

DETAILED SITE INVESTIGATION

42454 / 3 ARANUI RD AND 11 TAHI STREET, MĀPUA 7005, LOT 2 DP
11502 AND LOT 2 DP 11106 / MĀPUA BOAT RAMP TRUST

0800 999 333

hello@do.nz

Level 1, 24 Moorhouse Avenue, Addington

PO Box 589, Christchurch 8140

www.do.nz

Davis Ogilvie & Partners Ltd

QUALITY ASSURANCE

Title: Detailed Site Investigation: 11 Aranui Road, Māpua 7005

Client: Māpua Boat Ramp Trust

File Location: \\DONELSON\Data\Projects\20000+\42454 - Mapua Boat Club\Environmental\Report\220801.go.DSI_42454 Mapua Boat Club DSI.docx

Version: 2

Date: 26 April 2023

Project No: 42454

Prepared By: **Gareth Oddy** **Signature:** 
Technical Director - Environmental Scientist
CEnvP, BSc, MSc, IP402/405

Reviewed By: **Charlotte Stephen-Brownie** **Signature:** 
Senior Geotechnical Engineer
MSc (Hons) BSc

Approved By: **Gareth Oddy** **Signature:** 
Technical Director - Environmental Scientist
CEnvP, BSc, MSc, IP402/405

DISCLAIMER

This report has been prepared on the specific instructions of Māpua Boat Ramp Trust in connection with an environmental investigation in 11 Aranui Road, Māpua 7005. Māpua Boat Ramp Trust and the Local and Regional Territorial Authorities are entitled to rely upon this report. Davis Ogilvie & Partners Limited (Davis Ogilvie) accepts no liability to anyone other than Māpua Boat Ramp Trust in any way in relation to this report and the content of it and any direct or indirect effect this report may have. Davis Ogilvie does not consider anyone else relying on this report or that it will be used for any other purpose.

Davis Ogilvie did not complete an assessment of all possible conditions or circumstances that may exist at the site. Davis Ogilvie has provided an opinion based on information reviewed, site observations and investigations, and analysis methodologies current at the time of reporting. Variations in conditions may occur, and there may be conditions onsite which have not been revealed by the investigation, which have not been taken into account in the report. No warranty is included — either expressed or implied—that the actual conditions will conform to the assessments contained in this report. If any unexpected contamination is discovered during any soil disturbance works at the site, Davis Ogilvie should be notified to assess contamination conditions and possible management requirements.

Should anyone wish to discuss the content of this report with Davis Ogilvie & Partners Ltd, they are welcome to contact us on (03) 366 1653.

TABLE OF CONTENTS

1.0 INTRODUCTION AND BACKGROUND.....	5
1.1 Scope of Works.....	6
2.0 SITE INFORMATION.....	7
2.1 Site Identification.....	7
2.2 Proposed Activity	8
2.3 Site Description	9
2.4 Site History.....	11
2.5 Maritime Museum.....	19
2.6 Geology and Hydrogeology	20
3.0 PRELIMINARY CONCEPTUAL SITE MODEL	21
3.1 Source.....	22
3.2 Potential Contaminants of Concern	22
3.3 Potentially Relevant Receptors.....	22
3.4 Potential Contaminant Exposure Pathways.....	22
4.0 SOIL SAMPLING	23
4.1 DSI Objective	23
4.2 Methodology.....	23
4.3 Quality Assurance/Quality Control (QA/QC).....	24
4.4 Laboratory Analysis	25
5.0 ASSESSMENT CRITERIA	25
5.1 Environmental Standards.....	25
5.2 Applicable Soil Contaminant Standards	26
6.0 RESULTS	27
6.1 Observations	27
6.2 Soil Analytical Results.....	27
7.0 CONCEPTUAL SITE MODEL AND RISK ASSESSMENT	28
8.0 CONCLUSIONS.....	28
8.1 Summary.....	28
8.2 Regulatory Considerations.....	29
8.3 Development Considerations.....	29

TABLE 3 – Soil Results and Assessment Criteria

APPENDIX A – Site Photographs

APPENDIX B – TDC Site Management Plan (2012) V2

APPENDIX C – Laboratory Analytical Reports

1.0 INTRODUCTION AND BACKGROUND

Davis Ogilvie & Partners Ltd (Davis Ogilvie) has been engaged by Māpua Boat Ramp Trust (the client) to undertake a Detailed Site Investigation (DSI) at 11 Aranui Road, Māpua in Tasman District (“the site”, Figure 1), where construction of a new boat ramp, access road and boat storage building is proposed. This DSI was undertaken in accordance with Davis Ogilvie’s letter of engagement dated 12 May 2022.



Figure 1: Site Location, showing existing lot boundaries. Recent aerial imagery from Top of the South.

The Ministry for the Environment (MfE)’s 2011 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS¹) applies to activities on sites that have, have had, or are more likely than not to have had an activity on the Hazardous Activities and Industries List (HAIL) carried out.

¹ Ministry for the Environment (MfE) (2012). Users’ Guide. National Environmental Standard for Assessing and Managing Contaminants in Soils to Protect Human Health. Ministry for the Environment, Wellington, New Zealand.

The site was previously the location of the Fruit growers Chemical Company (FCC) which closed in 1988 and is understood to have been remediated between 2004 and 2008. A significant number of reports document the conditions prior to remediation, the results of the remedial works and monitoring of the groundwater and sediment quality post remediation. This DSI does not seek to investigate and characterise the condition and presence of soil contamination at the site, nor does it look to evaluate the risk to human health or environmental receptors on or adjacent to the site from the contamination which was placed into the landfill. The objective of this assessment was to characterise shallow soil (<0.5 metres below ground level (m bgl) which may potentially be required to be disturbed during construction of the boat ramp and assess the potential soil management options available.

Change of land use, soil disturbance and soil disposal as required by the proposed development are activities listed under the NESCS which require assessments when HAIL and/or potential HAIL activities have been identified on the site. As such, an investigation of the site was required to assist with resource consent applications for proposed soil disturbance work on a HAIL site.

The objectives of the investigation were to review site contamination information relating to the area of the site proposed for the boat ramp and associated building and to characterise potential shallow (<0.5 m bgl) soil contamination, enabling evaluation of requirements around NESCS consenting requirements and soil management during potential construction earthworks. This assessment does not include an assessment of PCBs or dioxins, which may be present as a result of the fugitive emissions caused during the remediation process, instead a review of existing information from the soil validation reports was completed for these contaminants.

1.1 Scope of Works

The following scope of works was undertaken under the supervision of a Suitably Qualified and Experienced Practitioner (SQEP):

- Desk study comprising review of the site history from available historical aerial photographs, and review of existing reporting on the site.
- Site walkover to identify potential visual soil contamination indicators.
- Collection of soil samples from shallow hand excavated test pits along the route of the proposed boat ramp.
- Laboratory analysis of selected samples for a heavy metals suite (including total recoverable screen level analysis for arsenic, cadmium, chromium, copper, lead, nickel and zinc) and a suite of Organochlorine Pesticides (OCP) including aldrin, dieldrin and the six individual DDT isomers.
- Preparation of a report reviewed and authorised by a suitably qualified and experienced practitioner, as required by the NESCS, presenting investigation methodology and results (this report).

Investigation works were undertaken in general accordance with MfE Contaminated Land Management Guidelines No. 5: Site Investigation and Analysis of Soils (revised 2021) and the findings are presented in accordance with MfE Contaminated Land Management Guideline No.1: Reporting on Contaminated Sites in New Zealand (revised 2021). Both these documents are incorporated by reference into the NESCS.

2.0 SITE INFORMATION

2.1 Site Identification

A summary of the site identification is provided below and displayed in Figure 2 ².

Site Address: 3 Aranui Road, 5, 11 & 6-16 Tahī Street, Māpua

Legal Descriptions: Lot 6 DP11502, Lot 1, 4 & 5 DP11502, Lot 2 DP 11502, Lot 2 DP 11106,
Sections 13,14,15,16, 24 & 25,26,28 & 29 SO496194.

Owner(s): Tasman District Council

Site Area: 19,394 m²

² Information sourced from GRIP Online Cadastral Mapping, accessed June 2022.

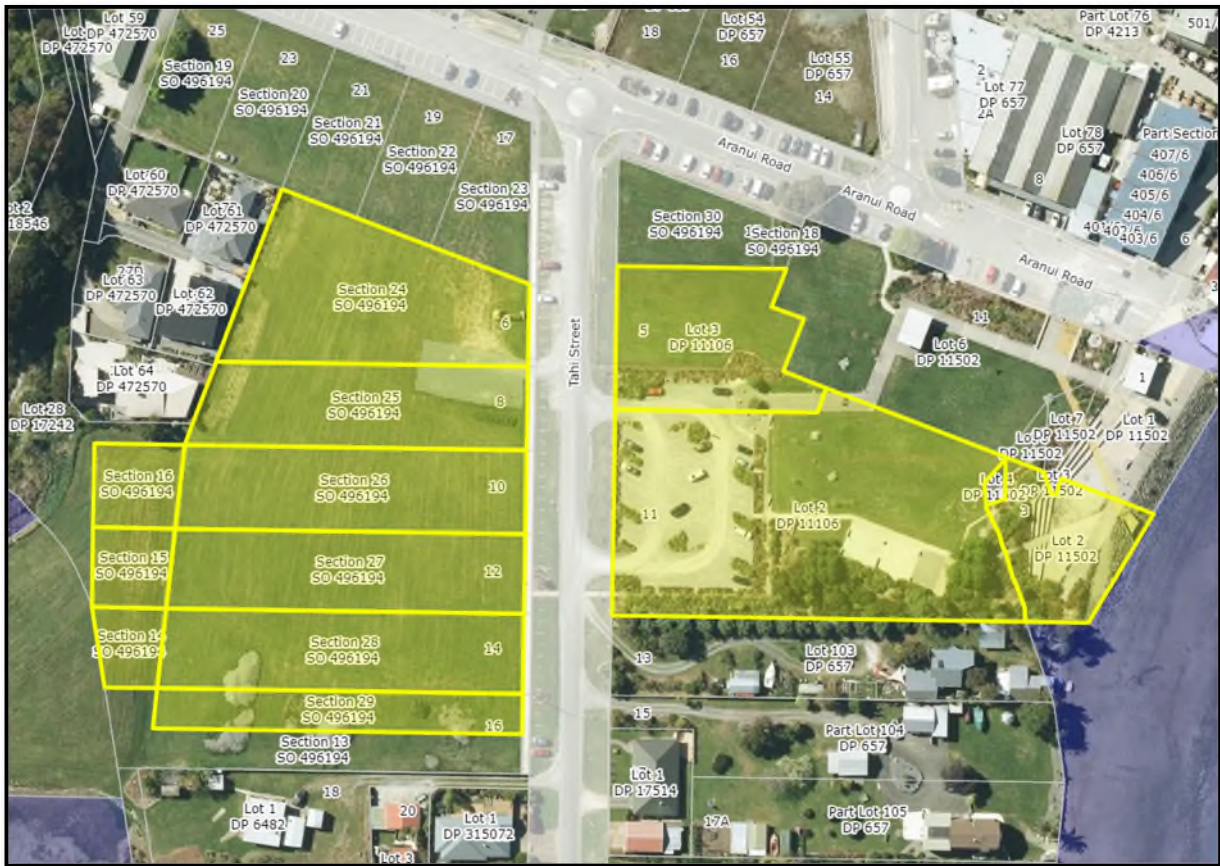


Figure 2: Site Location, showing existing lot boundaries. Source GRIP.

2.2 Proposed Activity

We understand the proposed development on the site includes the following:

- Construction of a Boat ramp: 11 m width with circa 2 m wide floating pontoon, at gradient of 1V:8H with pedestrian crossing on flat area immediately to west of the ramp to accessway transition point.
- Eastern Site - a new vehicle crossing off Tahī Street and exposed aggregate accessway of width 7m transitioning to 11 m and turning head to service a new boat ramp. The accessway siting requires relocation of the existing pétanque area. A barrier arm is proposed to be installed near the proposed Sea Scout building to control boat ramp usage.
- Sea Scout and Community Building 40 m x 20 m area with car parking and perimeter hardstand located on the existing reserve car park area. This building will be subject to a building consent later, noting the bulk and location of the proposed building is shown on plans.

- New metalled car park to the west of Tahī Street to compensate for future loss of car parks due to the Sea Scout and Community Building and loss of informal parking on Tahī Street due to vehicle crossing installation. Some stormwater dish channels, sumps and pipework to be installed to convey stormwater from car park into existing swale to the east of Tahī Street.

The preliminary design for the car parking within 6 Tahī Street is shown in Figure 3.

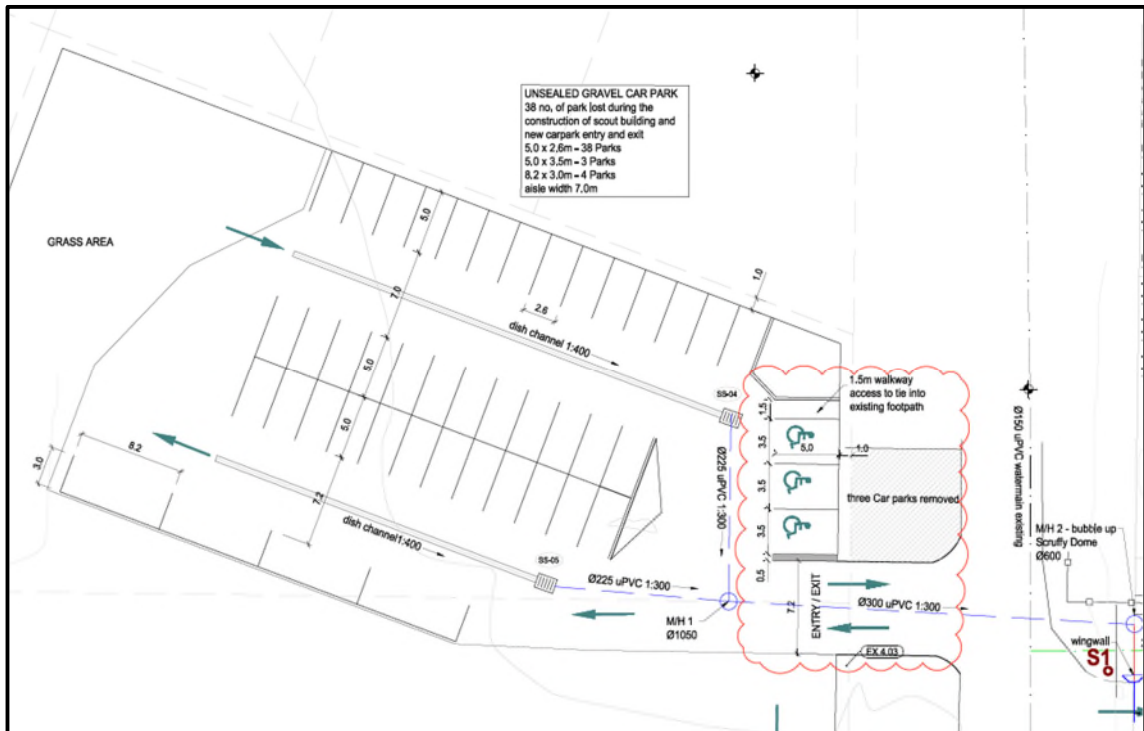


Figure 3: Proposed preliminary car park design. Source; Davis Ogilvie, Drawing P4-3 Carpark Rev 4.

