



Contaminated Ground Management Plan

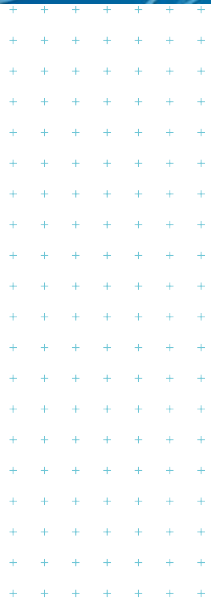
Category 2 Areas

Prepared for
Christchurch International Airport Ltd

Prepared by
Tonkin & Taylor Ltd

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This report has been prepared for the benefit of Christchurch International Airport Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report has been prepared in general accordance with national guidance and standards for conducting ground contamination-related desk study investigations in New Zealand. This includes compliance with the general format described in the Ministry for the Environment (MfE) Contaminated Land Management Guideline No. 1 *“Reporting on Contaminated Sites in New Zealand”*.

Tonkin & Taylor Ltd

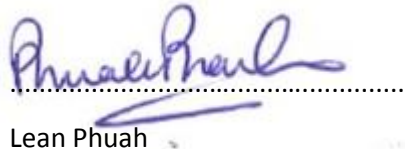
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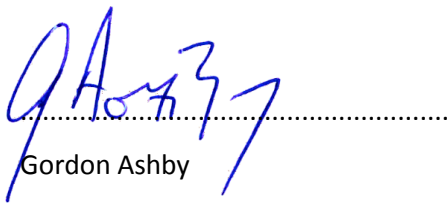
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Table of contents

1	Introduction	1
1.1	Basis for the procedures	1
1.2	Site management	1
1.3	Identification of contamination	1
1.4	Post works verification	3
2	Soil Management Procedures	4
2.1	Inspection procedures	4
2.2	General site management procedures	4
2.2.1	Stockpiling of contaminated soils	5
2.2.2	Dust generation	5
2.2.3	Stormwater and sediment control measures	5
2.2.4	Cross contamination	6
2.2.5	Prevention of preferential pathways along pipelines	6
2.2.6	Procedure for removing and reporting on unforeseen structures	6
2.2.7	Soil sampling requirements and procedures	6
2.2.8	Dewatering procedures	7
2.2.9	Imported material procedures	7
2.3	Additional site management procedures	7
2.3.1	Odour control	7
2.3.2	Product control	8
2.3.3	Control of VOCs	8
2.3.4	USTs (fuel and other chemicals)	9
2.3.5	Asbestos containing materials and asbestos in soil	10
3	Accidental Discovery Measures	11
4	Soil Disposal	12
4.1	Disposal of contaminated soil	12
4.2	Disposal of hydro excavation materials	12
4.3	Disposal of un-contaminated soil	12
5	Health and Safety Procedures	13
5.1	General requirements	13
5.1.1	Site establishment	13
5.1.2	General safety requirements	13
5.1.3	Hazard identification	14
5.1.4	General hazard minimisation procedures	14
5.2	Additional hazard management for specific Category 2 areas	15
5.2.1	Confined spaces	15
5.2.2	Ignition risk control	15
5.2.3	Inhalation of toxic gases	15
5.2.4	Inhalation of asbestos fibres	16
Appendix A :	Works Verification Form	

1 Introduction

1.1 Basis for the procedures

Tonkin & Taylor Ltd (T+T) has undertaken a Preliminary Site Investigation (PSI) on the Christchurch International Airport campus to identify current or historical uses at the site with the potential to cause ground contamination. This PSI informs a global consent under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES Soil) for soil disturbance, the removal and replacement of fuel storage systems and for land use changes.

Category 2 areas are those that have been used for one or more medium risk HAIL activities, as described in Section 1.2 of the campus wide Site Management Plan (SMP)¹. The boundaries of Category 2 areas are presented in Appendix A of the SMP. Ground contamination investigations have been undertaken on a number of HAIL sites within Category 2 areas. These investigations have not been assessed for methodology, results, or reliability.

Excavation shall proceed in accordance with the procedures in Sections 2 and 3 (following) to ensure the early identification and containment of any contaminants encountered. Where possible, the excavation shall also be undertaken in a manner which allows soils of different type/composition/contaminant levels to be kept separate. For instance excavated material containing hydrocarbons shall, where possible, be kept separate from soils which do not. If this is carried out the better material may be able to be disposed at a lower cost, following sampling and testing, potentially reducing the overall project costs.

The excavation method should allow for regular inspections and monitoring of the subsurface conditions to allow identification of any areas of unforeseen contamination. Inspection requirements are covered in SMP Section 2.1, with soil sampling procedures in Section 2.2.7 (following).

