

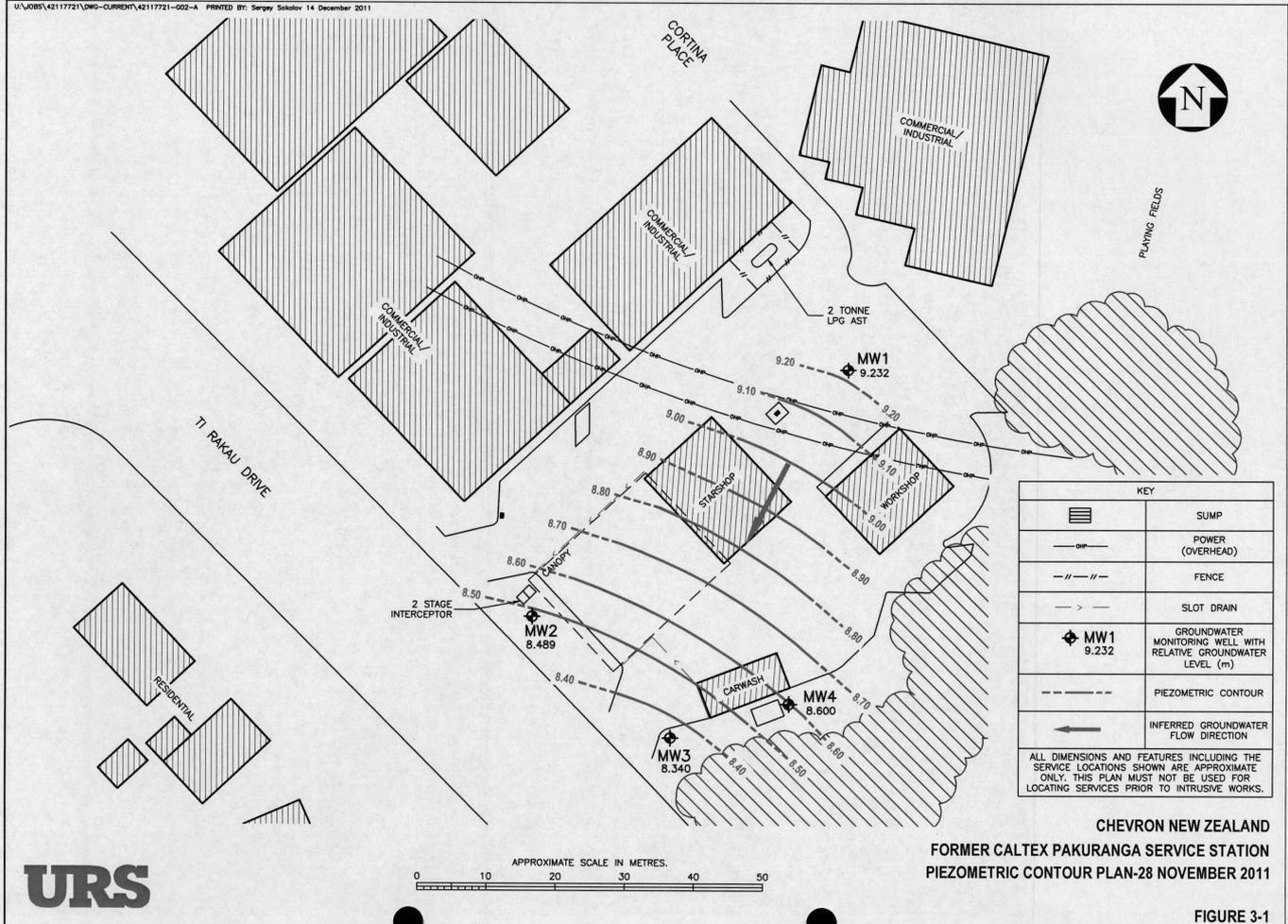
Appendix C

# Soil and Groundwater Results Tables



Appendix D

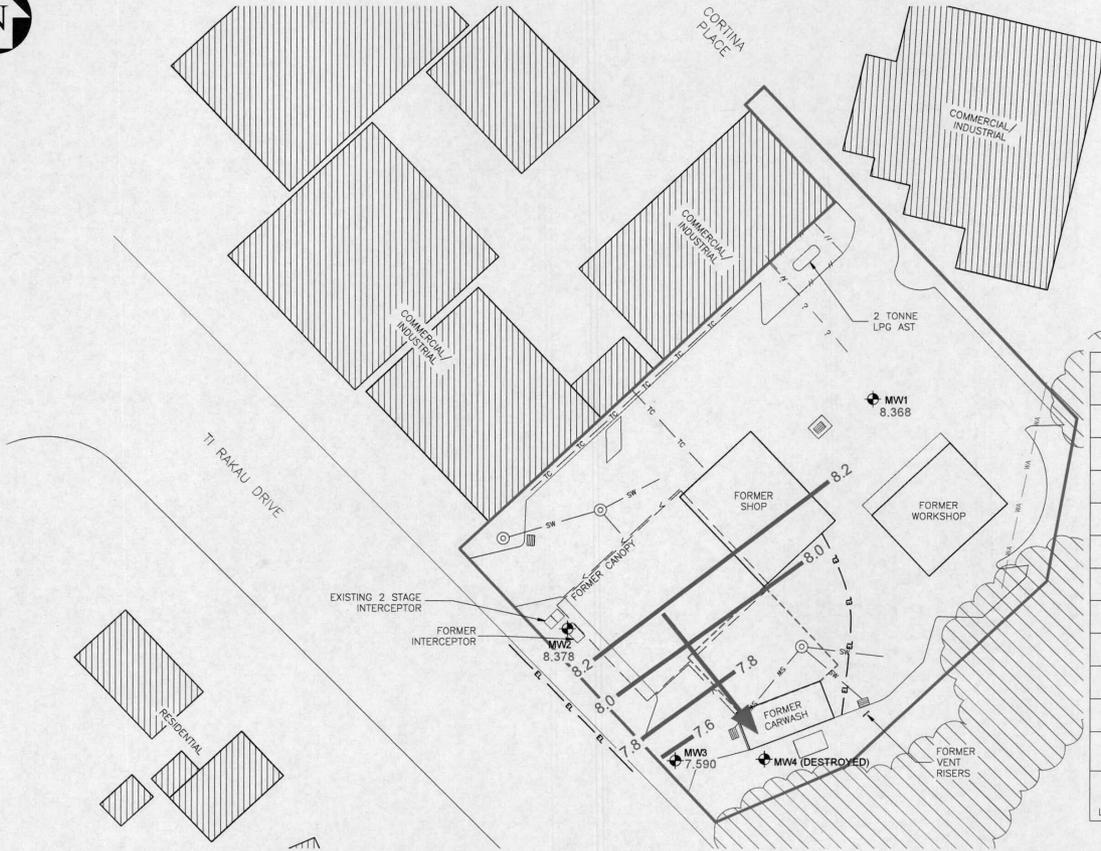
# Groundwater Contour Plans



KEY	
	SUMP
	POWER (OVERHEAD)
	FENCE
	SLOT DRAIN
	GROUNDWATER MONITORING WELL WITH RELATIVE GROUNDWATER LEVEL (m)
	PIEZOMETRIC CONTOUR
	INFERRED GROUNDWATER FLOW DIRECTION
ALL DIMENSIONS AND FEATURES INCLUDING THE SERVICE LOCATIONS SHOWN ARE APPROXIMATE ONLY. THIS PLAN MUST NOT BE USED FOR LOCATING SERVICES PRIOR TO INTRUSIVE WORKS.	

**CHEVRON NEW ZEALAND**  
**FORMER CALTEX PAKURANGA SERVICE STATION**  
**PIEZOMETRIC CONTOUR PLAN-28 NOVEMBER 2011**

**FIGURE 3-1**



KEY	
	SITE BOUNDARY
	FORMER TANK PIT
	SUMP
	FENCE
	SLOT DRAIN
	POWER LINE
	STORMWATER
	TELECOM
	WATER MAIN
	UNKNOWN SERVICE
	GROUNDWATER CONTOURS
	INTERPRETED GROUNDWATER FLOW DIRECTION

ALL DIMENSIONS AND FEATURES INCLUDING THE SERVICE LOCATIONS SHOWN ARE APPROXIMATE ONLY. THIS PLAN MUST NOT BE USED FOR LOCATING SERVICES PRIOR TO INTRUSIVE WORKS.



Printed: 1:27 pm, File Path: U:\bids\00110\DWG\Contour Draft By: Sengy Salaby  
 This drawing is subject to contract

Source:  
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Appendix E

# Auckland Transport Letter of Authorisation

## Walker, Andrew (Auckland)

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**From:** Walker, Andrew (Auckland)  
**Sent:** Thursday, 18 February 2016 3:58 p.m.  
**To:** 'Nick Wilson'; Coombe, Richard  
**Cc:** Payne, Jonathan; Parmar, Yasmin; Wells, Ned; Philip Hollings (AT)  
**Subject:** RE: Former Caltex Pakuranga/Auckland Transport - Ti Rakau Drive proposed excavation plan

Hi Nick –

Further to the below, we are submitting a resource consent application to undertake the proposed remedial works at the Caltex Pakuranga site tomorrow. To support our application and confirm the support of the intended works by Auckland Transport. Could we please get a letter from Auckland Transport confirming access to the property for the purposes of undertaking the proposed remedial works by way of excavation.

