

## Appendix F: 2019 DRAFT Environmental Assessment

# AMETI EASTERN BUSWAY 2 AND 3

DRAFT ENVIRONMENTAL ASSESSMENT (CONTAMINATION)

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Prepared for Auckland Transport | 15-Apr-2019



# DRAFT

## Draft Environmental Assessment (Contamination)

AMETI Eastern Busway 2 and 3 Design and Consenting

Client: Auckland Transport

Co No.: N/A

Prepared by

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**DRAFT****Quality Information**

Document Draft Environmental Assessment (Contamination)

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Reviewed by Emma Trembath

## Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
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## 1.0 Introduction

### 1.1 Preface

AECOM New Zealand Limited (AECOM) has been engaged by Auckland Transport (AT) to complete an environmental assessment of contaminated land related aspects (gap analysis of existing Preliminary Site Investigation (PSI)) and Detailed Site Investigation (DSI) in support of the design for the proposed Auckland Manukau Eastern Transport Initiative (AMET1) Eastern Busway 2 (EB2) and 3 (EB3) packages (referenced in this report as the 'proposed transport improvement works area').

### 1.2 Summary of Proposed Development

The AMET1 programme aims to improve transport for Auckland's eastern suburbs by 2025. The programme is divided into a number of packages and this report focuses on packages EB2 and EB3 (**Figure 1**). Refer to **Appendix A** for further figures outlining the development. In summary:

- Package EB2:
  - A bus station within the Pakuranga town centre.
  - A flyover from Pakuranga Road to the Pakuranga Highway following the alignment of the existing Reeves Road.
- Package EB3:
  - A dedicated busway running between the dual carriageways of Ti Rakau Drive through to the Te Koha intersection.
  - Ti Rakau Drive being widened to the south of the existing road through the mainly residential area north west of the Pakuranga Creek Bridge.
  - The replacement and widening of Ti Rakau Bridge.
  - Ti Rakau Drive being widened approximately evenly on both sides of the road through the mainly commercial area South-East of the Pakuranga Creek Bridge.
  - In addition to the above, it has been identified that Riverhills Park (located within the EB3 footprint) may be utilised as a potential temporary laydown area to facilitate the construction of both Package EB2 and EB3 and the replacement and widening of Ti Rakau Bridge.

### 1.3 Objective

The objectives of the environmental assessment (contaminated land) were the following:

- Provide an understanding of the nature and extent of the current and historical Hazardous Activities and Industries List (HAIL) landuse activities within the vicinity of the proposed transport improvement works area, including the temporary laydown area.
- Provide a conceptual site model (CSM) including an exposure pathway assessment.
- Understand potential contaminant conditions of spoil materials scheduled for land disturbance as part of the proposed transport improvement works.
- Confirm contaminated land resource consent requirements under the following legislation:
  - Auckland Unitary Plan Operative in part (AUPOIP).
  - Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations, 2011 (NES Soil).
- Provide waste spoil classification advice for spoil materials to be disposed of off-site as part of the proposed transport improvement works.

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## 1.4 Scope of Work

In order to meet the objective, the following scope of works was completed:

- Data Gap Review:
  - Review of the Phase 1 PSI for the Pakuranga Scheme Assessment of the Auckland Manukau Eastern Transport Initiative (AMETI) Alignment, prepared by GHD Limited (GHD), dated 7 December 2012.
  - Identification of data gaps (related to contaminated land aspects) considered pertinent to the proposed transport improvement works.
  - Review of the following data sources for the period between the issue of the GHD PSI report (December 2012) and the present day (August 2018):
    - Publicly available historical aerial photographs.
    - Auckland Council (AC) contaminated land enquiry.
- Intrusive Investigation:
  - Collection of environmental soil samples from six boreholes (advanced for geotechnical purposes) along the length of the proposed transport improvement works area.
  - Advancement of 21 environmental hand augers and collection of soil samples along the length of the proposed transport improvement works area.
  - Advancement of 12 environmental hand augers and collection of soil samples within in the proposed temporary laydown area.
  - Collection of environmental sediment samples at two locations adjacent to the Tamaki River.
  - Analysis of selected soil samples for a range of potential contaminants of concern including:
    - Heavy metals,
    - Total petroleum hydrocarbons (TPH),
    - Volatile organic compounds (VOCs),
    - Semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs) and pesticides,
    - Pentachlorophenol (PCP), and
    - Asbestos containing materials (ACM).
- Preparation of this environmental assessment report including:
  - Comparison of soil and sediment analytical results against relevant human health and environmental guideline criteria.
  - Identification of preliminary contaminated land resource consent requirements.
  - Provision of soil classification advice with respect to reuse or disposal.

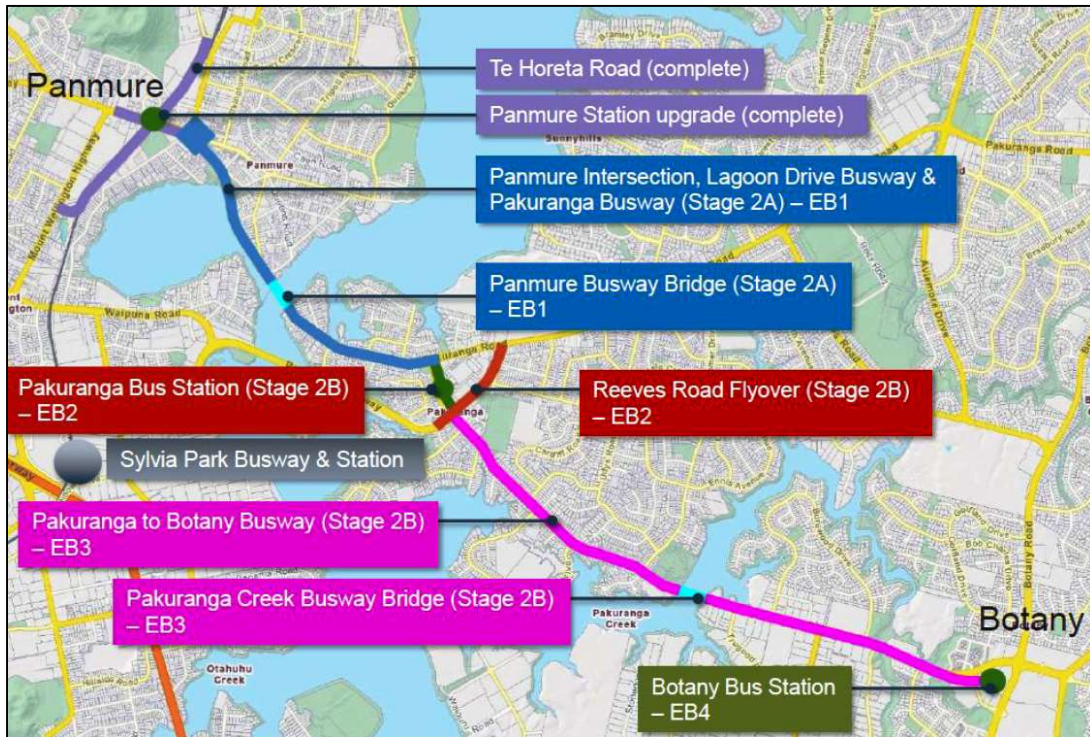
## 1.5 Project Exclusions

It is acknowledged that a number of residential homes and commercial buildings, including service stations, will need to be demolished and removed in order for the EB2 and EB3 works programme to progress. Full hazardous materials surveys will need to be completed, with potential risks mitigated (i.e., removal of asbestos, decommissioning of underground storage tanks), prior to the commencement of the physical works programme. Further commentary on this matter is outside of the scope of this report.



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Figure 1 AMETI Stage 2B Location (sourced from tender documents)



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## 2.0 Site and Environmental Setting

### 2.1 Site Description

Figure 1 presents an overview of the extent of EB2 and EB3. In summary:

- Package EB2:
  - The proposed location of the Pakuranga Bus Station is on Ti Rakau Drive near Pakuranga Town Centre. The area is generally level.
  - The proposed Reeves Road Flyover runs from Pakuranga Highway in the west across Ti Rakau Drive, along Reeves Road adjacent to William Roberts Road and joins Pakuranga Road to the north. The ground rises gently from Reeves Rd to Pakuranga Rd in the north through residential properties.
- Package EB3:
  - The proposed Pakuranga to Botany Busway runs along Ti Rakau Drive from the Mattson Road intersection to Te Irirangi Drive and includes the replacement and widening of Ti Rakau Bridge.
  - The road is generally level from Pakuranga Rd to Huntington Drive near the eastern end of the project where the alignment dips gently into two creek crossings. There are mangroves along the edge of Pakuranga Creek and its tributaries. Landuse is residential housing and open ground to Pakuranga Creek then commercial property to the end of the busway.
  - A temporary laydown area for the proposed works is located at Riverhills Park, situated on the corner of Ti Rakau Drive and Gossamer Drive; adjacent to the Ti Rakau Drive bridge. The majority of the area is an open grassed area currently used as recreational sports fields (soccer). The park is relatively flat, the carpark and ground on the western edge of the reserve rises gradually to meet Gossamer Drive. The ground drops down from the edge of the playing fields on the eastern side approximately 10 meters (m) to Pakuranga Creek..

