REPORT

Tonkin+Taylor

Site Management Plan

Excavation and Handling of Contaminated Soils at Christchurch International Airport

Prepared for
Christchurch International Airport Ltd
Prepared by
Tonkin & Taylor Ltd
Date
April 2019
Job Number
53920.2000.v2

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Document Control

Title: Site Management Plan					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
April 2016	1		Lyn Nugent		Peter Cochrane
April 2019	2	Inclusion of updated Category 1, 2 and 3 areas management plans (April 2019).	Mark Morley	Lean Phuah	Gordon Ashby

Distribution:

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Document Control (Continued)

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

Report prepared by:

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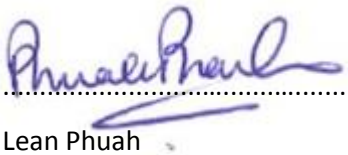
Mark Morley

Environmental Geologist

Report certified by a suitably qualified and experienced practitioner as prescribed under the NES Soil Users Guide (April 2012):



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Lean Phuah

Principal Environmental Engineer

Authorised for Tonkin & Taylor Ltd by:

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Gordon Ashby
Project Director

LNN+MDDM
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1 Introduction

Tonkin & Taylor Ltd (T+T) has been engaged by Christchurch International Airport Ltd (CIAL) to prepare this Site Management Plan (SMP) for ground disturbance at the Christchurch International Airport campus (the site). CIAL manages operations at the 850 ha site, which comprises the airport and associated operations, leased commercial land, undeveloped areas, and roadways. Soil disturbance may be required during operations at the site, which include airport maintenance and expansion projects, and the development of commercial land and associated roadways. This SMP has been prepared for use by CIAL to provide procedures for the appropriate excavation, handling and disposal of potentially contaminated materials that may be encountered when disturbing soils at the site.

This SMP is a general document that can be applied to future CIAL projects that necessitate ground disturbance. It has been prepared to support a global resource consent to the Christchurch City Council (CCC) for works regulated under the NES Soil[1], including soil disturbance, changing land use, and the removal or replacement of a fuel storage system. If a land use change is proposed that will change an area to more sensitive land use, a Suitably Qualified and Experienced Practitioner (SQEP)[2] shall review the land use change and advise if additional remedial or management measures are required. A letter will prepared by the SQEP and provided to the CCC prior to the commencement of works.

1.1 Background

T+T has prepared a Preliminary Site Investigation (PSI)[3] to identify current or historical uses at the site with the potential to cause ground contamination, and the likely nature and extent of contamination. The PSI identified several uses that are included on the Ministry for the Environment's Hazardous Activities and Industries List (HAIL)[4]. The presence of potentially contaminated soil has implications for disposal of waste soil, as well as for health and safety practices for site workers and the public. The findings of the PSI form the basis for this SMP.

This SMP is not intended to cover the management of non-soil waste materials, such as the removed pipe work or other infrastructure materials. It does however cover the handling and disposal procedures for asbestos containing materials (ACM) such as asbestos cement pipes.

1.2 Format of the SMP

In order to efficiently and consistently address the management of potentially contaminated areas across the Christchurch International Airport campus, a whole-site risk based management approach has been developed. HAIL activities identified in the PSI have been classified based on likely risk to human health (refer PSI Table 4.1). Based on the nature and occurrence of HAIL activities, the Airport campus has been subdivided into three management categories of declining risk. HAIL activities for each management category are summarised as follows:

- **Category 1 (areas that have been used for high-risk activities):**
  - Petroleum depots (Activity A13);
  - Storage tanks or drums for fuel, chemicals or liquid waste (Activity A17) – A high-risk activity if the total volume stored in the proposed work area meets or exceeds 20,000 L;

[1] National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Regulations 2011 (NES Soil).
[2] As defined in the NES Soil User's Guide.
[3] Tonkin & Taylor, March 2016. Preliminary Site Investigation for Ground Contamination, Christchurch International Airport, prepared for CIAL.
[4] Hazardous activities and industries list, Ministry for the Environment, 2011.

  - Service stations (Activity F7); and
  - Landfilling (Activity G3).
- **Category 2 (areas that have been used for medium-risk activities):**
  - Sheep dips (Activity A8);
  - Storage tanks or drums for fuel, chemicals or liquid waste (Activity A17) – Chemical or limited fuel storage (medium-risk activity if the total volume of fuel stored in the proposed work area is below 20,000 L);
  - Power generators and transformers (B2);
  - Ordinance bulk storage and disposal (Activity C1);
  - Electroplating (D3);
  - Engineering workshops (Activity D5);
  - Buildings with asbestos products (Activity E1);
  - Asphalt or bitumen manufacture or bulk storage (Activity E2);
  - Airport facilities and operations (Activity F1);
  - Engine reconditioning workshops (Activity F3);
  - Vehicle workshops (Activity F4);
  - Transport depots (Activity F8);
  - Waste disposal to land (Activity G5);
  - Migrating contamination (Activity H); and
  - Miscellaneous intentional or accidental releases (Activity I).
- **Category 3 (areas that have been used only for low-risk activities):**
  - Corrosives bulk storage (Activity A4);
  - Persistent pesticide use and storage (Activity A10);
  - Commercial printers (Activity A15);
  - Wool storage (Activity A16); and
  - Detonation areas for explosive ammunition (Activity C3).

Maps showing the boundaries of each management category are provided in Appendix A.

Separate SMPs have been prepared for each management category. The Category SMPs provide management and health and safety procedures that have been designed to reflect the likelihood of encountering ground contamination in the area and the potential risk to human health. Areas that are not or have not been subject to HAIL activities are not covered by the NES Soil and therefore do not require additional site management procedures above those required for standard earthworks.

Prior to works commencing, CIAL is to ascertain (via the category maps) which category applies to a proposed work area and notify the Contractor, who shall apply the appropriate SMP for all soil disturbance works. Several areas have been used for multiple HAIL activities that have been classified in different risk categories (e.g. Fuel storage and persistent pesticide use). Where a work area contains more than one category, the SMP for the highest risk category shall be used.

Copies of the Category SMPs are provided in Appendices Appendix B to Appendix D.

Ground contamination investigations have been undertaken on a number of HAIL sites within the Airport campus. These investigations have not been assessed for methodology, results, or reliability. Additionally, the suitability of the sampling program will be highly dependent on the development plan and proposed use of the area. The CIAL Environmental Management team may choose to review these reports to refine the risk

classification selection for a particular work area. If the final classification differs from the categorisation above and in

Figure 1.1, a rationale for the selection shall be included in reporting to CCC. We recommend consultation with the Contaminated Land Specialist if existing reports are used to modify an area classification.

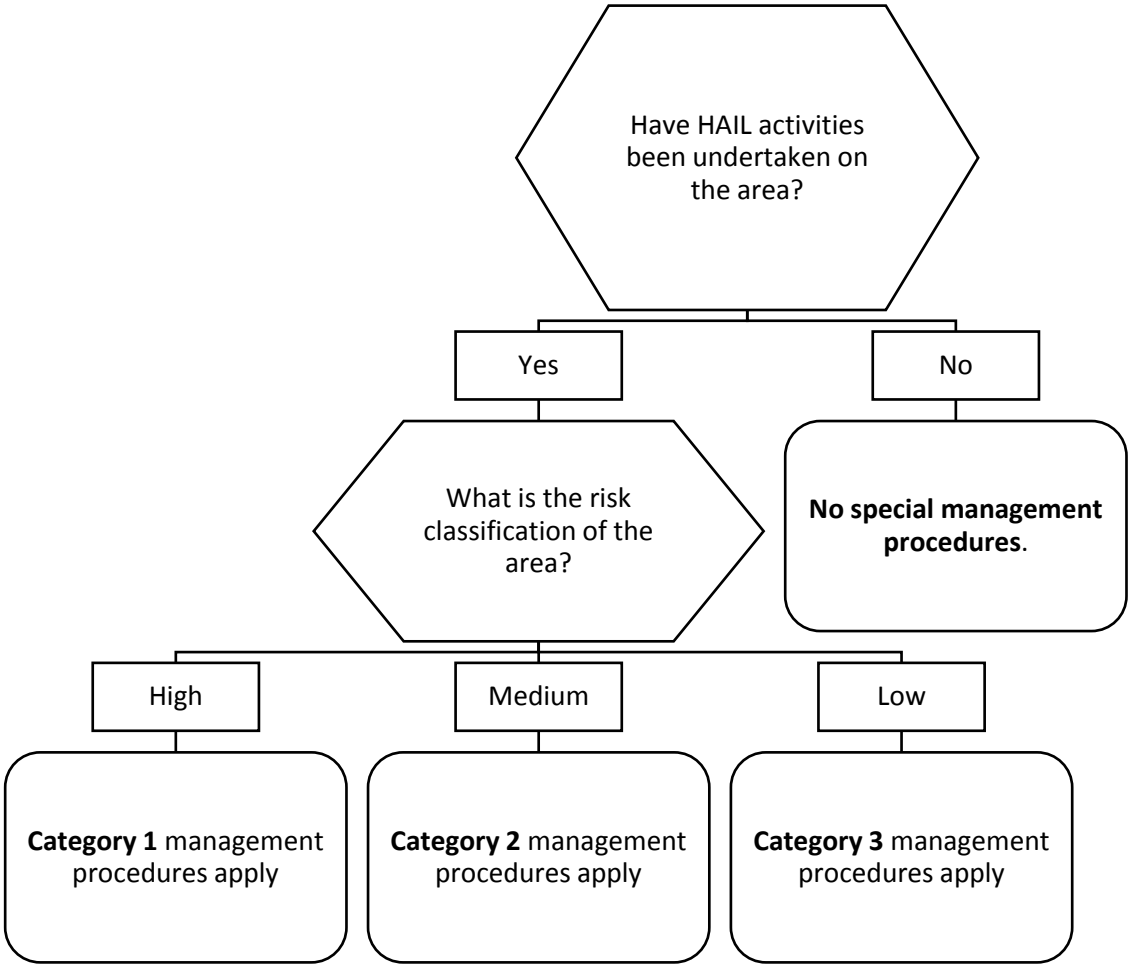

Figure 1.1: Christchurch Airport risk categorisation.

