WAKA KOTAHI
NZ TRANSPORT AGENCY

DRURY ACCESS RAMP PROJECT

Appendix O – Contaminated Land Assessment of Effects

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New Zealand Government

More information

NZ Transport Agency
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Abbreviations

Abbreviation	Term
AEE	Assessment of environmental effects
AUP	Auckland Unitary Plan (Operative in Part 2016)
CSM	Conceptual site model
CSMP	Contaminated land management plan
DSI	Detailed Site Investigation
HAIL	Hazardous Activity Industry List
MfE	Ministry for the Environment
NES - CS	National environmental standard for assessing and managing contaminants in soil to protect human health 2011
NIMT	North Island Main Trunk
NOR	Notice of requirement
P2DS	SH1 upgrades project between Papakura to Drury South
PSI	Preliminary Site Investigation
RMA	Resource Management Act 1991
RIA	Relevant Iwi authorities
SH1	State Highway 1 motorway, the southern motorway
The Site	The footprint of the proposed construction of the Drury offramp at the Drury Interchange area off State Highway 1
SH22	State Highway 22, Great South Road
SPR	Source-pathway-receptor
SUP	Shared user path
The Project	Drury Access Ramp Project

EXECUTIVE SUMMARY

This contaminated land assessment report has been prepared to support the construction of a proposed motorway access ramp at the Drury Interchange area off State Highway 1 (the Site) as part of the Drury Interchange project (the Project). This report has been prepared in accordance with the requirements stipulated in the Auckland Unitary Plan Operative in Part 15 November 2016 (AUP)[1] and National Environmental Standard for assessing and managing contaminants in soil to protect human health (NES-CS)[2].

The Preliminary Site Investigation (PSI) report prepared for the site (refer *Attachment A*) identified a number of current and former land uses identified as HAIL (MfE Hazardous Activities and Industries List, updated 2023) along with a small number of other potential contamination sources located within or in close proximity to the footprint of the proposed offramp.

For there to be an 'effect', there must be a contamination source and a mechanism (pathway) for contamination arising from that source to affect human health or the environment (receptor). This is known as a 'source – pathway - receptor (SPR) linkage' and forms the basis of the methodology applied to this report. In general:

- A ***less than minor effect***, is where the contaminant of concern (COC) is exposed to a human health receptor or an ecological receptor at concentrations in soil below the regional background soil concentrations and for water (groundwater and freshwater) below the 95% Australian and New Zealand guidelines for fresh and marine water quality criteria (ANZG). For this scenario no mitigation controls would be required.
- A ***minor effect*** is where the COC is exposed to a human health receptor or ecological receptors to COC concentrations in soil or water but are below the 'Tier 1' risk-based criteria for human and environment/ecological health relevant to land use and sensitivity of the receiving environment. For this scenario, management controls would need to be implemented to manage the effects.
- A ***more than minor effect*** is where there is a complete SPR linkage due to exposure of human health or ecological receptors to the COC in soil and / or water at concentrations in exceedance of the adopted risk screening criteria set by the suitably qualified environmental practitioner (SQEP). For this scenario, more detailed risk assessment, engineering controls and / or remediation may need to be implemented to manage this effect.

For ease of reporting, the site can be broadly subdivided where it intersects the NIMT corridor. North of the NIMT, the offramp alignment is in close proximity to the Drury Industrial Estate, home to a number of off-site commercial and industrial land uses. This area was investigated as part of the DSI for the main SH1 Papakura to Drury South (P2DS) project upgrades. Results of testing completed on samples collected from this area to date have not identified contamination exceeding adopted human health or ecological 'Tier 1' risk screening levels.

To the south of the NIMT, previously identified contamination sources (related to rural pastoral grazing land use) were investigated and remediated as part of the Drury Centre Precinct (DCP) development. Within areas previously investigated or remediated there remains a low residual risk that further unidentified contamination may be encountered.

There are still also some contamination sources that have not been investigated to date. These include areas of former landfilling at Karaka Reserve and 108 Flanagan Road, along with the NIMT railway corridor. Noting the proposed land use, an off-ramp and bridge structure, risk of exposure to future site users (i.e., patrons of the off-ramp) is low. The conceptual site model developed for the onramp PSI, did still identify the following potential complete SPR linkages, principally arising during the construction phase of the project:

- Site earthworks / construction workers that may come into direct contact with contaminated material (soil, water, landfill gas, landfill leachate) or inhale contaminated dust during excavation works.
- Adjacent site users including members of the public present in the vicinity of the site during construction / excavation works; and

[1] Resource consents for regional plan matters in the Auckland Unitary Plan - Operative in Part (AUP), 2016

[2] Resource consents for contaminated land matters under the Regulations, 2011

- Nearby environmental / ecological receptors (Hingaia Stream and identified wetland) that may be impacted by discharges or surface runoff generated during earthworks / construction activities.

Based on the findings of the PSI, this AEE presents the measures required to mitigate the SPR linkages (effects) outlined above. These include:

- Development and implementation of a Contaminated Site Management Plan (CSMP);
- Designing offramp bridge structure such that contamination source activities are not disturbed (i.e., the bridge spans are constructed over these activities, or the alignment does not intersect risk areas); and
- Ensuring no soil disturbance will take place during the onramp construction phase within the areas of former landfilling. This will further ensure that the onramp construction does not adversely affect the stability of the landfill or create preferential flow pathways for re-mobilised contamination.

The associated effects from the soil disturbance during earthworks / construction is considered to be ***less than minor*** on the basis of the identified risks and proposed mitigation measures (CSMP) to be implemented as part of the Project.

1 INTRODUCTION

1.1 Project background

This contaminated land (technical specialist) - assessment of effects (AEE) report supports the application lodged by Waka Kotahi NZ Transport Agency (Waka Kotahi) for the construction of a proposed southbound access ramp (referred to herein as 'the site') for the Drury Interchange project (referred to herein as 'the Project').

The site is considered in the context of the Papakura to Drury South Project (P2DS). P2DS is a Waka Kotahi project set to improve the safety and functionality of State Highway 1 (SH1) and provide for long term growth in the south of Auckland. Waka Kotahi has structured P2DS into five stages. The most pertinent of these is Stage 1B1, which pertains to the approved upgrades of the Drury Interchange. Stage 1B1 was approved under the COVID-19 Recovery (Fast Track Consenting) Act 2020 ('FTA') and findings from the previous investigations forms the basis of this AEE (refer Section *2.2* for further details).

In addition, the site for the Project interfaces the following consented and future developments in the area:

- Future development areas in Drury which are detailed in Section 2.1.
- Realigned SH1 corridor and SH22 / Great South Road as consented in Stage 1B1 of the Papakura to Drury South (P2DS) project by Waka Kotahi.
- Future proofing works along North Island Main Trunk (NIMT) rail corridor by KiwiRail as part of Papakura to Pukekōhe (P2P) rail electrification works; and
- Establishment of active mode corridor (AMC) along SH22 / Great South Road by Auckland Transport (AT). Alignment is yet to be determined at this stage.

1.2 Proposed works

The site in relation to the surrounding existing and planned environment is shown in Figure 1-1. The proposed works at the site will comprise:

- Construction of a 245 metre (m) long seven (7) span bridge structure from the southbound lane of State Highway 1 (SH1) to an area off Flanagan Road.
- Foundation piling works for bridge support.
- Cut and fill earthworks for the mechanically stabilised earth wall (MSE) retaining wall at the abutment to the bridge; and
- Establishment of a left-hand shoulder lane on the new bridge (with a minimum width of 2 m) and right -hand shoulder lane (with a minimum width of 1 m) respectively.

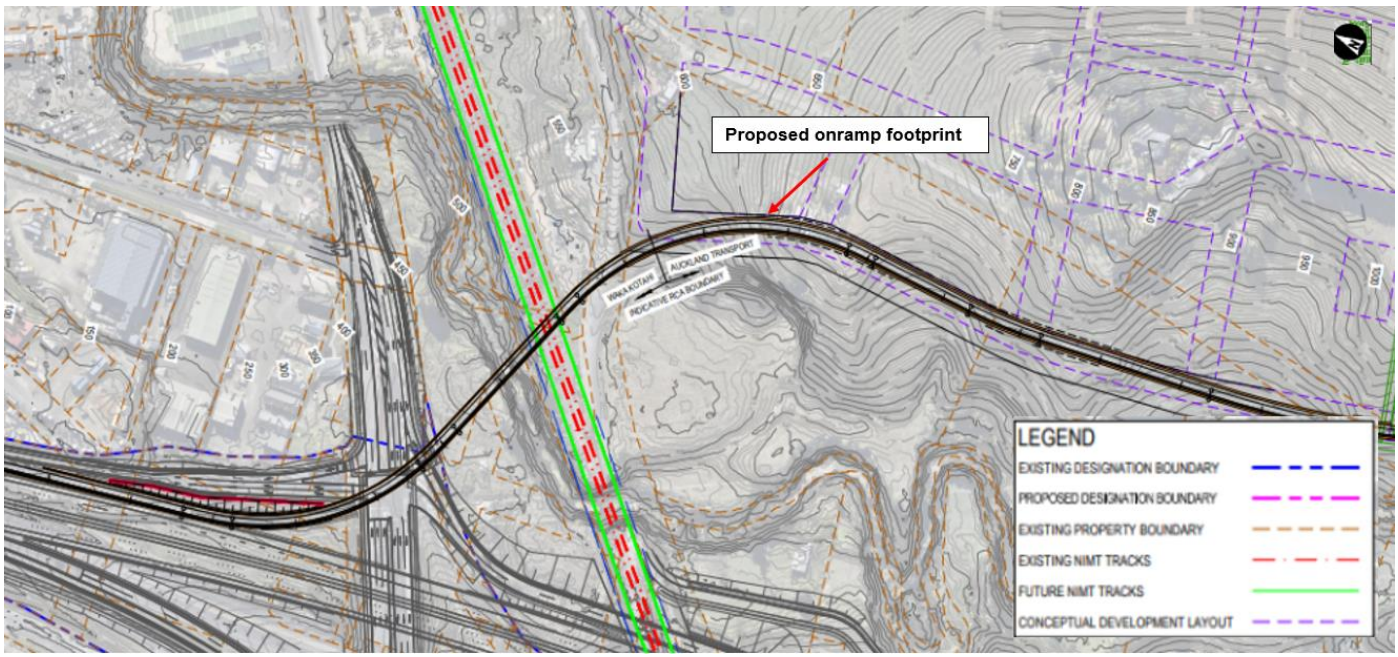

Figure 1-1: Proposed access ramp showing planning environment

1.3 Purpose of report

This contaminated land assessment report (referred to herein as 'the report') forms part of the suite of technical reports prepared to inform the Project's Assessment of Environmental Effects (AEE) report required for:

- Notice of Requirement (NoR) for alteration to the existing SH1 Designation 6706 (for which Waka Kotahi is the requiring authority) under section 181 of the Resource Management Act (RMA);
- Resource consent application for national environmental standard matters under NES-CS; and
- Resource consent application for regional matters under the AUP.

This report will:

- Identify hazardous activities industries list (HAIL) and/or contamination sources, based on the findings of the PSI (refer *Attachment A*), with the potential to impact underlying soil and water at the site.
- Assess the potential adverse effects of the identified HAIL and / or contamination sources for the proposed works; and
- Recommend mitigation and management measures to address potential adverse effects.

The main elements associated with the proposed works (refer Section 1.2) that is assessed in this report are as follows:

- ***Construction phase risks*:** Soil disturbance works associated with the foundation piling earthworks for the bridge structure during the construction phase. Given the suspended bridge structure does not come into direct contact with underlying soil and / or water, any potential risks have been omitted from the effects assessment.
- ***Operational phase:*** Residual in-situ contamination, if identified as part intrusive works completed for the site and applicable for Waka Kotahi.

1.4 Supporting documents

The following contamination reports have been prepared to for the site to aid with this assessment and this report should be read in conjunction with them:

- ***Access ramp PSI, 2023***. Proposed Access Onramp at Drury Interchange. Preliminary Site Investigation (PSI) included as *Attachment A.*

- ***Access ramp CSMP, 2023***. and Report 2: draft Contaminated Site Management Plan (CSMP) included as *Attachment B.*

The following previous contamination reports have been referenced within this assessment:

- ***P2B, PSI, 2019.*** Preliminary Site Investigation, Stage 1 Papakura to Bombay (now referred to as Papakura to Drury South), Report prepared by Aurecon on behalf of Waka Kotahi (Aurecon report reference: 506207-0310-REP-KF-0035).
- ***P2B, DSI, 2020.*** Detailed Site Investigation, Stage 1 Papakura to Bombay (now referred to as Papakura to Drury South), Report prepared by Aurecon on behalf of Waka Kotahi (Aurecon report reference: 506207-0310-REP-KF-0042).
- ***DCP, PSI, 2020.*** Drury Centre Precinct- Preliminary Site Investigation. Report prepared by Aurecon for Kiwi Properties Limited (Aurecon report reference: 510611-0000-REP-0001).
- ***DCP, DSI, 2021.*** Drury Centre Precinct - Detailed Site Investigation. Report prepared by Aurecon for Kiwi Properties Limited, 2021 (Aurecon report reference: 510611-0000-REP-0002).
- ***DCP, CSMP/RAP, 2022.*** Drury Centre Precinct – Contaminated Site Management Plan and Remediation Plan (Aurecon report reference:510611-0100-REP-KF-004).
- ***Jacobs, P2P, DSI, 2021.*** Papakura to Pukekohe (P2P) Electrification Detailed Site Investigation, Report prepared by Jacobs Consultants for be KiwiRail Dated 4 March 2021(Jacob report reference: P2P-RP-NIMT-XD-NA-06240-0).

2 EXISTING ENVIROMENT

2.1 Site setting

The offramp is a short section of additional road corridor connecting the existing SH1 southbound corridor to an urban growth area known as the Drury Centre Precinct, an area of former agricultural land currently under development for mixed residential and commercial land use. The connection will be established through construction of a bridge that crosses SH22, the North Island Main Trunk and Hingaia Stream. Below is a high-level overview of the existing environment. Further detail is provided in the PSI at Appendices A and C.

The existing receiving environment contains a combination of residential and business uses in addition to areas of undeveloped residential, informal recreation and business zones.

The site straddles a geological boundary between the South Auckland Volcanic Field (SAVF) and the Puketoka Formation, which is part of the Tauranga Group. The SAVF is described as basalt, specifically fine-grained and coarse-grained porphyritic olivine basalt, basanite and hawaiite lava flows. The Puketoka Formation consists of pumiceous mud, sand and gravel with muddy peat, lignite, and tephra.

The site is located in the 'high-use aquifer management area' Auckland Council (AC) overlay map, denoting the area requires careful management of water availability to meet user needs and maintain base flows. It is also included in the 'quality-sensitive aquifer management areas' overlay, inferring that the aquifer underlying the site is shallow and unconfined, thus requiring management to prevent the discharge of contaminants from surface sources. Groundwater at the site is anticipated to be shallow (< 5 metres below ground level (m bgl) and flow towards Manukau Harbour in a westerly direction.