The scale of the works remain the same as initially communicated in the proposed excavation to Auckland Transport in October 2015.

If you have any questions, please don't hesitate to give me a call.

Regards,

**Andrew Walker**  
Principal Environmental Scientist  
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---

**From:** Nick Wilson [<mailto:Nick.Wilson@simpsongrierson.com>]  
**Sent:** Thursday, 8 October 2015 8:04 a.m.  
**To:** Coombe, Richard  
**Cc:** Walker, Andrew (Auckland); Payne, Jonathan; Mel Easton ([mel.easton@buddlefindlay.com](mailto:mel.easton@buddlefindlay.com)); Parmar, Yasmin; Wells, Ned; Philip Hollings (AT)  
**Subject:** RE: Former Caltex Pakuranga/Auckland Transport - Ti Rakau Drive proposed excavation plan

Hi Richard,

As discussed with Andrew Walker yesterday, our client has reviewed your letter and has confirmed it is happy with the proposal.

Please advise if you need any assistance with access. Our client understands the property may now be fenced.

Otherwise, it would also be grateful if you could keep it informed as to progress of the works and the likely completion date.

Regards

Nick

---

**From:** Coombe, Richard  
**Sent:** 17/09/2015 10:46 a.m.  
**To:** Nick Wilson  
**Cc:** Walker, Andrew (Auckland); Payne, Jonathan; Mel Easton (mel.easton@buddlefindlay.com); Parmar, Yasmin; Wells, Ned  
**Subject:** Former Caltex Pakuranga/Auckland Transport - Ti Rakau Drive proposed excavation plan

Hello Nick

I understand that you are acting on behalf of Auckland Transport in relation to Chevron's obligations to undertake remediation on the subject site.

Please find attached AECOMS letter and Figure 1 setting out the proposed actions on the site

**Richard Coombe**  
Associate Director - Environment  
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## Appendix F

# Conceptual Site Model

16<sup>th</sup> November 2015

Chevron EMC  
PO Box 684, Shortland Street,  
Auckland, 1140,  
New Zealand

Dear Jon Payne

### **Former Caltex Pakuranga - Conceptual Site Model**

#### **1.0 Introduction**

AECOM New Zealand Limited (AECOM) is pleased to present Chevron EMC (Chevron) with the following document detailing the expected Conceptual Site Model (CSM) for the former Caltex Pakuranga Service Station, located on Ti Rakau Drive, Auckland (the site).

The purpose of this CSM is to provide a description of the expected distribution of residual hydrocarbon impact resulting from the migration of petroleum hydrocarbons immediately beyond the boundary of the site into below the Ti Rakau Road carriageway.

The CSM is supported by two cross sections of the site, detailing the expected distribution of hydrocarbon impact, as well as a site plan (**Figure 1**) showing the location of the respective cross sections.

#### **2.0 Preamble**

Chevron plan to undertake a remedial excavation at the site with view to removing hydrocarbon impacts in soil above Tier 1 commercial and industrial (C&I) land-use criteria as specified in the Ministry for the Environment (MfE) 1999 Guidelines<sup>1</sup>.

The remediation is planned on the premise that once soils below the site meet C&I Tier 1 acceptance criteria, residual impacts beneath Ti Rakau drive will be minimal and if undisturbed will not pose a significant risk to environmental and human receptors. Therefore, in the event that disturbance of soils underlying the Ti Rakau road carriageway is required, a Site Management Plan (SMP) will be sufficient to manage the risks associated with such temporary activities.

#### **3.0 Conceptual Distribution of Contamination within the Site**

With the exception of the former underground petroleum storage system (UPSS) tank pit which housed the underground storage tanks (UST), the distribution of hydrocarbon contamination appears to be restricted to the previous UPSS foot-print, including the ancillary stormwater management infrastructure.

The former forecourt has benchmarked hydrocarbon impacts to depths between 1.2 and 1.7 meters below ground level (mbgl) in sand material (likely bedding / construction material), although the vertical extent of impact into the underlying natural silty clay is not fully defined. Samples taken from walls of the tank pit next to the forecourt indicate hydrocarbon impacts below C&I soil acceptance criteria at depths of 2.5 to 3.0 mbgl. Given the low permeability of the underlying natural silty clay geology, and the relatively shallow depth to groundwater (1.5 mbgl), it is unlikely that hydrocarbon impacts beneath the forecourt will have penetrated significantly into the underlying natural geology. This will be verified during the remedial excavation.

The remaining hydrocarbon impacts between depths of 1.2 and 2.4 mbgl are present along the Ti Rakau Drive frontage, associated with former stormwater interceptor (now removed) and ancillary connections. This impacted material within the site will also be removed during the remedial excavation, with soil benchmarking planned along the Ti Rakau Drive frontage of the site and around removed stormwater infrastructure.

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<sup>1</sup> Ministry for the Environment, 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (Revised 2011).

**4.0 Conceptual Site Model From Beyond Boundary**

The CSM associated with the Ti Rakau Drive frontage and the surrounding area has been developed based on soil and groundwater sampling data, measured infrastructure inverts, groundwater levels and field observations recorded during the decommissioning of the UPSS at the site.

Two CSM cross sections have been prepared showing the distribution of current hydrocarbon impact, namely:

- Cross section A–A' orientated northeast to southwest and perpendicular to Ti Rakau Drive.
- Cross section B–B' southeast to northwest and parallel to the site frontage and Ti Rakau Drive.

**4.1 Cross section A–A'**

The A–A' cross section shows the expected distribution of hydrocarbons in the sub-surface along the north western boundary of the site.

The cross section also shows groundwater present within the underlying natural silty clay geology which is expected to partially inhibit vertical migration of hydrocarbons owing to its low permeability properties.

Soil sampling from the various phases of investigation at the site indicate that hydrocarbon impacts are present between 1.2 to 2.4 mbgl along the site frontage with Ti Rakau Drive. These soil samples were taken in areas immediately associated with a former stormwater interceptor system. It is inferred that hydrocarbon impact has preferentially migrated and settled along the more permeable bedding material associated with the interceptor pipe-work and sub-surface structures. The impacts are expected to have settled in close proximity to the infrastructure rather than having penetrated significantly into the underlying silty clay geology.

It is noted that this impacted material within the site will be largely removed during the planned remedial excavation works and residual impacts beyond site boundary are expected to be minimal due to the low permeability of the surrounding of natural silty clay geology.

**4.2 Cross section B–B'**

The principles affecting the distribution of hydrocarbon impacts in cross section A–A' are also reflected in cross section B–B'. Hydrocarbon impacts associated with the stormwater system are inferred to have migrated preferentially along the bedding material surrounding the stormwater pipework, towards Manhole 4 at the corner of the site and then towards Manhole 5, located off-site. This distribution of impact is also evidenced by low level readings for volatile organics of between 1 and 5 ppm on a photo-ionisation detector (PID) within the stormwater chamber of Manhole 4. Readings in Manhole 5 were <1ppm.

Residual impacts around the stormwater system with the site will be removed during the planned remedial excavation, with the remaining impact present in soils immediately surrounding the stormwater infrastructure between Manhole 4 and Manhole 5 beneath the Ti Rakau Drive foot-path.

**5.0 Potential Receptors and Exposure Pathways**

Potential receptors considered in this CSM comprise the following:

- Maintenance and Excavation Workers in Ti Rakau Drive carriageway.
- Occupants of neighbouring commercial property.
- Occupants of residential properties across Ti Rakau Drive carriageway.

The table below provides a summary of the receptors and potential exposure pathways.

Exposure Pathway and Receptor	CSM Consideration
The main exposure pathway to <b>Maintenance and Excavation workers</b> in the Ti Rakau Drive carriageway is dermal contact with soil and/or inhalation of soil vapours within an excavation.	These exposure pathways are considered intermittent, present only during road excavation works and can be managed through institutional controls such as a SMP  Auckland Transport will be provided with a copy of the SMP for future reference.