1.3 Objective and scope of the SMP/HSP

The objective of the SMP is to provide procedures for the excavation, handling and disposal of contaminated soil encountered during maintenance and capital works projects, to minimise adverse effects on human health, and manage discharges to the environment.

The category-specific SMPs should be read in conjunction with the applicable findings of the PSI.

The category-specific SMPs provide procedures for:

- Undertaking excavations in areas potentially containing contaminated soils;
- Identifying the presence of contaminants;
- Managing and containing contaminated soils encountered/excavated during soil disturbance works;
- Managing potential nuisance effects during the works such as odour, dust and tracked soil;
- Managing health and safety during the works associated with potentially contaminated soil;

- Undertaking validation soil sampling to assess whether soils remaining on site are compliant with use criteria;
- Monitoring the works to ensure that works are undertaken in accordance with the SMP; and
- Determining the appropriate disposal location of surplus soils.

1.4 Regulatory context

This document and associated Category SMPs have been prepared in general accordance with Ministry for the Environment Contamination Land Management Guidelines No.1 – *Guidelines for Consultants Reporting on Contaminated Sites in New Zealand*. Sampling procedures provided in the plans generally comply with the MfE Contamination Land Management Guidelines No.5 – *Site Investigation and Analysis of Soils*.

The plans are also prepared in general accordance with the soil disturbance related controls referred to in the NES Soil Regulations. The persons preparing and certifying these SMPs are suitably qualified and experienced practitioners as required by the NES Soil and defined in the NES Soil Users' Guide (April 2012).

1.5 Applicability

The SMPs referred to in this document provide a framework for managing soil contamination hazards on site by identifying potential hazards and detailing mitigation measures. They provide information and recommendations to augment this process but are not intended to relieve the Contractor or the Principal of their responsibility for the health and safety of their workers, contractors and the public, or their responsibility for protection of the environment.

The provisions of the applicable SMP are mandatory for all persons (employees, contractor and sub-contractors) who will be involved in undertaking any of the proposed works.

It is recommended that any persons undertaking works develop a site specific safety plan (SSSP) or job safety assessment (JSA) to complement the SMP and to address other health and safety requirements that may be applicable to their particular works. This plan should also be modified to address any specific health, safety or environmental issues that may arise during the works.

From time to time, statutory requirements, site occupation, operating procedures or site conditions may vary and will require that this plan be amended or updated.

2 Plan Management and Control

2.1 Roles and responsibilities

CIAL shall be responsible for:

- Ensuring that the site works are undertaken in accordance with this document and the category-specific SMPs;
- Designating a Contaminated Land Specialist to provide training and inductions to site personnel, and provide contaminated land-related advice during works;
- Ensuring that all site staff and subcontractors understand and comply with the procedures and the health and safety requirements;
- Updating the SMP as necessary and ensuring any updated versions are provided to CCC;
- Identifying the appropriate category-specific SMP using the boundary maps provided in the PSI;
- Distributing the appropriate SMP to site contractors carrying out works and to ensure the most recent updated copy of the SMP is kept at the work area; and
- Compiling an annual report.

The Contractor is responsible for:

- Designating a Site Environmental Supervisor and Health and Safety Officer;
- Implementing the required management procedures and health and safety controls as set out in the SMP; and
- Notifying the CIAL Environmental Manager and the Contaminated Land Specialist prior to commencing works that require observation.

2.2 Project organisation

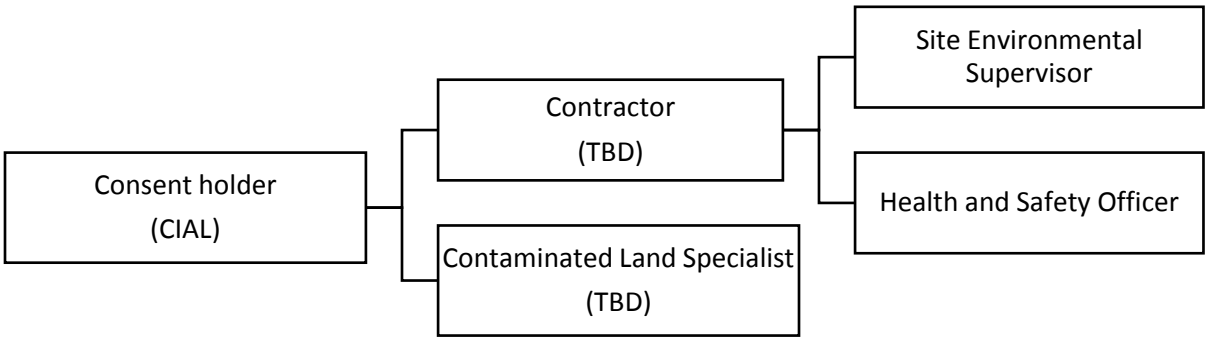

Figure 2.1: Project organisation and required personnel.

2.3 Required site personnel

2.3.1 Contaminated land specialist

The Contaminated Land Specialist is engaged by CIAL to provide technical expertise as needed in the identification and disposal of contaminated soil. For the purposes of this SMP the Contaminated Land Specialist shall meet the following criteria:

> *The Contaminated Land Specialist shall be a person who is qualified to undertake a detailed site investigation (supervised) and who should have at least tertiary education in*

environmental science or engineering or a related field and two or more years of professional experience in environmental investigations and risk assessment.

The Contaminated Land Specialist shall provide training to the Site Environmental Supervisor/Site Project Manager/Foreman on likely contaminants at the site, indicators of contamination, and the contents of the SMP. Additionally, at the commencement of works, all site staff shall be inducted by the Contaminated Land Specialist on appropriate personal protective equipment (PPE) use and indicators of contamination.

2.3.2 Site environmental supervisor

Prior to commencing any physical works on site, the Contractor shall nominate a Site Environmental Supervisor, who will receive training from the Contaminated Land Specialist on likely contaminants at the site, identification of contaminated materials, and the contents of the SMP. The Site Environmental Supervisor shall be responsible for ensuring that all requirements of this SMP are complied with, in particular:

- Conducting site inspections (regular inspections on Category 2 areas, daily inspections on Category 1 areas);
- The timely securing of permissions and documentation to dispose spoil material at appropriate disposal facilities;
- Notifying of CIAL and the Contaminated Land Specialist if suspected ground contamination is encountered;
- Collating and summarising tracking documentation detailing the disposal of contaminated materials; and
- Complying with building and resource consent conditions during the construction works.

2.3.3 Health and safety officer

An Environmental and Health and Safety Officer (HSO) shall be appointed by the Contractor for the duration of the works to ensure that contaminated land-related health and safety procedures are adhered to, alongside of those required under the Contractor's own Health and Safety Plan. The HSO shall have basic first aid training.

The HSO shall ensure that all relevant personnel are familiar with the application and use of the procedures and any PPE specified in this SMP before commencement of site work.

2.4 Distribution

The following parties have been provided with this SMP and the three category-specific SMPs:

- CIAL; and
- CCC.

A copy of the SMP shall be kept at the work area at all times.

2.5 Review and update

Any variations to the SMP shall be provided to CCC prior to implementation. Any changes made shall not reduce the level of control of the works without good evidence that this is acceptable.

It is the responsibility of CIAL to distribute updated versions of the SMP and to ensure the correct copy of the report is on site at all times.

2.6 Implementation

Contractors undertaking the works must implement the SMP.

2.7 Reporting

Annually, a report shall be compiled and provided to the CCC[5]. The report shall be compiled by CIAL. The report shall set out:

- The records of all contaminated land inspections completed in the preceding annual period where contaminated material has been positively identified; and
- Any contaminated land reports or testing results undertaken to comply with this SMP.

Contractors undertaking soil disturbance works will provide CIAL copies of all reports documenting the sampling, analysis, assessment, or disposal of any contaminated materials encountered. These reports will include information relating to the location, type and depths of contamination observed (if any), photographs, surrounding land uses and any monitoring/validation (if any).

[5] Marked for the attention of Team Leader Environmental Compliance Team (EnvResourceMonitoring@ccc.govt.nz).

3 Site Description

The site comprises 106 parcels covering approximately 850 ha in western Christchurch. It is generally located west of Russley Road (SH1) between the intersections of McLeans Island Road and Ryans Road. Approximately 380 ha of the site is used for airport operations; the remainder is either vacant, developed/undergoing development for commercial use, or used for landfilling of suitable surplus hardfill material.

The PSI report (refer Section 1.1) describes the study area, the potential for contamination and the geology/hydrology in detail. The general findings are summarised below:

- The Airport campus was primarily used for agricultural activities prior its development in 1937;
- In 1940, the Airport was converted to a RNZAF elementary flying school. A bomb squadron was established on the site in the event of an enemy attack. Shooting and grenade throwing training was also reported to have occurred within the site;
- Post-WW2, the airport was developed as an international airport; and
- The land surrounding the Airport campus was incrementally acquired to accommodate airport expansion and the development of adjacent parcels for commercial tenancy.

If HAIL activities have been undertaken in the proposed work area, the PSI report should be referenced for details regarding the location, probably degree and extent of contaminants, and findings of any previous investigations.

4 Site Management Categories

The GIS maps provided with the PSI identify the presence and extent of known HAIL activities at the Airport campus. A summary of each of these activities, the type of contamination they produce, identification of that contamination and the specific procedures required for soil management are outlined in Table 1.1 of each Category SMP. These procedures are in addition to the general, site-wide procedures. A general summary of each Category is provided below.

4.1 Category 1: Works in high-risk areas

Areas within this Category have been used for one or more high-risk HAIL activities (refer Section 2.1), possibly in addition to medium- and/or low-risk HAIL activities. Soil management procedures for this Category reflect the high potential for encountering at least one of the following:

- Hydrocarbon contamination in soils (surface or subsurface) and/or groundwater; and/or
- Landfill materials containing a wide range of contaminants including asbestos (fragments or free fibres).

The boundaries of Category 1 areas are presented in Figure 3, Appendix A.

Procedures are included to address the risks associated with airborne contaminants (e.g. dust, asbestos fibres), hydrocarbon odours, free hydrocarbon product and volatile organic compounds (VOCs) as well as the removal/management of subsurface structures (e.g. ACM pipes, underground tanks (USTs), conveyance lines, and sumps).

All persons working on these sites should be aware that contamination is likely to be present, and understand the procedures to identify and manage contamination expected for this Category. The nature of the contamination can be found in the maps attached to the PSI. The SMP for Category 1 is included as Appendix B.