The Auckland Council Geomaps resource shows the Hingaia Stream, a meandering stream as a significant overland flow path. There are several floodplains noted within the low-lying sections of the site (at 108 Flanagan Road and Karaka Reserve) including two seepage wetlands (which are in the vicinity of the site) with ecological significance. The Hingaia Stream flows into Slippery Creek, which ultimately discharges to the Manukau Harbour. The foundation piling for the bridge structure will either border the Hingaia Stream or be placed across the Hingaia Stream along the Flanagan Road end of the bridge structure.

2.2 Summary of potentially contaminating activities

A Preliminary Site Investigation (PSI) completed for the onramp development is provided in *Attachment A*.

The PSI included a review of environmental investigations completed as part of the Papakura to Drury (P2D) project and Kiwi Properties' Drury Central Precinct (DCP) development project, the boundaries for which overlap the access ramp footprint (the Site). Supporting reports are referenced in section 1.4 above.

Investigations completed as part of the P2DS at the northern end of the alignment have not identified the presence of contamination exceeding adopted human health or ecological risk criteria. Previous investigations within the DCP have identified localised hotspots of heavy metal and asbestos contamination associated with historic buildings. These hotspots have since been remediated and validated. Areas of the alignment not characterised by previous investigations include historic landfilling located within the Karaka Reserve and within a section of the property addressed 108 Flanagan Road within the DCP area.

The conceptual site model (CSM) completed as part of the PSI reviewed all hazardous activity industries lists (HAIL) and contamination sources identified as part of the above-mentioned projects. The CSM identifies disturbance of soils within the landfills, the North Island Main Trunk (NIMT) and State Highway 1 corridor could be considered to pose a risk to construction workers, adjacent users and result in adverse discharges to the nearby Hingaia Stream if not adequately controlled.

Noting the proposed land use, an off-ramp and bridge structure, risk of exposure to future site users is considered low.

3 ASSESSMENT OF EFFECTS

3.1 Assessment methodology overview

The CSM indicates that for there to be an effect, there must be a contamination source and a mechanism (pathway) for contamination to affect human health or the environment (receptor). This is known as ‘source pathway receptor (SPR) linkage’ and forms the methodology applied to this report. In general:

- A ***less than minor effect***, is where the contaminant of concern (COC) is exposed to a human health receptor or an ecological receptor at concentrations in soil below the regional background soil concentrations and for water (groundwater and freshwater) below the 95% Australian and New Zealand guidelines for fresh and marine water quality criteria (ANZG). For this scenario, no mitigation controls would be required.
- A ***minor effect*** is where the COC is exposed to a human health receptor or ecological receptors to COC concentrations in soil or water but are below the 'Tier 1’ risk-based criteria for human and environment/ecological health relevant to land use and sensitivity of the receiving environment. For this scenario, management controls would need to be implemented to manage the effects.
- A ***more than minor effect*** is where there is a complete SPR linkage due to exposure of human health or ecological receptors to the COC in soil and / or water at concentrations in exceedance of the adopted risk screening criteria set by the suitably qualified environmental practitioner (SQEP). For this scenario, more detailed risk assessment, engineering controls and / or remediation may need to be implemented to manage this effect.

Table 3-1 presents the CSM and associated SPR linkages and assesses the unmitigated effects on the environment and human health based on no controls in place and the and anticipated effects with mitigation controls.

3.2 Construction effects

3.2.1 Adverse construction effects

During earthworks / construction activities, soil disturbance works can create direct pathways, which can have a potential adverse effect on human health and the environment. These include:

- Inhalation exposure to workers and members of the public.
- Ingestion and dermal contact exposure to workers and neighbouring site users.
- Migration of contaminants.
- Discharge to surface water (Hingaia Stream).
- Passive discharge to groundwater, and subsequent discharge to surface water, if applicable.
- Compromised landfill containment systems (though noting the age of the landfills unlikely to be present).
- Accumulation of contaminants resulting in uptake by flora and fauna.
- Vegetation impacts.

Effects during construction activities will be generally transient, though it should be noted that for some contaminants, additional exposure can lead to irreversible impacts.

3.2.2 Positive construction effects

Positive effects of the construction may include:

- Characterisation of areas of historical contamination previously unknown, allowing appropriate management controls to be implemented to protect human health and the environment during construction.

- The possible removal, stabilisation and / or encapsulation of contaminated materials, from the proposed soil disturbance areas within at the site, thus reducing the ongoing potential risk. Where possible Waka Kotahi and Mana Whenua would seek to limit off-site disposal of cut material encouraging more sustainable practices.

3.3 Operational effects

3.3.1 Adverse operational effects

Given the suspended bridge structure does not come into direct contact with underlying soil and / or water the effect to users of the off-ramp is considered to be negligible. At ground surface level, any residual contamination is likely to be sealed beneath highway or landscaped features and stormwater directed away from the landfill. There remains some potential for disturbance during operations (i.e., as part of maintenance or repair contracts) however in the context of this project:

- Future maintenance within NIMT will be managed by KiwiRail.
- Areas of former landfilling in the centre of the site, where proposed to be utilised as part of the design, are anticipated to require minimal future soil disturbance as part of maintenance activities. Maintenance of the landfill is to be undertaken by the asset owners.

3.3.2 Positive construction effects

The proposed design, where intersecting bodies of fill or landfill waste, will need to ensure that the landfill body remains stable. Any engineering controls to stabilise landfill material will likely improve global stability beyond that which currently exists.

Table 3-1: Assessment of effects

Source/HAIL	Contaminant of Concern	Exposure Pathway	Receptor	SRP Linkage Considered (based on PSI findings)	Unmitigated Effect
HAIL G5 – landfilling at 108 Flanagan Road (DCP) and Karaka Reserve (should foundation piling intercept these areas)	▪ Asbestos ▪ Heavy metals Poly aromatic hydrocarbons ▪ Methane and Carbon Dioxide gas (through potential landfill) Asbestos ▪ PFAS	▪ Dermal Contact ▪ Ingestion or inhalation of dust/vapours ▪ Landfill gas	▪ On site excavation construction workers ▪ Future site users ▪ General public in the vicinity of earthworks. ▪ Surface water	General exposure during earthworks – ***Complete*** **108 Flanagan Road, Drury** A former landfill is confirmed within this property, which was operational between the mid-1970's and mid-1990's. Limited investigation completed as part of the Drury Central Precinct (DCP) confirms waste-bearing fill (namely metal, steel, potential asbestos, brick and concrete). Heavy metal concentrations above human health criteria (for lead and arsenic) including Polycyclic Aromatic hydrocarbon (PAH) and asbestos were detected in the soil samples analysed. Groundwater was encountered between 1.5 and 2.0 m bgl, with oily sheen and "white foam". **Karaka Reserve** One geotechnical borehole (BH003) was completed within this area confirming fill material up to 1.8 m bgl. A completed SPR linkage only exists where the design proposes to disturb soils within this area.	If foundation pilings intercept former landfilling area, effects could be ***more than minor.***
NIMT	▪ Asbestos ▪ Heavy metals ▪ Poly aromatic hydrocarbons ▪ Total petroleum Hydrocarbons	▪ Dermal Contact ▪ Ingestion or inhalation of dust/vapours	▪ On site excavation construction workers ▪ Future site users ▪ General public in the vicinity of earthworks. ▪ Surface water	Some works have been completed within the NIMT as part of the P2P Electrification Project which identified soil exceedances above Auckland background concentrations for heavy metals. No exceedance above adopted environmental and human health criteria were noted for heavy metals, Polycyclic Aromatic Hydrocarbon compounds (PAH, in particular, pyrene and benzo (a) pyrene) and Total Petroleum Hydrocarbon (TPH).	Based on the limited soil data reviewed, the potential effects is considered ***less than minor.***
SH1 corridor	▪ Asbestos ▪ Heavy metals Poly aromatic hydrocarbons	▪ Dermal Contact	▪ On site excavation construction workers	No contaminants of concern above the Tier 1 human health and ecological criteria or above AUP Permitted Activity Criteria	Based on the limited soil data reviewed and the geotechnical results indicating no fill in the

Source/HAIL	Contaminant of Concern	Exposure Pathway	Receptor	SRP Linkage Considered (based on PSI findings)	Unmitigated Effect
		▪ Ingestion or inhalation of dust/vapours	▪ Future site users ▪ General public in the vicinity of earthworks. ▪ Surface water	were identified for the HAIL activities associated with the Drury Industrial Estate, adjacent the proposed onramp development	bridge alignment area, the potential effects is considered ***less than minor.***

4 MITIGATION AND MANAGEMENT CONTROLS

Based on the recommended controls set out within technical supporting documentation (Refer Section *1*) and the assessment of potential adverse effects on the environment, the following mitigation and management measures are proposed.

4.1 Contaminated site management plan

The draft CSMP is presented in *Attachment B* and will be required to be implemented to mitigate and manage effects. It provides the following with respect to the completion of land disturbance activities on contaminated sites:

- Project background, summary or proposed works, areas of affected materials and summary of onsite hazards, and scope of report.
- Contact information and summary of specified roles for client, consultant and contractors engaged to work on the Project.
- Site controls and procedures.
- Protocols for unexpected contamination discovery.
- Health and safety protection measures.
- Environmental management procedures; and
- Testing requirements for imported fill, waste disposal and / or groundwater.

The draft CSMP will be updated to include a summary of the additional investigation findings, if undertaken. Prior to commencement of the Project works, the CSMP will be updated by the Principal Contractor's suitably qualified and experienced practitioner (SQEP), and reviewed and certified by Council to specify:

- Responsible parties, their roles and contact details.
- Finalised Project extents and locations of soil disturbance.
- Dewatering requirements.
- Project access / egress points and laydown areas.
- Methodologies for additional investigation or sampling (if necessary).
- Reporting requirements.

The CSMP will be implemented by the Principal Contractor through the appointed subcontractors. If unexpected contamination is identified during the construction phase, it will be managed using the advice of a SQEP. On completion of the works, all contamination will have either been removed or will be in a managed state, e.g., capped to provide a barrier between the contamination and all identified receptors.

4.2 Further investigations

Where earthworks and proposed bridge foundations are proposed to be located within former landfills at 108 Flanagan Road and Karaka Reserve, Detailed Site Investigation (DSI) is recommended to assess soil and groundwater quality, assessment potential leachate mobility and potential for generation of landfill gas. From the findings of these investigations, the risk associated with these sites can be refined and thus the effect from known SPR linkages. Conservative measures to protect for these risks are provided within the draft CSMP.

4.3 Recommended mitigations

Table 4-1 assesses the unmitigated effects on the environment and human health based with mitigation controls and the anticipated effects on the environment.

Table 4-1: Mitigation controls and anticipated effects

Source/HAIL	Unmitigated Effect	With Mitigation Controls	Anticipated Effect
HAIL G5 – landfilling 108 Flanagan Road (DCP) and Karaka Reserve	Applicable only if foundation pilings intercept former landfilling area, effects could be ***more than minor.***	Detailed Site Investigation (DSI) is required to provide more certainty regarding soil and groundwater quality, leachate mobility and generation of landfill gas and impacts for the site to assist with design and construction. Controls to manage construction phase risks will be outlined within the CSMP (enhanced erosion and sediment control, ground gas protections, protection of waterways). Future design will ensure no ongoing instability risks.	***Less than minor.***
NIMT	Based on the limited soil data reviewed, the potential effects is considered ***less than minor.***	Implementation of a CSMP	***Less than minor.***
SH1 corridor	Based on the limited soil data reviewed, the potential effects is considered ***less than minor.***	Implementation of a CSMP	***Less than minor.***

5 CONCLUSION

This report has been prepared to provide an assessment of environmental effects associated with land contamination of the Project at the Site. The associated effects from the soil disturbance during earthworks / construction will be ***less than minor*** on the basis of the identified risks and proposed mitigation measures (CSMP) to be implemented as part of the Project.

Positive effects include:

- Identification of areas of historical contamination previously unknown, allowing appropriate management controls to be implemented to protect human health and the environment during construction; and
- The possible removal and/or encapsulation of contaminated materials, from the proposed soil disturbance areas within the site, thus reducing the ongoing potential risk. This approach proposed by Waka Kotahi and Mana Whenua would seek to limit off-site disposal of cut material encouraging more sustainable practices. This has been taken into consideration in this report.

Potential adverse effects include:

- Inhalation exposure to workers and members of the public.
- Ingestion and dermal contact exposure to workers and neighbouring site users.
- Migration of contaminants via stormwater; and
- Discharge to surface water (Hingaia Stream).

These effects can be managed or mitigated by:

- Implementation of a Contaminated Site Management Plan (CSMP);
- Designing offramp bridge structure such that contamination source activities are not disturbed (i.e., the bridge spans are constructed over these activities, or the alignment does not intersect risk areas); and
- Ensuring no soil disturbance will take place during the onramp construction phase within the areas of former landfilling. This will further ensure that the onramp construction does not adversely affect the stability of the landfill or create preferential flow pathways for re-mobilised contamination.

Based on the assessment undertaken the proposed construction works may cause temporary effects, as a result of temporary discharges to Hingaia Stream during fill disturbance. Proposed mitigation activities and management of stormwater, sediment and waste (i.e., implementation of CSMP measures and ESC measures) will likely enable the health and wellbeing of freshwater bodies to be maintained. The draft CSMP is attached as Attachment B to this report, and an Erosion and Sediment Control Plan (ESCP) has been prepared separately for the Project as a standalone report and is taken into account in the Project's AEE report.

ATTACHMENT A - PRELIMINARY SITE INVESTIGATION REPORT

WAKA KOTAHI
NZ TRANSPORT AGENCY

DRURY ACCESS RAMP PROJECT

Attachment A – Contaminated Land - Preliminary Site Investigation (PSI)

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More information

NZ Transport Agency
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B	17-05-2023	Update following client review	M.Gamman			
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1 EXECUTIVE SUMMARY

A Preliminary Site Investigation (PSI) has been completed for the construction of a proposed southbound motorway access ramp (the site) as part of the Drury Interchange Project (the project). The PSI included a review of environmental investigations completed as part of the Papakura to Drury (P2D) project and Kiwi Properties' Drury Central Precinct (DCP) development, the boundaries for which overlap the access ramp footprint.

The access ramp is to be constructed to connect SH1 southbound lane to the new Drury Central Precinct. Located near to the centre of the Drury township, the alignment passes to the south of existing commercial and industrial land before crossing the North Island Main Trunk (NIMT) and entering the proposed Drury Central Precinct, which currently comprises vacant pastoral grazing land.

Investigations completed as part of the P2D at the northern end of the alignment have not identified the presence of contamination exceeding adopted human health or ecological risk criteria. Previous investigations within the DCP have identified localised hotspots of heavy metal and asbestos contamination associated with historic buildings. These hotspots have since been remediated and validated. Areas of the alignment not characterised by previous investigations include historic landfilling located within the Karaka Reserve, and within a section of the property addressed 108 Flanagan Road (DCP).