2.3 Site Description

The roughly rectangular site is located between Tahī Street to the west, the foreshore and Waimea inlet to the east, adjoining lots owned by Tasman District Council (TDC) and Aranui Road to the north, and residential sections to the south (Figure 1). The site is comprised of a car park in the west accessed from Tahī Street, recreational park area, footpaths, seating, and picnic areas across 11 Tahī Street leading to further seating, viewing platform and footpath access through the coastal protection down to the foreshore. No structures exist on the site, however there are several large concrete landscaping features particularly in 3 Aranui Road. 6 – 16 Tahī Street are relatively flat, grassed, residential zoned sections owned by TDC.

The site is generally flat lying, although slightly (approximately 1 m) higher than surrounding land, particularly in the centre of the site with a gradual slope east toward the foreshore and Waimea inlet. According to LiDAR contours the difference in elevation between the highest and lowest areas of the site is approximately 1.5 m. The higher elevation land extends through the site in a slightly mounded ridge running north to south to the east of the car park. The topography steepens towards the south of the site within the landscaped areas (refer to Figure 4).



Figure 4: Site Location with LIDAR contours, footpaths, and services. Source GRIP.

Several areas of standing water were present across the site during the site visit completed in the afternoon of Wednesday 13 July 2022. Photographs collected during the site visit and showing the ponding and other significant site features are provided in Appendix A.

An informal drainage swale was observed running parallel and adjacent to the southern boundary and, conveying stormwater east and eventually discharging above the rock protection onto the foreshore.

A geotextile cloth and clay material was observed on the footpath down through the coastal protection and may have been related to the former remediation and capping process. In addition, a clay soil with gravel inclusions was observed at the ground surface at the eastern end of the site (sample location S05) and appeared to be different to ground conditions encountered elsewhere on site.

Several monitoring wells (Figure 5) were observed during the site walkover and generally appeared to be in a suitable condition. BH1a appeared to be located close to or within the proposed path of the boat ramp. Through discussions³ with TDC we understand the monitoring wells are accessed annually to conduct groundwater sampling to evaluate discharges from the site to the marine environment.

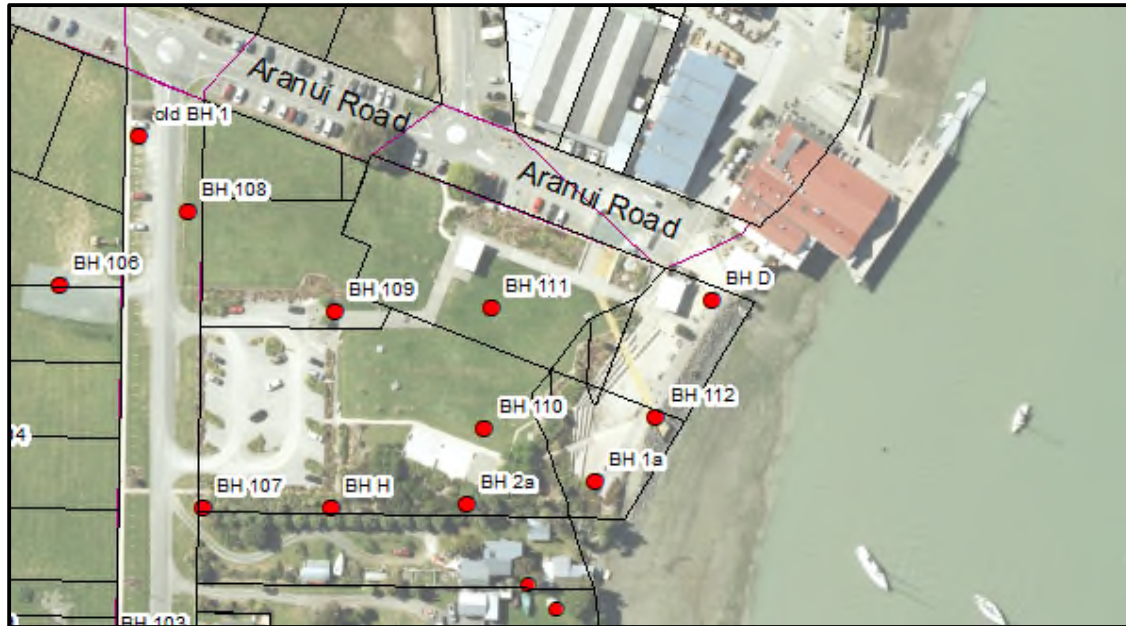


Figure 5: Site Plan showing groundwater monitoring wells. Source TDC.

2.4 Site History

As described in the introduction, the site has a significant history in the context of land contamination and remediation and this report does not seek to provide an in-depth overview of all aspects of that. Rather, relevant information related to the proposed redevelopment of the site, soil contaminant data and applicable potential exposure pathways in these areas has been completed.

The history of the site also goes back further than FCC involvement and we understand cultural impact assessments and the archaeology of the site are being evaluated. A brief history of the site with regards to land contamination, the remediation undertaken and how that relates to the proposed development are summarised in this section of the report. References are provided to the extensive reporting on the initial land contamination characterisation, remediation process, soil validation and post completion monitoring undertaken should the reader require more detail on any aspect of the aforementioned.


³ Pers. comm. Glenn Stevens (TDC) and Gareth Oddy (Davis Ogilvie) on 29/07/2022.

2.4.1 Existing Reporting

The following available reports have been reviewed, and findings from those reports relating to soil contamination are summarised in Table 1, below.

- SKM, 11 December 2008, Site Validation Report for the Former Fruitgrowers Chemical Company Site, Mapua. Final Version 3.0. Ref AE03621.
- Department of Labour, 2012, A report on occupational health and safety at the Fruitgrowers Chemical Company remediation site, Mapua.
- Tasman District Council, 8 March 2012, Former Fruitgrowers Chemical Company Site, Mapua, FCC East and FCC Landfill Sites, Site Management Plan v2.
- Davidson Environmental Ltd, March 2019, Summary of post-remediation contaminant monitoring of sediments and shellfish from estuarine areas adjacent to the former Fruitgrowers Chemical Company (FCC) site, Mapua, Nelson (2019).
- Envirolink Ltd, 2022. Mapua Boat Ramp Sediment Sample Analysis. Ref. 000451.

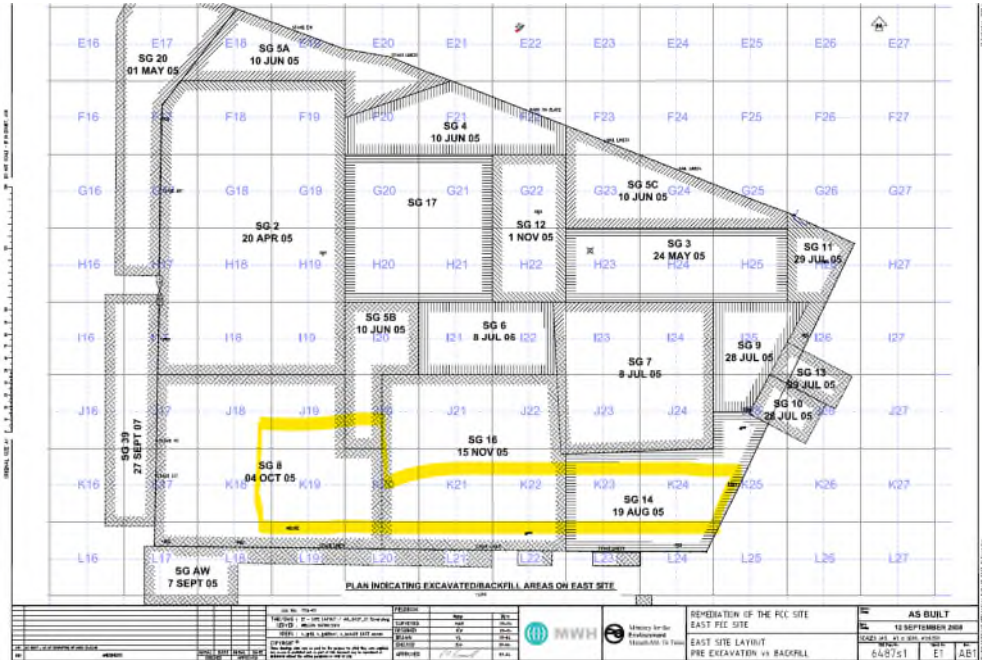
This is not an exhaustive list of the reports on the site but a selection with information and findings relevant to the boat ramp proposal. Further reports related to the FCC site investigation, remediation, validation and on-going monitoring can be found on the TDC and Ministry for the Environment (MfE) websites⁴⁵.

Table 1: Summary of Existing Reporting	
Report	Summary of land contamination matters related to proposal
<p>SKM, 11 December 2008, Site Validation Report for the Former Fruitgrowers Chemical Company Site, Mapua. Final Version 3.0. Ref AE03621.</p>	<p>The Soil Validation Report (SVR) produced by SKM documents the extensive soil sampling completed during and following remediation. The SKM SVR also displays the original investigation data highlighting where contaminants were identified during the original DSI completed by Woodward-Clyde in 1996 (excerpt below).</p>  <p>Layer 1 Map Legend</p> <ul style="list-style-type: none"> Boundaries, establish the site boundaries and surface features, set-up a soil sampling grid and establish sufficient site control benchmarks. Layer 1 Map Legend Red line: Categorical Property boundaries Blue line: The Site Green line: Neighbouring Properties Orange line: Landfill Area Blue line: Marine Sediments Sampling Grid (7.5m x 7.5m) Sampling Locations for Layer East Site: <ul style="list-style-type: none"> Red dot: ODK < 5 Or A+D+HL10 < 3 Green dot: ODK = 9 Or A+D+HL10 = 3 Blue dot: ODK = 20 Or A+D+HL10 = 95 West Site: <ul style="list-style-type: none"> Red dot: ODK = 9 Or A+D+HL10 = 3 Green dot: ODK = 20 Or A+D+HL10 = 95 Blue dot: Removal Area for Layers (ODK > 200 Or A+D+HL10 > 95) Removal Areas for Layers (ODK > 200 Or A+D+HL10 > 95) Removal Areas for Layer (ODK > 3 Or A+D+HL10 > 3) East Site: <ul style="list-style-type: none"> Red line: Landfill Site Green line: West Site Blue line: Landfill Site 1996 Woodward-Clyde Sample Locations for Layer Blue dot: ODK < 200 Or A+D+HL10 < 95 <p>TDC Tasman District Council</p> <p>Contract 514: Remediation of the FCC Site LAYER 1 - Contaminated Area Plan Including 1996 Woodward-Clyde Data</p>

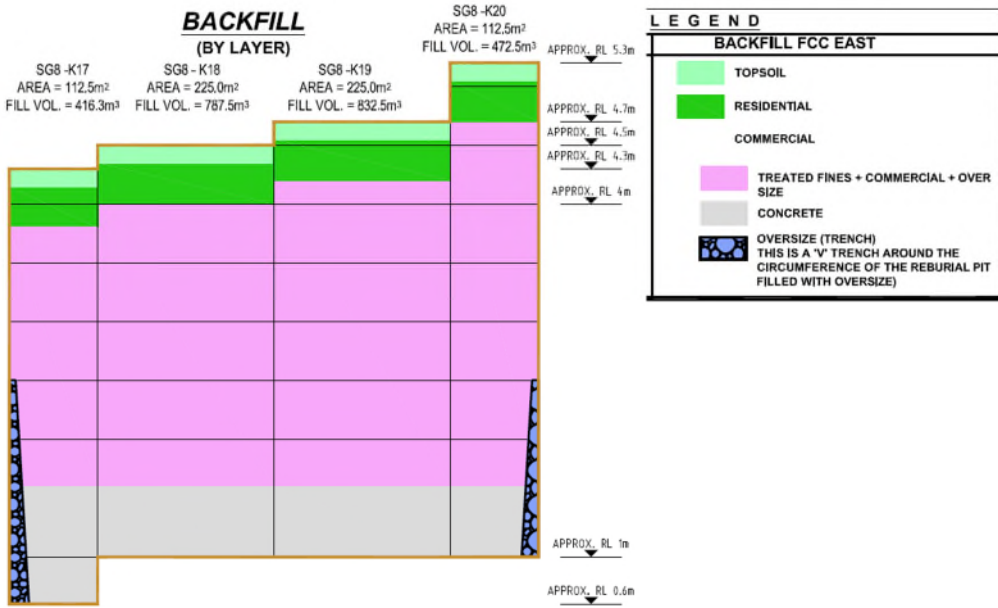
⁴ <https://www.tasman.govt.nz/my-region/environment/environmental-management/land/hail-sites/historic/>