Excavations shall proceed in a manner that ensures early identification and containment of any contaminants encountered. Contaminated soils will (where possible) be kept separate from uncontaminated soils, to assist in reducing overall project costs. Daily inspections are mandatory during any excavation works in this area and shall be undertaken and documented by the Site Environmental Supervisor. The Contaminated Land Specialist shall visit the site, as requested by the Site Environmental Supervisor, to assess for contamination, validate the inspections undertaken by the Contractor, and advise on additional soil management procedures, if required. Records shall be kept of all inspections undertaken, including photographs, written descriptions of observations including address, depth and tests undertaken. The SMP includes procedures for laboratory testing, as recommended by the Contaminated Land Specialist, or required by the Site Environmental Supervisor.

4.2 Category 2: Works in medium-risk areas

Areas within this Category have been used for medium-risk HAIL activities, possibly in addition to low-risk HAIL activities. Soil management procedures for this Category reflect the low to moderate potential for encountering at least one of the following:

- Hydrocarbon contamination in soils (surface or subsurface) and/or groundwater;
- Varied contaminants (e.g. metals, solvents) in surface soils; and/or
- Localised asbestos (fragments or free fibres) resulting from historical ACM use in structures.

The boundaries of Category 2 areas are presented in Figure 4, Appendix A.

All persons working on these sites should be aware that contamination may be present, and understand the procedures to identify and manage any unforeseen contamination. The nature of the contamination can be found in the maps attached to the PSI. The SMP for Category 2 is included as Appendix C.

Soil management procedures have been identified for some Category 2 areas reflect the low to moderate likelihood of encountering asbestos contamination (fragment or free fibre) from the improper demolition of previous structures, a moderate likelihood of encountering various contaminants in surface soils, and a low to moderate likelihood of encountering hydrocarbon contamination in subsurface soils or groundwater.

Some areas (e.g. military ammunitions dumps) require a specific SMP be prepared targeted to the HAIL activity and the activity proposed.

The excavation of soil shall proceed normally with the addition of procedures specific to the type of HAIL activity identified. This shall include undertaking excavations in a manner that allows for early identification of potential contamination. Where possible, the excavation shall also be undertaken in a manner which allows soils of a different type/composition/contaminant levels to be kept separate. Additional procedures address hazards such as odours from hydrocarbon contamination, and handling of asbestos containing materials (ACM).

The excavation method should allow for regular inspections and monitoring of the subsurface conditions to allow identification of any areas of unforeseen contamination. Regular inspections shall be undertaken by the Site Environmental Supervisor at a frequency determined by the Contaminated Land Specialist.

The area shall be upgraded to Category 1 if any of the following occurs:

- Unanticipated USTs or landfill material are encountered;
- Contamination is verified at levels that exceed the commercial landuse/worker safety criteria; or
- Asbestos is detected at a level that exceeds the restricted works threshold established by WorkSafe NZ and associated documents.

4.3 Category 3: Works in low-risk areas

Areas within this Category have been used exclusively for low-risk HAIL activities. The procedures that apply to this category recognise a low likelihood of disturbing soils that contain contamination above commercial landuse/worker safety criteria. The boundaries of Category 3 areas are presented in Figure 4, Appendix A.

All persons working in these areas should be aware that contamination may be present, and understand the procedures to identify and manage any unforeseen contamination. The nature of the contamination can be found in the maps attached to the PSI. The SMP for Category 3 is included as Appendix D.

In Category 3, excavation of material can be undertaken using standard procedures, as outlined in Appendix D. However, to enable identification of areas of unforeseen contamination, the construction methods shall allow for regular inspections by the Site Environmental Supervisor at a frequency determined by the Contaminated Land Specialist.

If the Contractor identifies suspected contamination during works or inspections (refer Section 1.3 of the Category 3 SMP in Appendix D), the material shall be isolated from other material and the Contaminated Land Specialist should be contacted for further advice and to undertake testing as required (refer Section 2.2.7 of the Category 3 SMP in Appendix D).

The area shall be upgraded to Category 2 if any of the following occurs:

- Demolition materials are encountered that may contain asbestos (fragments or free fibre); or
- Suspected contaminated materials are encountered (refer Section 1.3 of the Category 3 SMP).

It shall be upgraded to Category 1 if any of the following occurs:

- Unanticipated USTs or landfill material are encountered;
- Contamination is verified at levels that exceed the commercial landuse/worker safety criteria; or
- Asbestos is detected at a level that exceeds the restricted works threshold established by WorkSafe NZ and associated documents.

4.4 Non-HAIL

Land owned or leased by the CIAL has not been subject to any HAIL activities is not covered by the NES Soil. Therefore, this land does not require additional earthworks controls above what would be undertaken for standard earthworks. However, contractors should be aware of the potential for unforeseen contamination to exist and be prepared to implement additional procedures if required by the contaminated land specialist.

5 Verification and Reporting

Verification is the process of confirming the objectives of the works have been achieved, and confirming works were undertaken according to agreed procedures and reporting requirements.

Verification shall be carried out on all work areas, with validation sampling carried out where evidence of contamination has been identified.

A Works Verification Form (Appendix E) will form the basis of the verification process and will be completed by the Contractor within one week of completion of the works. If sampling is required, this will be undertaken by the Contaminated Land Specialist in accordance with the procedures outlined in Section 5.2. The Works Verification Form shall be submitted by the Contractor to CIAL's Environmental Manager. The Works Verification Form addresses the following:

- Confirmation that the soil disturbance works are complete;
- Confirmation if contaminated material was encountered or not during the works;
- Confirmation that soil disturbance works were completed according to this SMP and that there were no variations during the works;
- Confirmation that there were no environmental incidents during the works. If there was an environmental incident, then a letter shall detail the nature of the incident and the measures taken to mitigate effects;
- Results of any contamination tests undertaken; and
- Confirmation of the disposal destination of clean and contaminated soils and the verification test results undertaken for disposal permitting.

Appended to the Works Verification Form will be copies of any laboratory results and contractor information as required below.

5.1 Information required from the Contractor

The following information, where not included specifically in the Works Verification Form, will be appended to the form and kept on file by CIAL's Environmental Manager. The information requirements are:

- Copies of weigh bridge summaries for the disposal destination for contaminated soil;
- Disposal volumes for natural soil removed and disposed;
- Records of visits by council representatives;
- Details of any complaints; and
- Details of any health and safety incident related to the contamination and how they were resolved.

The Contractor shall provide the required information within one month of completion of the works to which the information relates.

5.2 Validation sampling

As wide-scale remedial actions are not expected, and most of the site is likely to be sealed on the completion of works, validation sampling is not generally required. One notable exception will be if unexpected contamination is identified that may present a risk to future users of the site or groundwater or surface water discharges. If the Contaminated Land Specialist deems that validation sampling is required for a specific project, this will be carried out in accordance with the soil sampling procedures outlined in the relevant sections of each individual SMP.

5.3 Reporting

Works Verification Forms for the preceding twelve-month period shall be submitted by CIAL to Christchurch City Council on an annual basis. All Works Verification Forms will be submitted regardless of the level of contamination identified during works. If no works have been completed during the preceding twelve-month period, a letter will be provided to Christchurch City Council stating this. Reporting is the responsibility of CIAL's Environmental Manager.

Appendix A: Risk Category Zoning Maps

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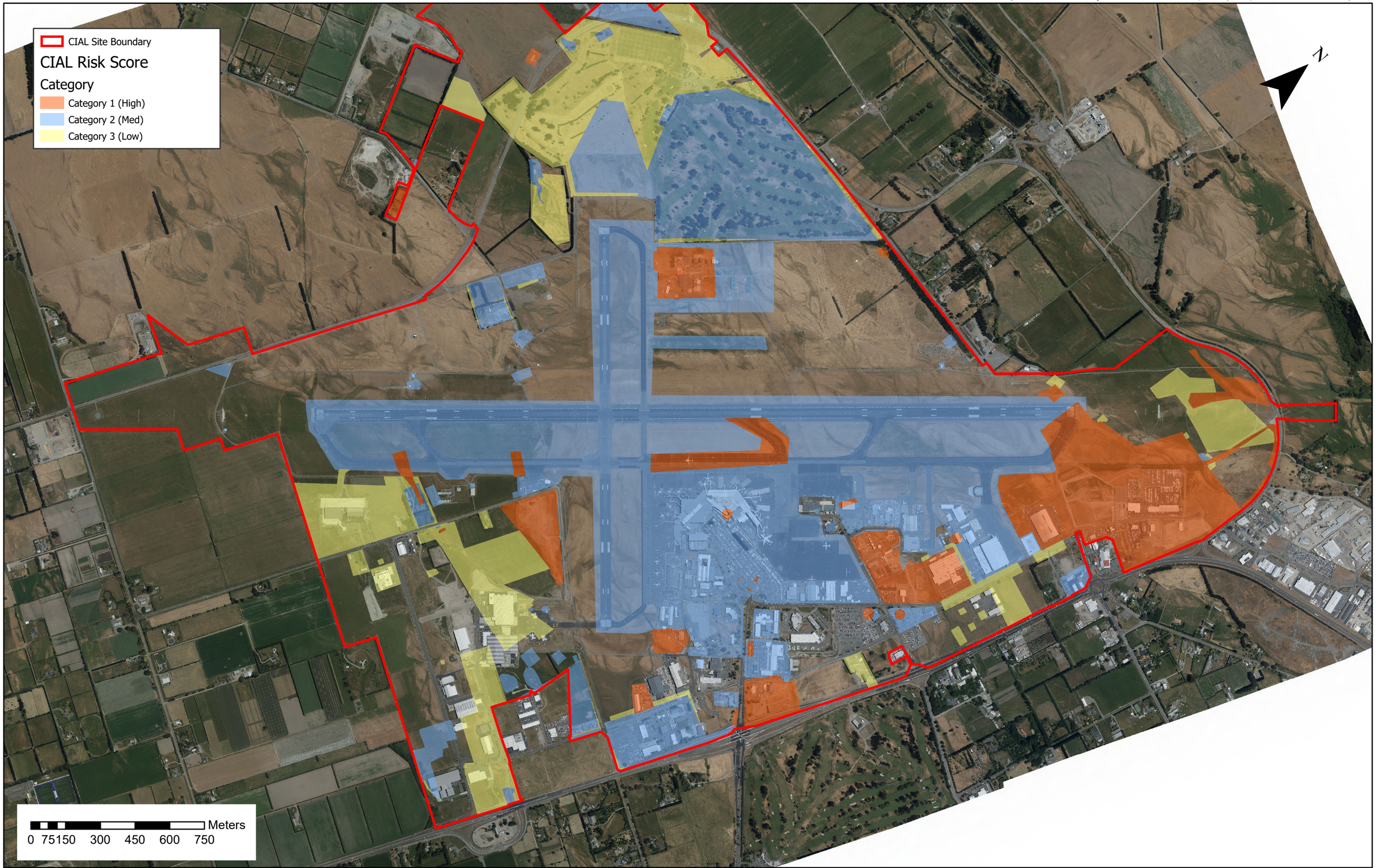

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This figure and the information used in its preparation will reviewed and updated no later than 31 July 2021.

