

# Northern Corridor Improvements

## Assessment of Land Contamination Effects

Project No: 250310

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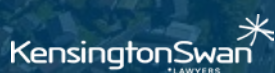
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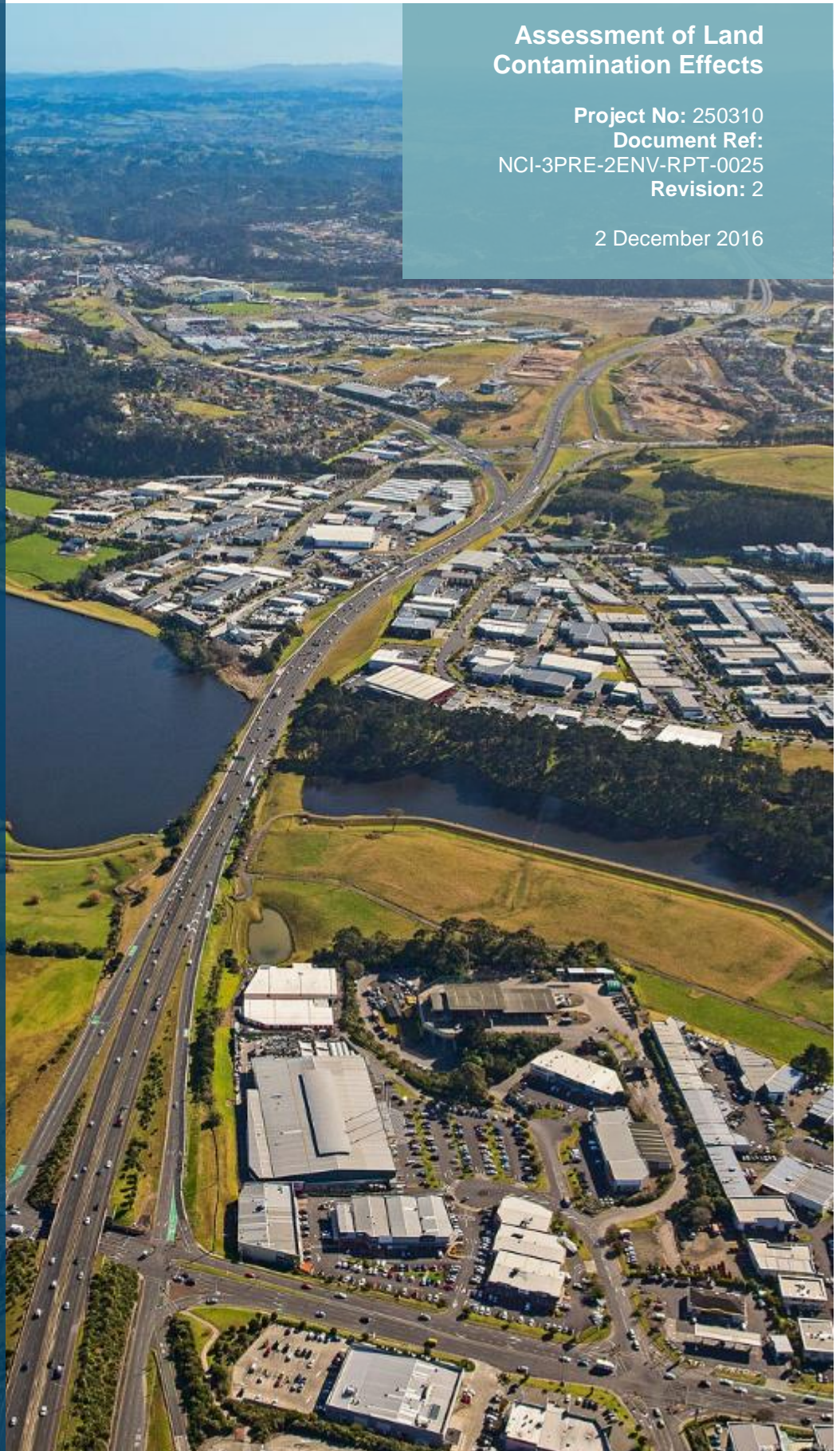
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# Executive summary

The New Zealand Transport Agency (NZ Transport Agency) has engaged Aurecon New Zealand Ltd (Aurecon) to complete an assessment of land contamination effects to support the Notices of Requirement and resource consent applications for the proposed improvement works known as Northern Corridor Improvements (the Project). The Project area covers the section of State Highway 18 (SH18) between Albany Highway and the Upper Harbour Highway (UHH) Interchange, as well as State Highway 1 (SH1) between Oteha Valley Road and the UHH Interchange.

This document has been prepared based on the findings of Aurecon's Preliminary Site Investigation (PSI) for the Project (Ref. Northern Corridor Improvements Preliminary Site Investigation attached at **Appendix A**) undertaken on the proposed alignment, with the exception of the Rosedale Landfill for which a separate report has been prepared (**Volume 3 – Technical Assessment 7**).