The conceptual site model (CSM) completed as part of the PSI reviewed all hazardous activity industries lists (HAIL) and contamination sources identified as part of the above-mentioned projects. The CSM identifies disturbance of soils within the landfills, the North Island Main Trunk (NIMT) and State Highway 1 corridor could be considered to pose a risk to construction workers, adjacent users, the integrity of foundation structures, and result in adverse discharges to the nearby Hingaia Stream if not adequately controlled. Noting the proposed land use, an off-ramp and bridge structure, risk of exposure to future site users is low.

To mitigate construction phase risks a Contaminated Site Management Plan (CSMP) will be required to support the earthworks, which shall document procedures and standards to be followed during earthworks and construction and to address the potential sources of contamination identified for the site. Through implementation of the CSMP, the risk posed to site users (principally earthworks) and public can be substantially reduced to an acceptable standard.

Where proposed, any soil disturbance work within the former landfills at 108 Flanagan Road and Karaka Reserve require further detailed site investigations (DSI) to assess soil and groundwater quality, potential leachate mobility and potential for generation of landfill gas. Investigation of groundwater quality will be required to inform appropriate disposal strategy in the event dewatering is required.

2 INTRODUCTION

Aurecon New Zealand Limited (Aurecon) has been engaged by Waka Kotahi NZ Transport Agency (Waka Kotahi) to undertake a Preliminary Site Investigation (PSI) for the construction of a proposed southbound motorway access ramp (referred to herein as 'the site') as part of the Drury Interchange project (referred to herein as 'the project'). Refer to Figure 2-1: Site locationFigure 2-1 below for the proposed site location. The PSI supports the Contaminated Land (technical specialist) - assessment of environment effects (AEE) report (Aurecon report reference: 523844-W00001-REP-EC-0002) prepared to support the resource consent application for the site.

2.1 Proposed works

The proposed works will comprise:

- Construction of a 245 metre (m) long seven (7) span bridge structure from the southbound lane of State Highway 1 (SH1) to an area off Flanagan Road (within the Kiwi Properties Drury centre development).
- Foundation piling works for bridge supports; and
- Establishment of a left-hand shoulder lane on the new bridge (with a minimum width of 2 m) and right -hand shoulder lane (with a minimum width of 1 m) respectively.

Refer to Figure 2-1 for the site location, an enlarged version of which is provided in *Appendix A*. For this PSI, the site is defined as the area within the orange buffer, as shown in Figure 2-1 to accommodate changes to final piling layout and bridge structure placement, noting detailed design for the project is yet to be completed.

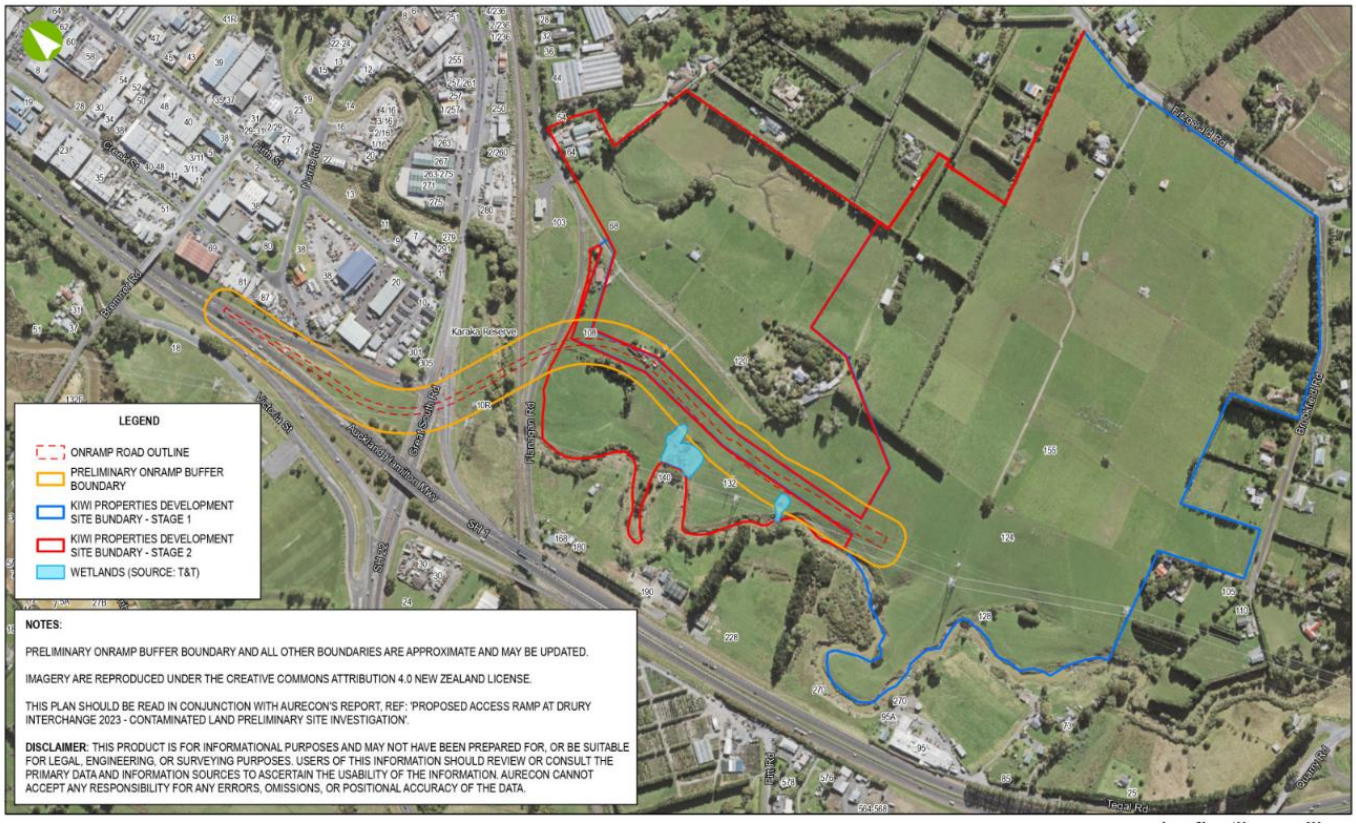


Figure 2-1: Site location

2.2 Objective and scope

The objectives of the PSI are to:

- Assess whether there are current and historical activities with the potential to have caused soil and / or groundwater contamination at the site, based on readily available information and previous environmental investigation reports; and
- Inform risk implications associated with these activities for the design and construction of the bridge, including any consenting requirements under the National Environmental Standards for assessing and managing contaminants in soil to protect human health (NES-CS) and the Auckland Unitary Plan - operative in part (AUP).

In order to achieve the above objectives, the following scope of works was undertaken:

- A review of readily available information, including:
  - Regional geological and topographical information
  - Hydrological and hydrogeological information.
  - Historical aerial photographs.
  - Environmental reports pertaining to the Kiwi Properties' Drury Centre Precinct (DCP) Project[1] and the Papakura to Drury (P2D) Project[2] which overlaps the current site (previously consented and known to Aurecon);
  - Auckland Council property file and contamination enquiry information contained within the above two-mentioned projects; and
- Preparation of this PSI report.

This report has been prepared in general accordance with the Ministry for the Environment (MfE) Contaminated Land Management Guideline No. 1 (CLMG No.1)[3]

The persons undertaking, managing, reviewing, and certifying (verifying) this report are suitably qualified and experienced practitioners (SQEPs) as defined in the MfE's NES Users Guide[4].

2.3 Limitation

Aurecon has prepared this PSI report for Waka Kotahi, exclusively for its use. Data or opinions contained within the report may not be used in other contexts or for any other purposes without Aurecon's prior review and agreement.

Aurecon accepts no responsibility or liability to any third party for the use of, or reliance on, the report by any third party and the use of, or reliance on, the report by any third party is at the risk of that party.

Only a finite amount of information has been collected to meet the specific technical requirements of project brief and this report does not purport to completely describe all the site's characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it must be appreciated that actual conditions could vary from the assumed model.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined in Section *1.2* above. Should further information become available regarding the conditions at the site, including previously unknown likely sources of contamination, Aurecon reserves the right to review the report in the context of the additional information.

This report has been prepared for Waka Kotahi for its own use and is based on information provided. Aurecon takes no responsibility and disclaims all liability whatsoever for any loss or damage that the Waka Kotahi may suffer as a

[1]Drury Centre Project - *Preliminary Site Investigation*. Report prepared by Aurecon for Kiwi Properties Limited, 2020 (report reference: 510611-0000-REP-0001).

[2] Papakura to Drury Project - *Preliminary Site Investigation*, 2019 (Aurecon report reference. 506207-0310-REP-KF-0035) and *Detailed Site Investigation Report*, 2020 (Aurecon report reference: 506207-0310-REP-0042). Report prepared by Aurecon for Waka Kotahi.

[3] Ministry for the Environment, 2021, *Contaminated Land Management Guidelines No. 1*: Reporting on Contaminated Sites in New Zealand, ME 1071, Revised Draft

[4] Ministry for the Environment, 2012, *Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*, ME 1092

result of using or relying on any such information or recommendations contained in this report, except to the extent Aurecon expressly indicates in this report that it has verified the information to its satisfaction. This report is not to be reproduced either wholly or in part without our prior written permission.

3 ENVIRONMENTAL SETTING

Table 3-1 describes the environmental setting for the site.

Table 3-1: Environmental setting

Environmental Setting	Description
Site location and general description	The proposed site (following State Highway 1 (SH1) north to south) is situated within the SH1 Designation 6706[5] adjacent the Great South Road offramp in Drury, Auckland. Subsequently the site spans over State Highway (SH22), Karaka Park, the North Island Main Trunk line (NIMT)[6]), portion of the Kiwi Properties Group owned land (identified for commercial and industrial development – Drury Centre Precinct) and Hingaia Stream, ultimately terminating at 133 Fitzgerald Road, Drury (within the Kiwi Properties Group owned land/development). Refer to *Figure 1* for site location and layout. The existing receiving environment contains a combination of residential and business uses in addition to areas of undeveloped residential, informal recreation and business zones.
Topography	The site topography generally consists of broad, undulating slopes with localised dips and shallow depressions. The site elevation ranges from approximately 16 metres above relative level (m RL) to 20 m RL[7], with the lowest points located along the Hingaia Stream.
Geology	The surface geology of the Auckland area[8] indicates the site straddles a geological boundary between the South Auckland Volcanic Field (SAVF) and the Puketoka Formation, which is part of the Tauranga Group. The SAVF is described as basalt, specifically fine-grained and coarse-grained porphyritic olivine basalt, basanite and hawaiite lava flows. The Puketoka Formation consists of pumiceous mud, sand and gravel with muddy peat, lignite and tephra. A review of geotechnical borelogs (BH001, BH003, BH004, BH006 and HA001 – HA003) advanced as part of the Geotechnical investigations for the site completed to a maximum depth of 70 metres below ground level (m bgl) noted underlying soils predominately comprised silty clay, sandy clay, clay and silty clay of the Tauranga Group soils. Engineered fill was also encountered within BH003 (within the area identified as HAIL G5, refer *Figure 510611-0000-DRG-KF-0002 (HAIL Map), Appendix A*) to 1.8 m bgl which comprised of gravels, silt, cobble and scoria. Refer to the Geotechnical Report prepared for the resource consent application for further details. Similar geology was also identified during the drilling works completed for the P2D DSI, 2020[9].
Hydrogeology	The site is located in the 'high-use aquifer management area' Auckland Council (AC) overlay map, denoting the area requires careful management of water availability to meet user needs and maintain base flows. It is also included in the "quality-sensitive aquifer management areas" overlay, inferring that the aquifer underlying the site is shallow and unconfined, thus requiring management to prevent the discharge of contaminants from surface sources. These management areas describe the Drury sand aquifer, which is made up of Tauranga Group and SAVF. Deeper aquifers are also likely to be present within underlying bedrock of the Kaawa Formation and Waitemata Group.

[5]Waka Kotahi Designation 6706 – Motorway purposes between Auckland and Hamilton

[6]KiwiRail Designation 6302 – NIMT railway

[7] Auckland Council geomap, accessed on 13 February 2023

[8]1:250,000 scale geological map of the Auckland area (Map 3, 2001, Institute of Geological and Nuclear Sciences, Geological Map of New Zealand)

[9]Aurecon, 2020. *Detailed Site Investigation, Stage 1 Papakura to Bombay. Report prepared for Waka Kotahi* (report reference:506207-0310-REP-KF-0042)

Environmental Setting	Description
	A review of the groundwater data from piezometers installed as part of the Geotechnical Investigation for the site revealed groundwater at BH003 – BH006 ranged between 2.5 m – 4.8 m bgl. Refer to the Geotechnical Report prepared as part of the resource consent application for further details. Groundwater is anticipated to flow in a westerly direction towards Manukau Harbour.
Hydrology	The Auckland Council Geomaps resource[10] shows the Hingaia Stream, a meandering stream as a significant overland flow path. There are several floodplains noted within the low-lying sections of the site (at 108 Flanagan Road and Karaka Reserve) including two seepage wetlands (which are in the vicinity of the site). The larger wetland being approximately 1000 square meters[11] (refer *Figure 510611-0000-DRG-KF-0001, Appendix A* for the wetland locations). The Hingaia Stream flows into Slippery Creek, which ultimately discharges to the Manukau Harbour. The foundation piling for the bridge structure will either border the Hingaia Stream or be placed across the Hingaia Stream along the Flanagan Road end of the bridge structure.
Ecological Sensitive Receptor	As stated above, the Hingaia Stream contains two wetlands and groundwater at the site was measured to be less than 5 m bgl. As such the site is considered a **sensitive receptor** as per the Ministry for the Environment (MfE) sensitive receptor definition[12]. The location of both wetlands is presented in *Figure 510611-0000-DRG-KF-0001, Appendix A.*

[10] Accessed on 13 March 2023

[11] Tonkin & Taylor, 2019. *The Drury Metropolitan – An Ecological Assessment of* Effects prepared for Kiwi Properties Limited.