### 2.2 Environmental Setting

#### 2.2.1 Geology

The published geological map of the area (Kermode, 1992), illustrates that the proposed transport improvement works area is underlain by seven mapped geological strata (refer **Figure 2**). A summary of the geological strata mapped along the routes is presented in **Table 1**. Refer to the first column of **Table 1** below for descriptions of mapped strata.

#### 2.2.2 Hydrogeology

Beca Limited (Beca) reported on groundwater levels across the proposed transport improvement area for the months of July and August 2014. It was noted that groundwater was generally encountered between 2 m to 3 m below ground level (bgl).

GHD further noted that the entire transport improvement works area was underlain by a relatively shallow groundwater table (< 5 m bgl) that appeared to be generally consistent with topography (GHD, 2012). Given the proximity to coastal areas, regional groundwater flow is anticipated to be in a generally north, north east and north west direction towards the inner Waitemata Harbour. Localised groundwater flows will also be expected towards the Tamaki Basin, Tamaki River, and the Pakuranga Creek. Groundwater was encountered environmental assessment.

Groundwater was recorded at depths ranging from 0.7 to 3.3. m bgl as part of the AECOM environmental assessment (refer **Section 6**).

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## 2.2.3 Ecology

The following potentially sensitive ecological receptors have been identified along the length of the proposed transport improvement works area:

- The Tamaki River within the vicinity of Ti Rakau Bridge and Riverhills Park
- A stream/creek to the north of the fuel service station at 386 Ti Rakau Drive.

Figure 2 Geological Map Extract 1:50,000 (Kermode, 1992)

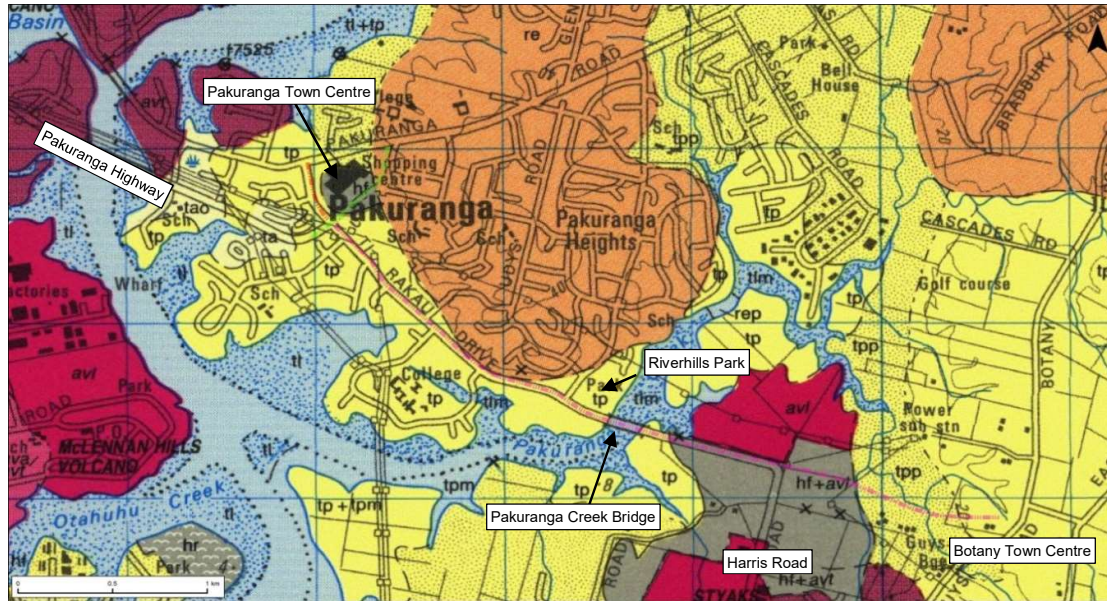


Table 1 Mapped Geological Strata Summary

Strata Map Code	Strata Name	Strata Description	Approximate Locations
hf+avl	Construction Fill & Basalt Lava	Construction fill: re-compacted clay to gravel sized materials may include demolition debris. Basalt lava: grey, dense, fine grained lava	Ti Rakau Drive between Trugood Drive and Greenmount Drive, and around Pakuranga Town Centre
tlm	Intertidal Mud	Grey to black, indistinctly bedded	Beneath Pakuranga Creek Bridge
ta	Undifferentiated Alluvium	Mud, sand and gravel	Pakuranga Highway
avl	Basalt & Basanite Lava	Grey, dense, fine grained lava	North of Ti Rakau Drive between Burswood Drive and Harris Road
tp	Puketoka Formation	Pumiceous deposits: light grey to orange brown, pumiceous mud, sand and gravel with black muddy peat lignite	Pakuranga Highway, southern end of Reeves Road, Ti Rakau Drive between Pakuranga Town Centre and Trugood Drive
tpp	Puketoka Formation	Rhyolite pumice: light grey, massive to finely laminated, mud to sand sized pumice, includes non-welded ignimbrite, tephra and alluvial pumice deposits	Ti Rakau Drive between Greenmount Drive and Botany Town Centre
re	East Coast Bays Formation	Greenish grey, alternating muddy sandstone and mudstone with occasional interbedded lenses of grit	Pakuranga Heights, northern end of William Roberts Road

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## 3.0 Gap Analysis

As part of the gap analysis a review of the GHD PSI was completed. The review was undertaken for the purposes of identifying data gaps (related to contaminated land aspects) considered pertinent to the proposed transport improvement works.

### 3.1 Summary Review

#### 3.1.1 Background

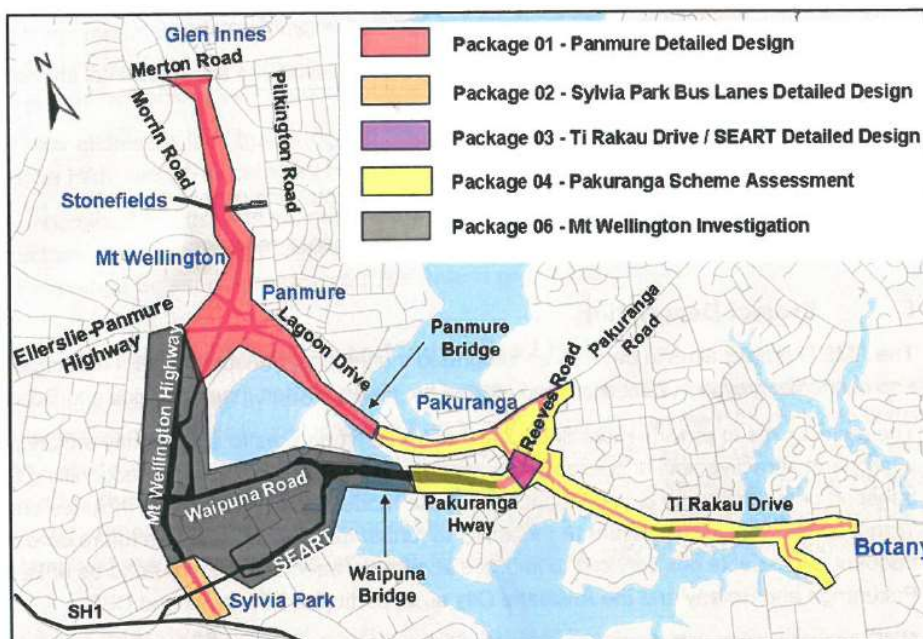
GHD completed a PSI (2012) in support of the proposed Package 4 portion (running between Pakuranga and Botany) of the AMETI Alignment (detailed on **Figure 3**, hereinafter referred to in this section as 'the alignment').

The Package 4 Scheme Assessment is noted to comprise five segments, and these are summarised in **Table 2** Error! Reference source not found.. The entire Package 4 Scheme (including each of the five segments) forms the subject of the GHD PSI and encompasses packages EB2 and EB3 (which are the focus of this environmental assessment). The review of the GHD PSI indicates that Package 4 appears to generally align with packages EB2 and EB3 of the current AMETI programme.

**Table 2 Package 4 Scheme Assessment**

Segment	Description
One	Pakuranga Road between the eastern abutment of the Panmure Bridge and Ti Rakau Drive.
Two	Pakuranga Town Centre and immediate surrounding corridors. These include Pakuranga Road, between Ti Rakau Drive (including the Pakuranga Road intersection) and St Kentigerns signalised entrance; Ti Rakau Drive, between Pakuranga Road and Reeves Road (including the Reeves Road intersection); and Reeves Road, between William Roberts Road and Ti Rakau Drive.
Three	Ti Rakau Drive between Reeves Road and Gossamer Drive.
Four	Ti Rakau Drive between Gossamer Drive and Greenmount Drive.
Five	Ti Rakau Drive between Greenmount Drive and Botany Road.

