7. LAND CONTAMINATION

7.1 Introduction

This *Section* identifies and assesses the potential land contamination impacts due to historical and current land uses within the Project site. The assessment was undertaken in accordance with the criteria set out in Annex 19 of the *EIAO-TM*.

As part of the land contamination assessment, a Contamination Assessment Plan (CAP) has been prepared to identify the presence of potential land contamination areas and investigate the associated land contamination impacts within the Project site due to past and present operations, and subsequently devise a sampling and testing plan. The CAP was endorsed by EPD on 13 July 2021 and is provided in ***Appendix 7A***.

7.2 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 Land* (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); and
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.

7.3 Description of the Project

The existing GT2, GT3, GT4, GT57 and GT6 and its auxiliaries, including the transformers, generator coolers and aboveground lube oil tanks, will be demolished for the installation of new GT8, GT9, GT10 and GT11. The existing foundation piles and concrete structure will be reused to support the new units, therefore no corresponding excavation works will be required for the installation of new units. As part of the Project, the lube oil tank adjacent to GT5, the existing BSGT at the northwest corner of the GT Compound and the miscellaneous storage shed immediate south of the BSGT will be demolished. A new BSGT will be installed at the same location as the existing BSGT.

Upon retirement of GT57, the existing GTAB will be converted to a new 132kV Switching Station. Existing equipment inside the GTAB (i.e. the main oil tank, chemical dosing pit, miscellaneous gas tanks, cooling water pumps, generator, generator coolers and lube oil coolers, etc) will be removed. As part of the conversion to a new 132kV Switching Station, the existing Turbo Block structure inside the GTAB will be demolished for reconstruction works which will involve minor excavation down to 2.6m below ground level (bgl). The construction of new 132kV cable trenches for the new units will also require minor excavation down to 1.8m bgl. In addition, a New Staircase and Lift will be

constructed at the immediate east of existing GTAB which is currently a Circulating Water Pipe Room to be demolished under the Project. The construction of the New Staircase and Lift will require excavation down to 5m bgl and new piles will be installed to support the said New Staircase and Lift. The existing stacks (80 m tall) serving the existing OCGTs and CCGT will be retained for the new units. Other existing building structures and equipment, including the Gas Turbine 132kV Switching Station and Gas Turbine Equipment Building, will be retained.

In general, the demolition of abovementioned structures and installation of new OCGTs and BSGT will not involve earthworks, except minor excavation (down to about 1.8m bgl) required for the new cable trenches for the new units. The work areas requiring structure removal/demolition and minor excavation are highlighted in ***Figure 7.1***.

7.4 Assessment Methodology

The assessment of potential land contamination impact within the Project site was conducted by undertaking:

- A desktop study to review the hydrogeology of the Site from previous SI conducted within/ at vicinity of the Project site;
- A desktop study to review the current and historical land use information from Lands Department (LandsD) and publicly available information;
- A site walkover to identify the current land uses;
- A proposed SI programme, including soil and groundwater sampling and testing at proposed sampling locations; and
- Review of potential contamination sources and possible remediation methods.

7.5 Historical and Current Land Uses

7.5.1 Historical Land Uses

A review of past land uses of the Concerned Areas were conducted by reviewing the aerial photographs in the years of 1978, 1985, 1991, 1995, 1999, 2002 and 2019. The aerial photographs were obtained from the Surveys and Mapping Office of the Lands Department. The historical land uses of the Project Site are presented in ***Table 7.1***.

Table 7.1 Summary of Historical Land Uses of Project Site

Date Began/ Period	Description of Site History
1970s to 1980s	The land where the Project site is situated was previously the coastline of Lamma Island.
1985	Reclamation for LPS was completed between late 1970s and early 1980s. The Project site was vacant.
1991	Construction of six (6) OCGTs, i.e. GT2 to GT7, was completed and its operation commissioned in 1989.
2002 - present	Two (2) of the OCGTs, i.e. GT5 and GT7, were later converted into a CCGT, i.e. GT57, in 2002. Reportedly, no historical spillage and leakage incidents occurred during the conversion works in 2002. GTAB was constructed at the eastern boundary of the Project site in early 2000s with the purpose of housing the steam turbine and the auxiliaries. The operation of GT compound remained unchanged since 2002 until present.

7.5.2 Current Land Uses

Site walkover and site management interview were conducted on 5 January 2021 to observe the Project site conditions and identify signs of potential contamination. Site observations and findings were summarised in ***Table 7.2***.

Table 7.2 Summary of Current Land Uses of Project Site

Site		Description of Site Walkovers and Interviews Findings
GT Compound	General	The outdoor portions of whole Project site, including vehicle access roads and outdoor area, were concrete paved and in good condition. No signs of oil stains or chemical stains were noted along the access roads as well as the proposed new cable trenches during the site walkover. Reportedly by site management, no historical fuel/ chemical spillage were occurred in the Project site.
	Six (6) GTs and its auxiliaries	Each GT was mounted on foundation pile and concrete structure with support from external steel reinforcement. Each GT contained one (1) lube oil tank installed at about 3m aboveground. No underground storage tank (UST) was installed. Each GT's auxiliaries, including transformer and generator cooler, were installed side by side to the GT. Each transformer was constructed within a concrete containment bund filled with pebbles inside an isolated area. No signs of oil stains were observed. Reportedly, no historical leakage or spillage incidents were recorded. Each generator cooler was supported by metal structure and mounted on concrete footings. The operation of generator coolers did not require use of fuel and chemicals. During the site walkover, no significant signs of oil stain and leakage or spillage marks were observed on the floor of each GT and its auxiliaries. No signs of cracks were noted on the floor. Lube oil pipes and fuel pipes connected to the GTs were observed in good conditions with no signs of seepage or corrosion. Six GT transformers were observed to be well maintained. No significant signs of stains or odour were noted during the site walkover. Reportedly by the site management, the composition of transformer oil used was free of PCBs. Reportedly by site management, no historical fuel/ chemical spillage or leakage were occurred at the six (6) GTs and its auxiliaries.
	Lube Oil Tank area	A lube oil tank of about 30,000L capacity adjacent to GT5 was installed above two (2) concrete footings and placed within a concrete bund. During the site walkover, minor black colour deposits ($1m^2$) were noted at the bottom of the lube oil tank footings and under several pipe joints. The black deposits were in powder / granular form with no signs petroleum odour or colour. Reportedly by the site management, no lube oil leakage incident was recorded in its operation history. As a result, the black deposits were likely caused by the erosion of screws / steel bars in the concrete footings of the lube oil tank.
	BSGT	The BSGT comprised one (1) diesel generator and three (3) air compressor units. No onsite diesel tank was equipped with the BSGT. Reportedly, diesel was supplied from an offsite source located 300m north of the Project site to the BSGT. Minor fuel seepage from the diesel supply pipes was observed to be absorbed by pipe wrapping materials. No signs of oil leaks on ground were noted during the site walkover. In addition, minor oil stain was observed in one of the air compressor units. The concrete slabs supporting the BSGT and air compressor units were intact.

Site		Description of Site Walkovers and Interviews Findings
	GTAB	One (1) Main Oil Tank of about 30,000L was installed on the ground floor of this building in 2001 and was put into operation in 2003. The Main Oil Tank was constructed within a concrete bund. No signs of oil leakage or spillage stains were observed within the bunded area. Oil pipes were also observed in good condition without signs of seepage or corrosion. The main oil tank and its oil pipes have been maintained in good condition as they are located in an indoor environment and protected from extreme weather. No signs of corrosion or cracks were noted during the site walkover. Reportedly by site management, no historical fuel/ chemical spillage or leakage incidents were occurred at the Main Oil Tank. One (1) Chemical Dosing Pit (Hydrazine Hydrate Tank), which is also a licensed Cat.4 DG storage, was also installed on the ground floor of this building and it is equipped with mechanical pump for dosing operation. No signs of chemical leakage or spillage were observed during the site walkover. Reportedly by site management, no historical chemical spillage or leakage incidents were occurred. However, the potential of mechanical pump oil leakage from the mechanical pump could not be ruled out. Immediate east to the GTAB is the Circulating Water Pipe Room. The emerging sections of two (2) circulating water pipes connected to the Condenser inside the GTAB were enclosed in this room. No signs of ground contamination was observed. No current and historical land contamination activities were noted. The rest of the ground floor was occupied by cooling water pumps and miscellaneous gas tanks. No chemical storage or signs of contaminations were observed during the site walkover. The generator, generator coolers, lube oil coolers were installed on 1/F and above floors. No potential land contamination impacts were observed.
	Miscellaneous Storage Shed	Approximately 20 empty chemical containers without secondary containers were placed in the vicinity of the Miscellaneous Storage Shed. Several black stains of about 1m^2 were observed on the ground of the shed's entrance.

7.6 Review of Land Contamination Potential within the Project Site

The Project site are divided into different areas based on their types of structures and equipment installed to evaluate the likelihood and presence of potential land contamination hotspots, and the need of SI to assess potential land contamination impacts.

- General
- Six (6) GTs and its auxiliaries
- Lube Oil Tank area
- BSGT
- Main Oil Tank area in GTAB
- Chemical Dosing Pit (Hydrazine Hydrate Tank) in GTAB
- Circulating Water Pipe Room
- Miscellaneous Storage Shed

7.6.1 General

The demolition of abovementioned structures and installation of new OCGTs will not involve any forms of earthworks, such as ground breaking, trenching and excavation, except minor excavation required for associated new cable trenches for the new OCGTs (down to about 1.8m bgl). Minor

excavation will also be required for the construction of the New Staircase and Lift (down to about 5m bgl) and the reconstruction works within GTAB (down to about 2.6m bgl).

Based on the site walkover observation, the outdoor portions of whole Project site, including vehicle access roads and outdoor area, was concrete paved and in good condition. No signs of oil stains or chemical stains were noted along the access roads as well as the alignment of proposed new cable trenches during the site walkover.

Although minor excavation works will be required for the construction of new 132kV cable trenches, the concrete paved surface of Project site was observed to be in good condition. No historical land contaminations were identified. Therefore, the land contamination potential of the outdoor portions of Project Site is unlikely in general and no sampling locations are required.

7.6.2 Six (6) GTs and its auxiliaries

No obvious signs of potential land contamination were noted at the six (6) GTs and its auxiliaries during the site walkover and review of its operation history.

Each GT was mounted on a concrete made foundation pile which provided a barrier to prevent any potential fuel leakage from entering the soil. Each transformer was constructed within a concrete containment bund filled with pebbles inside an isolated area, which prevents contamination from entering the ground beneath of the transformer. No signs of oil stains were observed. The composition of transformer oil used was reportedly free of PCBs. The generator coolers for GT did not require use of fuel and chemicals. Based on the site walkover and interview with site management, no historical fuel / or chemical spillage or leakage were occurred at the six (6) GTs and its auxiliaries.

Review of historical information indicated the operation in this area remained unchanged since its operation started in 1989, except the conversion works for OCGT (GT5 and GT7) to CCGT (GT57) in 2002. Reportedly, no historical spillage and leakage incidents occurred during the conversion works in 2002.

In addition, no excavation works will be required during demolition of GT structures and installation of new OCGTs. Therefore, the overall land contamination potential at the six (6) GTs and its auxiliaries is considered unlikely. No sampling locations are required at the six (6) GTs and its auxiliaries.

7.6.3 Lube Oil Tank area

Based on the site observation and operation history of the lube oil tank, the black deposits were likely caused by erosion of screws / steel bars in the concrete footings of the lube oil tank and at the several pipe joints. The lube oil tank structure and its piping are also exposed to ambient environment, thus it could be damaged under extreme weather conditions over the years. Although no significant signs of potential land contamination were noted in the lube oil tank area, the potential land contamination risks as a result of long term usage and extreme weather impacts could not be ruled out. Considering the lube oil tank was installed within a concrete bund to contain any potential oil leakage or spillage, the extent of potential contamination is likely localised.

Therefore, one (1) sampling location is proposed at the centre of Lube Oil Tank area based on hotspot sampling approach to represent the overall land condition.

7.6.4 BSGT

Minor fuel seepage was noted from the diesel supply pipes. Minor oil stains was also observed in one of the air compressor units. The diesel supply pipes are also exposed to ambient environment, thus it could be damaged under extreme weather conditions over the years. Due to its long operation history and its direct exposure without physical protection, potential land contamination caused by the fuel leakage could not be ruled out. Since no significant oil stains were noted on the ground of the BSGT, the extent of potential contamination is likely localised.

Therefore, two (2) sampling locations are proposed at BSGT, i.e. the bottom of diesel generator and the bottom of an air compressor unit, based on the hotspot sampling approach to investigate the potential contamination.

7.6.5 Main Oil Tank area in GTAB

No signs of potential land contamination, including oil stain or colour stain, were observed at the main oil tank area during the site walkover. According to the information provided by HK Electric, the Main Oil Tank was fabricated in 2001 and put into operation in 2003. The Main Oil Tank and its oil pipes have been maintained in good condition as they are located in an indoor environment. In addition, the concrete bund that contains the Main Oil Tank and its oil pipes prevents contamination from entering the ground beneath. No signs of corrosion or damages were noted at the tank structure and its oil pipes during the site walkover.

Therefore, the good condition of tank structure and oil pipes and the concrete bund indicated that there's a remote chance of historical oil leakage or spillage at the Main Oil Tank area. In addition, no excavation works will be required during demolition of main oil tank.

Hence, the land contamination potential is considered unlikely. No sampling locations are required at the Main Oil Tank Area.

7.6.6 Chemical Dosing Pit (Hydrazine Hydrate Tank) in GTAB

Minor excavation down to 1.8m bgl will be required for the construction of new cable trenches for the new OCGTs under the existing chemical dosing pit (hydrazine hydrate tank) at GTAB after demolition.

Based on site walkover observation and interview with site management, the Chemical Dosing Pit (Hydrazine Hydrate Tank) appeared to be well maintained. No signs of chemical leakage or spillage were observed. Moreover, the concrete containment bund surrounding the Chemical Dosing Pit (Hydrazine Hydrate Tank) prevents contamination from entering the ground beneath. Reportedly by site management, no historical chemical spillage or leakage incidents were occurred. The risk of hydrazine hydrate being released into the soil is very low. However, potential mechanical pump oil leakage as a result of long term usage of the mechanical pump of the dosing pit could not be ruled out. Due to the small footprint of mechanical pump, the extent of potential contamination is likely localised.

Therefore, one (1) sampling location is proposed at the bottom of the mechanical pump of Chemical Dosing Pit (Hydrazine Hydrate Tank) based on hotspot sampling approach to investigate the potential land contamination. Due to shallow excavation depth required for the new cable trenches, trial pit is recommended as site investigation (SI) method.

7.6.7 Other Facilities in GTAB

No signs of potential land contamination, including oil stain or colour stain, and no chemical storage were observed at the Turbo Block structure, miscellaneous gas tanks and cooling water pumps on G/F during the site walkover. No potential land contamination impacts were observed at the generator, generator coolers and lube oil coolers that were installed on 1/F and above floors.

Although minor excavation works down to 2.6m bgl will be undertaken for the demolition and reconstruction works at the Turbo Block structure, the chances of encountering contaminated materials under the Turbo Block structure is very low. Hence, no sampling location is required at the other facilities in GTAB.

7.6.8 Circulating Water Pipe Room

The Circulating Water Pipe Room only served to enclose the emerging section of two (2) circulating water pipes connected to the Condenser inside the GTAB. No current and historical land contamination activities were noted. Although deep excavation works down to 5m bgl will be

undertaken for the construction of New Staircase and Lift, the chances of encountering contaminated materials under the Circulating Water Pipe Room during the construction phase is very low. Therefore, no sampling location is proposed at the Circulating Water Pipe Room.

7.6.9 Miscellaneous Storage Shed

Based on the observation during the site walkover, approximately 20 empty chemical containers without secondary containers were placed in the vicinity of the Miscellaneous Storage Shed. The area of Miscellaneous Storage Shed is about 40 m^2. In addition, two black stains of about 1m^2 in total were observed on the ground of the shed's entrance. The potential land contamination from fuel or chemical leakage is likely. Considering the small footprint of black stains observed onsite, the extent of potential contamination is likely localised.

Therefore, one (1) sampling location is proposed at the shed entrance based on hotspot sampling approach to investigate the potential contamination at the black stains.

7.7 Site Investigation Programme

A SI plan was proposed in the CAP provided in ***Appendix 7A*** to assess the potential contamination in the hotspots locations of Project site.

Details of the proposed SI plan are summarised in ***Table 7.3***. The proposed sampling locations are presented in ***Figure 7.2***. Since the Project site area is still in use at the time of preparing this EIA, the proposed sampling locations are not accessible at the moment. SI and sampling shall be carried out when the proposed sampling locations are available after the demolition stage.