Aerial Images: CIAL, 2018

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DESIGNED	ANDO	Jul.19	
DRAWN	ANDO	Jul.19	
CHECKED	JJXC	Jul.19	
APPROVED	DATE		

CLIENT CHRISTCHURCH INTERNATIONAL AIRPORT LTD

PROJECT CHRISTCHURCH AIRPORT PSI UPDATE

TITLE RISK CATEGORY ZONING - JULY 2019

SCALE (A3) 1:15,000 FIG No. Figure 5 REV 0

Appendix B: Site Management Plan for Category 1 Areas

REPORT

Tonkin+Taylor

Contaminated Site Management Plan

Category 1 Areas

Prepared for
Christchurch International Airport Ltd
Prepared by
Tonkin & Taylor Ltd
Date
April 2019
Job Number
53920.2000.v4

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Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
April 2016	1		Lyn Nugent		Peter Cochrane
December 2016	2	Inclusion of accidental discovery protocols (Section 3); asbestos related works controls and procedures (Appendix B).	Mark Morley		Gordon Ashby
March 2018	3	Update for asbestos in soil earthworks (Appendix B).	Mark Morley		Gordon Ashby
April 2019	4	Updates to asbestos in soils earthworks controls (after New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, November 2017)) and CIAL discussions.	Mark Morley	Lean Phuah	Gordon Ashby

Distribution:

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Report prepared by:

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Mark Morley

Environmental Geologist

Report certified by a suitably qualified and experienced practitioner as prescribed under the NES Soil Users Guide (April 2012):

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Lean Phuah

Principal Environmental Engineer

Authorised for Tonkin & Taylor Ltd by:

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Gordon Ashby
Project Director

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Table of contents

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 1 areas are those that have been used for one or more high-risk HAIL activities, possibly in addition to multiple medium- and/or low-risk HAIL activities. The classification of HAIL activities is described in Section 1.2 of the campus-wide Site Management Plan (SMP)[1], to which this document is appended. The boundaries of Category 1 areas are presented in Figure 3, Appendix A of the SMP. Ground contamination investigations have been undertaken on a number of HAIL sites within Category 1 areas. These investigations have not been assessed for methodology, results, or reliability.

All soils excavated from Category 1 areas shall be assumed to be contaminated unless testing has indicated otherwise and the requirements of this SMP shall apply.

Soil management procedures for this Category reflect the high potential for encountering at least one of the following:

- Hydrocarbon contamination in soils (surface or subsurface) and/or groundwater; and/or
- Landfill materials containing a wide range of contaminants including asbestos (fragments or free fibres).

Procedures are included to address the potential risks associated with airborne contaminants (e.g. dust, fibres), hydrocarbon odours, free hydrocarbon product and volatile organic compounds (VOCs) as well as the removal/management of subsurface structures (e.g. asbestos containing material (ACM) cement pipes, underground tanks (USTs), conveyance lines, and sumps). For asbestos in soils, the procedures in this plan are for low levels of asbestos in soils and for earthworks being undertaken as either asbestos related works or unlicensed asbestos works under the Health and Safety at Work (Asbestos) Regulations 2016 (refer to Appendix B). The Contaminated Land Specialist and/or CIAL shall provide confirmation of the status of the earthworks under the Asbestos Regulations before commencement.

Excavations 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 uncontaminated soils. 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.

Removal and/or replacement of fuel storage systems may also be carried out in Category 1 areas. Specific measures for the removal of fuel storage systems are set out in 2.3.4 of this SMP, and are consistent with Ministry for the Environment (MfE) guidelines[2].

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

[2] Ministry for the Environment - Guidelines for Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (revised 2011).

Daily inspections are mandatory during any excavation works in Category 1 areas and shall be undertaken by the Site Environmental Supervisor with the Contaminated Land Specialist providing guidance as requested by the Site Environmental Supervisor (refer SMP Section 2.1).

1.2 Site management

The following are key aspects of site management during all earthworks on Category 1 areas:

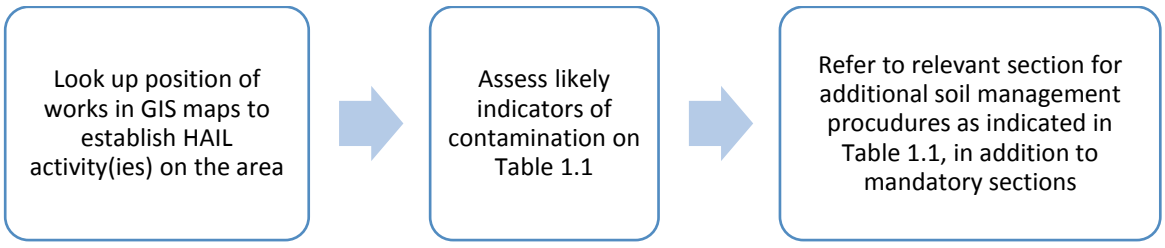
- The contractor shall advise CIAL's Environmental Manager at least one day prior to commencement;
- The site Hazard Board shall include information pertaining to the contamination likely to be identified (refer Table 1.1). The Contractor's details shall be provided on the Hazard Board;
- Personal protective 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 established prior to works commencing.

1.3 Identification of contamination

The most significant contaminants likely to be identified in Category 1 areas are hydrocarbons and asbestos in landfill materials; however Category 1 areas may have also been used for medium-risk and low-risk HAIL activities so there is potential for additional contaminants (e.g. pesticides and metals such as lead). Indicators that contamination may be present include:

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

In order to identify HAIL activities that have occurred on a proposed work area and potential indicators of likely contamination, the following procedure should be followed:



There may be situations where the development of specific site management procedures are 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 organic waste or former military emplacements require specialist advice that is not within the scope of this document. Table 1.1 summarises the range of likely contaminants that may be encountered in Category 1 and instances where specialist advice is required prior to earthworks.

Table 1.1: Specific HAIL activities, key contaminants and additional management sections

Type of HAIL activity	Potential Contaminants	Identification of Contamination	Sections
• Landfilling (Activity G3), with landfill materials possibly including gasworks waste, asbestos containing materials (ACM), chemical waste. • Waste disposal to land (Activity G5).	<u>Gasworks waste</u> Polycyclic aromatic hydrocarbons (PAHs) benzene, toluene, ethylbenzene, and xylenes (BTEX), heavy metals, cyanide.	Fine black gravels, ash, hydrocarbon odours.	2.3.1, 2.3.3, 5.2.1 to 5.2.3 inclusive.
	Asbestos (e.g. ACM fragments, friable asbestos and free fibres).	Visual identification of ACM fragments (e.g. Super 6 sheeting). Asbestos fibres in soil may not be visible, soil sampling and laboratory analysis required.	Appendix B.
	<u>Chemical waste</u> Common contaminants include: total petroleum hydrocarbons (TPH), VOCs, semi-volatile organic compounds (SVOCs), solvents, acids/bases, biocides.	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 to 5.2.3 inclusive.
	<u>Domestic/organic waste</u> Wide range of contaminants dependent on waste composition, possible generation of landfill gases.	Strong odours (H2S, 'rotten' odours), visible refuse.	Specific site management procedures required.
• Corrosives bulk storage (Activity A4).	Various acids and bases.	Stressed vegetation.	2.3.1, 5.2.3.
• Commercial printers (Activity A15).	Solvents, metals, acids and bases.	Stained ground, stressed, vegetation, solvent odours.	2.3.1, 2.3.3, 5.2.3.
• Persistent pesticide storage or use (Activity A10). • Spray race (sheep dip) operations (Activity A8). • Woolsheds (Activity A16).	Metals and organochlorine pesticides (OCPs).	Stained ground, stressed vegetation.	2.3.1.

Type of HAIL activity	Potential Contaminants	Identification of Contamination	Sections
• Storage tanks or drums for fuels, chemicals, or liquid waste (Activity A17). • Petroleum depots (Activity A13). • Service stations (Activity F7). • Engineering workshops (Activity D5). • Asphalt of bitumen storage or manufacture (Activity E2). • Vehicle workshops (Activity F4). • Engine reconditioning (Activity F3).	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 to 5.2.3 inclusive.
• Transformers and substations (Activity B2).	PCBs, hydrocarbons, copper, tin, lead and mercury. Asbestos in substations.	Stained ground, likely to be localised. Asbestos sheeting, insulation or cladding.	2.3.1 to 2.3.3 inclusive, Appendix B.
• Military emplacements (Activity C1). • Grenade throwing (Activity C3).	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 (Activity E1).	Asbestos (e.g. ACM fragments, friable asbestos and free fibres).	Visual identification of ACM fragments (e.g. Super 6 sheeting). Asbestos fibres in soil may not be visible, soil sampling and laboratory analysis required.	Appendix B.
• Electroplating (Activity D3).	Metals, cyanide, fluorine, and barium.	Stained ground, likely to be localised.	2.3.1 to 2.3.3.
• Airport facilities and operations (Activity F1).	Hydrocarbons, PAHs, metals, and dioxins.	Stained ground, hydrocarbon odours or sheen.	2.3.1 to 2.3.4 inclusive, 5.2.1 to 5.2.3 inclusive.
• Transport depot (Activity F8).	Wide range of contaminants dependent on materials being transported.	Stained ground, likely to be localised.	2.3.1 to 2.3.3 inclusive, 4.2, 4.3.
• Migrating contamination (Activity H).	Varies depending on source area.	Sheen or odours on groundwater.	2.2.8, 2.3.1 to 2.3.3 inclusive.