**Figure 3 AMETI Alignment Entire Scheme Assessment**



Source: GHD, 2012.

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### 3.1.2 Purpose

The GHD PSI was undertaken to support AT in meeting the requirements of the NES Soil. The NES Soil applies to any site where a potentially hazardous activity or industry (historically or current) is identified on the HAIL. As such, the objective of the GHD PSI was to assess the likelihood of the presence of soil contamination resulting from historic and/or current landuse activity within or adjacent to the alignment.

### 3.1.3 Scope

The GHD PSI comprised a review of information from the following sources:

- Draft alignment plans as of October 2012 developed by GHD/Aurecon.
- Publicly available historical aerial photographs from 1940 to 2010.
- Collection of photographs as part of a walkover.
- AC contaminated sites register.
- AC groundwater borehole register.
- Readily available site investigation reports resulting from site register search.
- Walkover inspection conducted on 26 September 2012.
- Readily available geology and hydrogeology information.
- Determination of surrounding landuses to assess potential environmental impacts from off-site sources.
- Identification of potential contaminants of concern.
- Publicly available information on the environmental fate of contaminants.
- Identification of sensitive human and/or environmental receptors.

### 3.1.4 Key Findings and Conclusions

The key findings and conclusions of the GHD PSI were as follows:

- Along the length of the alignment there are a number of geological units present with the most prominent being rhyolitic pumiceous deposits of the Tauranga Group.
- Engineered construction fill (likely comprising re-compacted clay/gravel and may include construction and demolition wastes) is noted to a large complex between Ti Rakau Drive and Pakuranga Road. Construction fill is also noted as a geological component to the industrial zone between Trugood Drive and Burswood Drive.
- A site contamination enquiry was completed seeking records from AC. A number of items were identified including pollution incidents, records of discharge consents, submittal of a tank pull report, submittal of two environmental site assessment (ESA) reports for service station facilities, and borehole installation records for environmental monitoring or investigation purposes at three sites (two service stations and one chemical supplier facility). The report notes that the two ESA reports were requested from AC but one was still outstanding at the time that the GHD PSI report was issued.
- A walkover identified no sensitive receptors in close proximity to the proposed transport improvement works area with the exception of the tributary of the Pakuranga Creek flowing at the back of the fuel service station located at 386 Ti Rakau Drive.
- Adjacent to the alignment up to twenty sites with landuses included on the HAIL were identified. It was stated that, given surface soils will be disturbed along the alignment corridor through significant soil disturbance the regulations of the NES Soil apply on the basis of HAIL category H adjacent sites. Category H is defined as 'any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment'. The identified HAIL sites are detailed in **Table 3**.

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The report recommended that the following are considered to minimise risks associated with contaminated land along the alignment:

- Obtain environmental site investigation reports from AC.
- Engage with AC contaminated site officers to present the planned strategy to assess potential contamination from adjacent sites.
- Undertake intrusive soil investigations to assess potential contamination along the project route, at locations where the adjacent landuse has been identified as having current or historic HAIL activities and where the likelihood of contamination has been assessed as medium to high.

**Table 3 Summary of Identified HAIL Sites (GHD, 2012)**

Site Name	Landuse Activity	HAIL Category
11 Cortina Place / 64B Ti Rakau Drive	Former Caltex branded service station, now a vacant site	F7 – Service stations including retail or commercial refuelling activities
Aylesbury Street, Pakuranga Town Centre	New Zealand Dry Cleaners	A5 – Dry-cleaning plants including dry-cleaning premises or the bulk storage of dry cleaning solvents
12 Cortina Place	Pakuranga Panel Beaters	F4 – Motor vehicle workshops
16 Cortina Place	Pakuranga Automotive	F4 – Motor vehicle workshops
16D Cortina Place	Pakuranga Auto Transport	F4 – Motor vehicle workshops
3 Reeves Road	Gull branded service station	F7 – Service stations including retail or commercial refuelling activities
242 Ti Rakau Drive	Mobil branded service station	F7 – Service stations including retail or commercial refuelling activities
269 Ti Rakau Drive	Sandvik Materials Technology (metal supplier/fabrication)	D5 – Engineering workshops with metal fabrication
279 Ti Rakau Drive	Former Timber Storage Yard	A18 – Wood treatment or preservation including the commercial use of anti-sapstain chemicals during milling, or bulk storage of treated timber outside
Corner Ti Rakau Drive and Burswood Drive	Z branded service station	F7 – Service stations including retail or commercial refuelling activities
179D Harris Road	Jireh Auto Tyres	F4 – Motor vehicle workshops
Corner Ti Rakau Drive and Harris Road	BP branded service station	F7 – Service stations including retail or commercial refuelling activities
293 Ti Rakau Drive	Forging Ahead (Foundry)	D2 – Foundry operations including the commercial production of metal products by injecting or pouring molten metal into moulds
333 Ti Rakau Drive	Blue n Green Dry Cleaners	A5 – Dry-cleaning plants including dry-cleaning premises or the bulk storage of dry cleaning solvents
380 Ti Rakau Drive	Howick and Eastern Bus Depot	F8 – Transport depots or yards including areas used for refuelling or the bulk storage of hazardous substances
386 Ti Rakau Drive	Gull branded service station	F7 – Service stations including retail or commercial refuelling

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Site Name	Landuse Activity	HAIL Category
		activities
550 T Irirangi Drive	Z branded service station	F7 – Service stations including retail or commercial refuelling activities

**3.2 Data Gap Summary**

At the time of issue and given the associated status of the AMETI scheme at the time, the GHD PSI report would have been considered generally sufficient for the purposes of supporting the proposed transport improvement works. However, it is noted that the identified HAIL sites (**Table 3**) are outside of the current proposed transport improvement works area. Given that only shallow soils (i.e. up to 0.5 m bgl) are likely to be disturbed as part of the current proposed works, the HAIL sites are not considered relevant as it is unlikely that they have contributed to the migration of hazardous substances in a sufficient quantity in shallow soils that could result in a risk to human health or the environment.

Even so, given the passage of time since the development of the GHD PSI report (almost six years), and the progression of the planning/design of the overall AMETI scheme, it is considered that there is scope for data gaps to exist with respect to understanding of potential risks associated with contaminated land.

To address the existence of potential data gaps the following sources were selected to be reviewed to specifically address the period between the issue of the GHD PSI report (December 2012) and the present day (August 2018):

- Publicly available historical and current aerial photographs.
- AC contaminated site enquiry.

A summary review of each of the above data sources is provided in **Section 4**.

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## 4.0 Data Source Review

### 4.1 Aerial Photographs

Historical and current aerial photographs were obtained through the AC Geomaps online portal, the Retrolens online portal and Google Maps/Streetview 2018 imagery. In addition to covering the identified data gap period (December 2012 to present day) a review of aerial photographs was undertaken for the period 1939 through to the present day. This allowed for the determination of landuse changes and the identification of any pertinent items that have become apparent since December 2012 but also to allow for the identification of any pertinent landuses that may have been omitted during the development of the GHD PSI. The aerial photographs are included in **Appendix B**.

In addition to items identified by the GHD PSI the review of aerial photographs highlighted the following key items:

- On the 1968 aerial photograph there are buildings present to the south west of Ti Rakau Drive at the junction of the current Highway 10. A number of these buildings are no longer present on the 1972 aerial photograph as infilling of the current Highway 10 location to the south west of Ti Rakau Drive is evident.
- The 1980 aerial photograph records Highway 10 having been constructed.
- The site at 64B Ti Rakau Drive is noted as a former Caltex branded service station and 'vacant' in the GHD PSI. The site has been redeveloped and is now occupied by the 'Pakuranga Medical Centre' which comprises of a two-storey building and associated car park.
- The BP branded service station on the corner of Ti Rakau Drive and Harris Road (as noted in the GHD PSI) is now a car showroom and sales centre.
- Blue n Green Dry Cleaners noted as located at 333 Ti Rakau Drive in the GHD PSI appears to be currently located at 317 Ti Rakau Drive.
- Two reclaimed inlets of the Tamaki River were infilled between 1959 and 1996 (to form Riverhills Park).

### 4.2 Auckland Council Contaminated Site Enquiry

The AC contaminated site enquiry gathers information from the former Auckland Regional Council (ARC) records system and information currently held by the AC Natural Resources and Specialist Input Unit. Records include closed landfills, bores, air discharge, industrial and trade process consents, contaminated site discharge consents, and environmental assessments within approximately 200 m either side of the proposed transport improvement works area. A copy of the report (for the period 2012 to present day) is provided in **Appendix C**.

