18														
19														
20														

- Disturbed sample
- Piston sample
- U76 undisturbed sample
- U100 undisturbed sample
- Mazier sample
- SPT liner sample
- Water sample
- En Environmental Sample
- Standard penetration test
- V In-situ vane shear test
- Permeability test
- Pressuremeter test
- Packer Test
- Acoustic or optical televiewer survey
- Piezometer tip
- Standpipe

LOGGED	T. C. Yip
DATE	21/03/2011
CHECKED	E. Leung
DATE	22/03/2011

REMARKS

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. PC/TKL-BH03

CONTRACT No.: GE/2007/13

SHEET: 1 of 4

PROJECT: Agreement No. CE 61/2007 (CE), North East New Territories New Development Areas Planning and Engineering Study - Investigation (Batch 2)

METHOD: Rotary Drilling

MACHINE & No.: FDR-23

FLUSHING MEDIUM: Water

CO-ORDINATES:
E 833767.32
N 843667.06

ORIENTATION: Vertical

WORKS ORDER No. GE/2007/13.29A

DATE from: 29/05/2009 to 10/06/2009

GROUND LEVEL + 10.49 mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
											10.49	0.00				
30/05/2009	SW								1	INSPECTION PIT	0.45 0.50					Soft, grey (7.5YR/6/1), sandy clayey SILT with occasional asphalt fragments. (FILL)
1									2		0.95 1.00	9.49	1.00			Soft, greyish brown (10YR/5/2), sandy clayey SILT. (ALLUVIUM)
30/05/2009 01/06/2009				100					3		1.45 1.50	8.99	1.50			Soft to firm, light grey (10R/7/1), mottled yellow, sandy clayey SILT with occasional subrounded medium gravel of moderately strong quartz. (ALLUVIUM)
2			80						4							
	SW 2.60 PW								5		2.50 2.60	7.89	2.60			
3								1, 1, 2, 2, 2, 3 N=9	6		2.70					Soft to firm, light grey (10R/7/1), mottled red and yellow, slightly sandy, clayey SILT. (ALLUVIUM)
									7		3.00 3.05					
				100					8		3.50					
4			80					k=7.79E-8m/s								
									9		4.50 4.60 4.70					
5								2, 3, 3, 4, 6, 6 N=19	10							
									11		5.00 5.05					
				100					12		5.50					
6			80													
01/06/2009		1.60m at 18:00							13		6.50 6.60	3.89	6.60			
03/06/2009 7		1.20m at 08:00						2, 3, 4, 6, 6, 9 N=25	14		6.70				V	Extremely weak, reddish yellow (5YR/6/6), mottled light grey, completely decomposed METATUFF. (Firm, slightly sandy, clayey SILT)
									15		7.00 7.05					
				65					16		7.50					
8			80													
									17		8.50					
				100					18		8.60					
9			80													
									19		9.60 9.70	0.79	9.70			
10								2, 4, 5, 8, 11, 13	20		9.80		10.00		V	Extremely weak, reddish yellow (5YR/6/6) and

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
SPT Liner Sample
Water Sample
Piezometer Tip

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

LOGGED P. Zhang
DATE 16/06/2009
CHECKED S.M. Pyle
DATE 26/06/2009

REMARKS

1. An inspection pit was excavated to a depth of 1.50m.
2. Falling head permeability tests were performed from 3.00m to 4.50m, 12.20m to 13.70m and 22.10m to 23.60m below existing ground level on 02/06/2009, 04/06/2009 and 06/06/2009 respectively.
3. Acoustic borehole televiewer survey test was performed from 27.65m to 35.32m below existing ground level on 10/06/2009.
4. Two piezometers were installed at 27.00m and 5.00m below existing ground level on 10/06/2009.

FGS Job No.: 07 0254 13 29A

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. PC/TKL-BH03
	CONTRACT No.: GE/2007/13	SHEET: 2 of 4

PROJECT: Agreement No. CE 61/2007 (CE), North East New Territories New Development Areas Planning and Engineering Study - Investigation (Batch 2)

METHOD: Rotary Drilling	CO-ORDINATES:	WORKS ORDER No. GE/2007/13.29A
MACHINE & No.: FDR-23	E 833767.32 N 843667.06	DATE from: 29/05/2009 to 10/06/2009
FLUSHING MEDIUM: Water	ORIENTATION: Vertical	GROUND LEVEL + 10.49 mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
								N=37	21 18.19	0.49	10.00		V	grey (7.5YR/6/1), completely decomposed METATUFF. (Stiff, slightly sandy, clayey SILT)
11			80	100					22 10.60					
								4, 5, 7, 9, 11, 13 N=40	23 11.60 11.70	-1.21	11.70		V	Extremely weak, yellowish red (5YR/5/6), completely decomposed METATUFF. (Stiff, slightly sandy, clayey SILT)
12									24 11.60					
									25 12.10 12.15					
13			80	100				k=1.34E-6m/s	26 12.60					
13/06/2009		1.36m at 18:00							27 13.60 13.70					
04/06/2009		1.64m at 08:00						4, 6, 8, 9, 12, 15 N=44	28 13.60					
14									29 14.10 14.15					
									30 14.60	-4.11	14.60		V	Extremely weak, yellow (10YR/7/8), completely decomposed METATUFF. (Very stiff, slightly sandy, clayey SILT)
15			80	85					31 15.60 15.70					
	PW 15.70 HW							5, 5, 8, 10, 15, 18 N=51	32 15.80					
16									33 16.10 16.15					
									34 16.60					
17			80	90					35 17.60 17.70					
								8, 12, 17, 21, 29, 33 / 45mm 100 blows / 270mm	36 17.80					
18									37 18.07 18.12					
									38 18.60					
19			80	100										
		19.00 at						15, 15, 22, 28, 38, 12 / 50mm	39 19.60 19.70					
20									40 19.60	-9.51	20.00			

Small Disturbed Sample
Piston sample
U76 Undisturbed Sample
U100 Undisturbed Sample
Mazier Sample
SPT Liner Sample
Water Sample
Piezometer Tip
Standard Penetration Test
In-situ Vane Shear Test
Permeability Test
Pressuremeter Test
Televiewer Survey
Packer Test
Impression Packer Test
Standpipe

LOGGED P. Zhang
DATE 16/06/2009
CHECKED S.M. Pyle
DATE 26/06/2009

REMARKS

FUGRO GEOTECHNICAL SERVICES LTD	DRILLHOLE RECORD	HOLE No. PC/TKL-BH03
	CONTRACT No.: GE/2007/13	SHEET: 3 of 4

PROJECT: Agreement No. CE 61/2007 (CE), North East New Territories New Development Areas Planning and Engineering Study - Investigation (Batch 2)

METHOD: Rotary Drilling	CO-ORDINATES:	WORKS ORDER No. GE/2007/13.29A
MACHINE & No.: FDR-23	E 833767.32 N 843667.06	DATE from: 29/05/2009 to 10/06/2009
FLUSHING MEDIUM: Water	ORIENTATION: Vertical	GROUND LEVEL + 10.49 mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No.	Type	Depth	Reduced Level	Depth (m)	Legend	Grade	Description
04/06/2009 05/06/2009								100 blS/275mm	41		20.075 20.125	-9.51	20.00		V	As sheet 2 of 4.
21			80	100					42		20.60					
									43		21.60					
								13, 19, 21, 31, 40, 8 / 50mm 100 bls / 275mm	44		21.70 21.60					
22									45		22.075 22.125					
									46		22.60	-12.11	22.60		IV	Weak, very pale brown and light grey, highly decomposed METATUFF. (Recovered as angular coarse gravel)
23			80	100				k=8.31E-7m/s								
		1.46m at 18:00							47		23.60 23.70					
24		1.60m at 08:00						15, 22, 28, 42, 30 / 30mm 100 bls / 180mm	48		23.80					
05/06/2009 06/06/2009									49		23.90 24.00					
									50		24.60					
25			80	60												
									51		25.60					
									52		25.70					
26			80	100												
									53		26.70 26.80					
27								28, 22 / 35mm, 59, 41 / 25mm 100 bls / 100mm	54		26.90					
	HW 27.55								55		27.01					
			80	100	0	0					27.55	-17.06	27.55		III	Moderately strong, grey, moderately decomposed METATUFF with a crude foliation.
28			80	100	0	0	>20				27.75					Joints are very closely to closely spaced, smooth planar, extremely narrow, iron oxide stained, kaolin coated, dipping at 20°-30°, 45°-55° and subvertical.
										T2I01						
29			80	100	17	0					28.78					
										T2I01						
											29.48					
										T2I01						
30												-19.51	30.00			