1.2 Site management

The following are key aspects of site management during all earthworks on Category 2 areas:

- The contractor shall advise CIAL's Environmental Manager at least one day prior to works commencing;
- The site Hazard Board shall include information pertaining to the contamination likely to be encountered (as identified in Table 1.1). The Contractor's details shall be provided on the Hazard Board;
- Personal protective equipment (PPE) relevant to the expected contamination shall be available on site (Section 5);
- The site shall remain secured during non-working hours to prevent access by the public or unauthorised personnel; and
- Appropriate earthworks controls (Section 2) shall be emplaced prior to works commencing.

1.3 Identification of contamination

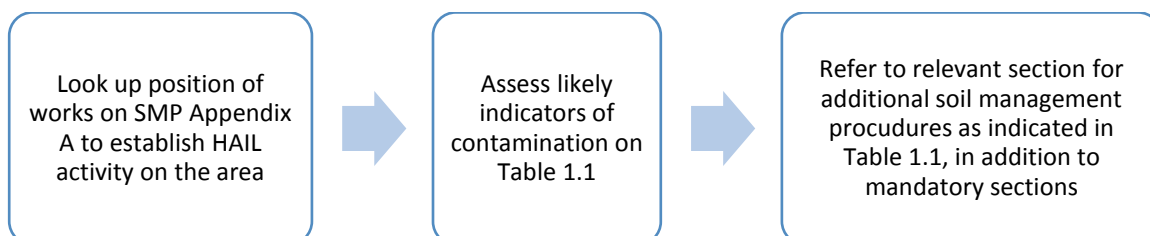
A range of contaminants may be present within Category 2 areas, depending on the nature of the HAIL activity. Indicators that contamination may be present include:

- A hydrocarbon odour (typically smells like petrol, diesel, kerosene etc.);

¹ Site Management Plan, Excavation and handling of contaminated soils at Christchurch International Airport – T+T reference 53920v2 – April 2019.

- Other abnormal odours not normally associated with soil;
- Discoloured soil (i.e. areas of soil with dark staining, abnormal or unnatural colouring);
- Soil with waste material or building debris (i.e. plastics, metal, bricks, timber etc.) indicating the ground has been filled and may contain asbestos containing materials (ACM); and
- An oily substance or sheen on the surface of soil, or on the surface of water in the excavation.

In order to identify HAIL activities that have occurred on an area and indicators of contamination, the following procedure should be followed:



There may be situations where the development of specific site management procedures is needed in addition to the procedures outlined in this document, depending on the nature of the excavations and the HAIL activity. For example, excavations in areas with ACM or former military emplacements require specialist advice that is not within the scope of this document. These situations are commented on in Table 1.1 and earthworks may not proceed without specialist advice.

Table 1.1: Specific HAIL activities and their key contaminants

Type of HAIL activity	Potential Contaminants	Identification of Contamination	Additional Management Sections
Gasworks or gasworks waste	PAH, BTEX, heavy metals, cyanide	Fine black gravels, ash, hydrocarbon odours	2.3.1, 5.2.2
Fuel storage (above or below ground), petroleum depots and fuelling stations	Hydrocarbons including BTEX, PAHs, solvents, heavy metals including lead	Hydrocarbon odours, oily sheen on the surface of soil or water, black stained soil.	2.3.1 to 2.3.4 inclusive, 5.2.1 and 5.2.2
Transformers and substations	PCBs, hydrocarbons, copper, tin, lead and mercury. Asbestos in substations	Stained ground, likely to be localised. Asbestos sheeting, insulation or cladding.	2.3.5, 5.2.4, *
Military emplacements and dumping	PCP, nitroglycerine, heavy metals, fuel oils and solvents.	Visible shot or shells.	Specific site management procedures required.
Asbestos ACMs e.g. cement pipes, building materials, as well as fragments and free fibres in soil	Asbestos	Visual identification of ACM fragments (e.g. Super 6 sheeting). Asbestos fibres in soil may not be visible, soil sampling and laboratory analysis required.	2.3.5, 5.2.4, *
Coal yard	Hydrocarbons (PAH), boron and arsenic	Visible coal, odours.	2.3.1, 2.3.3

Type of HAIL activity	Potential Contaminants	Identification of Contamination	Additional Management Sections
Landfill, waste ponds and recycling centres.	Dependant on waste composition; wide range of hydrocarbons, metals, organic acids and landfill gas.	Strong odours (H ₂ S, 'rotten' odours), visible refuse.	Specific site management procedures required.
Wood storage or processing.	PCP, copper, arsenic, chromium, boron, PAHs, creosote, antisapstain, OCP, TBT.	Stained ground (especially green staining), unusual odours.	2.3.1
Foundry activities.	Heavy metals, acids, cyanide, BTEX, solvents.	Ash, slag or odours.	2.3.1, 2.3.5, 5.2.3 2.3.1, 2.3.3, 5.2.3

*for asbestos in soils see Appendix B, Contaminated Site Management Plan - Category 1 Areas –version 4, April 2019.