The report identified the following:

- There are three closed landfill sites within the vicinity of the Site which are noted as being located at Riverhills Park, Ti Rakau Park and Dale Crescent.
- Records of two discharge consents for the site at 11 Cortina Place/64B Ti Rakau Drive for a former petrol filling station. The consents relate to closure of the site and discharge to land and water from remediation of contaminated land, and are dated April 2011 and March 2016, respectively.
- Five sites identified as included on the HAIL for what appears to be reasons of contamination. Four of the sites appear to be aligned to the locations of the three closed landfills detailed above with the fifth location recorded as a site approximately 125 m to the south west of Ti Rakau Drive.



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## 5.0 Intrusive Works Methodology

### 5.1 Areas of Potential Concern and Investigation Rationale

The review of the GHD PSI and current/more recent historical information, along with the proposed transport improvement activities has highlighted the following:

- An activity or industry included on the HAIL has more likely than not (historical), and is not currently being undertaken along the length of the proposed transport improvement works area.
- Soil disturbance activities (albeit shallow) are anticipated as part of the proposed works. As such there is a need to understand potential soil contaminant conditions where soil disturbance works are anticipated.
- Sediment disturbance activities are anticipated as part of the proposed works. As such there is a need to understand potential sediment contaminant conditions where soil disturbance works are anticipated.

Based on the above, the AECOM environmental assessment focussed on the collection of soil and sediment samples for laboratory analysis from materials within anticipated areas of soil disturbance.

### 5.2 Environmental Soil and Sediment Sampling

**Table 4** presents a summary of the works completed between April and August 2019 and in February 2019. Investigation locations are presented on **Figure 4** in **Appendix A**.

**Table 4 Summary of Field Methodologies**

Scope of Works Completed	Methodology
Service Mark-out	<ul style="list-style-type: none"> <li>• Prior to mobilising, before you dig searches of relevant services were conducted by AECOM staff and locations were chosen to avoid these services.</li> <li>• Onsite service location was carried out by Underground Service Locators (USL) under AECOM supervision, using a ground penetrating radar (GPR) and cable avoidance tool (CAT) scanner.</li> <li>• Once excavation locations had been cleared by USL approval for breaking ground was cleared by an AECOM service identification and clearance (SIC) approver in discussion with the AECOM site supervisor.</li> </ul>
Borehole advancement	<ul style="list-style-type: none"> <li>• Six boreholes (locations DH102 to DH104 and DH107 to DH109) advanced as part of the AECOM geotechnical investigation. Initial progression (as part of service clearance requirements) utilised hydrovac excavation processes to depths of up to 2 m bgl. Environmental sampling was conducted during this process.</li> </ul>
Hand auger advancement	<ul style="list-style-type: none"> <li>• 21 hand augured boreholes (locations EHA101 to EHA108 and EHA111 to EHA123) were advanced for the purposes of environmental sampling to depths of up to 3.4 m bgl along EB2 and EB3.</li> <li>• 12 hand augured boreholes (locations HA1 to HA12) were advanced or environmental sampling to depths of up to 5 m bgl within Riverhills Park.</li> </ul>
Soil and sediment sample collection	<ul style="list-style-type: none"> <li>• During the advancement of the boreholes and hand augers, 135 soil samples were collected for potential laboratory analysis.</li> <li>• Field screening of select soil samples was completed with a photoionisation detector (PID) for VOCs.</li> <li>• Collection of two sediment samples adjacent to Ti Rakau Bridge.</li> <li>• Samples were placed directly into laboratory supplied containers and stored on ice in a chilled container while onsite and during transit to either Hill Laboratories Limited (Hills) or Analytica Laboratories Limited (Analytica).</li> <li>• Samples were transported to the laboratories under standard AECOM chain of custody (CoC) procedures.</li> <li>• To prevent cross contamination, a new pair of disposable nitrile gloves was used for each soil sample collected and the hand auger was decontaminated between each sample and between boreholes using a three-step process involving Decon90 and</li> </ul>

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Scope of Works Completed	Methodology
	<p>potable water.</p> <ul style="list-style-type: none"> <li>• Selected soil samples were analysed for a range of potential contaminants as detailed in <b>Table 5</b>.</li> <li>• The two sediment samples were analysed for heavy metals, TPH, PAHs and asbestos.</li> <li>• Spoil generated during the advancement of the works was reinstated at the completion of soil sampling.</li> </ul>

**Table 5 Soil Sample Analysis**

Analyte	No. of Samples Analysed
Heavy Metals	52
Total Petroleum Hydrocarbons (TPH)	22
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)	10
Polycyclic Aromatic Hydrocarbons (PAH) (other than as part of the SVOC suite)	10
Volatile Organic Compounds (VOC)	11
Semi-Volatile Organic Compounds (SVOC)	11
Pentachlorophenol (PCP)	1
Pesticides (other than as part of the SVOC suite)	3
Asbestos (screen for presence/absence of fibres)	16

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## 6.0 Intrusive Works Results

### 6.1 Field Observations

Key observations recorded as part of the environmental assessment are summarised below, with copies of borehole logs DH102 to DH109, EHA101 to EHA108, EHA111 to EHA123 and HA1 to HA12 provided in **Appendix D**. In summary:

- Aside from two investigation locations (DH108 and EHA101), where a gravel surface was present, observed surface coverings at the investigation locations comprised topsoil (generally comprising brown sandy silt).
- Fill (generally comprising reworked material) was encountered at the majority of locations (to a maximum depth of 3 m bgl). The exceptions to this were in the vicinity of the Pakuranga Highway/Ti Rakau Drive junction, adjacent to Ti Rakau Drive between Roseburn Place and Edgewater Drive, and adjacent to 279 Ti Rakau Drive, where clayey silt was recorded.
- At depth, silt (with varying components of sand and clay) was recorded at all investigation locations.
- No significant visual or olfactory evidence of contamination was recorded as part of this investigation.
- No refuse was observed in boreholes advanced across Riverhills Park.
- Groundwater was encountered in approximately half of the investigation locations. Groundwater was recorded at depths ranging from 0.7 to 3.3. m bgl. Refer to **Table 6** for a summary.
- Sediment samples collected from the Tamaki Strait adjacent to Ti Rakau Bridge comprised saturated brown/grey silty clay including the presence of rootlets.

**Table 6 Summary of Groundwater Level Recordings**

Environmental Assessment Location	Date Advanced	Recorded Groundwater Depth (metres below ground level)	Total Depth of Borehole (metres below ground level)
DH102	May 2018	2.2	2.2
DH103	May 2018	Not observed	2.0
DH104	May 2018	1.6	1.6
DH107	May 2018	Not observed	2.0
DH108	May 2018	Not observed	3.4
DH109	May 2018	Not observed	2.0
EHA101	August 2018	0.7	1.5
EHA102	August 2018	1.7	2.0
EHA103	August 2018	1.8	2.0
EHA104	August 2018	1.0	2.0
EHA105	August 2018	1.3	2.0
EHA106	August 2018	Not observed	2.8
EHA107	August 2018	1.6	2.0
EHA108	August 2018	3.3	3.4
EHA110	August 2018	1.9	2.0
EHA111	August 2018	Not observed	2.0
EHA112	August 2018	1.2	3.0

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Environmental Assessment Location	Date Advanced	Recorded Groundwater Depth (metres below ground level)	Total Depth of Borehole (metres below ground level)
EHA113	August 2018	Not observed	2.0
EHA114	August 2018	Not observed	1.6
EHA115	August 2018	Not observed	0.7
EHA116	August 2018	1.0	2.0
EHA117	August 2018	Not observed	2.8
EHA118	August 2018	Not observed	2.5
EHA119	August 2018	1.2	3.0
EHA120	August 2018	Not observed	2.0
EHA121	August 2018	Not observed	2.0
EHA122	August 2018	Not observed	1.5
EHA123	August 2018	1.2	2.0
HA1	February 2019	Not observed	3.0
HA2	February 2019	2.6	4.5
HA3	February 2019	Not observed	3.0
HA4	February 2019	Not observed	4.1
HA5	February 2019	2.1	3.0
HA6	February 2019	1.4	3.0
HA7	February 2019	Not observed	3.0
HA8	February 2019	2.5	3.0
HA9	February 2019	Not observed	3.0
HA10	February 2019	2.6	5.0
HA11	February 2019	2.5	4.2
HA12	February 2019	2.5	3.0

**6.2 Adopted Acceptance Criteria**

The adopted acceptance criteria for soil quality results have been adopted in accordance with the hierarchy defined by Ministry for the Environment Contaminated Land Management Guidelines No.2 (MfE, 2003, revised 2011) and are summarised below:

- Soil:
  - Resource Management Act (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations, 2011. Soil contaminant standards for commercial / industrial outdoor worker (unpaved) landuse scenario have been adopted allowing for exposure of workers during any ground disturbance activities associated with the proposed development. Hereinafter referred to as the **NES SCS**.
  - Auckland Council, 2017. Auckland Unitary Plan (Operative in Part) (AUPOiP). Reference Table E30.6.1.4.1 Permitted Activity Soil Acceptance Criteria. Hereinafter referred to as the **AC Permitted Activity Criteria**.
  - Auckland Council, 2017. AUPOiP. Reference Table E30.6.1.4.2 Background ranges of trace elements in Auckland soils sources from Table 3 of TP153:2001 Background Concentrations of Inorganic Elements in Soils from the Auckland Region. Background ranges for naturally

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occurring heavy metal concentrations in non-volcanic range soils were adopted. Hereinafter referred to as the **Auckland Background Concentrations**.