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

These procedures focus on the identification of hydrocarbons within soil and on the surface of ground and surface water, handling procedures for such contaminated soils and groundwater, and appropriate disposal procedures.

All earthworks in Category 1 areas will follow the soil handling procedures in Section 2.2.

Specific procedures/controls for soil disturbance works involving low levels of asbestos in soils are provided in Appendix B.

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, as requested by the Site Environmental Supervisor.

All excavations in Category 1 areas shall be inspected regularly by the Site Environmental Supervisor, with a minimum of one inspection per day. The contents of the inspection are dependent on the types of likely contaminants and will be determined by the Contaminated Land Specialist prior to the commencement of works.

If unforeseen contamination is encountered, the Contaminated Land Specialist shall be contacted to inspect the excavation and advise on the appropriate contaminated soil handling procedures, or soil sampling, if required by the Contaminated Land Specialist.

2.2 General soil handling procedures

The following general handling procedures should be followed where contamination is identified/suspected in any Category 1 area, except where testing of soils has proven soils to be absent of contaminants above published background levels (see Section 2.2.7):

- Consult the CIAL Environmental Manager and Contaminated Land Specialist prior to disturbing soils to determine a suitable receiving facility (if applicable);
- Material excavated shall be loaded by the Contractor directly onto trucks for offsite disposal (refer Section 4), 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 shall have a tracking document[3] 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 the receiving facility. These shall be affixed before leaving site;
- Stockpiling shall be in accordance with Section 2.2.1;
- The Contractor will be responsible for obtaining a permit/manifest from the disposal destination prior to transportation of materials;
- All contaminated material removed from site shall be disposed as per the procedures set out in Section 4.1; and

[3] Driver's log sheets will be sufficient as tracking documents.

- All weighbridge dockets shall be retained by the Contractor and provided to the Engineer to the Contract as soon as practicable or within two working days. The Engineer to the Contract is to provide a tracking summary to the CIAL Environmental Manager for all material removed from site.

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

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 far as is practicable.

Any material from Category 1 areas that requires stockpiling shall be managed by the Contractor as below:

- Sediment control measures shall encircle the stockpile, this may include:
  - Proprietary products (e.g. filter socks); and
  - Silt fences.
- If the stockpile is to be remain for more than 1-2 days and/or if rain is forecast during the time the stockpile is present, the stockpile shall be covered with geotextile or a polythene cover (or a similar material) 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 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.

In all Category 1 areas, in addition to the standard dust control practices, the Contractor shall:

- Limit the amount of material to be excavated as much as practicable;
- Dampen any material suspected to contain asbestos or seal with an approved dust suppressant polymer;
- 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; 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 soil may also be entrained in the stormwater and result in the deposition of contaminated sediment. All stormwater at the airport campus is discharged to groundwater via soakpits.

In all Category 1 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;
- Divert clean stormwater away from excavations/exposed soil in contaminated areas;
- If stormwater does enter contaminated areas, contain 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.

Erosion and sediment control plans will be prepared in accordance with the requirements of ECan report R06/23 (February 2007) – Erosion and Sediment Control Guidelines for the Canterbury Region. The purpose of the above stormwater and sediment control measures is to prevent contaminated water from entering groundwater via soakpits.

2.2.4 Cross contamination

To avoid transferring contaminated soils from one location to another, all machinery and equipment shall be decontaminated prior to moving from any Category 1 area to a different location. Decontamination procedures are site-specific and will be determined by the Contaminated Land Specialist prior to the commencement of works. Procedures may include the manual brushing down or washing of vehicles.

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 where the contaminants may interact and migrate with groundwater, 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 in Category 1 areas. 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, but do not include structures associated with 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 permanently capped to prevent the migration of contaminants, 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 is set out in Section 2.3.4.

2.2.7 Soil sampling requirements and procedures

Soil sampling required under Section 2.1 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.5[4]. 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";
- 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. Any evidence of the presence of asbestos shall trigger testing for asbestos content in soil. Other contaminants may be tested for at the discretion of the Contaminated Land Specialist.

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 1 areas. The Contractor shall in the first instance contact the Contaminated Land Specialist to advise if contamination is present. Groundwater and ponded surface water within Category 1 areas shall not be discharged to soakpits without prior approval by the CIAL Environmental Manager to ensure that water quality meets the conditions of CIAL's global stormwater consent (CRC130198).

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 sourced material, certified cleanfill, or topsoil from a garden supplier. Any other soil or aggregate imported to site that is not sourced from a quarry or garden supplier, site sourced, or certified as cleanfill shall be sampled by the Contaminated Land Specialist at a rate of one sample for every 500 m^3 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 resource consent conditions at the source location. It is preferable that fill is tested at its source prior to its

[4] Ministry for the Environment, 2004: Contaminated Land Management Guideline No. 5 – *Site Investigation and Sampling*, revised 2011.

use at the site. Otherwise, if not, the Contractor shall stockpile the fill on site until test results are available.

Rock or aggregate sourced directly from a quarry or supplier does not require testing prior to importation.

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 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;
- A ventilation or other mitigation system, for example odour suppression sprays, shall be established if covering or natural dispersion is not adequate; and
- Health and safety procedures as set out in Section 5 shall be employed.

2.3.2 Product control

Free flowing petroleum-based product may be encountered in soil on Category 1 sites due to HAIL activities. Petroleum products could include petroleum fuels, solvents, tar and creosote. Petroleum products can discharge from soil 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 every Category 1 site where there are known or potential free flowing petroleum products. The following procedures may be modified as necessary by the Contaminated Land Specialist in conjunction with the Contractor's Health and Safety Officer (HSO) to ensure a safe working environment for workers is maintained:

- Soil that contains petroleum products shall be handled in a manner which prevents the leaching or drainage of liquid contaminants into underlying and adjacent soils;
- Stockpile soils containing contaminants away from soakpits, and ensure the controls set out in Section 2.2.1 are installed; and
- Where ever possible all storage vessels (including USTs, ASTs, sumps and pipework) shall be drained of hydrocarbons prior to their removal and all openings sealed to prevent the escape of residual petroleum hydrocarbons.

Free flowing petroleum-based product may be encountered on soils in areas that have been subject to petroleum industry activities or storage tanks. If free flowing 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 vapours

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 vapours are present, hazardous atmospheres may occur and compromise the safety of workers, visitors and the general public.

The following procedures shall be implemented at every project site where there are known or potential vapours. The following procedures shall be modified as necessary by the Contaminated Land Specialist in conjunction with the Contractor's 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 vapour exposure is assessed. If vapours have been identified as potentially present, vapour levels at the excavation site shall be tested;
- Vapour levels shall be measured using a photoionsiation detector (PID), or an alternative vapour monitor. The results shall be compared with Work Place Exposure Standards (Table 2.1) and appropriate PPE selected;
- Wind and temperature conditions affect levels of vapours in the working area. If these conditions change, vapours levels shall be reassessed. If necessary, work shall cease until conditions are more favourable for minimising volatile inhalation risk and odour dispersion;
- Ventilation shall be established if natural dispersion is not adequate; and
- 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 high potential to encounter underground storage tanks (USTs) within Category 1 areas. Any USTs and associated pipe work identified within the excavation shall be removed in accordance with the regional plan rules and Ministry for the Environment (MfE) guidelines. The removal procedure, as follows, is appropriate for the removal of USTs formerly containing solvents or petroleum products:

- Notify the CIAL Environmental Manager, who shall contact 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 and cleaned;
- 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.

3 Accidental Discovery Protocols

Unexpected soil contamination is likely to be encountered during earthworks at Category 1 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 containing materials (e.g. asbestos cement pipes, cladding sheets, brake pads etc), 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 chips[5].

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.	☐
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.	☐
Implement contaminated soil Health and Safety procedures.	☐
Update the site Hazard Board and prevent access to the area by unnecessary personnel.	☐
The contractor and/or CIAL Environmental Manager must advise the Contaminated Land Specialist to inspect and advise of specific controls if appropriate.	☐

[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 1 areas shall be assumed to be contaminated unless testing (previous investigations or as per Section 2.2.7) 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, as determined by the Contaminated Land Specialist, 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 Specialist[6]. Contractors should be aware that laboratory testing takes **AT LEAST 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 consistent with 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, subject to CCC approval, in the locations directed by the site operator;
- If the levels of contaminants exceed the Burwood Landfill acceptance criteria, pre-treatment may be necessary or disposal shall be sought at facilities licensed to accept such waste (e.g. Texco , Kate Valley Landfill); 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.

Re use of materials within the airport campus may be possible based on discussion with CIAL Environmental Manager.

Records of the material disposed (weighbridge dockets etc.), and the location of disposal shall be kept for all loads and provided to the Engineer to the Contract and CIAL Environmental Manager as soon as practicable.

4.2 Disposal of hydro excavation materials

Materials from all hydro excavation (slurry etc.) works undertaken at Category 1 sites must only be disposed of at the designated location at the Burwood Landfill (or similarly licensed facility) as directed by the facility's operator.

[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.

4.3 Disposal of un-contaminated soil

Soils from Category 1 that have been pretested and proven to be uncontaminated[7] 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 and provided to the Engineer to the Contract and CIAL Environmental Manager as soon as practicable.

[7] Soils are uncontaminated for the purposes of disposal to cleanfill if they meet the relevant resource consent conditions of the receiving cleanfill.

5 Health and Safety Procedures

This Health and Safety Plan (HSP) relates to the risk to workers as a result of high 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 (JSAs). The following procedures are to be used as a guide for the preparation of these JSAs. 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 Category 1 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 m 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 HSO for the duration of the works. The HSO 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 HSO;
- 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 1 sites can be expected to encounter a range of contaminated ground, and the measures in this section are designed to protect workers from general exposure to the following contaminants:

- Heavy metals;
- Hydrocarbons (fuels, oils and greases);
- Solvents;
- Asbestos; 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 HSO 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 1 areas do not have any pre-existing condition which might place them at risk as a result of such stresses.

The HSO 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 1 areas are highly 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.

Specific procedures for managing low levels of asbestos in soils are provided in Appendix B.

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 1 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 AS2865[8] and the Confined Spaces Code of Practice[9] 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 sheet[10]. 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.