During the demolition stage, a Land Contamination Specialist shall oversee the removal / demolition process and record any new visual signs of potential contamination such as oil leakage or oil stains. The Land Contamination Specialist shall also review the need of additional sampling to capture potential contamination observed during the demolition stage.

Table 7.3 Summary of SI Plan

Potentially Contaminated Area	Sampling Location ID	Proposed Coordinates [a]	RBRGs Land Use Scenario	Proposed Testing Parameters	Soil Sampling Depths (m bgl)	Groundwater Sampling Depths (m bgl)
Lube Oil Tank area	BH1	E: 828818.021 N: 808678.132	Industrial	Metals [b], PCRs [c], VOCs [d], SVOCs [e]	Manual excavation of Inspection Pit (0-1.5m bgl): ■ To collect disturbed sample at 0.5m bgl Rotary Drilling of boreholes (1.5-7.0m 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 2m below static groundwater level, whichever shallower. To collect undisturbed soil samples at 3.0 m and 6.0 m bgl	Collect one (1) groundwater sample at static groundwater level, if groundwater is encountered before end of borehole.
BSGT	BH2	E:828699.830 N:808748.382	Industrial	Metals [b] PCRs [c], VOCs [d] , SVOCs [e]		
	BH3	E:828702.277 N:808740.643	Industrial	Metals [b] PCRs [c], VOCs [d] , SVOCs [e]		
Miscellaneous Storage Shed Entrance	BH4	E:828699.301 N:808729.200	Industrial	Metals [b] PCRs [c], VOCs [d], SVOCs [e]		
Mechanical Pump of Chemical Dosing Pit (Hydrazine Hydrate Tank)	TP1	E: 828922.015 N: 808675.576	Industrial	Metals [b] PCRs [c], VOCs [d], SVOCs [e]	Manual excavation of trial pit (0-2.0m bgl): ■ To collect disturbed sample at 0.5m, 1.0m and 2.0m bgl	No groundwater sampling is required as the excavation depth of trial pit is shallower than the anticipated groundwater table at 3.85m 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: For soil: Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Bis-(2-ethylhexyl)phthalate, Chrysene, Dibenz(a,h)anthracene, Fluoranthene, Fluorene, Hexachlorobenzene, Indeno(1,2,3cd)pyrene, Naphthalene, Phenanthrene, Phenol and Pyrene.
For groundwater: Acenaphthylene, Acenaphthene, Anthracene, Benzo(b)fluoranthene, Chrysene, Fluoranthene, Fluorene, Hexachlorobenzene, Naphthalene, Phenanthrene and Pyrene.

7.8 Impact Evaluation

Based on the site appraisal findings, only four (4) areas, i.e. Lube Oil Tank area, BSGT, Miscellaneous Storage Shed Entrance, and Mechanical Pump of Chemical Dosing Pit (Hydrazine Hydrate Tank) were identified as potential land contamination hotspots. The land contamination issues are considered surmountable due to the following reasons as discussed below.

(1) Localised contamination in the identified hotspots:

Based on the site appraisal, these potential contamination hotspots have small footprint in general. These areas are typically affected by potential contaminating activities such as small scale of fuel or chemical storage. Therefore, it is anticipated that the extent of land contamination, if any, would be localised.

(2) Chemical of Concerns (COCs) identified are treatable with existing remediation techniques:

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.

In addition, the soil contaminated with the abovementioned COCs had successfully been remediated in Hong Kong using proven remediation techniques. Notable local remediation projects include the following:

- 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.

Provided that the soil and groundwater contamination identified during the SI, if any, are properly treated using the appropriate remediation techniques in accordance with the approved Remediation Action Plan (RAP), adverse land contamination impacts associated with the Project is not expected.

7.9 Mitigation Measures

As adverse land contamination impacts associated with the Project is not expected, no mitigation measures specific to the Project are recommended.

However, a number of recommendations as discussed in the following sub-sections should be followed during the demolition and construction phases of the Project in order to minimise the risk of land contamination.

7.9.1 Handling and Disposal Arrangement of Removed Diesel / Petroleum Products and Spill Prevention during Demolition

Prior to commencement of demolition works in the Project site, the leftover diesel or other petroleum products in the equipment to be demolished shall be removed as much as possible. The removed diesel and other petroleum products are considered as chemical waste and are controlled under the *Waste Disposal (Chemical Waste)(General) Regulation*. The demolition contractor who will generate the chemical waste or cause it to be produced should register with the EPD as a chemical waste producer. Removed diesel and petroleum products shall be labelled and stored in accordance with the requirement stipulated in the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* issued by EPD. The removed petrol and petroleum products are required to be collected by licensed chemical waste collector for disposal. Trip tickets system shall be implemented during the collection and disposal of removed petrol and diesel.

7.9.2 Good Housekeeping Practices

During demolition and construction phases, the following good housekeeping practices shall be implemented to ensure that risk of ground contamination as a result of oil spills or leaks is kept to a practical minimum:

- Regular visual inspections to detect any early signs of fuel leakage prior to demolition;
- Provision of impermeable lining or absorbent materials to contain leaks;
- Minimise the chemical stock within the Project site, only store the amount of chemicals needed;
- Designated chemical/ chemical waste storage shall be established on concrete paved ground as far as practicable;
- Provision of secondary containment for the temporary storage of removed diesel or petroleum products, demolished structures and pipes;
- Provision of spill control materials and equipment;
- Conduct regular maintenance and inspection on plants and equipment, particularly those involve the use of fuel, hydraulic oil or any sort of chemicals; and
- Divert rainfall and surface run-off around construction areas.

7.10 Environmental Monitoring and Audit

To ensure the recommendations discussed in ***Section 7.9*** are properly implemented, regular site inspections should be carried out during the demolition and construction phases of the Project.

7.11 Conclusion

Based on the site appraisal findings, Lube Oil Tank area, BSGT, Chemical Dosing Pit (Hydrazine Hydrate Tank) and Miscellaneous Storage Shed are considered as the potential land contamination hotspots within the Project site. Five (5) sampling locations (BH 1 to BH4 and TP1) are proposed for SI to collect soil and groundwater samples for laboratory testing.

Since the Project site is still under active operation at the time of preparing this EIA, the proposed sampling locations are not accessible at the moment. SI and sampling shall be carried out when the proposed sampling locations are available after the demolition stage.

During the demolition stage, a Land Contamination Specialist shall oversee the removal / demolition process and record any new visual signs of potential contamination such as oil leakage or oil stains. The Land Contamination Specialist shall also review the need of additional sampling to capture potential contamination observed during the demolition stage.

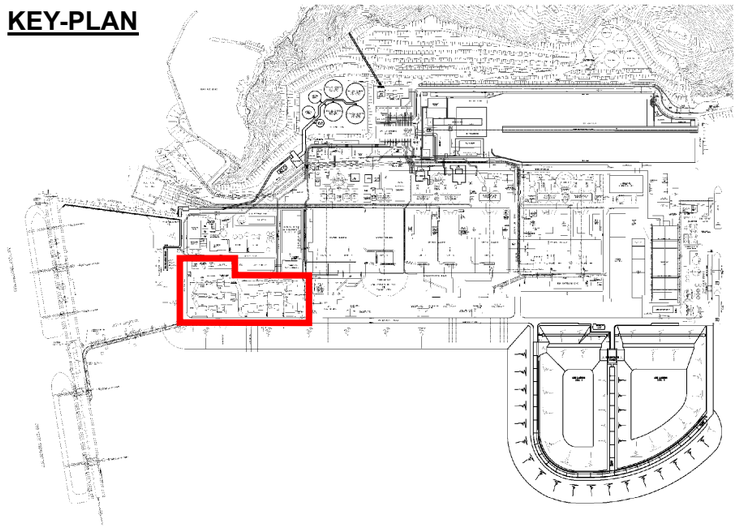
Provided that the soil and groundwater contamination identified during the SI, if any, are properly treated using the appropriate remediation techniques in accordance with the approved Remediation Action Plan (RAP), adverse land contamination impacts associated with the Project is not expected.

Upon completion of the remediation works (if necessary), a Remediation Report (RR) will be prepared and submitted to EPD for approval. No construction works within the contaminated area should be carried out prior to the approval of the RR by EPD.

Legend

- Gas Turbine Compound
- Gas Turbines (GT2, GT3, GT4, GT57, GT6)
- Black Start Gas Turbine
- Chemical Dosing Pit (Hydrazine Hydrate Tank)
- Lube Oil Tank area
- Main Oil Tank area in GT57 Auxiliary Building
- Miscellaneous Storage Shed
- New Staircase and Lift
- New Cable Trenches for the New OCGTs

KEY-PLAN



808 860.2 N
NEUTRALIZATION BASIN No. 1
EFFLUENT TREATMENT PLANT
CONTROL ROOM
No. 3 SEWAGE TREATMENT PLANT
T2
TRANSFORMER
D. G. STORE
HYDROGEN GENERATING PLANT
GAS TURBINE PLANT D/M STORAGE TANK FOR WATER INJECTION
4 Nos. R. F. W. TANK
NEUTRALIZATION BASIN No.2
NEUTRALIZATION BASIN No.3
STAND-BY
No. 2 SEWAGE TREATMENT PLANT
No. 2 DEMIN.
No. 1 DEMIN.
CONTROL ROOM No. 2
CONTROL ROOM No. 1
REMOTE CONTROL PLATFORM
OIL INTERCEPTOR
808 785 N
AMENITY ROAD
808 777.7 N
WEST HEAVY UNLOADING AREA
INTERBUS TX. (OUTDOOR)
GAS TURBINE 132Kv SWITCHING STATION
INTERBUS TX. (OUTDOOR)
GAS TURBINE EQUIPMENT BUILDING
G.S.S. BUILDING
AMENITY BUILDING (LAMMA CANTEEN)
FOOT BRIDGE
TRAINING & WORKSHOP BUILDING
UNIT 1
BLACK START GENERATOR
GAS TURBINE
AIR COOLER
GENERATOR COOLING WATER COOLER
GT4
UNIT 4
GENERATOR TRANSFORMER
EXHAUST SILENCER
LUBE OIL COOLER
GT3
TRANSFORMER COOLING WATER COOLER
GT2
UNIT 2
GT57 (Unit 7)
GT6
GT57 (Unit 5)
CHIMNEY
GT AUXILIARY BUILDING
808 740.2 N
GT57 & COAL JETTY ELECTRICAL EQUIPMENT BUILDING
NO. 1 C.W. INTAKE
JUNCTION TOWER T16
WEST WHARF ROAD
8730 N
8704 N
8678 N
8733 N
8707 N
8681 N
28719 E
28752 E
28776.5 E
28858 E
28891 E
28936.15 E
808670.5 E
CONCRETE APRON
N
Meteres
0
25
50

Figure 7.1

Project Location Map

File: T:\GIS\CONTRACT\0576490\mxd\0576490_Project_Location_Map.mxd
Date: 15/7/2021

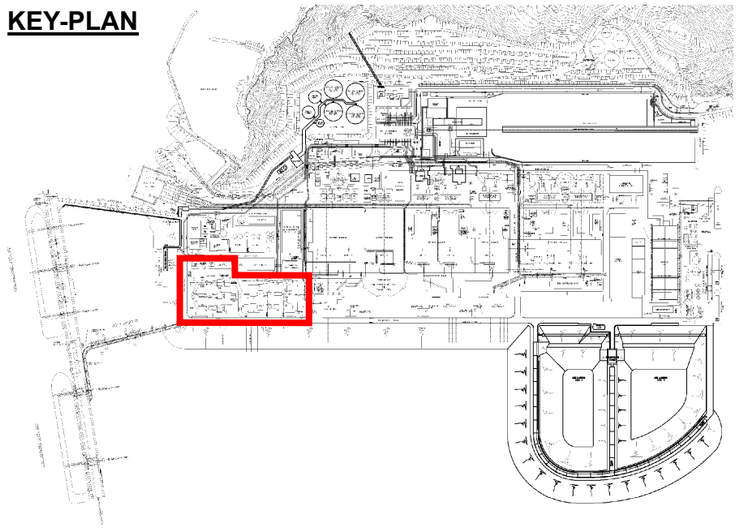
Environmental Resources Management

ERM

Legend

- Proposed Sampling Location
- Proposed Sampling Location (Trial Pit)
- Gas Turbine Compound
- Gas Turbines (GT2, GT3, GT4, GT57, GT6)
- Black Start Gas Turbine
- Chemical Dosing Pit (Hydrazine Hydrate Tank)
- Lube Oil Tank area
- Main Oil Tank area in GT57 Auxiliary Building
- Miscellaneous Storage Shed
- New Staircase and Lift
- New Cable Trenches for the New OCGT Units

KEY-PLAN



808 860.2 N
NEUTRALIZATION BASIN No. 1
EFFLUENT TREATMENT PLANT
CONTROL ROOM
No. 3 SEWAGE TREATMENT PLANT
TRANSFORMER
T2
D. G. STORE
HYDROGEN GENERATING PLANT
GAS TURBINE PLANT D/M STORAGE TANK FOR WATER INJECTION
4 Nos. R. F. W. TANK
NEUTRALIZATION BASIN No.2
NEUTRALIZATION BASIN No.3
STAND-BY
OIL INTERCEPTOR
No. 2 SEWAGE TREATMENT PLANT
No. 2 DEMIN.
CONTROL ROOM No. 2
No. 1 DEMIN.
CONTROL ROOM No. 1
808 785 N
AMENITY ROAD
FOOT BRIDGE
UNIT 1
808 777.7 N
WEST HEAVY UNLOADING AREA
INTERBUS TX. (OUTDOOR)
GAS TURBINE 132Kv SWITCHING STATION
INTERBUS TX. (OUTDOOR)
GAS TURBINE EQUIPMENT BUILDING
G.S.S. BUILDING
AMENITY BUILDING (LAMMA CANTEEN)
FOOT BRIDGE
TRAINING & WORKSHOP BUILDING
BLACK START GENERATOR
BH2
BH3
BH4
730 N
GAS TURBINE
AIR COOLER
GENERATOR COOLING WATER COOLER
GT4
UNIT 4
GENERATOR TRANSFORMER
EXHAUST SILENCER
LUBE OIL COOLER
GT3
TRANSFORMER COOLING WATER COOLER
GT2
UNIT 2
8704 N
8678 N
28719 E
23752 E
23778.5 E
WEST WHARF ROAD
GT57 (Unit 7)
8733 N
GT6
CHIMNEY
8707 N
GT AUXILIARY BUILDING
BH1
GT57 (Unit 5)
8681 N
TP1
808670.5 E
28936.15 E
28858 E
28891 E
808 740.2 N
GT57 & COAL JETTY ELECTRICAL EQUIPMENT BUILDING
JUNCTION TOWER T16
NO. 1 C.W. INTAKE
N
Meteres
0
25
50

Figure 7.2

Proposed Sampling Location

File: T:\GIS\CONTRACT\0576490\mxd\0576490_Proposed_Sampling_Location.mxd
Date: 15/6/2021

Environmental Resources Management

ERM

APPENDIX 7A CONTAMINATION ASSESSMENT PLAN

CONTENTS

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Acronyms and Abbreviations

Name	Description
CAP	Contamination Assessment Plan
CAR/RAP	Contamination Assessment Report / Remediation Action Plan
DEP	Director of Environmental Protection
DG	Dangerous Goods
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EPD	Environmental Protection Department
ERR	Environmental Review Report
FSD	Fire Service Department
GEO	Geotechnical Engineering Office
GI	Ground Investigation
GT	Gas Turbines
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
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
SVOCs	Semi Volatile Organic Compounds
WPCO	Water Pollution Control Ordinance
WDO	Waste Disposal Ordinance

1. INTRODUCTION

1.1 Background

The Hongkong Electric Co., Ltd (HK Electric) operates the Lamma Power Station (LPS) with a number of power generating units currently in active operation, including six (6) coal-fired units (i.e. L2, L4 to L8), three (3) gas-fired combined cycle gas turbine units (CCGTs) (i.e. L9, L10 and GT57) and five (5) oil-fired open cycle gas turbine units (OCGTs) (i.e. GT1 to GT4, GT6).

GT2, GT3, GT4, GT57 and GT6, with a total power generation capacity of 845MW, are located within the Gas Turbine Compound (GT Compound or Project Site) of LPS (see *Figure 7A.1*) and are approaching the end of their service life. Therefore, HK Electric proposes to decommission and demolish these units sequentially from 2022 onwards, and to construct and commission up to four new OCGTs with a capacity of up to 130 MW each (i.e. the proposed GT8, GT9, GT10 and GT11, with a total power generation capacity of 520 MW) within the GT Compound (hereafter referred to as "the Project") in order to maintain the peak-lopping and emergency operational requirements.