Exposure Pathway and Receptor	CSM Consideration
<p>The main exposure route for occupants of the <b>neighbouring commercial property</b> is in-door air inhalation of vapours within the building.</p>	<p>For this exposure pathway to be complete, vapours would need to be of sufficient concentration to migrate preferentially along the stormwater connection into the building.</p> <p>Validation of hydrocarbon impact around the stormwater system at the site boundary will be undertaken during the remedial excavation. An assessment of whether the in-door air vapour pathway warrants further investigation will be undertaken at that time. It is noted that no complaints of hydrocarbon nuisance or odour have been reported from the neighbouring commercial property.</p> <p>The stormwater network services collect run-off from the building roof and hard surface areas and is not expected to have a direct connection into the building. Waste water and sewage connections from the building connect to infrastructure in Cortina Place on the opposite side of the property.</p>
	<p>Hydrocarbon impacts are present in soils within the site from 0.7 mbgl in the vicinity of the neighbouring commercial building. The concentrations in soil are below the respective MfE Tier 1 guideline for in-door air inhalation.</p> <p>This soil will be removed during the planned remedial excavation, with soil validation samples submitted for laboratory analysis. Further review of the potential risk from soil vapour will be undertaken during and following completion of the remedial exercise.</p>
<p>The main exposure routes for exposure to occupiers of <b>residential buildings</b> across the Ti Rakau Drive carriageway are in-door air inhalation of vapours and/or ingestion of impacted groundwater used for drinking.</p>	<p>Given the low permeability of the underlying strata and distance of these residents from the site (approx. 30 metres), hydrocarbon impacts at this distance from the site are expected to be minimal and unlikely to pose a potential vapour intrusion risk to respective occupants.</p> <p>Regarding use of groundwater for use as drinking water, this is considered to be unlikely as the area is highly urbanised and on reticulated water supply.</p> <p>A search of registered bores within a 500 m radius of the site did not indicate any bores used for drinking water purposes. Bores present on the register were for geotechnical purposes only.</p> <p>Due to the low permeability of the underlying strata, the shallow aquifer in the area is not considered a viable resource for groundwater abstraction.</p>

**6.0 CSM Findings and Implementation of SMP**

The CSM suggests that following the completion of remedial excavation works, residual hydrocarbon impacts remaining below the site, under the Ti Rakau Drive carriageway and the below the neighbouring commercial site, are expected to be minimal and unlikely to pose any significant risk to the environment and/or human health. It is expected that the use of institutional controls such as a SMP, will be appropriate for on-going management of residual impacts.

As further soil validation data will be gathered during the planned remedial excavation, the SMP will be finalised upon completion of the remedial works.

## 7.0 Closure

We trust the above CSM and guidance meets your requirements. Please contact the undersigned should you require any further information.

Yours faithfully



Andrew Walker  
Principal  
Remediation Services

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## 8.0 Limitations

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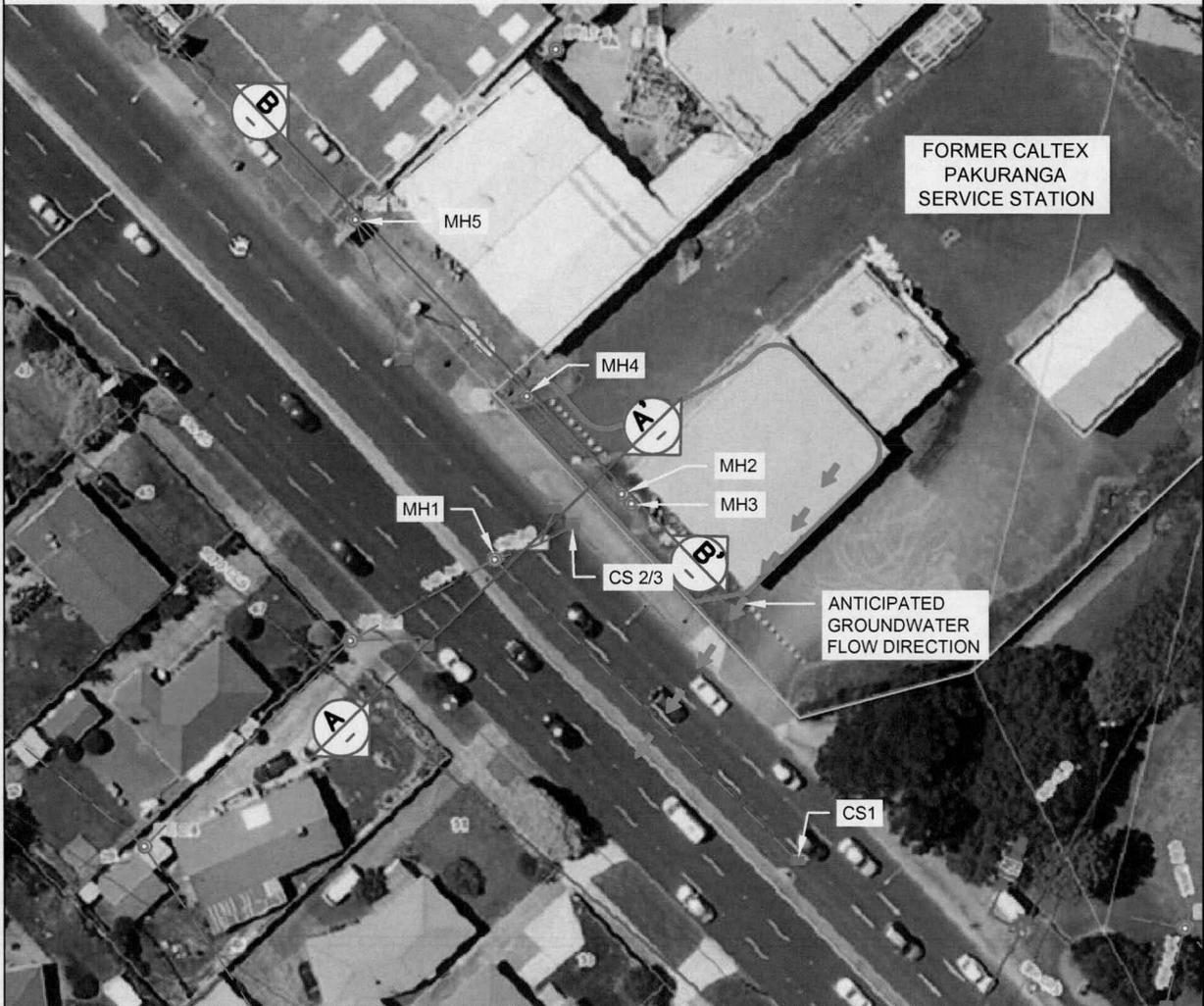
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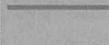
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MAP SOURCE: AUCKLAND COUNCIL GIS

**LEGEND:**

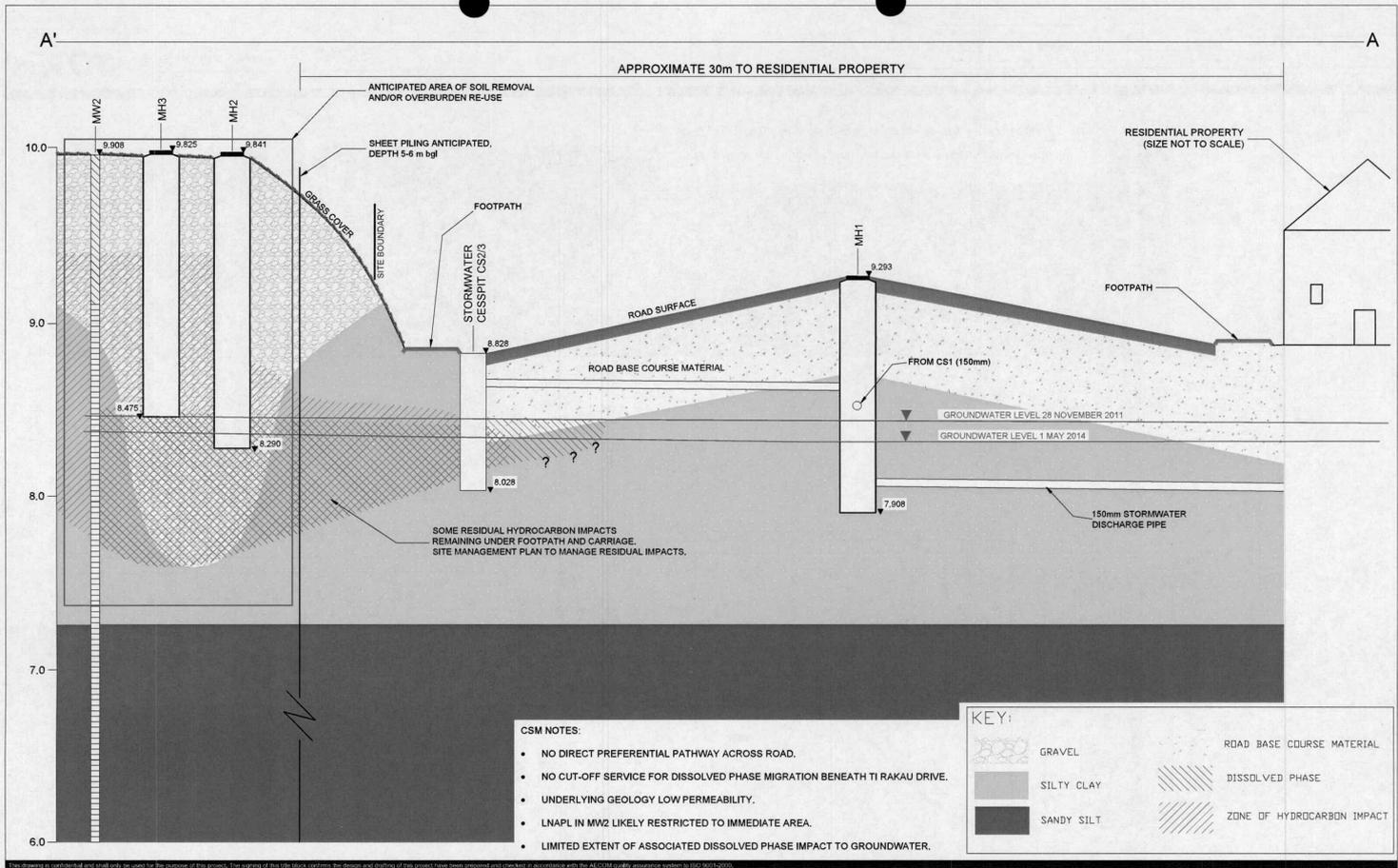
-  CONCEPTUAL CROSS SECTION
-  SITE BOUNDARY
-  ANTICIPATED EXTENT OF REMEDIAL EXCAVATION
-  MH
-  ANTICIPATED GROUNDWATER FLOW DIRECTION

### FORMER CALTEX PAKURANGA SERVICE STATION CROSS SECTION ORIENTATION PLAN



Figure 1

**Attachment 1 – Cross sections A–A' and B–B'**



- CSM NOTES:**
- NO DIRECT PREFERENTIAL PATHWAY ACROSS ROAD.
  - NO CUT-OFF SERVICE FOR DISSOLVED PHASE MIGRATION BENEATH TI RAKAU DRIVE.
  - UNDERLYING GEOLOGY LOW PERMEABILITY.
  - LNAPL IN MW2 LIKELY RESTRICTED TO IMMEDIATE AREA.
  - LIMITED EXTENT OF ASSOCIATED DISSOLVED PHASE IMPACT TO GROUNDWATER.

**KEY:**

	GRAVEL		ROAD BASE COURSE MATERIAL
	SILTY CLAY		DISSOLVED PHASE
	SANDY SILT		ZONE OF HYDROCARBON IMPACT

**AECOM**  
 CONSULTANT  
 AECOM Consulting Services (NZ) Limited  
 www.aecom.com

**PROJECT**  
 FORMER CALTEX PAKURANGA SERVICE STATION

**CLIENT**  
 CHEVRON NEW ZEALAND

<b>REGISTRATION</b>			<b>PROJECT MANAGEMENT INITIALS</b>			<b>ISSUE/REVISION</b>			<b>PROJECT NUMBER</b>		
DESIGNER	CHECKED	APPROVED							60435537	<b>SHEET TITLE</b>	
<b>PROJECT DATA</b>									CROSS SECTION A-A'		
DATUM	SURVEY										
IR	DATE	DESCRIPTION							<b>SHEET NUMBER</b>		



Parent: 1	Holding Number	Legal Description	Parcel Status	Parcel Type	Lot Size	Primary Address	Account Number	Valuation number	Account Status	Property Reference No.	Flat	House Number	Street Name	Suburb	Ward	Building Consents	Resource Consents
1	906611	ALL OT 321 SO 44272 PAKURANGA PSH & LOT 5 DP 5363	HISTORY	AMALG	0.4047	11 CORTINA PL PAKURANGA PAKURANGA	60306452	3533017100	VOID	9066/11		11	CORTINA PL	PAKURANGA	PAKURANGA	0	2

Selected Parcel	Holding Number	Legal Description	Parcel Status	Parcel Type	Lot Size	Primary Address	Account Number	Valuation number	Account Status	Property Reference No	Flat	House Number	Street Name	Suburb	Ward	Building Consents	Resource Consents
	H220972	SEC 4 SO 468793	LIVE	PARCEL	0.3112	11 CORTINA PL PAKURANGA PAKURANGA	6200216	3533017100	ACTIVE	9066/11		11	CORTINA PL	PAKURANGA	PAKURANGA	11	3

Name Description	Area	Measure	MSC	Proposed Plan
BUSINESS 4	0.3112	HA	73	2A

First Name	Last Name	Address	City	State
	AUCKLAND	PRIVATE BAG 92320	VICTORIA	AUCKLAND
	TRANSPORT	STREET WEST		

Children: 0	Holding Number	Legal Description	Parcel Status	Parcel Type	Lot Size	Primary Address	Account Number	Account Status	Property Reference No	Flat	House Number	Street Name	Suburb	Ward	Building Consents	Resource Consent
-------------	----------------	-------------------	---------------	-------------	----------	-----------------	----------------	----------------	-----------------------	------	--------------	-------------	--------	------	-------------------	------------------

Proposal Number	File No Number	Address	Applicant Name	Agent Name	Accepted Date	Decision Date	Decision Notified On	MC Collection Date	Description	Activity Description	Consent Type	Notified Flag	Officer	Decision	223 Received Date	223 Completed Date	224 Received Date	224 Completed Date
9532	9066/11	11 Cortina Pl Pakuranga 2010	CALTEX SERVICE STATION	CAL TEX OIL NZ LTD	12/06/1997	04/07/1997	26/07/1997		REDEVELOPMENT OF EXIST CALTEX SERVICE STATION & SIGNS	Restricted Dis.	Land Use	N	Robert Chan	Granted				
38376	9066/11	11 Cortina Pl Pakuranga 2010	CHEVRON NEW ZEALAND LTD	URS NEW ZEALAND LTD	12/01/2010	19/01/2010	19/01/2010	18/02/2010	EARTHWORKS IN ASSOCIATION WITH REMOVAL OF UNDERGROUND PETROLEUM TANKS.	Restricted Dis.	Land Use	N	John Newcome	Granted				
45016	9066/11	11 Cortina Pl Pakuranga 2010	PENTUM LIMITED	BENTLEY & CO. LIMITED	04/08/2014	18/08/2014			PRE-APP - NEW HEALTHCARE FACILITY ON EX-SERVICE STATION SITE INVOLVING REDEVELOPMENT OF CONTAMINATED SITE AND LIKELY CAR PARKING SHORTFALL. SITE LOCATED ON CORNER OF NEW ROAD - PART OF THE AMETI PROJECT.	Unknown	Pre Application	N	Scott Cheng	Not Recorded				

File Number	Holding Number	Address	11	Sub House	House	Street Name	Street Type	Suburb	Ward	Consent application details	Estimated Value	Received Date	Consent issued date	CCC Date	Work Type description	Work Description	Zone Type description	IRM Status	Bag Type description	
20101286	H220972	11 CORTINA PL PAKURANGA 2010			11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	Removal of existing SEP unit & 2 chamber interceptors. Exhrg basic lines (spigot & sealed)	3000	24/05/2010	18/06/2010	18/12/2011	Demolitions	Other	Commercial	CCC Issued 19/12/2011	Minor Commercial/Industrial Consent (Bus)	
695	H220972	11 CORTINA PL PAKURANGA 2010			11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	INSTALL NEW Y JUNCTION STORMWATER DRAIN	0	15/07/2014	12/06/1985		New	Drainage	Commercial	Building Permit	Paper Permits	
906811	H220972	11 CORTINA PL PAKURANGA 2010			11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	PORCH AREA	0	15/07/2014	25/06/1988		Additions / Alterations	Other	Commercial	Building Permit	Paper Permits	
920185	H220972	11 CORTINA PL PAKURANGA 2010			11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	DEMOLISH PART OF EXISTING BUILDING AND CONVERT REMAINDER INTO WORKSHOP AT CALTEX SERVICE STATION	50000	05/11/1992	30/11/1992		New	Commercial Buildings	Industrial	Commercial	CCC not issued	Commercial and Industrial
962814	H220972	11 CORTINA PL PAKURANGA 2010			11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	BACKFLOW PREVENTER FOR CAR WASH	200	20/05/1996	20/05/1996	12/06/1996	Additions / Alterations	Commercial Buildings	Commercial	CCC Issued 12/06/1996	Commercial and Industrial	
973166	H220972	11 CORTINA PL PAKURANGA 2010			11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	INTERNAL ALTERATIONS TO SERVICE STATION NEW CANDOPY PUMP ISLAND & NEW SIGNAGE AMEND S REC 25.08.97 INCREASE OF AREA TO OFFICE MOVE WALL, TEMP BAG C/O/D/A FEES C/WING 168.00 UPL#FTED 18.09.97 REC NO 27883	175000	11/07/1997	20/08/1997		Additions / Alterations	Commercial Buildings	Commercial	CCC not issued	Commercial and Industrial	
973166A1	H220972	11 CORTINA PL PAKURANGA 2010			11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	AMENDS REC 25.08.97 INCREASE OF AREA TO OFFICE MOVE WALL, TEMP BAG C/O/D/A	175000	11/07/1997	20/08/1997		Additions / Alterations	Commercial Buildings	Commercial	CCC not issued	Commercial and Industrial	
C019296	H220972	11 CORTINA PL PAKURANGA 2010			11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	OFFICES (AGE OF ORIGINAL BUILDING UNKNOWN)	0	15/07/2014	18/02/1985		New	Offices	Commercial	Building Permit	Paper Permits	

H202386	H220972	11 CORTINA PL PAKURANGA 2010	11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	KINDERGARTEN ALTERATIONS	0	15/07/2014	22/08/1990	Additions / Alterations	Other	Commercial	Building Permit	Paper Permits
J30179	H220972	11 CORTINA PL PAKURANGA 2010	11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	DEMOLITION	0	15/07/2014	18/12/1991	Demolitions	Other	Commercial	Building Permit	Paper Permits
R7872	H220972	11 CORTINA PL PAKURANGA 2010	11	CORTINA	PL	PAKURANGA	WARD PAKURANGA	SERVICE STATION - GROUND FLOOR 174 MC, OUTBUILDINGS 665 M2	0	19/06/2010	21/02/1992	New	Commercial Buildings	Miscellaneous	Building Permit	Paper Permits