1.4 Post works verification

Works verification procedures are outlined in Section 5 of the campus wide SMP and are centred on the use of a works verification form by the Contractor and Contaminated Land Specialist. A copy of the Works Verification Form is included in Appendix A.

2 Soil Management Procedures

Due to the range of contamination that may be identified in Category 2 areas, a range of soil management procedures may be applicable. These procedures focus on the early identification of contaminants and implementation of appropriate handling and disposal procedures.

All earthworks in Category 2 areas will follow the soil handling procedures in Section 2.2.

2.1 Inspection procedures

The Contaminated Land Specialist will attend a tool box meeting prior to excavations commencing to discuss potential soil and groundwater contamination issues that may arise during excavations. The Contaminated Land Specialist will then be on call as required and may inspect the excavations at any time during earthworks. In addition, all excavations in Category 2 areas shall be inspected regularly by the Site Environmental Manager, at an interval determined by the Contaminated Land Specialist.

If unforeseen contamination is encountered, the Contaminated Land Specialist will be contacted to inspect the excavation and advise on the appropriate soil handling and health and safety procedures.

2.2 General site management procedures

The following general handling procedures should be followed where contamination is identified/suspected in any Category 2 area, except where testing of soils has proven soils to be not impacted by the HAIL activity (see Section 2.2.7):

- Material excavated shall be loaded by the Contractor directly onto trucks for offsite disposal, or temporarily stockpiled to prevent contamination of other areas;
- Trucks shall be loaded within the site where runoff and possible spills during loading will be controlled and contained;
- Measures shall be put in place to ensure contaminated soil is not tracked offsite on wheels of trucks;
- Each truck will have a tracking document² signed onsite and collected at the receiving facility to track each load of material;
- Trucks shall have their loads covered by tarpaulins during transport of material to a facility licensed to receive the soil. These shall be affixed before leaving site;
- Stockpiling shall be in accordance with Section 2.2.1;
- A permit/manifest shall be obtained by the Contractor from the disposal destination prior to transportation and the Contractor is responsible for obtaining this approval;
- All contaminated material removed from site shall be disposed as per the procedures set out in Section 4.1; and
- All weighbridge dockets shall be retained by the Contractor and provided to the Engineer to the Contract and included in the Works Verification package.

Health and safety precautions identified in Section 5 shall also be followed.

Additional procedures for specific situations are provided in the following sections.

² Driver's log sheets will be sufficient as tracking documents.

2.2.1 Stockpiling of contaminated soils

It is possible stockpiling of contaminated soil on site may be required due to phasing of work, or other construction constraints. Where possible stockpiling should be avoided and, if required, the time material is stockpiled shall be minimised as much as practical.

Any material that is suspected to be contaminated that requires stockpiling shall be managed by the Contractor as below:

- Sediment control measures shall encircle the stockpile, this may include:
 - Earth bunds with a minimum height of 0.3 m;
 - Hay bales;
 - Silt fences; and
 - Proprietary products such as filter socks etc.
- If the stockpile is to be remain for more than 1-2 days, the stockpile shall be covered with clean soil, geotextile or a polythene cover to prevent rainfall induced erosion;
- Fenced or otherwise secured so that the general public cannot have access to the stockpile; and
- If the material is odorous, odour control measures shall be put in place. This could include covering the material with clean soil, a polythene cover or instituting a deodoriser system.

2.2.2 Dust generation

From an environmental and human health perspective, dust generated from contaminated soils has the potential to contain contaminants and, during windy conditions, may discharge offsite.

Where contamination is suspected/identified in Category 2 areas, in addition to the standard dust control practices that are incorporated in the Contractor's Environmental Management Plan, the Contractor shall:

- Limit the amount of material to be excavated as much as practicable;
- Limit vehicle access onto contaminated areas;
- Use a water truck or portable water sprays in trafficked areas to dampen dust during dry and windy conditions;
- If required, cover stockpile material awaiting laboratory testing/removal to prevent dust generation;
- Visually monitor dust emissions in the vicinity of the excavation until exposed material has been covered by clean material; and
- Avoid work during windy conditions.

When utilising water to control dust, the Contractor shall ensure that:

- The volume of water used for dust suppression does not cause surface ponding or runoff;
- The application does not cause surface runoff that would discharge into natural water bodies; and
- The application of water does not induce soil erosion and soil pugging.

2.2.3 Stormwater and sediment control measures

Rainwater has the potential to come into contact with contaminated material and become contaminated itself. Contaminated sediment may also be entrained in the stormwater.

Where contamination is suspected/identified in Category 2 areas, the Contractor shall ensure that stormwater and sediment control procedures are put in place prior to any ground breaking works commencing and include at a minimum:

- Limiting the duration of exposure of contaminated ground as much as possible;
- Containment of any runoff during rainfall events within the excavation;
- Bund stockpiles as set out in Section 2.2.1; and
- Controlled site exit points and methods to prevent contaminated soils being tracking offsite by vehicles.

The purpose of the above stormwater and sediment control measures is to prevent contaminated water from entering rivers and streams via the stormwater network.

2.2.4 Cross contamination

To avoid transferring contaminated soils from one site to another the site, all machinery and equipment shall be decontaminated prior to moving from a suspected/identified contaminated site (e.g. a Category 1 site) to a different location.

2.2.5 Prevention of preferential pathways along pipelines

Installation of pipelines through contaminated soils can provide a preferential flow path, through which contaminants can migrate. When laying pipe work through areas of contaminated soil with high groundwater where the contaminants may be mobile, measures (such as pipe dams) shall be put in place to prevent these contaminants from travelling along the permeable bedding of the pipeline. Advice on the design of the mitigation measures (pipe dam etc.) shall be sought from the Contaminated Land Specialist.

2.2.6 Procedure for removing and reporting on unforeseen structures

It is possible that subsurface structures with potential to cause ground contamination may be encountered during the works. Structures of concern are those associated with the storage, transfer or disposal of fuels, chemicals or wastes. These may include USTs, pipelines, waste tanks or sumps etc., but does not include structures associated with stormwater or municipal wastewater. If unforeseen structures of this type are encountered, the Contaminated Land Specialist shall inspect the structures and advise on handling, disposal, and site validation procedures. Any abandoned drainage lines shall be capped off with concrete and inspected by the Contaminated Land Specialist prior to reinstatement.

Underground fuel storage tanks (USTs) are a special case, and a procedure for their removal when encountered in the excavation is set out in Section 2.3.4.

2.2.7 Soil sampling requirements and procedures

Soil sampling shall be undertaken by the Contaminated Land Specialist according to the requirements of the NES Regulations 2012, the *“Australian/New Zealand Standard AS/NZS 5667 11:1998”* and the MfE Contaminated Land Management Guidelines No.5³. Soil samples shall be collected according to the following procedure:

- The materials encountered shall be described in accordance with the NZ Geotechnical Society *“Guidelines for the classification and field description of soils and rocks for engineering purposes”*;

³ Ministry for the Environment, 2004: Contaminated Land Management Guideline No. 5 – *Site Investigation and Sampling*, (revised 2011).

- Freshly gloved hands shall be used to collect soil samples and shall be placed immediately into 300 ml glass jars;
- Any equipment used to collect the samples shall be decontaminated between sample locations using clean water and Decon 90 (a phosphate-free detergent) or similar; and
- Samples shall be shipped in a chilled container to an IANZ accredited laboratory under chain of custody documentation.

The Contaminated Land Specialist shall identify potential contaminants on the basis of visual and olfactory observations. However, at a minimum they shall include metals (arsenic, chromium, copper, nickel, lead and zinc), TPH, BTEX and PAH. Other contaminants may be tested for at the discretion of the Contaminated Land Specialist.

Any evidence of the presence of asbestos shall trigger testing for asbestos content in soil.

The Contaminated Land Specialist shall report the results of any testing to CIAL and the Contractor. It is appropriate to evaluate the results with respect to:

- NES Soil soil contaminant standards for an industrial/commercial land use with respect to protection of human health; and
- Background concentrations for the local area.

2.2.8 Dewatering procedures

It is highly unlikely that groundwater will be encountered in excavations within Category 2 areas. Groundwater and ponded surface water within Category 2 areas shall not be discharged to stormwater unless testing confirms that contaminants are within CCC's permitted stormwater concentrations.

The Contractor shall in the first instance contact the Contaminated Land Specialist to advise if contamination is present. Disposal shall be to sewer at the discretion of CCC. Treatment of the water may be required prior to disposal. Alternatively, disposal by sucker truck and transport to a Treatment Plant may also be possible.

2.2.9 Imported material procedures

Material imported to site is generally virgin quarry material, site sources material, or certified cleanfill. Any other soil imported to site that is not certified cleanfill shall be sampled by a contaminated land specialist at a rate of one sample for every 500 m³ and tested for metals and hydrocarbons as well as any other contaminants as determined by the Contaminated Land Specialist. Results must be consistent with expected background, unless otherwise authorised by consent conditions at the receiving location. It is preferable that fill is tested at its source prior to its use at the site. However, if not, then the Contractor shall stockpile the fill on site until test results are available.

Hardfill imported for backfill, if sourced directly from a quarry or supplier, does not require testing.