According to the latest information provided from HK Electric, the existing GT2, GT3, GT4, GT57 and GT6, transformers and generator coolers associated with existing GTs, and its auxiliaries including one (1) Black Start Gas Turbine and one (1) aboveground lube oil tank, will be demolished for the installation of GT8, GT9, GT10 and GT11. The existing foundation piles and concrete structure will be reused to support the new OCGT units, therefore no corresponding excavation works will be required for the installation of new units.

The existing GT57 Auxiliary Building will be converted to a new 132kV switching station with new 132kV cables and associated cable trenches for the new OCGT units when it is available for modification after retirement of GT57. The construction of new 132kV cable trenches for the new OCGTs will require minor excavation down to 1.8m below ground level (m bgl). In addition, a New Staircase and Lift will be constructed at the immediate east of existing GT57 Auxiliary Building which is currently a Circulating Water Pipe Room. This construction will require excavation down to 5m bgl.

The existing stacks (80 m tall) serving the existing OCGTs will be retained for the new units. Other existing building structures and equipment, including Gas Turbine 132kV Switching Station and Gas Turbine Equipment Building, will be retained.

In general, the demolition of abovementioned structures and installation of new OCGTs will not involve earthworks, except minor excavation (down to about 1.8m bgl) required for associated new cable trenches for the new OCGTs. The work areas requiring structure removal/demolition and minor excavation are highlighted in *Figure 7A.1*.

1.2 Objectives of the CAP

The Contamination Assessment Plan (CAP) aims to identify the presence of potential land contamination sites within the Project area and determine whether potential land contamination sites, if any, are within the boundaries of work areas. The land history of the Project area of the Site in relation to possible contamination will be reviewed in the CAP. 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 desk top 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).

1.3 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 Appendices:

Annex A	Dangerous Goods License Record provided by Fire Service Department
Annex B	Previous Ground Investigation Record
Annex C	Site Walkover Checklists
Annex D	Site Walkover Photos
Annex E	Referenced Aerial Photographs
Annex F	Schematic Drawing of Groundwater Monitoring Well
Annex G	Risk-Based Remediation Goals

2. ENVIRONMENTAL LEGISLATION, STANDARDS, GUIDELINES AND EVALUATION CRITERIA

2.1 Environmental Legislation, Standards and Guidelines

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

- *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 Land* (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:

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

2.2 Selection of RBRGs Land Use Scenario

In accordance with Section 2 of the RBRGs Guidance Note, the Project Site'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.

As the future land use of the Project Site will remain as industrial use for the GT operation, the RBRGs conceptual site model under industrial land use scenarios will be adopted. Therefore, the RBRGs for industrial land use shall be adopted in this Project. The adopted RBRGs for soil and groundwater are presented in *Table 2.1*.

Table 2.1 RBRGs for Industrial Land Use for Soil and Groundwater & Soil Saturation Limit / Solubility Limit

Chemical	RBRGs for Soil		RBRGs for Groundwater	
	Industrial (mg/kg)	Soil Saturation Limit (C_{sat}) (mg/kg)	Industrial (mg/L)	Solubility Limit (mg/L)
Metals				
Lead	2,290	-	-	-
Antimony	261	-	-	-
Arsenic	196	-	-	-
Barium	1.00E+04*	-	-	-
Cadmium	653	-	-	-
Cobalt	1.00E+04*	-	-	-
Copper	1.00E+04*	-	-	-
Manganese	1.00E+04*	-	-	-
Molybdenum	3,260	-	-	-
Nickel	1.00E+04*	-	-	-
Tin	1.00E+04*	-	-	-
Zinc	1.00E+04*	-	-	-

Chemical	RBRGs for Soil		RBRGs for Groundwater	
	Industrial (mg/kg)	Soil Saturation Limit (C_{sat}) (mg/kg)	Industrial (mg/L)	Solubility Limit (mg/L)
Chromium III	1.00E+04*	-	-	-
Chromium VI	1,960	-	-	-
Mercury	38.4	-	6.79	-
Petroleum Carbon Ranges (PCRs)				
C6 - C8	1.00E+04*	1,000	1,150	5.23
C9 - C16	1.00E+04*	3,000	9,980	2.8
C17 - C35	1.00E+04*	5,000	178	2.8
Volatile Organic Compounds (VOCs)				
Acetone	1.00E+04*	***	1.00E+04*	***
Benzene	9.21	336	54	1,750
Bromodichloromethane	2.85	1,030	26.2	6,740
2-Butanone	1.00E+04*	***	1.00E+04*	***
Chloroform	1.54	1,100	11.3	7,920
Ethylbenzene	8,240	138	1.00E+04*	169
Methyl tert-Butyl Ether	70.1	2,380	1,810	***
Methylene Chloride	13.9	921	224	***
Styrene	1.00E+04*	497	1.00E+04*	310
Tetrachloroethene	0.777	97.1	2.95	200
Toluene	1.00E+04*	235	1.00E+04*	526
Trichloroethene	5.68	488	14.2	1,100
Xylenes (Total)	1,230	150	1,570	175
Semi Volatile Organic Compounds (SVOCs)				
Acenaphthene	1.00E+04*	60.2	1.00E+04*	4.24
Acenaphthylene	1.00E+04*	19.8	1.00E+04*	3.93
Anthracene	1.00E+04*	2.56	1.00E+04*	0.0434
Benzo(a)anthracene	91.8	-	-	-
Benzo(a)pyrene	9.18	-	-	-
Benzo(b)fluoranthene	17.8	-	7.53	0.0015
Benzo(g,h,i)perylene	1.00E+04*	-	-	-
Benzo(k)fluoranthene	918	-	-	-
bis-(2-Ethylhexyl)phthalate	91.8	-	-	-
Chrysene	1,140	-	812	0.0016
Dibenzo(a,h)anthracene	9.18	-	-	-
Fluoranthene	1.00E+04*	-	1.00E+04*	0.206
Fluorene	1.00E+04*	54.7	1.00E+04*	1.98
Hexachlorobenzene	0.582	-	0.695	6.2
Indeno(1,2,3-cd)pyrene	91.8	-	-	-
Naphthalene	453	125	862	31
Phenanthrene	1.00E+04*	28	1.00E+04*	1
Phenol	1.00E+04*	7,260	-	-
Pyrene	1.00E+04*	-	1.00E+04*	0.135
Dioxins / PCBs				
Dioxins (I-TEQ)	0.005	-	-	-
PCBs	0.748	-	5.1100	0.031
Other Inorganic Compounds				
Cyanide, free	1.00E+04*	-	-	-
Organometallics				

Chemical	RBRGs for Soil		RBRGs for Groundwater	
	Industrial (mg/kg)	Soil Saturation Limit (C_{sat}) (mg/kg)	Industrial (mg/L)	Solubility Limit (mg/L)
TBTO	196	-	-	-

Notes:

* indicates a 'ceiling limit' concentration.

*** indicates that the C_{sat} value / solubility limit exceeds the 'ceiling limit' therefore the RBRG applies.

3. SITE APPRAISAL

The site appraisal comprises a description of general site setting; and a 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 Site and the adjacent areas.

3.1 General Site Setting

The Project Site is situated within the south-western portion of LPS. The whole Project Site is concrete paved. The existing GT2, GT3, GT4, GT57 and GT6 were mounted on foundation piles and concrete structures with support from external steel reinforcement. Various pipes, including fuel and cooling water supplies, connected to the GTs were laid within concrete trenches. A summary of the key equipment and structures within the Project Site are as follows:

Table 3.1 Key Structures and Equipment within Project Site

Item to be demolished / removed	Items to be retained
■ Six (6) GTs (GT2, GT3, GT4, GT57-Unit 5, GT57-Unit 7 and GT6) and its auxiliaries (generator coolers, transformers) ; ■ Black Start Gas Turbine for GTs; ■ Lube Oil Tank; ■ Equipment (G/F: main oil tank, chemical dosing pit, miscellaneous gas tanks, cooling water pumps and circulating water pipe room; 1/F and above floors: generator, generator coolers and lube oil coolers) at GT57 Auxiliary Building; and ■ Miscellaneous Storage Shed	■ Foundation piles and concrete structures of existing GTs; ■ Pipe trenches; ■ Six (6) stacks; ■ GT57 Auxiliary Building; ■ Gas Turbine Equipment Building and its equipment; and ■ Gas Turbine 132kV Switching Station and its equipment

Surrounding land uses of the neighbouring environment of the assessment areas are summarised as follows:

North: Laundry Building, Amenity Building and Vehicle access road. Further north is an area occupied by No.1 and No.2 Demin, Sewage Treatment Plant and Neutralisation Basins.

East: Vehicle access road. Further east is GT57 and Jetty Electrical Equipment Building and Cold Water Intake.

South: Vehicle Access Road. Further south is the Main Bridge and East Bridge connected to the Lamma Extension Island.

West: Vehicle Access Road. Further West is the seawall and West Heavy Unloading Area.

Figure 7A.2 presents the location of the Project Site and the surrounding structures.

3.2 Review of Historical Spillage and Leakage Record

Enquiries were made to the EPD and the Fire Services Department (FSD) on chemical waste producer records and historical spillage and leakage records of the corresponding potential contaminated sites identified in this CAP. A visit to the Chemical Waste Collection Licensing Section of the EPD Territorial Control Office was arranged and information related to Chemical Waste Producer (CWP) registered for the Site was extracted.

A total of 18 actives chemical waste producers were registered within Lamma Power Station. However, upon further confirmation with HKE, these chemical waste producers and their activities lead to chemical waste generation were not located within the Project Site. Reportedly, chemical

waste generated within the Project Site, if any, were collected and temporarily stored in designated chemical waste storage area outside of the Project Site.

An information request was sent to FSD regarding any historical Dangerous Goods (DG) licence records and incident records within the Site. According to FSD letter correspondence dated 5 February 2021, a total of 231 licensed DG stores were identified within the LPS. In addition, no incident record was found by FSD. Subsequently, further enquiries were made to HKE regarding the actual number of licensed DG stores located within the Project Site. HKE confirmed that only one (1) aboveground licensed DG store, i.e. Cat.4: Chemical Dosing Pit (Hydrazine Hydrate Tank), was located within the Project Site. Details of the licences DG store within the Project Site are presented in *Table 3.2*. Information provided by FSD is included in *Annex A*.

Table 3.2 Details of the Licensed DG Store within Project Site

DG License No.	Store Description	Location	Type of DG	Quantity
19028	Cat. 4: Chemical Dosing Pit (Hydrazine Hydrate Tank)	G/F, GT57 Combined Cycle Unit, LPS	Hydrazine Hydrate	710 litres

3.3 (Hydro) Geology and Underground Soil Profile

Previous Ground Investigation (GI) records within the Site obtained from Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD) were reviewed. According to the drillhole records for *The Hong Kong Electric Co. Ltd Lamma Power Station Unit 7 and Unit 8, Stage III (Site Investigation Works)*, the geological strata encountered were in general a thick fill materials of soil and boulders (from 0 to 16.5 m bgl). The fill material layer was underlain by marine deposit if light brown and whitish grey medium to coarse sand (from 16.5 to 24.0 m bgl). Beneath the marine deposit layer is alluvium of firm light yellowish brown silty coarse sand with some gravel (from 24.0 to 45.45m bgl). The approximate groundwater level was 3.85m bgl.

The groundwater flow of the area where the Project Site locates is estimated based on the groundwater levels information in the vicinity of the Project Site obtained from the previous GI records. The location of the closest surface water body is also taken into consideration. The identified groundwater levels at the north of the Project Site are generally higher than the south of the Project Site. In addition, the north of the Project Site is a range of hills and the immediate east, south and west of the Project Site are shorelines. As groundwater always flows from high points to low points by gravity, therefore the direction of groundwater flow of the Project Site is potentially from the north towards the south.

The actual groundwater flow is subject to change based on the results of the groundwater levels measured during the SI. The groundwater flow of the Site is also subject to the influence by the underground structures such as building foundations and underground trenches, etc.

Copies of the previous borehole record are attached in *Annex B.*

3.4 Review of Current Land Use

Site walkover and site management interview were conducted on 5 January 2021 to observe the Project Site conditions. “Standard Form 3.1 – Current Use” in accordance with the RBRGs Guidance Manual is included as *Table 3.3*. *Annex C* presents the Site Walkover Checklist. *Annex D* presents the selected site walkover photos.

3.5 Review of Past Land Use

A review of past land uses at the Project Site were conducted by reviewing the aerial photographs in the years of 1978, 1985, 1991, 1995, 1999, 2002 and 2019. The aerial photographs were obtained from the Surveys and Mapping Office of the Lands Department. Key changes of site setting observed within the Project Site are summarised in *Table 3.3 and 3.4* using the 'Standard Form 3.1 – Current Use' and 'Standard Form 3.2 – Past Use' in accordance with the RBRGs Guidance Manual. The referenced aerial photographs are attached in *Annex E*.

Table 3.3 Standard Form 3.1 Summary of On-Site Land Use – Current Use

Site		Type of Existing Facility/ Business	On-site Property Land Use	Date Began/ Period	Description of Site Walkovers and Interviews Findings	Owner or Occupier	Approximate Size of On-site Property (m^2)	Off-site Property Affected?
GT Compound	General	Industrial	Power Generation	1989	The outdoor portions of whole Project area, including vehicle access roads and outdoor area, were concrete paved and in good condition. No signs of oil stains or chemical stains were noted along the access roads as well as the proposed new cable trenches during the site walkover. Reportedly by site management, no historical fuel/ chemical spillage were occurred in the Project area.	HK Electric	31,000	No
	Six (6) GTs and its auxiliaries	Industrial	Power Generation	1989 / 2002	Each GT was mounted on foundation pile and concrete structure with support from external steel reinforcement. Each GT contained one (1) lube oil tank installed at about 3m aboveground. No underground storage tank (UST) was installed. Each GT's auxiliaries, including transformer and generator cooler, were installed side by side to the GT. Each transformer was constructed within a concrete containment bund filled with pebbles inside an isolated area. No signs of oil stains were observed. Reportedly, no historical leakage or spillage incidents were recorded. Each generator cooler was supported by metal structure and mounted on concrete footings. The operation of generator coolers did not require use of fuel and chemicals. The detailed locations are indicated in *Figure 7A.1*. During the site walkover, no significant signs of oil stain and leakage or spillage marks were	HK Electric	9,600 [(a)]	No

Site		Type of Existing Facility/ Business	On-site Property Land Use	Date Began/ Period	Description of Site Walkovers and Interviews Findings	Owner or Occupier	Approximate Size of On-site Property (m^2)	Off-site Property Affected?
					observed on the floor of each GT and its auxiliaries. No signs of cracks were noted on the floor. Lube oil pipes and fuel pipes connected to the GTs were observed in good conditions with no signs of seepage or corrosion. Six GT transformers were observed to be well maintained. No significant signs of stains or odour were noted during the site walkover. Reportedly by the site management, the composition of transformer oil used was free of PCBs. Reportedly by site management, no historical fuel/ chemical spillage or leakage were occurred at the six (6) GTs and its auxiliaries.			
	Lube Oil Tank area	Industrial	Power Generation	1989	A lube oil tank of about 30,000L capacity adjacent to GT5 was installed above two (2) concrete footings and placed within a concrete bund. During the site walkover, minor black colour deposits ($1m^2$) were noted at the bottom of the lube oil tank footings and under several pipe joints. The black deposits were in powder / granular form with no signs petroleum odour or colour. Reportedly by the site management, no lube oil leakage incident was recorded in its operation history. As a result, the black deposits were likely caused by the erosion of screws / steel bars in the concrete footings of the lube oil tank.	HK Electric	100	No
	Black Start Gas Turbine	Industrial	Power Generation	1989	The Black Start Gas Turbine comprised one (1) diesel generator and three (3) air compressor units. No onsite diesel tank was equipped with the Black Start Gas Turbine. Reportedly, diesel was supplied from an offsite source located	HK Electric	200	No

Site		Type of Existing Facility/ Business	On-site Property Land Use	Date Began/ Period	Description of Site Walkovers and Interviews Findings	Owner or Occupier	Approximate Size of On-site Property (m^2)	Off-site Property Affected?
					300m north of the Project Site to the Black Start Gas Turbine. Minor fuel seepage from the diesel supply pipes was observed to be absorbed by pipe wrapping materials. No signs of oil leaks on ground were noted during the site walkover. In addition, minor oil stain was observed in one of the air compressor units. The concrete slabs supporting the Black Start Gas Turbine and air compressor units were intact.			
	GT57 Auxiliary Building	Industrial	Power Generation	1989	One (1) Main Oil Tank of about 30,000L was installed on the ground floor of this building in 2001 and was put into operation in 2003. The Main Oil Tank was constructed within a concrete bund. No signs of oil leakage or spillage stains were observed within the bunded area. Oil pipes were also observed in good condition without signs of seepage or corrosion. The main oil tank and its oil pipes have been maintained in good condition as they are located in an indoor environment and protected from extreme weather. No signs of corrosion or cracks were noted during the site walkover. Reportedly by site management, no historical fuel/ chemical spillage or leakage incidents were occurred at the Main Oil Tank. One (1) Chemical Dosing Pit (Hydrazine Hydrate Tank), which is also a licensed Cat.4 DG storage, was also installed on the ground floor of this building and it is equipped with mechanical pump for dosing operation. No signs of chemical leakage or spillage were observed during the site walkover. Reportedly by site management, no historical chemical	HK Electric	GT57 Auxiliary Building:1,320 Main oil tank area: 60 Chemical Dosing Pit (Hydrazine Hydrate Tank): 10 Circulating Water Pipe Room: 37	No

Site		Type of Existing Facility/ Business	On-site Property Land Use	Date Began/ Period	Description of Site Walkovers and Interviews Findings	Owner or Occupier	Approximate Size of On-site Property (m^2)	Off-site Property Affected?
					spillage or leakage incidents were occurred. However, the potential of mechanical pump oil leakage from the mechanical pump could not be ruled out. Immediate east to the GT57 Auxiliary Building is the Circulating Water Pipe Room. The emerging sections of two (2) circulating water pipes connected to the Condenser inside the GT57 Auxiliary Building were enclosed in this room. No signs of ground contamination was observed. No current and historical land contamination activities were noted. The rest of the ground floor was occupied by cooling water pumps and miscellaneous gas tanks. No chemical storage or signs of contaminations were observed during the site walkover. The generator, generator coolers, lube oil coolers were installed on 1/F and above floors. No potential land contamination impacts were observed.			
	Miscellaneous Storage Shed	Industrial	Power Generation	1989	Approximately 20 empty chemical containers without secondary containers were placed in the vicinity of the Miscellaneous Storage Shed. Several black stains of about $1m^2$ were observed on the ground of the shed's entrance.	HK Electric	40	No

Note:
(a) Refers to the cumulative areas of six (6) GTs and its auxiliaries' footprints.