During construction of the Project, significant land disturbance/earthworks will be undertaken. The purpose of this technical assessment is to identify and document areas of potential environmental concern identified in the PSI which may present a risk to environment and/or public health, both during and post construction. This information is required to support resource consent applications by the NZ Transport Agency.

The PSI identified potential for risk associated with the contaminating activities across the route including a single landfill which is assessed and reported separately. As a Detailed Site Investigation (DSI) is currently underway and is not likely to be completed before the submission of this report, a Contaminated Site Management Plan (CSMP) has been completed for the Project and outlines mitigation and management measures to be implemented during its construction phase (see **Appendix B**). Potential soil contamination has been identified within and adjacent to the Project area. This includes:

- Asbestos within uncontrolled fill;
- Heavy metals from industrial land use, uncontrolled fill and high traffic volumes;
- Semivolatile organic compounds including PAHs and organochlorine pesticides from agricultural and industrial land uses; and
- Hydrocarbons such as Total Petroleum Hydrocarbons (TPH), Benzene Toluene Ethylbenzene Xylenes (BTEX) and Polyaromatic Hydrocarbons (PAHs) within sediments, dangerous goods storage, vehicle maintenance workshops, uncontrolled fill and road building materials<sup>1</sup>.

Potential adverse effects associated with the proposed development works could arise from human or environmental exposure to the identified contaminants during excavation activities, storm water runoff carrying contaminated sediment impacting off-site areas, or members of the public being exposed to

<sup>1</sup> Note that BTEX and cyanide could also be present, in the unlikely event that coal tar is found to be present in road materials.



contaminants carried in airborne dust. To manage these risks a draft CSMP has been prepared and is to be updated with the results of the DSI prior to works commencing within the Project area.



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Preliminary Site Investigation

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## Glossary of Abbreviations

Item	Description
AEE	Assessment of Environmental Effects
AoC	Area of Concern
AUP	Auckland Unitary Plan Operative in Part (15 November 2016)
BTEX	Benzene Toluene Ethylbenzene Xylenes
CBD	Central Business District
CEMP	Construction Environment Management Plan
CLMG	MfE Contaminated Land Management Guidelines
Ch	Chainage
CoPC	Contaminants of Potential Concern
CSMP	Contaminated Site Management Plan
DSI	Detailed Site Investigation
HAIL	Hazardous Activities and Industries List
MfE	Ministry for the Environment
NES <sub>Soil</sub>	National Environment Standard for assessing and managing contaminants in soil to protect human health
NZ Transport Agency	New Zealand Transport Authority
OMMP	Ongoing Monitoring and Management Plan
PAH	Polyaromatic Hydrocarbon
PSI	Preliminary Site Investigation
RMA	Resource Management Act 1991
RWWTF	Rosedale Waste Water Treatment Facility
SH1	State Highway 1
SH18	State Highway 18
SQEP	Suitably Qualified Environmental and Experienced Practitioner
SUP	Shared Use Path
SVOC	Semi Volatile Organic Compounds
TPH	Total Petroleum Hydrocarbon
UHH	Upper Harbour Highway



#### Terms and Definitions

Item	Description
Aurecon	Aurecon New Zealand Ltd
Contamination	The presence of a substance at concentrations in excess of background. Note this is distinct from the definition of 'Contaminated Land' in the Resource Management Act.
NZ Transport Agency	New Zealand Transport Agency
Project	Refers to the Northern Corridor Improvements Project including the extension to the Northern Busway and proposed Shared Use Pathway.
Project area	The area within the proposed designation(s) corridor for the Northern Corridor Improvements Project and that area abutting this corridor
Project corridor	The area in which the Project is located