[12] Ministry for the Environment (MfE), 2001 *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health,* Ministry for the Environment, Wellington

4 SITE HISTORY

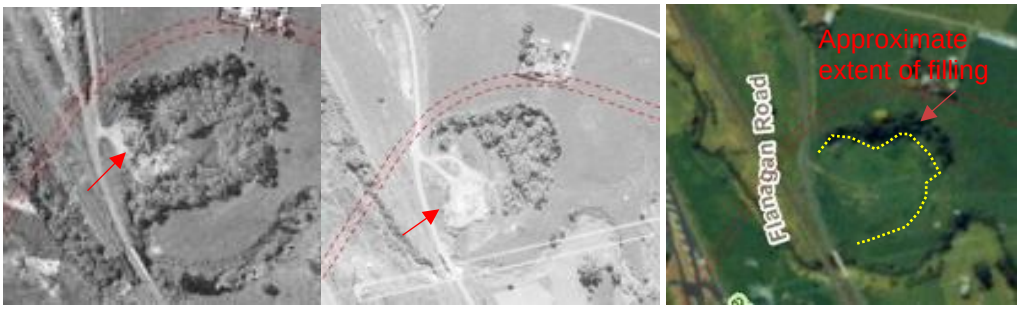
4.1 Aerial photograph review

A review of historical aerial photography, available from Auckland Council Geomaps and Retrolens[13] was undertaken. A summary of the findings is presented in Table 4-1. Copies of the aerial images are provided in *Appendix B.*

Table 4-1: Aerial photograph review

Year	Site	Adjacent area
1942	The site is situated on predominately rural land. Dense vegetation and a residential dwelling are evident at the property identified as 108 Flanagan Road. The natural landform through the centre of the alignment appears to comprise a low-lying gully or flood plain associated with the Hingaia Stream. The NIMT, is already shown to have been constructed through the centre of this feature has been constructed on a fill embankment.	SH1, Great South Road and Flanagan Road appear established. Dense vegetation is visible bordering the Hingaia Stream. Rural residential dwelling and ancillary buildings are also evident scattered throughout the neighbouring rural properties. The rural properties (identified as the DCP development, refer *Figure 510611-0000-DRG-KF-0001, Appendix A*) is predominately used for cattle and sheep grazing. Horticultural activities are evident at 190 Flanagan Road. A railway line is visible running adjacent to Flanagan Road, including a railway siding further north along Flanagan Road (approximately 200 m, upgradient of the site).
1960 and 1963	A contractor's yard is evident through the centre of alignment to the north of the NIMT, on the northern side of Great South Road. No other significant changes to the site.	No significant changes to the surrounding area. Hingaia Stream has been cleared of the dense vegetation which was noted on the earlier aerial photograph.
1974	The low-lying gully between the NIMT and Great South Road (Karaka Reserve) has been infilled, likely as part of the Drury Interchange construction. The heavily vegetated former river bend at 108 Flanagan Road, immediately to the south of NIMT corridor (within the Kiwi Properties development) has begun to be cleared and re-worked.	The Drury Interchange motorway layout appears to have been redesigned and SH1 has been constructed. The horticultural activity noted at 190 Flanagan Road is no longer visible. Some industrial development is also evident, east of the Great South Road offramp (within the Drury Industrial Estate).
1981	A new residential dwelling has been constructed in the eastern corner of 108 Flanagan Road, and the vegetated river bend continues to be infilled.	No significant changes to surrounding land use.
1996	Landfilling of the former gully/flood plain in these areas has been completed. No other significant changes noted to the site.	Two electrical pylons are visible bordering the site (within the DCP development). Commercial and industrial intensification is evident within the Drury Industrial Estate. The Karaka Reserve appears to have been developed. The area immediately west of the Hingaia Stream (at 190 Flanagan Road) appears to be used as a commercial property. A settlement pond and ancillary buildings are evident scattered throughout this property. Extensive market gardening

[13] Aerials review completed on 13 March 2022 based on aerials from Retrolens and Auckland Council Geomaps.

Year	Site	Adjacent area
		is also evident downgradient of the site (immediately west beyond SH1).
2010	No significant changes to the site.	Further commercial and industrial intensification is evident within the Drury industrial Estate. SH1 and connections mimic the current configurations.
2017	No significant changes to the site.	No significant changes to the surrounding area.
Summary	The site, adjacent to the Great South Road offramp, has been part of the SH1 designation. The only structure/dwelling visible within the site buffer appears to be at 108 Flanagan Road (within the DCP development). The site (within the DCP development) has historically been used as a cattle/dairy farm, with no evidence of other land use observed. Evidence of significant landfilling within a former gully/floodplain on either side of the NIMT is apparent.	The surrounding land use is predominantly rural with the main activities identified as market gardening, Drury Industrial area and the Karaka Reserve. The Hingaia Stream appears to have been modified with potential infilling and recontouring to form the current stream layout.
Summary of aerial photographs showing landfill extent at 108 Flanagan Road	 **1974** **1981** **1996**	

4.2 Summary of previous investigations

The following previous investigation reports have been reviewed to identify contamination sources which has the potential to impact underlying soil and/or groundwater at the site. Information pertaining to contaminated land from these investigations is considered sufficient to inform the site.

4.2.1 State Highway 1 Upgrades Papakura to Drury (2019)

Aurecon completed environmental investigations as part of the resource consent application for the Pakapura to Drury Stage 1B1 (P2D 1B1) project which included the Drury Interchange towards the east of the site, new bridges over State Highway 22 (SH22), a new off-road Shared user path (SUP), additional shoulders and associated stormwater infrastructure. Table 4-2 presents the key findings, relevant to the site, from these investigations.

Table 4-2: Summary of P2D investigations

Report description	Findings
P2D, PSI, 2019	***Preliminary Site Investigation, Stage 1 Papakura to Bombay, Report prepared by Aurecon on behalf of Waka Kotahi (Aurecon report reference: 506207-0310-REP-KF-0035),*** referred to herein as the 'P2D PSI, 2019'. The P2D PSI, 2019 report included a review of aerial photographs, Auckland Council contaminated site search, resource consents and previous environmental reports. Based on the findings, the following HAIL activities were identified within the vicinity of the site: ■ HAIL A10 – *orchards, market gardens and/or glass houses* (market gardening activities at 20 Firth Street (within the Drury Industrial Estate), 190 Flanagan Road) and at properties beyond SH1 (west of the site). ■ HAIL A4 – *Corrosives including formulation or bulk storage* at 20 Firth Steet (within the Drury Industrial Estate). ■ HAIL A17 – *storage tanks or drums for fuel, chemicals or liquid* waste at 38 Firth Street (within the Drury Industrial Estate). ■ HAIL F4/D5 – *motor vehicle workshop/engineering workshop* at 38 Firth Street and 87 Creek Road (within the Drury Industrial Estate). ■ HAIL E1 – *buildings containing asbestos containing material* at 10 Firth Street (within the Drury Industrial Estate). ■ HAIL G5 – *waste disposal to land* (at 10R Karaka Road Drury within the Karaka Reserve) and west, beyond SH1. ■ HAIL D5 – motor vehicle workshop (at 190 Flanagan Road). In addition to the above identified HAIL activities, the following potential sources within the highway designation were also considered as part of the PSI: ■ Areas of bulk filling within the road corridor. ■ Side water channels associated with road run-off. ■ Areas around overhead pylons associated with metallic paints. ■ the Drury Industrial Estate. The HAIL activities and potential contamination sources identified formed the basis of the Detailed Site Investigation (DSI) carried out for P2D, 1B1. Refer to *Figure 510611-0000-DRG-KF-0001, Appendix A* for the HAIL locations identified.
P2D, DSI, 2020	***Detailed Site Investigation, Stage 1 Papakura to Bombay, Report prepared by Aurecon on behalf of Waka Kotahi (Aurecon report reference: 506207-0310-REP-KF-0042),*** referred to herein as the 'P2D DSI, 2020'. Following the recommendations of the P2D PSI, 2019 a comprehensive DSI was completed for the P2D 1B1 project (within road chainage CH 9000 to CH14000) which included some intrusive works along Great South Road offramp (in the vicinity of the current site). A review of the DSI information identified two boreholes advanced to a maximum depth of 48 metres below ground level (m bgl) (borehole reference: AU19 BH124_40.7 m bgl, AU19 BH122_48.1 m bgl) and two hand auger (HA) boreholes within the Great South Road offramp area (AU20 HA144_0.4 m bgl, AU20-HA145_3 mbgl). Refer to *Figure 510611-0000-DRG-KF-0001, Appendix A* for approximate locations. The following key findings were noted: ■ Fill was encountered at HA144 as topsoil (with trace anthropogenic material) to a depth of 0-0.2 m bgl. ■ Laboratory analysis of soil reported did not exceed the national environmental standards for assessing and managing contaminants in soil to protect human health (NES – CS) - Tier 1 human health criteria for the above-mentioned locations. No other exceedances or information was available for the site.

4.2.2 Drury Central Precinct (2020)

Aurecon undertook comprehensive environmental investigations on behalf of Kiwi Properties Limited at 64, 68, 108, and 120 Flanagan Road, 133 Fitzgerald Road and 97 Brookfield Road, Drury (collectively forming Stages 1 and 2 of the Drury Central Precinct development, or DCP). The extent of the DCP is provided in *Figure 510611-0000-DRG-KF-0001, Appendix A*.

The environmental investigation comprised a PSI and DSI. In summary, the DCP development site comprised a series of rural properties comprising residential and ancillary buildings, with a large balance of paddocks used for pastoral grazing. The PSI identified a series of potential HAIL activities, some of which exist within the current site boundary. Of these activities, the majority of contamination identified with HAILs represented localised 'hotspots' of contamination that have since been remediated under Aurecon's supervision. The PSI also noted the area of landfilling located on the southern side of the NIMT. This landfill area was subject to some limited investigations as part of the DSI (see summary below). The landfill area is outside the scope of any remediation works completed to date. A summary of the key findings relevant for the current site are summarised in Table 4-3.

Table 4-3: Summary of Drury Central Precinct Project

Report description	Findings
Drury Central Precinct (DCP) PSI, 2020	***Drury Centre Project- Preliminary Site Investigation. Report prepared by Aurecon for Kiwi Properties Limited, 2020 (report reference: 510611-0000-REP-0001)*** Based on the findings of the PSI, potential contamination source areas or HAIL activities have been identified within the site buffer as follows: ■ Potential filling (HAIL G5) in the north-western corner of 108 Flanagan Road, which may have occurred between 1974 and 1996; and ■ Potential asbestos-containing material (HAIL E1) within the residential dwellings and associated farm sheds built prior to 2000, located across the site. Other areas of concern in the vicinity of the site (within the Kiwi Properties development) include: ■ Potential gully modifications / infilling – located within 68 Flanagan Road and 97 Brookfield Road. ■ Isolated farm sheds – located across the site. ■ Offal / burn pits – three offal pits identified within 120 Flanagan Road and 133 Fitzgerald Road, and an unknown number of burn pits across the site. ■ Sileage pit – located within 133 Fitzgerald Road. ■ Super-phosphate fertiliser application – this may have occurred across the site and have impacted topsoil material; and ■ Electrical pylons. Refer to *Figure 510611-0000-DRG-KF-0002, Appendix A* for HAIL locations identified in the vicinity of the site.
DCP DSI, 2021	***Drury Centre Project- Detailed Site Investigation. Report prepared by Aurecon for Kiwi Properties Limited, 2021 (report reference: 510611-0000-REP-0002)*** As mentioned above, except for the landfill area in the north-western corner of 108 Flanagan Road), all remediation works associated with the above-mentioned HAIL activities and contamination sources have since been completed as part of the Kiwi Properties development and resource consent requirements. With regard to the landfill area (HAIL G5), limited intrusive works was completed as part of the DCP DSI. This included advancement of five test pits (TP) to approximately 3 m bgl. In general, the TP's comprised topsoil underlain by waste-bearing fill (namely metal, steel, potential asbestos, brick and concrete). Heavy metal concentration above human health criteria (for lead and arsenic) including Poly aromatic hydrocarbon (PAH) and asbestos were detected in the soil samples analysed. Groundwater was encountered between 1.5 and 2.0 m bgl within the test pits, with oily sheen and white foam noted during field investigations. The DSI recommended that further investigation is required within this area to assess groundwater quality, leachate mobility and generation of landfill gas should developments encroach the identified landfill.

4.3 Summary of potentially contaminating activities

Based on the desktop review for the site, the following HAIL and potential sources of contamination have been identified with the potential to impact underlying soil and/or groundwater at the site. These include:

- HAIL E1, HAIL F4, HAIL A17, HAIL D5 and HAIL A4 associated with commercial properties within the Drury Industrial Estate, immediately adjacent to the Great South Road offramp.

- HAIL E1 (asbestos associated with dwellings/buildings) which is part to the DCP development.
- Market gardening activities HAIL A10 and HAIL D5 at 190 Flanagan Road, located immediately beyond the Hingaia Stream which borders the site.
- HAIL G5 (waste to land) within the Karaka Reserve and identified landfill at 108 Flanagan Road, should placement of foundation piling intercept these areas.

Whilst the NIMT and the SH1 corridor (including the Great South offramp) are not technically considered HAIL, unsealed areas associated with motorway corridors (for example swales and berms) and railway laydown areas and tracks (including ballast) have the potential to accumulate particulate contaminants such as heavy metals, asbestos and hydrocarbons. As such these areas have been included as part to the risk assessment should foundation pilings intercept these two designations.

4.3.1 Exclusions

HAIL activities identified as (HAIL G2 and G5, HAIL A10 and HAIL F4) beyond SH1 (opposite side of SH1) have been excluded as part of this PSI for the site assessment as they are located at a distance greater than 50 m (at Great South Road offramp) and greater than 100 m for the remainder of the site beyond Hingaia Steam; and the anticipated groundwater flow direction is to the west and thus not expected to impact the site.

Refer to *Figure 510611-0000-DRG-KF-0002, Appendix A* for HAIL locations identified.

5 PRELIMINARY CONCEPTUAL SITE MODEL

A conceptual site model (CSM) as defined by the MfE CLMG No. 5[14] sets out known and potential sources of contamination, potential exposure pathways, and potential receptors. For there to be an effect from the proposed activity, there must be a contamination source and a mechanism (pathway) for contamination to affect human health or the environment (receptor).

5.1 Potential sources of contamination

The potential sources of contamination are the HAIL activities identified in Section *3.3* of this report. Potential contaminants of concern (PCOC) associated with the identified HAIL, in general, include heavy metals, total petroleum hydrocarbons, asbestos containing material. Further details of the specific PCOC relating to the identified HAIL are provided in Table 5-1.

5.2 Pathways

Pathways for contaminant exposure and offsite migration of contaminants generally include the transport of contaminants via air, solid phase, and water. The potential pathways identified from the desktop information are:

- Direct contact (dermal and ingestion);
- Inhalation of contaminated dust.
- Overland transport of contaminated sediment in storm water run-off; and
- Migration of contaminants from offsite sources including from HAIL areas via surface water runoff (creating potential leachate runoff).

5.3 Receptors

Receptors include people and the environment (for example surface water ecosystems) that are or may be adversely affected by the identified contaminants. The potential receptors identified in the assessment include:

- Construction and maintenance workers.
- Adjacent site users/public.
- Ecology within the Hingaia Stream and the two identified wetlands; and
- Groundwater (< 5 m bgl).

Potential transport mechanisms and exposure pathways can be complex, depending on the contaminants of potential concern and receptor(s). Therefore, potential source-pathway-receptor (SPR) linkages are discussed in Table 5-1 below.

[14] MFE, 2021, Contaminated land management guidelines No.5 Site investigation and analysis of soils

Table 5-1: Conceptual site model

Source/HAIL	Contaminant of Concern	Exposure Pathway	Receptor	SPR Considered
HAIL E1, HAIL F4, HAIL A17, HAIL D5 and HAIL A4 associated with commercial/industrial properties within the Drury Industrial Estate, adjacent the offramp development (SH1)	▪ Asbestos ▪ Heavy metals ▪ Total petroleum hydrocarbons ▪ Poly aromatic hydrocarbons	▪ Dermal Contact ▪ Ingestion or inhalation of dust/vapours	▪ On site excavation construction workers ▪ Future site users ▪ General public in the vicinity of earthworks.	***Potentially Complete*** Earthworks proposed for the site adjacent to the Great South Road off ramp site comprises approximately 400 mm cut and fill and construction of a mechanically stabilised earth (MSE) retaining wall. Whilst a road corridor is not technically a HAIL, limited soil investigations was undertaken as part of the P2D 1B1 DSI, 2020 to establish contamination risk for earthworks and inform disposal. A review of the soil analytical data for this area did not identify PCOC above the NES-CS Tier 1 human health criteria. No fill material was also encountered during the recent geotechnical investigation for the site at BH001. As such the risk of contamination to be identified above the Tier 1 human health criteria, associated with the HAIL activities identified within the Drury Industrial Estate is consider low. Although unlikely (based on the above), the potential for contamination to be identified during earthworks as 'unexpected discovery' cannot be discarded. These can be managed through implementation of mitigation controls. Refer to section *5* for further details.
HAIL G5 – landfilling **108 Flanagan Road (DCP) and Karaka Reserve (should foundation piling intercept these areas)**	▪ Asbestos ▪ Heavy metals Poly aromatic hydrocarbons ▪ Methane gas (through potential landfill) ▪ PFAS	▪ Dermal Contact ▪ Ingestion or inhalation of dust/vapours ▪ Landfill gas	▪ On site excavation construction workers ▪ Future site users ▪ General public in the vicinity of earthworks. ▪ Surface water	General exposure during earthworks – ***Complete*** **108 Flanagan Road:** There is potential for contaminants to exist within this part of the earthworks, confirmed landfill at 108 Flanagan Road. Previous investigation completed as part of the DCP investigation identified topsoil underlain by waste-bearing fill (namely metal, steel, potential asbestos, brick and concrete). Heavy metal concentration above human health criteria (for lead and arsenic) including Poly aromatic hydrocarbon (PAH) and asbestos were detected in the soil samples analysed

Source/HAIL	Contaminant of Concern	Exposure Pathway	Receptor	SPR Considered
				Karaka Reserve: Fill material to 1.8 m bgl was also identified at BH003 during the Geotechnical Investigation carried out at Karaka Reserve. There is a potential for exposure during earthwork, if further investigation is not conducted and/or appropriate mitigation controls are not in place. It is critical that preferential pathways for flow of impacted groundwater or leachate to the Hingaia Stream are not created. Refer to Section *5* for further details.
Drury Centre Precinct Development **HAIL E1 (asbestos associated with dwellings/buildings) which is part to the Kiwi Properties development.**	■ Asbestos ■ Heavy metals ■ Polycyclic aromatic hydrocarbons	■ Dermal Contact ■ Ingestion or inhalation of dust/vapours	■ On site excavation construction workers ■ Future site users ■ General public in the vicinity of earthworks. ■ Surface water and ■ Groundwater	***Incomplete*** Foundation piling and bridge structure passes through the Drury Centre Precinct development. As discussed in Table 4-3, remediation and validation associated with HAIL activities and potential sources of contamination has been completed as part of the DCP. As such, contamination risk and exposure associated with the HAIL activities for the site, within the Kiwi Properties development is considered low. Refer to section 5 for potential risk to groundwater and surface water (Hingaia Steam) from the earthworks.
NIMT	■ Asbestos ■ Heavy metals ■ Polycyclic aromatic hydrocarbons ■ Total Petroleum Hydrocarbon	■ Dermal Contact ■ Ingestion or inhalation of dust/vapours	■ On site excavation construction workers ■ Future site users ■ General public in the vicinity of earthworks. ■ Surface water and ■ Groundwater	***Potentially Complete*** Some work have completed within the NIMT as part of the P2P Electrification Project which identified soil exceedance above Auckland background concentrations for heavy metals but below the Tier 1 human health criteria. Should foundation piling intercept the NIMT designation, some provision should be made for heavy metals, asbestos and hydrocarbon contamination to potentially be present.
Market gardening activities HAIL A10 and	■ OCPs ■ Heavy metals	■ Dermal Contact ■ Ingestion or inhalation of dust/vapours	■ On site excavation construction workers ■ Future site users	***Incomplete***

Source/HAIL	Contaminant of Concern	Exposure Pathway	Receptor	SPR Considered
HAIL D5 at 190 Flanagan Road, located immediately beyond the Hingaia Stream which borders the site.			▪ General public in the vicinity of earthworks. ▪ Surface water and ▪ Groundwater	Given the distance and location and the Hingaia Stream breaking the pathway (opposite side of Hingaia Stream along SH1), exposure during earthworks is considered unlikely. Although unlikely (based on the above), the potential for contamination to be identified during earthworks as 'unexpected discovery' cannot be discarded. These can be managed through mitigation controls. Refer to Section ***5*** for further details.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Suitability for development

6.1.1 General

The proposed development comprises the construction of a bridge structure to allow a direct road link from State Highway 1 to the Drury Centre Precinct, currently under construction. It is likely that the bridge structure will be completed utilising piled foundations, which minimise the level of earthworks required to construct the bridge, however some landform modification may be required to construct the approaches to the access ramp, including access routes, laydown areas and contractor yards. We do not anticipate significant risk to future users of the off ramp, due to the limited opportunity for exposure to impacted soils and groundwater. There are a number of potential contamination sources, the likely impacts to development of which are discussed below.

6.1.2 Drury Centre Precinct

For sections of the off-ramp development footprint located within the DCP development boundary, we anticipate minimal risk to human health and the environment. This is on the basis that previously identified contamination sources have since been remediated and validated by Aurecon separately. This is with the exception of landfilling activities (HAIL G5), discussed in more detail in Section *6.1.3* below. There may be some low-level heavy metal impact associated with pastoral land use to site topsoil. This topsoil is likely suitable for use as landscaping fill, or re-use elsewhere within the DCP development, however, may not be suitable for off-site cleanfill disposal without prior confirmatory testing.

6.1.3 Area of potential former landfilling (HAIL G5)

108 Flanagan Road, Drury

The area of former landfill on the southern side of NIMT is evidenced by historical aerials showing fill earthworks from the mid-1970s through to the mid-1990s. Some limited investigation was undertaken within the landfill as part of the DCP DSI work. While the scope of investigation and testing is limited to five test pits, we understand the landfill comprised of topsoil underlain by waste-bearing fill (namely metal, steel, potential asbestos, brick and concrete).

Heavy metal concentrations above human health criteria (for lead and arsenic) including Polycyclic Aromatic hydrocarbon (PAH) and asbestos were detected in the soil samples analysed. Groundwater was encountered between 1.5 and 2.0 m bgl, with oily sheen and white foam noted during field investigations. The foam maybe indicative of PFAS. No information pertaining to the base liner or landfill gas concentration were available from the works completed. As such, the design will need to demonstrate less than minor effects to the environment when constructing within or close proximity to the landfilled area.

Should foundation piling intercept this location, it is not expected that the construction will worsen adverse environmental effects to the receiving environment beyond that which exist already. However, the structure of the landfill should be investigated further, and that any future design shall consider the potential for construction of the off-ramp to compromise its stability or any containment system that may be present. It is critical that preferential pathways for flow of impacted groundwater or leachate to the Hingaia Stream are not created.

Where present, acidic leachate generated by the landfill represents additional risk to the integrity of pile foundations as a consequence of aggressive ground. This should be investigated as part of the design process.

Any surplus soil material generated by construction works in this area is unlikely to meet the MfE definition of cleanfill [15] and soil testing will be required to establish suitability reuse. This could either be done as part of a Detailed Site Investigations (DSI) to target foundation piling areas or potentially managed through construction.

[15]Ministry for the Environment, 2002, *A Guide to the Management of Cleanfills*

Karaka Reserve

One geotechnical borehole (BH003) was completed within this area to support the off-ramp design. Fill material up to 1.8 m bgl was noted during the investigation and comprises inert soil material with no evidence of contaminated materials. Noting this area was filled as part of the Drury Interchange construction, it is less likely that this represents an area of waste landfilling however investigations to confirm this should be considered where required by the design.

6.1.4 NIMT

Some works have been completed within the NIMT as part of the P2P Electrification Project[16] which identified soil exceedances above Auckland background concentrations for heavy metals. No exceedance above adopted environmental and human health criteria were noted for heavy metals, Polycyclic Aromatic Hydrocarbon compounds (PAH, in particular, pyrene and benzo (a) pyrene), Total Petroleum Hydrocarbon (TPH) and Organochlorine pesticides (OCPs) or asbestos containing material (ACM). Should foundation piling intercept the NIMT designation, some provision should be made for heavy metals, asbestos and hydrocarbon contamination to potentially be present.

6.1.5 SH1 Corridor

Based on limited soil sampling data, no PCOC above the Tier 1 human health and ecological criteria or above AUP Permitted Activity Criteria were identified for the HAIL activities associated with the Drury Industrial Estate, adjacent the proposed onramp development. No fill material was also encountered during the recent geotechnical investigation completed (BH001). As such, standard earthworks controls apply for this area (refer to section *5.1.5* below for further details).

6.2 Construction phase risks

6.2.1 Earthworks management

There is potential for piled foundations to intercept areas identified as HAIL G5 (within the Karaka Reserve and 108 Flanagan Road) and pass through the SH1 and NIMT. These activities pose a risk to site construction workers, adjacent users and nearby environmental receptors during earthworks if soil disturbance works are not investigated further and/or managed through the implementation of mitigation controls during earthworks (including for areas proposed for accessways, laydown areas and contractor yards as part of the project) .

A CSMP will be required to support the earthworks, which shall document as a minimum procedures and standards to be followed during the course of earthworks and construction to manage and/or remove the risks posed by the identified HAIL and potential contamination sources. Through implementation of the CSMP, the risk posed to site users (principally earthworks) and public can be substantially reduced to an acceptable standard.

In addition, a tributary of the Hingaia Stream flows through part of this area of the site which will require controls to mitigate risks to the environment. These controls can be addressed through the CSMP in conjunction with an Erosion and Sediment Control Plan (ESCP) for the site.

6.2.2 Hazardous ground gases

Additional hazards associated with landfills include the potential for generation of hazardous ground gases such as methane (CH_4) and carbon dioxide (CO_2). There are potential health risks for workers operating on the site, due to the increased risk of combustion (uncontrolled flames, hot works such as welding) and potential asphyxiation in confined spaces. We recommend that, where piling works are proposed to be undertaken within potential landfill materials that investigations to assess the potential for hazardous ground gas are completed to confirm this potential exposure pathway.

[16] Jacobs, 2021. Papakura to Pukekohe (P2P) Electrification Detailed Site Investigation, KiwiRail reference: P2P-RP-NIMT-XD-NA-06240-0. Dated 4 March 2021. The Jacobs 2021, DSI report was completed as part of the P2P Electrification Project and included shallow soil sampling at 350 m intervals along a 19 km stretch of the rail line.

6.2.3 Dewatering

Whilst final design has not yet been developed, the anticipated groundwater depths based on groundwater data from the geotechnical investigation < 5 m bgl means there is a high possibility of intercepting the groundwater table where significant cut is required for the foundation pile placement. In these situations, dewatering may be required to facilitate piling construction.

Where groundwater is demonstrated to be impacted by landfilling leachate or other activities, it is unlikely that disposal to stormwater networks or direct discharge to the stream will be appropriate without prior treatment or testing to confirm suitability of this approach. Where water is unsuitable for discharge back to the receiving environment, alternative disposal locations will need to be identified (back to ground, wastewater network, or an off-site facility). Any discharge back to ground is likely to require some level of investigation of water quality at the point of discharge and risk assessment.

6.3 Regulatory requirements

The AUP addresses the discharge of contaminants from land containing elevated levels of contaminants. The earthworks will likely exceed the soil disturbance volumes stated within rule E30.6.1.2, so the requirements stipulated in rule E30.6.1.4 (assessment of contaminants against natural background ranges, NES-CS Tier 1 soil acceptance criteria and permitted activity criteria) will need to be met.

This PSI report which includes the findings of the previously completed Detailed Site Investigations (DSI) carried out for the P2D and DCP development can be submitted as part of the resource consent application for the site. It is likely that a CSMP addressing the potential HAIL/contamination sources including earthworks controls and procedures will be required to comply with the AUP E30 (permitted activity criteria). A NES- CS discretionary consent is also likely required if foundation piles are to intercept HAIL G5 and the NIMT, including a Detailed Site Investigation report.

6.4 Recommendations

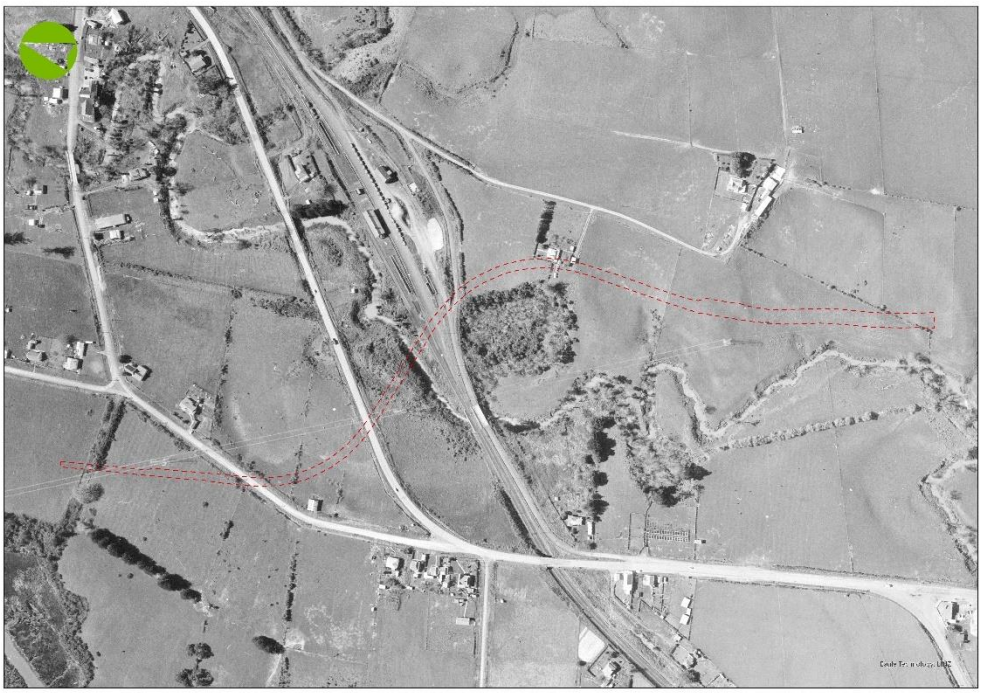
The following recommendations should be considered prior to commencement of earthworks:

- Should foundation piling intercept areas of potential landfill within the Karaka Reserve and 108 Flanagan Road, Detailed Site Investigation is required to assess soil and groundwater quality, leachate mobility and generation of landfill gas and impacts for the site to assist with design and construction.
- Prepare a ‘for construction’ CSMP to for the site to be implemented during the earthworks phase which will outline soil and/or groundwater mitigation controls to be in place during earthworks from the identified sources. A draft CSMP report has already been prepared for submission with the resource consent application for the project.