Table 3.4 Standard Form 3.2 Summary of On-Site Land Use – Past Use

Site	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?
Existing Gas Turbine (GT) compound	Industrial	Undeveloped land built from reclamation	1970s to 1980s	The land where the Project Site is situated was previously the coastline of Lamma Island.	Unknown	-	No
		Vacant	1985	Reclamation for Lamma Power Station was completed between late 1970s and early 1980s. The Project Site was vacant.	HK Electric	-	No
		GT compound	1989	Construction of six (6) OCGTs, i.e. GT2 to GT7, was completed and its operation commissioned in 1989.	HK Electric	30,600	No
			2002 - present	Two (2) of the OCGTs, i.e. GT5 and GT7, were later converted into a CCGT, i.e. GT57, in 2002. Reportedly, no historical spillage and leakage incidents occurred during the conversion works in 2002. GT57 Auxiliary Building was constructed at the eastern boundary of the Project Site in early 2000s with the purpose of housing the steam turbine and the auxiliaries. The operation of GT compound remained unchanged since 2002 until present.	HK Electric	30,600	No

3.6 Review of Land Contamination Potential within the Project Site

Based on the site appraisal findings presented in *Section 3*, the Project Site are divided into different areas based on their types of structures and equipment installed to evaluate the likelihood and presence of potential land contamination hotspots, and the need of SI to assess potential land contamination impacts.

- General
- Six (6) GTs and its auxiliaries
- Lube Oil Tank area
- Black Start Gas Turbine
- Main Oil Tank area in GT57 Auxiliary Building
- Chemical Dosing Pit (Hydrazine Hydrate Tank) in GT57 Auxiliary Building
- Circulating Water Pipe Room
- Miscellaneous Storage Shed

3.6.1 General

According to the information provided by HK Electric, the demolition of abovementioned structures and installation of new OCGTs will not involve any forms of earthworks, such as ground breaking, trenching and excavation, except minor excavation (down to about 1.8m below ground level (m bgl)) required for associated new cable trenches for the new OCGTs.

Based on the site walkover observation, the outdoor portions of whole Project area, including vehicle access roads and outdoor area, was concrete paved and in good condition. No signs of oil stains or chemical stains were noted along the access roads as well as the alignment of proposed new cable trenches during the site walkover.

Although minor excavation works will be required for the construction of new 132kV cable trenches, the concrete paved surface of Project Area was observed to be in good condition. No historical land contaminations were identified. Therefore, the land contamination potential of the outdoor portions of Project area is unlikely in general and no sampling locations are required.

3.6.2 Six (6) GTs and its auxiliaries

No obvious signs of potential land contamination were noted at the six (6) GTs and its auxiliaries during the site walkover and review of its operation history.

Each GT was mounted on a concrete made foundation pile which provided a barrier to prevent any potential fuel leakage from entering the soil. Each transformer was constructed within a concrete containment bund filled with pebbles inside an isolated area, which prevents contamination from entering the ground beneath of the transformer. No signs of oil stains were observed. The composition of transformer oil used was reportedly free of PCBs. The generator coolers for GT did not require use of fuel and chemicals. Based on the site walkover and interview with site management, no historical fuel / or chemical spillage or leakage were occurred at the six (6) GTs and its auxiliaries.

Review of historical information indicated the operation in this area remained unchanged since its operation started in 1989, except the conversion works for OCGT (GT5 and GT7) to CCGT (GT57) in 2002. Reportedly, no historical spillage and leakage incidents occurred during the conversion works in 2002.

In addition, no excavation works will be required during demolition of GT structures and installation of new OCGTs.

Therefore, the overall land contamination potential at the six (6) GTs and its auxiliaries is considered unlikely. No sampling locations are required at the six (6) GTs and its auxiliaries.

3.6.3 Lube Oil Tank area

Based on the site observation and operation history of the lube oil tank, the black deposits were likely caused by erosion of screws / steel bars in the concrete footings of the lube oil tank and at the several pipe joints. The lube oil tank structure and its piping are also exposed to ambient environment, thus it could be damaged under extreme weather conditions over the years. Although no significant signs of potential land contamination were noted in the lube oil tank area, the potential land contamination risks as a result of long term usage and extreme weather impacts could not be ruled out. Considering the lube oil tank was installed within a concrete bund to contain any potential oil leakage or spillage, the extent of potential contamination is likely localised.

Therefore, one (1) sampling location is proposed at the centre of Lube Oil Tank area based on hotspot sampling approach to represent the overall land condition.

Since only lube oil was stored in this area, the key COCs selected are limited to metals, petroleum PCRs, VOCs and SVOCs.

3.6.4 Black Start Gas Turbine

Minor fuel seepage was noted from the diesel supply pipes. Minor oil stains was also observed in one of the air compressor units. The diesel supply pipes are also exposed to ambient environment, thus it could be damaged under extreme weather conditions over the years. Due to its long operation history and its direct exposure without physical protection, potential land contamination caused by the fuel leakage could not be ruled out. Since no significant oil stains were noted on the ground of the Black Start Gas Turbine, the extent of potential contamination is likely localised.

Therefore, two (2) sampling locations are proposed at Black Start Gas Turbine, i.e. the bottom of diesel generator and the bottom of an air compressor unit, based on the hotspot sampling approach to investigate the potential contamination.

Since the chemicals used in Black Start Gas Turbine are diesel and air compressor oil, the key COCs selected are limited to metals, PCRs, VOCs and SVOCs.

3.6.5 Main Oil Tank area in GT57 Auxiliary Building

No signs of potential land contamination, including oil stain or colour stain, were observed at the main oil tank area during the site walkover. According to the information provided by HK Electric, the Main Oil Tank was fabricated in 2001 and put into operation in 2003. The Main Oil Tank and its oil pipes have been maintained in good condition as they are located in an indoor environment. In addition, the concrete bund that contains the Main Oil Tank and its oil pipes prevents contamination from entering the ground beneath. No signs of corrosion or damages were noted at the tank structure and its oil pipes during the site walkover.

Therefore, the good condition of tank structure and oil pipes and the concrete bund indicated that there's a remote chance of historical oil leakage or spillage at the Main Oil Tank area. In addition, no excavation works will be required during demolition of main oil tank.

Hence, the land contamination potential is considered unlikely. No sampling locations are required at the Main Oil Tank Area.

3.6.6 Chemical Dosing Pit (Hydrazine Hydrate Tank) in GT57 Auxiliary Building

Minor excavation down to 1.8m bgl will be required for the construction of new cable trenches for the new OCGTs under the existing chemical dosing pit (hydrazine hydrate tank) at GT57 Auxiliary Building after demolition.

Based on site walkover observation and interview with site management, the Chemical Dosing Pit (Hydrazine Hydrate Tank) appeared to be well maintained. No signs of chemical leakage or spillage

were observed. Moreover, the concrete containment bund surrounding the Chemical Dosing Pit (Hydrazine Hydrate Tank) prevents contamination from entering the ground beneath. Reportedly by site management, no historical chemical spillage or leakage incidents were occurred. The risk of hydrazine hydrate being released into the soil is very low. However, potential mechanical pump oil leakage as a result of long term usage of the mechanical pump of the dosing pit could not be ruled out. Due to the small footprint of mechanical pump, the extent of potential contamination is likely localised.

Therefore, one (1) sampling location is proposed at the bottom of the mechanical pump of Chemical Dosing Pit (Hydrazine Hydrate Tank) based on hotspot sampling approach to investigate the potential land contamination. Due to shallow excavation depth required for the new cable trenches, trial pit is recommended as SI method.

The key COCs selected for chemical dosing pit (hydrazine hydrate tank) are metals, petroleum PCRs, VOCs and SVOCs.

3.6.7 Other Facilities in GT57 Auxiliary Building

No signs of potential land contamination, including oil stain or colour stain, and no chemical storage were observed at miscellaneous gas tanks and cooling water pumps on G/F during the site walkover. No potential land contamination impacts were observed at the generator, generator coolers and lube oil coolers that were installed on 1/F and above floors.

Hence, the land contamination potential is considered unlikely. No sampling locations are required at the other facilities in GT57 Auxiliary Building.

3.6.8 Circulating Water Pipe Room

The Circulating Water Pipe Room only served to enclose the emerging section of two (2) circulating water pipes connected to the Condenser inside the GT57 Auxiliary Building. No current and historical land contamination activities were noted. Although deep excavation works down to 5m bgl will be undertaken for the construction of New Staircase and Lift, the chances of encountering contaminated materials under the Circulating Water Pipe Room during the construction phase is very low. Therefore, no sampling location is proposed at the Circulating Water Pipe Room.

3.6.9 Miscellaneous Storage Shed

Based on the observation during the site walkover, approximately 20 empty chemical containers without secondary containers were placed in the vicinity of the Miscellaneous Storage Shed. The area of Miscellaneous Storage Shed is about 40 m^2. In addition, two black stains of about 1m^2 in total were observed on the ground of the shed's entrance. The potential land contamination from fuel or chemical leakage is likely. Considering the small footprint of black stains observed onsite, the extent of potential contamination is likely localised.

Therefore, one (1) sampling location is proposed at the shed entrance based on hotspot sampling approach to investigate the potential contamination at the black stains.

Since various chemicals could be stored in the Miscellaneous Storage Shed for a long period of time, the key COCs selected are metals, PCRs, VOCs and SVOCs.

4. SAMPLING AND TESTING PLAN

4.1 Proposed Sampling Locations

Based on the site appraisal findings and review of land contamination potentials in the Project Area presented in *Section 3*, SI is recommended at these hotspots locations to assess its potential land contamination impacts.

4.2 Sampling and Analysis Plan

Considering the information presented in *Section 3* and *Section 4.1*, a SI plan for the Project is presented in this section. The proposed sampling locations are determined and verified by the Land Contamination Specialist to provide a representation of the potential contamination impacts based on the site appraisal findings and observations made at the time of site walkover.

Since the Project Site area is still in use at the time of preparing this CAP, the proposed sampling locations are not accessible at the moment. SI and sampling shall be carried out when the proposed sampling locations are available after the demolition stage.

During the demolition stage, a Land Contamination Specialist shall oversee the removal / demolition process and record any new visual signs of potential contamination such as oil leakage or oil stains. The Land Contamination Specialist shall also review the need of additional sampling to capture potential contamination observed during the demolition stage.

Table 4.1 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 7A.2.*

Table 4.2 presents the laboratory analytical methods and reporting limits proposed for the soil and groundwater samples.

Table 4.1 Proposed Sampling and Analysis Plan

Potentially Contaminated Area	Sampling Location ID	Proposed Coordinates [a]	RBRGs Land Use Scenario	Proposed Testing Parameters	Soil Sampling	Groundwater
					Depths (m bgl)	Sampling Depths (m bgl)
Lube Oil Tank area	BH1	E: 828818.021 N: 808678.132	Industrial	Metals [b], PCRs [c], VOCs [d], SVOCs [e]	Manual excavation of Inspection Pit (0-1.5m bgl): ■ To collect disturbed sample at 0.5m bgl Rotary Drilling of boreholes (1.5-7.0m 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 2m below static groundwater level, whichever shallower. To collect undisturbed soil samples at 3.0 m and 6.0 m bgl	Collect one (1) groundwater sample at static groundwater level, if groundwater is encountered before end of borehole.
Black Start Gas Turbine	BH2	E:828699.830 N:808748.382	Industrial	Metals [b] PCRs [c], VOCs [d] , SVOCs [e]		
	BH3	E:828702.277 N:808740.643	Industrial	Metals [b] PCRs [c], VOCs [d] , SVOCs [e]		
Miscellaneous Storage Shed Entrance	BH4	E:828699.301 N:808729.200	Industrial	Metals [b] PCRs [c], VOCs [d], SVOCs [e]		
Mechanical Pump of Chemical Dosing Pit (Hydrazine Hydrate Tank)	TP1	E: 828922.015 N: 808675.576	Industrial	Metals [b] PCRs [c], VOCs [d], SVOCs [e]	Manual excavation of trial pit (0-2.0m bgl): ■ To collect disturbed sample at 0.5m, 1.0m and 2.0m bgl	No groundwater sampling is required as the excavation depth of trial pit is shallower than the anticipated groundwater table at 3.85m 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: For soil: Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Bis-(2-ethylhexyl)phthalate, Chrysene, Dibenz(a,h)anthracene, Fluoranthene, Fluorene, Hexachlorobenzene, Indeno(1,2,3cd)pyrene, Naphthalene, Phenanthrene, Phenol and Pyrene.
For groundwater: Acenaphthylene, Acenaphthene, Anthracene, Benzo(b)fluoranthene, Chrysene, Fluoranthene, Fluorene, Hexachlorobenzene, Naphthalene, Phenanthrene and Pyrene.

Table 4.2 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
PCRs [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]
Benzo(g,h,i)perylene	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)**
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.

5. SAMPLING METHODOLOGY

5.1 Overview

Trial pit excavation and borehole drilling are 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 a 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.

5.2 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 on-site supervision and management of the whole SI and sampling works; 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.

5.3 Trial Pit Excavation

The trial pit area shall be approximately 1.5m by 1.5m with a depth of 2.0m. The excavation shall proceed by hand digging in a series of shallow cuts, typically between 0.2 and 0.3m thickness. This will allow visual examination of the ground conditions, logging of the soil strata and the collection of soil samples.

For safety reasons, available utility service plans shall be checked and the surrounding area for visible covers/service runs. Utility scanning shall be performed at the proposed trial pit location to ensure clearance of underground structures prior to ground disturbance. Adequate measures, e.g. shoring or open cut method or equivalent, shall be considered to ensure the safety of the excavation workers.

Disturbed soil samples will be collected at the depth of 0.5m, 1.0m, 2.0m bgl from the trial pits. Where there are suspected signs of contamination, extra samples will be taken for laboratory analysis.

The excavated materials shall be positioned away from the immediate edge of the trial pit to avoid collapse. Upon completion, trial pit will be backfilled immediately in reverse order to which they are excavated.

5.4 Borehole Drilling

The borehole will be advanced by means of dry rotary drilling method, 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. 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 6.0 m bgl using the U76 / U100 core. Where there are suspected signs of contamination, extra samples will be taken for laboratory analysis.

5.5 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; and
- The thickness of any free product and groundwater if present at locations shall be measured with an interface probe.

5.6 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 F* presents a schematic drawing of groundwater monitoring well for reference.

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.

5.7 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 5.1* lists the recommended sample container types, sizes and preservation method.

Table 5.1 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 250ml 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)
SVOCs / PCRs	1 x 1,000 ml amber glass (no preserve)

5.8 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.

5.9 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 below.

- One (1) field duplicate sample (soil or groundwater) per twenty (20) soil and groundwater samples will be collected for full suite analysis;
- One (1) field blank will be collected for full suite analysis. The field blank will consist of laboratory supplied de-ionized water stored in the cooler boxes during sample shipment;
- One (1) equipment blank will be collected and analysed for metals to account for any potential cross-contamination due to drilling equipment. De-ionized water is poured onto decontaminated sampling equipment, and collected in appropriate sampling containers; and
- One (1) trip blank per trip will be analysed for VOCs to account for any potential cross-contamination.