- Small Disturbed Sample
- Piston sample
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- Mazier Sample
- SPT Liner Sample
- Water Sample
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- Standard Penetration Test
- In-situ Vane Shear Test
- Permeability Test
- Pressuremeter Test
- Televiewer Survey
- Packer Test
- Impression Packer Test
- Standpipe

LOGGED P. Zhang

DATE 16/06/2009

CHECKED S.M. Pyle

DATE 26/06/2009

REMARKS

FUGRO GEOTECHNICAL SERVICES LTD

DRILLHOLE RECORD

HOLE No. PC/TKL-BH03

CONTRACT No.: GE/2007/13

SHEET: 4 of 4

PROJECT: Agreement No. CE 61/2007 (CE), North East New Territories New Development Areas Planning and Engineering Study - Investigation (Batch 2)

METHOD: Rotary Drilling

MACHINE & No.: FDR-23

FLUSHING MEDIUM: Water

CO-ORDINATES:
E 833767.32
N 843667.06

ORIENTATION: Vertical

WORKS ORDER No. GE/2007/13.29A

DATE from: 29/05/2009 to 10/06/2009

GROUND LEVEL + 10.49 mPD

Drilling Progress	Casing depth/size	Water Level (m) Shift start/ end	Water Return %	T C R %	S C R %	R Q D %	F I	Tests	Samples No. Type Depth	Reduced Level	Depth (m)	Legend	Grade	Description
		1.55m at 18:00	80	100	59	50	10.0		T2\01 30.58				III	As sheet 3 of 4.
08/06/2009														
08/06/2009		1.68m at 08:00												
31			80	100	0	0			T2\01 31.26					
			80	100	17	0			T2\01 31.62					
			80	100	0	0	>20		T2\01 32.02					
32			80	100	0	0			T2\01 32.55					
			80	100	41	34			T2\01 33.29					
33			80	100	51	0	12.7		T2\01 33.99					
34		1.62m at 18:00								-23.70	34.19		II	Strong, grey, slightly decomposed METATUFF. Joints are medium spaced, smooth planar, extremely narrow, clean, dipping at 45°-55°.
08/06/2009														
09/06/2009		1.85m at 08:00	80	100	54	54			T2\01 34.49					
35			80	100	100	100	2.5		T2\01 35.37	-24.88	35.37			
09/06/2009														End of investigation hole at 35.37m.
36														
37														
38														
39														
40											40.00			

- Small Disturbed Sample
- Piston sample
- U76 Undisturbed Sample
- U100 Undisturbed Sample
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- Permeability Test
- Pressuremeter Test
- Televiewer Survey
- Packer Test
- Impression Packer Test
- Standpipe

LOGGED P. Zhang

DATE 16/06/2009

CHECKED S.M. Pyle

DATE 26/06/2009

REMARKS

FGS Job No.: 07 0254 13 29A

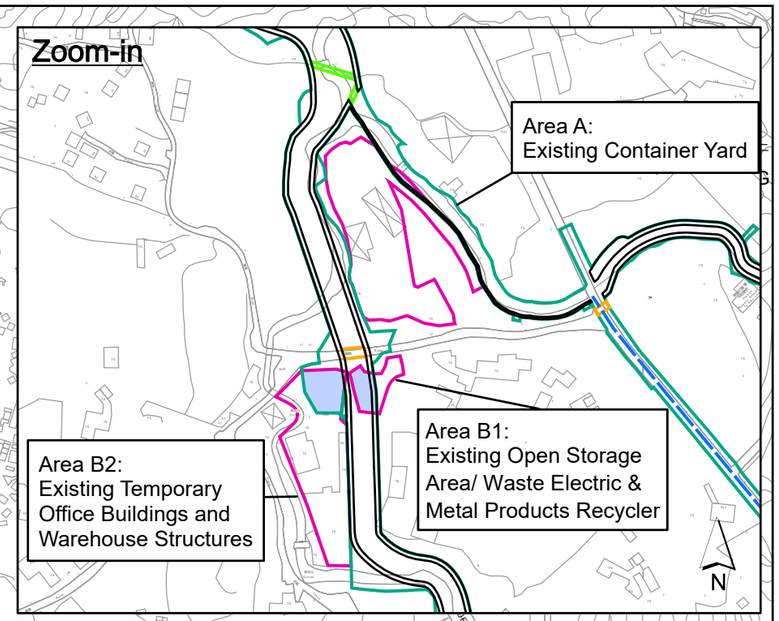
ANNEX C SITE WALKOVER PHOTOS

Area A:
Existing Container Yard

Area B1:
Existing Open Storage Area / Waste Electric & Metal Products Recycler

Area B2:
Existing Temporary Office Buildings and Warehouse Structures

Zoom-in



Legend

- Photo Location
- View Angle
- Proposed Project Area
- Alignment of Proposed Drainage Improvement Works

Proposed Associated Drainage Facilities

- Proposed Vehicular Crossing
- Proposed Footway Crossing
- Proposed Drainage Pipe
- Proposed U-Channel/Rectangular Channel

Suspected Land Contamination Sources

- Suspected Contaminated Sites
- Suspected Land Contamination Sources within Proposed Project Area

N
Metres
0 200 400

Annex C

Locations of Selected Site Walkover Photos

File: T:\GIS\CONTRACT\0482209\mxd\0482209_Suspected_Land_Contamination_Sites_Project_Area.mxd
Date: 7/1/2022

Environmental Resources Management

ERM

Photograph: 1	Boundary of Area A

Photograph: 2	Entrance of Area B1

Photograph: 3	Entrance of Area B2

Photograph: 4	Entrance of a warehouse nearby (not within Project Area)

Photograph: 5	View of the existing nullah

Photograph: 6	Ping Che Road

Photograph: 7	Location of Proposed Vehicular Crossing

Photograph: 8	View of the existing nullah

Photograph: 9	View of the existing nullah and the adjacent greenfield

Photograph: 10	Location of Proposed Footway Crossing

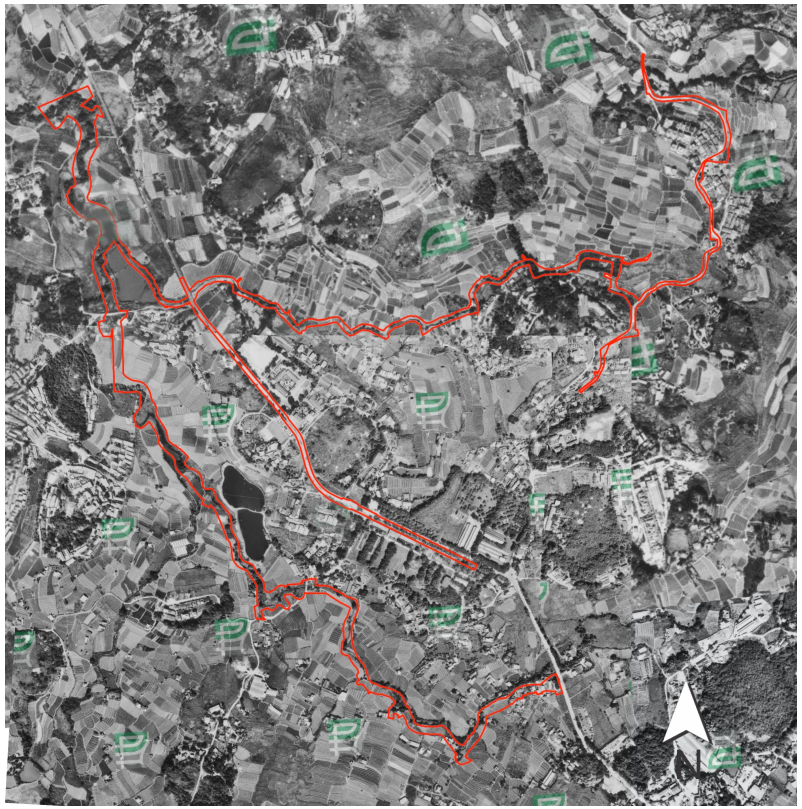
Photograph: 11	Location of Proposed Footway Crossing

Photograph: 12	View of the existing nullah from Ping Che Road

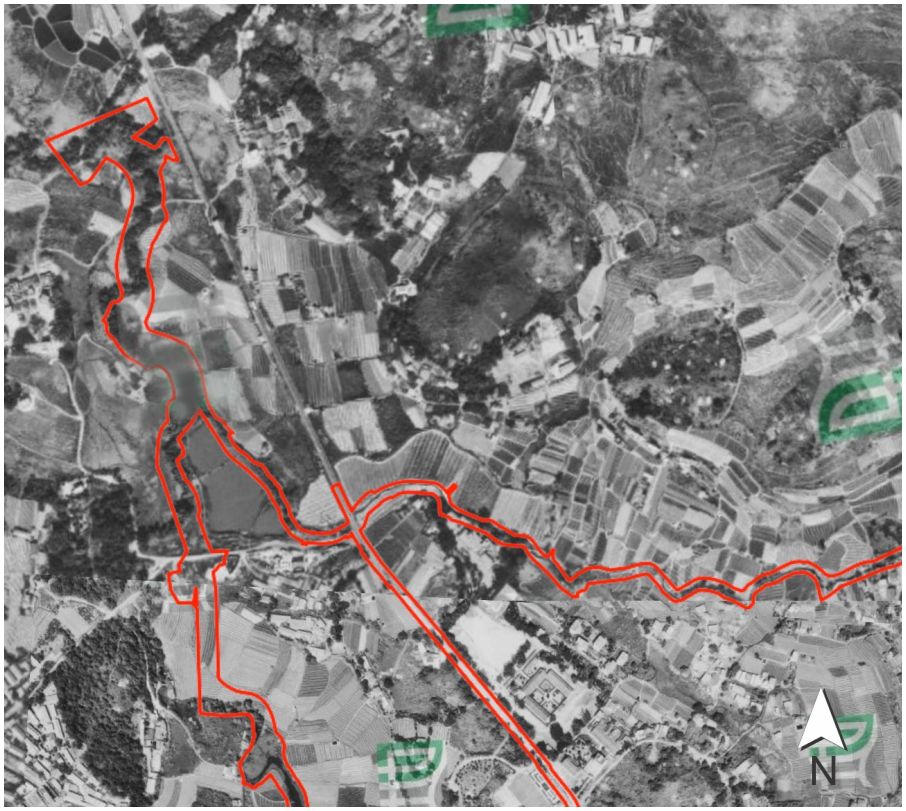
Photograph: 13	Existing vehicle road - Proposed U-channel/Rectangular Channel

Photograph: 14	Existing vehicle road - Proposed U-channel/Rectangular Channel

ANNEX D REFERENCED AERIAL PHOTOGRAPHS



Year 1982:
The Project Area was an undeveloped land in 1982. The Project Area comprised with farmland, vegetation, road, drainage facilities and village houses.



Year 1982 (Zoom-in map 1):
This section of Project Area was an undeveloped land in 1982. It mainly comprised with farmland and vegetation, also with road, drainage facilities and village houses.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

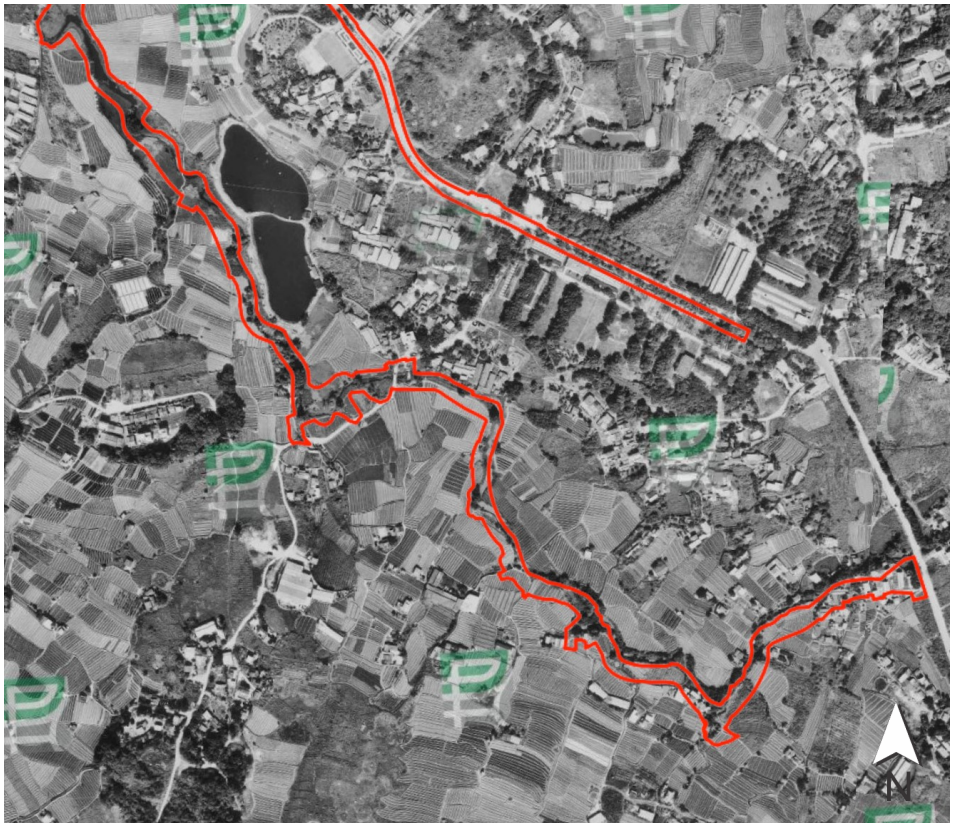
PROJECT:
Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling - Investigation, Design and Construction

ERM-Hong Kong, Limited
2509, 25/F, One Harbourfront,
Tak Fung Street,
Hung Hom, Kowloon
Tel: (852) 2271 3000
Fax: (852) 3015 8052

TITLE: Annex D
Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0482209
DRAWN:	APPROVED:	SCALE:
DRAWING:		SIZE: A4 / REV: 0

Year 1982 (Zoom-in map 2):
This section of Project Area was an undeveloped land in 1982. Similarly, it mainly comprised with farmland and vegetation, also with drainage facilities and village houses.