LIR	Export To LIR Print Template	Title	Register
LIR Number	Comments		
LIR_00029709	REFER TO PUBLIC HEALTH INSPECTORS (MR N BEASER) INTER OFFICE MEMO ON FILE F01 DATED 10/12/85. SUGGESTED REQUIREMENT IS THAT ANY BUILDING CONSTRUCTION OR EXCAVATION WITHIN 2.0 METRES OF MCC 300mm WATERMAIN BE REFERRED TO MCC PUBLIC HEALTH ENGINEER. THE PURPOSE IS TO PROVIDE ADDITIONAL PROTECTION TO MCC 300mm WATERMAIN. ALLOT 319 PAKURANGA PSH WHICH IS ALSO REFERRED TO IN THE MEMO IS NOW LOT 1 DP 110665.	WATERMAIN PROTECTION CORTINA PLACE	C.655
LIR_00030387	SITES MAY BE SUBJECT TO SURFACE WATER OVERLAND FLOWPATH IN HEAVY RAINFALL EVENTS. PRIOR TO ANY CONSENT TO SUBDIVISION OR BUILDING THE COUNCIL MAY REQUIRE ANY OR ALL OF THE FOLLOWINGS: 1) DETAILED FLOOD ASSESSMENT BY A REGISTERED ENGINEER, 2) SPECIFIC FLOOR LEVEL DESIGN, 3) THE CREATION OF AN OVERLAND FLOWPATH EASEMENT IN FAVOUR OF THE COUNCIL, 4) THE ISSUE OF A SECTION 91 (1) CERTIFICATE IN TERMS OF THE BUILDING ACT, 5) SPECIFIC DESIGN OF ANY PROPOSED SITE WORKS. THE ABOVE MEASURES MAY PRECLUDE THE PLACEMENT OF ADDITIONAL BUILDINGS ON THE SITE OR THE CONSENT TO A SUBDIVISION OF THE LAND.	INTER-OFFICE MEMO	C.805

# Former Caltex Pakuranga

## Site Validation Report



## Former Caltex Pakuranga

### Site Validation Report

Client: Chevron Environmental Management Company

Co No.: N/A

#### Prepared by

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07-Jun-2016

Job No.: 60492475

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## Executive Summary

Chevron Environmental Management Company (EMC) undertook planned remedial excavation works at the former Caltex Pakuranga service station located at 64 Ti Rakau Drive/11 Cortina Place, Pakuranga, Auckland (hereinafter referred to as the Site).

This Soil Validation Report (SVR) provides details of the works undertaken in accordance with consents issued for the works by Auckland Council (ref 49495 and P-49517).

The Site was closed in May 2010 with the underground petroleum storage system (UPSS) decommissioned and removed. Soil benchmarking undertaken during the UPSS removal identified concentrations of petroleum hydrocarbons in soil at the Site that exceeded criteria for commercial/industrial (C&I) land-use as defined within Ministry of the Environment (MfE) Guidelines (MfE Guidelines)<sup>1</sup>.

In April and early May 2016, EMC commissioned Fuel Installations Auckland Limited (FIAL) to undertake a remedial excavation for the removal of hydrocarbon impacted soil with subsequent backfilling of the excavation void with validated spoil won from the excavation and imported aggregates. The removal of soil from the Site for offsite disposal occurred over a six week period. Over the course of the remedial works approximately 2530 tonnes of hydrocarbon impacted soil was removed from Site and disposed at Redvale Landfill, Auckland. An additional 33 tonnes disposed to Greenmont Landfill, East Tamaki, Auckland.

AECOM Consulting Services Limited (AECOM) was engaged by EMC to undertake an environmental oversight role of the works. A total of 59 soil validation samples, representative of Site conditions post remedial works and the Site won spoil used to backfill the excavation, recorded concentrations of hydrocarbons below the analytical method detection limits or at low concentrations. All soil validation results complied with MfE Guidelines for commercial/industrial land-use.

Overall, it is considered that the remedial objective has been achieved and that soil conditions at the Site meet the adopted commercial/industrial criteria.

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<sup>1</sup> Ministry for the Environment, 1999: Guidelines for Assessing and Managing Petroleum Hydrocarbon Sites in New Zealand, revised 2011.

## 1.0 Introduction

Chevron EMC completed remedial works at the former Caltex Pakuranga service station Site located on Ti Rakau Drive, Pakuranga, Auckland, hereinafter referred to as the Site, during April and May 2016. Figure 1, Appendix A details the Site location. The Site is accessible from both Ti Rakau Drive and Cortina Place. The physical address for the Site is 11 Cortina Place, Pakuranga, Auckland.

The UPSS was decommissioned and removed from the Site following closure of the service station in circa May 2010 and the Site was sold to Auckland Transport (AT). The land use will remain commercial with a medical centre operated by Medispace planned for the Site. A portion of the Site to the southeast has been ear-marked for additional road carriageway, connecting Ti Rakau Drive and Cortina Place.

As a consequence of former service station activities, soil and groundwater at the Site was known to have residual hydrocarbon impact. Prior to the planned Site development as a medical centre, Chevron EMC agreed with AT to undertake a remedial excavation of soils at the Site to meet commercial/industrial land-use criteria as defined in the MfE Guidelines.

Hydrocarbon impacted soils were excavated and removed from the Site with subsequent replacement and backfilling with Site won spoil from the excavation and imported aggregates. The removal of soil from the Site for offsite disposal occurred over a six week period during April and early May 2016. AECOM field scientists were onsite during the soil excavation and removal phase of works, and obtained soil samples from the excavation walls and base as well as Site won material to benchmark the quality of soils remaining on-Site. The following report summarises the remedial works completed.

### 1.1 Purpose of Reporting

Land use consent 49495 and discharge consent P-49517 were granted by Auckland Council to authorise the remedial works. This SVR has been prepared in accordance with the Auckland Council consent requirements and in general accordance with MfE Contaminated Land Management Guideline No. 1<sup>2</sup>. The resource consents are provided as Appendix B.

Special condition 17 for consents 49495 and P-49517 states that at completion of the remedial works a SVR will be prepared and include, but not be limited to the following:

- a. A summary of the works undertaken, a statement confirming whether the remediation works have been completed in accordance with the approved Remediation Action Plan (Application Report).
- b. The location and dimensions of the excavations carried out, including a relevant site plan.
- c. Records of any unexpected contamination encountered during the works, if applicable.
- d. Copies of the disposal dockets for the material, including separate phase hydrocarbons (SPH) and groundwater removed from the Site.
- e. A summary of validation sampling undertaken, tabulated analytical results, and interpretation of the results in the context of the Contaminated Land Rules of the Auckland Council Regional Plan: Air, Land and Water, and the Proposed Auckland Unitary Plan.
- f. Details regarding any complaints and/or breaches of the procedures set out in the Remedial Action Plan (RAP) and the conditions of this consent.
- g. Evidence of landfill disposal.
- h. Conditions of the final site ground surface.
- i. Scaled plans (plan and elevation views) showing the location of any contaminated materials exceeding acceptance criteria remaining on the site.

<sup>2</sup> MfE Contaminated Land Management Guidelines No.1 – Reporting on Contaminated Sites in New Zealand (Revised 2011).

## 2.0 Remedial Objective

The remedial objective was to remove soils impacted by hydrocarbon compounds from the Site which exceed commercial/industrial land-use criteria as defined by the MfE Guidelines as detailed within the AECOM Assessment of Environmental Effects (AEE)<sup>3</sup> as accepted by Auckland Council for this project.

Post remediation validation sample results shall not exceed the MfE Guidelines for Commercial/Industrial land-use as presented below in Table 1. The values represent the adopted acceptance criteria for the remedial works.

Table 1 1999 (rev 2011) Guidelines and NES Regulations 2011 for a C&I Land-use Scenario

Contaminant of Concern	MfE 1999 Guideline (rev 2011) C&I Guideline Value (mg/kg) for SANDY SILT <sup>1</sup>		NES <sup>4</sup> SCS – C&I (mg/kg) <sup>2</sup>
	Surface (<1m)	1m-4m	
<b>Total Petroleum Hydrocarbons</b>			
TPH C <sub>7</sub> to C <sub>9</sub>	500	500	-
TPH C <sub>10</sub> to C <sub>14</sub> <sup>3</sup>	1,700	2,200	-
<b>Benzene, Toluene, Ethyl-benzene and Xylenes</b>			
Benzene	3.6	7.2	-
Toluene	270	480	-
Ethylbenzene	200	300	-
Xylenes	200	420	-
<b>Polycyclic Aromatic Hydrocarbons</b>			
Naphthalene	210	270	-
Benzo(a)pyrene (eq)	-	-	35

Note: 1) Guideline values taken from Tables 4.11 and 4.14 of the MfE 1999 Guidelines (rev 2011) for a sandy silt soil type. 2) Value taken from Table B3 of the NES User's Guide. 3) TPH C<sub>10</sub> to C<sub>14</sub> is a screening criteria to prompt additional PAH surrogate analysis if required. 4) Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health, dated April 2012.