5.10 Soil and Groundwater Sampling Summary

Based on the proposed sampling plan, the sampling quantity for soil, groundwater and QA/QC analysis are summarised in *Table 5.2*.

Table 5.2 Soil and Groundwater Sampling Summary

Sampling Location /Type		Sampling Depth (m bgl)	Estimated Maximum No. of Samples[a]	Proposed Testing Parameters
Soil and Groundwater				
Lube Oil Tank area	BH1	■ Disturbed sampling at 0.5m bgl ■ Undisturbed sampling at 3.0m and 6.0m bgl	■ Three (3) soil samples ■ One (1) water sample	Metals [b], PCRs [c], VOCs [d] SVOCs[e]

Sampling Location /Type		Sampling Depth (m bgl)	Estimated Maximum No. of Samples[a]	Proposed Testing Parameters
Black Start Gas Turbine	BH2, BH3	■ One groundwater sample at static groundwater level, if encountered during SI	■ Three (3) soil samples ■ One (1) water sample	Metals [b], PCRs [c], VOCs [d] SVOCs[e]
Miscellaneous Storage Shed Entrance	BH4		■ Three (3) soil samples ■ One (1) water sample	Metals [b], PCRs [c], VOCs [d] SVOCs[e]
Mechanical Pump of Chemical Dosing Pit (Hydrazine Hydrate Tank)	TP1	■ Disturbed sampling at 0.5m, 1.0m and 2.0m bgl	■ Three (3) soil samples	Metals [b], PCRs [c], VOCs [d] SVOCs[e]
QA/QC				
Duplicate Sample		Disturbed sampling at 0.5m bgl from proposed sampling location(s)	One (1) soil / groundwater sample per twenty (20) soil and groundwater samples	Metals [b], PCRs [c], VOCs [d] SVOCs[e]
Field Blank		NA	One (1)	Metals [b], PCRs [c], VOCs [d] SVOCs[e]
Equipment Blank		NA	One (1) per each set of drilling tools and rig	Metals [b]
Trip Blank		NA	One (1) per trip	VOCs [d]

Notes:
NA: Not applicable
(a) The estimated maximum no. of samples are for reference only and the exact no of soil and groundwater samples of each borehole should be decided by on-site Land Contamination Specialist subject to adjustment due to sampling constraints (e.g. presence of boulders) during the actual SI. Collect one (1) groundwater sample at static groundwater level, if groundwater is encountered before end of borehole.
(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: For soil: Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Bis-(2- ethylhexyl)phthalate, Chrysene, Dibenz(a,h)anthracene, Fluoranthene, Fluorene, Hexachlorobenzene, Indeno(1,2,3cd)pyrene, Naphthalene, Phenanthrene, Phenol and Pyrene.
For groundwater: Acenaphthylene, Acenaphthene, Anthracene, Benzo(b)fluoranthene, Chrysene, Fluoranthene, Fluorene, Hexachlorobenzene, Naphthalene, Phenanthrene and Pyrene.

5.11 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:

- 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.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Based on the site appraisal findings, Lube Oil Tank area, Black Start Gas Turbine, Chemical Dosing Pit (Hydrazine Hydrate Tank) and Miscellaneous Storage Shed are considered as the potential land contamination hotspots within the Project Site. Five (5) sampling locations (BH 1 to BH4 and TP1) are proposed for SI to collect soil and groundwater samples for laboratory testing.

Since the Project Site is still in under active operation at the time of preparing this CAP, the proposed sampling locations are not accessible at the moment. SI and sampling shall be carried out when the proposed sampling locations are available after the demolition stage.

During the demolition stage, a Land Contamination Specialist shall oversee the removal / demolition process and record any new visual signs of potential contamination such as oil leakage or oil stains. The Land Contamination Specialist shall also review the need of additional sampling to capture potential contamination observed during the demolition stage.

6.2 Way Forward and Recommendations for the Project

Sampling and testing works proposed in this CAP will be supervised by Land Contamination Specialist. Upon the receipt of laboratory testing reports, the results will be compared against the RBRGs for industrial land use (see *Annex G*) and a *Contamination Assessment Report* (CAR) will be prepared and submitted to EPD for agreement.

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. The RAP will be prepared to evaluate the needs of a remediation, and if so, identify appropriate remediation methods suitable for the site conditions and the contaminants requiring remediation.

The contamination extent (both horizontal and vertical) will be estimated in the RAP. The confirmation of such contamination extent, the implementation of remediation action, and the preparation of *Remediation Report* (RR) will be conducted according to the approved RAP by the demolition contractor.

Upon completion of remediation works (if necessary), a RR will be prepared and submitted to EPD to demonstrate that the decontamination works are carried out in accordance with the approved CAR and RAP prior to commencement of any proposed construction works for subsequent developments. No excavation works will be carried out before the agreement of RR by EPD.

6.3 Handling and Disposal Arrangement of Removed Diesel / Petroleum Products and Spill Prevention Measures during Demolition

Prior to commencement of demolition in the Project area, the leftover diesel or other petroleum products in the equipment to be demolished shall be removed as much as possible. The removed diesel and other petroleum products shall be considered as chemical waste and are controlled under the *Waste Disposal (Chemical Waste)(General) Regulation*.

The demolition contractor who will generate chemical waste or cause it to be produced should register with the EPD as a chemical waste producer.

Removed diesel and petroleum products shall be labelled and stored in accordance with the requirement stipulated in the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* issued by EPD.

The removed petrol and petroleum products are required to be collected by licensed chemical waste collector for disposal. Trip tickets system shall be implemented during the collection and disposal of removed petrol and diesel.

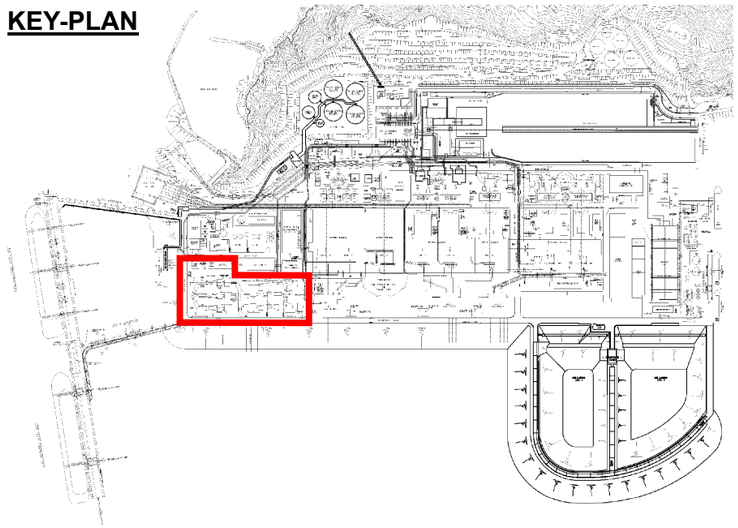
The following mitigations measures shall be implemented to ensure that risk of ground contamination as a result of oil spills or leaks is kept to a practical minimum:

- Regular visual inspections to detect any early signs of fuel leakage prior to demolition;
- Provision of impermeable lining or absorbent materials to contain leaks;
- Provision of secondary containment for the temporary storage of removed diesel or petroleum products, demolished structures and pipes; and
- Provision of spill control materials and equipment.

Legend

- Gas Turbine Compound
- Gas Turbines (GT2, GT3, GT4, GT57, GT6)
- Black Start Gas Turbine
- Chemical Dosing Pit (Hydrazine Hydrate Tank)
- Lube Oil Tank area
- Main Oil Tank area in GT57 Auxiliary Building
- Miscellaneous Storage Shed
- New Staircase and Lift
- New Cable Trenches for the New OCGTs

KEY-PLAN



808 860.2 N
NEUTRALIZATION BASIN No. 1
EFFLUENT TREATMENT PLANT
CONTROL ROOM
No. 3 SEWAGE TREATMENT PLANT
T2
TRANSFORMER
D. G. STORE
HYDROGEN GENERATING PLANT
GAS TURBINE PLANT D/M STORAGE TANK FOR WATER INJECTION
4 Nos. R. F. W. TANK
NEUTRALIZATION BASIN No.2
NEUTRALIZATION BASIN No.3
STAND-BY
No. 2 SEWAGE TREATMENT PLANT
No. 2 DEMIN.
No. 1 DEMIN.
CONTROL ROOM No. 2
CONTROL ROOM No. 1
REMOTE CONTROL PLATFORM
OIL INTERCEPTOR
808 785 N
AMENITY ROAD
808 777.7 N
WEST HEAVY UNLOADING AREA
INTERBUS TX. (OUTDOOR)
GAS TURBINE 132Kv SWITCHING STATION
INTERBUS TX. (OUTDOOR)
GAS TURBINE EQUIPMENT BUILDING
G.S.S. BUILDING
AMENITY BUILDING (LAMMA CANTEEN)
FOOT BRIDGE
TRAINING & WORKSHOP BUILDING
UNIT 1
BLACK START GENERATOR
GAS TURBINE
AIR COOLER
GENERATOR COOLING WATER COOLER
GT4
UNIT 4
GENERATOR TRANSFORMER
EXHAUST SILENCER
LUBE OIL COOLER
GT3
TRANSFORMER COOLING WATER COOLER
GT2
UNIT 2
GT57 (Unit 7)
GT6
GT57 (Unit 5)
CHIMNEY
GT AUXILIARY BUILDING
GT57 & COAL JETTY ELECTRICAL EQUIPMENT BUILDING
808 740.2 N
NO. 1 C.W. INTAKE
JUNCTION TOWER T16
WEST WHARF ROAD
8730 N
8704 N
8678 N
8733 N
8707 N
8681 N
28719 E
28752 E
28776.5 E
28858 E
28891 E
28936.15 E
808670.5 E
N
Meteres
0
25
50

Figure 7A.1

Project Location Map

File: T:\GIS\CONTRACT\0576490\mxd\0576490_Project_Location_Map.mxd
Date: 15/7/2021

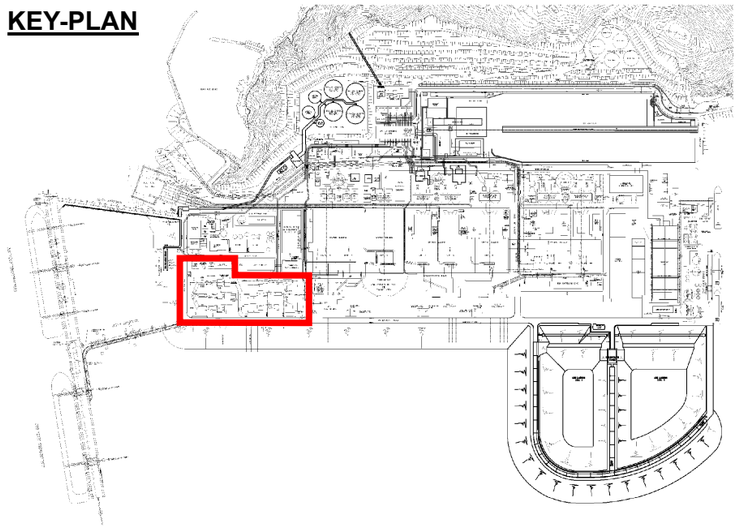
Environmental Resources Management

ERM

Legend

- Proposed Sampling Location
- Proposed Sampling Location (Trial Pit)
- Gas Turbine Compound
- Gas Turbines (GT2, GT3, GT4, GT57, GT6)
- Black Start Gas Turbine
- Chemical Dosing Pit (Hydrazine Hydrate Tank)
- Lube Oil Tank area
- Main Oil Tank area in GT57 Auxiliary Building
- Miscellaneous Storage Shed
- New Staircase and Lift
- New Cable Trenches for the New OCGT Units

KEY-PLAN



808 860.2 N
NEUTRALIZATION BASIN No. 1
EFFLUENT TREATMENT PLANT
CONTROL ROOM
No. 3 SEWAGE TREATMENT PLANT
TRANSFORMER
T2
D. G. STORE
HYDROGEN GENERATING PLANT
GAS TURBINE PLANT D/M STORAGE TANK FOR WATER INJECTION
4 Nos. R. F. W. TANK
NEUTRALIZATION BASIN No.2
NEUTRALIZATION BASIN No.3
STAND-BY
OIL INTERCEPTOR
No. 2 SEWAGE TREATMENT PLANT
No. 2 DEMIN.
CONTROL ROOM No. 2
No. 1 DEMIN.
CONTROL ROOM No. 1
808 785 N
AMENITY ROAD
FOOT BRIDGE
UNIT 1
808 777.7 N
WEST HEAVY UNLOADING AREA
INTERBUS TX. (OUTDOOR)
GAS TURBINE 132Kv SWITCHING STATION
INTERBUS TX. (OUTDOOR)
GAS TURBINE EQUIPMENT BUILDING
G.S.S. BUILDING
AMENITY BUILDING (LAMMA CANTEEN)
FOOT BRIDGE
TRAINING & WORKSHOP BUILDING
BLACK START GENERATOR
BH2
BH3
BH4
GAS TURBINE
AIR COOLER
GENERATOR COOLING WATER COOLER
GT4
UNIT 4
GENERATOR TRANSFORMER
EXHAUST SILENCER
LUBE OIL COOLER
GT3
TRANSFORMER COOLING WATER COOLER
GT2
UNIT 2
GT57 (Unit 7)
GT6
CHIMNEY
GT AUXILIARY BUILDING
BH1
GT57 (Unit 5)
TP1
808670.5 E
808 740.2 N
GT57 & COAL JETTY ELECTRICAL EQUIPMENT BUILDING
JUNCTION TOWER T16
NO. 1 C.W. INTAKE
WEST WHARF ROAD
8730 N
8704 N
8678 N
8733 N
8707 N
8681 N
28719 E
28752 E
28776.5 E
28858 E
28891 E
28936.15 E
N
Meteres
0
25
50

Figure 7A.2

Proposed Sampling Location

File: T:\GIS\CONTRACT\0576490\mxd\0576490_Proposed_Sampling_Location.mxd
Date: 15/6/2021

Environmental Resources Management

ERM

ANNEX A DANGEROUS GOODS LICENSE RECORD PROVIDED BY FIRE SERVICE DEPARTMENT

消 防 處
香港九龍尖沙咀東部康莊道 1 號
消防總部大廈

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.** : (91) in FSD GR 6-5/4 R Pt. 31
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

5 February 2021

Environmental Resources Management
2501, 2507-10, 25/F, One Harbourfront,
18 Tak Fung Street, Hung Hom,
Kowloon, Hong Kong.
(Attn: Ms. Daisy WONG, Consultant)

Dear Ms. WONG,

Lamma Power Station
Request for Information of Dangerous Goods & Incident Records

I refer to your email of 7.1.2021 regarding the captioned request and reply below in response to your questions:-

According to our record, from the year of 1990 to present moment, dangerous goods licenses have been issued by this department to the subject address, with details as shown in **Appendix A**. No incident record was found at the aforesaid location with your given conditions.