- MfE, 1999 (revised 2011). Guidelines for Assessing and Managing Petroleum Hydrocarbon contaminated Sites in New Zealand. Tier 1 soil acceptance criteria for petroleum hydrocarbon concentrations in soil under a commercial / industrial outdoor worker (unpaved) landuse scenario. Hereinafter referred to as the **Oil Industry Guidelines**.
- Sediment:
  - Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (updated 2018): Revised toxicant default guideline values for sediment quality (Table 1). Hereinafter referred to as the **Sediment Quality Guidelines (SQG) - Default Guideline Values (DGV) and Upper Guideline Values (UGV)**.

### 6.3 Analytical Results

Analytical results for heavy metals in shallow soils and the sediment sample results are summarised in **Table G1** and **Table G2** in **Appendix G**. TPH, BTEX, VOCs, SVOCs, PCP, pesticides and asbestos are not summarised in the tables as these analytes were not detected above the method detection limited (MDL) during laboratory analysis, or were only recorded at trace levels in a minimal number of locations. Full results however, are presented in the associate laboratory certificates (**Appendix H**). Key findings of the analysis of soil materials are summarised as follows:

- No exceedances of the NES SCS or AC Permitted Activity Criteria were recorded.
- A number of heavy metals were detected at concentrations exceeding Auckland Background Concentrations. A summary of these results is provided in **Table 7**.
- The presence of asbestos was not detected in any of the samples analysed.
- Organic compounds were only recorded at a concentration which exceeded the MDL in two of 62 samples analysed as part of this investigation.
  - One soil sample collected from 0.5 m bgl in EHA106 recorded a benzo(a)pyrene (BaP) toxic equivalency (TEQ) of 7.7 mg/kg. The recorded concentration did not exceed the adopted acceptance criteria.
  - One soil sample collected from 0.2 m bgl in HA9 recorded a minor detection of TPH of 62 mg/kg. The recorded concentration did not exceed the adopted acceptance criteria.
- One sediment sample (SEDIMENT 01) recorded lead, nickel and zinc at concentrations which marginally exceeded the SQG DGV whilst the other sediment sample (SEDIMENT 02) recorded zinc at concentrations which marginally exceeding the SQG DGV. Sediment sample SEDIMENT 01 also recorded TPH concentrations which marginally exceeded the SQG UGV.

**Table 7 Summary of Heavy Metals Results and Auckland Background Concentrations**

Analyte	No. of Samples Analysed	Auckland Background Concentration (Non-Volcanic Range) (mg/kg)	Recorded Concentration (mg/kg)			Number of Exceedances
			Minimum	Maximum	Average	
Arsenic	52	0.4 – 12	<2	6.48	2.57	0
Cadmium		<0.1 – 0.65	<0.10	0.6	0.06	0
Chromium		2 – 55	3.0	51.0	25.5	0
Copper		1 – 45	3.0	50.0	10.63	1
Lead		<5 – 65	4.8	103.0	14.11	2
Nickel		0.9 – 35	4.0	61.0	16.90	4
Zinc		9 – 180	5	157	32.24	0

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## 6.4 Quality Assurance and Quality Control

Refer to **Appendix E** for a summary of QA/QC procedures. The QA/QC procedures employed indicate that the reported analytical results are representative of shallow soil conditions at the sample locations and that the overall quality of the analytical data produced is acceptably reliable for the purpose of this investigation.

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## 7.0 Discussion

### 7.1 Conceptual Site Model

Based on the results of the investigation a basic CSM has been developed for the completion of land disturbance activities within the proposed transport improvement works area. In summary:

- The review of available information indicates that a HAIL activity or industry has more likely than not (historical), and is not currently being undertaken within the piece of land covered by this assessment (i.e., the proposed transport improvement works area).
- A soil sampling exercise was completed to provide a preliminary understanding of contaminant conditions along the length of the proposed transport improvement works area including the proposed temporary laydown area.
- Observed shallow soil conditions generally comprised fill (largely reworked material) at the majority of locations (to a maximum depth of 3 m bgl). The exceptions to this were in the vicinity of the Pakuranga Highway/Ti Rakau Drive junction, adjacent to Ti Rakau Drive between Roseburn Place and Edgewater Drive, and adjacent to 279 Ti Rakau Drive, where clayey silt was recorded. At depth, silt (with varying components of sand and clay) was recorded at all investigation locations.
- The results of the soil sampling programme completed as part of this assessment indicate that the disturbance of soil and sediment materials within the proposed transport improvement works area are unlikely to present a risk to human health or the environment during the works programme. No exposure pathways are considered to be complete. Importantly:
  - No exceedances of the NES SCS or AC Permitted Activity Criteria were recorded.
  - The presence of ACM was not detected in any of the samples analysed.

### 7.2 Regulatory Assessment (Contaminated Land)

#### 7.2.1 National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES)

This assessment concludes that the NES Soil does not apply (Regulation 5[9]) to land disturbance within the proposed transport improvement works area. No HAIL activities undertaken adjacent to or within the piece of land covered by this assessment have impacted soil quality within the proposed land disturbance areas in a sufficient quantity that could result in a risk to human health or the environment.

#### 7.2.2 Auckland Unitary Plan Operative in Part (AUPOiP)

This assessment concludes that the proposal meets the requirements of Permitted Activity Standard E30.6.1.4 and consent is not required. The results of the DSI have indicated that the concentration of contaminants in soil do not exceed the Permitted Activity Criteria.

### 7.3 Spoil Reuse and Disposal Recommendations

Spoil materials generated as part of land disturbance activities can be reused as required. However, it is anticipated that soil will need to be removed from the transport improvement works area. This soil should be disposed of at a licensed facility. With the contaminant concentrations detected being generally low, the soil could potentially be disposed of as cleanfill or managed fill; subject to meeting the disposal facility's consented waste acceptance criteria.

### 7.4 Site Management Planning

Although the potential risk of encountering significantly impacted soil materials during the proposed transport improvement works is considered low, it is appropriate that a Site Management Plan (SMP) be provided to the Contractor engaged to complete the physical works programme. The intent of this plan would be to provide guidance and procedures should unexpected soil contamination be encountered.

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# Appendix A

Figures



**Legend**

▲ Hand Auger Location



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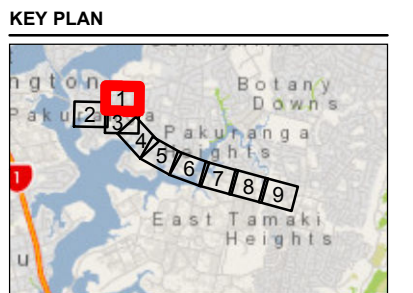
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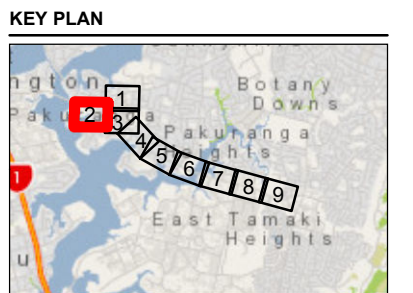
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 FIGURE 4B

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- Borehole Location

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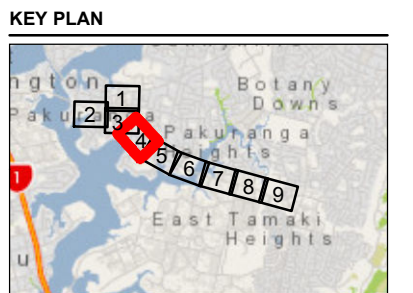
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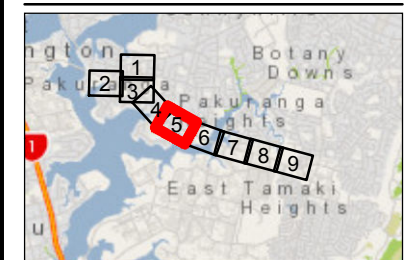
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FIGURE 4E

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Borehole Location

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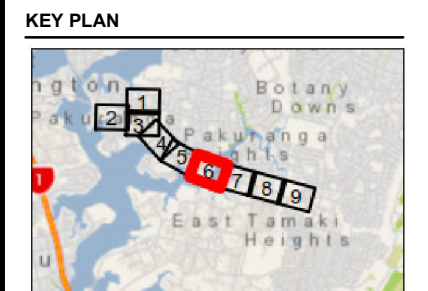
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 FIGURE 4F

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- Hand Auger Location
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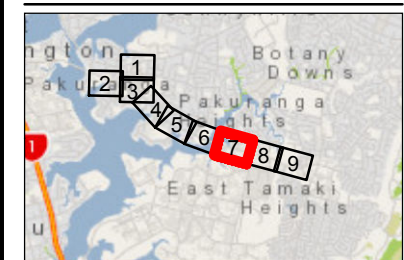
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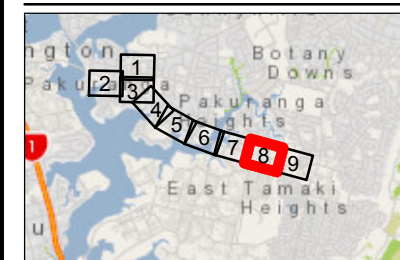
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FIGURE 4H

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- Hand Auger Location
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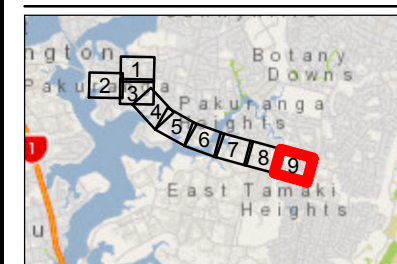
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 FIGURE 41

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- Hand Auger Location
- Borehole Location

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DRAFT

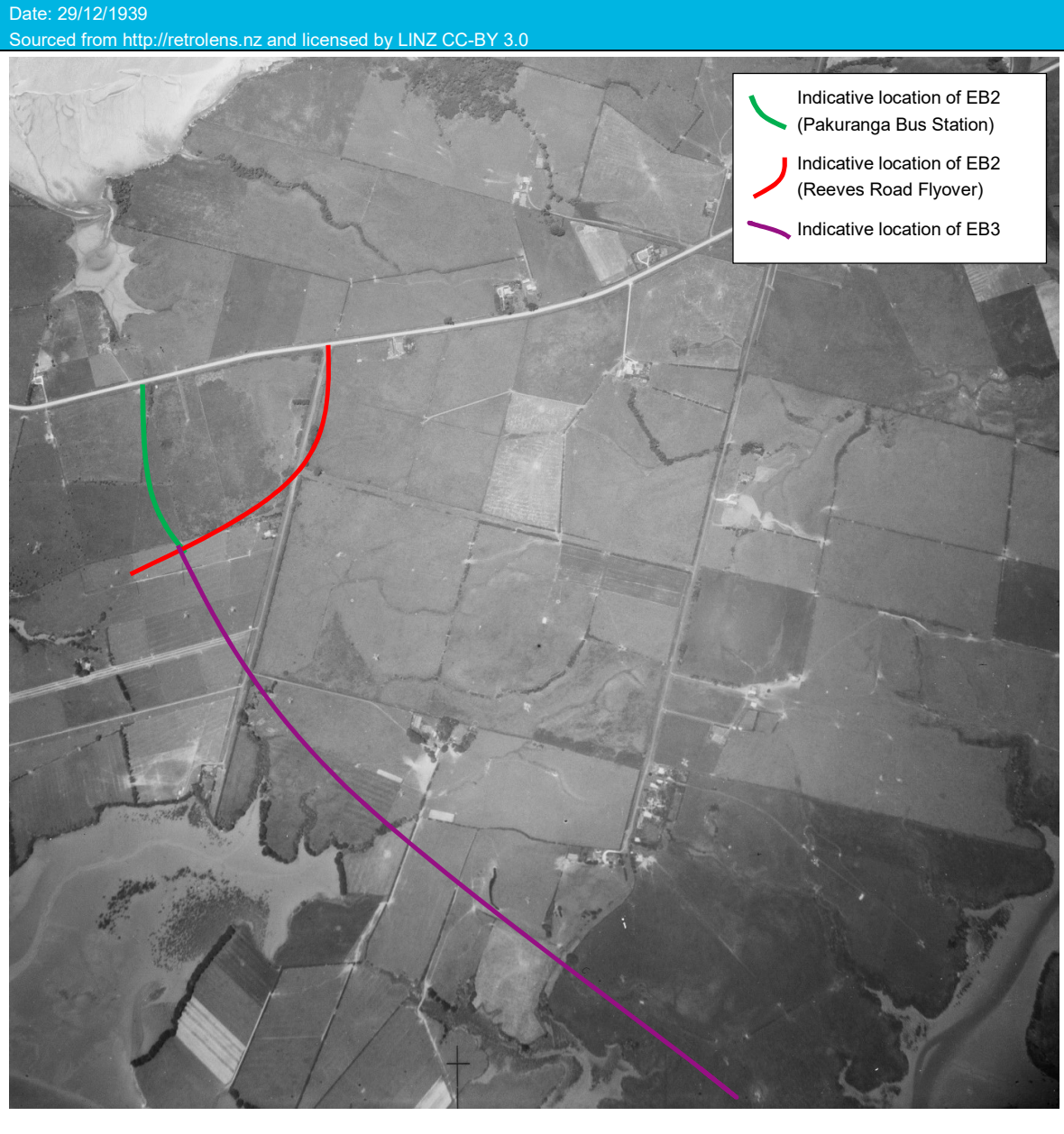
# Appendix B

## Aerial Photographs

# DRAFT

## Appendix B Aerial Photographs

### Package EB2 and EB3



# DRAFT

Date: 1940

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# DRAFT

Date: 14/04/1940

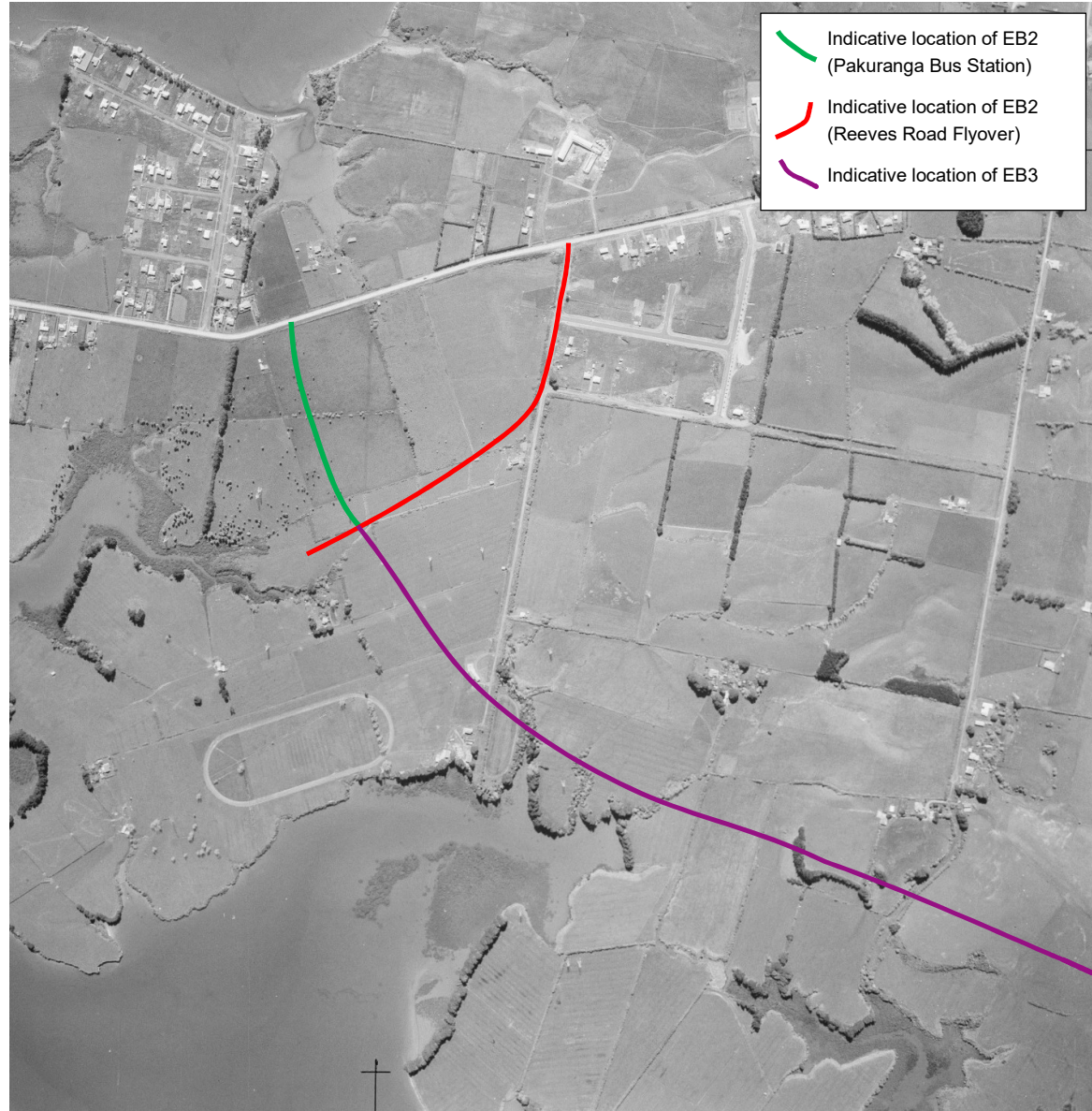
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# DRAFT