2.3 Additional site management procedures

2.3.1 Odour control

If odorous material is uncovered during excavation works the following odour control measures shall be implemented to prevent a nuisance to neighbouring businesses and to ensure the health of workers:

- All work in the immediate vicinity of odorous material shall cease and the exposed material shall be covered, for example with tarpaulin, polyethylene sheeting or a layer of clean soil to prevent further discharge of odour. The contractor shall then seek advice from the Contaminated Land Specialist;
- The Contaminated Land Specialist shall assess the potential for volatile compounds and advise on health and safety requirements. Assessment of volatility may include use of a Photoionisation Detector (PID) and soil sampling and testing;
- Wind conditions shall be assessed and if necessary work shall cease until conditions are more favourable for minimising discharge of odour; and
- A ventilation or other mitigation system, for example odour suppression sprays, shall be established if natural dispersion is not adequate.

Health and safety procedures as set out in Section 5 shall be employed.

2.3.2 Product control

Petroleum-based products may occur in soil on Category 2 sites in close proximity to fuel storage facilities. Petroleum-based products could include petroleum fuels (e.g. petrol, diesel), solvents, tar and creosote. Petroleum-based products can cause discharges if not managed appropriately and may affect the safety of workers, visitors and the general public as well as the environment. Preventing and managing vapour discharges is discussed in Section 2.3.3.

The following procedures shall be implemented at Category 2 sites where it has been identified that there is a potential for petroleum-based product to occur. The following procedures shall be modified as necessary by the Contaminated Land Specialist in conjunction with the Contractors HSO to ensure a safe working environment for workers is maintained:

- No hydrocarbons are to drain to ground during excavations; all leaks are to be collected in drain trays or collection vessels;
- Store all petroleum products away from waterways. An oil tray and suitable absorbent material shall be placed on the ground under all petroleum product storage tanks, drums, etc. The oil tray and absorbent material shall be removed and disposed of by the Contractor prior to Contract completion;
- All valves, taps, pumps etc. on tanks containing petroleum products must be kept locked or secured at all times. All reasonable precautions against release of the contents due to vandalism shall be taken; and
- Machinery cannot be refuelled near waterways.

Free hydrocarbon product may be encountered on soils in areas that have been subject to petroleum industry activities or storage tanks. If free product is encountered, work shall cease and the Contaminated Land Specialist advised immediately. The Contaminated Land Specialist will advise on containment and disposal procedures, which may include use of a spill kit or removal by sucker truck and disposal at an approved facility.

2.3.3 Control of VOCs

Volatile organic compounds (VOCs) are the vapour component of petroleum fuels, solvents, heavy end hydrocarbons such as tar and creosote and can occur as vapour in soil even where a source of the vapours is not present (i.e. product). If VOCs are present hazardous atmospheres may occur and the safety of workers, visitors and the general public compromised.

The following procedures shall be implemented at every project site where there is potential for or it is known that VOCs occur. The following procedures shall be modified as necessary by the

Contaminated Land Specialist in conjunction with the Contractors HSO to ensure a safe working environment for workers is maintained:

- Before starting an excavation in a low or high potential for contamination area, the potential for VOC exposure is assessed. If VOCs have been identified as potentially present, VOC levels at the excavation site shall be tested;
- VOC levels shall be measured using a photoionisation detector (PID), or an alternative VOC monitor. The results shall be compared with Work Place Exposure Standards (Table 2) and appropriate PPE selected;
- Wind and temperature conditions affect levels of VOCs in the working area. If these conditions change, VOC levels shall be reassessed. If necessary work shall cease until conditions are more favourable for minimising volatile inhalation risk and odour dispersion; and
- Ventilation shall be established if natural dispersion is not adequate.

Health and safety procedures as set out in Section 5 shall be employed.

Table 2.1: Workplace exposure limits

Exposure scenario	Exposure limit TWA ppm	STEL ppm
VOCs total (adopted n-hexane limit)	20	60
Benzene	1	2.5

Reference: Workplace Exposure Standards and Biological Exposure Indices.

2.3.4 USTs (fuel and other chemicals)

There is potential to encounter USTs within some Category 2 areas. Any USTs and associated pipe work identified within the excavation shall be removed⁴. The removal procedure, as follows, is appropriate for the removal of USTs formerly containing solvents or petroleum products:

- Notify the Contaminated Land Specialist as soon as the UST is encountered;
- Notify Environment Canterbury and the Christchurch City Council before any works begin;
- Engage a Contractor certified in removal of fuel/chemical tanks;
- Breakout overlying concrete (if present);
- Expose the top and sides of the tanks by pulling back the overburden soil;
- Seal all upper tank openings;
- Remove concrete anchors;
- Lift the tank from the excavation;
- Seal all lower tank openings, and prepare tanks for transport (e.g. label according to dangerous goods class);
- Remove any obviously contaminated bedding material under direction from the Contaminated Land Specialist;
- Transport the tank offsite to a licensed tank disposal location under the appropriate dangerous goods certification, where they will be purged, cleaned and broken down into scrap metal;

⁴ The removal shall be in accordance with the Regional Plan rules.