⁵ <https://environment.govt.nz/publications/audit-of-the-remediation-of-the-former-fruitgrowers-chemical-company-site-mapua/>

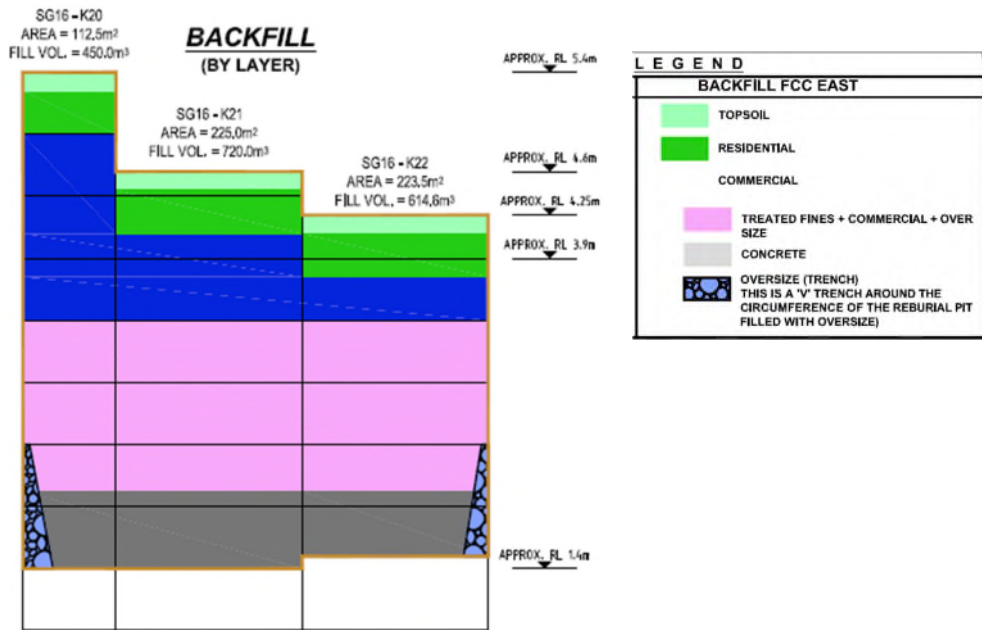
The site was split into East FCC (Commercial) and West FCC (Residential). The 'As built drawings' and cross sections presented in Appendix F and shown below display the backfilled material types depths and locations. The proposed boat ramp and scout building would be located above remedial cells SG8, SG15 and SG14.



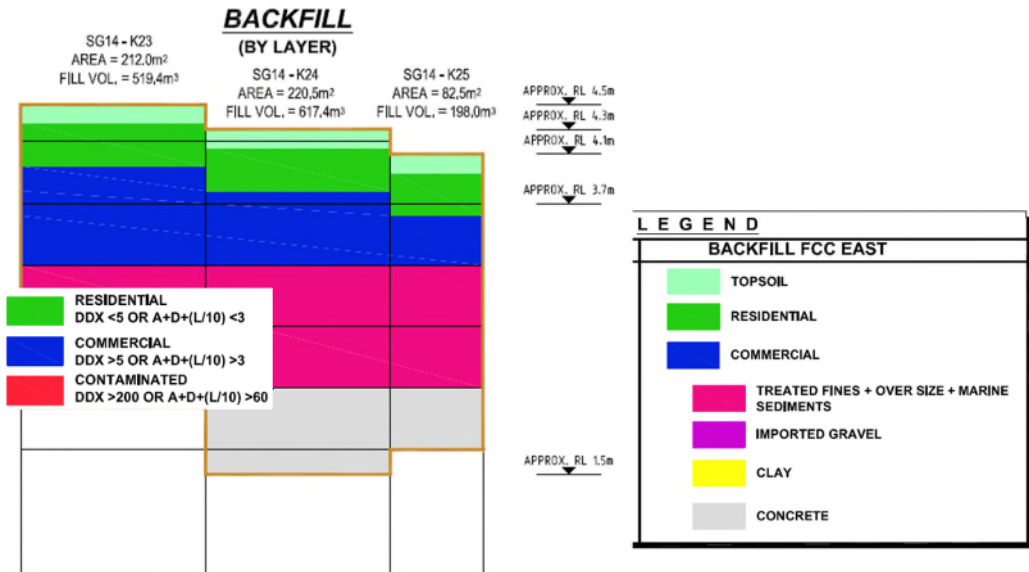
SG8 Southwest cell of FCC East. Sub cells K17 – K20 depicted below show approximately 0.6 m of capping material consisting of topsoil and residential grade soil over treated fines (which contains DDT concentrations max of 300 mg/kg, 95% UCL of the mean 114 mg/kg, aldrin and dieldrin max 16.8, 59.9 mg/kg). It is unclear if the concrete depicted at the base of the cells was poured concrete or crushed concrete. No details are provided in the validation report on this.



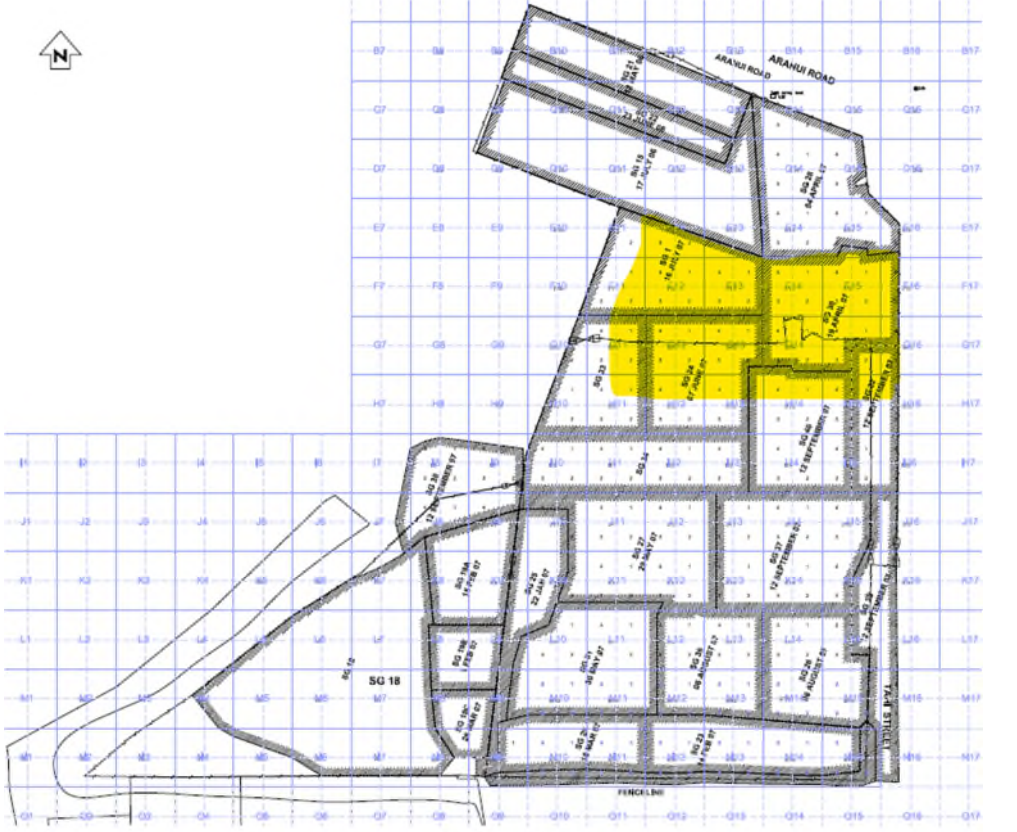
Central southern remedial cell SG16 and sub cells K20 0 K22 depicted below showing topsoil overlying residential soils over commercial over treated fines and commercial and oversized material.



Backfilled Material – SG14 Eastern half of proposed boat ramp



In the west of the site, within the proposed footprint of the car parking area and where stormwater infrastructure is proposed was also remediated. All contaminated soil was excavated, treated and only soil that met residential levels was returned to the cells in the west of the site. Within the proposed area of the car park and stormwater services, remedial works within cells SG30, SG32 and SG40 were limited to approx. 0.5m bgl. With SG24 remedial works went to approx. 1.7m bgl. Remediation of the FCC Site; (west) as built, MWH, 2008 (presented in SVR) shown below. Cells of interest highlighted yellow.

	 <p style="text-align: center;">SITE LOCATION PLAN</p>
<p>DoL, 2012 A report on occupational health and safety at the FCC remediation site, Mapua.</p>	<p>The report provides considerable detail on the remediation process, monitoring completed during the works and detailed background on the toxicology of the OCPs identified at the former FCC site.</p> <p>The report highlights failings with the remediation process that may have resulted in the fugitive release of emissions including of dioxins and PCBs. Emissions monitoring during the remedial works was largely absent and therefore the contaminants and concentrations were unknown.</p>
<p>TDC, 2012, Former FCC Site, Site Management Plan v2.</p>	<p>The main objective of the SMP is to <i>'ensure that any residual contamination on the site does not cause adverse effects on human health or the environment for the proposed site use, by specifying controls on development and maintenance activities, particularly excavation'</i>.</p> <p>According to the SMP <i>'The FCC East ... sites have been capped with 500mm of residential quality material. This cap is composed of 150mm of imported topsoil (cleanfill) and the layer from 150mm to 500mm depth is a mixture of imported material, and residential soil sourced from the site during remediation and has been validated as meeting the residential SAC [Soil Acceptance Criteria]. Beneath this layer, both sites have been reinstated using materials that are, on average, below the relevant SACs for the intended future land use of the sites'</i>.</p> <p><i>'Although the sites have been validated as remediated to the appropriate SACs, concentrations of contaminants above 'natural' background levels (and above SACs for unrestricted use) are still present in the subsurface soils of the site'</i></p> <p><i>'Soils at the FCC East and FCC Landfill sites have been remediated to Open Space /Commercial SACs'</i></p> <p><i>Selected Soil/Sediment Acceptance Criteria</i></p>

Land Use	Depth (m bgl)	DDX (total DDT, DDD, DDE) (mg/kg)	Aldrin + Dieldrin + 10% Lindane(mg/kg)	Copper
Residential	All	5	3	300
Commercial	0-0.5	5	3	300
	Below 0.5	200	60	5000
Recreational or open space	0-0.5	5	3	300
	Below 0.5	200	60	5000
Marine sediment	All	0.01	0.01	65


*'The soil from 150 – 500 mm depth has OCP residues at concentrations that present no human health risk **but could present a risk to the marine environment** if brought to the surface or disposed of in a location where it could be transported to the marine environment in significant quantities via run-off.*

'It is imperative that the 150mm topsoil (cleanfill) layer is maintained within 30m of the FCC East boundary adjacent to the foreshore. If this layer is removed within 30m of the boundary, it should be immediately replaced by a protective layer to prevent mobilisation of the underlying residential soils by sediment run-off'.

The majority of the controls to be implemented are for when soil beneath the capping layer is exposed (> 500 mm). The SMP is attached to this report in Appendix 2.

Davidson Environmental collected shallow sediment samples (shallow 0-2 cm, deep 6-10 cm) for the analysis of contaminant concentrations in May 2018. Six sediment samples were collected from the foreshore to the east of the site as during the previous sampling rounds. Five of the six surface (0-2cm) and all six deeper (6-10cm) sediment samples contained detectable concentrations of total DDT in excess of the Soil Acceptance Criteria (SAC, 0.01 mg/kg). Total DDT concentrations were reported in 2019 to have ranged from 0.022 – 0.064 mg/kg (0-2cm) and 0.014 – 2.2 mg/kg (Peak DDT in sample "East FCC new2" (south)). Concentrations of aldrin and dieldrin were lower than those of DDT and only exceeded the SAC (0.01 mg/kg) in two of the 12 samples analysed.

Davidson Environmental Ltd, March 2019, Summary of post-remediation contaminant monitoring of sediments and shellfish from estuarine areas adjacent to the former FCC site, Mapua, Nelson



**Envirolink Ltd,
2022. Mapua
Boat Ramp
Sediment
Sample
Analysis. Ref.
000451**

The report summarises the results from five shallow (top 0.25 m) sediment samples collected to the east of the site within the proposed location of the boat ramp. Four of the five sediment samples contained concentrations of total DDT in excess of the ANZ Sediment Quality Value, while the fifth sample detection limit was higher than the guideline value and therefore may have also exceeded the value. DDT concentrations ranged between 0.14 – 0.55 mg/kg.



2.4.2 Historical Aerial Photography

Historical aerial photography from Top of the South Maps⁶, V C Browne and Son Ltd⁷ and Google Earth have been viewed and are included in Figures 6 and 7. Observations from the aerial images are summarised below.

⁶ www.topofthesouthmaps.co.nz. Accessed 01 August 2022.

⁷ V.C. Browne & Son Aerial Photograph Collection. Images from 1935, 1950 and 1983 from Vcbrowne.com.



Figure 6: Historical aerial, 1940 - 49. Source Top of the South Maps. Several manufacturing buildings are visible, and the coastline is notably different to present day.



Figure 7: Historical aerial, 1980 - 89. Source Top of the South Maps. The site has further been developed and the property boundary on the east has been formalised and presumably the low lying area with the coast was filled.

2.5 Maritime Museum

A number of historical photos from the Mapua Maritime Museum show how the site used to look during the former FCC time at the site. Figures 8, 9 and 10 show the site from the air at various times throughout the site's former industrial past.



Figure 8: FCC 1959. Source Maritime Museum.



Figure 9: FCC 1959. Source Maritime Museum.



Figure 10: FCC 1953. Source Maritime Museum.

2.6 Geology and Hydrogeology

The published geological map⁸ identifies that the site is underlain by marine gravels, boulders, sand, and mud of Holocene age (Q1b). No active faults are recognised at the site, the nearest mapped active fault being the Waimea-Flaxmore Fault ~12.7 km to the southeast.

Given the previous remediation of the site, the natural ground has been excavated, remediated through an ex-situ process, and deposited into various remedial cells constructed at the site. Based on information provided in the SKM validation report, the fill material was placed on a concrete base with the fill material over 3.5m thick in places. The contaminated fill material is then capped with approximately 0.35m thick layer of clay subsoil and 0.15m of topsoil.