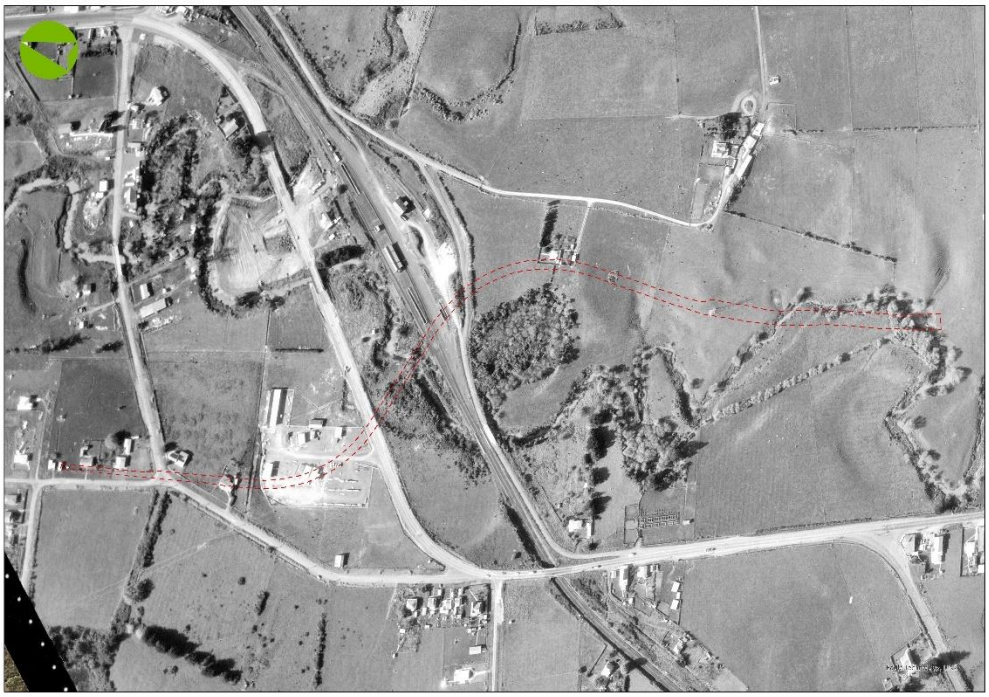
Aurecon reserves the right to review our conclusions and recommendations in the event further information becomes available regarding the history of the site, or the proposed works at the site are subject to change.

APPENDIX A FIGURES

APPENDIX B AERIAL PHOTOGRAPH REVIEW

Year/Source	Photograph
1942 **Retrolens**	
1960 **Retrolens**	

1963
Retrolens

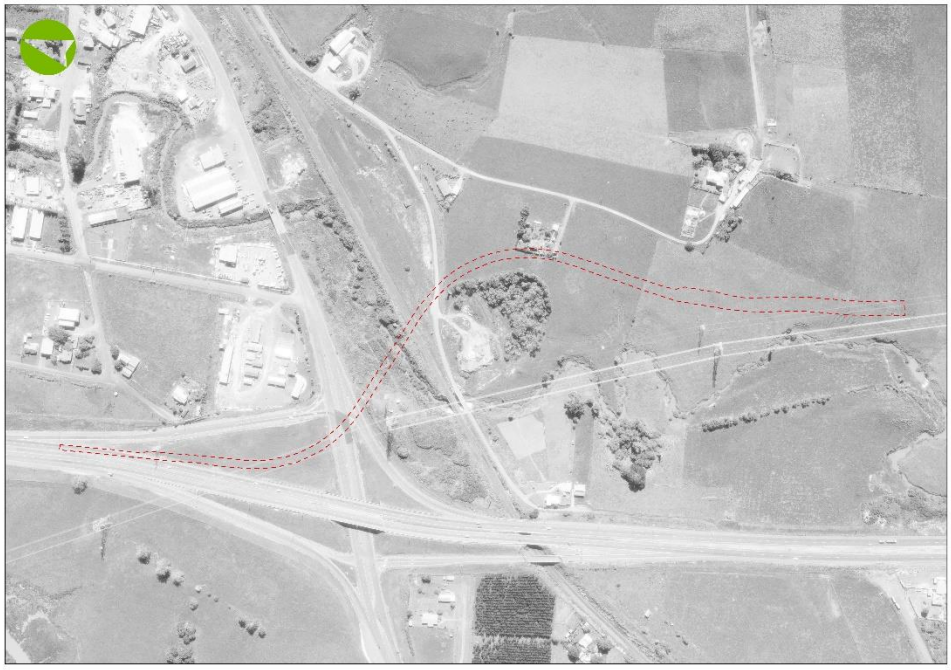


1974

Retrolens

1981

Retrolens



1996

Auckland Council Geomaps

2006

Auckland Council Geomaps

2008

Auckland Council Geomaps

2010-11

Auckland Council Geomaps

2017

Auckland Council Geomaps

Drury Access Ramp Project Office

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ATTACHMENT B - CONTAMINATED LAND SITE MANAGEMENT PLAN

WAKA KOTAHI
NZ TRANSPORT AGENCY

DRURY ACCESS RAMP PROJECT

Attachment B - Contaminated Site Management Plan (CSMP)

Revision No: C

Published Date: 13/07/2023

Author: M.Gamman

Reference: 523844-W0001-REP-EC-0003

New Zealand Government

More information

NZ Transport Agency
June 2021

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This document is available on the NZ Transport Agency's website at **http://www.nzta.govt.nz**

Document Control

Rev No	Date	Description	Author	Reviewer	Verifier	Approver
A	06-04-2023	Draft Contaminated Site Management Plan [FOR CONSENT]	M.Gamman	K.Macorison	R.Griffiths CEnvP:SC	H.McLean
B	17-05-2023	Update following Client review	M.Gamman			
C	13-07-2023	Final report	M.Gamman	K.Macorison	R.Griffiths CEnvP:SC	H.McLean

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Appendices

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Tables

PLAN REVISION PROCESS

Table 1 sets out the revision process for updating this draft contaminated site management plan (CSMP), referred to herein as 'the Plan' for the construction of a proposed southbound motorway access ramp ('the site') as part of the Drury interchange project ('the project').

Table 1: The Plan revision process

The Plan revision process	Discussion	Plan suitability
For resource consent application only	The Plan has been prepared following the findings of a preliminary site investigation (PSI) completed for the site (refer Section *1*). The Plan is to be submitted as part of the resource consent application being sought for the site.	Yes
For tender	By this point the design will have progressed to the point that a construction and a tender can be released to the market. It may be in some instances that long periods of time have progressed since the consent was obtained. This version of the Plan will be require updating to include: ■ The results of any soil investigations, if applicable. ■ Any changes to required controls based on results of soil investigations, if applicable or changes to design or methodology. ■ Relevant consent conditions. ■ Any outstanding risk items or uncharacterised contamination conditions. At this point the principal contractor is still unknown and it may not be confirmed as to whether the contaminated land suitably qualified environmental practitioner 'SQEP' appointed to support consenting/tendering will be retained by the client for construction phase, or that risk will be placed on contractor who will need to engage their own SQEP.	This version of the Plan is not suitable for tender.
For earthworks/construction	The principal contractor is appointed, SQEP is confirmed, design complete and methodology agreed. Typically, this version of the Plan will be finalised, with the following specific information included: ■ Final names and contact information for all roles. ■ Any further soil investigation results, if applicable. ■ Any changes to required controls based on changes to methodology. ■ Dewatering methodology, if applicable. ■ Any outstanding risk items or uncharacterised contamination conditions. This version of the Plan will be sent to Auckland Council (AC) prior to earthworks commencing in accordance with resource consent timeframes for final certification/approval. If the SQEP appointed to manage works through the construction process differs from the SQEP used to procure consent and tender contract, a final Plan will be prepared by the new SQEP unless agreed as part of the tendering process.	This version of the Plan is not suitable for construction.

1 INTRODUCTION

1.1 Project background

Aurecon New Zealand Limited (Aurecon) has been engaged by Waka Kotahi NZ Transport Agency (Waka Kotahi) to prepare a contaminated site management plan (CSMP) for the construction of a proposed southbound motorway access ramp (referred to herein as 'the site') for the Drury Interchange Project (referred to herein as 'the project'). Programme definitions referred to are presented in *Table 2* below.

Table 2: Programme definitions

Programme definitions	Referred to herein as:
Contaminated site management plan	'the Plan'
The proposed construction of the onramp	'the site'
Drury interchange project	'the project'
Earthworks programme for the construction of the onramp	'the works'

1.2 Proposed works and earthworks volume

The proposed access ramp will provide a road link from the SH1 southbound corridor to the Drury Centre Precinct, currently under development. The access road link will be constructed over a bridge structure founded on piles. Earthworks will be required to form fill and pavement subgrades at either end of the bridge. A design has not been completed and earthworks quantities are currently unknown. This section of the Plan shall be updated once final design for the project is completed.

1.3 Plan purpose

The CSMP is required to direct methods associated with soil and water disturbance as a result of the proposed access ramp construction, specifically the Project. This CSMP will primarily be used as supporting documentation in resource consent applications associated with this project to demonstrate at a high level that risks can be managed to avoid adverse effects. A final CSMP revised with the contractor's terms will be required prior to commencement of the works. The final CSMP shall be prepared with far more specific guidance pending results of any further investigations and on confirmation of layout, design and contractor methodology by the SQEP

The key purpose of the Plan is to ensure that all proposed works at the site are adequately managed and that any potential risks associated with land, groundwater and the environment are adequately managed. The Plan focuses on protecting:

- The health of workers.
- The on-site environment.
- The off-site environment (including the health of neighbouring site users, where appropriate).

This Plan informs the earthworks contractor of the requirements for the management of contaminated materials, if encountered. It does not describe all issues required to manage earthworks effectively, and it is intended that this plan be incorporated into a relevant overall works management plan or equivalent by the principal contractor.

The Plan is intended to provide for the management of soil and / or water during the works. The Plan covers the following:

- A summary of proposed works, areas of affected materials and remedial objectives (Section *1*);
- A summary of anticipated site contamination and key management strategies for the works (Section *2*);
- Contact information and a summary of specified roles for the client, consultant and contractors engaged to work on this project (*Section 3*).
- Site and environmental management procedures including protocols for any unexpected contamination discovery (Section *4).*
- Health and safety protection measures (Section *5*).
- Testing requirements for imported fill and waste disposal (Section *6*).
- Works completion reporting requirements for regulatory authorities (Section *7*) and
- On-going monitoring and management should this be required.

This Plan should be used to inform the site risk assessment register and should be updated throughout the project to reflect any changes to site conditions by the principal contractor.

This Plan is restricted to the management of potentially contaminated soil and / or groundwater and should not be used to replace any other site management processes that will need to be in place during the construction phase of the project.

Where the processes defined in this plan are in direct conflict with consent conditions, advice should be sought from both the consent issuing authority and the suitably qualified and experienced practitioner (SQEP).

The Plan is required to provide appropriate soil management controls and procedures for the site. The plan should be read in conjunction with the preliminary site investigation[1] report prepared for the site.

The Plan has been prepared to meet the requirements of the Ministry for the Environment (MfE) national environmental standard for assessing and managing contaminants in soil (NES-CS)[2] with reference to the *Contaminated Land Management Guidelines No. 1 (CLMG No 1)[3].*

1.4 Summary of previous reports

The following contamination report has been prepared to aid this CSMP:

- ***Access ramp PSI, 2023***. Proposed Access Onramp at Drury Interchange. Preliminary Site Investigation (PSI) included as *Attachment A.*

The following previous contamination reports have been assessed to aid with the preparation of this CSMP:

- ***P2D, PSI, 2019.*** Preliminary Site Investigation, Stage 1 Papakura to Bombay, Report prepared by Aurecon on behalf of Waka Kotahi (Aurecon report reference: 506207-0310-REP-KF-0035).
- ***P2D, DSI, 2020.*** Detailed Site Investigation, Stage 1 Papakura to Bombay, Report prepared by Aurecon on behalf of Waka Kotahi (Aurecon report reference: 506207-0310-REP-KF-0042).
- ***DCP, PSI, 2020.*** Drury Centre Precinct- Preliminary Site Investigation. Report prepared by Aurecon for Kiwi Properties Limited (Aurecon report reference: 510611-0000-REP-0001).
- ***DCP, DSI, 2021.*** Drury Centre Precinct **-** Detailed Site Investigation. Report prepared by Aurecon for Kiwi Properties Limited, 2021 (Aurecon report reference: 510611-0000-REP-0002).

[1]Aurecon, 2023, *Contaminated Land, Preliminary Site Investigation*, Revision A (Aurecon report reference: 523844-W00001-REP-EC-0003)

[2]Ministry for the Environment, 2021, *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*

[3]Ministry for the Environment, 2021, *Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand*, ME 1071, Revised Draft

- ***DCP, CSMP/RAP, 2022.*** Drury Centre Precinct – Contaminated Site Management Plan and Remediation Plan (Aurecon report reference:510611-0100-REP-KF-004).
- ***Jacobs, P2P, DSI, 2021.*** Papakura to Pukekohe (P2P) Electrification Detailed Site Investigation, Report prepared by Jacobs Consultants for be KiwiRail Dated 4 March 2021(Jacob report reference: P2P-RP-NIMT-XD-NA-06240-0).

1.5 Explanatory statement

1.5.1 Review scope and use

The Plan has been prepared by Aurecon for Waka Kotahi for the purpose outlined in Section *1.2*. If a party other than Aurecon is tasked with providing the Plan with more complete details, then they must produce their own report. All material included in this report should be accurately referenced if it is referred to or quoted.

1.5.2 Limits on investigation and information

Only a limited amount of information has been collected and the Plan does not purport to completely describe all the site characteristics, properties, and hazards. The nature and continuity of the ground between test locations has been inferred using experience and judgment and it must be appreciated that actual conditions could vary from the assumed conditions. Should further information become available regarding the conditions in the site, including previously unknown likely sources of contamination, Aurecon reserves the right to review the Plan in the context of the additional information.

The Plan makes various assumptions from the data collected, and while providing a framework for managing the contamination hazards, it only presents a summary of identified hazards and mitigation measures relevant to the expected site conditions. Aurecon accepts no responsibility for any deviations from the Plan which may result in harm to the site workers, damage to the environment or breaches of consent.