- Contaminated Land Specialist to undertake validation sampling and reporting as per the MfE guidelines, this may require the excavation to be left open for a period of 5-7 days; and
- Backfill the excavation with suitable material.

2.3.5 Asbestos containing materials and asbestos in soil

There is potential for pipework or buildings to contain asbestos, or for asbestos (either as fragments or free fibres) to be identified within soils on site (particularly in fill or in areas where historic buildings have been demolished). If ACM including pipes or building cladding is encountered on site, the Contractor shall cease work in the area and notify CIAL Environmental Manager, Project Manager and the Contaminated Land Specialist.

Specific controls for the disturbance of soils with trace levels of asbestos (i.e. <0.001 % weight/weight) are detailed in the Contaminated Site Management Plan - Category 1 Areas (version 4, April 2019).

3 Accidental Discovery Measures

Unexpected soil contamination could be encountered during earthworks at Category 2 Areas. Visual and olfactory indicators of contamination include, but are not limited to, the following:

- Odour (petroleum hydrocarbons, oil);
- Green/yellow discoloured soil which may indicate high levels of copper and chromium;
- Black staining coupled with an odour which may indicate heavy oil/hydrocarbon contamination;
- Black gravel/sand which may be boiler ash materials that could be high in metals and PAHs; and
- Inclusions of deleterious materials including, but not limited to, abrasive blasting sand/agents, asbestos, asphalt, bark, cables, cesspit/stormwater sump cleanings, containers, cork tiles, corrugated iron, electrical equipment and insulation, formica, foundry sand, greenwaste, hardboard, household waste, MDF, medical and veterinary waste, metals, paint, painted materials, paper and cardboard, particleboard (chipboard), plywood, road sweepings, sawdust, tar, timber (processed) and wood chips⁵.

The following is a “first response” checklist for the Contractor to follow should visual or olfactory evidence of contamination be encountered during the execution of earthworks.

The presence of other contaminants in high levels may dictate further controls need to be implemented and additional or amended containment/disposal procedures may be required. The first response procedures are designed to provide actions for the Contractor to ensure that contamination is contained while decisions and procedures regarding its management and final disposal are being confirmed.

First Response Checklist:	
Stop work within 10 m of the contamination discovery and isolate the area by taping, coning or fencing off.	<input type="checkbox"/>
Advise the site controller (e.g. appointed person by the contractor managing the works) who will inform the CIAL Environmental Manager as soon as practicable.	<input type="checkbox"/>
Prepare and implement contaminated soil Health and Safety procedures.	<input type="checkbox"/>
Update the site Hazard Board and prevent access to the area by unnecessary personnel.	<input type="checkbox"/>
The contractor and/or CIAL Environmental Manager must advise the Contaminated Land Specialist to inspect and advise of specific controls if appropriate.	<input type="checkbox"/>

⁵ MfE A guide to Management of Cleanfills 2002 – Unacceptable materials.

4 Soil Disposal

4.1 Disposal of contaminated soil

All soils excavated from Category 2 areas shall be assumed to be contaminated unless testing (as per Section 2.2.7) or advice from the Contaminated Land Specialist has indicated that soils are uncontaminated. Contaminated soils shall be kept separate from other excavated material where possible in order to minimise disposal costs.

If sampling is required, it can be undertaken in situ (pre testing prior to excavation) or following excavation from stockpiles. All sampling must be undertaken by a Contaminated Land Specialist⁶. Contractors should be aware that laboratory testing takes 5-7 working days and methodology should account for this potential delay.

The results of the testing will dictate the disposal locations. Broad guidelines are as follows:

- If the levels of contaminants are less than background concentrations (or specific cleanfill consent conditions) then these materials may be disposed of to cleanfill (subject to approval from the cleanfill operator; see Section 4.3);
- If the levels of contaminants are greater than background but less than the Burwood Landfill acceptance criteria then these materials can be disposed of within the Burwood Landfill in the locations directed by the site operator;
- If the levels of contaminants exceeds the Burwood Landfill acceptance criteria, options for pre-treatment, disposal to the facility at Texco Remediation or disposal to Kate Valley should be sought; and
- Excavated materials containing asbestos require disposal to a facility licensed to accept this waste type (e.g. Kate Valley Landfill) with the prior approval of the operator.

Records of the material disposed (weighbridge dockets etc.), and the location of disposal shall be kept for all loads.

4.2 Disposal of hydro excavation materials

Materials from all hydro excavation (slurry etc.) works undertaken at Category 2 sites must only be disposed of at the designated location at the Burwood Landfill as directed by the facilities site operator.

4.3 Disposal of un-contaminated soil

Soils from Category 2 that have been pretested (see Section 2.2.7) and proven to be uncontaminated may be transported to cleanfill for disposal, subject to approval from the cleanfill operator, or retained on site.

The loading of trucks and transport to the cleanfill shall be as per standard soil handling procedures.

Records of the material disposed, and the location of disposal should be kept.

⁶ Where pre-testing is required for disposal or health and safety purposes then testing shall be undertaken in accordance with Ministry for the Environment Contaminated Land Management Guidelines. All testing shall be undertaken by a Contaminated Land Specialist. Analysis results will be compared to the receiving facility acceptance criteria and most recent and relevant human health assessment criteria.

5 Health and Safety Procedures

This Health and Safety Plan (HSP) relates to the risk to workers as a result of moderate potential for significant ground contamination. These are additional to standard health and safety requirements of the Contractor during excavation works.

5.1 General requirements

Health and Safety requirements shall be managed through site specific and job specific safety authorisations (JSA's). The following procedures are to be used as a guide for the preparation of these JSA's. The following procedures deal with health and safety matters relating to contaminated ground only and do not cover other hazards on site.

These general procedures are designed as a base level for all sites, and are designed to cover the generic health and safety set up and controls related to contaminated ground. Specific hazard management procedures for some Category 2 areas are provided in latter parts of this section, depending on the HAIL activity present.

5.1.1 Site establishment

The following shall be put in place by the Contractor prior to ground works commencing:

- The site will be fenced 1.8 metre secured fencing to restrict entry to authorised workers and prevent access by the general public. Appropriate warning signs (e.g. *"Restricted entry"*, *"Danger open excavations"*) shall be erected around the fenced site;
- Health and safety site specific inductions and daily prestart meetings shall be completed; and
- Health and safety facilities as required by the hazard management procedures, such as wash facilities, personal protection equipment stores and first aid points shall be provided.

5.1.2 General safety requirements

Contractor's staff, sub-contractors and visitors shall be required to undergo a site specific safety induction before entering and/or commencing work. The purpose of the safety induction is to make sure staff, sub-contractors and visitors are aware of the hazards related to contaminated soil relevant to the site, safe working procedures, safety equipment and requirements and the action plan in case of an emergency.

The Contractor shall appoint an environmental safety officer (ESO) for the duration of the works. The ESO shall be responsible for ensuring health and safety procedures are adhered to and that the risks associated with the potential hazards are controlled.

The following general safety procedures shall be followed by all staff entering and/or working in the immediate area of the project activities:

- All incidents shall be reported to the ESO;
- Workers shall be made aware of potential hazards on site so they can be identified and appropriate control measures can be taken to ensure the safety of workers, and passers-by;
- Site workers shall avoid unnecessary contact with site soils;
- Site workers shall avoid exposure to asbestos containing material;
- Site workers shall wear personnel protective clothing and equipment as outlined in Section 5.1.4;
- A first aid kit and fire extinguisher must remain and be available on site at all times; and
- Hand washing facilities must be provided onsite.

5.1.3 Hazard identification

Works within Category 2 sites can be expected to encounter a range of contaminated ground conditions, including exposure to the following contaminants:

- Heavy metals;
- Hydrocarbons (fuels, oils and greases);
- Solvents;
- Asbestos (see Appendix B, Contaminated Site Management Plan - Category 1 Areas –version 4, April 2019); and
- Volatile contaminants.

Exposure to the above can result in acute and long term adverse health effects, some of which manifest themselves long after the exposure occurs. It is important that the ESO makes the workers aware of these risks and the importance of complying with the procedures set out in this document.

Workers on contaminated sites can also be subject to unusual stresses, for example, manual work while wearing dust masks or respirators, or exposure to elevated concentrations of contaminants. It would be recommended that the Contractor undertakes continual monitoring and checks that any site workers in Category 2 areas do not have any pre-existing condition which might place them at risk as a result of such stresses.

The ESO shall ensure that all personnel are familiar with the application and use of the equipment and procedures specified in this plan, in addition to your standard Site Safe procedures before commencement of site work. No personnel are to commence work without prior knowledge and understanding of this plan and with the Contractors safety requirements.

5.1.4 General hazard minimisation procedures

Works undertaken in Category 2 areas are likely to encounter contaminated soil and groundwater. Therefore it is appropriate for all workers, sub-contractors and visitors adopt the contractor's health and safety measures to prevent exposure to potentially contaminated soils. The procedures set out below aim to prevent workers, sub-contractors and visitors being exposed to the soils by use of appropriate PPE as well as behavioural practices.

Workers may be exposed to contaminants via the ingestion of soil, skin contact with contaminated soil or inhalation of vapours. To prevent this exposure, the following procedures must be followed by workers who are likely to come into contact with soil or contaminants:

- Wear cloth coveralls;
- The cloth coveralls shall be removed at the end of each day and shall be stored at the work site. ***The coveralls shall not be left in vehicles or taken home*** (this is to prevent tracking contaminated material to the workers' homes);
- The coveralls shall be laundered weekly by a commercial laundry, unless heavily soiled in which case they shall be washed daily. The coveralls shall under no circumstances be taken home and washed;
- Wear P2 dust masks during dusty conditions;
- All staff physically involved in excavations, handling soil or working in excavations shall wear chemical resistant disposal gloves which shall be regularly changed;
- Minimise hand to mouth contact;
- Wash hands and face prior to eating, drinking using the toilet or smoking; and
- Do not eat or drink within the excavation area.

The Contractor must review any new work element and continually monitor and assess whether there are any new associated hazards, and whether these can be eliminated, isolated or minimised. If these hazards are related to ground contamination, the Contractor shall seek advice from the Contaminated Land Specialist. The Contractor shall then instruct all staff, sub-contractors and visitors on the health and safety procedures associated with the new hazard.

5.2 Additional hazard management for specific Category 2 areas

The following sections outline the measures to minimise the effects of the hazards associated with specific HAIL activities as identified in Table 1.1.

5.2.1 Confined spaces

The Contractor shall review the current Australian Standard AS2865⁷ and the Confined Spaces Code of Practice⁸ to determine if works (e.g. excavations or trenching) meet the definition of a confined space and require notification to WorkSafe New Zealand.

If works meet the confined space criteria, they shall be undertaken in accordance with the procedures outlined in the current version of AS2865, the Code of Practice, and the Worksafe New Zealand fact sheet⁹. In general, this will require the following:

- Persons entering excavations shall to be trained and competent in confined space entry;
- The Contractor shall provide an appropriate emergency response plan (ERP);
- The Contractor shall obtain any necessary permits; and
- Any safety and rescue equipment specified in the aforementioned documents shall be present at the commencement of works.

It is the responsibility of the Contractor to ensure their staff are trained, have practiced the ERP and comply with all the relevant regulations relating to confined space entry.

5.2.2 Ignition risk control

Volatile components have the potential to produce an ignition risk if present in air at levels above the lower explosive limit (LEL). In addition to any procedures established by Worksafe New Zealand, the following sets out the general procedures that the Contractor shall follow for monitoring the presence of gases and mitigating potential ignition risk:

- Only use machinery that is suitable for work in a flammable atmosphere;
- A LEL meter shall be onsite at all times, placed as near as practical to the excavation face of all excavated areas and monitoring the atmosphere continuously;
- No work shall be undertaken while ignitable gases are present above the LEL. Alternatively, where necessary, a ventilation system shall be established to dissipate ignitable gases to below the LEL; and
- A suitable fire extinguisher must be kept on site at all times.

5.2.3 Inhalation of toxic gases

If there is potential to encounter toxic gases, the Contractor shall reference the WorkSafe New Zealand Workplace Exposure Standards (WES) prior to the commencement of works to establish the

⁷ Safe Work Australia. AS 2865-2009 *Confined spaces*.

⁸ Safe Work Australia (February 2014). *Confined Spaces Code of Practice*.

⁹ Worksafe New Zealand (January 2016). Fact sheet – *Confined spaces: Planning entry and working safely in confined spaces* (current until review in 2018).

current Time Weighted Average (TWA) and Short Term Exposure Limit (STEL) for likely contaminants, as well as any appropriate measures if the TWA and/or STEL are exceeded. In addition to any chemical-specific protocols, the following general measures shall be undertaken to minimise the risks associated with exposure to toxic gases:

- Before the start of work each day, and following any break longer than 15 minutes, the atmosphere in the area of works shall be tested and recorded;
- All staff working the excavations shall wear personal gas meters;
- Appropriate respiratory protection shall be provided by the Contractor to all workers, including half or full face respirators equipped with the cartridges that are suitable for likely contaminants;
- The Contractor is responsible for providing workers with training in the correct use of respiratory protection and ensuring that it is used where appropriate; and
- Appropriate protection measures (e.g. use of respiratory protection or cessation of works) shall be undertaken if the applicable WES is exceeded.

5.2.4 Inhalation of asbestos fibres

Specific health and safety controls for the disturbance of soils with trace levels of asbestos (i.e. <0.001 % weight/weight) are detailed in Appendix B - Contaminated Site Management Plan - Category 1 Areas (version 4, April 2019).

Appendix A: Works Verification Form

Works Verification Form – Medium Risk Sites

Job Name:			
Location:			
Duration:			
Summary of Works:			
Contaminated soil/water identified (if yes, detail actions undertaken)			
Material disposed (fill name and volume disposed)	Cleanfill:		
	Managed Fill:		
	Landfill:		
Imported material:	Source:		
	Volume:		
Test results (including validation sampling)			
Form completed by:		Date:	
Project Manager		Signed:	
Contaminated Land Specialist		Signed:	