Groundwater has been recorded by PDP at the site in numerous monitoring wells to be at a depth of between 2-3 m bgl and inferred to flow east across the site towards the Waimea inlet. The piezometric contours at the site during a 2012 monitoring round are presented in Figure 11. Groundwater monitoring is conducted annually by TDC to evaluate groundwater quality at the site and potential discharges from the site to the marine environment. Monitoring well BH1a is located in the proposed route of the boat ramp and will need to be relocated during construction.

⁸ Brown, L.J., 1973. Sheet S76 Kaiapoi (1st edition). "Geological Map of New Zealand" 1:63,360. Department of Scientific and Industrial Research. Wellington, New Zealand.

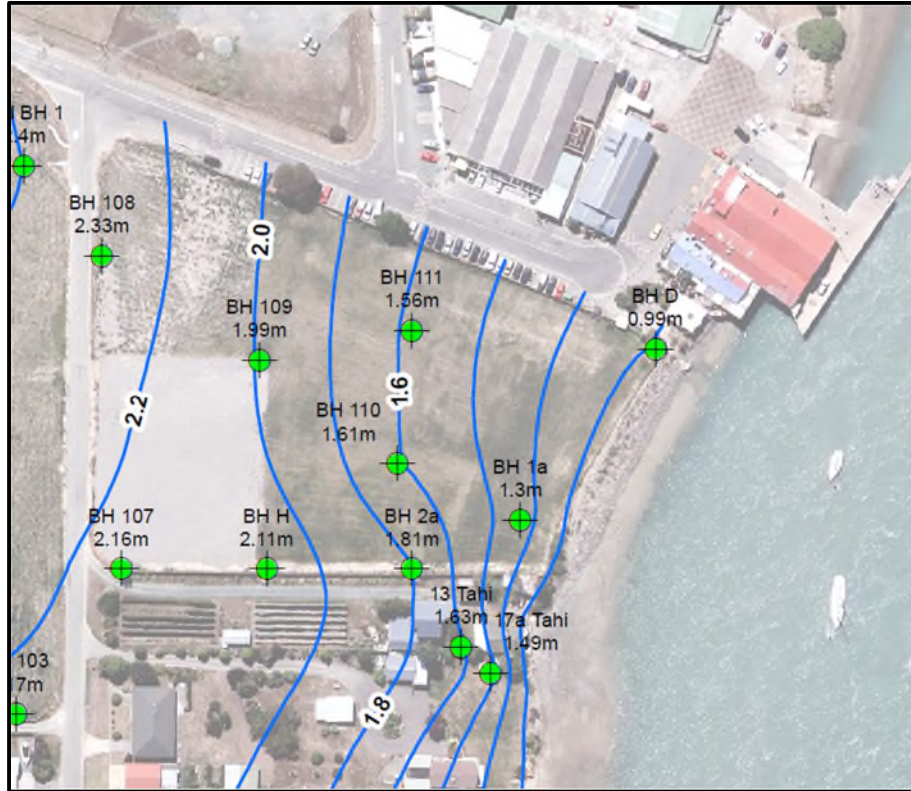


Figure 11: Groundwater levels and contours on 19 November 2012 (values in metres above mean sea level). Source PDP, 2013.

Further details of the site geology are provided in the Davis Ogilvie geotechnical report for the site, prepared concurrently to this report.

3.0 PRELIMINARY CONCEPTUAL SITE MODEL

A preliminary conceptual site model has been developed and consists of three primary components. For a contaminant to present a risk to human health or the environment, all four components are required to be present and connected. For the potential risk to be determined each component is required to be assessed. The four components of a conceptual site model are:

- Source of contamination.
- Pathway by which contamination can move from the source towards the receptors.
- Sensitive receptors which may be impacted by the contamination.
- Exposure pathway where contaminants potentially enter the receptor.

3.1 Source

On the basis of the historical information reviewed, site walkover, and reports reviewed, the primary HAIL / potential HAIL activities identified for the site are pesticide manufacture related to the former use of the site as the former FCC. No other potential HAIL land uses were identified during the site walkover or review of historical records.

3.2 Potential Contaminants of Concern

Potential contaminants of concern (CoCs) in soil related to the identified HAIL / potential HAIL activities include heavy metals, and organochlorine pesticides (OCP) specifically Dichlorodiphenyltrichloroethane (DDT), dieldrin, aldrin and lindane.

3.3 Potentially Relevant Receptors

3.3.1 Human Receptors

Given the proposed future recreational land use, potential receptors are considered to include future recreational visitors to the site. In addition, other future receptors could include earthworks contractors involved in undertaking the proposed boat ramp and boat club building construction, and future maintenance workers on the site completing subsurface works such as drainage.

3.3.2 Ecological Receptors

Given the site's proximity to the Waimea Inlet, the marine environment is considered a sensitive ecological receptor at the site.

3.4 Potential Contaminant Exposure Pathways

The potential receptors listed above may come into contact with the contaminants through several potential exposure pathways. The applicability of the exposure pathways are discussed in more detail in Section 7.

Potential relevant exposure pathways for the site where human health receptors may be exposed to the contaminants within the topsoil include dermal contact, accidental ingestion and/or inhalation of dust pathways. The marine environment may be exposed to contamination at the site through stormwater interaction with contaminants in the topsoil and run-off to the inlet. In addition, stormwater run-off may infiltrate through the cap and potentially leach contaminants from the subsoil and managed fill into groundwater.

Table 2: Preliminary Conceptual Site Model					
Potential Sources	HAIL ID	Contaminants of Concern	Potential Receptors	Exposure Route and Pathways	Investigation locations
Pesticide residues in topsoil on site and within capping soil (0.15 – 0.5 m bgl) associated with the former Mapua FCC remediation project.	A12 Pesticide manufacture (including animal poisons, insecticides, fungicides or herbicides) including the commercial manufacturing, blending, mixing or formulating of pesticides	OCPs – DDT and dieldrin Heavy Metals	Recreational land users Construction workers and future maintenance workers	Dermal contact, inhalation of dust and accidental ingestion of soil.	All shallow soil samples
			Waimea Inlet	Stormwater run-off Groundwater discharge to the inlet	Investigations by others.

To evaluate the preliminary conceptual site model a targeted soil assessment was completed of soil likely to be disturbed during the earthworks and limited to the upper 0.5 m. The TDC SMP was consulted, and controls adopted to ensure the soil sampling was completed with minimal disruption to the existing cap. The DSI was completed on 13 July 2022 by a Davis Ogilvie Environmental Scientist.

4.0 SOIL SAMPLING

4.1 DSI Objective

The objective of the DSI was to evaluate the soil within the upper 0.5 m likely to be disturbed during the proposed earthworks. Although the soil was validated post remediation, for the purposes of waste classification, more recent data was required. At the time of the assessment, no development was proposed to the west of Tahi Street and therefore no samples to verify the contaminant concentrations in this part of the site were collected. Based on the SKM soil validation report, soil to the west of Tahi Street can be expected to contain contaminants of concern below residential levels but above background and ANZECC sediment quality guideline criteria for DDT.

4.2 Methodology

The site investigation was carried out on 13 July 2022 and comprised a site walkover inspection and collection of soil samples from five hand dug test pits. Test pit locations are indicated on Figure 10 while the scope of work included the following;

- Excavation by hand of five shallow test pits to a maximum depth of 0.5 m bgl.
- Samples were collected from representative soil horizons within each test pit but typically consisted of one sample within the topsoil layer (0 – 0.15m) and a second deeper sample within the underlying capping material (0.15 – 0.5m).

- A square turf was cut and set aside while soil was excavated and placed in small stockpiles for each unit to allow it to be placed back in the test pits in the order it was excavated. The turf was replaced at each point following backfilling.
- The test pit locations were targeted to areas of the site where earthworks associated with the boat ramp may be necessary.

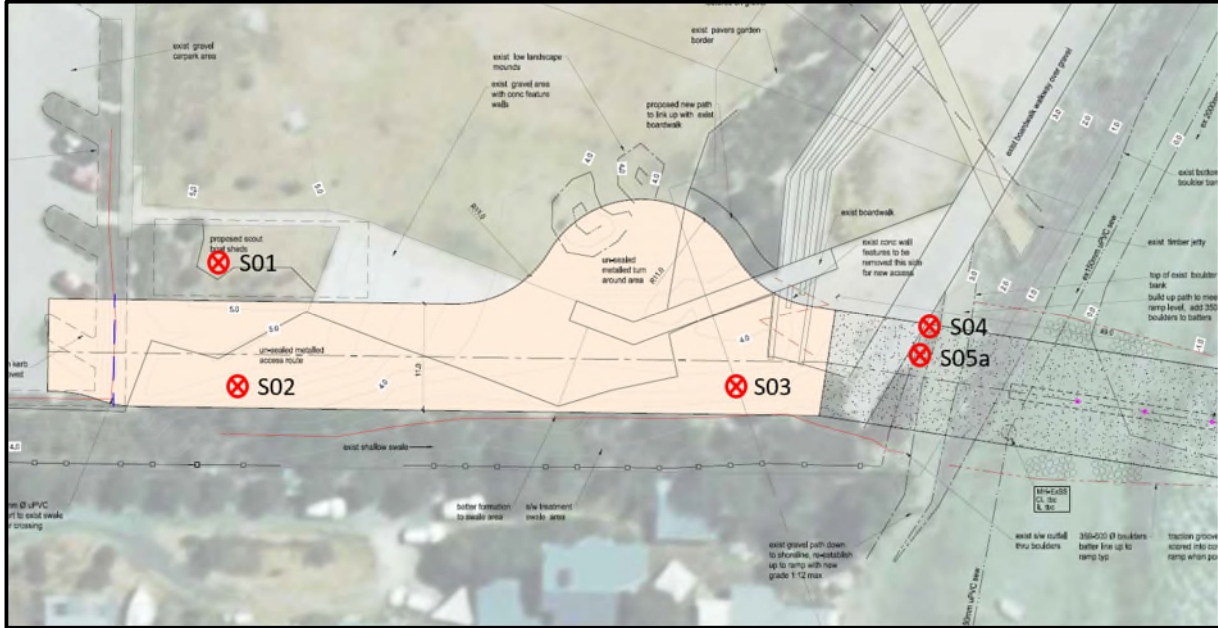


Figure 10: Overview of sample locations. Source; Davis Ogilvie Prelim P1.

4.3 Quality Assurance/Quality Control (QA/QC)

The following procedures were adopted during the assessment to assist with meeting quality control objectives during the assessment:

- All field work was carried out in compliance with project specific hazard identification procedures.
- All works were conducted by trained staff with precautions taken including implementation of procedures for the appropriate handling of potentially contaminated material.
- Soils encountered during sampling were examined for visual or olfactory evidence of contamination.
- Soil was logged in accordance with the NZ Geotechnical Society Field Description.
- Soil samples were collected as per the MfE Contaminated Land Management Guidelines.
- Soil samples were collected using a clean new pair of nitrile gloves per sample and then placed directly into a new plastic or glass jar.
- Sampling implements, if used, were cleaned between samples using a three-stage decontamination process.

- Following field analysis, all soil samples for laboratory analysis were placed directly into storage and transported under standard Davis Ogilvie chain of custody procedures, to Hill Laboratories for analysis.
- At each sample location, any remaining soil that was not collected was placed back into the sampling pit in the order it was excavated. Topsoil and/or turf was placed back on top following sampling to make safe the test pit.
- A pair of duplicate samples were collected and submitted for analysis to assess the variability in contaminant concentrations and accuracy of the laboratory analysis. No other QA/QC samples were collected or analysed.
- All fieldwork has been conducted under the supervision of a SQEP and the report was reviewed by a SQEP, as required by the NESCS.
- All soil samples were submitted to Hill Laboratories Limited. Hill Laboratories are a recognised laboratory that is endorsed by International Accreditation New Zealand (IANZ) which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). The tests were performed in accordance with the terms of accreditation.

4.4 Laboratory Analysis

The methods used by Hill Laboratories are presented in their analytical report presented in Appendix C. The following laboratory analysis was completed by Hill Laboratories.

- 12 of the soil samples were analysed for heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc).
- 12 of the soil samples were analysed for OCPs (including DDT and dieldrin).

Analytical results are discussed in Section 6.0 and summarised in Table 3 (at end of report). Laboratory reports are provided in Appendix C.

5.0 ASSESSMENT CRITERIA

5.1 Environmental Standards

Te Mana o te Wai refers to the vital importance of water. The National Policy Statement for Freshwater Management 2020 (NPS-FM 2020) strengthens and clarifies Te Mana o te Wai with a hierarchy of obligations introduced which means prioritising the health and well-being of water first over people's needs. An assessment of potential contaminant entrainment within stormwater discharge during potential earthworks has been completed.

Comparison of soil concentrations with the Australia & New Zealand Guidelines for Fresh & Marine Water Quality default guideline values (DGVs) toxicant default guideline values for sediment quality and also the 'upper' guideline values (GV-high). Evaluation of soil concentrations against sediment guideline criteria has been completed as an initial conservative assessment to evaluate potential stormwater runoff quality with regards to contamination.

To assess the potential risk to the marine environment, default sediment guideline values from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018) (ANZG) have been adopted. Although our sampling targeted the soil on site and not the sediment in the marine environment, the assessment of soil concentrations against a sediment guideline, especially when located so close to the marine environment, can assist with evaluating the potential risk via suspended solids in stormwater run-off from the site. The sediment guidelines adopted are the default GV-high values given the modified nature of the marine environment. The values have not been adjusted to take account of organic carbon content in soil.

5.2 Applicable Soil Contaminant Standards

5.2.1 Background Concentrations

The site is located within the Tasman Region. Accordingly, background concentrations have been adopted from Landcare Research (2015) Background concentrations of trace elements and options for managing soil quality in the Tasman and Nelson Districts⁹. Adopted background criteria are presented in the Table 3 at the end of the report.

The NES Regulations under 5(9) do not apply to a piece of land where a detailed site investigation exists that demonstrates that any contaminants in or on the piece of land are at, or below, background concentrations.