Date: 09/09/1955

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# DRAFT

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# DRAFT

Date: 1959

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# DRAFT

Date: 02/11/1961

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# DRAFT

Date: 02/11/1961  
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# DRAFT

Date: 28/09/1968

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# DRAFT

Date: 14/04/1972

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# DRAFT

Date: 28/04/1977

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# DRAFT

Date: 24/10/1980

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# DRAFT

Date: 04/07/1995

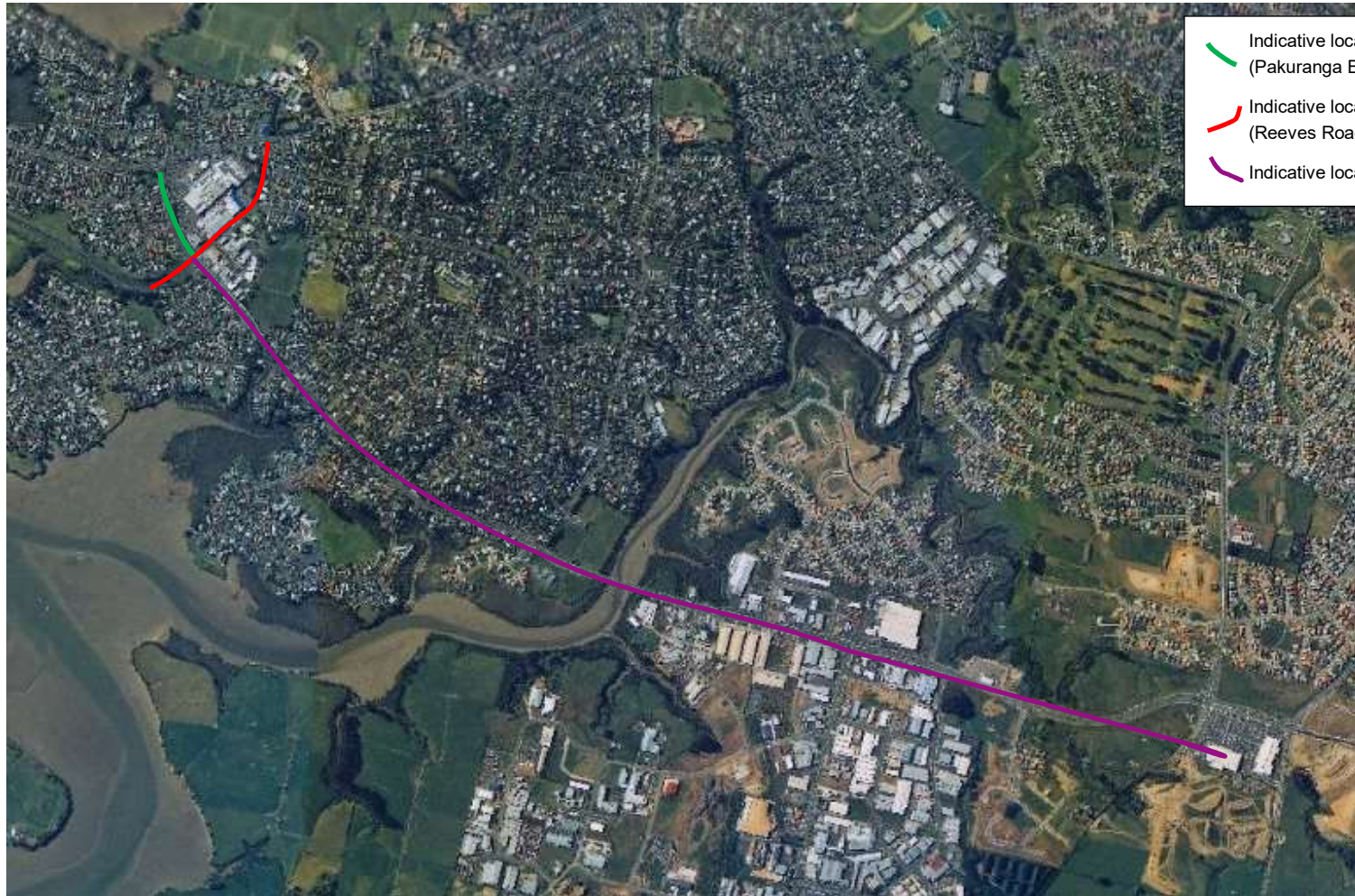
Sourced from <http://retrolens.nz> and licensed by LINZ CC-BY 3.0



# DRAFT

Date: 1996

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# DRAFT

Date: 2001

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# DRAFT

Date: 18/11/2003

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# DRAFT

Date: 2003/2004

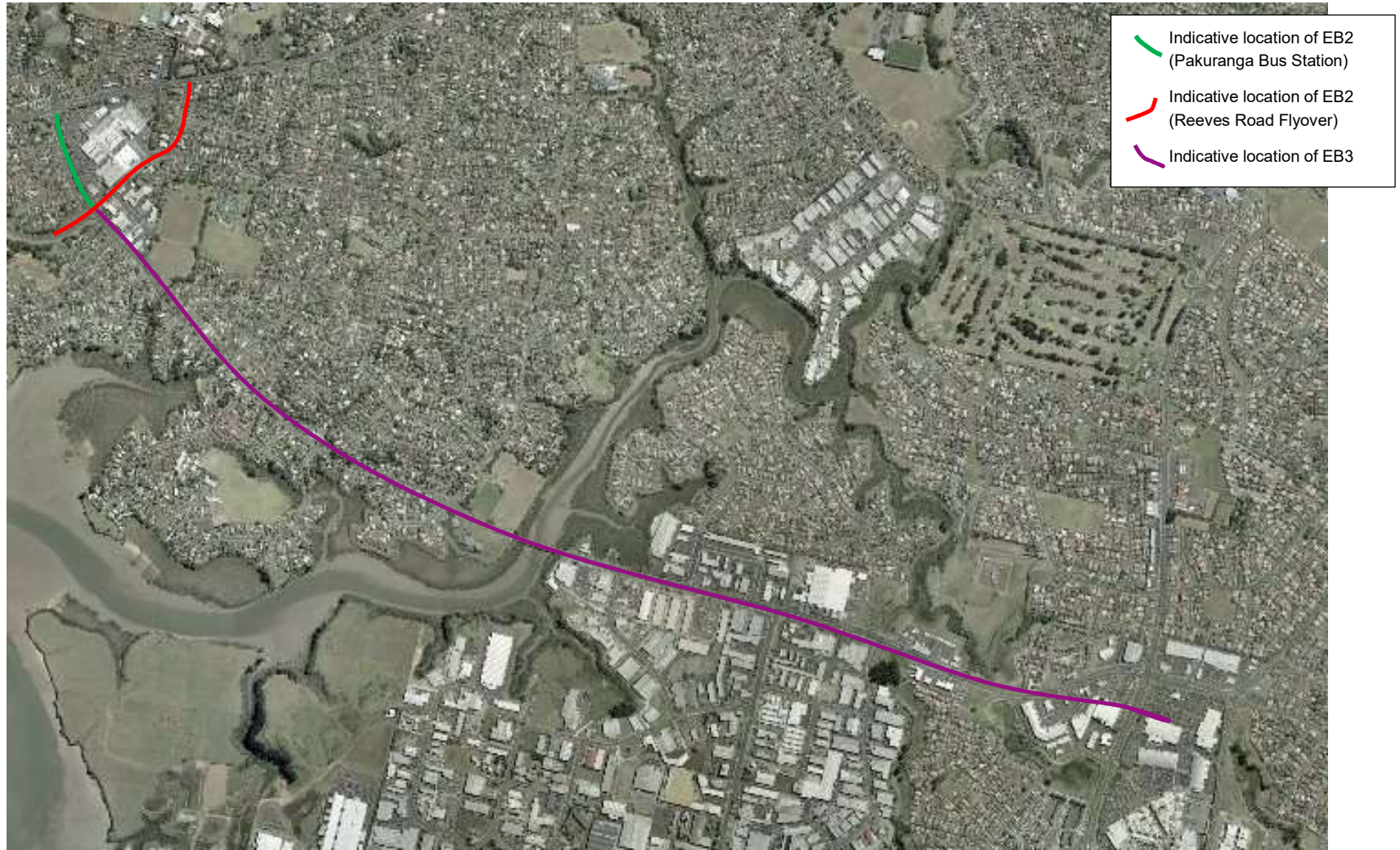
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# DRAFT