The Plan is also based on information available to Aurecon. Aurecon takes no responsibility and disclaims all liability whatsoever for any loss or damage that Waka Kotahi or any other party may suffer resulting from any conclusions based on information provided to Aurecon, except to the extent that Aurecon expressly indicates in the Plan that it has verified the information to its satisfaction.

2 SITE MANAGEMENT PHILOSOPHY

2.1 General

This plan has been prepared based on the findings from the Preliminary Site Investigation report prepared for the site and referenced in Section *1.4* above. The PSI included a review of environmental investigations and/or remediation completed as part of the Papakura to Drury South (P2DS) project and Kiwi Properties' Drury Central Precinct development, the boundaries for which overlap the access ramp footprint. Based on the findings from these investigations, Section *2.1* presents the key risk areas for the site and management of soils within these areas. Refer to *Figure 1* below for site management areas described in *Table 3* below. A figure of all HAIL and potential sources of contamination identified as part of the PSI is also included with this CSMP for reference (refer *Appendix A*).

Figure 1: Map showing key management areas

2.2 Summary of Potential Contamination Hazards

2.2.1 Karaka Reserve

An area of historic filling is located within the Karaka Reserve, between the NIMT corridor and SH22 (Great South Road). The type and quality of fill material is unknown. One geotechnical borehole (BH003) was completed within this area to support the off-ramp design. Fill material up to 1.8 metres below ground level (m bgl) was noted during the investigation and comprises inert soil material with no evidence of contaminated materials.

2.2.2 Landfill at 108 Flanagan Road (DCP)

A former landfill has been identified on the southern side of NIMT (with filling between mid-1970's to mid-1990's. Some limited soil investigation was undertaken within the landfill as part of the Drury Central Precinct work. Previous investigation for DCP noted that the landfill comprised of topsoil underlain by waste-bearing fill (namely metal, steel,

potential asbestos, brick, and concrete). Heavy metal concentrations above human health criteria (for lead and arsenic) including Polycyclic Aromatic hydrocarbon (PAH) and asbestos were detected in the soil samples analysed. Groundwater was encountered between 1.5 and 2.0 m bgl, with oily sheen and white foam noted during field investigations.

2.2.3 North Island Main Trunk

Some works have been completed within the NIMT as part of the P2P Electrification Project which identified soil exceedances above Auckland background concentrations for heavy metals. No exceedance above adopted environmental and human health criteria were noted for heavy metals, Polycyclic Aromatic Hydrocarbon compounds (PAH, in particular, pyrene and benzo (a) pyrene), Total Petroleum Hydrocarbon (TPH) and Organochlorine pesticides (OCPs) or asbestos containing material (ACM) was identified.

2.2.4 Other site areas / contamination sources

- ***Drury Central Precinct*** (onramp development footprint located within the DCP development boundary), excluding identified landfill (as described in Section 2.2.2 above):

  Although these areas present minimal risk to human health given previously identified contamination sources have since been remediated and validated by Aurecon separately. There may be some low-level heavy metal impact associated with pastoral land use to site topsoil.

- ***SH1 corridor***

  Limited soil investigations completed for contamination sources associated with Drury Industrial Estate area (and immediately adjacent the onramp development) did not identify contaminants of concern above the adopted human health and environmental criteria. No fill material was also encountered during the recent geotechnical investigation completed for the onramp development.

Although unlikely (based on the above), the potential for contamination to be identified during earthworks as ‘unexpected discovery’ cannot be discarded.

2.3 Management strategies

A summary of proposed management options to mitigate adverse effects associated with identified hazards is presented in *Table 3*.

Table 3: Site management and key management strategies

Location on site (figure reference)	Item/ area description	Site contamination hazard	Summary of management options[1,2,3]	Plan reference
Karaka Reserve 108 Flanagan Road, Drury	Areas of known former landfilling	**108 Flanagan Road, Drury** A former landfill has been identified on the southern side of NIMT (with filling between mid-1970's to mid-1990's. Some limited soil investigation was undertaken within the landfill as part of the Drury Central Precinct work. While the scope of investigation and testing is limited to five test pits, the landfill comprised of topsoil underlain by waste-bearing fill (namely metal, steel, potential asbestos, brick and concrete). Heavy metal concentrations above human health criteria (for lead and arsenic) including Polycyclic Aromatic hydrocarbon (PAH) and asbestos were detected in the soil samples analysed. Groundwater was encountered between 1.5 and 2.0 m bgl, with oily sheen and white foam noted during field investigations. The foam maybe indicative of PFAS. **Karaka Reserve** An area of historic filling is located within the Karaka Reserve, between the NIMT corridor and SH22 (Great South Road). The type and quality of fill material is unknown. One borehole (BH003) completed within the reserve confirms fill to a depth of 1.8 m bgl, and relatively inert soils however no formal contamination investigation has been completed.	General controls for temporary earthworks are provided within this CSMP. No works should commence within these areas without prior investigations to confirm contamination status, the findings of which shall be presented in an updated CSMP. Any temporary or permanent earthworks design shall not compromise stability of the landfill body, or any identified containment structures. Any stormwater generated should also be directed away from this area to avoid the possibility of generating leachate. Any design of earthworks and structures within the landfill should be capped and stabilised for expected long term land use. All designs should adhere to any separate landfill management or closure plans held by the asset owner. Any surplus soil material generated by construction works in this area is unlikely to meet the MfE definition of cleanfill [4] and soil testing will be required to establish suitability reuse.	Section *6*
NIMT Rail designation area.	Railway Corridor	Some works have been completed within the NIMT as part of the P2P Electrification Project which identified soil exceedances above Auckland background concentrations for heavy metals. No exceedance above adopted environmental and human health criteria were noted for heavy metals, Polycyclic Aromatic Hydrocarbon compounds (PAH, in particular, pyrene and benzo (a) pyrene), Total Petroleum Hydrocarbon (TPH) and Organochlorine pesticides (OCPs) or	General controls for temporary earthworks are provided within this CSMP. No works should commence within the NIMT designation prior to confirming NIMT designation requirements and if applicable obtaining necessary resource consents for soil disturbance works.	Section *6*

[4]Ministry for the Environment, 2002, *A Guide to the Management of Cleanfills*

Location on site (figure reference)	Item/ area description	Site contamination hazard	Summary of management options[1,2,3]	Plan reference
		asbestos containing material (ACM). Should foundation piling intercept the NIMT designation, some provision should be made for heavy metals, asbestos and hydrocarbon contamination to potentially be present.	Any surplus soil (including ballast) material disturbed and/or generated by construction works in this area is unlikely to meet the MfE definition of cleanfill [5] and soil testing will be required to establish suitability and reuse.	
Site wide	All areas excluding the above two identified areas.	There may be potential for unexpected contamination to be encountered, requiring additional controls beyond that described in the Plan.	Standard site management controls apply for the entire site. Contractors are to familiarise themselves with this Plan and they are to implement the 'unexpected discovery protocols' detailed in Section *4.1* during accidental discoveries.	Section *4.1*

Notes:

1. Management options not presented in order or preference and shall be considered in the context of the works, preferred construction methodology for the site.
2. Management options shall be reviewed in the context of any changes to understanding of site conditions (i.e. new test data, change in ground conditions etc).
3. Management options to be considered may require adjustment/updating to reflect any consent conditions, once granted.

[5]Ministry for the Environment, 2002, *A Guide to the Management of Cleanfills*

3 ROLES AND CONTACT INFORMATION

All employees engaged in field activities and under the direct control of the principal contractor shall comply with the requirements of this Plan.

Roles assigned to key project personnel are identified in *Table 4.*

Table 4: Project roles and responsibilities

Tasks	Organisation	Name	Email	Phone
Distribution of this plan to the lead contractor & ensuring compliance with the Plan	Waka Kotahi	TBD	TBD	TBD
Updating the Plan Providing guidance for unexpected discoveries Contaminated land technical reporting	Environmental consultant (SQEP)	TBD	TBD	TBD
Implementation of the Plan	Principal contractor	TBD	TBD	TBD
	Site manager	TBD	TBD	TBD
	Earthworks contractor	TBD	TBD	TBD
Review of the Plan Production of site-specific erosion and sediment control plan Preparation of asbestos control plan	Principal contractor	TBD	TBD	TBD
Emergency response contact information				
Auckland Council – compliance officer			-	09 354 8700
Auckland Council pollution response hotline			-	09 377 3107
WorkSafe NZ			info@worksafe.govt.nz	0800 030 040
National Poisons Centre			https://poisons.co.nz/	0800 764 766

4 SITE MANAGEMENT PROCEDURES

4.1 Site administration

This section provides guidance on the site-specific measures required to control the site and to protect the environment during activities on the site that disturb potentially contaminated soils and/or groundwater. The procedures should be referenced and / or included in a site-specific over-arching environmental management plan.

Table 5 presents the general site management requirements for the works.

Table 5: General site management

Item	Requirement
Consents and plans	Prior to commencing works, the following should be conducted: ■ Confirm that all necessary consents have been obtained; ■ Establish exclusion zones around the site as required and ■ Ensure the approved and certified Plan is utilised for the works.
Site record keeping and monitoring requirements	Records which should be kept on site during the works include: ■ Site conditions; ■ Condition and replacement of erosion and sediment control measures; ■ Any further requirements for analysis of soil samples for disposal acceptance purposes (refer Section *6*); ■ Environmental discussions, incidents, and non-compliance issues; ■ Third party complaints lodged regarding the works, as well as all corrective measures implemented to limit such complaints from reoccurring; ■ Waste disposal records/tipping dockets; ■ Information of the source / site / sample results from any imported clean material for the works and ■ Any other relevant information to aid the works completion report and compliance requirements (refer Section *7*).
Induction and awareness	The contractor shall ensure the following: ■ A**ll** site workers are inducted onto the approved Plan; ■ All staff are aware of soil tracking requirements, including retaining disposal records/tipping dockets for inclusion into a works completion report/site validation report; ■ A site plan, identifying where exactly the temporary stockpile is to be stored is clearly identified and ■ All details are recorded of unexpected contamination and hazardous materials discovery on an incident form.
Site Control, access, and egress	The contractor shall ensure the following: ■ Define the site ingress and egress arrangements, haulage routes within the site, the location of any uncontaminated areas and location of site support/rest/decontamination facilities; ■ Access to the site shall be restricted using security fencing, with access to contaminated areas within the site further restricted to authorised personnel; ■ Personnel shall be authorised following completion of appropriate site induction procedures and following donning of required personal protective equipment (PPE) and ■ The contractor shall establish exclusion zones around excavation areas, clearly delineating, isolating, and securing these areas as required. The location of these

	areas will be established by the contractor and visibly displayed within the work area.
Areas of former landfilling	Where proposed to be disturbed, areas of former landfilling shall be investigated to confirm contamination status and to clarify risks requiring management and or remediation. The Investigation shall be scoped and undertaken by a SQEP in accordance with CLMG Vol. 5. A DSI report shall be prepared to document the findings of the investigation. These findings shall be utilised to update recommended controls for soil disturbance and dewatering within these areas of the site.

4.2 Unexpected discoveries

The unexpected discovery protocols detailed in *Table 6* are to be implemented in the event unexpected contamination is discovered during the works. The procedures outlined below provide the principal contractor with protocols to address unforeseen contamination and take appropriate action to avoid the dispersion of potential contaminants into the surrounding environment.

Table 6: Unexpected contamination discovery

Item	Requirement
Contamination indicators	Contamination discoveries may include the following: ■ Presence of discoloured surface water (including sheens or slicks). ■ Unusual odours. ■ Gas bubbles in pooled surface water. ■ Oily substances. ■ Intact or broken drums/containers or ■ Fibrous materials such as fibre cement which may contain asbestos. These discoveries differ significantly from the expected ground conditions such that additional management, is required.
Process	During the works, the principal contractor shall actively monitor ground conditions for the conditions / materials specified above. If newly discovered contaminated material is encountered, the works must immediately stop in the area. The material must remain in situ until the SQEP has had the opportunity to assess and test the material, and to provide advice on how to proceed. The SQEP shall: ■ Notify the regulatory authority/authorities, if required. ■ Characterise the contaminated material and if deemed necessary, collect samples for laboratory analysis to establish contaminant concentrations. ■ Prepare / update a RAP, if required. ■ If appropriate, advise the contractor to excavate the suspected contaminated material into a covered and contained receptacle to allow works to continue with minimum delay. ■ When the material or water characteristics have been established by the SQEP, they will advise the site supervisor as to whether the: – Controls within this Plan are suitable for the management of the materials identified; or – The additional controls required to suitably manage the material for the protection of human health and the environment.

4.3 Environmental management procedures

Table 7 provides the environmental controls required to minimise any adverse effects on the environment.

Table 7: Environmental management

Item	Requirement
Excavation, transportation, and disposal of potentially contaminated soils	The following shall be adhered to during the excavation and transportation of excavated soils across the site: ■ Sediment and erosion controls shall be in place prior to the commencement of earthworks. ■ Trucks shall be loaded within the confines of the environmental controls, where runoff and potential spills during loading are able to be controlled and contained. ■ All materials removed from site will be transported to a suitably licensed facility for disposal. ■ All trucks will be securely covered with close fitting tarpaulins and ■ All materials leaving the site will be tracked by way of weighbridge dockets which include the disposal location and the weight of the load. The primary mechanisms for sediment spreading on the site is spillage during excavation and tracking by machinery. Any soils tracked beyond the site boundary should be swept up promptly and appropriately disposed of.
Erosion and sediment control	During earthworks, rainwater has the potential to contact exposed soil and transport sediment and contamination off-site. Erosion and sediment controls shall be put in place to ensure that the generation of potentially contaminated sediment and stormwater is minimised and appropriately managed. Protection of nearby surface water bodies and receiving ecosystems is a primary consideration of all works on-site All earthworks will be completed in accordance with guidelines in: ■ Auckland Council's 'erosion and sediment control guide for land disturbing activities in the Auckland Region (GD05)'. Priority is to be given to protection of any adjacent watercourses and storm water drains. A site-specific erosion and sediment control plan will be prepared by the principal contractor and provided to the client and to the Auckland Council. This will detail the location(s) and nature of the erosion and sediment control device(s), having regard to the anticipated extent and quantity of earthworks, along with the site layout. The site-specific plan is to be available on site at all times during the earthworks and is to be reviewed and amended if required upon the commencement of, and during, the works. Earthworks areas are to be stabilised as soon as is practical to minimise erosion potential on site. *For areas of former landfilling contamination specific and independent sediment and erosion control measures will be required (as guided by the DSI). These may include covering areas of exposed soils with sheeting and tarpaulins, having areas that require additional bunding, and suspending or limiting works during periods of wet weather. If significant waste is identified the construction of a physical impermeable barrier such as a sheet pile wall may be necessary to allow for the protection of the Hingaia Stream during construction works.*
Stockpiling	■ Stockpiling of contaminated / odorous soil should be avoided where possible during the course of works. ■ The following management options are considered appropriate for the mitigation of potential hazards arising from the creation of potentially contaminated stockpiles at the site: – Soil stockpiles will be kept clean and tidy, no more than 4 m in height and with a compacted stable slope. – Stockpiles will not be placed within 20 m of a waterways (including dry stream channels/ephemeral waterways and overland flow paths, if known) and vehicular movement over stockpiled soil will not be allowed. – Bunds or sediment fences will be constructed or installed around the edges of the stockpile management area to prevent storm water run-off from carrying contaminated or potentially contaminated soil away from the stockpile management area.