Cleanfill sites also use background concentrations relative to their location, to determine waste acceptance criteria. Soil above background concentrations is typically not permitted to be disposed of to cleanfill sites.

5.2.2 Priority Contaminants: Soil Contaminant Standards

The User's Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health¹⁰ details Soil Contaminant Standards (SCSs) for seven inorganic substances and five organic compounds (or groups of compounds). The contaminants analysed at this site for which SCSs are available are arsenic, cadmium, chromium, copper, lead, mercury, DDT, dieldrin and aldrin.

⁹ Landcare Research (2015). Background concentrations of trace elements and options for managing soil quality in the Tasman and Nelson Districts. Report prepared by Jo Cavanagh, Landcare Research, June 2015.

¹⁰ Ministry for the Environment (MfE) (2012). Users' Guide. National Environmental Standard for Assessing and Managing Contaminants in Soils to Protect Human Health. Ministry for the Environment, Wellington, New Zealand.

Given the planned future recreational land use, a recreational land-use exposure scenario has been adopted. SCSs adopted for the site are presented in Table 3.

5.2.3 Other Applicable Human Health Standards

For contaminants of concern that are not listed as priority contaminants, the NESCS references the Ministry for the Environment's Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values to provide guidance.

For the two heavy metals detected at the site for which SCSs are not available, nickel and zinc, the Australian National Environment Protection (Assessment of Site Contamination) Measure (NEPM) (NEPC, 2013) concentrations have been adopted for screening assessment purposes for a recreational land use scenario.

6.0 RESULTS

6.1 Observations

- Soil encountered in the three shallow test pits in the west of the site (S01, 2 and 3) consisted of a brown silty topsoil with frequent medium to coarse gravel between ground surface and a depth of approximately 0.2m bgl.
- Topsoil included frequent rootlets and multiple earthworms observed with no visual or olfactory evidence of significant contamination.
- The subsoil fill material consisted of a light orange/brown gravelly clay. Gravel was predominately medium to coarse sub angular to sub rounded and included occasional cobbles. No visual or olfactory evidence of contamination was observed.
- No topsoil was observed at soil sampling locations S04 or 5a, instead the orange gravelly clay was encountered at ground level.

6.2 Soil Analytical Results

- No concentrations were detected in excess of SCS for recreational land use.
- Copper concentrations in excess of background levels were detected in the majority (10/12) of soil samples analysed.
- Concentrations of other metals were at or below background concentrations.
- Total DDT concentrations ranged from 0.3 to 4.8 mg/kg (peak concentration in S04 at 0.2 m bgl).
- Aldrin and dieldrin concentrations ranged from 0.014 to 2.4 mg/kg (peak concentration in SO4 at 0.05 m bgl).
- Heavy metal concentrations in the samples analysed did not exceed the ANZG sediment guideline values - GV-high.

- Total DDT, aldrin and dieldrin concentrations in all samples exceeded ANZG sediment guideline values - GV-high.
- The duplicate soil samples (S01_0.3m and Duplicate 01) had acceptable relative percentage differences for both heavy metals and OCPs.

Laboratory concentrations compared to adopted assessment criteria are presented in Table 3 at the rear of this report.

7.0 CONCEPTUAL SITE MODEL AND RISK ASSESSMENT

The potential source, pathway, receptor linkages at this subject site are provided in Table 4.

Table 4: Conceptual Site Model			
Potential Sources and Contaminants of Concern	Potential Receptors	Exposure Route and Pathways	Risk Assessment
Pesticide residues in topsoil on site and within capping soil (0.15 – 0.5 m bgl) associated with the former Mapua FCC remediation project. OCPs – DDT and dieldrin Heavy Metals	Recreational land users Construction workers and future maintenance workers	Dermal contact, inhalation of dust and accidental ingestion of soil.	All shallow soil samples meet recreational land use criteria. Acceptable risk to human health for proposed redevelopment work.
	Waimea Inlet	Stormwater run-off Groundwater discharge to the inlet	Potential risk to the marine environment if earthworks not controlled appropriately. Significant erosion and sediment control measures should be in place to prevent sediment generation in runoff and prevent suspend solids leaving the site.

8.0 CONCLUSIONS

8.1 Summary

The site has an extensive land contamination history and once operated as the Fruitgrowers Chemical Company where it processed and manufactured multiple chemicals for the agriculture industry. The site was the subject of a multimillion-dollar soil remediation project between 2004 – 2008 to make the site suitable for commercial and recreational land use. This included the construction of approximately a half metre thick soil cap of imported and site won material which met the required soil concentration grades.

The Māpua Boat Ramp Trust propose to construct a boat ramp and associated boat club building at the site. The preliminary designs indicate that some earthworks to recontour localised areas of the cap maybe necessary to obtain the required grades. The earthworks are understood at this stage to not extend beyond 0.4 m bgl. The proposal will include a gravel access road (approximately 0.3 m thick and concrete boat ramp which will replace the soil cap if this is required to be reduced in thickness. The foundation type and specification for the proposed building have yet to be determined.

Concentrations exceeding background levels of copper, DDT, dieldrin and aldrin were detected in the topsoil and underlying fill material, but no concentrations in excess of recreational land use SCS were detected. All soil samples also contained concentrations of DDT, dieldrin and aldrin which exceeded the sediment guideline values (high) which are protective of the aquatic environment. The highest DDT concentrations were identified in close proximity to the foreshore and at or very close to the ground surface and pose a potential risk to the marine environment if disturbed and sediment is unwittingly permitted to leave the site via stormwater runoff.

8.2 Regulatory Considerations

Soil concentrations in excess of background were detected and as such Davis Ogilvie consider that the NESCS regulations do apply. Concentrations in excess of SCS for recreational land use were not detected and therefore the soil disturbance associated with the proposed new build will require consent as a controlled activity under Regulation 9 of the NESCS.

8.3 Development Considerations

Concentrations in excess of background levels were detected in topsoil and fill materials in all locations on the site. While remediation of these soils will not be required for recreational land use, it is anticipated that that some soil may need to be excavated during development earthworks to obtain the required falls, and this will require appropriate management. The soil can be retained on site, if feasible to do so, but should be reinstated into an erosion resistant state as quickly as possible.

Any topsoil or fill which requires removal from site will need to be disposed of to a licensed facility that can accept the contaminant concentrations detailed in this report. The soil is not to be disposed of as cleanfill.


Fill material at a depth greater than 0.5 m is reported to contain treated fines and soil that contains up to 200 mg/kg DDT, 60 mg/kg dieldrin and aldrin and 5,000 mg/kg copper. This material should not be encountered by the current redevelopment designs. All redevelopment work should follow the TDC SMP (2012). If earthworks are required to extend below the cap (0.5m) then TDC is to be informed immediately.

A robust site management plan (SMP) including erosion and sediment controls should be produced by a contaminated land SQEP for the project once final designs are produced. This should be produced in conjunction with Tasman District Council to ensure the controls are acceptable to the landowner.

Unexpected Discovery

Given the limited extent of sampling and observation, it is possible that conditions exist which were not detected during the investigation.

Should ground conditions differing to those described in this report be encountered on site, particularly if fill or building materials are observed, a suitably qualified environmental practitioner (SQEP) must be immediately approached for comment.

Table 3: Laboratory Results and Assessment Criteria Comparison.															
 42454, Mapua Boat Ramp	Background Concentrations ⁵ (mg/kg)	NES SCSs ¹ for Protection of Human Health based on a Recreational land use ⁷ (mg/kg)	Australian and New Zealand Guidelines for Fresh and Marine Water Quality - GV-high (mg/kg) ⁹	MP_S01	MP_S01	Duplicate 01 (S01_0.3m)	MP_S02	MP_S02	MP_S03	MP_S03	MP_S03	MP_S03	MP_S04	MP_S04	MP_5a
				3034646.11	3034646.20	3034646.12	3034646.10	3034646.70	3034646.90	3034646.80	3034646.30	3034646.40	3034646.60	3034646.50	3034646.10
Laboratory number															
Date Collected				13-Jul-22											
Sample depth (m bgl)				0.1m	0.3m		0.1m	0.3m	0.05m	0.3m	0.4m	0.5m	0.05m	0.2m	0.05m
Soil Type				Topsoil	Fill (clay)		Topsoil	Fill (clay)	Topsoil	Topsoil	Fill (clay)	Fill (clay)	Fill (clay)	Fill (clay)	Fill (clay)
Heavy Metals (mg/kg)															
Arsenic	8.6	80	70	7	8	8	5	8	6	5	5	7	4	5	4
Cadmium	0.7	400	10	0.14	0.24	0.26	0.12	0.27	0.17	0.13	0.13	0.18	< 0.10	< 0.10	< 0.10
Chromium ²	85	2,700	370	37	32	31	38	33	28	31	37	33	45	29	28
Copper	38.8	>10,000	270	42	51	52	39	53	37	40	45	48	61	74	29
Lead	27.6	880	220	15.6	15.3	15.6	16.3	15.8	24	16.1	16.3	15.9	12.4	14.3	12.8
Nickel	184	1,200 ⁸	52	37	29	27	42	33	29	37	42	34	61	42	41
Zinc	128	30,000 ⁸	410	73	95	95	77	93	84	71	76	79	110	59	49
Organochlorine Pesticides (OCPs) (mg/kg) ^{4*}															
2,4'-DDD	-	-	0.020	0.02	0.019	0.019	0.112	0.016	0.019	0.068	0.07	0.051	0.046	0.2	0.028
4,4'-DDD	-	-	0.020	0.037	0.038	0.04	0.175	0.023	0.032	0.146	0.175	0.129	0.1	0.31	0.051
2,4'-DDE	-	-	-	0.013	0.012	0.017	0.083	< 0.012	0.016	0.035	0.028	0.025	0.019	0.137	0.014
4,4'-DDE	0.028 ⁶	-	0.027	0.137	0.106	0.116	1.09	0.155	0.31	0.37	0.24	0.21	0.43	0.78	0.22
2,4'-DDT	0.0017 ⁶	-	-	0.033	0.023	0.019	0.27	0.052	0.053	0.04	0.018	0.02	0.48	0.58	0.192
4,4'-DDT	0.0254 ⁶	-	-	0.145	0.105	0.086	1.46	0.24	0.29	0.182	0.074	0.083	2.4	2.8	0.75
Total DDT Isomers	0.052 ⁶	400	0.005	0.39	0.3	0.3	3.2	0.5	0.72	0.84	0.61	0.52	3.5	4.8	1.26
Aldrin	-	70 ¹⁰	0.007	< 0.013	< 0.012	< 0.012	< 0.013	< 0.012	< 0.013	< 0.014	< 0.014	< 0.013	0.59	< 0.012	< 0.012
Dieldrin	0.00061	70 ¹⁰	0.007	0.023	0.017	0.014	0.21	0.023	0.048	0.054	0.045	0.034	1.81	0.72	0.22
Aldrin + dieldrin	0.00061	70 ¹⁰	0.007	0.023	0.017	0.014	0.21	0.023	0.048	0.054	0.045	0.034	2.4	0.72	0.22

Notes:

Grey shaded: Value exceeds adopted background or ambient concentrations

Bold: Value exceeds the ANZG-GV-high

Red: Value exceeds the ANZG-GV-high & recreational land use criteria.

m bgl - metres below ground level

mg/kg - milligrams per kilogram

< - reported at a concentration less than the laboratory limit of reporting (LOR)

1. Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NESCS).

2. NESCS SCS criteria presented are for Chromium (VI)

3. National Environment Protection Council (NEPC) (2013). National Environmental Protection (Assessment of Site Contamination) Measure as amended in 2013 Schedule B1, Health Investigation Levels (HIL) for soil contaminants based on Residential (A) land use.

4. Refer to appended laboratory report for a full list of OCPs analysed.

5. Landcare Research (2015). Background concentrations of trace elements and options for managing soil quality in the Tasman and Nelson Districts. Table 4 - 95th percentile background concentration.

6. Ministry for the Environment (1998). Ambient concentrations of selected organochlorines in soils. Table F3 - mean values for provincial centre soils.

7. NESCS (2011) soil quality Recreational land-use SCSs for the protection of human health.

8. National Environment Protection Council (NEPC) (2013). National Environmental Protection (Assessment of Site Contamination) Measure as amended in 2013 Schedule B1, Health Investigation Levels (HIL) for soil contaminants based on Recreational (C) land use.

9. Australian and New Zealand Guidelines for Fresh and Marine Water Quality Guidelines. Recommended default guideline values for toxicants in sediment. Guideline values - High.

10. The SCS is applicable to either dieldrin or aldrin separately, or to the sum of aldrin and dieldrin if both are involved.

APPENDIX A

Site Photographs



Photograph: 1

View west across site.



Project Ref: 42454

Māpua Boat Club



Photograph: 2

View East from SB1



Project Ref: 42454

Māpua Boat Club



Photograph: 3

View north from SB2



Project Ref: 42454

Māpua Boat Club



Photograph: 4

View west from SB3



Project Ref: 42454

Māpua Boat Club



Photograph: 5

Perched water in SB3.