Date: 2006

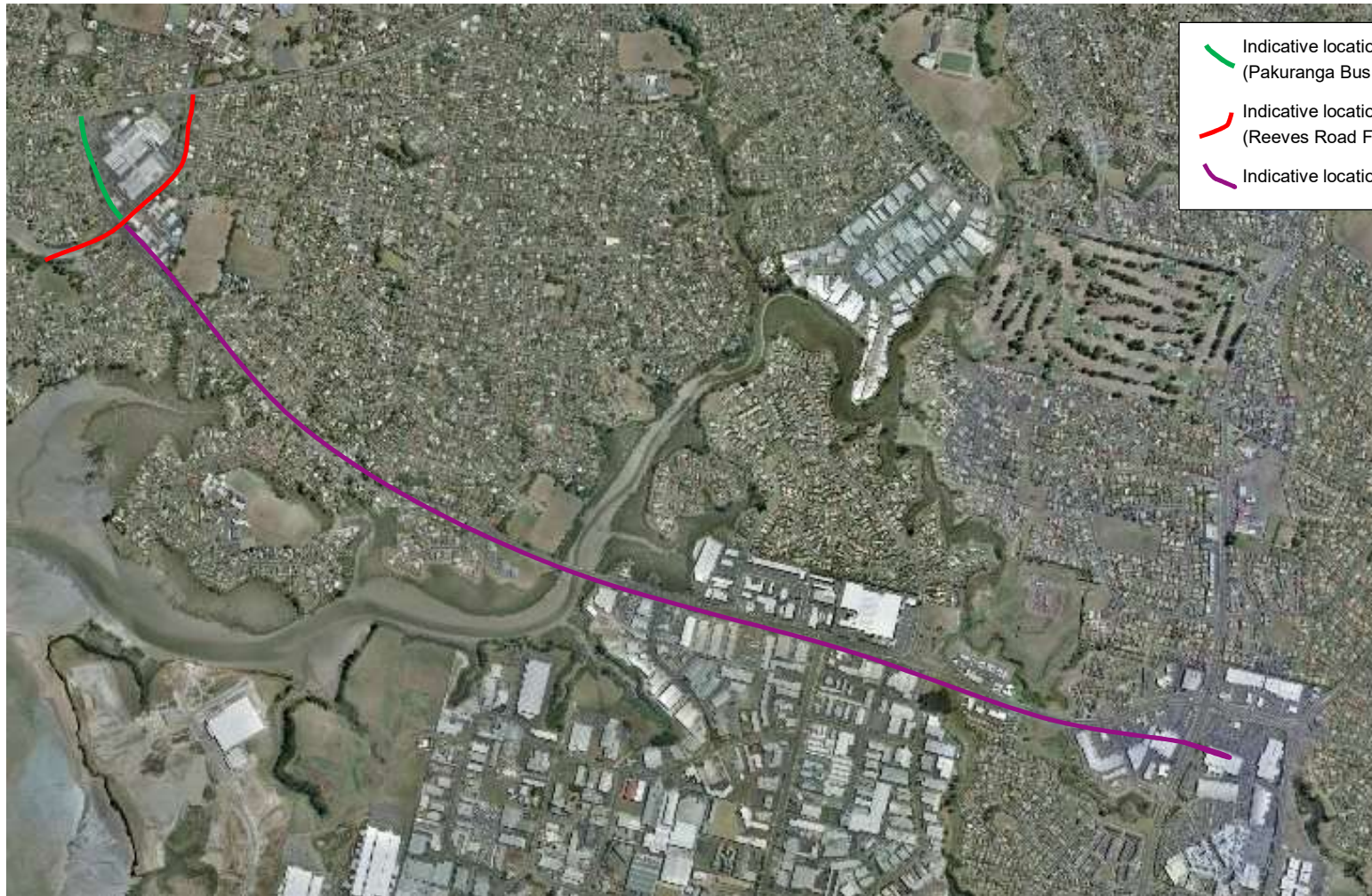
Sourced from <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html> and owned by / licensed to Auckland Council



# DRAFT

Date: 2008

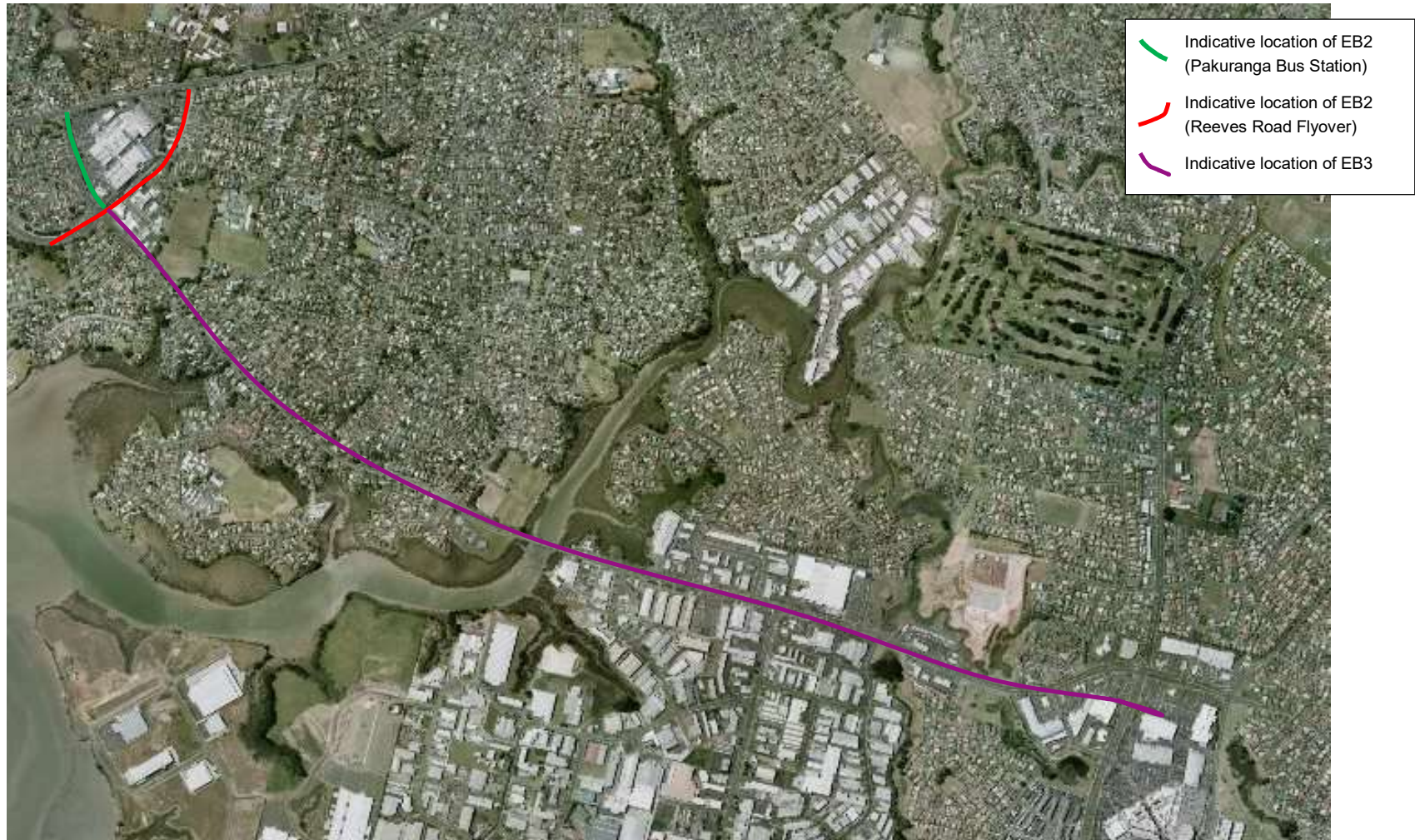
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# DRAFT

Date: 2010/2011

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# DRAFT

Date: 2015/2016

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# DRAFT

Date: 2017

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Date: 2018

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# DRAFT

## Riverhills Park

Reference	Photograph
<p><b>Date:</b> 1959</p> <p><b>Sourced from:</b> Auckland Council GeoMAPS</p> <p>(Red line is only an indication of the Site boundary)</p>	
<p><b>Date:</b> 1996</p> <p><b>Sourced from:</b> Auckland Council GeoMAPS</p> <p>(Red line is only an indication of the Site boundary)</p>	
<p><b>Date:</b> 2001</p> <p><b>Sourced from:</b> Auckland Council GeoMAPS</p> <p>(Red line is only an indication of the Site boundary)</p>	

# DRAFT

Reference	Photograph
<p><b>Date:</b> 2006</p> <p><b>Sourced from:</b> Auckland Council GeoMAPS</p> <p>(Red line is only an indication of the Site boundary)</p>	
<p><b>Date:</b> 2008</p> <p><b>Sourced from:</b> Auckland Council GeoMAPS</p> <p>(Red line is only an indication of the Site boundary)</p>	
<p><b>Date:</b> 2017</p> <p><b>Sourced from:</b> Auckland Council GeoMAPS</p> <p>(Red line is only an indication of the Site boundary)</p>	