<sup>3</sup> AECOM: Former Caltex Pakuranga Service Station: Resource Consent Application & Assessment of Environmental Effects, dated February 2016.

## 3.0 Site Background

The Site operated at a Caltex branded service station comprised of UPSS components, forecourt, carwash, retail shop, workshop and car parking. See Figure 2 for the historical site layout. The following provides a brief summary of previous investigations undertaken following closure of the Site in May 2010.

### 3.1 Previous Investigations

#### 3.1.1 May 2010 – Underground Petroleum Storage System Decommissioning

The UPSS included four underground storage tanks (USTs) comprising 2 x 40,000 litre 91 octane petrol, 1 x 40,000 litre 96 octane petrol, 1 x 20,000 litre diesel, with associated pipe work and dispensers. A soil validation and sampling exercise was completed at the time of UPSS decommissioning<sup>5</sup> that indicated concentrations of hydrocarbon compounds within soil remaining on-site exceeded the MfE Guidelines, Tier 1 soil acceptance criteria for commercial/industrial land-use.

The exceedances were detected in shallow soil samples collected within the footprint of the former forecourt, generally in the vicinity of the former dispenser islands, remote fills and interceptor. No exceedances were detected in soil samples collected from the tank pit excavation in the location of the former USTs.

#### 3.1.2 November 2011 – Groundwater Assessment

In November 2011<sup>6</sup> URS completed an Environmental Site Assessment (ESA) to assess shallow soil and groundwater conditions at the Site. These works involved the advancement of four boreholes and the installation and sampling from four on-site groundwater monitoring wells (MW1 to MW4). Elevated concentrations of hydrocarbon compounds were detected in soil and groundwater samples collected from MW2 (located at the southwest site boundary). Groundwater flow across the Site was towards the south and at a depth of approximately 1.4 m bgl.

#### 3.1.3 May 2014 – Site Delineation

In May 2014<sup>7</sup> URS undertook further environmental assessment involving the completion of sixteen test pits (TP1 to TP16). Concentrations of petroleum hydrocarbons above the MfE Guidelines for C&I land-use were detected in soil samples in the vicinity of the former stormwater interceptor and ancillary pipework. Groundwater flow across the Site was towards the southeast and at a depth ranging between approximately 1.5 and 2.1 m bgl.

#### 3.1.4 November 2015 – Conceptual Site Model

In May 2015<sup>8</sup> AECOM undertook an exercise to appraise the likely extent of hydrocarbon impact in soil and groundwater beyond the boundary of the Site in Ti Rakau Drive. It was initially thought a stormwater or sewer main might be present within the carriageway, which would effectively act as a 'cut-off' for migration of hydrocarbon down the natural groundwater hydraulic gradient. An inspection of services (inverts etc) indicated that this was not the case.

A review of the existing soil and groundwater data and on-site services indicated that because of the less permeable nature of the underlying natural geology, remaining hydrocarbon impact was likely to

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<sup>5</sup>URS 2010. Caltex Pakuranga Service Station - Underground Petroleum Storage System Decommissioning, Residual Petroleum Hydrocarbon Assessment prepared, dated 24 June 2010 (42115121).

<sup>6</sup>URS 2011. Caltex Pakuranga Service Station - Environmental Site Assessment, dated November 2011 (42117721).

<sup>7</sup>URS 2014. Former Caltex Pakuranga Service Station – Soil and Groundwater Assessment, dated September 2014 (42100310).

<sup>8</sup>AECOM 2015. Former Caltex Pakuranga – Conceptual Site Model, dated November 2015 (42101210).

predominantly reside around the on-site stormwater management system. This infrastructure is located parallel to the Ti Rakau Drive road frontage.

Because of the low permeability of the underlying natural geology, the extent of associated hydrocarbon dissolved phase was also expected to be limited.

Following completion of the remedial works, the residual hydrocarbon impacts within carriageway were expected to be limited and best controlled through a site management plan. Recent discussions with Auckland Council support this premise.

## 4.0 Remedial Rationale and Methodology

### 4.1 Excavation Rationale

The excavation of hydrocarbon impacted soil from the Site was completed in accordance with the AECOM consent application and AEE approved by Auckland Council through consents 49495 and P-49517. The objective of the AEE was to implement the following control measures at the Site during the remedial works programme:

- Render the Site suitable for expected future C&I land-use with respect to hydrocarbon compounds.

### 4.2 Principal Stakeholders

Table 2 details principal stakeholders associated with the excavation works.

Table 2 Responsible Parties to the Excavation Works

Stakeholder	Responsibility
Chevron EMC	Consent Holder. Principal to the Contract.
Auckland Transport	Site Owner.
Fuel Installations Auckland Limited (FIAL)	Remediation Contractor. Site Manager.
AECOM	Suitably Qualified Environmental Practitioner for oversight and validation of hydrocarbon impacted soil removal.

### 4.3 Extent of Excavation

The proposed excavation and actual excavation extents are provided on Figure 3. The proposed and actual excavations differed in shape, but were similar in overall volume. The proposed excavation extended further northeast beneath the former forecourt, whereas the actual area remediated extended northwest towards the site boundary.

Factors considered prior to excavation included:

- Managing potential environmental and human health effects associated with the excavation.
- Allowing for temporary stockpiling on-Site.
- Safe truck ingress, egress and onsite movements.
- Ability for soil validation samples to be collected immediately after soil removal.

### 4.4 Excavation Phasing

Easy access and a generous site area allowed the excavation work to be completed in a single phase of works, however has been broken down into Excavations A, B and C below for ease of reporting. Excavation began at the southern end of the Ti Rakau Drive boundary and was progressed in a north-westerly direction towards the northern boundary. Once all impacted material was removed from the Ti Rakau Drive boundary area, the excavation was advanced in a north-easterly direction until reaching its final extent.

#### 4.4.1 Site Establishment and Sheet Pile Instillation

The following works were undertaken prior to excavation of hydrocarbon impacted soils;

- Establishment of site offices and security fencing.
- Installation of sheet piling along the south western boundary of the Site to protect underground services and footpath integrity.
- Installation of sediment controls.

#### 4.4.2 Excavation Methodology

The approach to excavation varied dependent on the soil conditions encountered but can be simplified into three primary zones, former interceptor area and former forecourt area and northwest corner service corridor.

##### Excavation A - Former Interceptor Area

The former interceptor area lies across the front of the Site/along the Ti Rakau Drive frontage. Excavation in this area comprised the following:

- Soils (overburden) from surface to approximately 1.5 m below ground level (bgl) that appeared to be un-impacted by hydrocarbons were stripped and stockpiled in temporary stockpiles (stockpile 1) to allow for soil validation testing. The stockpiles were covered with heavy duty PVC material to stop surface water infiltration and saturation that would prevent the soils from being compacted to optimum density back in the void.
- Soils from approximately 1.5 m bgl to 3.0 m bgl were loaded directly into sealed truck and trailer units for offsite disposal. All materials removed offsite were recorded with waste manifest procedures.
- Soil validation samples were collected from the temporary stockpiles, sidewalls and base of the excavation and submitted for laboratory analysis.
- The soil validation results were then used to determine if the excavation sidewalls and base complied with the remedial objective and whether material contained in the temporary stockpiles could be reused on-Site.
- During excavation of the former interceptor area, rainwater collected in the excavation. As there was a potential for this water to be impacted with hydrocarbons, it was removed using a vacuum truck and disposed to Salters Environmental Limited located at 5 Bolderwood Place, Manukau City, Auckland. A total of 16,500 litres of rainwater was removed from the excavation.

##### Excavation B - Former Forecourt Area

The former forecourt area lies northwest of the former interceptor area and reflects the rectangular shape of the former forecourt slab. Excavation in this area involved the following:

- Aggregate imported (post-decommissioning) to a depth of approximately 0.3 m bgl was stripped and stockpiled (stockpile 1).
- Natural clays to a depth of approximately 0.3 m bgl to 1.0 m bgl that appeared to have marginal hydrocarbon impacts were stripped and stockpiled (stockpile 2) with the same controls as for Excavation A.
- Soil materials from approximately 1.0 m bgl to 2.5 m bgl were loaded directly into sealed truck and trailer units for offsite disposal.

- Soil validation samples were collected from the temporary stockpiles, sidewalls and base of the excavation and submitted for laboratory analysis.
- The soil validation results were then used to determine if the excavation sidewalls and base complied with the remedial objective and whether the clay material contained in the temporary stockpiles could be reused onsite.

#### Excavation C- North West Corner Service Corridor

The northwest service corridor area runs from the northwest corner of site to adjacent to the former dispenser area. The area contained numerous stormwater pipes and associated bedding material from both the service station site layout and historical drainage which had acted as conduits for migration of hydrocarbons. Excavation in this area involved the following:

- Aggregate to a depth of approximately 0.3 m bgl stripped and stockpiled. Stockpile controls as per Excavation A (stockpile 1).
- Chasing and removing redundant services and any associated bedding material with evidence of hydrocarbon impact.
- Natural clay soils from approximately 0.3 m bgl to 1.0 m bgl not in close proximity to service trenches that appeared to have marginal hydrocarbon impacts were stripped and stockpiled (stockpile 2).
- Sandy soils from approximately 1.0 m bgl to 2.5 m bgl were loaded directly into sealed truck and trailer units for offsite disposal.
- Soil validation samples were collected from the temporary stockpiles, sidewalls and base of the excavation and submitted for laboratory analysis.
- The soil validation results were then used to determine if the excavation sidewalls and base complied with the remedial objective and whether the clay material contained in the temporary stockpiles could be reused onsite.

Upon confirmation that the material from stockpile 1 and stockpile 2 as well as excavation sidewall and excavation base samples complied with the adopted acceptance criteria (Table 1), the excavation was backfilled with stockpiled material and imported quarry aggregate. The reinstatement and compaction methodology is summarised in Section 4.5 below.

#### 4.5 Backfilling and Compaction

The backfilling of Excavation Areas A and B followed the process described below. Backfilling did not commence until the validation sample analysis showed that soils remaining met the validation criteria. ✓

Although compaction effort was applied to the backfill in accordance with the requirements of the construction specification, compaction was not monitored by a geotechnical engineer and certification of the backfill compaction is not provided. The fill will be noted on the council property file as **non-engineered fill**. ✖

- a) Material A19a filter fabric was placed at depth within the base of the excavation directly onto natural ground (peat/clay layer).
- b) A 'no fines' aggregate (pea-gravel) was placed on top of the filter fabric for the extent that was below the observed ground water level. This material required no compaction, is unaffected by rising groundwater and will not wick groundwater into subsequently placed fine grained backfill.

- c) A second layer of A19 filter fabric was placed on top of the pea-gravel.
- d) Un-impacted site won aggregate from stockpile 1 was placed on top of the natural ground bench formed in the eastern corner of the excavation. This material was placed in layers not exceeding 200mm and track rolled by a 30 t excavator.
- e) Imported virgin quarry aggregate was placed on top of the filter fabric to a depth of 1.5 m bgl and compacted by 4 passes of a 6.5 tonne drum roller.
- f) Along the Ti Rakau Drive frontage a 1.1 m by 5.0 m (depth x width) strip of site won topsoil and silt was placed and compacted by 4 passes of the 6.5 tonne drum roller.
- g) Two 200 mm layers of site won clay material were placed above the aggregate material across the void excluding the area described above at a depth of between 1.1 m and 1.5 m bgl. Both layers were compacted by 4 passes with a 6.5 tonne drum roller.
- h) The remainder of the void was filled with imported virgin aggregate to approximately 0.2 m bgl and compacted with 8 passes of 6.5 tonne drum roller.
- i) The Site was left approximately 200 mm low to facilitate future development, as agreed with AT.

A backfill profile schematic is provided in Section A – A' within Figure 4.

#### 4.6 Compliance with the Consent and Excavation Oversight

An AECOM environmental scientist was onsite between 29 March and 27 April 2016 to supervise the excavation and removal of contaminated soils from the Site. The AECOM representative performed the following tasks:

- Observed compliance with the Auckland Council resource consent(s).
- Observed compliance with the AECOM AEE.
- Observed excavation areas and load out onto truck and trailer units.
- Retained a vehicle movement log of truck number, approximate loaded volume, and disposal location.
- Collected photo evidence of the excavation works (refer Plates 1 through 31 in **Appendix E**).
- Collected soil validation samples and dispatched these to Hill Laboratories Limited (Hills) for analysis. Chain of custody information is provided in **Appendix C**.

#### 4.7 Disposal Rationale

In accordance with the AEE, excavation materials were either disposed of offsite to Greenmount or Redvale Landfills, or temporarily stockpiled onsite for re-use (pending receipt of soil validation results). A summary of excavated materials is provided in Section 5.1.

#### 4.8 Re-use of Site Material Rationale

Two stock-piles were created during the works to allow re-use of materials below the acceptance criteria from the Site. Stockpile 1 comprised Site won aggregates and topsoil. Stockpile 2 comprised Site won natural clay material. PID headspace sampling supported a validation sampling exercise for both these stockpiles.

Concentrations of hydrocarbons in soil sampled from stockpile 1 were below laboratory detection limits and therefore below the C&I acceptance criteria.

Concentrations of hydrocarbons in soil sampled from stockpile 2 were above laboratory detection limits but below the C&I acceptance criteria for soils placed between 1 and 4 m bgl. Therefore, these soils were placed between 1.1 and 1.5 m bgl to meet C&I acceptance criteria. It is noted that these soils were mostly placed above the highest measured groundwater level of 1.4 m bgl. Compaction of the material is expected to increase the density of the material and reduce contact with groundwater.

A summary of excavated materials is provided in Section 5.1.

## 4.9 Separate Phase Hydrocarbons Removal and Monitoring

Standing SPH was not observed within the excavation during the remedial works.

### 4.10 Soil Validation Sampling

AECOM collected and requested from Hills, the analysis of 59 soil validation samples over the course of the remedial works, including four duplicates. All soils samples were submitted for total petroleum hydrocarbon (TPH) and benzene, toluene, ethylbenzene and xylene (BTEX) analysis. In summary:

- Seven soil validation samples were collected and analysed from the temporarily stockpiled overburden, soil that was returned to the excavation. One duplicate sample was also analysed. This corresponds to one sample for every 41 m<sup>3</sup> of stockpiled overburden.
- Fifty two soil validation samples were analysed from the sidewalls and base of the excavation area at depths of 0.5 m to 3.0 m bgl. Three duplicate soil samples were collected, at ratio of one duplicate sample for every 20 validation samples. Due to the high density validation sampling undertaken, three duplicate samples are considered adequate for QA/QC purposes.
- A single sample was analysed to validate historical results of elevated hydrocarbons in soil. This material was subsequently removed.

Soil validation sample locations are illustrated in **Figure 4**. Tabulated soil analytical results can be viewed in **Appendix D**.

### 4.11 Imported Material

Importation of materials was limited to the following:

- Pea metal from Winstone Aggregates, Hunua Gorge, Papakura.
- Virgin aggregate from Stevenson Quarry, Quarry Road, Drury.

A copy of the imported material documentation is included in **Appendix C**.

## 5.0 Summary of Remedial Works

### 5.1 Summary of Excavated Materials

Over the course of the remedial works approximately 2530 tonnes of contaminated soil was removed from the Site and disposed to Redvale Landfill (North Shore), Auckland. A single load (33 tonnes) of grass and topsoil was disposed to Greenmount Landfill (East Tamaki). Table 3 below provides a summary of the disposal locations. Additionally, a further 10 tonnes of impacted concrete was disposed to Redvale Landfill.

Table 3 Soil Disposal Locations and Volumes

Disposal Location	Tonnage
Redvale Landfill	2530
Greenmount Landfill	33

In addition to the 2563 tonnes / 1422 m<sup>3</sup> (at a density of 1.8 t/m<sup>3</sup>) of impacted soil disposed to landfill, a further 287 m<sup>3</sup> (loose measure) of "clean" overburden material was stockpiled on Site to be returned to the excavation. At the completion of each excavation phase, a survey was undertaken by a registered surveyor (Survey Worx Limited) to determine the volume of the excavation and volume of stockpiled overburden.

Table 4 provides a summary of soil excavated from the Site. **Appendix E** provides a photographic record of the works undertaken.

Table 4 Excavation Volume Summary

Excavation Summary	Volume / %
Volume Disposed to Landfill (m <sup>3</sup> )	1422 m <sup>3</sup>
Volume of Material Stockpiled Onsite (m <sup>3</sup> )	205 m <sup>3</sup>
Total Volume Excavated (m <sup>3</sup> )	1627 m <sup>3</sup>
Total Surveyed Volume of Excavation (m <sup>3</sup> )	1421 m <sup>3</sup>
Difference between Volume of Excavation and Volume Excavated	206 m <sup>3</sup>

1: Volume calculated based on a density of 1.8 tonnes/m<sup>3</sup>

Overall, it is considered that the volume of material excavated from the Site is consistent with surveyed volume of the excavation. The 12.5 % difference in calculated volumes reflects the inaccuracy of truck measurements and bulking factors, and more importantly, that the survey volume does not fully account for the undulating grade across the site as levelling of the site to facilitate the works had already occurred at the time of survey. This difference is not considered to be significant.

Copies of the disposal documentation are included in **Appendix F**.

### 5.2 Summary of Backfill Materials

In addition to overburden materials of approximately 205 m<sup>3</sup>, the following volumes of backfill materials were imported to the Site:

- 1451 m<sup>3</sup> virgin quarry aggregate sourced from Stevenson Quarry
- 150 m<sup>3</sup> of GAP10 gravel (pea gravel) sourced from Winstone Aggregates

Copies of imported fill docket are provided in **Appendix G**.