Project Ref: 42454

Māpua Boat Club



Photograph: 6

View south of SB4 and 5a



Project Ref: 42454

Māpua Boat Club

Former Fruitgrowers Chemical Company Site, Mapua

FCC East and FCC Landfill Sites



Site Management Plan

- Version 2.0
- 8 March 2012

Contents

1	Introduction	1
2	Objectives	2
3	Site Status	2
3.1	Overall Site Conditions	2
3.2	Soil Subcategories.....	3
3.3	Current Site Use	4
3.4	Associated Hazards.....	4
4	General Site Management Implementation Strategy	5
4.1	Site Area.....	5
4.2	Implementation Mechanisms	5
4.2.1	FCC East.....	5
4.2.2	FCC Landfill.....	5
4.2.3	Tahi Street and The Creek	6
4.3	Responsibilities.....	6
4.3.1	The Site Owner (TDC Property Manager).....	6
4.3.2	Plan Approvals (Environment & Planning Manager)	6
4.3.3	Site Occupiers/Tenants	7
4.3.3.1	FCC East	7
4.3.3.2	FCC Landfill	7
4.4	SMP Review.....	7
5	General Management Measures	7
6	Specific Management Measures	8
6.1	General	8
6.2	Control of Soil Movement.....	8
6.2.1	Excavation and Replacement of Soils.....	8
6.2.2	Surface to 150mm Depth.....	9

6.2.3	150mm to 500mm Depth	9
6.2.4	500mm Depth and Below	9
6.3	Subsurface Works	10
6.3.1	General	10
6.3.2	Tahi Street.....	10
6.3.3	Groundwater Cut-off Wall	11
6.4	Sediment and Erosion Control	11
6.5	Dust Control	12
6.6	Groundwater Diversion, Disposal and Abstraction	12
6.7	Phytotoxic Effects	13
6.8	Health and Safety for Construction and Maintenance Workers	13
6.8.1	Ammonia Gas.....	13
6.9	Additional Provisions for the Creek Adjacent to the North-West Boundary of FCC Landfill.....	14
7	References	15
Appendix A	Site Location Plan.....	16

Document History and Status

Revision	Date Issued	Reviewed By	Approved By	Date Approved	Revision Type
Draft01	30 Aug 2007	D Robotham	D Robotham	3 Sept 2007	Internal, Edits on e-copy
Draft01	3 Sept 2007	R Graham	R Graham	6 Sept 2007	Internal, Edits on e-copy
Draft02	12 Sept 2007	D Robotham	A Reeve	12 Sept 2007	Internal
Draft03	14 Sept 2007	MfE			
Draft 04	24 June 2009	Bruce Clarke	Bruce Clarke	24 June 2009	
Version 07	5 Aug 2009	Bruce Clarke	Chris Purchas	5 August 2009	For Client Review
Issue version 1.0	6 Aug 2009	Bruce Clarke	Chris Purchas	5 August 2009	Issue
Issue Version 1.0	6 Aug 2009	MfE, TDC and PDP	B Clarke	6 August 2009	Issue

Revision of Document, originally prepared by Bruce Clarke of Sinclair Knight Mertz: SKM, PO Box 9806, Newmarket, Auckland

Revision	Date	Title	Revision by
First Revision	March 2012	Version 2	Jenny Easton, Tasman District Council

File name:

1 Introduction

A remediation project has been completed at the former Fruitgrowers Chemical Company (FCC) site located at Mapua, New Zealand. Soil and groundwater at the site were affected by organochlorine pesticide (OCP) contamination from the operation of the FCC plant from 1932 until 1988. The remediation was required to reduce the risk posed by the site to future site users, the local inhabitants and the environment. In their report, “Audit of the Remediation of the Former Fruitgrowers Chemical Company Site, Mapua” (2009), the Site Auditor, Pattle Delamore Partners Limited (PDP) has advised that the site is now fit for its intended purpose, subject to the implementation of the management measures set out in this Site Management Plan (SMP).

This SMP sets out the requirements for the post-remediation management of the health, safety and environmental risks associated with the FCC East site, FCC Landfill site, Tahī Street roadway between FCC East and FCC West and the creek adjacent to the FCC Landfill site, Mapua. Adherence to this plan for all works covered by the plan is mandatory.

The application of this SMP is slightly different for each site. Where a section or part of a section of the SMP does not apply to all sites, this is made clear in the text.

This SMP is intended to cover risks from residual contamination and is not intended to be a health and safety plan for normal construction activities. Separate health and safety plans specific to particular construction works may need to be prepared by the site owner, tenants or site contractors, on a case by case basis.

This SMP is not intended to provide detailed information on site contamination, investigation results or site remediation. Details of the remediation and current site status are given in the SKM report “Site Validation Report for the Former Fruitgrowers Chemical Company, Mapua” (2008). The site remediation and the SKM Site Validation Report have been assessed and approved by the independent auditor, PDP. The reader is referred to the PDP report “Audit of the Remediation of the Former Fruitgrowers Chemical Company Site, Mapua” (2009).

This SMP has been created in accordance with guidelines set out by MfE Contaminated Land Management Guidelines No. 1: “Reporting on Contaminated Sites in New Zealand” (MfE, 2001) and NSW DEC (2006) guidelines.

Tasman District Council (TDC), acting through its Property Manager, is the owner of the site. As owner, TDC may carry out work in its own right or ensure compliance with this plan by contractors or tenants on the site.

TDC, acting through its Environment & Planning Manager, is responsible for regulating activity on the site and controlling discharges, and will consider any approvals or consents required for this site, including any approvals sought by TDC’s Property Manager acting on behalf of TDC. TDC’s various roles are discussed further in Section 4.3.

2 Objectives

The main objective of the SMP is to ensure that any residual contamination on the FCC East and FCC Landfill sites, the area of Tahi Street between the FCC East and FCC West sites and the creek adjacent to the FCC Landfill site does not cause adverse effects on human health or the environment for the proposed site use, by specifying controls on development and maintenance activities, particularly excavation.

This SMP is not intended to provide detailed information on site history, site contamination, investigation results or the remediation of the sites. Reference should be made to the following reports for more detailed information:

- “Site Validation Report for the Former Fruitgrowers Chemical Company, Mapua” SKM (2008); and
- “Audit of the Remediation of the Former Fruitgrowers Chemical Company Site, Mapua” PDP (2009).

3 Site Status

3.1 Overall Site Conditions

The site, apart from the Tahi Street southern road reserve and the creek, has been remediated to meet Soil Acceptance Criteria (SAC) as set out in the resource consents for the site remediation project and according to the Site Auditor is therefore fit for its intended purpose as open space (FCC Landfill) and open space/commercial land (FCC East). The SACs were set in conditions to resource consents granted for the Mapua site remediation.

Contaminated soils above relevant SAC (shown in Table 1) have either been removed from site or treated and reused. The FCC East and FCC Landfill sites have been capped with 500mm of residential quality material. This cap is composed of 150mm of imported topsoil (cleanfill) and the layer from 150mm to 500mm depth is a mixture of imported material, and residential soil sourced from the site during remediation and has been validated as meeting the residential SAC.

Beneath this layer, both sites have been reinstated using materials that are, on average, below the relevant SACs for the intended future land use of the sites. These subsurface materials are generally soils which were either left in place (because they were found to already conform to the appropriate SACs), or were excavated and moved around the site during the remediation works. The excavated soils have been validated as suitable for reuse in an appropriate area of the site without treatment or treated then validated as suitable for reuse.

Although the sites have been validated as remediated to the appropriate SACs, concentrations of contaminants above ‘natural’ background levels (and above SACs for unrestricted use) are still present in the subsurface soils of the site. The relevant SACs for each land use and for each contaminant are presented in Table 1. Residual contaminant concentrations remaining in the subsurface soils of the different areas of the site will be below these relevant SACs. Soils at the FCC East and FCC Landfill sites have been remediated to Open Space/Commercial SACs.

Table 1: Selected Soil/Sediment Acceptance Criteria

Land Use	Depth (m)	DDX (total DDT, DDD, DDE) (mg/kg)	Aldrin + Dieldrin + 10% Lindane3 (mg/kg)	Copper
<i>Residential</i>	All	51	31	300
<i>Commercial</i>	0–0.5	51	31	300
	Below 0.5	2002	602	5000
<i>Recreational or open space</i>	0–0.5	51	31	300
	Below 0.5	2002	602	5000
<i>Marine sediment</i>	All	0.01	0.01	65

Notes:

- 1 Based on protection of the off-site environment through rainfall run-off. This will also be protective of human health and groundwater.
- 2 Based on protection of groundwater.
- 3 Based on a WHO ADI of 0.001 mg/kg/day for lindane (Egis, April 2002).

3.2 Soil Subcategories

Various soil sub-categories have been placed on the sites. These are:

- topsoil;
- residential;
- commercial;
- treated fines (including 5-10mm component);
- concrete (crushed);
- oversize material (>10mm);
- oversize marine sediments (>10mm);
- sand;
- marine sediments;
- clay;
- imported gravel; and
- path and rocks (at surface).

Details of the placement depths of each material are presented in the as-built drawings in Appendix F of the validation report (SKM 2008).

Sinclair Knight Merz

3.3 Current Site Use

The FCC East and FCC Landfill sites are currently vacant. The site owners should ensure that there is no disturbance of the sites' soils whilst they remain vacant.

3.4 Associated Hazards

The FCC East and FCC Landfill sites have been capped with 500mm of residential quality material. This cap is composed of 150mm of imported topsoil (cleanfill) and the layer from 150mm to 500mm depth is a mixture of imported material, and residential soil sourced from the site during remediation. This layer contains residual OCP which presents a hazard to the estuary.

Any soils at the sites containing residual contamination require careful management. Failure to control soil movement at the site could result in the following hazards:

Soil from surface to 500mm depth

- The surface 150mm is topsoil (cleanfill) and presents no contaminant hazard for the future use of the site. Maintaining the 150mm of topsoil (cleanfill) over the next layer down or some other cover, eg, grass, is important (see below); and
- The soil from 150 – 500mm depth has OCP residues at concentrations that present no human health risk but could present a risk to the marine environment if brought to the surface or disposed of in a location where it could be transported to the marine environment in significant quantities via run-off.

Soil deeper than 500mm has:

- Contaminant residues that present a risk to the marine environment if brought to the surface or disposed of in a location where the soil could be readily transported to the marine environment in surface run-off;
- Contaminant residues that present risk to the environment if disposed of off-site to a more sensitive environment, eg, residential land, and that may otherwise require a resource consent for discharge to land if not disposed of to an appropriate disposal facility, eg, landfill;
- Ammonia and copper residues within treated soil at some locations which may present risk to plant health for some deeper rooted plants; and
- Groundwater under the site which has concentration of contaminants that may present a risk to the marine environment if disposed of to TDC's stormwater system or directly to the marine environment.

4 General Site Management Implementation Strategy

4.1 Site Area

The areas controlled by this SMP are:

- FCC Landfill Site – Lot 1 DP 14311;
- FCC East Site – Lots 2, 3 and 4 DP 11106, Lots 1, 2, 4, 5, 6 and 7 DP 11502;
- Tahi Street between FCC East and FCC West;
- The creek adjacent to the north-west boundary of FCC Landfill.

A site plan of these areas in context with the other areas of the former Fruitgrowers Chemical Company site are annotated as “Landfill FCC”, “East FCC”, “Creek” and “Tahi Street” on the drawing in Appendix A.

4.2 Implementation Mechanisms

Adherence to this plan by any person carrying out work at the site is mandatory.

Those carrying out work on any part of the site shall be familiar with this plan. This includes, but is not limited to, employees, consultants, contractors and sub-contractors of TDC, tenants or other occupiers, whether temporary or permanent, of the site or parts of the site.

4.2.1 FCC EAST

It is important for the future users of the FCC East site that this SMP is adhered to by site owners/tenants, and any agents or contractors of future owners or tenants. To ensure the implementation of and compliance with the SMP, TDC will retain ownership of the site and will lease the site, or parts of the site, for future development. Compliance with the SMP will be made a condition of any lease agreement.

If TDC sells the site, or part of the site, a mechanism must be established to ensure that the requirements of the SMP are adhered to by the future owners.

4.2.2 FCC LANDFILL

To ensure the implementation of and compliance with the SMP, TDC will retain ownership of the site including any future developments with the long term site use as a recreational facility.

If TDC sells the site, a mechanism must be established to ensure that the requirements of the SMP are adhered to by the future owners.

4.2.3 TAHI STREET AND THE CREEK

Implementation of this SMP in Tahī Street and the creek will be controlled by TDC retaining ownership/responsibility of these areas.

4.3 Responsibilities

The following parties have responsibilities relating to the implementation of the SMP.

4.3.1 THE SITE OWNER (TDC PROPERTY MANAGER)

The TDC Property Manager represents TDC as the current site owner. The Property Manager is responsible for:

- the implementation of this SMP whilst TDC remains the site owner;
- ongoing compliance with the SMP whilst TDC remains the site owner;
- producing all Earthworks Management Plans (EMPs) for the site and ensuring these are approved by the TDC Environment & Planning Manager before any work is carried out at the site;
- ensuring that any people carrying out subsurface works on the site are aware of the SMP (this includes underground service providers);
- maintaining adequate records of works controlled by the SMP;
- ensuring the SMP is adapted to changing circumstances; and
- ensuring work is carried out in accordance with approved EMPs and any additional conditions imposed by the Environment & Planning Manager.

In the case of parts of the site that are leased for commercial use, the TDC Property Manager, acting as site owner and leaseholder, will pass responsibility for adhering to the requirements of the SMP and any relevant consent conditions to tenants through the lease agreement.

4.3.2 PLAN APPROVALS (ENVIRONMENT & PLANNING MANAGER)

The Environment & Planning Manager at TDC shall be responsible for ensuring the Property Manager complies with this SMP, considers and grants approvals, as appropriate, for any EMPs or other work-specific plans submitted pursuant to this SMP, and ensures any conditions in such plans are complied with. The Environment & Planning Manager is responsible for:

- setting conditions that will need to be met by site developers and occupiers that will be overseen by the site owner (TDC Property Manager). Adherence to the requirements of this SMP will form one of these conditions. Further conditions may include ongoing monitoring requirements (for example, a future groundwater monitoring programme).

4.3.3 SITE OCCUPIERS/TENANTS

4.3.3.1 FCC East

The long term site use for the FCC East site is envisaged to be open space and commercial. TDC intends to retain ownership of the FCC East site and will lease parts of the FCC East site for redevelopment. TDC will be responsible for ensuring that the site occupiers/tenants comply with the SMP as discussed in Section 4.3.1. This will ensure that this SMP is implemented during site use.

4.3.3.2 FCC Landfill

The long term use for the FCC Landfill site is envisaged to be recreational. As TDC will retain ownership of the FCC Landfill site, it will be responsible for developing and administering the recreational land use facility which is scheduled to be developed on the FCC Landfill area.

4.4 SMP Review

The SMP is a live document that will be updated to reflect any changes to relevant laws, industry best practices or site circumstances.