Year 1982 (Zoom-in map 3):
This section of Project Area was an undeveloped land in 1982. It mainly comprised with farmland and vegetation, also with road, drainage facilities and village houses.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling - Investigation, Design and Construction

ERM-Hong Kong, Limited
2509, 25/F, One Harbourfront,
Tak Fung Street,
Hung Hom, Kowloon
Tel: (852) 2271 3000
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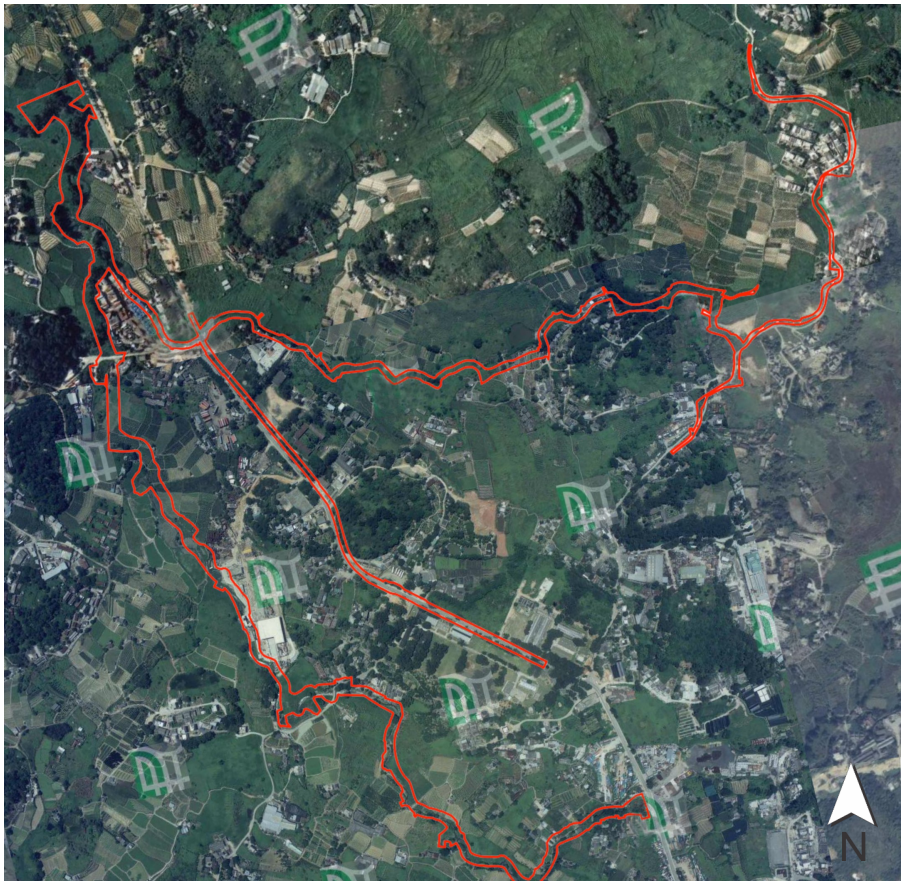
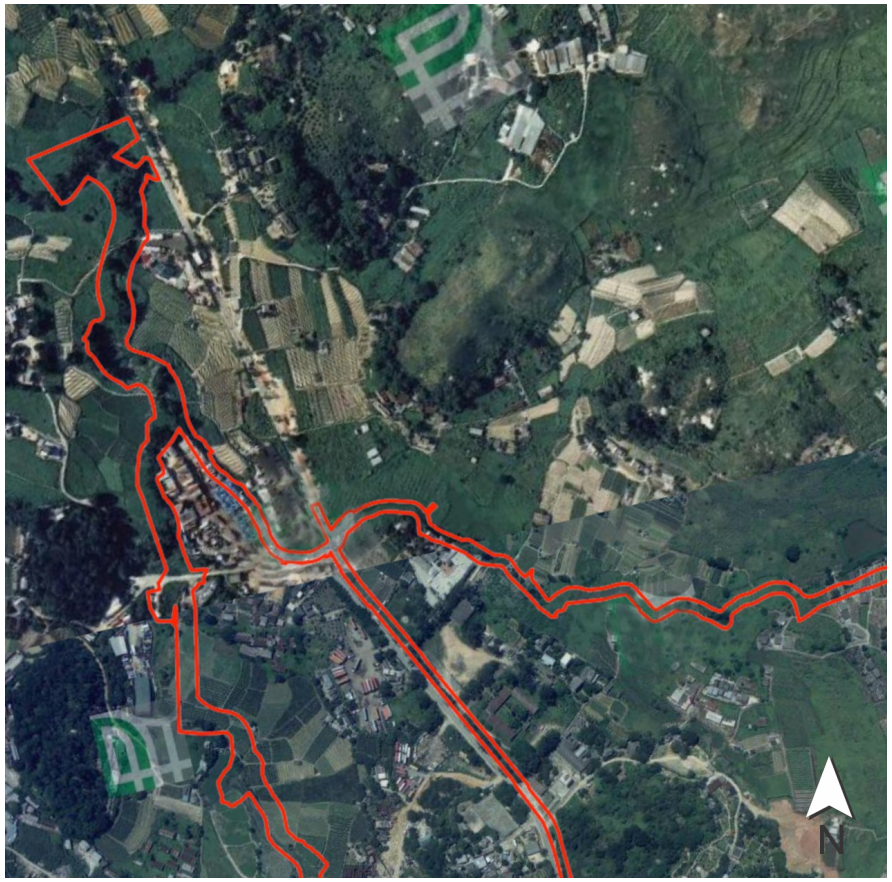
TITLE: Annex D
Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0482209
DRAWN:	APPROVED:	SCALE:
DRAWING:		SIZE: A4 / REV: 0



Year 1994:
No significant change was observed at the Project Area (except the Concerned Areas).



Year 1994 (Zoom-in map 1):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with farmland and vegetation, also with road, drainage facilities and village houses.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling - Investigation, Design and Construction

ERM-Hong Kong, Limited
2509, 25/F, One Harbourfront,
Tak Fung Street,
Hung Hom, Kowloon
Tel: (852) 2271 3000
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TITLE: Annex D
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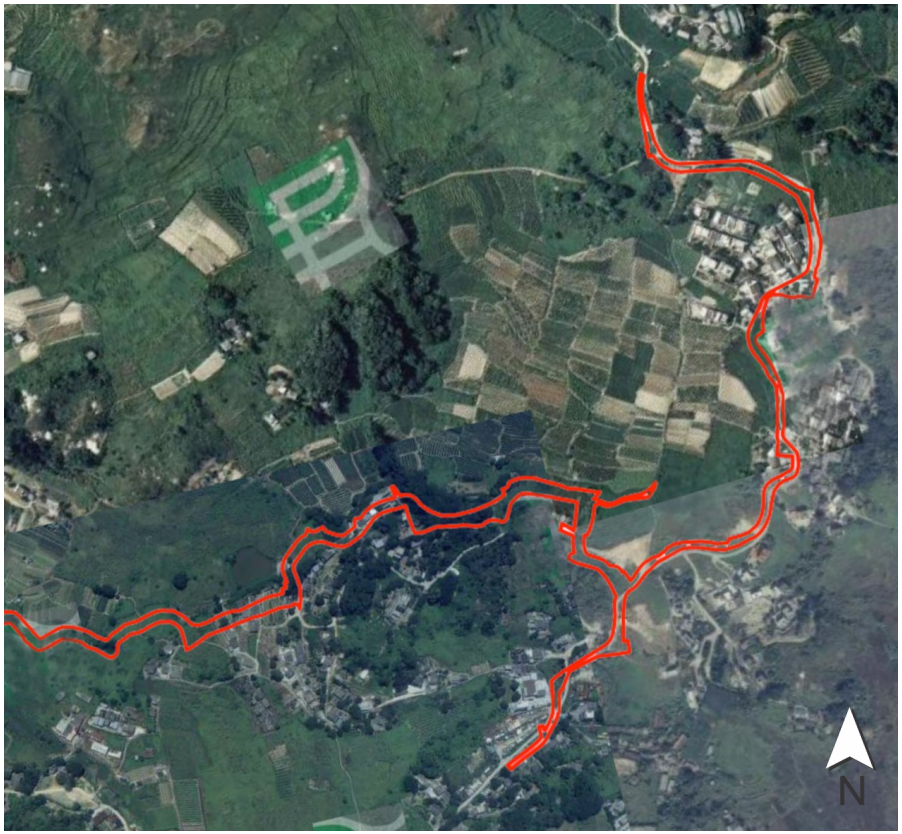
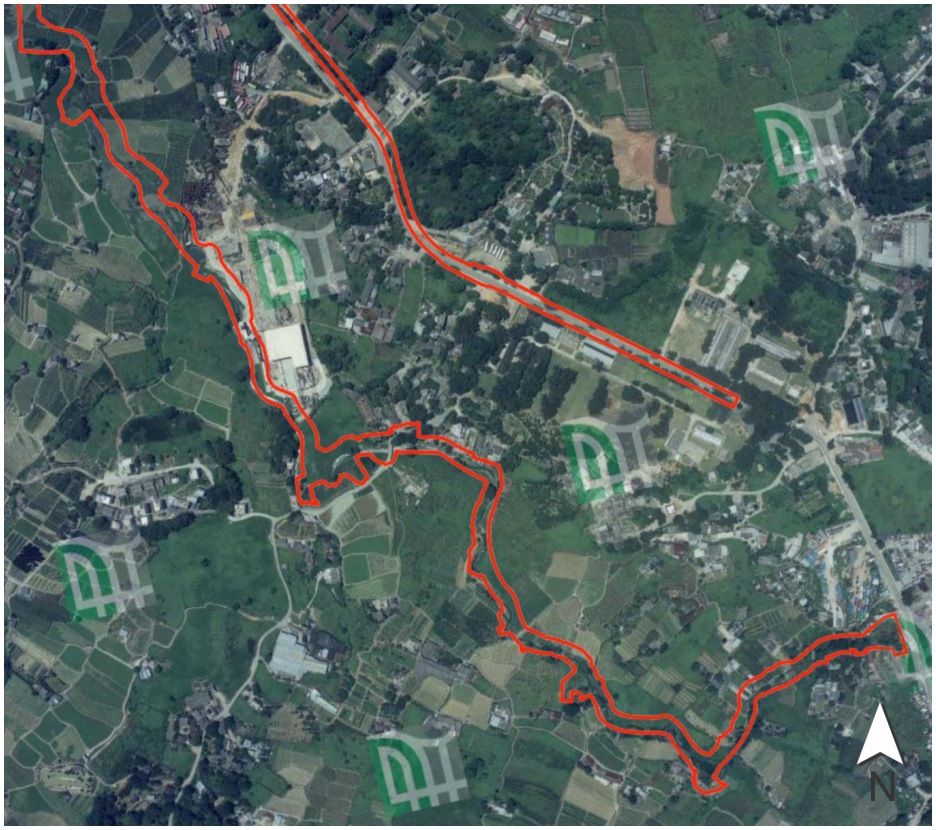
DATE:	CHECKED:	PROJECT: 0482209	
DRAWN:	APPROVED:	SCALE:	
DRAWING:		SIZE: A4	REV: 0



Year 1994 (Zoom-in map 2):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with farmland and vegetation, also with drainage facilities and village houses.



Year 1994 (Zoom-in map 3):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with farmland and vegetation, also with road, drainage facilities and village houses.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling - Investigation, Design and Construction

ERM-Hong Kong, Limited
2509, 25/F, One Harbourfront,
Tak Fung Street,
Hung Hom, Kowloon
Tel: (852) 2271 3000
Fax: (852) 3015 8052

TITLE: Annex D
Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0482209
DRAWN:	APPROVED:	SCALE:
DRAWING:		SIZE: A4 / REV: 0

Year 2004:
No significant change was observed at the Project Area (except the Concerned Areas).

Year 2004 (Zoom-in map 1):
No significant change was observed at this section of Project Area (except the Concerned Areas). Minor site clearance works was carried out for drainage facilities in the northern corner of Project Area.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling - Investigation, Design and Construction

ERM-Hong Kong, Limited
2509, 25/F, One Harbourfront,
Tak Fung Street,
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Tel: (852) 2271 3000
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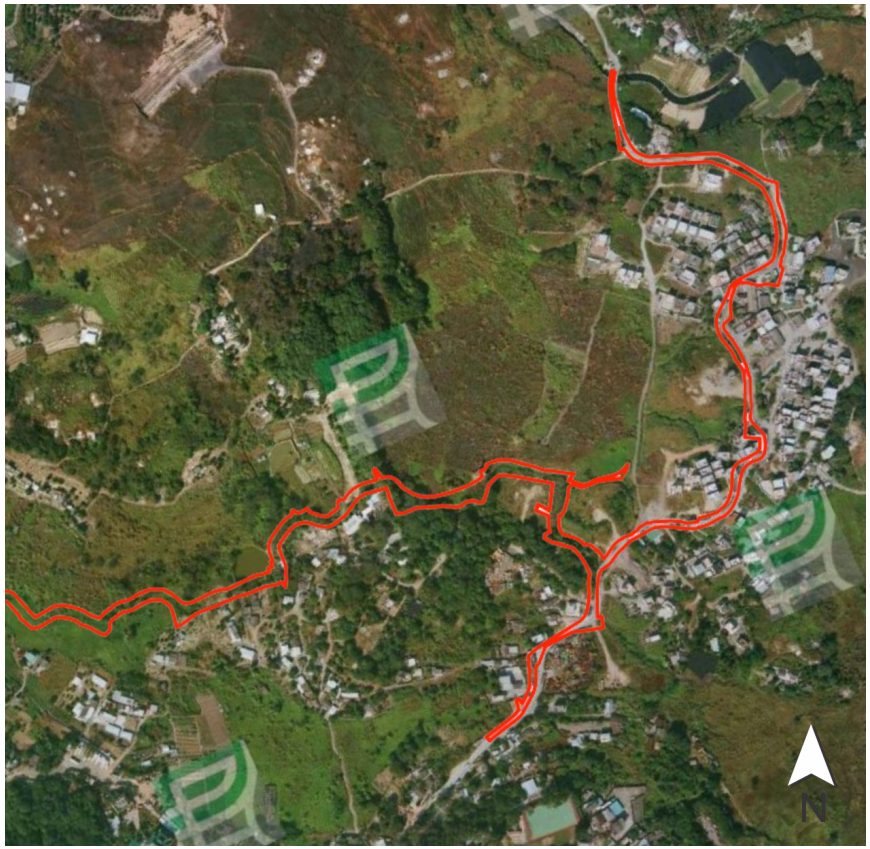
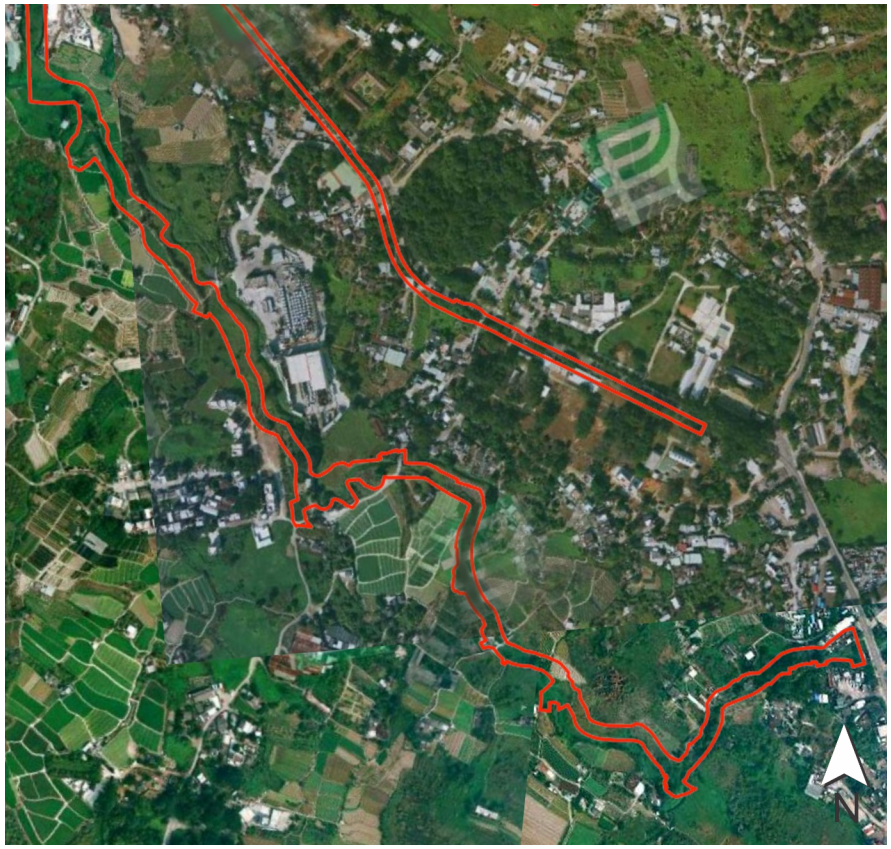
TITLE: Annex D
Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0482209
DRAWN:	APPROVED:	SCALE:
DRAWING:		SIZE: A4 / REV: 0



Year 2004 (Zoom-in map 2):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with farmland and vegetation, also with drainage facilities and village houses.



Year 2004 (Zoom-in map 3):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with farmland and vegetation, also with road, drainage facilities and village houses.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling - Investigation, Design and Construction

ERM-Hong Kong, Limited
2509, 25/F, One Harbourfront,
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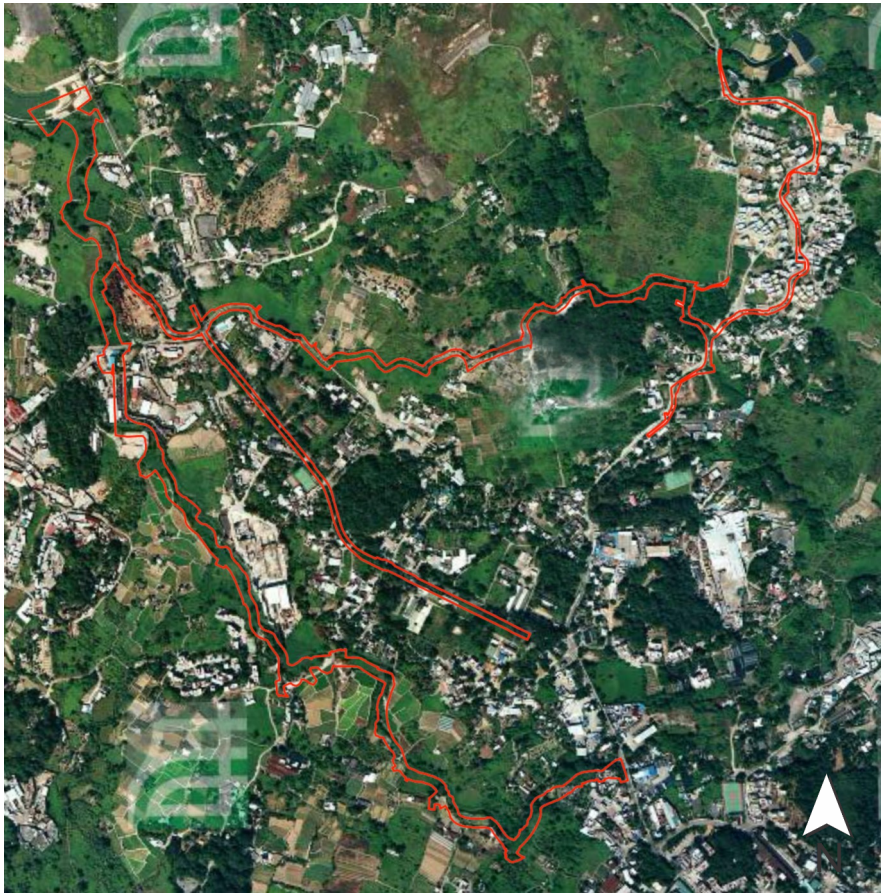
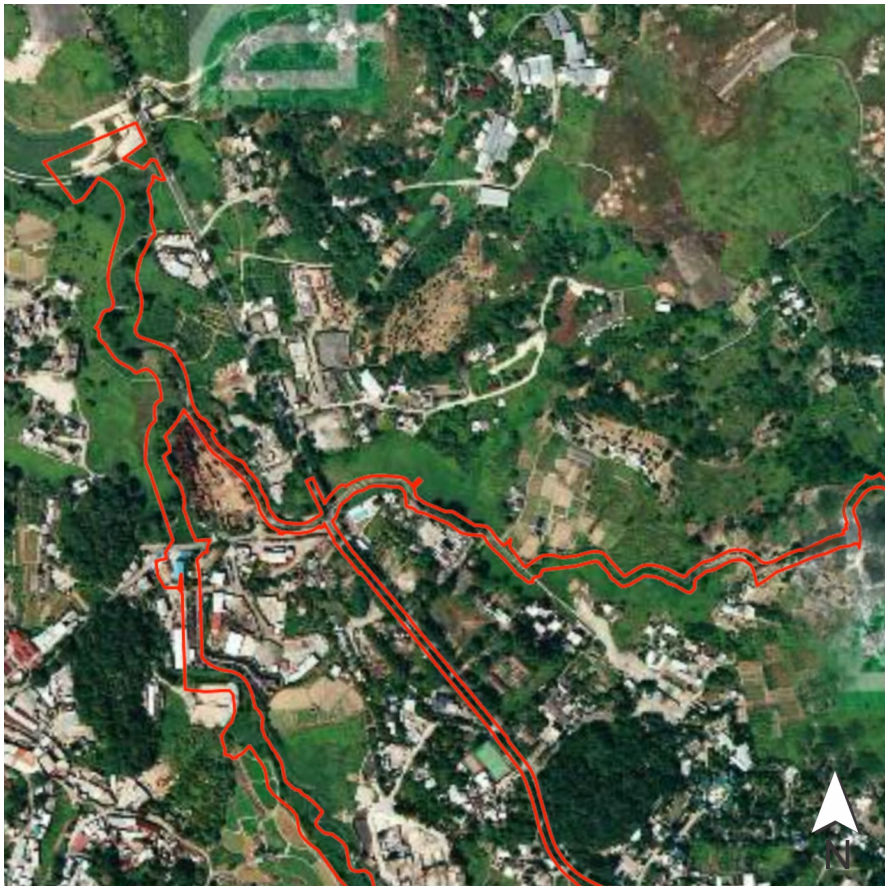
TITLE: Annex D
Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0482209	
DRAWN:	APPROVED:	SCALE:	
DRAWING:		SIZE: A4	REV: 0



Year 2008:
No significant change was observed at the Project Area (except the Concerned Areas).



Year 2008 (Zoom-in map 1):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with farmland and vegetation, also with road, drainage facilities and village houses.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Land Contamination Assessment for Drainage Improvement Works in Ta Kwu Ling - Investigation, Design and Construction

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Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0482209
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Year 2008 (Zoom-in map 2):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with vegetation, drainage facilities and village houses.

Year 2008 (Zoom-in map 3):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with farmland and vegetation, also with road, drainage facilities and village houses.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
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TITLE: Annex D
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DATE:	CHECKED:	PROJECT: 0482209	
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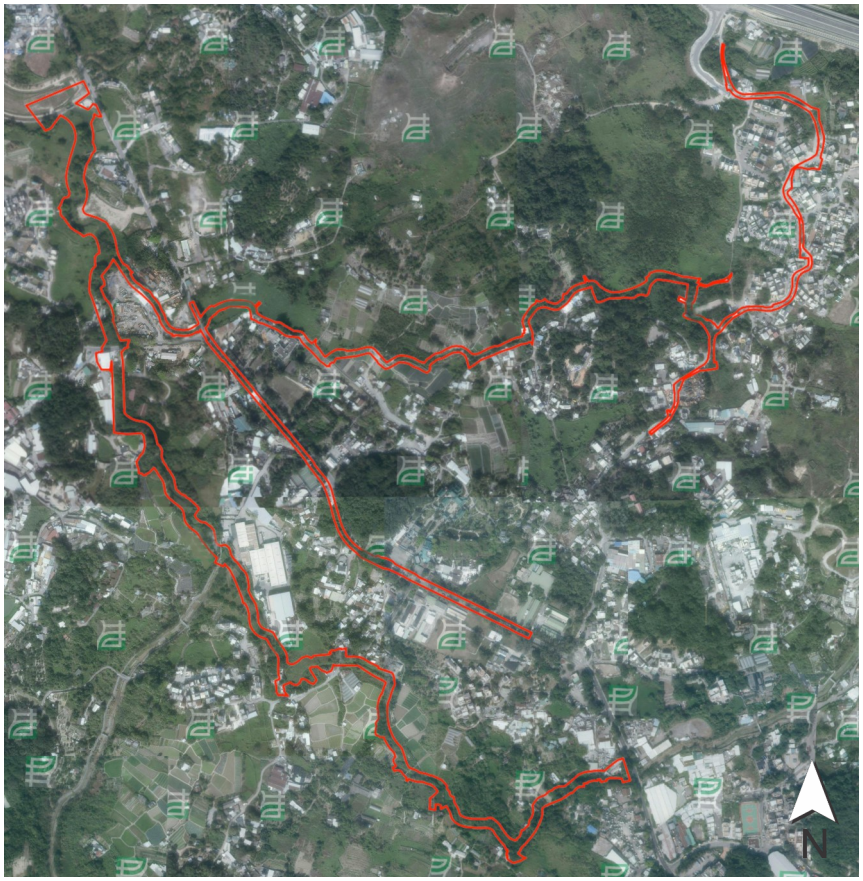
DRAWING:		SIZE: A4	REV: 0



Year 2020:
No significant change was observed at the Project Area (except the Concerned Areas).

Year 2020 (Zoom-in map 1):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with farmland and vegetation, also with road, drainage facilities and village houses.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

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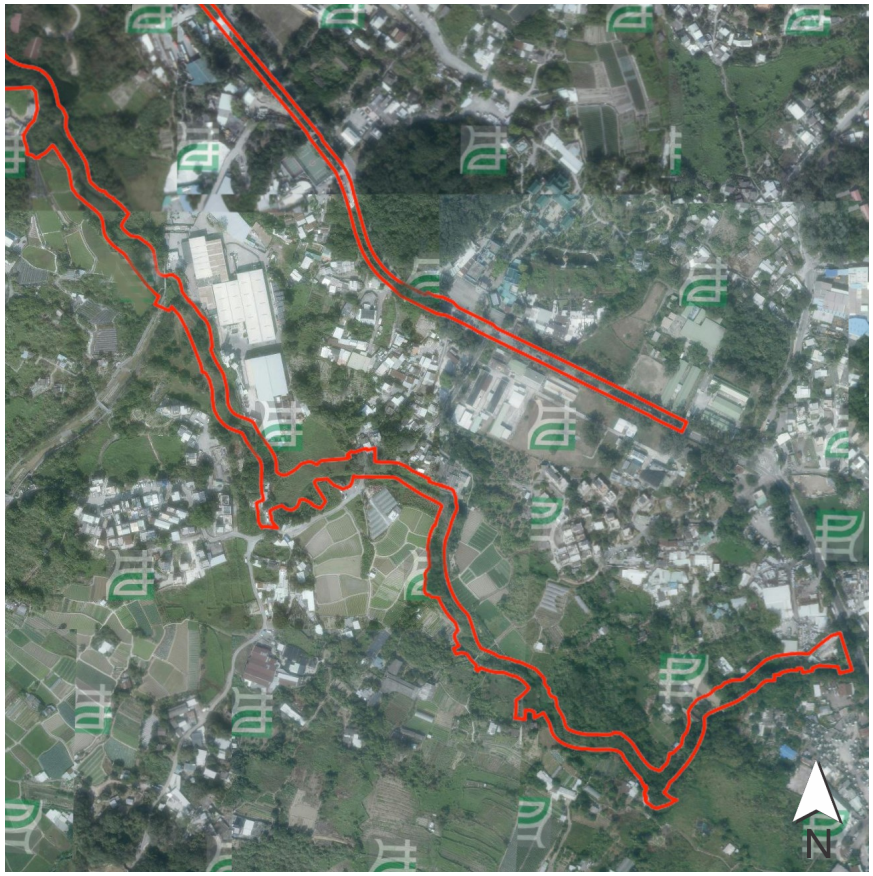
Year 2020 (Zoom-in map 2):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with vegetation, drainage facilities and village houses.



Year 2020 (Zoom-in map 3):
No significant change was observed at this section of Project Area (except the Concerned Areas). It mainly comprised with farmland and vegetation, also with road, drainage facilities and village houses.

Approximate location of the Project Area

Source - GEO INFO, Lands Department, HKSARG

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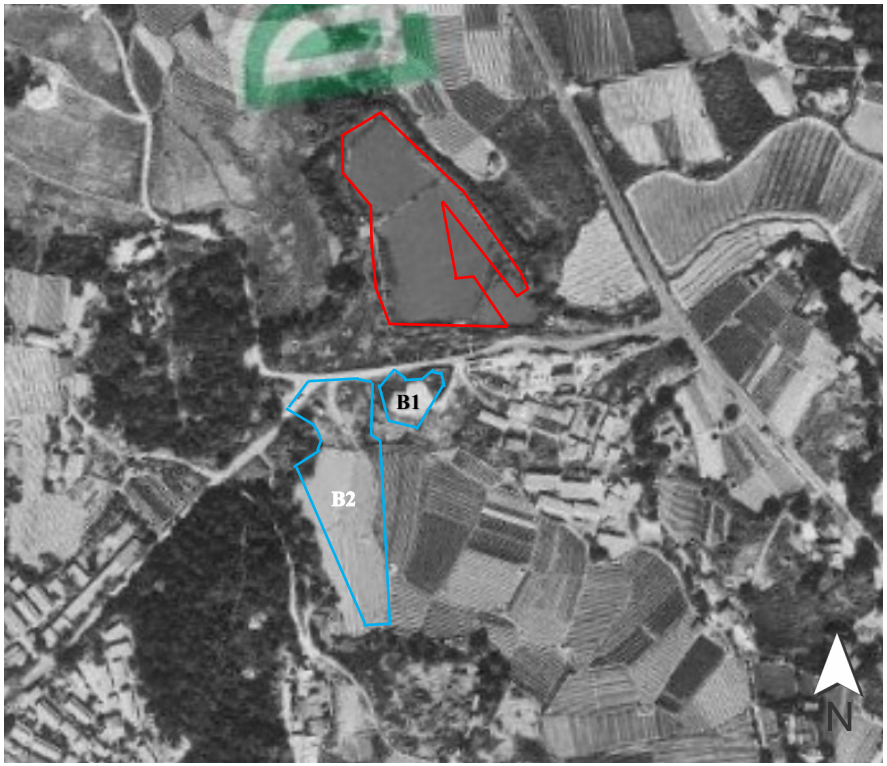
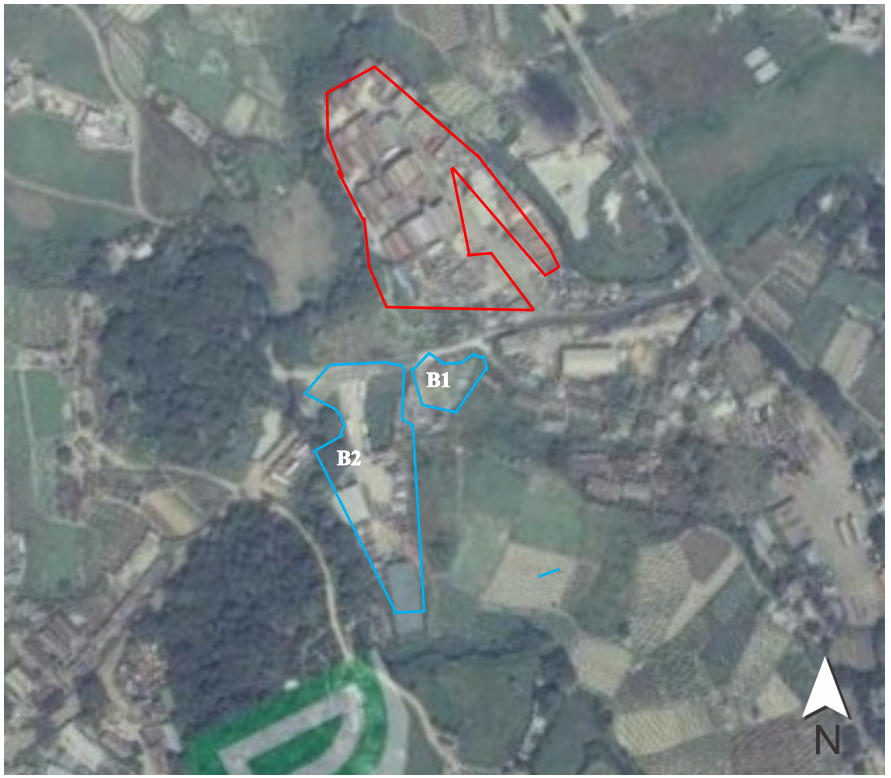


Year 1982 (Ref: 46740)
Concerned Area A, B1, and B3 were undeveloped land in 1982. It mainly comprised with farmland.



Year 1994 (Ref: CN08662)
Concerned Area A, B1 and B2 were developed as contractor storage yard, open storage area, and temporary office buildings and warehouse structures, respectively.

Approximate location of the Area A
Approximate location of the Area B1 & B2

Source - GEO INFO, Lands Department, HKSARG

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Year 2004 (Ref: CW63043)
No significant change was observed at the Concerned Area A, B1 and B2.

Year 2008 (Ref: CS18090):
No significant change was observed at the Concerned Area A, B1 and B2.

Approximate location of the Area A
Approximate location of the Area B1 & B2

Source - GEO INFO, Lands Department, HKSARG

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Year 2020 (Ref: E113964C):
No significant change was observed at the Concerned Area A, B1 and B2.

Approximate location of the Area A
Approximate location of the Area B1 & B2

Source - GEO INFO, Lands Department, HKSARG

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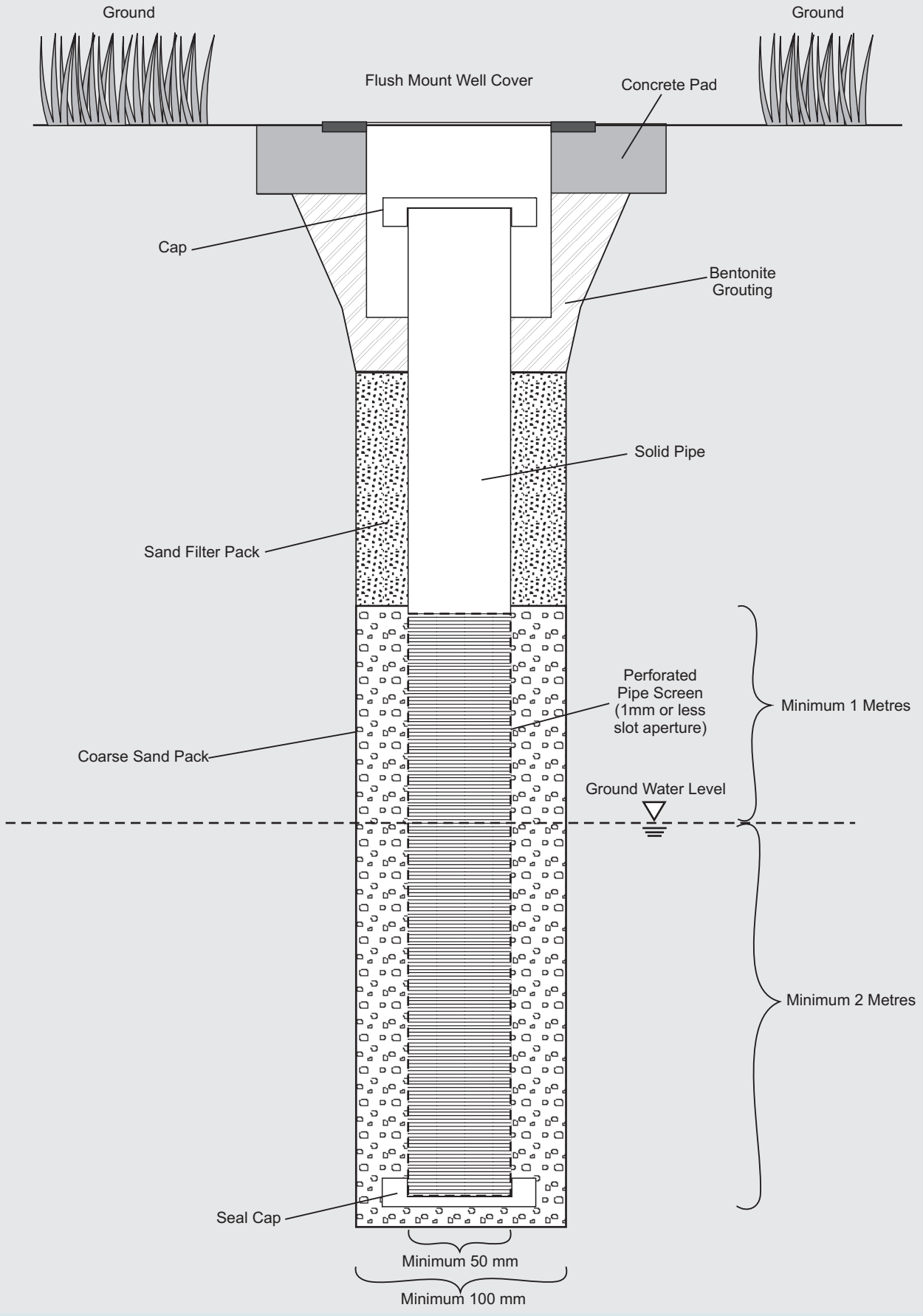
Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0482209
DRAWN:	APPROVED:	SCALE:
DRAWING:		SIZE: A4 / REV: 0

ANNEX E SCHEMATIC DRAWING OF GROUNDWATER MONITORING WELL



Annex E

Schematic Drawing of Groundwater Monitoring Well

FILE: 0131608a
DATE: 04/04/2011

Environmental
Resources
Management

ERM

ANNEX F RISK-BASED REMEDIATION GOALS

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

Chemical	Risk-Based Remediation Goals for Soil				Soil Saturation Limit (C_{sat}) (mg/kg)
	Urban Residential (mg/kg)	Rural Residential (mg/kg)	Industrial (mg/kg)	Public Parks (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 C_{sat} 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			Solubility Limit (mg/L)
	Urban Residential (mg/L)	Rural Residential (mg/L)	Industrial (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>1.00E-05 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.

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