[8] Safe Work Australia. AS 2865-2009 *Confined spaces.*
[9] Safe Work Australia (February 2014). *Confined Spaces Code of Practice.*
[10] WorkSafe New Zealand (August 2017). Quick Guide – *Confined spaces: Planning entry and working safely in confined space.*

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 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.

Appendix A: Works Verification Form

Works Verification Form – High 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:**	

Appendix B: Controls for Earthworks - Asbestos

B1 Introduction

Prior to works commencing the Contaminated Land Specialist and/or CIAL shall inform the contractor of the status of the works under the Asbestos Regulations.

This appendix provides additional controls and procedures to Sections 2, 4 and 5 of the SMP for use by CIAL and their contractor(s) in relation to control measures to be employed during earthworks disturbing low levels of asbestos in soils pursuant to the Asbestos Regulations[11]. WorkSafe NZ has prepared an ACoP[12] and NZ Asbestos in soil Guidelines[13] which provides includes provisions for what controls are required to disturb asbestos in soil depending in part on the quantities of asbestos present in the soils. For asbestos fines and fibrous asbestos (AF, FA respectively) in soils, these are:

- ≤0.001% w/w AF/FA – unlicensed asbestos works; and
- >0.001% to ≤0.01% w/w AF/FA – asbestos related works.

For bonded asbestos containing material (ACM), these are:

- ≤0.01% w/w ACM – unlicensed asbestos works; and
- >0.01% to ≤1% w/w ACM – asbestos related works.

NOTE - Where the asbestos content in soils is more than the levels above, the disturbance of such materials/soils shall be either Class A or Class B asbestos removal works. Such work will require the preparation of a task specific asbestos removal control plan (Asbestos Regulations – Regulation 32 and ACoP Section 26). This is beyond the information presented in this appendix.

CIAL and/or the contractor will need to engage the services of licensed asbestos removalist to prepare the asbestos removal control plan and undertake such works.

The controls and procedures presented herein are **mandatory** for all persons (employees, contractor and sub-contractors) disturbing soils containing low levels of asbestos (i.e. ≤0.01 % w/w AF/FA and/or ≤1 % w/w ACM).

B2 Personnel training

Staff engaged in undertaking either asbestos related works or unlicensed asbestos works shall complete a general site induction as well as a specific asbestos in soils induction before commencement of the works. The asbestos induction shall be delivered by the Site Environmental Supervisor and Contaminated Land Specialist and include the following topics:

- Nature and extent of asbestos contaminated soils or materials;
- Site layout including internal separation of works areas including support zone and works area where the asbestos controls apply, as well as and entry/egress points;
- Personal decontamination procedures;
- Use of personnel protective equipment including respiratory protective equipment; and
- Accidental discovery protocols (i.e. Section 3 of SMP) and emergency procedures.

B3 Air monitoring

Air monitoring shall be undertaken during the first 3 days of earthworks disturbing asbestos in soils.

[11] Health and Safety at Work (Asbestos) Regulations 2016.
[12] Worksafe New Zealand – Approved Code of Practice for the Management and Removal of Asbestos (November 2016).
[13] BRANZ – New Zealand Guidelines for Assessing and Managing Asbestos in Soil (November 2017).

Air monitoring shall be undertaken by either the Contaminated Land Specialist or Competent Person[14] and the samples analysed at an accredited laboratory[4]. Sampling shall be undertaken in accordance with the procedures of the ACoP (Section 30).

Air monitoring shall be undertaken from a number of stations determined by the Contaminated Land Specialist/Competent Person and based on the spatial extent of earthworks, prevailing wind directions, proximity of sensitive neighbours and type of earthworks activity (e.g. impact rolling, excavation and truck loading).

Each day's results shall be reviewed against the trace level in air level <0.01 fibres/mL[15] criterion. If all monitoring results from the 3 days are below this level, the Contaminated Land Specialist/Competent Person can propose changing the status of the works under the Asbestos Regulations (e.g. to unlicensed asbestos removal works).

Further air monitoring shall be undertaken if site conditions or earthworks methodology change. The contractor's Site Environmental Supervisor and/or site foreman shall inform CIAL and the Contaminated Land Specialist/Competent Person immediately if there is a change in conditions (e.g. accidental discovery protocols – SMP Section 3).

B4 Works area and signage

Access to the asbestos works area (i.e. where the soils containing low levels of asbestos will be disturbed) shall be strictly controlled at all times and limited to the following personnel only:

- Loader/excavator driver(s);
- Lorry driver(s) including water cart;
- Plant operator(s) (e.g. grader, dozer, excavator, compactor); and
- Contaminated Land Specialist and/or Competent Person.

If other personnel need to undertake activities in the works area, they shall be inducted per Section B2.

Before earthworks commence on site (i.e. soil disturbance), internal barriers/fencing shall be installed and used (e.g. stakes and rope, fence panels) to separate the earthworks area and adjacent support zone (see Figure B1). Perimeter fencing shall comprise interlinked fence panels (or another suitable alternative) to impede access by the public. Ingress/egress of the works area by personnel shall be managed through the decontamination area (see Section B7.1). Site plant shall not leave the works area until it has completed decontamination (see Section B7.2).

The site Hazard Board (located by main site entrance) shall include details pertaining to the asbestos related works/unlicensed asbestos works.

Signage shall be placed at regular intervals around the works area on the internal barrier/fencing stating access is restricted to trained and site inducted personnel only and that an asbestos hazard is present.

No plant involved in other site activities (e.g. delivering construction materials) shall use the works area until completion of all asbestos works (see Section B10 below).

[14] Asbestos Regulations – Regulation 3 – Competent person "a person who has the knowledge, experience, skills, and qualifications to carry out a particular task under these regulations".
[15] ACoP Section 30.

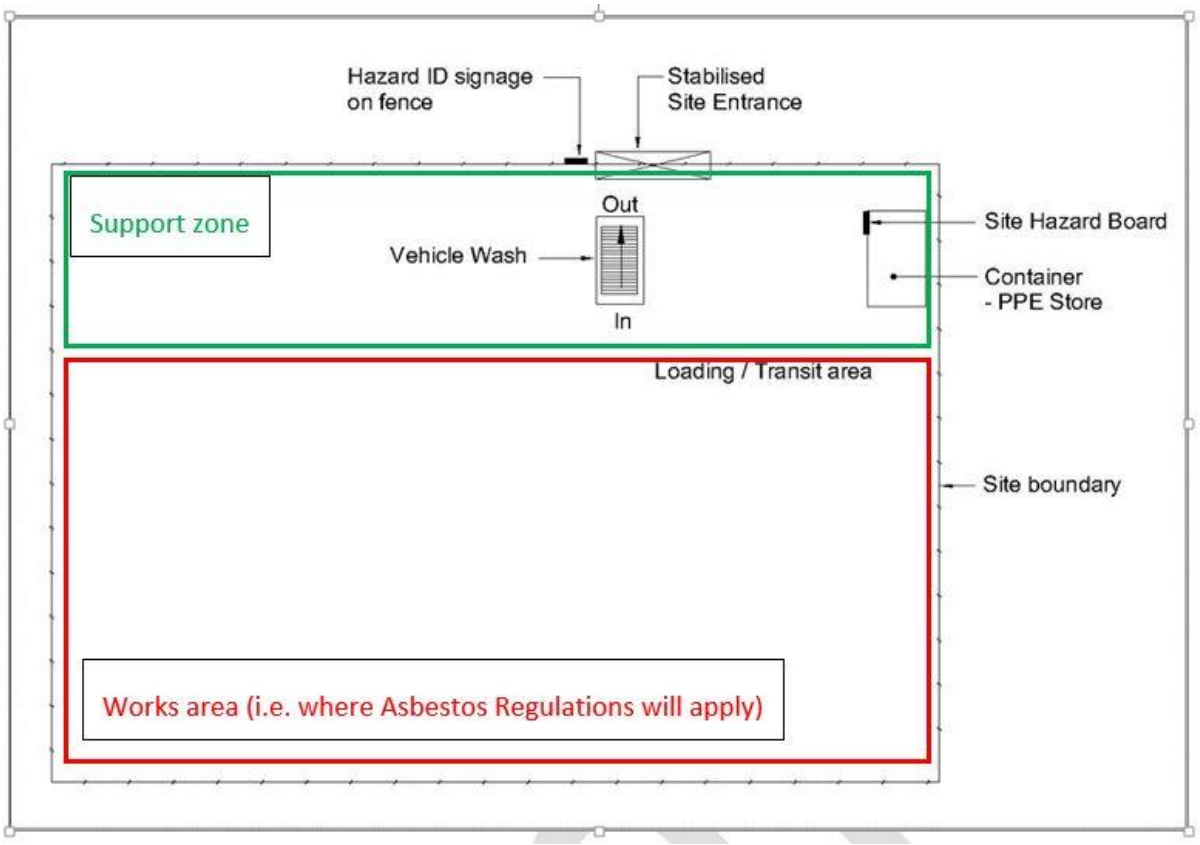


Figure B1 – Indicative site establishment layout.

B5 Personnel protective equipment

All staff undertaking earthworks within the works area shall be provided with and use the following PPE detailed in Table B1 (at end of this appendix); the level of PPE required will depend on the status of the works (i.e. asbestos related works or unlicensed asbestos works).

Drivers working in cabs with air conditioning switched on and who do not need to exit their truck/equipment while in the works area do not need to use the asbestos related PPE referenced in Table B1.

Requirements for other PPE (e.g. hi visibility clothing) shall be dependent upon the task being undertaken and the Contractor's own task analysis.

B6 Dust suppression controls

During the activities disturbing asbestos in soils, the disturbed materials shall be kept damp to reduce the generation of dust. The dust control shall not generate surface water run off outside of the asbestos works area. The Contaminated Land Specialist/Competent Person will advise the contractor if the use of dust suppressants or surfactants shall be necessary for the earthworks.

The Contractor's site foreman and/or Site Environmental Supervisor shall constantly observe for dust generation and implement further wetting, as necessary. This applies to activities such as, but not limited to, loading of asbestos contaminated materials into lorries, tipping from lorries and blading/grading.

Table B1 (at end of this appendix) and SMP Section 2.2.2 summarise the dust suppression controls to be employed.