As TDC is to retain ownership of the sites, the TDC Property Manager will also be responsible for the regular reviewing and updating of the SMP if required. The SMP shall be reviewed after 1 year, or after additional investigations recommended by the site audit report have been completed. The SMP shall also be reviewed if ownership of any part of the site changes. The SMP shall subsequently be reviewed on a 5 yearly basis.

Note that the first review was after 3 years in 2012, after the results of the ammonia soil gas testing.

5 General Management Measures

Prior to any works commencing on site, the following procedures shall be followed for the sites:

- an Earthworks Management Plan (EMP) must be submitted to the TDC Environment & Planning Manager for approval prior to undertaking any earthworks or excavation on the site;
- excavation shall be minimised; and
- the removal of groundwater shall be minimised.

Earthworks include digging, drilling, piling, trenching, installation and maintenance of underground services, foundation works, roading, landscaping and any other subsurface activity that has the potential to bring commercial quality soil to the surface, or which might reduce the thickness of the 500mm residential quality capping layer.

Earthworks do not include landscaping and garden maintenance activities within the depth of imported topsoil validated to comply with residential quality soil.

It should be noted that the requirements of this plan are in addition to any requirements under existing applicable legislation, planning instruments or by-laws.

Specific management measures for FCC East, FCC Landfill, the creek and Tahiti Street are stated in the following sections of this SMP.

6 Specific Management Measures

6.1 General

An EMP must be submitted to the TDC Environment & Planning Manager and approval attained before any earthworks or excavation occurs. The EMP shall describe the proposed works and detail the proposed methods that are to be employed to ensure compliance with the SMP requirements. The approval of the TDC Environment & Planning Manager is not required where the works do not penetrate the base of or compromise the thickness of the 500mm capping layer or, if within 30m of the foreshore, the 150mm topsoil layer.

6.2 Control of Soil Movement

The following sections will describe the controls required for each distinct layer of material at the FCC East and FCC Landfill sites.

6.2.1 EXCAVATION AND REPLACEMENT OF SOILS

The soils at the site have been placed in distinct layers as described in below. These discrete layers shall be maintained during and after excavation by excavation in stages. All soils should be excavated and replaced in the excavation in the sequence they were removed, with the ground surface layer being removed first and placed back last. The following methodology shall be followed during any excavation on the site:

1 Soil from ground surface to 150mm depth

Material to be excavated and stockpiled separately, it should be removed first and placed last.

2 Soil from 150mm to 500mm depth

Material to be excavated and stockpiled separately, it should be removed second and replaced second to last.

3 Soil from 500mm depth and deeper

Material to be excavated and stockpiled separately, it should be removed last and replaced first.

4 Soil replacement

The soil shall be replaced in the reverse order of excavation to ensure that the discrete layers are preserved.

6.2.2 SURFACE TO 150MM DEPTH

Topsoil (cleanfill) has been placed over the site from surface to 150mm depth.

It is imperative that the 150mm topsoil (cleanfill) layer is maintained within 30m of the FCC East boundary adjacent to the foreshore. If this layer is removed within 30m of the boundary, it should be immediately replaced by a protective layer to prevent mobilisation of the underlying residential soils by sediment run-off. For example, this could be achieved by using paving, grass, geotextile and bark layer, etc.

Should flower beds or gardens with bare soil be planned within the 30m buffer zone, a greater depth of topsoil (cleanfill) should be imported to these areas to ensure that the soil below the existing 150mm topsoil (cleanfill) layer is not exposed during garden maintenance.

6.2.3 150MM TO 500MM DEPTH

A 500mm capping layer of residential quality soil exists on the site (including the 150mm surface layer of topsoil). This layer shall be maintained unless replaced by a structure such as a building or pavement.

6.2.4 500MM DEPTH AND BELOW

Soil below 500mm depth is suitable for commercial site use but has residual contamination with the potential to cause adverse effects in a more sensitive environment. The movement of this soil must be controlled to ensure that no such adverse effects occur. Soil from below 500mm depth shall only be placed or disposed of as follows:

- within the FCC East site boundary, below the 500mm capping layer of residential quality material;
- within the boundary of FCC Landfill, below the 500mm capping layer of residential quality material;
- to an off-site facility such as a landfill that is licensed to accept such soil; or
- to an off-site location with appropriate consents to allow discharges of contaminants to land.

Temporary stockpiling of the commercial quality soil will need to be controlled to ensure that the stockpiled soil does not contaminate clean areas. Stockpiles shall be constructed within designated areas, and kept separate from stockpiles of topsoil or residential soil, labelled with appropriate signage. Unless constructed on paved areas, topsoil and residential quality soil shall be stripped from commercial stockpile locations before commencing stockpiling.

Run-off from the stockpiles will require controls.

Transport of commercial quality soil within the site shall be carried out in a manner that avoids spillage from excavator and front-end loader buckets, trucks, trailers and the like, where that spillage could fall on residential quality soil. Measures to avoid

such spillage or effects from such spillage may include avoiding overfilling buckets and trucks, and temporarily stripping residential quality material from haul roads.

Off-site movement of commercial quality soil will be carried out in such a way as to avoid spillage of soil or liquid and excessive generation of dust. Measures to be considered include not overfilling trucks, sealed trays, high-sided trays and covering of loads.

Controls must also be established to avoid the inadvertent transport of soil by vehicles or machinery to more sensitive parts of the FCC site. This may include measures such as cleaning of vehicle wheels and tracks by manual means within a designated area or establishment of wheel washes. Unless tested to be shown otherwise, soil and sediment from cleaning operations shall be treated as commercial quality material and disposed of as described above.

6.3 Subsurface Works

6.3.1 GENERAL

Soil contaminants at the sites are not expected to impact underground structures. Ammonia gas may be emitted from nitrogenous compounds within the soil matrix. However, investigation in 2010 showed there to be low concentrations of ammonia gas, which will not pose a risk to subsurface workers.

All proposals for underground structures or services below the winter-high groundwater level shall be submitted to the TDC Environment & Planning Manager for approval.

Proposals for piling or drilling that may penetrate the Moutere Gravel formation shall be submitted to the Environment & Planning Manager for approval. Such proposals shall have measures to prevent transfer of contaminated soil or water to the underlying aquifers.

6.3.2 TAHI STREET

Road maintenance, including work in the verges, and maintenance of existing underground services or installation of new services is possible on the section of Tahī Street between FCC East and FCC West, north of 13 and 18 Tahī Street. The management controls set out in this SMP for FCC East are appropriate for the road reserve on the east of Tahī Street and the section of the road reserve on the west of Tahī Street from the boundary of 18 Tahī Street to a point 75 metres north. All construction and maintenance workers shall take suitable precautions including the use of full PPE at all times.

Extra precautions should be taken in the area beneath the watermain along the Tahī Street road reserve adjacent to the southern part of the FCC West site. There is the potential to encounter contamination beneath this section of Tahī Street at concentrations higher than elsewhere on the site. A testing regime should be undertaken in this area prior to the excavation of soils to assess risks to maintenance workers and to determine disposal options for surplus soil.

The Tahī Street sealed roadway has not been sampled or remediated. A testing regime should be undertaken in this area prior to the excavation of soils to assess risks to maintenance workers and to determine disposal options for surplus soil.

Specific control methods and health and safety measures for any trenching or roadworks where the underlying soil in the roadway area is disturbed shall be developed by the TDC Property Manager and submitted for approval by the TDC Environment & Planning Manager.

6.3.3 GROUNDWATER CUT-OFF WALL

A groundwater cut-off wall has been constructed between the FCC West and FCC Landfill areas. The wall has been constructed beneath the ground surface, is made of impermeable clay and forms a barrier preventing groundwater movement between these areas. Excavations through this area which may compromise its integrity should not be undertaken. If excavations in this area cannot be avoided, authorisation to proceed should be gained from the TDC Environment & Planning Manager and the cut-off wall should be reinstated and checked by a qualified engineer.

6.4 Sediment and Erosion Control

Sediment and erosion control measures should be established for the duration of ground-breaking activities. Sediment and erosion control will need to be included in the EMP. Proposed sediment and erosion control measures must be submitted to the TDC Environment & Planning Manager for approval before any works commence. All control measures should be viewed on site by the TDC Environment & Planning Manager or designate during site works to ensure the controls are implemented.

To reduce the potential for sediment discharges off-site, sediment and erosion control measures should include, but are not be limited to:

- staging the construction works to avoid creating large areas of exposed ground at any one time, and allowing progressive stabilisation and reinstatement of previously worked areas;
- installation of all sediment and erosion control measures prior to ground-breaking activities commencing;
- limiting earthworks and any vegetation clearance to the footprint of any proposed development to minimise the disturbed area;
- the sediment and erosion control section of the TDC publication Engineering Standards & Policies 2004 should be referred to for more detail;
- removal of excess or unsuitable excavated materials from site as soon as possible. Where stockpiling is necessary, locate stockpiles away from stormwater drains and water bodies;
- ensure stockpiles are protected by additional sediment and erosion control measures;
- utilising a range of sediment and erosion control measures on and around exposed areas including silt fences, run-off diversion channels draining to on-site sediment ponds, bunding, the creation of stabilised site entrances, stormwater drain and foreshore protection, etc;

- diverting clean run-off away from the exposed areas via bunding and cut-off drains;
- installing sediment and erosion control measures for the duration of the works or until an area can be stabilised/reinstated; and
- regularly inspecting, monitoring, maintaining and repairing all sediment and erosion control measures.

6.5 Dust Control

During any excavation which exposes soil beneath the 500mm capping layer, mitigation measures shall be employed to avoid generation of dust.

Dust control measures will need to be included in the EMP and submitted to the TDC Environment & Planning Manager for approval before any works commence.

To reduce the potential for dust to be generated during site works, the control measures could include but not be limited to:

- excavated or exposed soils should be kept damp to prevent the generation of dust;
- use of water sprays to dampen down work areas, but not so much as to generate run-off;
- excessive dust generated during earthworks may be controlled through the use of wind screens, ceasing the operation until better control can be achieved, or by covering the material;
- areas of the site that are not worked for long periods of time should be covered or stabilised to prevent excessive dust generation; and
- measurement and monitoring of dust generation, and analysis of contaminants contained in dust, may need to be carried out as required by any consent conditions.

6.6 Groundwater Diversion, Disposal and Abstraction

Groundwater may be encountered below the site at depths of between 0.9m and 2.5m below ground level. Any development should be designed to avoid the removal of groundwater wherever possible, however, if interaction with groundwater cannot be avoided, works may require groundwater to be diverted and/or pumped out of excavations for disposal. The groundwater is likely to contain both suspended and dissolved contaminants and shall not be discharged to stormwater drains which discharge into the marine environment.

Groundwater control measures will need to be included in the EMP and submitted to the TDC Environment & Planning Manager for approval before any works commence. The TDC Resource Management Plan (Section 31.1.2) indicates that a resource consent will be required to abstract groundwater on the sites if the amount is more than 5m³ per property per day. Diversion or disposal of drainage water is controlled by Section 36.4.2. Diversion or disposal would be a controlled activity according to Section 36.4.3A and will therefore require consent.

Any removal and disposal of groundwater shall be undertaken to avoid adverse impacts to environmental receptors.

The EMP should include the following data regarding groundwater removal and disposal methods:

- anticipated water quality at the time of the request given by recent test data;
- water volumes involved and the duration of the activity;
- proposed disposal methods; and
- groundwater treatment methods, if any, prior to disposal.

Sediment-laden groundwater flows must be controlled and diverted, for example, to settlement ponds on site prior to disposal or via soakaway, or disposed of at appropriate facilities able to accept sediment-laden water. The soil from surface to 500mm depth that remains on site must not be contaminated by sediment-laden water.

Groundwater beneath the site is not suitable for abstraction for potable use, use in stock watering or irrigation.

6.7 Phytotoxic Effects

Phytotoxic chemicals (ammonia or copper) may be present within the plant root zone. Any plants affected could be replaced, or soil in the root zone could be replaced with topsoil (cleanfill).

6.8 Health and Safety for Construction and Maintenance Workers

The soil and groundwater present little risk to site occupants or workers, including excavation workers.

Construction and maintenance workers should minimise exposure to contaminated soil as a matter of good practice with the use of appropriate PPE and personal hygiene practices (washing hands and face before eating, drinking or smoking).

6.8.1 AMMONIA GAS

Although soil testing in 2010 showed very low concentrations of ammonia gas, if the odour of ammonia is detected during any earthworks, appropriate testing should be carried out, and measures undertaken to manage this risk. The measures should adhere to the guidelines given in the Department of Labour, Occupational Safety & Health Service's booklet "Safe Working in a Confined Space".

The risk from ammonia gas on future site users due to migration into buildings should be investigated on a case by case basis. Mitigation measures such as vapour barriers may be required.

6.9 Additional Provisions for the Creek Adjacent to the North-West Boundary of FCC Landfill

The Property Manager is to liaise with the TDC Utilities Asset Manager to ensure the protection of the stream banks and beds of the creek.

The creek banks are to be maintained to avoid erosion by stormwater flows (including increased stormwater flows as a result of upstream modifications to the stormwater network), by maintaining vegetation, rock protection and the like.