Item	Requirement
	– At the end of each day, or prior to forecast rainfall, stockpiles shall be covered to prevent discharges form the stockpiles. ■ Imported fill required for backfilling excavations may be temporarily stockpiled in a designated, clean area on site. All imported fill is required to be free of contaminants.
Odour and dust management controls	Excavation, stockpiling, movement of plant and transport of soils may generate dust and/or release odours. Dust must be managed during the works in accordance with the good practice guide for dust emissions. The generation of dust and odour will be minimised during the works by the following: ■ Suspending stockpiling and transport of soils during periods of high wind. ■ Limiting speed of travel on site. ■ Limiting transport routes across site to designated haulage routes. ■ Using a water spray to dampen exposed and stockpiled soils and ■ Ensuring trucks transporting material from the Site are covered and that vehicles are adequately cleaned of dirt before leaving site. Additional dust suppression measures may be required when asbestos is present (refer *Table 8*) *For areas of former landfilling must have contaminant specific and independent dust and odour control measures will be required (as guided by the DSI). These may include:* ■ *Suspending or limiting excavation, stockpiling and transport of soils during periods of high wind.* ■ *Using water on exposed soils to suppress dust / odour, while ensuring that any water run-off is minimised as far as possible and appropriately controlled. Water is not to be used on soils contaminated with non-soluble compounds such as hydrocarbon fuels.* ■ *Covering areas of exposed soil with sheeting / tarpaulins.* ■ *Ensuring trucks transporting material from the site are covered and that vehicles are adequately cleaned.* ■ *Daily quantitative monitoring of dust generation.*
Groundwater / surface water management and dewatering	There is a possibility of intercepting the groundwater table where significant cut is required for the foundation pile placement. In these situations, dewatering may be required to facilitate piling construction. Should volumes exceed the capacity to soak naturally, and off-site disposal is required, the following options are available: ■ Testing for chemical and physical contaminants (e.g. turbidity, temperature) to determine if it is acceptable for discharge to the council's stormwater reticulation network in compliance with any associated council plan requirements, and / or whether a consent may be required or ■ Testing for chemical and physical contaminants (e.g. turbidity, temperature) to determine if the water may be discharged to trade waste with appropriate permits / asset holder approval. A dewatering plan shall be prepared required prior to excavation earthworks commencing and if foundation pilings intercept HAIL G5 or are in close proximity to HAIL G5 where the SQEP considers that there may be risk of drawing on contaminated groundwater. Records of this disposal shall be kept and maintained on site.
Landfill Gas*	Areas of former landfilling have potential for generation of hazardous ground gases such as methane (CH_4) and carbon dioxide (CO_2). There are potential health risks for workers operating on the site, due to the increased risk of combustion (uncontrolled flames, hot works such as welding) and potential asphyxiation in confined spaces.

Item	Requirement
	Gas monitoring and protection measures may need to be implemented during construction works where trenching is being undertaken or enclosed spaces are created and accessed. This may include personal or site gas monitors. Should significant gas risk be identified, for example putrescible wastes then no ignition sources will be permitted within the works area. If piling works are proposed to be undertaken within potential landfill materials further testing is required and landfill gas management included as part of this CSMP (refer Section *6*).
Imported material	Any soil materials imported to site for the purpose of reinstating the ground, should be suitable and comply with the MfE definition of 'cleanfill'[6].

(*) Applicable only areas of former landfills.

4.4 Asbestos in soil

Asbestos has not been identified within the landfill at 108 Flanagan Road during previous investigations, -however the potential for the unexpected discovery of asbestos during works cannot be precluded. Should asbestos be identified asbestos management recommendations are provided in *Appendix B*.

[6]Ministry for the Environment, 2002, *MfE document 'A Guide to the Management of Cleanfills*

5 HEALTH AND SAFETY

All works shall be undertaken in accordance with the contractor's health and safety plan, which should include reference to the requirements in this plan. Inductions should discuss actions that need to be taken for handling and managing potentially contaminated soil as described in this plan.

Table 8 sets out the health and safety measures required for the works.

Table 8: Health and safety

Item	Requirement
Health and safety plan	In accordance with the provisions of the health and safety at work Act[7] , it is the responsibility of the Principal Contractor to communicate to their workers undertaking work on the site the nature and extent of the contamination and associated hazards and recommended management practices. This Plan is intended to support this process and does not relieve the principal contractor of their responsibility for the health and safety of workers. All works are to be undertaken in accordance with the contractor's health and safety plan for the works.
Site control information required	The health and safety plan will define the site ingress and egress arrangements, haulage routes for the Works, and location of site support / rest / decontamination facilities. This should include consideration of where the landfill areas are located and haulage routes, yards, laydown areas should not be established in these areas.
Identification of hazards and management	The following contaminated land related hazards may be encountered during the works if contaminated soil is encountered: ■ Dermal skin contact with contaminated soil or groundwater. ■ Inhalation of contaminated dust and / or, ■ Ingestion of contaminated soil or groundwater. The primary hazard management method is minimising exposure to contaminated soil during excavations and transportation. Further unspecified hazards may be identified during the course of the works. The hazards identified above will be managed through the wearing of appropriate personal protective equipment (PPE) and the procedures set out below. Maintenance of earthworks controls is a key component of contaminated soil hazard management.
Personal Protective Equipment	During site induction, potential hazards associated with exposure to contaminants and the following PPE will be made available for use by site workers, as required: ■ Chemical-resistant gloves. ■ Safety boots and ■ Full length clothing. Should unexpected contamination or asbestos be present additional PPE or Respiratory Protective Equipment (RPE) requirements may be required as directed by a SQEP and may include: ■ Eye protection. ■ Type 5/6 Coveralls. ■ P2 Dust mask. ■ Half Face P3 Respirator; and ■ Flame Retardant Overalls.

[7]Health and Safety at Work Act, 2015, *Public Act No.70. Version as at 28 October 2021*

Item	Requirement
Hazard minimisation procedures & hygiene controls	The following procedures to minimise hazards related to contaminated soils will be implemented by the contractor: ■ Dust controls, according to the procedures set out in *Table 7;* ■ Minimise contact with potentially contaminated material through excavations using machinery. However, as a precautionary measure, any worker that is required to manually handle any contaminated soil will be required to wear appropriate PPE as outlined above and ■ Maintaining good personnel hygiene, including: – No eating, drinking, or smoking / vaping in the works area, whilst potentially contaminated soils are being excavated to prevent contaminated soil contacting food or being ingested directly through soiled hands. – Avoiding hand to mouth and hand to face contact during work with potentially contaminated soils. – Washing boots if contaminated soil has been contacted. – Disposing of gloves that have contacted contaminated material; and – Hands and face will be washed before eating, drinking, and smoking, which is only permitted where site personnel are off-site or in designated areas.

6 TESTING AND DISPOSAL REQUIREMENTS

Table 9 sets out any testing requirements for the site.

Table 9: Soil and water testing requirements

Item	Test Required (Y/N)	Requirements (*)
Soil testing	N*	Soil testing (as part of a DSI) only required if foundation pilings intercept former landfills or NIMT area (refer section *6.1* below).
Landfill Gas/Leachate Testing	N*	As above, required as part of the DSI if foundation piling intercept HAIL G5.
Water testing	N*	No water testing required unless dewatering is required and foundation pilings intercept HAIL G5.
Soil disposal testing	N*	Refer to *Table 10.*
Imported material	N* (depending on source of imported material)	Any materials imported to site for the purpose of reinstating the ground, should be suitable to comply with the definition of 'cleanfill'[8]. For any imported material, the following applies: ■ Imported material directly from quarries (virgin excavated natural material) does not require testing. ■ Any imported material acquired from an alternative source should be assessed by a SQEP to determine its appropriateness for use on the site and to identify any potential discharge consent requirements. ■ Where no analytical data exists, the SQEP is likely to require sampling and testing at a minimum rate of one sample for every 500 m^3 with not less than three samples tested per source, testing shall as a minimum include: – Heavy metals; and – Asbestos presence / absence. Testing on materials with a major component (i.e. 50% or more by mass) with a particle size greater than 2 mm may differ from that prescribed above, and will be determined by the SQEP. Analysis of samples shall be undertaken at an International Accreditation New Zealand (IANZ) accredited laboratory.

6.1 Project specific reuse/disposal options

A summary of soil re-use and disposal requirements is presented in *Table 10.*

Table 10: Summary of proposed testing requirements for off-site disposal or reuse

Material type identified	Site-wide and Unexpected discoveries	HAIL G5 (if relevant and subject to final foundation placement)
Material Description	Material surplus to requirements from foundation pile works.	Unknown

[8] Waste Management Institute New Zealand (WasteMINZ), 2022. Technical Guidelines for Disposal to Land

Material type identified	Site-wide and Unexpected discoveries	HAIL G5 (if relevant and subject to final foundation placement)
Depth (m bgl)	Varies	Unknown
Re-use suitability	■ If unexpected discovery is identified, re use suitability to be confirmed following soil testing by a SQEP. ■ All other soil suitable for reuse, subject to engineering suitability.	TBC
Current disposal suitability	TBC	TBC
Action needed	Further testing and / or seek SQEP advice.	Findings of DSI required to confirm disposal pending final foundation pile placement.

7 WORKS COMPLETION REPORT

On completion of the work, a works completion report (WCR) may be required. The WCR shall be completed by a SQEP in general accordance with the requirements of CLMG No.1[9].

A copy of the WCR, if completed, will be provided to the relevant authorities to comply with any associated resource consent conditions.

Table 11 sets out the minimum requirements.

Table 11: Works completion reporting

Item	Requirement
Works completion report	As a minimum the following is required: ■ Confirmation that all works were undertaken in accordance with the CSMP and any applicable consent conditions. ■ Details of any unexpected contamination discovered at the site, a summary of actions undertaken to manage it, and a plan showing the location of the material. ■ Any testing undertaken during the Works for disposal purposes. ■ Proof of disposal of any material to a facility authorised to receive the material by way of waste manifests and / or weigh bridge receipts. ■ Details of any changes or management of the identified HAIL features on site; and ■ The timing of the works.

[9] Ministry for the Environment, 2021, *Contaminated Land Management Guidelines No. 1*: Reporting on Contaminated Sites in New Zealand, ME 1071, Revised Draft

APPENDIX A - FIGURES

APPENDIX B - ASBESTOS MANAGEMENT

Control requirements

Where asbestos is identified in soil as 'unexpected contamination' during the early works programme, works will need to be completed in accordance with *WorkSafe Approved Code of Practice for Management and Removal of Asbestos*[10], *Health and Safety at Work (Asbestos) Regulations 2016*[11], and *New Zealand Guidelines for Assessing and Managing Asbestos in Soil*[12].

Table B-1 is extracted from the BRANZ guidance and indicates the mitigation and control requirements for working with asbestos, which may need to be implemented in addition to those required by the Site Manager's health and safety plans and protocols. A Licensed Asbestos Removalist may be required to manage the soil disturbance work and produce an Asbestos Removal Control Plan (ARCP).

Table B-1 Primary mitigation control requirements for work involving asbestos[13]

Scenario	PPE	Respiratory protective equipment (RPE)	Dust/asbestos fibre suppression	Decontamination Facilities
Class A: Friable **> 1% w/w FA and/or FA in soil.**	Disposable coveralls rated type 5, category 3, nitrile gloves, steel toe capped gumboots or safety footwear with disposable overshoes.	Full-face P3 respirator with particulate filter. Consider increasing to power-assisted if required.	Water and asbestos-encapsulating polymer emulsion product applied before starting work and during as required. Consider adding a surfactant to water for amphibole fibres (brown and blue).	Basic disposable wet decontamination tent or trailer. Consider powered and plumbed decontamination unit if project scale warrants.
Class B: Non-friable **> 0.01% w/w FA and/or FA in soil.**		Half-face P3 respirator with particulate filter. Consider increasing to full-face if friable ACM present.		Basic disposable decontamination tent and foot wash.
Asbestos related work **> 0.001% w/w FA and/or FA in soil.** **> 0.01% w/w ACM**		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 contaminated area awaiting remediation.	
Unlicensed asbestos work **≤ 0.001% w/w FA and/or FA in soil** **≤ 0.01% w/w ACM**	No asbestos-specific PPE if air monitoring confirms asbestos below 0.01 f/ml.	No asbestos specific RPE if SQEP confirms unlikely to exceed trace levels in air monitoring (0.01 f/ml) and/or if air monitoring confirms asbestos below 0.01 f/ml.		Foot wash and used PPE collection area.

[10]WorkSafe, November 2019, *Workplace Exposure Standards and Biological Exposure Indices*, 11th Edition
[11]Ministry of Business, Innovation and Employment, 12 April 2019, *Health and Safety at Work (Asbestos) Regulations 2016*
[12]BRANZ, 2017, *New Zealand Guidelines for Assessing and Managing Asbestos in Soil*
[13]BRANZ, 2017, *New Zealand Guidelines for Assessing and Managing Asbestos in Soil*

Establishment of asbestos work area

In addition to the general site requirements set out in this CSMP (refer to *Section 4*) if any ACM is encountered during site works the following shall be established:

- Establishment of an ‘asbestos work area’ as determined by the Licensed Asbestos Removalist by fencing and appropriate signage, including dust barriers where necessary. The controls should be sufficient to prevent accidental access to this area.
- Establishment of an access way to and from the ‘asbestos work area.
- Establishment of a truck loading area and machinery decontamination area adjacent to the ‘asbestos work area’, to minimise the spread of asbestos contamination via machinery.
- Health and safety inductions are to be completed prior to allowing workers to operate within the ‘asbestos work area’, including works required as part of the site establishment.
- Notification to WorkSafe (if required) of the intent to commence works.
- Any spoil removed from an asbestos work area that is to be stockpiled rather than directly removed from the site must be kept separate from other stockpiles in a signed and security fenced area. When not being added to or removed, these stockpiles must be covered to prevent fibre release; and
- Additional dust suppression measures are required when asbestos is present in soil. These will be as described in the Asbestos Removal Control Plan.

Air monitoring

Air monitoring requirements for asbestos shall be determined by the Independent Licensed Asbestos Assessor, to provide assurance that the trace level and airborne contamination standard for asbestos in the *Health and Safety at Work (Asbestos) Regulations 2016* are not exceeded.

The air monitoring must be carried out:

- Immediately before the licensed asbestos removal work commences, if the assessor determines that it is likely that the air contains respirable asbestos fibres in a concentration greater than trace level; and
- While the licensed asbestos removal work is carried out.

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