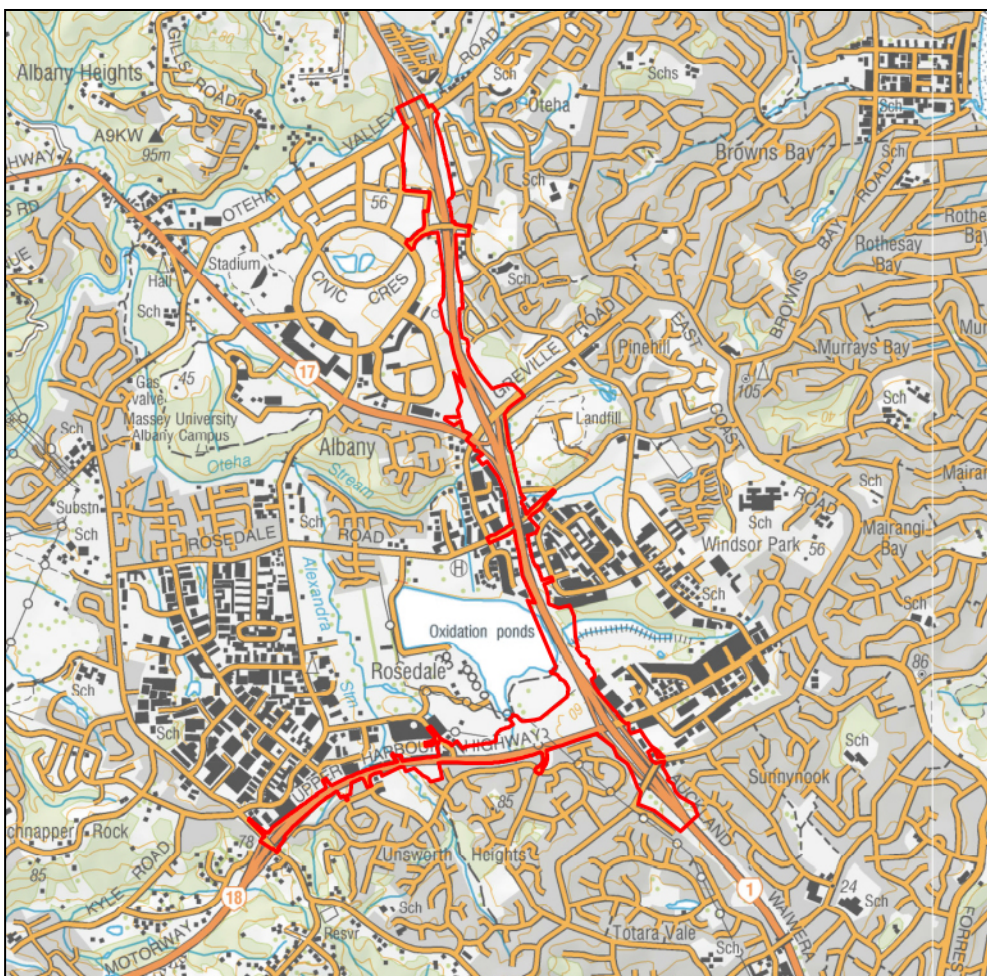


# 1 Description of Project

## 1.1 Project Background

The Northern Corridor Improvements Project (the Project) is an accelerated project. The Project area covers the area of SH18 between Albany Highway and Constellation Drive, and SH1 between Upper Harbour Highway (UHH) interchange to just beyond the Oteha Valley Road Interchange as indicated on **Figure 1** below and confirmed in the suite of plans provided in **Volume 5**.

Figure 1 Extent of Project Area



Source: Base Map from LINZ

The Project proposes to upgrade the existing State highways within the Project area. In summary, the key elements of the Project are as follows:

- North and West Motorway Interchange connections – SH1/SH18;
- State highway capacity and safety improvements;
- Northern busway extension from Constellation Bus Station and connection to Albany Bus Station;



- Reconfiguration of Constellation Bus Station converting it from a terminus station to a dual direction station;
- Shared Use Path (SUP) provision along existing SH1 and SH18 routes for the full extent of the Project corridor:
  - Constellation Station to Oteha Valley Road;
  - Constellation Drive to Albany Highway; and
  - Intermediate linkages to the local network.

A full description of the Project, including its components and construction, is contained in section 5 of the Assessment of Environmental Effects (AEE).

## 1.2 Purpose of this Report

This report is one of a suite of technical reports that has been prepared to inform the AEE (**Volume 2**) for the Project.

The New Zealand Transport Agency (NZ Transport Agency) has engaged Aurecon New Zealand Ltd (Aurecon) to complete an Assessment of Land Contamination Effects (relating specifically to soil and groundwater) to support the notices of requirement and relevant resource consent applications for the Project.

This document has been prepared based on the findings of Aurecon's Preliminary Site Investigation (PSI) for the Project (Ref. Northern Corridor Improvements Preliminary Site Investigation attached at **Appendix A**) undertaken on the proposed alignment, with the exception of the Rosedale Landfill for which a separate report has been prepared (**Volume 3 – Technical Assessment 7**).

The final report appended (**Appendix B**) to this assessment is a draft Contaminated Site Management Plan (CSMP). This assessment assumes familiarity with the three reports and, as such, all readers are referred to these reports for further detail.

## 1.3 Regulatory Framework

The applicable standards and guidelines for the Project area include the Ministry for the Environment (MfE) National Environment Standards for Assessing and Managing Contaminants in Soil to Protect Human Health, 2011 (NESSoil) and the Auckland Unitary Plan Operative in Part (15 November 2016) (AUP) as resource consents (as described below) are required, together with further guidance from the following MfE Contaminated Land Management Guidelines (CLMG):

- MfE, 2011, Contaminated Land Management Guidelines No. 1, Reporting on Contaminated Sites in New Zealand, ME No. 1071; and
- MfE, 2011, Contaminated Land Management Guidelines No. 5, Site Investigation and Analysis of Soils, ME No. 1073.

Under the NES<sub>Soil</sub>, removing or replacing a fuel storage system, soil sampling, soil disturbance, subdividing or changing land use all trigger requirements for assessment in the event that a Hazardous Activities and Industries List (HAIL) land use has occurred on the relevant piece of land. It is expected that earthworks and changes in land use activities will be prevalent as part of the Project, and because no Detailed Site Investigation (DSI) is yet available, the activity defaults to a discretionary activity. This assessment addresses these requirements for seeking a consent for these activities under the NES<sub>Soil</sub>.

Under the AUP, discretionary activity consent is required to authorise the discharge of contaminants from soil that is contaminated (where that discharge cannot comply with the permitted and controlled



activity standards<sup>2</sup>). The Project works will involve the discharge of contaminants to air, water or land, arising out of dust creation, runoff, disturbance and the moving of soil.

In addition, contaminants may already be discharging into air, water or land from properties to be acquired as part of the Project. If these discharges are currently occurring, it is unlikely that the Project will alter the discharge except from limited source removal. For these types of existing discharges, if the proposed DSI identifies that consent to authorise the existing discharge of contaminants from contaminated land is required, consent will be sought separately from this application. The Project does not directly influence these potential discharges from existing contaminated land.

It should be noted that, as a precautionary measure, the draft CSMP incorporates controls for managing existing discharges from contaminated land and it is intended that once areas with the potential to discharge contaminants and the relevant catchments into which they discharge are understood, consent will be sought under Section E30 of the AUP to authorise these existing discharges.

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<sup>2</sup> E30.6.1.2 and E30.6.2.1.



## 2 Assessment Methodology

### 2.1 Purpose

During construction of the Project, significant land disturbance/earthworks will be undertaken. The purpose of this technical assessment is to identify and document areas of potential environmental concern identified by the PSI which may present a risk to environment and/or public health both during and post construction (i.e. sites within or adjacent to the Project area in which current or historical land-uses may have impacted soil or groundwater). This information is required for obtaining resource consents on behalf of NZ Transport Agency. This will enable development of appropriate conditions to mitigate adverse environmental effects during construction and use (if required).

This assessment focuses on key areas of land disturbance as detailed in the General Arrangements Plans (see **Volume 5**) which include the following activities:

- Areas where indicative cut, fill or piling activities are required for construction;
- Temporary construction staging areas; and
- Ongoing maintenance laybys

The information and findings of this report are largely based on the PSI included at **Appendix A**. The Project location including identifying potential activities from the Hazardous Activities and Industries List as described in the NES<sub>Soil</sub> is included in **Appendix A** of the PSI report. A Detailed Site Investigation (DSI) to characterise the presence and extent of contamination was underway at the time this report was completed, but will not be completed before lodgement.

The PSI is sufficient to identify the potential areas which are affected by contaminated land. The CSMP is a draft document and it is anticipated that this will be revised on the basis of the findings of a DSI and comments received during the application process.

### 2.2 Scope of works

The following scope of works was completed to inform this assessment:

- Review of geological mapping documents for the Project;
- Review of ecological receptors adjacent to the Project;
- Completion of a Project walkover inspection with a focus on the identification of current activities on the Hazardous Activities and Industries List (HAIL – MfE 2012, User's Guide) sites;
- Review of historical aerial photographs for the period 1939 through 2010;
- Review of historical information held by the Council including:
  - The identification of contaminated sites and landfills as well as general pollution incident information within the Project area by the Council Resource Consents Department, Specialist Input Division (former Auckland Regional Council files);
  - The identification of HAIL sites within the Project area by the Council Licensing and Compliance Services Team;
  - The identification of bore, air discharge, industrial trade process, contaminated sites, and landfill resource consents within the Project area by the Council GIS team; and





- The identification of closed landfills within the Project area by the Council Infrastructure and Environmental Services Department.
- The review of historical certificates of title for selected properties within the Project area;
- Identification of areas of potential environmental concern including completion of preliminary risk assessment i.e., Contaminants of Potential Concern (CoPC), exposure pathways, and management strategies;
- Review of contaminated land statutory framework with respect to the Project;
- Provide an overview of the scope of the DSI currently underway;
- Assessment of Effects relating to construction and future operation and maintenance activities;
- Mitigation measures where effects are assessed as being more than minor;
- This report has been completed in general accordance with the following regulations, plans and guideline documents:
  - Auckland Council, 2016. Auckland Unitary Plan Operative in Part (15 November 2016) (AUP);
  - Ministry for the Environment, 2001. Contaminated Land Management Guidelines No. 1. Reporting on Contaminated Sites in New Zealand. Revised 2011;
  - Ministry for the Environment, 2012. User's Guide, National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health; and
  - Resource Management Act (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations, 2011 (NES<sub>Soil</sub>).





## 3 Existing Environment

### 3.1 General

The Project area is primarily located in the suburbs of Albany and Rosedale to the north of Auckland City (approximately 10 km from the Central Business District (CBD)). The corridor can be addressed as SH1 and SH18, as defined by the drawings presented as part of our PSI, which is appended within **Appendix A** of this document. The existing SH1 and SH18 corridors are in the ownership of the Crown. For a full description of the Project's setting, please refer to the PSI.

### 3.2 Surrounding Land use

The surrounding land use and Project elements are presented in section 2.2 of the PSI report, and can be summarised as follows:

- Residential properties are present adjacent to the Project alignment
  - SH1
    - Chainage (Ch)11500 - Ch13250
    - Ch14500-Ch15000,
  - SH18
    - Ch500-Ch2128
- Commercial properties are adjacent to the Project alignment between
  - SH1
    - Ch12000-Ch15000,
  - SH18
    - Ch1250-Ch2128
- Concrete plant SH1 – CH14775
- Rosedale Waste Water Treatment facility – SH1 Ch15000-Ch15500
- Rosedale Landfill – SH1 Ch13755-Ch14200

### 3.3 Geology

A full geological model of the Project area is presented within a description of the geological and hydrogeological setting in Section 2.3 of the PSI report in **Appendix A**. The model is summarised as the Project area is located in a moderately developed urban area and is dominated by a motorway. As such it is anticipated that at least 0.3 m of fill will be present over the whole route. The Project area is situated within the Waitemata Basin, formed approximately 24 to 18 million years ago, which extended from North Waikato to Whangarei (Isaac et al. 1994). The basin was a shallow marine subsiding basin receiving sediment from eroding landforms to the west, including the historical Manukau and Waitakere volcanoes. The sediment was dominated by interbedded silts and muddy sands, with some coarser grained volcanoclastic sediments within the sequence.

### 3.4 Topographic Setting

The topographic highs within the Project area are located around Spencer Road (Ch13000, SH1), Sunset Road (Ch16200, SH1) and Albany Expressway (SH18) where relative levels (RL) range



between 75 m and 85 m RL. The topographic low points are located around the streams/waterways (between 25 m to 30 m RL).

### 3.5 Hydrology Setting

There are three main catchments within the Project area and its surroundings, namely Alexandra Stream, Oteha Stream and Lucas Creek. These cross the Project area at Ch1600 (SH18), Ch14000 and Ch11900 (SH1) respectively.

### 3.6 Hydrogeological Setting

Based on the understanding of ground conditions, it is expected that a shallow water table is present within lower lying areas of the Project area that may be conversant with the level of surface water features. In areas of elevated topography depth to a permanent groundwater table may be greater; however perched water tables may exist within pockets of fill or Puketoka Formation following heavy rainfall events.

Based on geological and topographic information, it is expected that shallow groundwater water will be directed towards local surface water bodies draining to Waitemata Harbour in the west.

Sections of the three stream catchments in the Project area (refer Section 3.5) are classified under the AUP as Significant Ecological Areas, as are the treatment ponds at the Rosedale Waste Water Treatment facility (RWWTF). The classified areas are mainly to the west and north of the Project corridor, and for the purposes of this assessment all freshwater has been presumed to be ecologically sensitive. However, no discharges of contaminants are intended to water, or to land in circumstances which may result in that contaminant entering water.

### 3.7 Summary of the PSI

#### 3.7.1 Potentially Contaminating Activities

Potentially contaminating activities that have occurred on the Project site, as defined by the MfE under its HAIL, identified during the PSI process include the following:

- Infilling of the area during the development of the motorways with fill of unknown origins (potential HAIL activity I);
- Historical market gardening land use within the Project area (HAIL activity A10);
- Historical photographs suggest that the area was subjected to gum digging excavations and backfilling in the early 1900's (HAIL activity I);
- A neighbouring property within the new alignment is the Rosedale landfill which operated between 1959 and at least 2010. This constitutes a HAIL activity (G3); and
- The new alignment is to be widened through the Rosedale Wastewater treatment plant ponds. This area is considered to be HAIL activity G6.

These and other HAIL activities identified are further described within section 4.4 of the PSI report. Several other potential HAIL activities have occurred in close proximity to the Project area as detailed in the PSI report. In terms of activities close to areas of proposed ground disturbance these include petrol stations, vehicle workshops, bulk fuel storage, power generation, a substation, cement plant and a waste transfer station.



### 3.7.2 Risk assessment

#### 3.7.2.1 Conceptual model

Central to the requirements of the risk assessment was the development of a conceptual model based on the available information. The conceptual model is the combination of all sources, pathways and receptors and can be used to understand where complete pollutant linkages have the potential to exist.

For the purpose of this assessment, a conceptual model was developed based on the findings of the PSI. On-site sources identified by the PSI (both as a result of historic and current activity) refer to source areas of contamination located within and directly adjacent to the Project corridor.

All pathways (dermal contact, inhalation, ingestion, or through secondary media such as groundwater) are considered to be present as none can be discounted currently on the PSI alone.

Receptors, which include human health (site users, construction workers and adjacent site users), environmental receptors (such as groundwater and surface water bodies; and by implication sensitive ecology) and the built environment (foundations, culverts, infrastructure) are determined to have potential to be affected by the disturbance of contamination along the Project corridor. On the basis of the PSI and for the purpose of the assessment, complete source-pathway-receptor linkages are determined to exist for all HAIL activities until proven otherwise by subsequent DSI.

A summary of the potential Areas of Concern (AOCs), the pathways which they will affect and the receptors are presented in **Appendix F** of the PSI report. In summary, the proposed works involve improvements along the Project corridor and it is likely that construction and maintenance workers (as human health receptors) are at most risk of exposure to soils when works commence.

In addition, there are three streams within the vicinity which cut through the Project area. Without appropriate controls there is potential that these could be affected by disturbance or construction within identified HAIL activities along the Project corridor. This would be where sediments from earthworks within contaminated soil discharge into the stream. Appropriate controls are detailed in the CSMP and it is recommended that the works adhere to this plan wherever contaminated soils are identified.

#### 3.7.2.2 Preliminary Risk Assessment

The risk assessment was completed without significant reference to the proposed works as it is beneficial to identify where potential risk could exist in the context of earthworks to support a motorway development. However, certain activities were determined to have greater potential to pose a risk to human health, environmental receptors and the built environment. The risk assessment is further detailed in the PSI report (**Appendix A**) and **Table 1** identifies those sites in close proximity to the Project corridor which are considered more likely than not to result in land contamination and require the use of measures described in the CSMP. That list is further refined below by only including those sites in proximity to areas of ground disturbance.

Table 1 Summary of activities which pose a greater risk

HAIL reference	Site name and activity	Receptors of most concern
B4a	Constellation Drive Substation pre-1970's	Groundwater and Construction and maintenance workers
F7a	Z Energy service Station SH18	



HAIL reference	Site name and activity	Receptors of most concern
F7c	Caltex Service Station SH18/Paul Matthews Road	Adjacent site users, construction and maintenance workers and groundwater
G3a	Rosedale Closed Landfill	Groundwater and Construction and maintenance workers
lb	Fill for causeway between Watercare Ponds	Groundwater and Construction and maintenance workers
lc	Fill for accessway for work around the Watercare Ponds	
le	Elevated area potentially made from fill after the formation of the causeway	
li	Infilling of gully/channel (CH14700)	
lj	Infilling of gully/channel (CH14300)	
ln	Infilling of stream near Rosedale Closed Landfill (CH14000)	

Additional similar activities have been identified in the vicinity of the Project but they are remote from the Project corridor (i.e. not within or adjacent to the designation footprint) or areas of ground disturbance and as such are not considered further in this assessment.

### 3.7.3 Conclusions

The PSI report identified the potential for contamination to exist from a number of sources within the Project area. The following controls were recommended to address these risks:

- All earthworks associated with the Project will need to be completed under a CSMP (**Appendix B**). The CSMP will need to be prepared by a Suitably Qualified and Experienced Practitioner of contaminated land services (SQEP); and will need to demonstrate that any risks to human health and the environment can be managed appropriately, including disposal of material to an appropriate landfill.
- To further assess actual site conditions within areas of potential contamination and better understand the risk profile a DSI shall be undertaken (this is now underway).



## 4 Effects Assessment: Construction Activities

### 4.1 Description of Construction Effects

The potential effects in relation to contamination have been evaluated based on the findings of this assessment and the PSI. **Table 2** lists locations of potential contamination as defined by the PSI and proposals for avoiding, remedying and mitigating potential adverse effects arising from their presence and disturbance.

Table 2 Activities and contaminants of potential concern

Location	Contaminants
<b>Uncontrolled Fill</b>	
Watercare Causeway	Asbestos containing material Metals Hydrocarbons Semi volatile organic compounds
Infilling of gully (Ch14700)	
Infilling of gully (Ch14300)	
Infilling of stream (Ch 14000)	
<b>Power Substation</b>	
Constellation Drive	Polychlorinated biphenyls
<b>Petrol Station</b>	
Caltex service station SH18	Hydrocarbons Metals
Z Service station SH18	Hydrocarbons

The draft CSMP is provided within **Appendix B** of this report and includes controls and mitigation measures required to be implemented during construction activities to protect human health and the environment.

#### 4.1.1 Positive Effects

Some positive environmental effects of the proposed works are outlined below.

- Characterisation of areas of potentially contaminated land which would otherwise not have been assessed;
- Identification of areas of historical contamination previously unknown allowing controls to be implemented to protect human health and the environment;
- The possible removal of contaminated material from the proposed development areas within the Project corridor; and
- Removal of some soil contamination.





#### 4.1.2 Assessment of Adverse Effects

Adverse effects may occur when there is a linkage between source, pathway and receptor. During construction there is potential for such linkages to be created through soil disturbance and surface seal removal. Pathways potentially created during construction works may include:

- Inhalation exposure to workers and members of the public;
- Ingestion and dermal contact exposure to workers and neighbouring site users;
- Discharge to stormwater;
- Passive discharge to groundwater;
- Accumulation in impacted sediment;
- Effects on amenity values (i.e. odours); and
- Vegetation impacts.

All effects during construction will be transient, however it should be noted that for some compounds, notably asbestos, lead, and benzene, any additional exposure can lead to irreversible impact. However this is highly unlikely, and well managed contaminated sites should not result in a significant increase in human health risk. Management strategies to address all potential pathways and adverse effects have been incorporated into the draft CSMP. The draft CSMP provides the general framework to effectively manage these risks and will be updated to respond to specific risks identified by the results of the DSI. It is anticipated that the results of the DSI will be known in December 2016, providing an opportunity to revise the CSMP at that time.

The Project does not include any proposal to discharge contaminants to stormwater or groundwater. The effects of contaminant discharges to water can be significant with fish kills, conspicuous oil and grease colour and clarity changes, and objectionable odour all real possibilities if management measures are not adhered to.

It is intended however that all works will be carried out in strict accordance with a site specific CSMP informed by a DSI. A draft of the CSMP is included in **Appendix B**. As long as the proposed management measures are adhered to no discharge to water is anticipated to occur and no exposure to humans above background concentrations typical of the local environment is expected to occur.

**Table 3** summarises the risks from those sites perceived to present the higher potential for risk at the Project area as detailed in the PSI and the measures which are proposed to control those risks. It should be noted that in all cases a CSMP and DSI is proposed where physical works are to occur. This applies to all identified HAIL sites not just the higher risk site identified below.

Table 3 Potential adverse effects from higher risk sites

Source type (Location)	Effects	Comment
<b>Uncontrolled Fills</b>		
Watercare Causeway	Dust inhalation exposure to workers and neighbouring site users resulting in adverse health conditions	Construction management plan and entire CSMP, notably sections 4 and 5 will control risk associated with these materials
Infilling of gully (Ch14700)	Discharge to stormwater resulting in degradation of surface water or ecological receptors	
Infilling of gully (Ch14300)	Passive discharge to groundwater resulting in degradation of groundwater and subsequently surface water or ecological receptors	
Infilling of stream (Ch 14000)		DSI to identify presence of source material



Source type (Location)	Effects	Comment
	Accumulation of sediment resulting in degradation of surface water or ecological receptors	
<b>Power Substations</b>		
Constellation Drive	<p>Dermal contact, ingestion by onsite workers resulting in adverse health conditions</p> <p>Passive discharge to groundwater resulting in degradation of groundwater and subsequently surface water or ecological receptors</p>	DSI will identify source material, CSMP, notably sections 4 and 5 will manage risk to receptors
<b>Service Stations</b>		
Caltex service station SH18	<p>Dermal contact, ingestion, inhalation by onsite workers and neighbouring site users resulting in adverse health conditions</p> <p>Passive discharge to groundwater resulting in degradation of groundwater and subsequently surface water or ecological receptors</p> <p>Amenity values, notably odour resulting in minor inconvenience during the works</p>	<p>DSI will confirm presence of source material</p> <p>CSMP, notably sections 4 and 5 will manage risks to receptors.</p>
Z Service station SH18	<p>Dermal contact, ingestion, inhalation by onsite workers and neighbouring site users resulting in adverse health conditions</p> <p>Passive discharge to groundwater resulting in degradation of groundwater and subsequently surface water or ecological receptors</p> <p>Amenity values, notably odour resulting in minor inconvenience during the works</p>	<p>DSI will confirm presence of source material</p> <p>CSMP, notably sections 4 and 5 will manage risks to receptors.</p> <p>Note that works are not proposed within this site, simply nearby to it and as such the only risk is posed from groundwater migration beneath works area.</p>



## 5 Effects Assessment: Operation of Project

### 5.1 Description of Operational Effects

The potential effects associated with future operational and maintenance activities have been evaluated based on the findings of this Assessment of Land Contamination Effects and the PSI report.

Adverse effects may occur when there is a pollutant linkage between the source, pathway, and receptor. During operation, any residual contamination will be sealed beneath the highway, landscaped over or a drainage feature. As such, no linkages will exist where the Project area remains undisturbed. However, there is potential for linkages to be created in the event that contamination is disturbed during routine maintenance. Some disturbance activities in which pathways may be created during the course of operation include:

- Trenching for installation of underground services;
- Vertical or horizontal drilling for small scale civil works or alterations; and
- Earthworks for landscaping.

Adverse effects associated with maintenance activities involving soil disturbance may include:

- Inhalation exposure to workers and members of the public;
- Discharge to stormwater of impacted material from unauthorised soil management and uncontrolled waste disposal;
- Passive discharge to groundwater or air from unauthorised soil management and uncontrolled waste disposal;
- Accumulation of impacted sediment from unauthorised soil management and uncontrolled waste disposal; and
- Amenity values and ecology or vegetation impacts from unauthorised soil management and uncontrolled waste disposal.

**Table 3** lists activities/locations, potential environmental effects and options for avoiding, remedying and mitigating potential adverse effects for construction. This table is also applicable for future operation and maintenance activities where impacted material remains in-situ and has potential to have adverse effects on human health or the environment.

In the event that ongoing management requirements are identified subsequent to construction, a long term management plan should be prepared to address ongoing management requirements for any contamination remaining in-situ.

### 5.2 Assessment of Adverse Effects for Operation

If residual contamination remains post construction, adverse effects for the operational phase (i.e. post construction) of the Project will be mitigated under the framework of an Ongoing Monitoring and Management Plan (OMMP) prepared by a SQEP following completion of construction works. The OMMP will address worker and public protection for areas where contaminated soil may be excavated or re-used. Refer to Section 6 for more information on mitigation measures applicable for both operational and construction activities.



As results are yet to be received for the DSI, comparison of results against regulatory guidelines or standards cannot be made at the time this report was written. Should additional controls be identified as a result of the findings of the DSI, these will be incorporated into an updated CSMP.



## 6 Mitigation Measures

The following is an outline of the mitigation measures for the Project. Mitigation of effects will primarily be managed under a CSMP. The key steps required for mitigation include completion of a DSI (characterisation of contaminants) and updating of the current CSMP. The DSI will incorporate the following key elements:

- Targeted sampling programme (currently underway), based on primary areas of disturbance (cut and fill). The sample locations and depths are based on the scope of disturbance works;
- Analyse soil samples based on locations where potentially contaminating activities/land use have occurred as identified in **Table 3** and identified in the combined drawings in the PSI report in **Appendix A**; and
- The results of the DSI will be used to:
  - Characterise actual contaminant conditions of spoil materials scheduled for land disturbance/earthworks as part of the Project.
  - Inform the development of technical sections of the CSMP and other management plans.
  - Provide waste spoil classification advice for:
    - Spoil materials to be re-used within the Project area (i.e. cut-to-fill activities).
    - Spoil materials to be disposed of off-site as part of the development works (i.e. spoil materials which may be geotechnically unsuitable for re-use within the Project area).
- The CSMP provides for the following with respect to the completion of land disturbance activities on contaminated sites:
  - Health and safety requirements (including).
    - Hierarchy of control considerations such as personal protective equipment and personal monitoring requirements.
    - Personal decontamination requirements.
  - Protocols for accidental discovery.
  - Sediment and erosion control and monitoring.
  - Dust and odour control.
  - Surface water control and monitoring.
  - Imported fill.
  - Stockpile management.
  - Waste spoil classification and disposal.
  - Site validation reporting requirements.

In addition, the draft CSMP will be updated to include a summary of the DSI findings, summary of responsible parties and their roles, methodologies for additional sampling and validation and reporting





requirements. The CSMP will be implemented by NZ Transport Agency through the appointed subcontractors.



## 7 Summary and Conclusions

### 7.1 Concluding Remarks

The PSI has identified potentially contaminated land associated with current or historical activities within the Project area. These activities include landfill sites, waste water treatment plants, the placement of fill of unknown origins, and petroleum service stations.

A CSMP completed for the Project outlines mitigation and management measures to be implemented during the construction phase of the Project.

This report summarises the key findings of the PSI which identified potential for soil contamination to exist within and adjacent to the Project area. These included:

- Asbestos within uncontrolled fill;
- Heavy metals from industrial land use, uncontrolled fill and high traffic volumes;
- Semi Volatile Organic Compounds (SVOCs) including PAHs and organochlorine pesticides from agricultural and industrial land uses; and
- Hydrocarbons such as Total Petroleum Hydrocarbons (TPH), Benzene Toluene Ethylbenzene Xylenes (BTEX) and Polyaromatic Hydrocarbons (PAHs) within sediments, dangerous goods storage, vehicle maintenance workshops, uncontrolled fill and road building materials<sup>3</sup>.

Potential adverse effects could arise from human or environmental exposure to the identified contaminants during excavation activities, stormwater runoff carrying contaminated sediment could impact off-site areas, or members of the public could be exposed to contaminants carried in airborne dust. Measures proposed in the CSMP will address all potential risks identified within this report. The CSMP will be updated following the DSI investigation.

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<sup>3</sup> Note that BTEX and cyanide could also be present in the unlikely event that coal tar is found to be present in road materials.



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