Table 5 Comparison of Excavated and Imported Soil Volumes

Materials Summary	Volume / %
Volume (compacted) Overburden Stockpiled Onsite for Reuse	205 m <sup>3</sup>
Volume (compacted) Pea Gravel	150 m <sup>3</sup>
Volume (compacted) GAP40	70 m <sup>3</sup>
Volume (compacted) GAP65	1026 m <sup>3</sup>
Total Volume Placed in Excavation	1451 m <sup>3</sup>
Total Surveyed Volume of Excavation (m <sup>3</sup> )	1421 m <sup>3</sup>
Difference between Surveyed Volume and Volume Placed in Excavation	30 m <sup>3</sup> / 2 %

Overall, it is considered that the surveyed volume is consistent with the volume of material imported to the Site. The 2 % difference calculated between surveyed volume and imported material reflects the inaccuracy of truck measurements and adopted compaction factors and is not considered to be significant. ✓

### 5.3 Summary of Soil Validation Results

Figure 2 illustrates soil validation sample locations. Soil validation results are indicative of Site conditions post remedial works. Laboratory reports and chain of custody documentation are provided in **Appendix C**.

#### 5.3.1 Validation Results

Soil validation results for samples collected from the walls and base of the excavation at its final extent are presented in Tables 6 and 7 in **Appendix D**. Soil validation results were compared against the adopted acceptance criteria for the remedial works as outlined in Table 1. Reported concentrations of TPH and BTEX were below the adopted acceptance criteria for the remedial works.

#### 5.3.2 Overburden Stockpiles Results

Soil validation results for samples collected from the temporary overburden stockpiles are provided in **Appendix D** and compared against the adopted acceptance criteria for the remedial works as outlined in Table 1. Concentrations of TPH and BTEX reported for all validation stockpile samples were below the adopted acceptance criteria for depth of placement and were deemed suitable for backfill between 1.1 and 1.5 m bgl.

#### 5.3.3 Quality Assurance / Quality Control Samples

Hills hold IANZ accreditation for the sample analyses undertaken. The laboratory report did not note any issues with analytical quality.

For QA/QC purposes, four duplicate soil samples were collected for analysis. The relative percentage difference (RPD) between the primary samples (SAC721, 728, 743 and 761) and the duplicate soil samples (SAC722, 730, 744 and 762) are presented in **Appendix D**.

The RPD data ranged between 21% and 142%. The MfE Guidelines allow a variability range of up to 50% (MfE, 2004, revised 2011). This variation is most likely due to natural soil heterogeneity and onsite stockpile mixing. However, higher RPD are often encountered where sample results are at low

concentrations close to the laboratory detection limits. It is considered that the soil analytical results are appropriate and suitable for the purpose of this site investigation.

#### 5.3.4 Imported Material Validation Results

All imported aggregate was virgin material obtained from licensed suppliers of cleanfill and did not require validation sampling. Imported material dockets are provided in **Appendix G**.

### 5.4 Sheetpile Abandonment

Due to unforeseen ground conditions a total of 12 sheetpiles were abandoned *in-situ*. Each sheetpile was cut off to approximately 1.5 m bgl to facilitate service installation to the Site. The location of the abandoned sheetpiles is provided in **Figure 3**.

## 6.0 Closure

In April 2016, Chevron EMC undertook a remediation of hydrocarbon impacted soils by excavation and removal of soils above commercial/industrial land-use standards.

The remedial objective was to remove soils from Site which exceeded commercial/industrial land-use as defined by the MfE 1999 Guidelines as the adopted acceptance criteria.

The excavation of soil materials from the Site took place over a four week period between 4 April and 27 April 2016. Over the course of the remedial works approximately 2560 tonnes of contaminated soil materials was removed from the Site and disposed to either Greenmount or Redvale Landfills.

No unexpected contamination was encountered during the works. Standing SPH was not observed within the excavation during the remedial works.

Fifty-nine soil samples, representative of Site conditions post remedial works and backfill material used to reinstate the excavation, recorded contaminant concentrations below the method detection limit or at low concentrations. All detected TPH and BTEX concentrations complied with the commercial/industrial adopted acceptance criteria.

A summary of the works undertaken, a statement confirming whether the remediation works have been completed in accordance with the approved Remediation Action Plan (Application Report).

The remediation works have been completed in accordance with the approved RAP. Overall, it is considered that the remedial objective has been achieved and that the soil conditions at the Site meet the adopted acceptance criteria for ongoing commercial/industrial land-use at the Site.

## 7.0 Standard Limitation

AECOM Consulting Services (NZ) Limited (AECOM) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Chevron EMC and only those third parties who have been authorised in writing by AECOM to rely on this Report.

It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this Report.

It is prepared in accordance with the scope of work and for the purpose outlined in the contract dated 24 March 2016.

Where this Report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information except as expressly stated in the Report. AECOM assumes no liability for any inaccuracies in or omissions to that information.

This Report was prepared between 29 March and 24 May 2016 and is based on the conditions encountered and information reviewed at the time of preparation. AECOM disclaims responsibility for any changes that may have occurred after this time.

This Report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This Report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Except as required by law, no third party may use or rely on this Report unless otherwise agreed by AECOM in writing. Where such agreement is provided, AECOM will provide a letter of reliance to the agreed third party in the form required by AECOM.

To the extent permitted by law, AECOM expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this Report. AECOM does not admit that any action, liability or claim may exist or be available to any third party.

Except as specifically stated in this section, AECOM does not authorise the use of this Report by any third party.

It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the site.

Any estimates of potential costs which have been provided are presented as estimates only as at the date of the Report. Any cost estimates that have been provided may therefore vary from actual costs at the time of expenditure.

Based on the works undertaken by AECOM, in accordance with the scope described in this Report, the soil conditions assessed by AECOM at the site are consistent with the use of the site for commercial/industrial determined in accordance with industry standards and environmental regulatory authority standards, guidelines and/or assessment criteria applicable to the site as at the date of this Report.

This conclusion and all information in this Report is provided strictly in accordance with and subject to the following limitations and recommendations:

- a) This Report has been prepared for the sole benefit of Chevron EMC.

- b) Except as required by law, no third party may use or rely on, this Report unless otherwise agreed by AECOM in writing. Where such agreement is provided, AECOM will provide a letter of reliance to the agreed third party in the form required by AECOM.
- c) This Report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by AECOM for use of any part of this Report in any other context.
- d) This conclusion is based solely on the information and findings contained in this Report.
- e) This conclusion is based solely on the scope of work agreed between AECOM and Chevron EMC and described in Section 1.1 ("Purpose of reporting") of this Report.
- f) This Report is dated 24 May 2016 and is based on the conditions encountered during the site investigations conducted, and information reviewed, from April 2016 to May 2016. AECOM accepts no responsibility for any events arising from any changes in site conditions or in the information reviewed that have occurred after the completion of the site investigations.
- g) The investigations carried out for the purposes of the Report have been undertaken, and the Report has been prepared, in accordance with normal prudent practice and by reference to applicable environmental regulatory authority and industry standards, guidelines and assessment criteria in existence at the date of this Report.
- h) Where this Report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information except as expressly stated in the Report. AECOM assumes no liability for any inaccuracies in or omissions to that information.
- i) AECOM has tested only for those chemicals specifically referred to in this Report. AECOM makes no statement or representation as to the existence (or otherwise) of any other chemicals.
- j) Except as otherwise specifically stated in this Report, AECOM makes no warranty or representation as to the presence or otherwise of asbestos and/or asbestos containing materials ("ACM") on the site. If fill has been imported on to the site at any time, or if any buildings constructed prior to 1970 have been demolished on the site or materials from such buildings disposed of on the site, the site may contain asbestos or ACM. Without limiting the generality of sub-clauses (h) and (m), even if asbestos was tested for and those test results did not reveal the presence of asbestos at specific points of sampling, asbestos may still be present at the site if fill has been imported at any time, or if any buildings constructed prior to 1970 have been demolished on the site or materials from such buildings disposed of on the site.
- k) No investigations have been undertaken into any offsite conditions, or whether any adjoining sites may have been impacted by contamination or other conditions originating from this site.
- l) Investigations undertaken in respect of this Report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and contamination may have been identified in this Report.
- m) Subsurface conditions can vary across a particular site and cannot be exhaustively defined by the investigations described in this Report. It is unlikely therefore that the results and estimations expressed in this Report will represent conditions at any location removed from the specific points of sampling.

- n) A site which appears to be unaffected by contamination at the time the Report was prepared may later, due to natural phenomena or human intervention, become contaminated.
- o) Except as specifically stated above, AECOM makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.
- p) Use, development or re-development of the site for any purpose may require planning and other approvals and, in some cases, environmental regulatory authority approval. AECOM offers no opinion as to whether the current use has any or all approvals required, is operating in accordance with any approvals, the likelihood of obtaining any approvals for development or redevelopment of the site, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environmental works.
- q) AECOM makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site.
- r) The ongoing use of the site and/or the use of the site for any different purpose may require the owner/user to manage and/or remediate site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this Report.
- s) To the extent permitted by law, AECOM expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this Report. AECOM does not admit that any action, liability or claim may exist or be available to any third party.
- t) Except as specifically stated in this section, AECOM does not authorise the use of this Report by any third party.
- u) It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the site.