Maintenance of the creek so that it fulfils its function as a stormwater drain, such as removal of excessive vegetation, maintaining its flow area by the removal of deposited sediment or increasing its flow area, shall be carried out in accordance with this management plan with the following additional provisions:

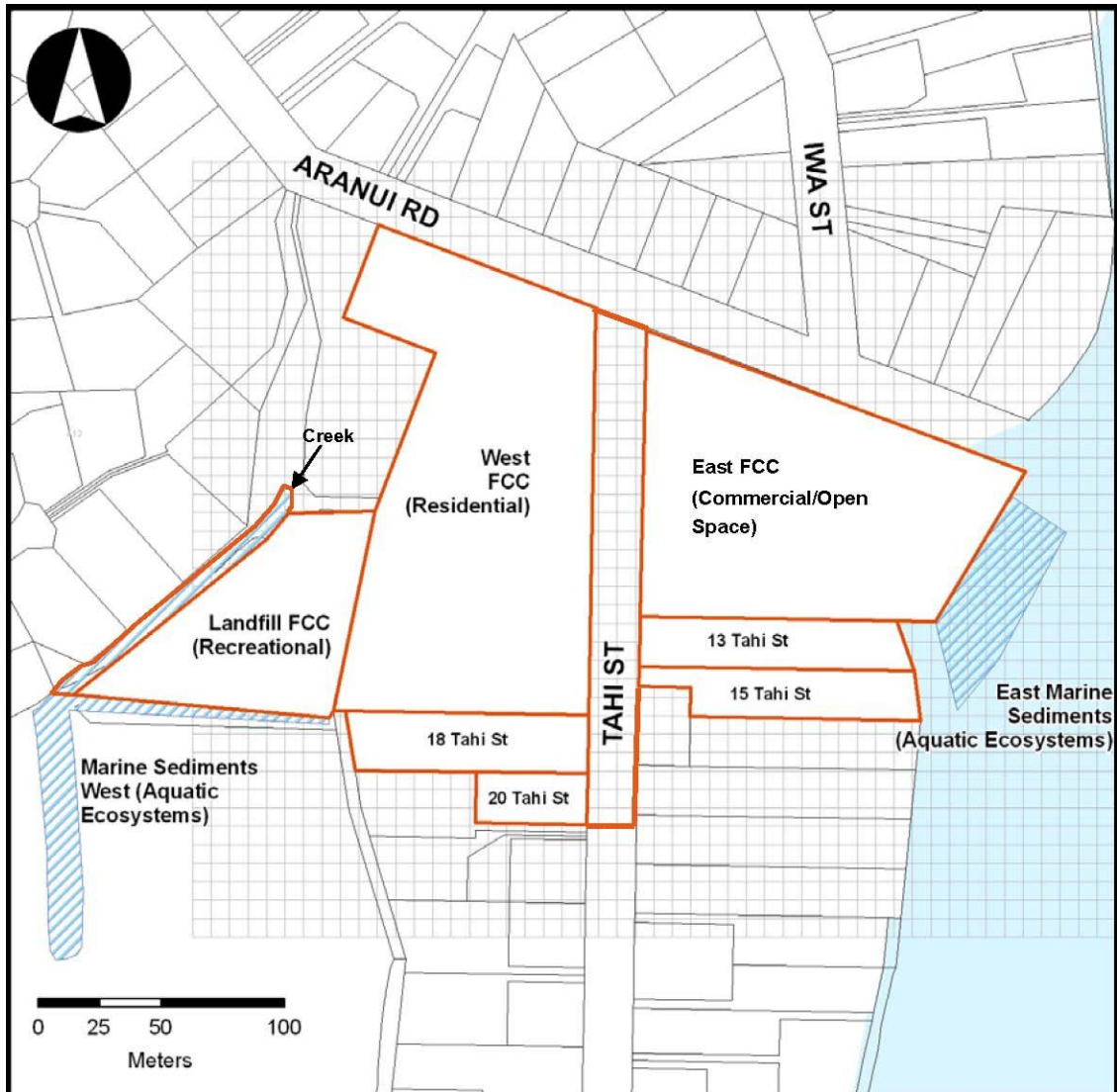
- no in-stream works may be carried out without submitting a method statement to, and gaining the approval of, the TDC Environment & Planning Manager; and
- The method statement shall be guided by testing of the banks and bed of the creek over the length of creek where work is to be carried out.

In the event that the material to be disturbed has contaminant concentrations in excess of the marine sediment SACs, methods shall be proposed to avoid transport of sediment to the estuary. Methods that could be considered include diversion of the stream around the works and silt traps and fences. All proposed methods must be submitted to the TDC Environment & Planning Manager for approval before any works commence.

7 References

- 1) ANZECC, 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council.
- 2) Department of Labour, OSH, 1994. Health and Safety Guidelines on the Clean Up of Contaminated Sites. Department of Labour and the Occupational Health & Safety Service.
- 3) Egis, 2001. Risk-Based Acceptance Criteria for FCC Mapua.
- 4) MfE, 1993. Draft Health and Environmental Guidelines for Selected Timber Treatment Chemicals. Ministry for the Environment.
- 5) MfE, 1997. Health and Environmental Guidelines for Selected Timber Treatment Chemicals. Ministry for the Environment.
- 6) MfE, 1999. Guidelines for Assessing and Managing Petroleum Hydrocarbon-Contaminated Sites in New Zealand. Ministry for the Environment.
- 7) MfE, 2001. Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand. Ministry for the Environment.
- 8) MfE, 2003. Contaminated Land Management Guidelines No. 2 – Hierarchy and Application in New Zealand of Environmental Guideline Values. Ministry for the Environment.
- 9) NEPC, 1999. National Environmental Protection Measure (Assessment of Site Contamination): Guideline on the Investigation Levels for Soil and Groundwater. National Environmental Protection Council.
- 10) NSW Department of Environment & Conservation, 2006. Contaminated Sites: Guidelines for the NSW Site Auditor Scheme, Second Edition, April 2006.
- 11) PDP, 2009. Audit of the Remediation of the Former Fruitgrowers Chemical Company Site, Mapua.
- 12) SKM, 2008. Site Validation Report for the Former Fruitgrowers Chemical Company, Mapua. Sinclair Knight Merz.
- 13) RIVM, 2001. Technical Evaluation of the Intervention Values for Soil/Sediment and Groundwater.
- 14) Theiss, 2004. Remedial Action Plan, Former Fruitgrowers Chemical Company Site, Mapua.
- 15) URS, 2010. Former Fruitgrowers Chemical Company Site (FCC) Mapua – Ammonia Gas Survey Investigation. February and April 2010.

Appendix A: Site Location Plan



APPENDIX C

Laboratory Analytical Reports



Certificate of Analysis

Client:	Davis Ogilvie & Partners Limited	Lab No:	3034646	SPV1
Contact:	Gareth Oddy C/- Davis Ogilvie & Partners Limited PO Box 589 Addington Christchurch 8140	Date Received:	15-Jul-2022	
		Date Reported:	19-Jul-2022	
		Quote No:	118850	
		Order No:		
		Client Reference:	42454	
		Submitted By:	Gareth Oddy	

Sample Type: Soil						
Sample Name:	MP_5a_0.05m	MP_S01_0.3m	MP_S03_0.4m	MP_S03_0.5m	MP_S04_0.2m	
	13-Jul-2022 5:00 pm	13-Jul-2022 5:00 pm	13-Jul-2022 5:00 pm	13-Jul-2022 5:00 pm	13-Jul-2022 5:00 pm	13-Jul-2022 5:00 pm
Lab Number:	3034646.1	3034646.2	3034646.3	3034646.4	3034646.5	
Individual Tests						
Dry Matter	g/100g as rcvd	84	85	75	79	86
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	4	8	5	7	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.24	0.13	0.18	< 0.10
Total Recoverable Chromium	mg/kg dry wt	28	32	37	33	29
Total Recoverable Copper	mg/kg dry wt	29	51	45	48	74
Total Recoverable Lead	mg/kg dry wt	12.8	15.3	16.3	15.9	14.3
Total Recoverable Nickel	mg/kg dry wt	41	29	42	34	42
Total Recoverable Zinc	mg/kg dry wt	49	95	76	79	59
Organochlorine Pesticides Screening in Soil						
Aldrin	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
alpha-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
beta-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
delta-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
gamma-BHC (Lindane)	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
cis-Chlordane	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
trans-Chlordane	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
2,4'-DDD	mg/kg dry wt	0.028	0.019	0.070	0.051	0.20
4,4'-DDD	mg/kg dry wt	0.051	0.038	0.175	0.129	0.31
2,4'-DDE	mg/kg dry wt	0.014	0.012	0.028	0.025	0.137
4,4'-DDE	mg/kg dry wt	0.22	0.106	0.24	0.21	0.78
2,4'-DDT	mg/kg dry wt	0.192	0.023	0.018	0.020	0.58
4,4'-DDT	mg/kg dry wt	0.75	0.105	0.074	0.083	2.8
Total DDT Isomers	mg/kg dry wt	1.26	0.30	0.61	0.52	4.8
Dieldrin	mg/kg dry wt	0.22	0.017	0.045	0.034	0.72
Endosulfan I	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
Endosulfan II	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
Endosulfan sulphate	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
Endrin	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
Endrin aldehyde	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
Endrin ketone	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
Heptachlor	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
Heptachlor epoxide	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
Hexachlorobenzene	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012
Methoxychlor	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.012



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Soil

Sample Name:	MP_S04_0.05m 13-Jul-2022 5:00 pm	MP_S02_0.3m 13-Jul-2022 5:00 pm	MP_S03_0.3m 13-Jul-2022 5:00 pm	MP_S03_0.05m 13-Jul-2022 5:00 pm	MP_S02_0.1m 13-Jul-2022 5:00 pm
Lab Number:	3034646.6	3034646.7	3034646.8	3034646.9	3034646.10

Individual Tests

Dry Matter	g/100g as rcvd	80	83	73	77	75
------------	----------------	----	----	----	----	----

Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	4	8	5	6	5
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.27	0.13	0.17	0.12
Total Recoverable Chromium	mg/kg dry wt	45	33	31	28	38
Total Recoverable Copper	mg/kg dry wt	61	53	40	37	39
Total Recoverable Lead	mg/kg dry wt	12.4	15.8	16.1	24	16.3
Total Recoverable Nickel	mg/kg dry wt	61	33	37	29	42
Total Recoverable Zinc	mg/kg dry wt	110	93	71	84	77

Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	0.59	< 0.012	< 0.014	< 0.013	< 0.013
alpha-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
beta-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
delta-BHC	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
gamma-BHC (Lindane)	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
cis-Chlordane	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
trans-Chlordane	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
2,4'-DDD	mg/kg dry wt	0.046	0.016	0.068	0.019	0.112
4,4'-DDD	mg/kg dry wt	0.100	0.023	0.146	0.032	0.175
2,4'-DDE	mg/kg dry wt	0.019	< 0.012	0.035	0.016	0.083
4,4'-DDE	mg/kg dry wt	0.43	0.155	0.37	0.31	1.09
2,4'-DDT	mg/kg dry wt	0.48	0.052	0.040	0.053	0.27
4,4'-DDT	mg/kg dry wt	2.4	0.24	0.182	0.29	1.46
Total DDT Isomers	mg/kg dry wt	3.5	0.50	0.84	0.72	3.2
Dieldrin	mg/kg dry wt	1.81	0.023	0.054	0.048	0.21
Endosulfan I	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
Endosulfan II	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
Endosulfan sulphate	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
Endrin	mg/kg dry wt	0.041	< 0.012	< 0.014	< 0.013	< 0.013
Endrin aldehyde	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
Endrin ketone	mg/kg dry wt	0.036	< 0.012	< 0.014	< 0.013	< 0.013
Heptachlor	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
Heptachlor epoxide	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
Hexachlorobenzene	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013
Methoxychlor	mg/kg dry wt	< 0.012	< 0.012	< 0.014	< 0.013	< 0.013

Sample Name:	MP_S01_0.1m 13-Jul-2022 5:00 pm	Duplicate 01 13-Jul-2022 5:00 pm			
Lab Number:	3034646.11	3034646.12			

Individual Tests

Dry Matter	g/100g as rcvd	76	85	-	-	-
------------	----------------	----	----	---	---	---

Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	7	8	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.14	0.26	-	-	-
Total Recoverable Chromium	mg/kg dry wt	37	31	-	-	-
Total Recoverable Copper	mg/kg dry wt	42	52	-	-	-
Total Recoverable Lead	mg/kg dry wt	15.6	15.6	-	-	-
Total Recoverable Nickel	mg/kg dry wt	37	27	-	-	-
Total Recoverable Zinc	mg/kg dry wt	73	95	-	-	-

Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	< 0.013	< 0.012	-	-	-
alpha-BHC	mg/kg dry wt	< 0.013	< 0.012	-	-	-
beta-BHC	mg/kg dry wt	< 0.013	< 0.012	-	-	-
delta-BHC	mg/kg dry wt	< 0.013	< 0.012	-	-	-

Sample Type: Soil						
Sample Name:		MP_S01_0.1m 13-Jul-2022 5:00 pm	Duplicate 01 13-Jul-2022 5:00 pm			
Lab Number:		3034646.11	3034646.12			
Organochlorine Pesticides Screening in Soil						
gamma-BHC (Lindane)	mg/kg dry wt	< 0.013	< 0.012	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.013	< 0.012	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.013	< 0.012	-	-	-
2,4'-DDD	mg/kg dry wt	0.020	0.019	-	-	-
4,4'-DDD	mg/kg dry wt	0.037	0.040	-	-	-
2,4'-DDE	mg/kg dry wt	0.013	0.017	-	-	-
4,4'-DDE	mg/kg dry wt	0.137	0.116	-	-	-
2,4'-DDT	mg/kg dry wt	0.033	0.019	-	-	-
4,4'-DDT	mg/kg dry wt	0.145	0.086	-	-	-
Total DDT Isomers	mg/kg dry wt	0.39	0.30	-	-	-
Dieldrin	mg/kg dry wt	0.023	0.014	-	-	-
Endosulfan I	mg/kg dry wt	< 0.013	< 0.012	-	-	-
Endosulfan II	mg/kg dry wt	< 0.013	< 0.012	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.013	< 0.012	-	-	-
Endrin	mg/kg dry wt	< 0.013	< 0.012	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.013	< 0.012	-	-	-
Endrin ketone	mg/kg dry wt	< 0.013	< 0.012	-	-	-
Heptachlor	mg/kg dry wt	< 0.013	< 0.012	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.013	< 0.012	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.013	< 0.012	-	-	-
Methoxychlor	mg/kg dry wt	< 0.013	< 0.012	-	-	-

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-12
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1-12
Organochlorine Pesticides Screening in Soil	Sonication extraction, GC-ECD analysis. Tested on as received sample. In-house based on US EPA 8081.	0.010 - 0.06 mg/kg dry wt	1-12
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry), gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-12

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 18-Jul-2022 and 19-Jul-2022. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental