

Annex I

Contamination Assessment Plan (CAP)

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One of the key concerns identified for the Agreement No. CE 21/97, Planning and Development Study of Potential Housing Sites in Area 54, Tuen Mun is land contamination. In order to address the contamination concern, this Revised Contamination Assessment Plan (CAP) for the site is hereby submitted. ERM previously submitted a CAP in response to a 2 April 1998 letter (ref: (15) in EP2/N4/65 (V)) from the Environmental Protection Department (EPD). In response to a 23 June 1998 *ad hoc* meeting held among ERM, the Territory Development Department (TDD), and EPD, more detailed information was requested on the historical land uses, to further justify the selected intrusive sampling locations. This revised CAP sets out in detail the requirements for the baseline evaluation of the site, to assess potential contaminated soil and waste disposal arising from contaminated land uses and the subsequent impacts which may arise during the development programme.

1.1

BACKGROUND

ERM is presently conducting Environmental Impact Assessment (EIA) studies for the Planning and Development Study of Potential Housing Sites in Area 54, Tuen Mun. During several site visits, a number of properties within the overall Study area were noted to be open storage areas, trailer yards, vehicle maintenance facilities and such. Some areas were noted to store various quantities of chemicals in various drums and containers, and some properties had visible staining and apparent contamination, which was suspected to be derived from the particular land uses.

Although these areas of concern and the contamination appeared to be localised, the implications for development, as previously presented in ERM's EIA Initial Assessment Report (IAR) for this project, relate to the following:

- Disposal of potentially contaminated soils which will arise during excavation of such areas if they are located within the specific development works. At present, there is a Master Layout Plan (November 1998), however, there is no detailed design for the proposed development, nor estimate of the quantity of contaminated soils which will be generated in the works.
- Disposal of ground water where any excavations take place below the water table. As stated above, there is presently no detailed design for excavations within the proposed development, nor estimate of any locations where excavations may encounter groundwater. Likewise, there are no details available on the groundwater quality within the Study area, but shallow groundwater may be encountered during the construction programme, and if contaminated, special handling and disposal will be required.
- Potential health risks to site construction workers during development works. This is likely to involve a short term risk, and as the majority of the works is likely to involve the use of mechanical excavators the potential interface with workers is not considered to be significant.
- Potential health risks to future site users. This is not considered to be a major concern as the potentially contaminated areas identified are small and

localised, and works areas and the future developments will be built up or paved with hardstanding.

Typical contaminants associated with historic land use activities observed in the Study area are summarised in *Table 1.1a*.

Table 1.1a *Potential Contaminants Associated with Former Historical Land Uses*

Historical Use	Potential Site Contaminants	Comments
Scrap and trailer storage yards	Heavy metals, petroleum oils, possible acids	- Localised spillages
Vehicle maintenance and possible machining works	Oils, fuel storage, possible solvents, acids, degreasants	- Spillages from maintenance and dismantling of equipment - Localised areas of contamination - Possible presence of underground storage tanks
Timber yards and woodworking facilities	Oils, stains, wood preservatives and other treatment chemicals, creosote	- Localised spillages
Tannery	Acids, alkalis, phenolic compounds, heavy metals	- Localised spillages - Possible presence of storage tanks

The main expected contaminants in the site area derive from container storage yards, container vehicle parks and vehicle repair workshops. The associated contaminants will comprise fuels, light and heavy petroleum oils, heavy metals, solvents, and possibly some acids. During the preliminary site inspection only small scale, localised staining was observed in the storage yard areas.

A description of general hazardous properties of typical compounds which may have been used or stored in the Study area is presented in *Table 1.1b*.

Table 1.1b *General Properties of Hazardous Substances Potentially Found in Storage Yards*

Typical Material	General Hazardous Properties
Petroleum hydrocarbons (including benzene, toluene, xylenes, and ethyl benzene - BTEX)	<ul style="list-style-type: none"> • Can be toxic by inhalation, ingestion and contact • Concentrations may be flammable
Oils, oily wastes	<ul style="list-style-type: none"> • Can be toxic by contact • Concentrations may be flammable
Thinners, solvents, degreasants	<ul style="list-style-type: none"> • Toxic by contact, inhalation and ingestion
Wood treatment chemicals	<ul style="list-style-type: none"> • Toxic by contact, inhalation and ingestion
Heavy Metals (including copper, chromium, lead, and zinc)	<ul style="list-style-type: none"> • Can be toxic by ingestion and contact • Most are toxic to fish, plants, and marine plants (especially copper) • Specific precautions may be required in relation to monitoring and dust control in site formation works
Acids	<ul style="list-style-type: none"> • Toxic and harmful by contact • Corrosive to metal, concrete
Polycyclic Aromatic Hydrocarbons (PAHs)	<ul style="list-style-type: none"> • Toxic by contact and ingestion

The main objective of this proposed intrusive investigation is to define the potential soil and/or ground water contamination levels which were observed in the previous preliminary site inspections, and to assess the requirements for disposal of contaminated soil and ground water, where such contaminants are encountered. If possible, the intrusive investigation should detail the quantity of material which is contaminated and thus requiring special handling and disposal. However there are a number of limitations, as described in *Section 3.3*. Any potential impacts of the construction programme to construction workers should also be considered, where appropriate.

ENVIRONMENTAL LEGISLATION AND NON-STATUTORY GUIDELINES

Assessments of land contamination sources and the potential impacts to particular development projects are investigated in accordance with *Professional Persons Environmental Consultative Committee Practice Note 3/94 - Contaminated Land Assessment and Remediation* (ProPECC PN 3/94), and the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*.

In accordance with ProPECC PN 3/94, the assessment evaluation should be made to:

- provide a clear and detailed account of the present use of the land in question and the relevant past land use history, in relation to possible land contamination;
- identify those areas of potential contamination and associated impacts, risks or hazards; and
- as required, submit a plan to evaluate the actual contamination conditions for soil and/or ground water.

In ProPECC PN 3/94, the Dutch Ministry of Public Housing, Land-Use and Environment Guidelines (1994) are used as criteria by the EPD for evaluating what is classified as a contaminated material.

Under the EIA Ordinance, *Annex 19: Guidelines for Assessment of Other Impacts*, consideration shall be given during development and redevelopment projects to a number of potentially contaminating historical land uses, which have the potential to cause, or have caused, land contamination. This includes developing a Contamination Assessment Plan (CAP) where such land uses are identified, and if contamination is confirmed, a Remediation Action Plan (RAP).

2.1 SCOPE

The scope of the proposed investigation should be performed in accordance with the methodologies detailed below. These methodologies are developed in general accordance with US EPA standards for site investigations, and the American Society for Testing and Materials (ASTM) E 1527-97, *Standard Practice for Environmental Site Assessment: Phase II Environmental Site Assessment Process*, and adapted to Asian standards of practice as applicable, to ensure efficient and defensible data collection in the Hong Kong situation. The scope of the intrusive investigation should involve the following:

- Drilling of an approximately 25 boreholes at 7 of the 9 locations (details see below) in the development area, where potential contamination has been identified, to a maximum of 5 m depth. As there is presently no detailed design for the development, we can only indicate on a preliminary basis whether these intrusive locations should be within the footprint or vicinity of proposed buildings. The number of boreholes is estimated based upon findings of the initial field observations and investigation in this EIA Study. It should be noted that the actual number and exact location of the boreholes will need to be further confirmed with EPD and take into account property access issues during project implementation.
- Collection of a maximum of three soil samples at each of the 25 boreholes, at depths of within 0.5 m of the surface, and approximately 1 m intervals, or at a location determined by the on-site geologist. Soil samples should be submitted for chemical analysis as described below. Samples for analysis should be selected on the basis of field monitoring using a hand held organic vapour meter.
- Where encountered and appropriate, collection of at least one representative grab ground water sample from the borings for chemical analysis as described below.

2.2 METHODOLOGY

2.2.1 *Site History and Determination of Sample Locations*

Specific information was requested from the District Lands Office (DLO), District Planning Office (DPO), Fire Services Department (FSD) and EPD's Local Control Office, regarding the Study area and any historical records of land uses that have the potential to cause any contamination. Specifically, details were requested on the following:

- sites of potentially contaminating land uses (according to the EIAO-TM), including illegal land uses;
- any specific case files for sites or properties in this Study area which are undergoing or have been the subject of investigation for contamination;

- any information on potential "black spot" areas in this vicinity that Government is or has targeted for mitigation (ie uncontrolled or illegal dumping areas, storage yards, etc.);
- spill or incident reports for any properties; and
- licence/registration of any properties as chemical waste and/or dangerous goods storage facilities or hazardous waste producers.

The only responses received were from the DLO ((29) in DLOTM 257/MPG/74 III), which provided information on the permit uses for 31 properties in the Study area, and from the EPD's Local Control Office/Territory West (EF 330/G1/1), regarding four properties in the Study area registered as chemical waste producers with the EPD. Therefore, the proposed drilling locations were selected based on this information and on site visits, observed storage of chemicals or wastes, the type of land use, or specific site history information. In each instance, the specific location was selected for investigation as the potential of contamination at these properties was judged to exist.

The overall drilling locations selected in the Study Area are shown on *Figure 1*, with specific information presented below and further site locations detailed in the attached *Figures*. Selected photographs of these specific areas are included in *Annex 1*.

Location 1 - Former trailer storage yard (presently vacant) along Tsz Tin Road

Description: This site was used for trailer storage from the 1980s up until late 1997, when the trailers were removed. The site is paved with concrete and presently vacant, with surrounding lands under construction for housing (see *Figure 2* and *Photo 1*). Immediately north of the site is the Great Eastern Metal Extrusion Factory, which is reportedly 30 years old.

Location in relation to 1998 Master Layout Plan: This location falls within proposed Kei Lun Wai village land, immediately south of the proposed L54B roadway of the Area 54 development. Based on the observed extent of potential contamination, 4 boreholes are recommended to be drilled at this location.

Potential Contaminants: petroleum hydrocarbons, oils, possible degreasers and solvents, heavy metals, and acids

Location 2 - Unprotected and uncontained container storage location

Description: This property, located next to the Shun Lee Plastic recycling factory on Tsz Tin Road, was noted to contain several hundred derelict plastic chemical jugs and containers. The containers were stored in a haphazard pile on open ground without any secondary containment, and any residual liquid or spillage would be direct to open ground. Whilst most containers had no labels, several containers did have labels which were noted to be hydrogen peroxide and orthophosphoric acid (see *Figure 3* and *Photo 2*).

Location in relation to 1998 Master Layout Plan: This location falls within the existing Tsz Tin Tsuen village and according to the current plan no development will occur at this location. Therefore, unless the existing access road next to this location is to be widened, no borehole will be required for the present Project.

Possible contaminants: petroleum hydrocarbons, oils, degreasers and solvents, paint, thinners

Location 3 - Wai Shing Motor Services yard

Description: This vehicle maintenance area, formerly used as a trailer storage yard, is located at Lot 230, Tsz Tin Road in Tsz Tin Tsuen. The site was noted to have several fuel drums stored in several locations, without any forms of containment. Evidence of localised spillage of oil and fuel product was noted around vehicles in service bays, however the site was paved with concrete. The site also stored several various containers of thinners, paints and automotive lacquers, and car batteries on shelves and in cabinets. The site operators reported they had been in operation for over 10 years, and the site is registered with the EPD as a chemical waste producer. However, correspondence with the EPD indicated that the site apparently had no visual land contamination problems (see *Figure 3* and *Photo 3*).

Location in relation to 1998 Master Layout Plan: This location falls within the existing Tsz Tin Tsuen village and will not be occupied by the proposed Area 54 development. As such, no borehole is required unless the access road is confirmed to be widened as part of the Area 54 development.

Possible contaminants: petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids, paint, thinners, lacquer

Location 4 - Lee Ki Woodworking and Sawmill

Description: This site, located at the end of Tsz Tin Road in Tsz Tin Tsuen, was noted to have abundant stores of wood and plywood. The site management reported that the operation consisted of sawing and had been in operation for almost 30 years (see *Figure 3* and *Photo 4*). Drums of water and diesel were noted stored at the site.

Location in relation to 1998 Master Layout Plan: This location falls within the proposed public rental estate Site Number 2, however, whether or not it lies within the footprint of a proposed building is undetermined. As excavation will be required as part of the development, it is recommended that 4 boreholes are to be developed at this location.

Possible contaminants: petroleum hydrocarbons, oils, stains and wood finishes, wood preservatives and treatment chemicals

Location 5 - Drum storage area for Kin Kat Waste, Waste paper and Alloy Company

Description: This site, located at the end of an unpaved track adjacent to the main Nullah along Tsing Lun Road, was initially noted to contain in excess of 800, 205 litre drums, all reportedly stored for recycling. On a second visit, the number of drums and containers had decreased, but the orientation of storage had changed. There was no secondary containment in any of the storage areas, with the drums and containers stored on the ground, on their sides, and stacked in rows up to nine drums high. The majority of the drums were labelled Epoxidized Soybean Oil, however, numerous other labels were noted on drums and plastic jugs, including hydrogen peroxide, phosphoric acid, nitric acid, vitric acid, Shell tergitol, trichloroethylene (TCE), and flammable flavourings. Site management reported that they had been in operation for 10 to 15 years, and

there had "never been" any contamination problems. Surface water, suspected to be rainwater runoff, was noted passing along the ground through the drums and discharging directly to the nullah (see *Figure 2* and Photos 5 and 6).

Location in relation to 1998 Master Layout Plan: This location falls within the proposed three-storey commercial centre/bus terminus/four-storey carpark. Due to the extent of potential contamination, it is recommended that 4 boreholes are to be developed at this location.

Possible contaminants: petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids, paint, thinners, stains and wood finishes, wood preservatives and treatment chemicals

Location 6 - Vacant lot- suspected former tannery factory

Description: This site, a vacant lot adjacent to several small, unidentified industries on Hong Po Road, is situated on the natural stream channel that enters into the concrete nullah under Hong Po Road. It is also located at the Study area boundary. Review of old survey maps indicates that this area, and possibly this lot, was operated as a tannery from the early 1970s until approximately 1984. Prior to that (ie in 1968), the land was undeveloped. There is presently no other information available for this site (see *Figure 1* and Photo 7).

Location in relation to 1998 Master Layout Plan: This location will fall under the proposed Road D7 around the Study area. 3 boreholes are recommended to be developed at this location.

Possible contaminants: petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids, alkalis, phenolics

Location 7 - Above ground fuel tanks (ASTs) and vehicle maintenance area

Description: This property, located along Hing Kwai Road near Siu Hang Tsuen, had a service bay for trucks, and a pair of small, above ground diesel fuel storage tanks. The tanks did not have any secondary containment (see *Figure 4* and Photo 8). Review of old survey maps indicated that this location was formerly the site of three factory buildings in the early 1970s, but the types of industries were not identified.

Location in relation to 1998 Master Layout Plan: This location will fall on the margin of proposed Siu Hang Tsuen village land and a proposed dual roadway (L54A) with cycle ways/footpaths. It is recommended that 3 boreholes are to be developed to ascertain the level of potential contamination.

Possible contaminants: petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids

Location 8 - Open storage lots and vehicle service areas

Description: These lots, located along an unpaved track to the north of Po Tong Ha, were noted to contain several trucks, trailers, and other vehicles in various states of repair. Heavy equipment (bulldozers and graders) and an above ground storage tank were also noted in this area. The tank did not have any secondary containment (See *Figure 5* and Photo 8).

Location in relation to 1998 Master Layout Plan: This location will fall under the proposed Road D7 around the Study area. 3 boreholes are recommended at this location.

Possible contaminants: petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids

Location 9 - PCL Trailer Storage Yard, Hing Kwai Road

Description: This site is presently operated as the PCL trailer storage yard and stores several hundred shipping containers, stacked up to seven high. It is located next to the Sun Power Trailer Depot, and across the road from the Shun Fat Trailer Depot C. Prior to June 1998, this site was operated as the Hoi Kong Container Services Corp. The site is registered with the EPD's Local Control Office (Territory West) as a chemical waste producer. However, correspondence with the EPD indicated that the site apparently had no visual land contamination problems.

Review of aerial photographs for the site indicated that this entire open site area was developed in late 1976 for timber storage. Raw trees were stored on the site until the late 1980s, when the land was converted to trailer storage.

Location in relation to 1998 Master Layout Plan: The location falls within the proposed PSPS Development Site Number 3. 4 boreholes are recommended to be developed based on the size of this location.

Possible contaminants: petroleum hydrocarbons, oils, degreasers and solvents, heavy metals, acids, possible wood preservatives and treatment chemicals

2.2.2

Drilling and Sampling Programme

The boreholes shall be drilled using a drilling rig equipped with a down hole standard penetration (SPT) split barrel sampling tool. Prior to commencement of intrusive activities, all proposed drilling locations will be marked and cleared of any underground utilities.

Drilling and sampling equipment shall be cleaned with a non-phosphate soap solution and water, with a distilled water rinse. This procedure shall be repeated after use at each borehole to avoid potential cross contamination between boreholes, and during sampling to ensure that any contamination from the surface of the site does not affect deeper substrata or the ground water.

The drilling process shall be performed by an appropriate drilling contractor, under the direction of a qualified geologist, who should record the lithology.

The final borehole depth shall be dependent upon the site conditions at the discretion of the on-site geologist, but is expected to be 3 m if there is no indication of any significant contamination, or 5 m if there is some indication of contamination beyond that depth. At least one of the samples, as described above, will be collected below the level of apparent contamination. The locations of the proposed borings are shown in the *Figures*.

The sampling programme shall be undertaken following appropriate protocols so as to minimize the potential for cross-contamination between sampling locations. The soil sampling methodologies specified are based on methods

developed by the US EPA and ASTM, as detailed above. These methods include decontamination procedures, sample preparation and preservation, and chain-of-custody documentation, as outlined below.

Decontamination Procedures

Sampling equipment used during the course of the investigation programme shall be decontaminated appropriately using the following procedures.

- manual wash and scrub with Decon-90, a non-phosphate detergent;
- distilled water rinse; and
- air drying.

During sampling and decontamination activities, disposable latex gloves should be worn to prevent transfer of contaminants from other sources. Any disposable equipment such as latex gloves should be discarded after each use.

Soil Sample Collection

Soil samples should be placed into clean glass bottles or sampling containers (provided by the laboratory) immediately after collection. They should then be transferred to an ice box or cooler container, also provided by the laboratory. Samples should be kept as cool as possible, by regularly replacing the icepacks. All samples should be collected by the site investigation contractor under chain of custody protocols as described below.

Soil samples should be collected for head space analysis using an organic vapour monitor (OVM), to assist in the selection of any samples for analysis for volatile or semivolatile organic compounds.

Groundwater Sample Collection

As appropriate, a groundwater samples shall be collected if possible, for analysis. Field measurements of temperature, pH, and specific conductance (SC) should be taken from the sample.

A bottom loading PVC or Teflon bailer should be used to collect the ground water grab samples. The bailer shall be decontaminated before use, as above. Immediately after collection, samples should be transferred to labelled sample containers containing the necessary preservatives (supplied by the laboratory). The samples should be packed in the coolers with icepacks prior to shipment under chain of custody to the laboratory.

2.2.3 *Sample Management*

The sample collection shall be performed by qualified technical staff on site. All samples collected should be placed in a cooler with ice and kept at less than 4 degrees Celsius. Samples should be dispatched to the analytical laboratory for analysis as soon as possible following sampling. All samples should be handled under chain of custody protocols and relinquished to the laboratory representative at the drill site or at a location specified by laboratory.

The three soil samples submitted from each of the boreholes (maximum number of samples to be determined) should be analysed for total petroleum hydrocarbons (TPH) and priority pollutant metals. In addition, if field evidence indicates the presence of contamination (ie any discolouration, odour, or instrument response on the OVM), then a selected number of these samples (up to half the total) should also be analysed for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). The selected analytes may be related to the particular type of land use and suspected contaminants present.

If collected, the ground water samples should be analysed for TPH, SVOCs, and VOCs.

These analytical tests should provide coverage of the expected and potential contaminants at the specific locations within the Study area. The typical target chemical compounds for each of these specific analytical tests, along with detection limits, are presented in *Annex 2*.

2.3.1

Analytical Laboratory

Analysis of samples should be carried out by an appropriately qualified and equipped laboratory, preferably located in Hong Kong. The laboratory chosen is also expected to be Hong Kong Laboratory Accreditation Scheme (HOKLAS) certified and maintain high standards of analytical and technical services including internal quality control/quality assurance (QA/QC) for the detection of trace organic contaminants. All analysis should be conducted according to standard procedures set by the US EPA.

3.1 TIMING OF SITE CONTAMINATION INVESTIGATION

The EIA Study Team have encountered extreme difficulties with regard to site access for the recommended on-site contamination investigations. A review of the land status of borehole locations proposed indicates that eight of the nine proposed locations are within private land lots. Details are presented in Table 3.1a.

Table 3.1a Land Status of Proposed Borehole Locations

Primary Borehole No.	Land Status	Location in Relation to 1998 Master Layout Plan
1	Private land (within Lot No. 606)	within existing and proposed Kei Lun Wai village land
2	Government land (abutting Tsz Tin Road)	within existing and proposed Tsz Tin Tsuen village land
3	Private land (within Lot 272)	within existing and proposed Tsz Tin Tsuen village land
4	Private land (within Lot 305)	within area of the proposed public rental estate Site Number 2
5	Private land (within Lot 364RP)	within area of the proposed three-storey commercial centre/bus terminus/four-storey carpark
6	Probably within private land (Lot 377RP)	location will fall under the proposed Road D7
7	Private land (within Lot 817RP)	on the margin of proposed Siu Hang Tsuen village land and a proposed dual roadway (L54A) with cycle ways/footpaths
8	Private land (within Lot 65)	location will fall under the proposed Road D7
9	Private land (within Lot 785)	within area of the proposed PSPS Development Site Number 3

Any investigation work on private land is subject to access approval/agreement by the owner of the land, and the procedures involved in the notification of owners and obtaining agreement will be extremely time-consuming, in particular in the case of joint private land ownership ('Tso' and 'Tong') within the Study area. By law, Government departments or agencies have no authority to enter private land under normal circumstances. In view of the anticipated difficulties and delays for access, the tight schedule of the Study Programme, the tie in with the consideration of the Project by the Committee on Planning and Land Development (CPLD), and the difficulties with programme phasing and implementation, it is considered that the necessary on-site investigations could not be realistically completed as part of this EIA Study. The abovementioned site access problems, however, would be automatically resolved with the completion of the land resumption process during the early stages of the Implementation Programme.

For the above reasons, it is proposed that the on-site contamination investigations specified in this CAP, and any additional investigation work that may be identified by the findings of the investigations specified in this CAP, should be conducted as part of the Implementation Programme before the commencement of any site clearance works. A CAR should be compiled, upon completion of all relevant site work and laboratory analyses of soil and/or groundwater samples, to assess the presence of any land contamination and the associated environmental impacts. If site contamination is confirmed, a RAP should be compiled and submitted for approval by the EPD. The preparation of these reports and any remediation action that may be required should all be conducted prior to any site clearance works, in accordance with the requirements of the EIAO-TM.

3.2

ASSESSMENT AND REPORTING

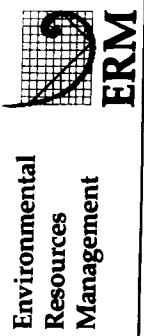
A Contamination Assessment Report (CAR), presenting the findings of the contamination assessment programme, should be developed after obtaining analytical results from the laboratory. The CAR should present the methodology used during the soil boring and sampling work, details of field observations, and findings of the investigation programme, including detailed site histories. It should include visual observations made during the investigation programme, provision of data regarding boreholes and analytical results from soil and ground water sample analyses.

As there are currently no legislative standards requiring clean up of soil and ground water contamination in Hong Kong, the analytical results should be compared against international standards for soil and ground water contamination (i.e. Dutch Standards). Arising from the on-site observations and the quantitative sampling results received, professional judgement should be provided regarding soil and ground water contamination, and the necessity of appropriate mitigation measures.

As necessary, a Remedial Action Plan (RAP) should be prepared in accordance with relevant practice notes or guidance document issued by the Government. In light of the fact that there are no standards for the cleanup of soil and ground water in Hong Kong, any proposed recommendation should examine the relevant issues of soil and ground water treatment versus disposal, as well as outline requirements for construction workers to follow to limit potential future exposures in the event that construction activities encounter contamination. The results of the sampling programme, the report, and the objectives of the RAP should be submitted for EPD's comments prior to finalisation.



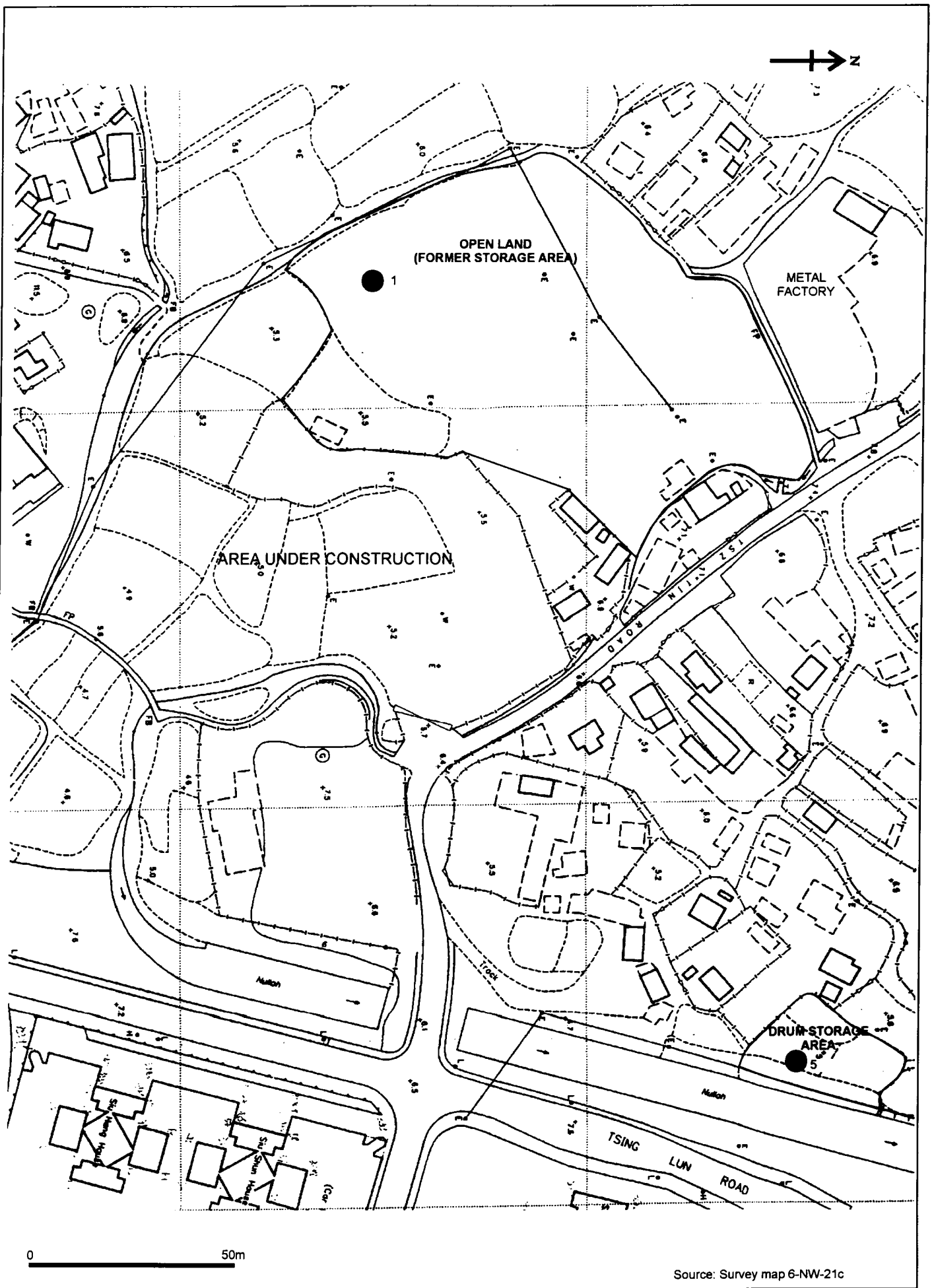
KEY
● 1
BOREHOLE LOCATION



PRELIMINARY SOIL SAMPLING LOCATIONS

FIGURE 1

FILE: C1707C1707g
DATE: 26/05/98



Source: Survey map 6-NW-21c

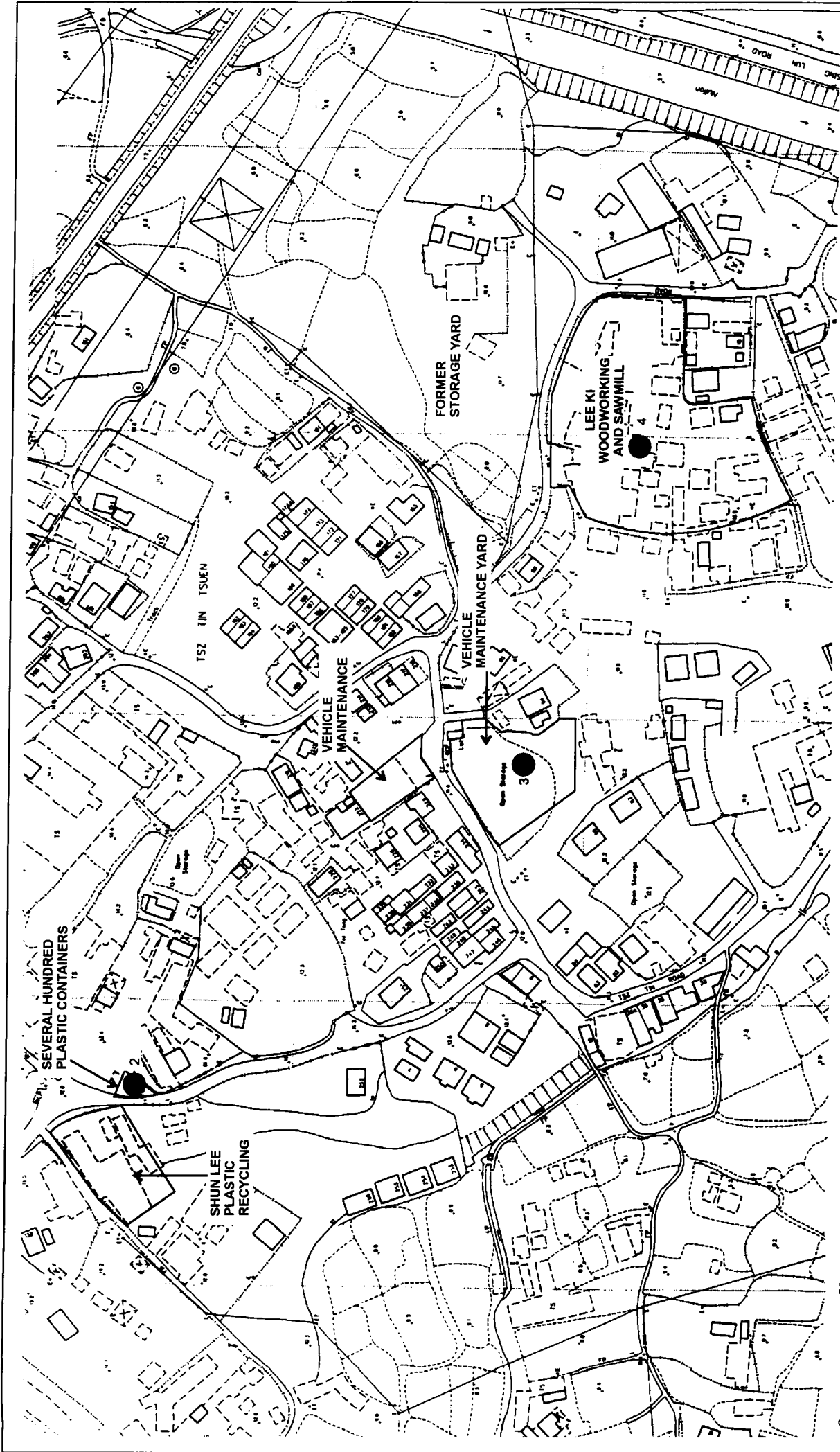
FIGURE 2

PROPOSED BOREHOLE LOCATIONS

FILE: C1707/c170713
DATE: 15/07/98

Environmental
Resources
Management





Source: Survey map 6-NW-21A

PROPOSED BOREHOLE LOCATIONS

FIGURE 3

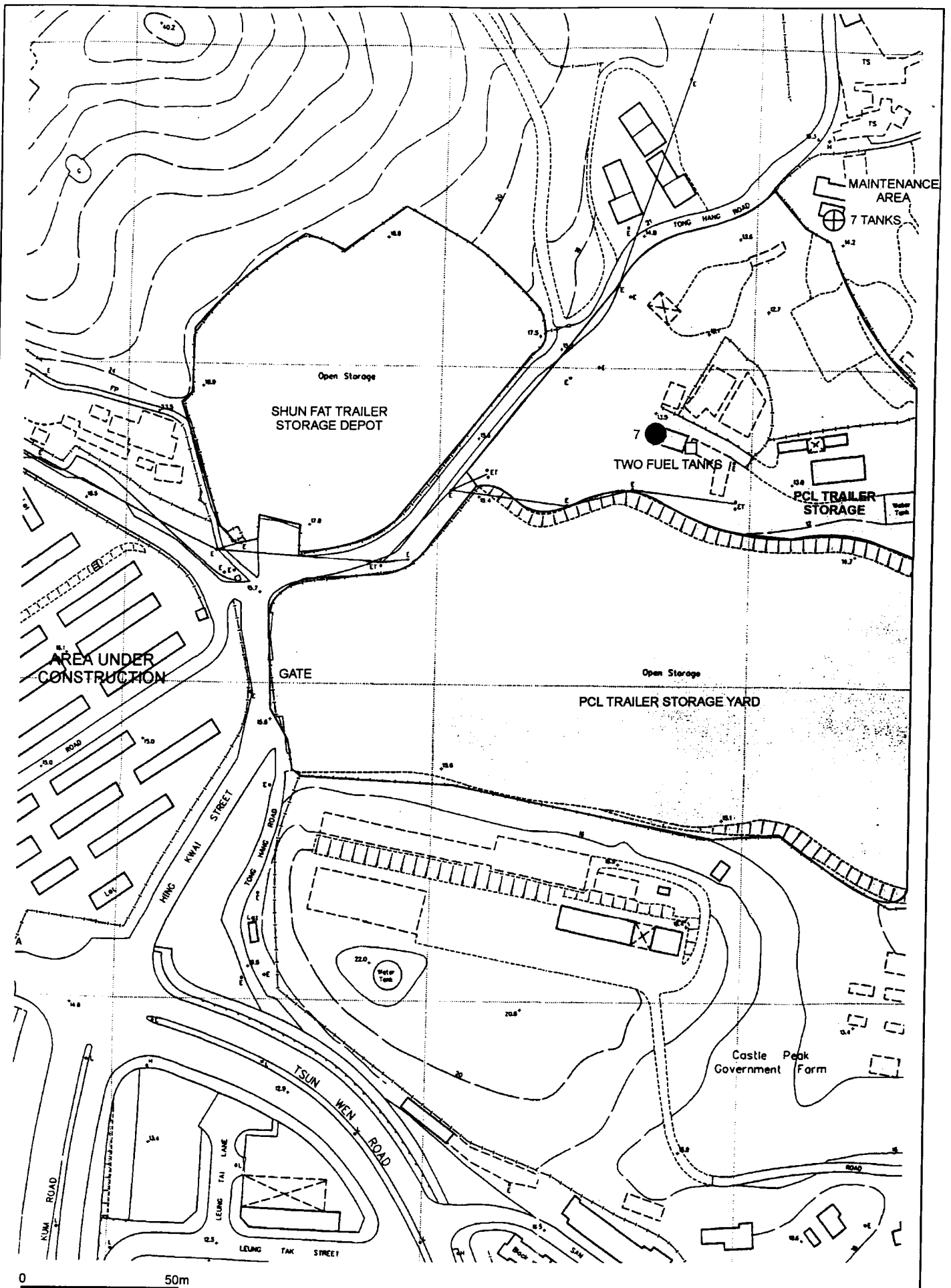


FIGURE 4

PROPOSED BOREHOLE LOCATIONS

FILE: C1707a/17071
DATE: 15/07/98

Source: Survey map 5-NE-25D

Environmental
Resources
Management



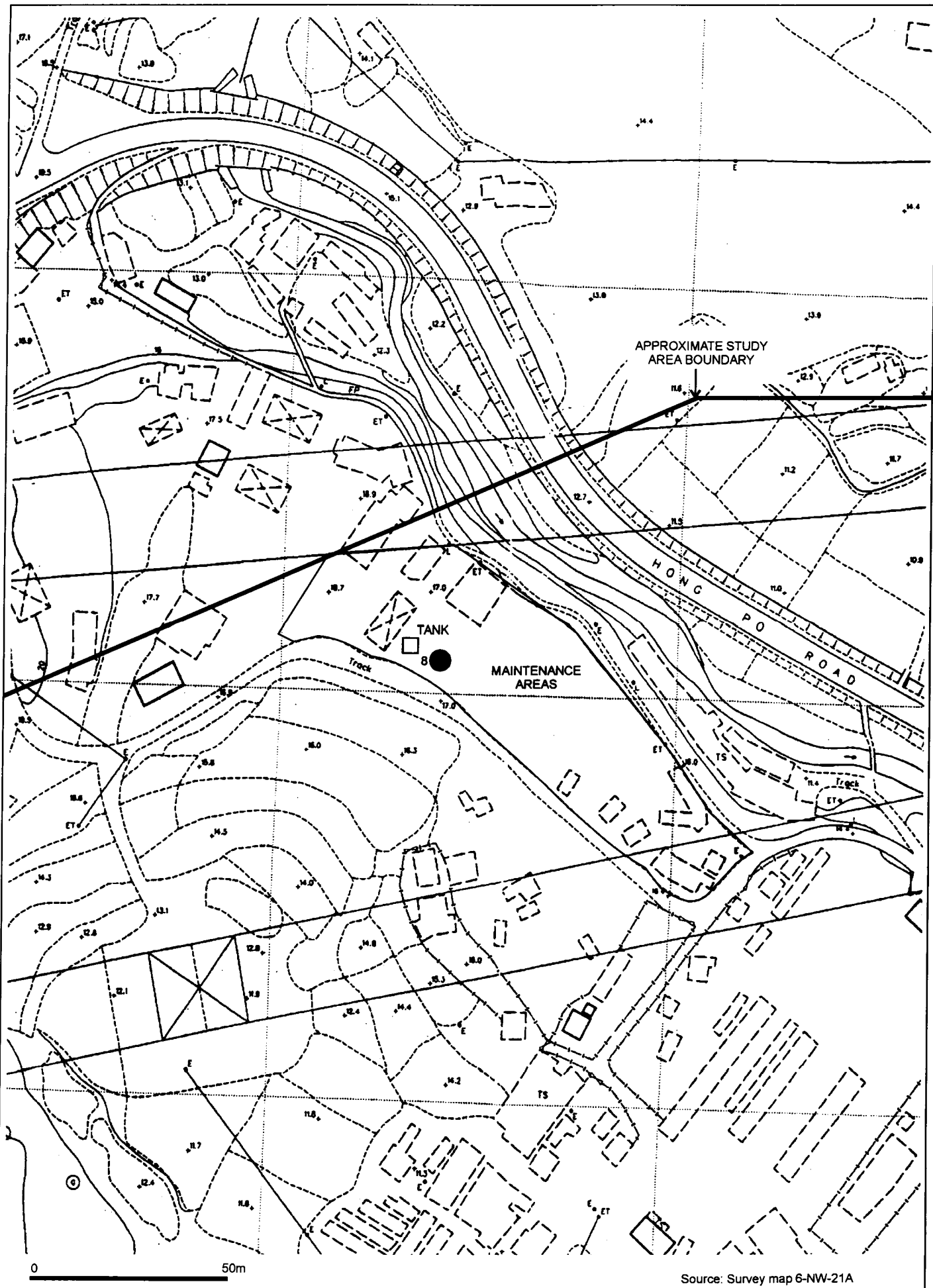


FIGURE 5

PROPOSED BOREHOLE LOCATIONS

FILE: C1707/c170712
DATE: 15/07/98

Source: Survey map 6-NW-21A

Environmental
Resources
Management



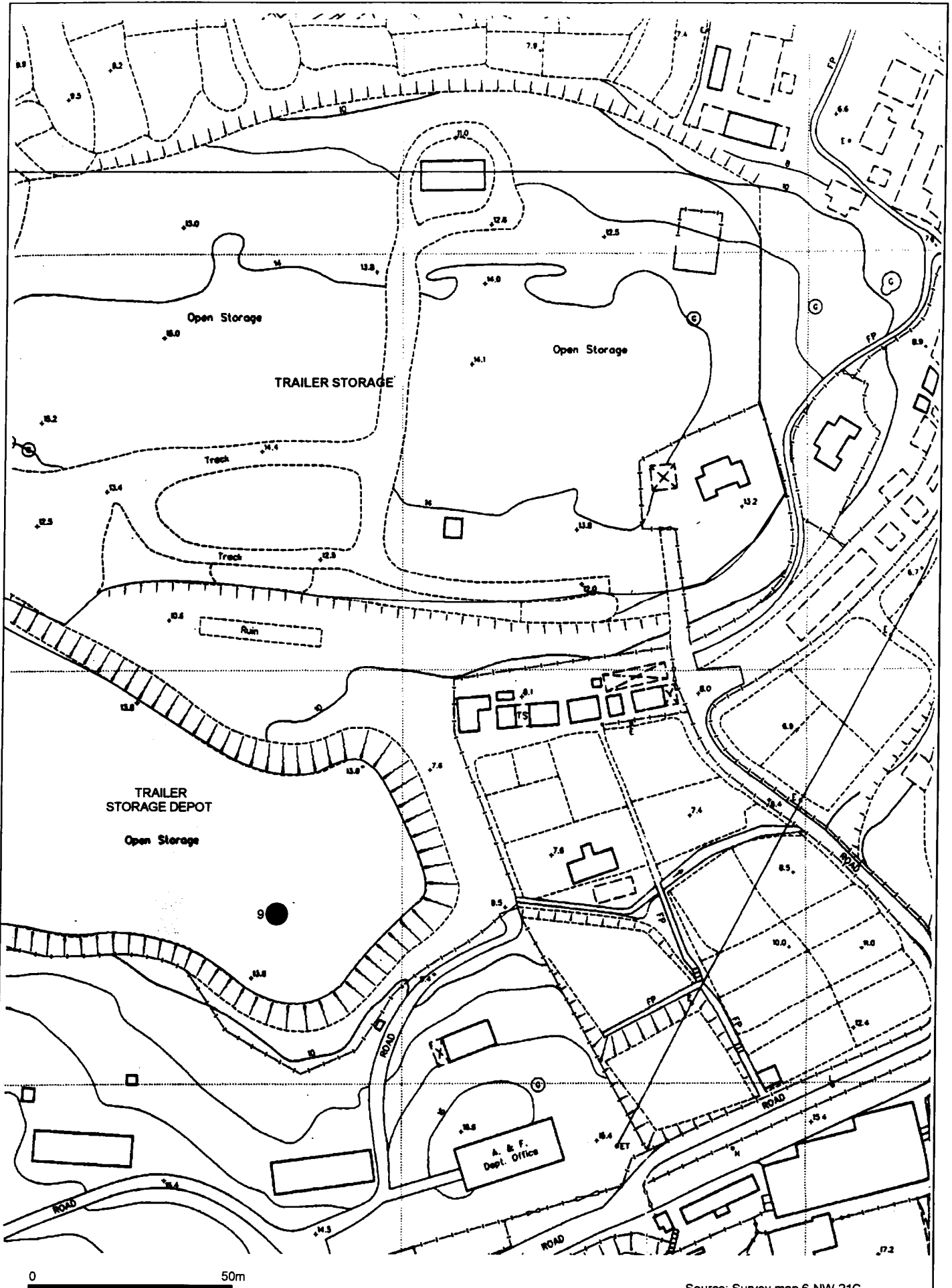


FIGURE 6

PROPOSED BOREHOLE LOCATIONS

FILE: C1707/c170711
DATE: 15/07/98

Environmental
Resources
Management



Annex I(1)

Photographs

Photo 1: Location #1 Former storage area (now vacant) on Tsz Tin Road



Photo 2: Location #2. Empty containers for recycling, next to Shun Lee Factory



Photo 3: Location #3, Part of vehicle maintenance operation on Tsz Tin Road

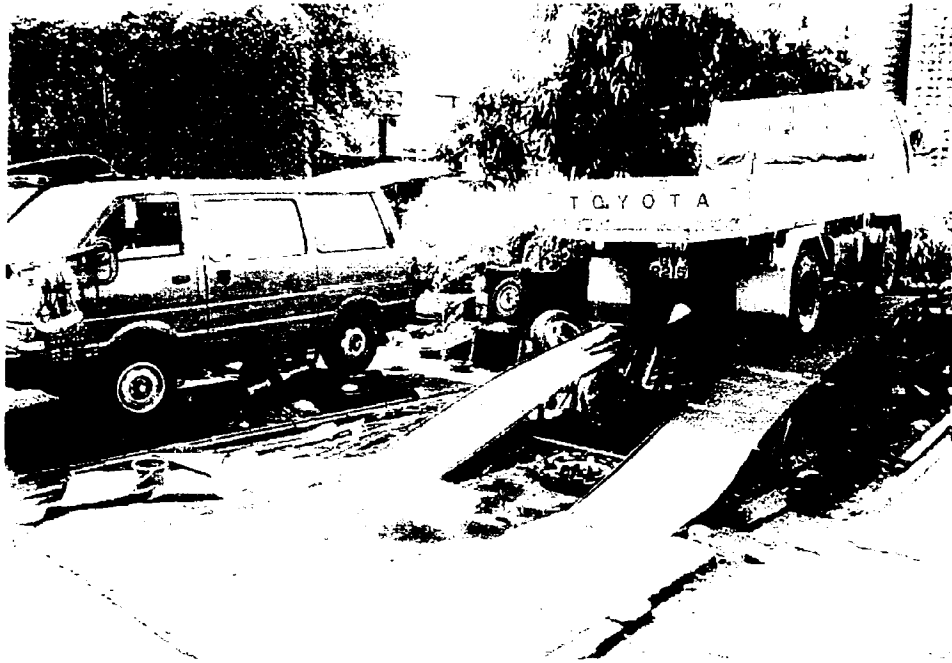


Photo 4: Location #4. Saw mill at at Lot 306, DD32 in Tsz Tin Tsuen

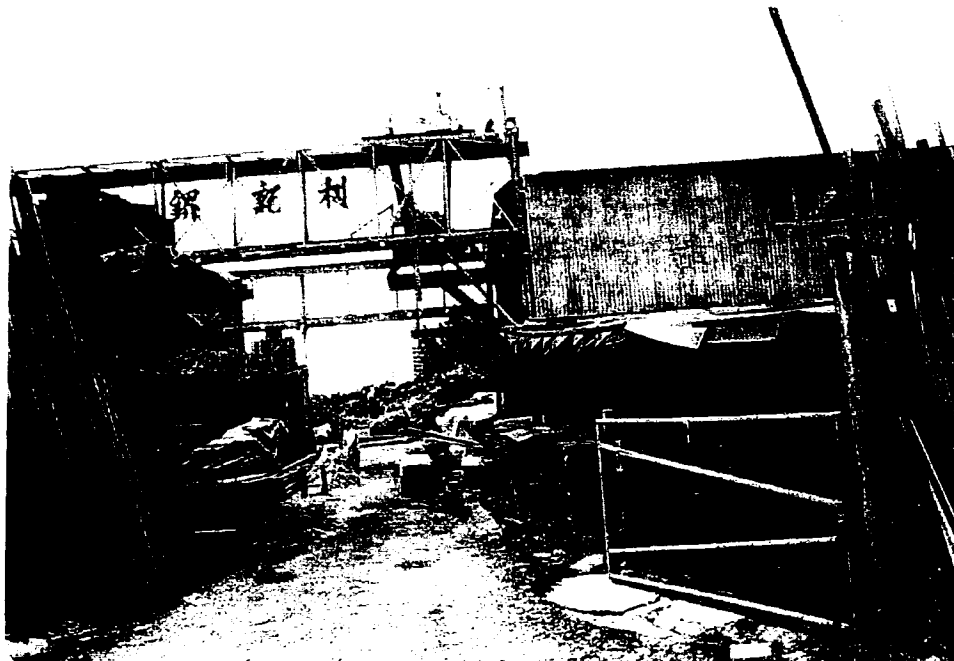
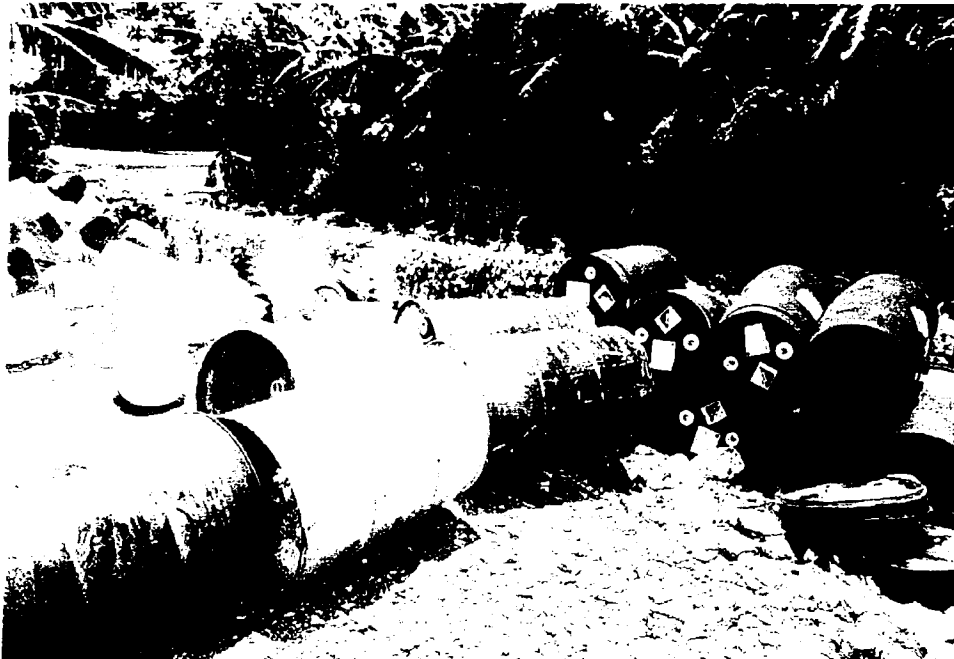


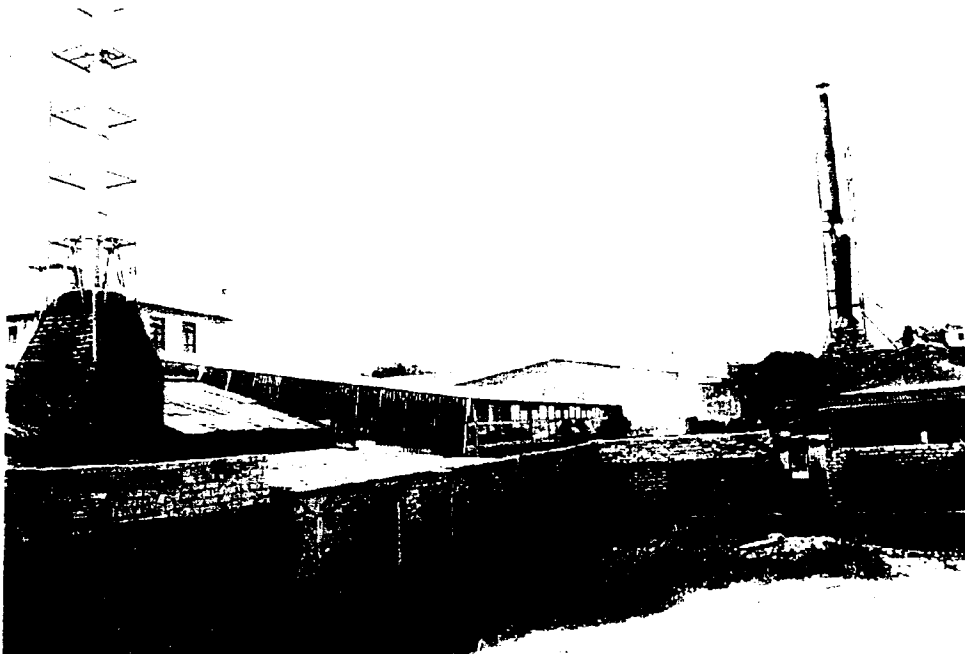
Photo 5: Location #5, Drum recycling operation of the Kin Kat Waste, Waste paper and Alloy Company



Photo 6: Location #5. Second view of drums at Kin Kat Company



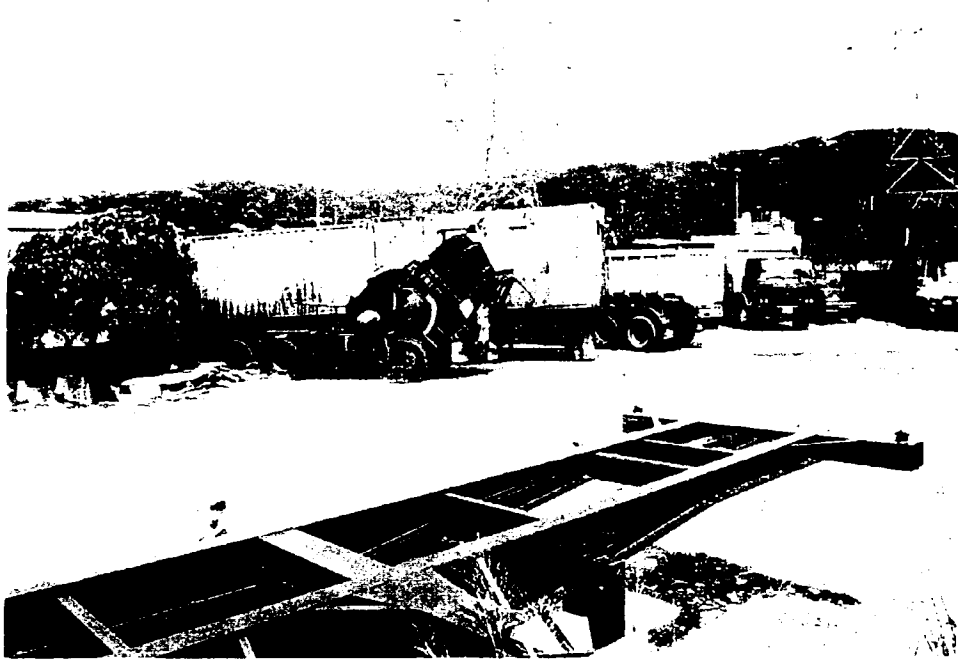
*Photo 7: Location #6, Industrial properties and vacant lot along Hong Po Road
(Suspected tannery in the 1970s)*



*Photo 8: Location #7. Trailer and truck maintenance areas along Hing Kwai Road
(Note two fuel tanks to left)*



Photo 9: Location #8, Typical view of open storage and Maintenance areas along Hong Po Road



Annex I(2)

**Typical Target Chemical
Compounds**

(source: ALS Technichem (HK) Pty Ltd)

TOTAL PETROLEUM HYDROCARBONS (TPH)

ALS METHOD: EP-071
REF: USEPA 8015 (MOD)/GCMS/FID

REPORTING BANDS (Fractions)	LEVEL OF REPORTING	
	SOIL mg/kg	WATER ug/L
EP-071: TPH		
C6 - C9	2	20
C10 - C14	50	50
C15 - C28	100	100
C29 - C36	100	50

SEMIVOLATILE ORGANIC COMPOUNDS (SVOC)

ALS METHOD: EP-075
REF: USEPA 8270/GCMS

TARGET COMPOUNDS	LEVEL OF REPORTING	
	SOIL mg/kg	WATER ug/L
EP-075A: PHENOLS		
Phenol	0.5	2
2-Chlorophenol	0.5	2
2-Methylphenol	0.5	2
4-Methylphenol	0.5	2
2-Nitrophenol	0.5	2
2,4-Dimethylphenol	0.5	2
2,4-Dichlorophenol	0.5	2
2,6-Dichlorophenol	0.5	2
4-Chloro-3-methylphenol	0.5	2
2,4,6-Trichlorophenol	0.5	2
2,4,5-Trichlorophenol	0.5	2
Pentachlorophenol	1	4
EP-075B: POLYAROMATIC HYDROCARBONS		
Naphthalene	0.5	2
2-Methylnaphthalene	0.5	2
2-Chloronaphthalene	0.5	2
Acenaphthylene	0.5	2
Acenaphthene	0.5	2
Fluorene	0.5	2
Phenanthrene	0.5	2
Anthracene	0.5	2
Fluoranthene	0.5	2
Pyrene	0.5	2
N-2-Fluorenylacetamide	0.5	2
Benz(a)anthracene	0.5	2
Chrysene	0.5	2
Benzo(b) & (k) fluoranthene	1	4
7,12-Dimethylbenz(a)anthracene	0.5	2
Benzo(a)pyrene	0.5	2
3-Methylcholanthrene	0.5	2
Indeno(1,2,3-cd)pyrene	0.5	2
Dibenz(a,h)anthracene	0.5	2
Benzo(g,h,i)perylene	0.5	2

TARGET COMPOUNDS	LEVEL OF REPORTING	
	SOIL mg/kg	WATER ug/L
EP-075C: PHTHALATE ESTERS		
Dimethyl phthalate	0.5	2
Diethyl phthalate	0.5	2
Di-n-butyl phthalate	0.5	2
Butyl benzyl phthalate	0.5	2
Bis(2-ethylhexyl) phthalate	5	20
Di-n-octyl phthalate	0.5	2
EP-075D: NITROSAMINES		
N-Nitrosomethylethylamine	0.5	2
N-Nitrosodiethylamine	0.5	2
N-Nitrosopyrrolidine	1	4
N-Nitrosomorpholine	0.5	2
N-Nitrosodi-n-propylamine	0.5	2
N-Nitrosopiperidine	0.5	2
N-Nitrosodibutylamine	0.5	2
Diphenylamine & N-Nitrosodiphenylamine	1	4
Diallate	0.5	2
Methapyrilene	0.5	2
EP-075E: NITROAROMATICS AND KETONES		
2-Picoline	0.5	2
Acetophenone	0.5	2
Nitrobenzene	0.5	2
Isophorone	0.5	2
2,6-Dinitrotoluene	1	4
2,4-Dinitrotoluene	1	4
1-Naphthylamine	0.5	2
4-Nitroquinoline-N-oxide	0.5	2
5-Nitro-o-toluidine	0.5	2
Azobenzene	0.5	2
1,3,5-Trinitrobenzene	0.5	2
Phenacetin	0.5	2
4-Aminobiphenyl	0.5	2
Pentachloronitrobenzene	0.5	2
Pronamide	0.5	2
Dimethylaminoazobenzene	0.5	2
Chlorobenzilate	0.5	2