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

Yours sincerely,

(NG Wing-chit)
for Director of Fire Services

Receipt Chop
ERM
To: Daisy
Received by:
Date: 17 FEB 2021
Login Ref.: HM-860
GMS No:
Action taken: Email soft copy to Daisy

Ref. number and date should be quoted in reference to this letter
凡 提 及 本 信 時 請 引 述 編 號 及 日 期

Appendix A

Lamma Power Station

Request for Information of Dangerous Goods & Incident Records

Item	Type of DG	Quantity	Location
1	Cat. 3	30000 litres	No. 3 Demineralization Plant, Lamma Power Station Extension, Lot No. 2200 in D.D.3 Lamma
2	Cat. 3	30000 litres	No. 3 Demineralization Plant, Lamma Power Station Extension, Lot No. 2200 in D.D.3 Lamma
3	Cat. 5	3455 m^3	Light Oil Tank, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 2200
4	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
5	Cat. 2	2 cylinders	New Control Building, Lamma Power Station, Lamma Island
6	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
7	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
8	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
9	Cat. 2	3 cylinders	New Control Building, Lamma Power Station, Lamma Island
10	Cat. 2	2 cylinders	New Control Building, Lamma Power Station, Lamma Island
11	Cat. 2	2 cylinders	New Control Building, Lamma Power Station, Lamma Island
12	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
13	Cat. 2	7 cylinders	New Control Building, Lamma Power Station, Lamma Island
14	Cat. 2	2 cylinders	New Control Building, Lamma Power Station, Lamma Island
15	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
16	Cat. 2	2 cylinders	New Control Building, Lamma Power Station, Lamma Island
17	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
18	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
19	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island

Item	Type of DG	Quantity	Location
20	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
21	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
22	Cat. 4	N.A.	Unit 9, Electrochlorination Plant, Lamma Power Station Extension, Lot No. 2200 in D.D. 3, Lamma, Hong Kong
23	Cat. 3	11000 litres	Effluent Treatment Plant, Lamma Power Station, Lamma Island
24	Cat. 3	17600 litres	Effluent Treatment Plant, Lamma Power Station, Lamma Island
25	Cat. 3	7800 litres	Effluent Treatment Plant, Lamma Power Station, Lamma Island
26	Cat. 5	250000 litres	Effluent Treatment Plant, Lamma Power Station, Lamma Island
27	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
28	Cat. 2	4 cylinders	New Control Building, Lamma Power Station, Lamma Island
29	Cat. 2	2 cylinders	New Control Building, Lamma Power Station, Lamma Island
30	Cat. 2	1 cylinder	New Control Building, Lamma Power Station, Lamma Island
31	Cat. 5	22393000 litres	Tank Farm, Lamma Power Station Lamma Island
32	Cat. 5	22393000 litres	Tank Farm, Lamma Power Station Lamma Island
33	Cat. 5	10799000 litres	Tank Farm, Lamma Power Station Lamma Island
34	Cat. 5	2120000 litres	Tank Farm, Lamma Power Station Lamma Island
35	Cat. 3	32000 litres	Demin Plant No. 1, Lamma Power Station, Lamma Island
36	Cat. 3	16500 litres	Demin Plant No. 1, Lamma Power Station, Lamma Island
37	Cat. 5	340 litres	Lamma Power Station, Lamma Island
38	Cat. 5	340 litres	Lamma Power Station, Lamma Island
39	Cat. 4	2270 kg	Lamma Power Station, Lamma Island
40	Cat. 3	7945 kg	Lamma Power Station, Lamma Island
41	Cat. 3	14000 kg	Lamma Power Station, Lamma Island
42	Cat. 3	15000 kg	Lamma Power Station, Lamma Island
43	Cat. 2	64 cylinders	Lamma Power Station, Lamma Island

Item	Type of DG	Quantity	Location
44	Cat. 5	4000 litres	Lamma Power Station, Lamma Island
45	Cat. 5	7000 litres	Lamma Power Station, Lamma Island
46	Cat. 2	90 cylinders	Lamma Power Station, Lamma Island
47	Cat. 2	50 cylinders	Lamma Power Station, Lamma Island
48	Cat. 2	50 cylinders	Lamma Power Station, Lamma Island
49	Cat. 2	48 cylinders	Lamma Power Station, Lamma Island
50	Cat. 5	62000 litres	Lamma Power Station, Lamma Island
51	Cat. 5	62000 litres	Lamma Power Station, Lamma Island
52	Cat. 3	5000 litres	Lamma Power Station, Lamma Island
53	Cat. 3	7000 litres	Lamma Power Station, Lamma Island
54	Cat. 3	20000 litres	Lamma Power Station, Lamma Island
55	Cat. 3	30000 litres	Lamma Power Station, Lamma Island
56	Cat. 3	15000 litres	Lamma Power Station, Lamma Island
57	Cat. 5	22393000 litres	Lamma Power Station, Lamma Island
58	Cat. 5	22393000 litres	Lamma Power Station, Lamma Island
59	Cat. 5	200000 litres	Open ground, Lamma Power Station, Lamma Island
60	Cat. 4	3178 litres	Lamma Power Station, Lamma Island
61	Cat. 5	1350 litres	Lamma Power Station, Lamma Island
62	Cat. 3	113000 litres	Lamma Power Station, Flue Gas Desulphurization Plant, Waste Water Treatment System, Lamma Island, Hong Kong
63	Cat. 3	113000 litres	Lamma Power Station, Flue Gas Desulphurization Plant, Waste Water Treatment System, Lamma Island, Hong Kong
64	Cat. 3	33000 litres	Lamma Power Station, Flue Gas Desulphurization Plant, Waste Water Treatment System, Lamma Island, Hong Kong

Item	Type of DG	Quantity	Location
65	Cat. 3	42000 litres	Lamma Power Station, Flue Gas Desulphurization Plant, Waste Water Treatment System, Lamma Island, Hong Kong
66	Cat. 3	42000 litres	Lamma Power Station, Flue Gas Desulphurization Plant, Waste Water Treatment System, Lamma Island, Hong Kong
67	Cat. 4	N.A.	Lamma Power Station - Stage II, No. 7 Electrochlorinator, Lamma Island
68	Cat. 5	250000 litres	Lamma Power Station, Lamma Island
69	Cat. 2	N.A.	Recycling Plant Room, G/F, Plant Building, Lamma Power Station, HK Electric Co. Ltd.
70	Cat. 4	N.A.	Electrochlorination Plant at Stage III, Lamma Power Station, Lamma Island
71	Cat. 4	N.A.	Lamma Power Station - Stage III
72	Cat. 4	300 litres	Unit 7, Lamma Power Station, Lamma Island
73	Cat. 4	300 litres	Unit 8, Lamma Power Station, Lamma Island
74	Cat. 2	26 cylinders	D.G. Store at Fire and Security Building - Phase 2, Lamma Power Station, Lamma Island
75	Cat. 3	35000 litres	Openground, Acid Cleaning Plant, Lamma Power Station
76	Cat. 3	15000 litres	Openground, Acid Cleaning Plant, Lamma Power Station
77	Cat. 4	600 litre	Openground, Acid Cleaning Plant, Lamma Power Station
78	Cat. 4	1000 litre	Openground, Acid Cleaning Plant, Lamma Power Station
79	Cat. 4	N.A.	Lamma Power Station - Stage I
80	Cat. 2	14 cylinders	Store 2, G/F, DG Store Building, Lamma Power Station
81	Cat. 2	10 cylinders	Store 2, G/F, DG Store Building, Lamma Power Station
82	Cat. 2	1 cylinder	Store 2, DG Store Building, Lamma Power Station
83	Cat. 2	2 cylinders	Store 2, G/F, DG Store Building, Lamma Power Station

Item	Type of DG	Quantity	Location
84	Cat. 2	2 cylinders	Store 2, G/F, DG Store Building, Lamma Power Station
85	Cat. 2	7 cylinders	Store 2, G/F, DG Store Building, Lamma Power Station
86	Cat. 2	13 cylinders	Store 2, G/F, DG Store Building, Lamma Power Station
87	Cat. 2	1 cylinder	Store 2, G/F, DG Store Building, Lamma Power Station
88	Cat. 2	1 cylinder	Store 2, G/F, DG Store Building, Lamma Power Station
89	Cat. 2	1 cylinder	Store 2, DG Store Building, Lamma Power Station
90	Cat. 2	13 cylinders	Store 2, G/F, DG Store Building, Lamma Power Station
91	Cat. 2	8 cylinders	Store 2, G/F, DG Store Building, Lamma Power Station
92	Cat. 2	2 cylinders	Store 2, G/F, DG Store Building, Lamma Power Station
93	Cat. 2	1 cylinder	Store 2, G/F, DG Store Building, Lamma Power Station
94	Cat. 2	1 cylinder	Store 2, G/F, DG Store Building, Lamma Power Station
95	Cat. 2	1 cylinder	Store 2, DG Store Building, Lamma Power Station
96	Cat. 2	1 cylinder	Store 2, G/F, DG Store Building, Lamma Power Station
97	Cat. 2	1 cylinder	Store 2, G/F, DG Store Building, Lamma Power Station
98	Cat. 2	4 cylinders	Store 1, G/F, DG Store Building, Lamma Power Station
99	Cat. 2	4 cylinders	Store 1, G/F, DG Store Building, Lamma Power Station
100	Cat. 2	1 cylinder	Store 1, G/F, DG Store Building, Lamma Power Station
101	Cat. 2	1 cylinder	Store 1, G/F, DG Store Building, Lamma Power Station
102	Cat. 2	1 cylinder	Store 1, G/F, DG Store Building, Lamma Power Station
103	Cat. 2	3 cylinders	Store 1, G/F, DG Store Building, Lamma Power Station
104	Cat. 2	2 cylinders	Store 1, G/F, DG Store Building, Lamma Power Station
105	Cat. 2	80 cylinders	Room G10, G/F, DG Store Building, Lamma Power Station
106	Cat. 2	80 cylinders	Training & Workshop Building, Lamma Power Station, Po Lo Tsui, Lamma Island

Item	Type of DG	Quantity	Location
107	Cat. 4	710 litres	G/F, GT57 Combined Cycle Unit, Lamma Power Station, Lamma Island
108	Cat. 2	320 cylinders	Inside Hydrogen Pallet Store at openground, Lamma Power Station, Lamma Island
109	Cat. 2	4060 kg	D.G. Store (G-9), Lamma Power Station, Lamma Island
110	Cat. 5	400 litres	D.G. Store (G-14), Lamma Power Station, Lamma Island
111	Cat. 5	2000 litres	D.G. Store (G-14), Lamma Power Station, Lamma Island
112	Cat. 5	8000 litres	D.G. Store (G-20), Lamma Power Station, Lamma Island
113	Cat. 2	30 cylinders	Contract No. 04/9011 & 04/9012, Unit 9, Lamma Power Station
114	Cat. 2	30 cylinders	Contract No. 04/9011 & 04/9012, Unit 9, Lamma Power Station
115	Cat. 2	50 cylinders	G/F of Lamma Extension 275kV Switching Station (Phase I), Lamma Power Station Extension, Lot No.2220 in DD 3 Lamma
116	Cat. 2	33 cylinders	DG Store (G15), Lamma Power Station, Lamma Island
117	Cat. 5	200000 litres	Lamma Power Station, Lamma Island
118	Cat. 5	10799000 litres	Lamma Power Station, Lamma Island
119	Cat. 4	N.A.	At Electrochlorination Plant No. 2, Lamma Power Station Stage II, Lamma Island
120	Cat. 2	128 cylinders	Lamma Power Station Extension, Lot No. 2200 in D.D.3, Lamma Island
121	Cat. 10	100 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
122	Cat. 5	280 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
123	Cat. 5	300 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934

Item	Type of DG	Quantity	Location
124	Cat. 5	280 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
125	Cat. 5	280 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
126	Cat. 5	320 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
127	Cat. 5	280 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
128	Cat. 5	1950 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
129	Cat. 5	52 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
130	Cat. 5	550 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
131	Cat. 5	95 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
132	Cat. 5	540 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
133	Cat. 5	160 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
134	Cat. 5	160 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
135	Cat. 5	176 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
136	Cat. 5	176 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934

Item	Type of DG	Quantity	Location
137	Cat. 5	980 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
138	Cat. 5	490 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
139	Cat. 5	980 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
140	Cat. 5	270 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
141	Cat. 5	204 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
142	Cat. 5	1950 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
143	Cat. 5	17 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
144	Cat. 5	13 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
145	Cat. 5	231 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
146	Cat. 10	50 litres	G/F, Store Building, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 1934
147	Cat. 4	2400 kg	Lamma Power Station, Lamma Island
148	Cat. 4	N.A.	Unit 10 Electrochlorination Plant, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 2200
149	Cat. 2	18 cylinders	Refurbishment Works for Pipe Trench Covers, Façade Improvement for New Control Building,Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 2200

Item	Type of DG	Quantity	Location
150	Cat. 2	18 cylinders	Refurbishment Works for Pipe Trench Covers, Façade Improvement for New Control Building,Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 2200
151	Cat. 2	18 cylinders	G/F at Construction Site of Lamma Power Station Term Contract for Replacement of Coal Conveyor Belts (2014-2015), Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 2200
152	Cat. 2	18 cylinders	G/F at Construction Site of Lamma Power Station Term Contract for Replacement of Coal Conveyor Belts (2014-2015), Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 2200
153	Cat. 2	N.A.	G/F of plant Building, Lamma Power Station
154	Cat. 3	11200 litres	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
155	Cat. 4	12000 litres	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
156	Cat. 4	3178 litres	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
157	Cat. 2	46 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
158	Cat. 2	50 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
159	Cat. 2	130 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
160	Cat. 2	6 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
161	Cat. 2	4 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
162	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
163	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
164	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
165	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
166	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200

Item	Type of DG	Quantity	Location
167	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
168	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
169	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
170	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
171	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
172	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
173	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
174	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
175	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
176	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
177	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
178	Cat. 2	8 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
179	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
180	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
181	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
182	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
183	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
184	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
185	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
186	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
187	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
188	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
189	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
190	Cat. 2	14 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
191	Cat. 2	10 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200

Item	Type of DG	Quantity	Location
192	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
193	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
194	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
195	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
196	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
197	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
198	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
199	Cat. 2	3 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
200	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
201	Cat. 2	13 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
202	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
203	Cat. 2	2 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
204	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
205	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
206	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
207	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
208	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
209	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
210	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
211	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
212	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
213	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
214	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
215	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
216	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200

Item	Type of DG	Quantity	Location
217	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
218	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
219	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
220	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
221	Cat. 2	3 cylinders	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
222	Cat. 2	1 cylinder	Lamma Power Station Extension, Lamma Island DD3 Lot 2200
223	Cat. 2	2 cylinders	Inside Hydrogen Pallet Store at openground, Lamma Power Station, Lamma Island
224	Cat. 2	2 cylinders	Inside Hydrogen Pallet Store at openground, Lamma Power Station, Lamma Island
225	Cat. 2	2 cylinders	Inside Hydrogen Pallet Store at openground, Lamma Power Station, Lamma Island
226	Cat. 2	18 cylinders	Construction Site - Contract No. 15/8009 Lamma Power Station Extension Foundation Works for Unit L10
227	Cat. 2	18 cylinders	Construction Site - Contract No. 15/8009 Lamma Power Station Extension Foundation Works for Unit L10
228	Cat. 2	18 cylinders	Construction Site - Contract No. 15/8009 Lamma Power Station Extension Foundation Works for Unit L10
229	Cat. 2	18 cylinders	Construction Site - Contract No. 15/8009 Lamma Power Station Extension Foundation Works for Unit L10
230	Cat. 2	18 cylinders	Construction Site of Lamma Power Station in Contract no. 17/2203 of Light Oil Storage Tank No. 2, Lamma Power Station Extension, Po Lo Tsui, Lamma Island DD3 Lot 2200
231	Cat. 2	130 cylinders	Under Sun Shield Cover, Lamma Power Station Extension - Unit 10, Lot No. 2200 in D.D. 3 Lamma Island

ANNEX B PREVIOUS GROUND INVESTIGATION RECORD

Freyssinet
HONG KONG

DRILLHOLE LOG

HOLE NO. L7/BH75
SHEET 1 of 5
DATE from 18-8-92 to 25-8-92

D2

PROJECT The Hong kong Electric Co. Ltd
Lamma Power Station, Unit 7 & Unit 8, Stage III (Site Investigation Works).

METHOD Rotary	CO-ORDINATES	ROCK COREBIT TNW
Rig & No. TOHO RJ	E 829307.00 N 808711.50	HOLE DIA. PW & HW & NW 76mm IN BED ROCK
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND-LEVEL 5.04 m.P.D.

Drilling Progress	Casing depth/size	Water level/ time/ date	Water Recovery %	Total core Recovery %	Solid core Recovery %	R. Q. D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Zone	Description
18/8	P	3.66m at 8:00 24/8									1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00 10.00				Soil & Boulders. (Fill)
18/8	P									-4.96					

- Small disturbed sample
- Large disturbed sample
- SPT liner sample
- U75 undisturbed sample
- U100 undisturbed sample
- Water sample
- P/S Piston sample
- Water sample
- Water level
- Standard penetration test
- Permeability test
- Piezometer tip
- Inmsitu vane shear test

LOGGED JK
DATE 26-8-92
CHECKED AL
DATE 15-9-92

REMARKS
Inspection pit was dug 1.50m depth below ground level. PW casing was driven by percussive method to 16.5m depth.

Freyssinet Hong Kong Ltd.
2/3 Fl., Frankl Centre, 320 Junction Road, Kowloon Tong, Hong Kong.
Tel: 784 0322 Telex: 54608 FPEHK HX Fax: 338 3264

AB/96

Freyssinet HONG KONG

DRILLHOLE LOG

HOLE NO. L7/BH75
SHEET 2 of 5
DATE from 18-8-92 to 25-8-92

PROJECT The Hong kong Electric Co. Ltd
Lamma Power Station, Unit 7 & Unit 8, Stage III (Site Investigation Works)

METHOD Rotary	CO-ORDINATES	ROCK COREBIT TNW .
Rig & No. TOHO R3	E 829307.00 N 808711.50	HOLE DIA. PW & HW & NW 76mm IN BED ROCK
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND-LEVEL 5.04

Drilling Progress	Casing Depth/dia	Water level/ time/ date	Water Recovery %	Total core Recovery %	Solid core Recovery %	R. Q. D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Zone	Description
18/8	P										11.00				Same as sheet 1 of 5.
											12.00				
											13.00				
											14.00				
											15.00				
											16.00				
	16.50 P									-11.46	16.50				
	H										17.00		V		Light brown & whitish grey medium to coarse SAND. (Marine deposit)
											18.00				
											19.00				
18/8	H							21blo	No U76 Sample		20.00				

- Small disturbed sample
- Large disturbed sample
- SPT liner sample
- U76 undisturbed sample
- U100 undisturbed sample
- Water sample
- P/S Piston sample
- Water sample
- Water level
- Standard penetration test
- Permeability test
- Piezometer tip
- In-situ vane shear test

LOGGED JK
DATE 26-8-92
CHECKED AL
DATE 15-9-92

REMARKS
Inspection pit was dug 1.50m depth below ground level. PW casing was driven by percussive method to 16.5m depth.