B7 Decontamination procedures – personnel

Personnel leaving the works area (refer Figure B1) will pass through a designated decontamination area. The following sub sections summarise the personnel decontamination procedures dependent upon the status of the works and is to be read in conjunction with Table B1.

B7.1 Personnel decontamination

B7.1.1 For asbestos related works

Personnel decontamination procedures for exiting the asbestos related works area comprise:

- Staged wash/wipe down of outer clothing (i.e. disposable overall);
- Cleaning of footwear or removal and storage;
- Disposal or storage of outer clothing;
- Final stage removal of face mask:
  - Removal and disposal; or
  - Removal and wipe down and storage (for non-disposable masks).
- Changing/donning suitable personnel protective clothing required for working in the support zone.

The decontamination area will be divided into clean and dirty areas, with (if required) an area for the storage of footwear for reuse.

The decontamination area will be kept well maintained and asbestos waste regularly removed.

B7.1.2 For unlicensed asbestos works

Personnel decontamination procedures for exiting an unlicensed asbestos works comprise:

- Cleaning of footwear or removal and storage; and
- Standard procedures for a Category 1 area as per SMP Section 5.1.4 shall apply. Cloth coveralls used in the works area shall be stored in the decontamination area. These will be either disposed of as asbestos waste at the end of works, or if laundered, cleaned following the procedures in Section 15 of the ACoP. Alternatively, disposable overalls can be used instead.

B8 Decontamination procedures – plant and equipment

All plant will be decontaminated before leaving the works area (either asbestos related works or unlicensed asbestos works). A designated decontamination area will be established as follows:

- Place non-woven geotextile (e.g. Biddim) approximately 5 m x 5 m in plan on flat ground and secure at edges (e.g. peg or sand bag);
- Place either steel plates, or approximately 150 mm AP60, placed onto geotextile with approximately 1 m of geotextile extending beyond plates/gravel;
- Plant drives onto prepared pad and hosed down (i.e. low pressure water supply) systematically removing all materials from exterior of the plant). Washing will be undertaken with care to prevent water and washed off materials overshooting geotextile cloth area;
- If the plant is fitted with air conditioning and this is used during the works, no specific decontamination within the cab is necessary. If normal ventilation system is used the interior of cab wiped down with disposable wipes; and

- Cleaned plant to be inspected by the Contaminated Land Specialist or Competent Person to confirm decontamination completed, then plant drives off prepared pad and away from works area.

The geotextile, AP60 (if used), disposable wipes will be disposed of as asbestos waste.

B9 Off-site disposal of materials

Asbestos waste (e.g. spent PPE, discrete fragments ACM) will be double bagged and stored in a designated (labelled) lined skip[16] for disposal to an appropriate facility. Soils can be placed in a lined skip. The following materials from earthworks are considered asbestos waste:

- Asbestos contaminated soils;
- Discrete ACM (e.g. removed during hand picking);
- Personnel protective equipment; and
- Geotextile cloth, disposable wipes materials from plant and equipment decontamination.

Asbestos contaminated materials can only be disposed of to an approved facility, they cannot be disposed of at a cleanfill or Burwood Resource Recovery Park. The receiving facility should be notified of the origin of the materials before disposal commences to confirm their acceptance of the materials, including their requirements for lining the loads. The Contaminated Land Specialist/Competent Person can confirm the disposal options for the materials.

B10 Completion of asbestos in soils works

The asbestos in soil related controls described herein shall cease to apply after all the identified asbestos contaminated materials have been either removed from the works area, or covered with a minimum of 200 mm of clean imported fill materials (e.g. quarry sourced pit run). The Contaminated Land Specialist or Competent Person will inform CIAL and the Contractor when the asbestos controls can be ceased.

[16] Kate Valley Landfill requires asbestos loads to be lined.

Table B1: Summary of management actions for asbestos in soils works

Asbestos Regulations 2016 status	PPE	Respiratory protective equipment*1	Dust control/asbestos fibre suppression	Personnel decontamination	Vehicle assessment before demobilisation from works area	Vehicle assessment post decontamination completed by	Vehicle (truck) protection	Plant air conditioning
Asbestos related works	Disposable coveralls rated type 5, category 3, nitrile gloves, steel toe capped gumboots or safety footwear with disposable overshoes.	Disposable P2 dust mask.	Water via localised points. Addition of surfactants and polymers where the location is sensitive (such as adjacent to busy centres, schools). Temporary cover of materials.	Basic disposable decontamination area with foot wash.	Visual assessment.	Contaminated Land Specialist or Competent Person.	Truck lining/soil wrapping depending on the receiving landfill. All trucks should be covered.	Standard air conditioning.
Unlicensed asbestos work	No asbestos specific PPE if air monitoring confirms trace level asbestos in air <0.01 fibres/mL.	No asbestos specific RPE if Contaminated Land Specialist confirms unlikely to exceed trace levels in air monitoring and/or if air monitoring confirms asbestos level below trace level.		Foot wash and used PPE collection area.				

*1 – refer to ACoP Section 14.

(based on Tables 6 and 7 – Asbestos in Soil Guidelines).

Appendix C: Site Management Plan for Category 2 Areas

REPORT

Tonkin+Taylor

Contaminated Ground Management Plan

Category 2 Areas

Prepared for
Christchurch International Airport Ltd
Prepared by
Tonkin & Taylor Ltd
Date
April 2019
Job Number
53920.2000.v3

Exceptional thinking together
www.tonkintaylor.co.nz

Document Control

Title: Contaminated Ground Management Plan					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
April 2016	1		Lyn Nugent		Peter Cochrane
December 2016	2	Inclusion of accidental discovery measures (Section 3).	Mark Morley		Peter Cochrane
April 2019	3	Updates to asbestos in soils earthworks controls (after New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, November 2017)) and CIAL discussions. Refer to Category 1 areas plan (version 4, April 2019)	Mark Morley	Lean Phuah	Gordon Ashby

Distribution:

Christchurch International Airport Ltd	1 electronic copy
Tonkin & Taylor Ltd (FILE)	1 electronic copy

Document Control (Continued)

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

Report prepared by:

.....

Mark Morley

Environmental Geologist

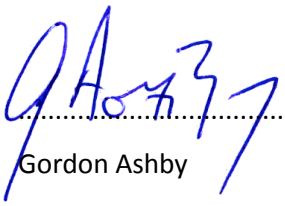
Report certified by a suitably qualified and experienced practitioner as prescribed under the NES Soil Users Guide (April 2012):

.....

Lean Phuah

Principal Environmental Engineer

Authorised for Tonkin & Taylor Ltd by:



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Gordon Ashby

Project Director

MDDM
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Table of contents

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

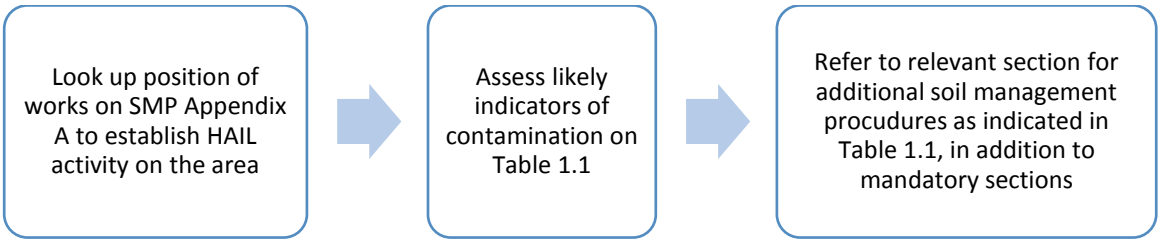
A range of contaminants may be present within Category 2 areas, depending on the nature of the HAIL activity. Indicators that contamination may be present include:

- 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 (H2S, '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 document[2] 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.5[3]. 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 Plan 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 m^3 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 authorise 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 removed[4]. 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 chips[5].

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.	☐
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.	☐
Prepare and implement contaminated soil Health and Safety procedures.	☐
Update the site Hazard Board and prevent access to the area by unnecessary personnel.	☐
The contractor and/or CIAL Environmental Manager must advise the Contaminated Land Specialist to inspect and advise of specific controls if appropriate.	☐

[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 Specialist[6]. 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 AS2865[7] and the Confined Spaces Code of Practice[8] 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 sheet[9]. 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:**	

Appendix D: Site Management Plan for Category 3 Areas

REPORT

Tonkin+Taylor

Contaminated Site Management Plan

Category 3 Areas

Prepared for
Christchurch International Airport Ltd
Prepared by
Tonkin & Taylor Ltd
Date
April 2019
Job Number
53920.2000.v3

Exceptional thinking together
www.tonkintaylor.co.nz

Document Control

Title: Contaminated Site Management Plan					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
April 2016	1		Lyn Nugent		Peter Cochrane
December 2016	2	Inclusion of accidental discovery protocols (Section 3).	Mark Morley		Peter Cochrane
April 2019	3	Updates to asbestos in soils earthworks controls (after New Zealand Guidelines for Assessing and Managing Asbestos in Soil (BRANZ, November 2017)) and CIAL discussions. Refer to Category 1 areas plan (version 4, April 2019).	Mark Morley	Lean Phuah	Gordon Ashby

Distribution:

Christchurch International Airport Ltd	1 electronic copy
Tonkin & Taylor Ltd (FILE)	1 electronic copy

ocument Control (Continued)

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

Report prepared by:

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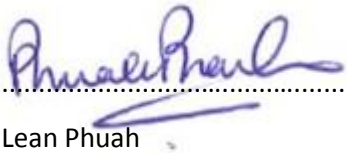
Mark Morley

Environment Geologist

Report certified by a suitably qualified and experienced practitioner as prescribed under the NES Soil Users Guide (April 2012):



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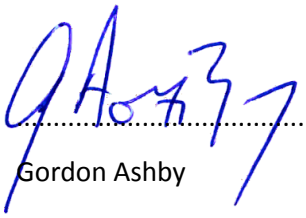
Lean Phuah

Principal Environmental Engineer

Authorised for Tonkin & Taylor Ltd by:



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Gordon Ashby

Project Director

MDDM + LNN+MDDM
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Table of contents

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 3 areas are those that have been used for only low-risk HAIL activities. The classification of HAIL activities is described in Section 1.2 of the campus-wide Site Management Plan (SMP) [1], to which this document is appended. The boundaries of Category 3 areas are presented in Figure 3, Appendix A of the SMP. Ground contamination investigations have been undertaken on a number of HAIL sites within Category 3 areas. These investigations have not been assessed for methodology, results, or reliability.