TARGET COMPOUNDS	LEVEL OF REPORTING	
	SOIL mg/kg	WATER ug/L
EP-075F: HALOETHERS		
Bis(2-chloroethyl) ether	0.5	2
Bis(2-chloroethoxy) methane	0.5	2
4-Chlorophenyl phenyl ether	0.5	2
4-Bromophenyl phenyl ether	0.5	2
EP-075G: CHLORINATED HYDROCARBONS		
1,3-Dichlorobenzene	0.5	2
1,4-Dichlorobenzene	0.5	2
1,2-Dichlorobenzene	0.5	2
Hexachloroethane	0.5	2
1,2,4-Trichlorobenzene	0.5	2
Hexachloropropylene	0.5	2
Hexachlorobutadiene	0.5	2
Hexachlorocyclopentadiene	2.5	10
Pentachlorobenzene	0.5	2
Hexachlorobenzene	1	4
EP-075H: ANILINES AND BENZIDINES		
Aniline	0.5	2
4-Chloroaniline	0.5	2
2-Nitroaniline	1	4
3-Nitroaniline	1	4
Dibenzofuran	0.5	2
4-Nitroaniline	0.5	2
Carbazole	0.5	2
3,3'-Dichlorobenzidine	0.5	2
EP-075I: ORGANOCHLORINE PESTICIDES		
alpha-BHC	0.5	2
gamma-BHC	0.5	2
beta-BHC	0.5	2
delta-BHC	0.5	2
Heptachlor	0.5	2
Aldrin	0.5	2
Heptachlor epoxide	0.5	2
Endosulfan I	0.5	2
p,p'-DDE	0.5	2

TARGET COMPOUNDS	LEVEL OF REPORTING	
	SOIL mg/kg	WATER ug/L
Dieldrin	0.5	2
Endrin	0.5	2
Endosulfan 2	0.5	2
p,p'-DDD	0.5	2
Endosulfan sulfate	0.5	2
p,p'-DDT	1	4
EP-075J: ORGANOPHOSPHORUS PESTICIDES		
Methanesulfonate methyl	0.5	2
Methanesulfonate ethyl	0.5	2
Dichlorvos	0.5	2
cis-ISOSAFROLE	0.5	2
trans-ISOSAFROLE	0.5	2
Safrole	0.5	2
Dimethoate	0.5	2
Diazinon	0.5	2
Chlorpyrifos methyl	0.5	2
Malathion	0.5	2
Fenthion	0.5	2
Chlorpyrifos	0.5	2
Pirimiphos ethyl	0.5	2
Chlorfenvinphos-E	0.5	2
Chlorfenvinphos-Z	0.5	2
Prothiofos	0.5	2
Ethion	0.5	2

VOLATILE ORGANIC COMPOUNDS (VOC)

ALS METHOD: EP-074

REF: USEPA 8260/GCMS

TARGET COMPOUNDS	LEVEL OF REPORTING	
	SOIL mg/kg	WATER ug/L
EP-074A: MONOCYCLIC AROMATICS		
Benzene	0.5	5
Toluene	0.5	5
Ethylbenzene	0.5	5
meta- & para-Xylene	1	10
Styrene	0.5	5
ortho-Xylene	0.5	5
Isopropylbenzene	0.5	5
n-Propylbenzene	0.5	5
1,3,5-Trimethylbenzene	0.5	5
sec-Butylbenzene	0.5	5
1,2,4-Trimethylbenzene	0.5	5
tert-Butylbenzene	0.5	5
p-Isopropyltoluene	0.5	5
n-Butylbenzene	0.5	5
EP-074B: OXYGENATED COMPOUNDS		
2-Propanone (Acetone)*	-	-
Vinyl acetate	5	50
2-Butanone (MEK)	5	50
4-Methyl-2-pentanone (MIBK)	5	50
2-Hexanone (MBK)	5	50
EP-074C: SULFONATED COMPOUNDS		
Carbon disulfide	0.5	5
EP-074D: FUMIGANTS		
2,2-Dichloropropane	0.5	5
1,2-Dichloropropane	0.5	5
cis-1,3-Dichloropropylene	0.5	5
trans-1,3-Dichloropropylene	0.5	5
1,2-Dibromoethane	0.5	5

TARGET COMPOUNDS	LEVEL OF REPORTING	
	SOIL mg/kg	WATER ug/L
EP-074E: HALOGENATED ALIPHATICS		
Dichlorodifluoromethane	5	50
Chloromethane	5	50
Vinyl chloride	5	50
Bromomethane	5	50
Chloroethane	5	50
Trichlorofluoromethane	5	50
1,1-Dichloroethene	0.5	5
Iodomethane	0.5	5
Methylene chloride*	-	-
trans-1,2-Dichloroethene	0.5	5
1,1-Dichloroethane	0.5	5
cis-1,2-Dichloroethene	0.5	5
1,1,1-Trichloroethane	0.5	5
1,1-Dichloropropylene	0.5	5
Carbon tetrachloride	0.5	5
1,2-Dichloroethane	0.5	5
Trichloroethene	0.5	5
Dibromomethane	0.5	5
1,1,2-Trichloroethane	0.5	5
1,3-Dichloropropane	0.5	5
Tetrachloroethene	0.5	5
1,1,1,2-Tetrachloroethane	0.5	5
trans-1,4-Dichloro-2-butene	0.5	5
cis-1,4-Dichloro-2-butene	0.5	5
1,1,2,2-Tetrachloroethane	0.5	5
1,2,3-Trichloropropane	0.5	5
Pentachloroethane	0.5	5
1,2-Dibromo-3-chloropropane	0.5	5
Hexachlorobutadiene	0.5	5
EP-074F: HALOGENATED AROMATICS		
Chlorobenzene	0.5	5
Bromobenzene	0.5	5
2-Chlorotoluene	0.5	5
4-Chlorotoluene	0.5	5
1,3-Dichlorobenzene	0.5	5
1,4-Dichlorobenzene	0.5	5
1,2-Dichlorobenzene	0.5	5
1,2,4-Trichlorobenzene	0.5	5
1,2,3-Trichlorobenzene	0.5	5

TARGET COMPOUNDS	LEVEL OF REPORTING	
	SOIL mg/kg	WATER ug/L
EP-074G: TRIHALOMETHANES		
Chloroform	0.5	5
Bromodichloromethane	0.5	5
Dibromochloromethane	0.5	5
Bromoform	0.5	5
EP-074H: NAPHTHALENE		
Naphthalene	5	7

* These compounds available upon request only.

Metals	Water		Soil	
	Method	Detection Limit (mg/L)	Method USEPA 3051	Detection Limit (mg/kg)
Antimony (Sb)	ICP-MS	0.001	ICP-MS	0.5
Arsenic (As)	ICP-MS	0.01	ICP-AES	0.5
Beryllium (Be)	ICP-MS	0.001	ICP-MS	0.5
Cadmium (Cd)	ICP-MS	0.001	ICP-AES	0.5
Chromium (Cr)	ICP-MS	0.001	ICP-AES	0.5
Copper (Cu)	ICP-MS	0.001	ICP-AES	0.5
Lead (Pb)	ICP-MS	0.001	ICP-AES	0.5
Mercury (Hg)	Cold VAP/AAS	0.0005	ICP-MS	0.05
Nickel (Ni)	ICP-MS	0.001	ICP-AES	0.5
Selenium (Se)	ICP-MS	0.01	ICP-MS	0.5
Silver (Ag)	ICP-MS	0.001	ICP-MS	0.5
Thallium (Tl)	ICP-MS	0.001	ICP-MS	0.5
Zinc (Zn)	ICP-MS	0.001	ICP-AES	0.5

USEPA 3051 = Microwave Assisted Acid Digestion for the determination of metals in soils, sediments, sludges and oils.

The Detection Limits listed for waters assume a 'clean' water with Total Dissolved Solids of less than 2000 mg/L.

For 'saline' waters the detection limits are raised in accordance with the dilution required to bring the TDS within the working range.

For soils, the DL's are for samples 'as received'.

Source: ALS Technichem (HK) Pty Ltd - USEPA Priority Pollutant Metals