Freyssinet Hong Kong Ltd.
2/3 Fl., Franki Centre, 320 Junction Road, Kowloon Tong, Hong Kong.
Tel: 794 0322 Telex: 54608 FPEHK HX Fax: 338 3264

Freyssinet HONG KONG

DRILLHOLE LOG

F.H.K.'s Contract No. L7/BH75
HOLE NO. 5
SHEET 3 of 5
DATE from 18-8-92 to 25-8-92

P4

PROJECT The Hong Kong Electric Co. Ltd
Lamma Power Station, Unit 7 & Unit 8, Stage III (Site Investigation Works).

METHOD Rotary	CO-ORDINATES	ROCK COREBIT TNW
Rig & No. TOHO R3	E 829307.00 N 808711.50	HOLE DIA. PW & HW & NW 76mm IN BED ROCK
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND-LEVEL 8.04 m.P.D.

Drilling Progress	Casing depth/dia	Water level/ time/ date	Water Recovery %	Total core Recovery %	Solid core Recovery %	R. Q. D.	Fracture spacing	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Zone	Description
18/8	H														
								19 blo	2 U76		21.00				Same as sheet 2 of 5.
								(0,8 1,10,11,11) N=44	3 Liner		22.00				
											23.00				
										-13.96	21.00				
				85				17 blo	4		25.00				Firm, light yellowish brown, silty coarse SAND with some gravels. (Alluvium)
											26.00				
											27.00				
											28.00				
				65					5		29.60				
										-26.95	30.00				
19/8	H														

c	Small disturbed sample	▲	Water sample
	Large disturbed sample	⊼	Water level
	SPT liner sample	↓	Standard penetration test
	U76 undisturbed sample	I	Permeability test
	U100 undisturbed sample		Piezometer tip
	Mazier sample		In-situ vane shear test
P/3	Pulse sample		

LOGGED JK
DATE 26-8-92
CHECKED AL
DATE 15-9-92

REMARKS
Inspection pit was dug 1.50m depth below ground level. PW casing was driven by percussive method to 16.5m depth.

Freyssinet Hong Kong Ltd.
2/3 Fl., Frankl Centre, 320 Junction Road, Kowloon Tong, Hong Kong.
Tel: 794 0322 Telex: 64608 FPEHK HX Fax: 338 3264

Freyssinet
Hong Kong

DRILLHOLE LOG

HOLE NO. 17/BH/2
SHEET 4 of 5
DATE from 15-9-92 to 25-9-92

PROJECT The Hong Kong Electric Co. Ltd
Lamma Power Station, Unit 7 & Unit 8, Stage III (Site Investigation Works)

METHOD Rotary	CO-ORDINATES	ROCK CORE BIT TWH
Rig & No. TOHO R3	E 829307.50 N 805711.80	HOLE DIA. PW & HW & NW 76mm IN BED ROCK
FLUSHING MEDIUM Water	ORIENTATION VERTICAL	GROUND-LEVEL 5.04

Drilling Progress	Casing Depth	Water level / time / date	Water Pressure Tests	Total core Recovery	Solid core Recovery	R.Q.D.	Fracture Index	Tests	Samples	Reduced Level	Depth	Legend	Core	Zone	Description
16/6	H										31.00				Same as sheet 3 of 5.
											32.00				
										-27.55	33.00				
											34.00				Medium dense, light yellowish brown, silty coarse SAND with some gravels. (Alluvium)
	34.50 H										35.00				
											36.00				
											37.00				
											38.00				
											39.00				
	39.96 H									-34.92	39.96				

- Small disturbed sample
- Large disturbed sample
- SPT liner sample
- U76 undisturbed sample
- U100 undisturbed sample
- Water sample
- P/S Piston sample
- Water sample
- Water level
- Standard penetration test
- Permeability test
- Piezometer tip
- In-situ vane shear test

LOGGED JK
DATE 25-8-92
CHECKED AL
DATE 15-9-92

REMARKS
Inspection pit was dug 1.50m depth below ground level. PW casing was driven by percussive method to 16.5m depth.

Freyssinet Hong Kong Ltd.
2/3 Fl., Franki Centre, 320 Junction Road, Kowloon Tong, Hong Kong.
Tel: 764 0322 Telex: 54808 FPEHK HX Fax: 338 3264

Freyssinet HONG KONG

DRILLHOLE LOG

FREY. Contract No. S911
HOLE NO. L7/BH75
SHEET 5 of 5
DATE from 18-8-92 to 25-8-92

PROJECT The Hong Kong Electric Co. Ltd
Lamma Power Station, Unit 7 & Unit 8, Stage III (Site Investigation Works)

METHOD Rotary
Rig & No. TOHO R3
FLUSHING MEDIUM Water
CO-ORDINATES E 829307.00 N 808711.50
ORIENTATION VERTICAL
ROCK COREBIT TNW
HOLE DIA. PW & HW & NW 76mm IN BED ROCK
GROUND-LEVEL 5.04

Drilling Progress	Casing depth/date	Water level/ time/ date	Water Recovery %	Total core Recovery %	Solid core Recovery %	R. Q. D.	Fracture Index	Tests	Samples	Reduced Level	Depth (m)	Legend	Grade	Zone	Description
				93	86	23	9.1				40.40				
				88	88	58	7.7				41.00				
				89	74	41	4.2		TNW		41.70				
				87	85	55	3.1				42.00				Strong, light pinkish grey, slightly decomposed medium to coarse grained GRANITE. Closely spaced to medium spaced rough planar joints with iron staining, joints dipping at 20 degrees, 45 degrees & 70 degrees.
				97	94	64	5.9				43.00				
				100	98	58	3.0				43.14		II		
25/8										40.41	44.00				
											44.44				
											45.00				
											45.45				End of investigation hole at 45.45m
											46.00				
											47.00				
											48.00				
											49.00				
											50.00				

Small disturbed sample ▲ Water sample
Large disturbed sample ▼ Water level
Standard penetration test : DA TP

LOGGED AB/100 JK

REMARKS
Inspection pit was dug 1.50m depth below ground level.
PW casing was driven by percussive method to 16.5m

ANNEX C SITE WALKOVER CHECKLISTS

Annex C1
Site Walkover Checklist

GENERAL SITE DETAILS

SITE OWNER/CLIENT: The Hong Kong Electric Co., Ltd

PROPERTY ADDRESS: Po Lo Tsui, Lamma Island, Hong Kong

PERSON CONDUCTING THE QUESTIONNAIRE

NAME: Anthony Ho, ERM

POSITION: Consultant

AUTHORIZED OWNER/CLIENT REPRESENTATIVE (IF APPLICABLE)

NAME: Eric Kwan

POSITION: Project Engineer

TELEPHONE: Nil

SITE ACTIVITIES

Briefly describe activities carried out on site, including types of products/chemicals/materials handled. **Obtain a flow schematic if possible.**

Number of employees:
- Full-time: Approximately 500
- Part-time: Nil
- Temporary/Seasonal: Nil

Maximum no. of people on site at any time: Not available

Typical hours of operation: 24 hours

Number of shifts: 2 shifts

Days per week: 7 days

Weeks per year: 52 weeks

Scheduled plant shut-down: Nil

Detail the main sources of energy at the site:

Gas	Yes/No
Electricity	Yes/No
Coal	Yes/No
Oil	Yes/No
Other	Yes/No

SITE DESCRIPTION

This section is intended to gather information on site setting and environmental receptors on, adjacent or close to the site.

What is the total site area: _____

What area of the site is covered by buildings (%): Approximately 60%

Please list all current and previous owners/occupiers if possible. The Hong Kong Electric Co., Ltd

Is a site plan available? If yes, please attach. Yes/No

Are there any other parties on site as tenants or sub-tenants? Yes/No

If yes, identify those parties: _____

Describe surrounding land use (residential, industrial, rural, etc.) and identify neighbouring facilities and types of industry.

North: Laundry Building, Amenity Building and Vehicle access road. Further north is an area occupied by No.1 and No.2 Demin, Sewage Treatment Plant and Neutralisation Basins.

South: Vehicle Access Road. Further south is the Main Bridge and East Bridge connected to the Lamma Extension Island.

East: Vehicle access road. Further east is GT57 and Jetty Electrical Equipment Building and Cold Water Intake.

West: Vehicle Access Road. Further West is the seawall and West Heavy Unloading Area.

Annex C1
Site Walkover Checklist

Describe the topography of the area (flat terrain, rolling hills, mountains, by a large body of water, vegetation, etc.).

Flat concrete paved terrain.

State the size and location of the nearest residential communities.

About 20 village houses located at 800m northeast to the Project site.

Are there any sensitive habitats nearby, such as nature reserves, parks, wetlands or sites of special scientific interest?

No sensitive habitats nearby. The nearest restricted area is Sham Wan located about 5km southeast to the Project site.

Questionnaire with Existing/Previous Site Owner or Occupier

		Yes/No	Notes
1.	What are the main activities/operations at the above address?	Yes	Power generation
2.	How long have you been occupying the site?	Yes	About 30 years since 1989
3.	Were you the first occupant on site? (If yes, what was the usage of the site prior to occupancy.)	Yes	No previous occupant
4.	Prior to your occupancy, who occupied the site?	No	
5.	What were the main activities/operations during their occupancy?	No	
6.	Have there been any major changes in operations carried out at the site in the last 10 years?	Yes	Conversion of GT57 and construction of GT57 Auxiliary Building
7.	Have any polluting activities been carried out in the vicinity of the site in the past?	No	
8.	To the best of your knowledge, has the site ever been used as a petrol filling station/car service garage?	No	
9.	Are there any boreholes/wells or natural springs either on the site or in the surrounding area?	Yes	
10.	Do you have any registered hazardous installations as defined under relevant ordinances? (If yes, please provide details.)	No	
11.	Are any chemicals used in your daily operations? (If yes, please provide details.)	Yes	Diesel, Lube Oil, Ammonia, Phosphate, Hydrazine
	• Where do you store these chemicals?		Individual tanks onsite for lube oil, ammonia, phosphate and hydrazine. Diesel is supplied from an offsite location.
12.	Material inventory lists, including quantities and locations available? (If yes, how often are these inventories updated?)	Yes	Frequency not specified
13.	Has the facility produced a separate hazardous substance inventory?	No	
14.	Have there ever been any incidents or accidents (e.g. spills, fires, injuries, etc.) involving any of these materials? (If yes, please provide details.)	No	

		Yes/No	Notes
15.	How are materials received (e.g. rail, truck, etc.) and stored on site (e.g. drums, tanks, carboys, bags, silos, cisterns, vaults and cylinders)?	Yes	Via ships and trucks. Storage: drums, tanks, silos, bags.
16.	Do you have any underground storage tanks? (If yes, please provide details.)	No	No UST within the Project site
	• How many underground storage tanks do you have on site?	NA	
	• What are the tanks constructed of?	NA	
	• What are the contents of these tanks?	NA	
	• Are the pipelines above or below ground?	NA	
	• If the pipelines are below ground, has any leak and integrity testing been performed?	NA	
	• Have there been any spills associated with these tanks?	NA	
17.	Are there any disused underground storage tanks?	No	
18.	Do you have regular check for any spillage and monitoring of chemicals handled? (If yes, please provide details.)	Yes	Regular site walkover inspection by HKE H&S team
19.	How are the wastes disposed of?	Yes	Collected and transfer to designated waste storage area
20.	Have you ever received any notices of violation of environmental regulations or received public complaints? (If yes, please provide details.)	No	
21.	Have any spills occurred on site? (If yes, please provide details.)	No	
	• When did the spill occur?	NA	
	• What were the substances spilled?	NA	
	• What was the quantity of material spilled?	NA	
	• Did you notify the relevant departments of the spill?	NA	
	• What were the actions taken to clean up the spill?	NA	
	• What were the areas affected?	NA	
22.	Do you have any records of major renovation of your site or re-arrangement of underground utilities, pipe work/underground tanks (If yes, please provide details.)	Yes	Conversion of GT5 and GT7 to GT57.
23.	Have disused underground tanks been removed or otherwise secured (e.g. concrete, sand, etc.)?	No	
24.	Are there any known contaminations on site? (If yes, please provide details.)	No	
25.	Has the site ever been remediated? (If yes, please provide details.)	No	

Annex C1
Site Walkover Checklist

Observations

		Yes/No	Notes
1.	Are chemical storage areas provided with secondary containment (i.e. bund walls and floors)?	Yes	Except empty chemical containers were not provided with drip traps at Miscellaneous Storage Shed
2.	What are the conditions of the bund walls and floors?	Yes	Good condition with no cracks.
3.	Are any surface water drains located near to drum storage and unloading areas?	Yes	
4.	Are any solid or liquid waste (other than wastewater) generated at the site? (If yes, please provide details.)	Yes	Lube oil.
5.	Is there a storage site for the wastes?	Yes	Located offsite.
6.	Is there an on-site landfill?	No	
7.	Were any stressed vegetation noted on site during the site reconnaissance? (If yes, please indicate location and approximate size.)	No	
8.	Were any stained surfaces noted on-site during the site reconnaissance? (If yes, please provide details.)	Yes	Minor oil stains noted at Black Start Generator and Miscellaneous Storage Shed
9.	Are there any potential off-site sources of contamination?	No	
10.	Does the site have any equipment which might contain polychlorinated biphenyls (PCBs)?	Yes	GT Transformers.
11.	Are there any sumps, effluent pits, interceptors or lagoons on site?	Yes	Sump pits
12.	Any noticeable odours during site walkover?	No	
13.	Are any of the following chemicals used on site: fuels, lubricating oils, hydraulic fluids, cleaning solvents, used chemical solutions, acids, anti-corrosive paints, thinners, coal, ash, oily tanks and bilge sludge, metal wastes, wood preservatives and polyurethane foam?	Yes	Diesel and lube oils

ANNEX D SITE WALKOVER PHOTOS

Photo 1: Gas Turbine Unit 2

Photo 2: Gas Turbine Unit 3

Photo 3: Gas Turbine Unit 4

Photo 4: Gas Turbine Unit 5

Photo 5: Gas Turbine Unit 6

Photo 6: Gas Turbine Unit 7

PROJECT:
Re-provision of Open Cycle Gas Turbines at Lamma Power Station

ERM-Hong Kong, Limited
2509, One Harbourfront,
18 Tak Fung Street, Hunghom,
Kowloon, Hong Kong
Tel: (852) 2271 3000
Fax: (852) 2723 5660

TITLE: Annex D

Selected Site Photographs

DATE:	CHECKED:	PROJECT: 0576490
DRAWN:	APPROVED:	SCALE:
DRAWING:		SIZE: A4 / REV: 0

Photo 7: Footings of Generator Coolers

Photo 8: GT's transformer concrete bund filled with pebbles

Photo 9: GT's transformer concrete paved ground

Photo 10: Black Start Generator set (one (1) diesel generator and three (3) air compressor units).