Although the potential for contamination is relatively low compared to other categories, there is still some potential for contamination to arise from general airport operations. All staff working on site should be aware of this potential and work methods should allow for early identification of contamination.

Excavations can proceed in accordance with standard earthworks procedures as set out in Sections 2 and 3. As with other categories, the excavation shall also be undertaken in a manner which allows soils of a different type/composition/contaminant levels to be kept separate, should contamination be identified. If this is carried out the better material may be able to be disposed at a lower landfill cost, following sampling and testing 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 Section 2.1, with soil sampling procedures in Section 2.2.7.

1.2 Site management

The following are key aspects of site management during all earthworks on Category 3 areas:

- The contractor shall advise CIAL's Environmental Manager at least one day prior to commencement;
- The site Hazard Board shall include information pertaining to the contamination likely to be identified (refer 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 established prior to works commencing.

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

1.3 Identification of contamination

A range of contaminants may be present within Category 3 areas, although the potential for them is lower than other categories. Standard indicators of contamination in Category 3 areas include the following:

- A hydrocarbon odour (typically smells like petrol, diesel, kerosene etc.);
- 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 a proposed work area and potential indicators of likely contamination are identified, the Contaminated Land Specialist shall be notified to inspect the excavation and advise on appropriate handling procedures if required in addition to the procedures in Section 2. Otherwise, soil shall be handled in accordance with the procedures in Section 2.

There may be situations where the development of specific site management procedures is needed in addition to the procedures outlined in this SMP, depending on the nature of the excavations and the HAIL activity (e.g. munitions from grenade throwing). Table 1.1 summarises likely contaminants that may be encountered in Category 3 and instances where specialist advice is required prior to earthworks.

Table 1.1: Specific HAIL activities, key contaminants and additional management sections

Type of HAIL activity	Potential Contaminants	Identification of Contamination	Sections
• Corrosives bulk storage (Activity A4)	Various acids and bases.	Stressed vegetation.	No additional management sections.
• Commercial printers (Activity A15)	Solvents, metals, acids and bases.	Stained ground, stressed, vegetation, solvent odours.	
• Persistent pesticide storage or use (Activity A10) • Woolsheds (Activity A16)	Metals and organochlorine pesticides (OCPs).	Stained ground, stressed vegetation.	
• Grenade throwing (Activity C3)	PCP, nitroglycerine, heavy metals, fuel oils and solvents.	Visible shot or shells.	Specific site management procedures required.

1 Note - 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 relatively low potential for contamination in Category 3 areas, standard soil management procedures will generally be applicable, with some additions to allow for low-level contamination. The additional procedures focus on the early identification of contaminants and implementation of appropriate handling and disposal procedures.

2.1 Inspection procedures

Inspections of Category 3 excavations will be undertaken by the Site Environmental Supervisor at an interval determined by the Contaminated Land Specialist prior to the commencement of works.

If unforeseen contamination is encountered (see accidental discovery protocols – Section 3), the Contaminated Land Specialist shall be contacted to inspect the excavation and advise on the appropriate contaminated soil handling procedures, or soil sampling, if required by the Contaminated Land Specialist.

2.2 General soil handling procedures

The following general handling procedures should be followed where contamination may be present in any Category 3 area, except where testing of soils has proven soils to be absent of contaminants above published background levels (see Section 2.2.7):

- Consult the CIAL Environmental Manager and Contaminated Land Specialist prior to disturbing soils to determine a suitable receiving facility (if applicable);
- Material excavated shall be loaded by the Contractor directly onto trucks for offsite disposal (refer Section 4), 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 shall have a tracking document[2] 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 the receiving facility. 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 as soon as practicable or within two working days. The Engineer to the Contract is to provide a tracking summary to the CIAL Environmental Manager for all material removed from site.

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

[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 far as is practicable.

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:
  - Proprietary products (e.g. filter socks); and
  - Silt fences.
- If the stockpile is to be remain for more than 1-2 days and/or if rain is forecast during the time the stockpile is present, the stockpile shall be covered with geotextile or a polythene cover (or a similar material) 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 there is potential for contamination in Category 3 areas, in addition to the standard dust control practices, 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; 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 soil may also be entrained in the stormwater and result in the deposition of contaminated sediment. All stormwater at the airport campus is discharged to groundwater via soakpits.

Where contamination is suspected/identified in Category 3 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;
- Divert clean stormwater away from excavations/exposed soil in contaminated areas.
- If stormwater does enter contaminated areas, contain runoff during rainfall events within the excavation;
- Bund stockpiles as set out in Section 2.2.1;
- 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 groundwater via soakpits.

2.2.4 Cross contamination

To avoid transferring contaminated soils from one location to another, all machinery and equipment shall be decontaminated prior to moving from a suspected/identified contaminated area to a different location. Decontamination procedures are site-specific and will be determined by the Contaminated Land Specialist prior to the commencement of works. Procedures may include the manual brushing down or washing of vehicles.

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 where the contaminants may interact and migrate with groundwater, 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 in Category 3 areas. 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, but do 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 permanently capped to prevent the migration of contaminants, 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, if encountered during works, is set out in the Category 1 SMP. The CIAL Environmental Management team and Contaminated Land Specialist shall be contacted if a UST is encountered during works.

2.2.7 Soil sampling requirements and procedures

Soil sampling required under Section 2.1 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.5[3]. Soil samples shall be collected according to the following procedure:

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

- 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";
- 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. Any evidence of the presence of asbestos shall trigger testing for asbestos content in soil. Other contaminants may be tested for at the discretion of the Contaminated Land Specialist.

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 3 areas. The Contractor shall in the first instance contact the Contaminated Land Specialist to advise if contamination is present. Groundwater and ponded surface water within Category 3 areas shall not be discharged to soakpits without prior approval by the CIAL Environmental Manager to ensure that water quality meets the conditions of CIAL's global stormwater consent (CRC130198).

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 sourced material, certified cleanfill, or topsoil from a garden supplier. Any other soil or aggregate imported to site that is not sourced from a quarry or garden supplier, site sourced, or certified as cleanfill shall be sampled by the Contaminated Land Specialist at a rate of one sample for every 500 m^3 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 resource consent conditions at the source location. It is preferable that fill is tested at its source prior to its use at the site. Otherwise, if not, the Contractor shall stockpile the fill on site until test results are available.

Rock or aggregate sourced directly from a quarry or supplier does not require testing prior to importation.

3 Accidental Discovery Protocols

Unexpected soil contamination could be encountered during earthworks at Category 3 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 chips[4].

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

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.	☐
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.	☐
Prepare and implement contaminated soil Health and Safety procedures.	☐
Update the site Hazard Board and prevent access to the area by unnecessary personnel.	☐
The contractor and/or CIAL Environmental Manager must advise the Contaminated Land Specialist to inspect and advise of specific controls if appropriate.	☐

[4] MfE A guide to Management of Cleanfills 2002 – Unacceptable materials.

4 Soil Disposal

4.1 Disposal of contaminated soil

All soils excavated from Category 3 areas shall be assumed to be contaminated unless testing (previous investigations or as per Section 2.2.7) 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, as determined by the Contaminated Land Specialist, 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 Specialist[5]. Contractors should be aware that laboratory testing takes **AT LEAST 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 consistent with 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, subject to CCC approval, in the locations directed by the site operator;
- If the levels of contaminants exceed the Burwood Landfill acceptance criteria, pre-treatment may be necessary or disposal shall be sought at facilities licensed to accept such waste (e.g. Texco , Kate Valley Landfill); 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 and provided to the Engineer to the Contract and CIAL Environmental Manager as soon as practicable.

4.2 Disposal of hydro excavation materials

Materials from all hydro excavation (slurry etc.) works undertaken at Category 3 sites must only be disposed of at the designated location at the Burwood Landfill (or similarly licensed facility) as directed by the site operator.

4.3 Disposal of un-contaminated soil

Soils from Category 3 that have been pretested and proven to be uncontaminated[6] 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 and provided to the Engineer to the Contract and CIAL Environmental Manager as soon as practicable.

[5] 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.

[6] Soils are uncontaminated for the purposes of disposal to cleanfill if they meet the relevant resource consent conditions of the receiving cleanfill.

5 Health and Safety Procedures

This Health and Safety Plan (HSP) relates to the risk to workers as a result of low to 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 (JSAs). The following procedures are to be used as a guide for the preparation of these JSAs. 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.

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 m 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 unless the works are is suitably excluded from the general public as deemed appropriate by a CIAL Senior Manager (i.e. WHS Manager, Environmental Manager, Property Projects Manager);
- 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 HSO for the duration of the works. The HSO 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 HSO;
- 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 suspected asbestos containing material;
- Site workers shall wear personnel protective clothing and equipment as outlined in Section 5.1.3;
- 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 General hazard minimisation procedures

Works undertaken in Category 3 areas are unlikely to contain highly contaminated soil. However, as there is still some risk, it is appropriate for all workers, sub-contractors and visitors to adopt a certain precautionary level of hazard management related to contaminated soils. This section sets out the procedures to manage the potential hazards on sites where no obvious signs of contamination are observed.

Where obvious signs of contamination are observed, additional procedures are contained in the procedures for Category 1 areas. To prevent exposure to potentially present contaminants, the following procedures shall be followed on Category 3 sites where no obvious signs of contamination are present:

- All workers physically involved in excavating soil, or working within the excavations shall:
  - Wear clothes that cover arms and legs;
  - Wear P2 dust masks during dusty conditions; and
  - Have good hygiene practises (i.e. wash hands before eating, drinking, using the toilet or smoking).

If signs of contamination are noted, the Contractor must immediately cease works until the additional health and safety measures set out for Category 1 areas are instituted.

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.

Appendix A: Works Verification Form

Works Verification Form – Low 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 (if any)		

Form completed by:		**Date:**	
Project Manager		**Signed:**	
Contaminated Land Specialist		**Signed:**	

Appendix E: Works Verification Form (Example)

Works Verification Form – Low 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 (if any)		

Form completed by:		**Date:**	
Project Manager		**Signed:**	
Contaminated Land Specialist		**Signed:**	

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:**	

Works Verification Form – High 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:**	

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