Photo 11: Diesel supply pipes

Photo 12: Lube oil tank

PROJECT:
Re-provision of Open Cycle Gas Turbines at Lamma Power Station

ERM-Hong Kong, Limited
2509, One Harbourfront,
18 Tak Fung Street, Hunghom,
Kowloon, Hong Kong
Tel: (852) 2271 3000
Fax: (852) 2723 5660

TITLE: Annex D

Selected Site Photographs

DATE:	CHECKED:	PROJECT: 0576490
DRAWN:	APPROVED:	SCALE:
DRAWING:		SIZE: A4 / REV: 0

Photo 13: Miscellaneous Storage Shed

Photo 14: Gas tanks installed at the ground floor of GT57 Auxiliary Building

Photo 15: Chemical Dosing Pit (Hydrazine Hydrate Tank) at the ground floor of GT57 Auxiliary Building

PROJECT:
Re-provision of Open Cycle Gas Turbines at Lamma Power Station

ERM-Hong Kong, Limited
2509, One Harbourfront,
18 Tak Fung Street, Hunghom,
Kowloon, Hong Kong
Tel: (852) 2271 3000
Fax: (852) 2723 5660

TITLE: Annex D

Selected Site Photographs

DATE:	CHECKED:	PROJECT: 0576490	
DRAWN:	APPROVED:	SCALE:	
DRAWING:		SIZE: A4	REV: 0

Photo 16:Main oil tank installed at the ground floor of GT57 Auxiliary Building

Photo 17:Main oil tank paved surface in good condition

Photo 18: Circulating Water Pipe Room at the immediate east of GT57 Auxiliary Building

Photo 19: Circulating Water Pipe emerging from underground

PROJECT:
Re-provision of Open Cycle Gas Turbines at Lamma Power Station

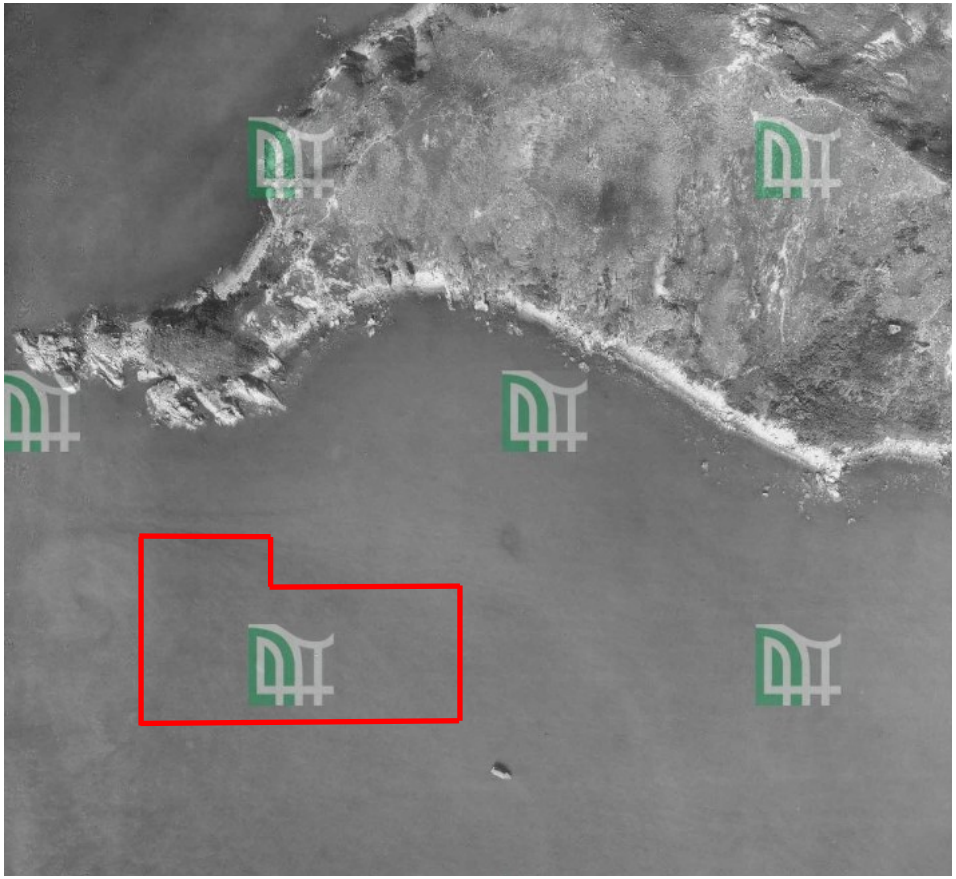
ERM-Hong Kong, Limited
2509, One Harbourfront,
18 Tak Fung Street, Hunghom,
Kowloon, Hong Kong
Tel: (852) 2271 3000
Fax: (852) 2723 5660

TITLE: Annex D

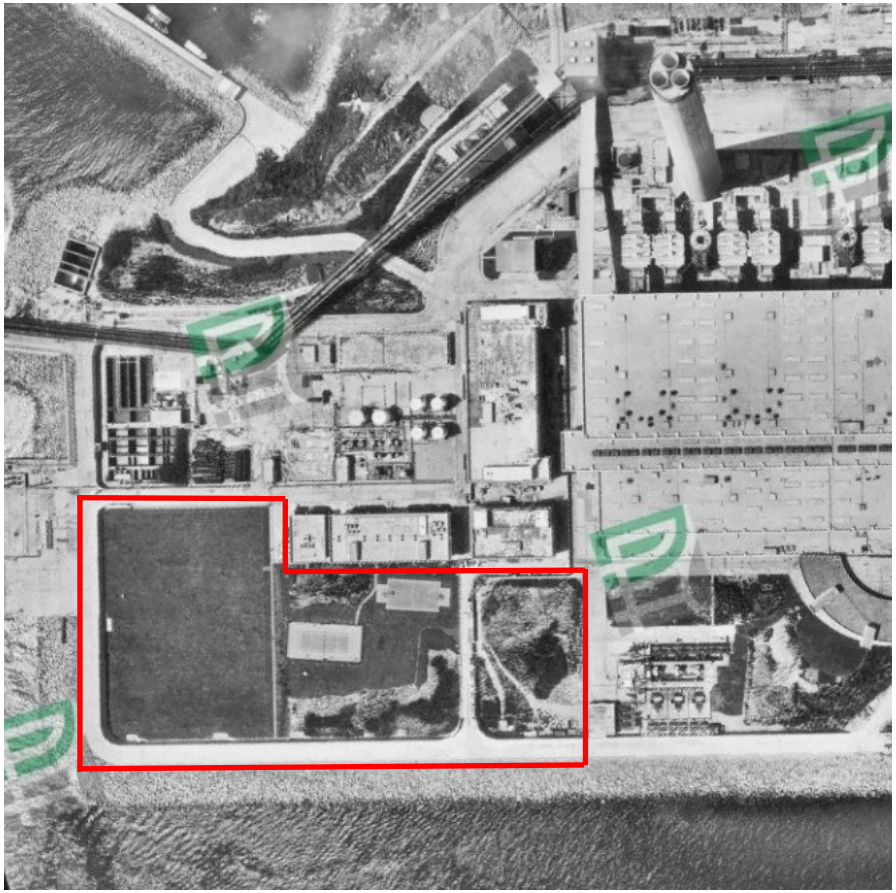
Selected Site Photographs

DATE:	CHECKED:	PROJECT: 0576490	
DRAWN:	APPROVED:	SCALE:	
DRAWING:		SIZE: A4	REV: 0

ANNEX E REFERENCED AERIAL PHOTOGRAPHS



Year 1978:
The land where the Site is situated was previously the coastline of Lamma Island prior to reclamation.



Year 1985:
The Site was located on a land developed from reclamation.

Approximate location of the Site

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Re-provision of Open Cycle Gas Turbines at Lamma Power Station

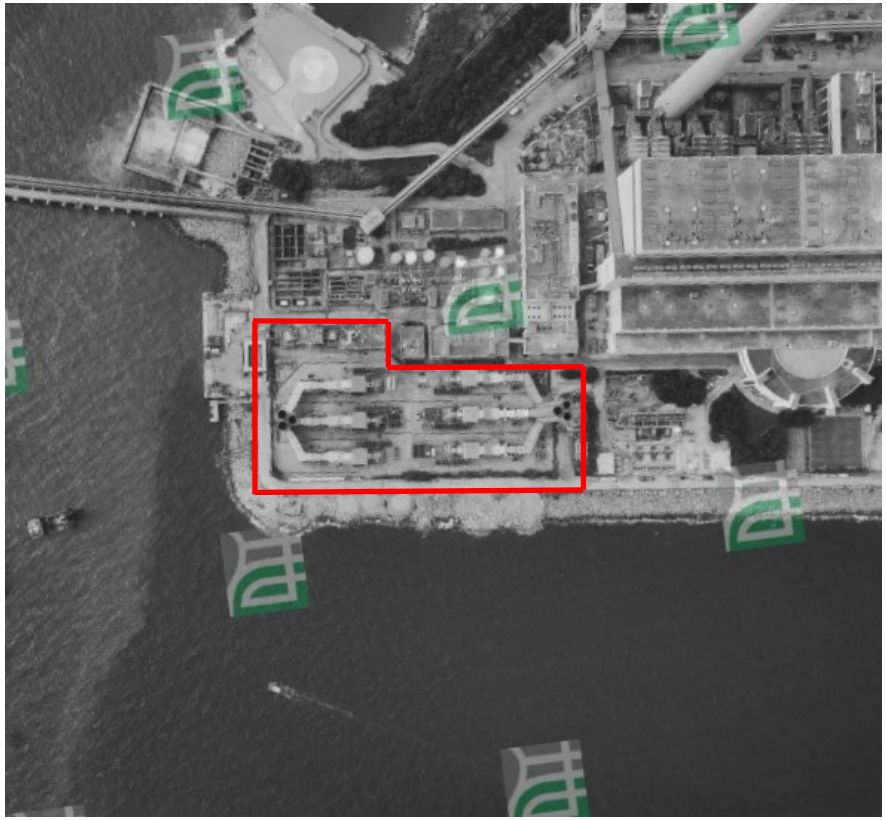
ERM-Hong Kong, Limited
2509, 25/F, One Harbourfront,
Tak Fung Street,
Hung Hom, Kowloon
Tel: (852) 2271 3000
Fax: (852) 2723 5660

TITLE:
Annex E

Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0576490	
DRAWN:	APPROVED:	SCALE:	
DRAWING:		SIZE: A4	REV: 0

Year 1995:
Construction of 6 gas turbines was completed.



Year 1999:
No significant change was observed at the Site.

Approximate location of the Site

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Re-provision of Open Cycle Gas Turbines at Lamma Power Station

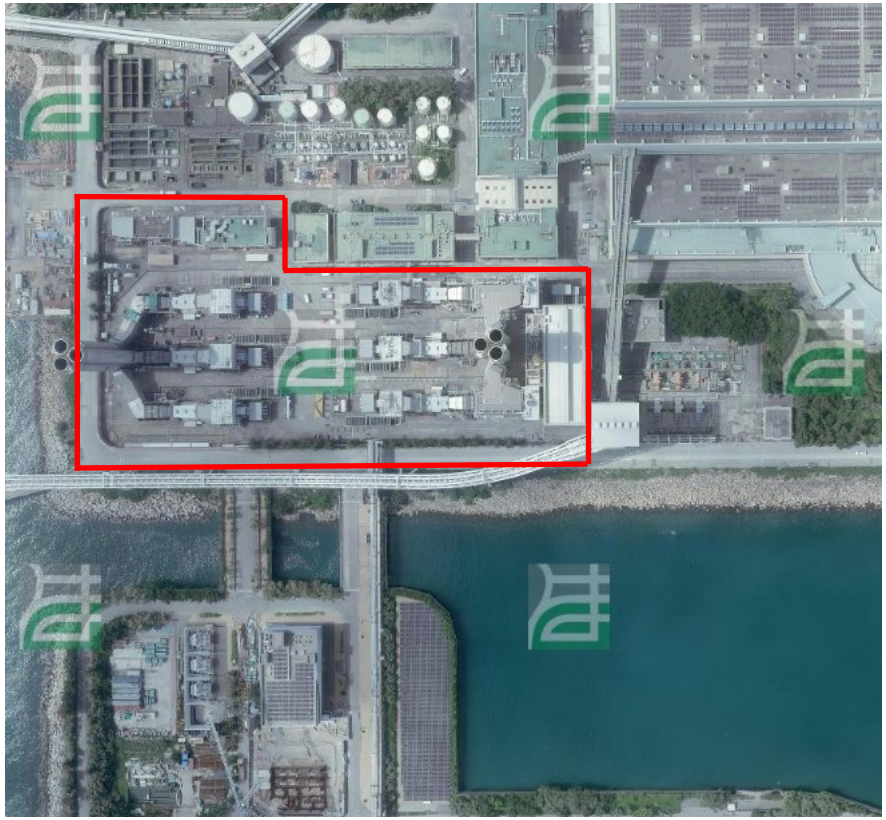
ERM-Hong Kong, Limited
2509, 25/F, One Harbourfront,
Tak Fung Street,
Hung Hom, Kowloon
Tel: (852) 2271 3000
Fax: (852) 2723 5660

TITLE:
Annex E

Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0576490	
DRAWN:	APPROVED:	SCALE:	
DRAWING:		SIZE: A4	REV: 0

Year 2002:
Construction of the GT57 Auxiliary Building was completed.



Year 2019:
No significant change was observed at the Site.

Approximate location of the Site

Source - GEO INFO, Lands Department, HKSARG

PROJECT:
Re-provision of Open Cycle Gas Turbines at Lamma Power Station

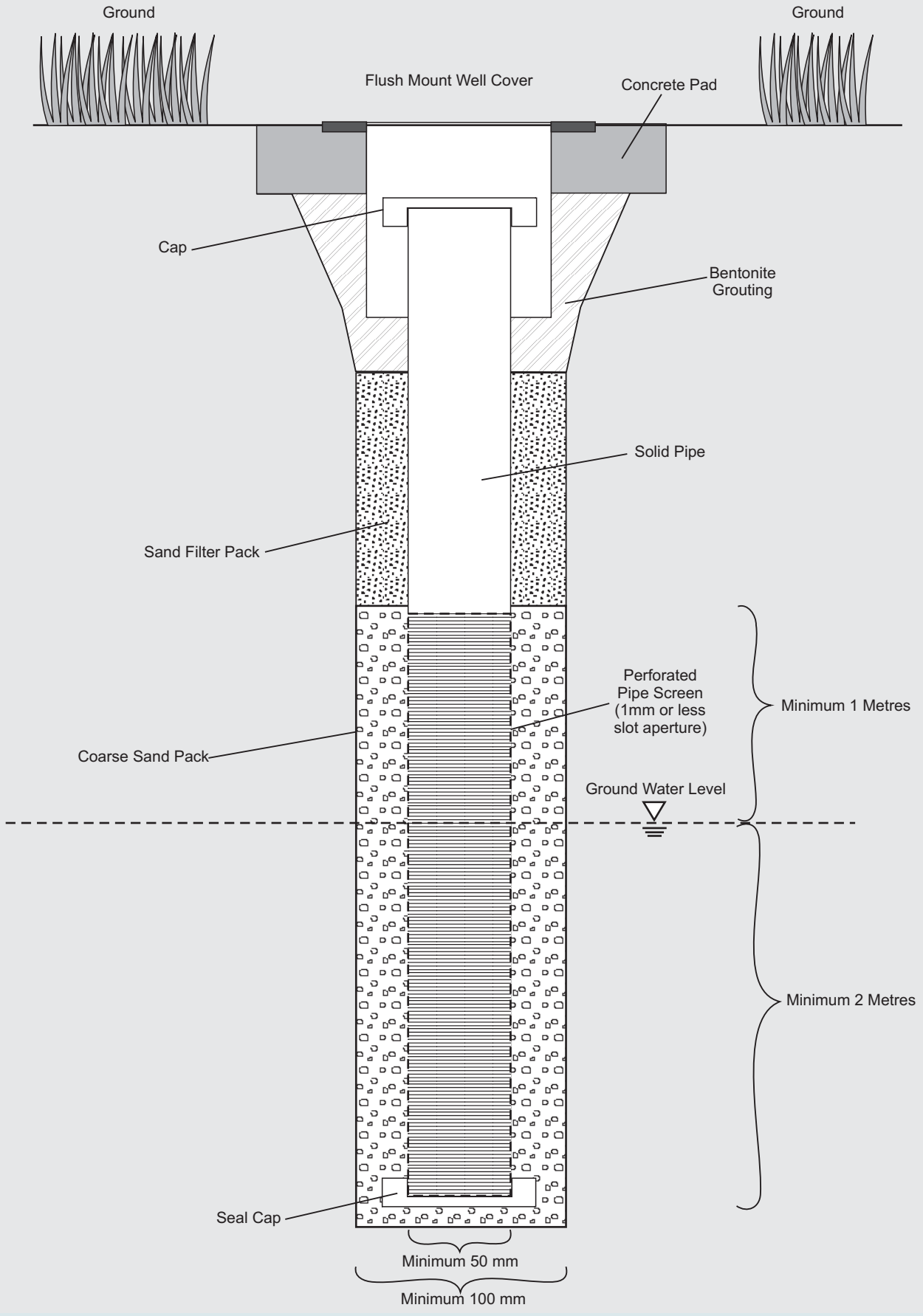
ERM-Hong Kong, Limited
2509, 25/F, One Harbourfront,
Tak Fung Street,
Hung Hom, Kowloon
Tel: (852) 2271 3000
Fax: (852) 2723 5660

TITLE:
Annex E

Referenced Aerial Photographs

DATE:	CHECKED:	PROJECT: 0576490	
DRAWN:	APPROVED:	SCALE:	
DRAWING:		SIZE: A4	REV: 0

ANNEX F SCHEMATIC DRAWING OF GROUNDWATER MONITORING WELL



Appendix F

Schematic Drawing of Groundwater Monitoring Well

FILE: 0131608a
DATE: 04/04/2011

Environmental
Resources
Management

ERM

ANNEX G 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.