

## Former Fruitgrowers Chemical Company Site, Mapua

### FCC East and FCC Landfill Sites



### Site Management Plan

- Version 2.0
- 8 March 2012

# Contents

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
<b>2</b>	<b>Objectives .....</b>	<b>2</b>
<b>3</b>	<b>Site Status .....</b>	<b>2</b>
3.1	Overall Site Conditions .....	2
3.2	Soil Subcategories.....	3
3.3	Current Site Use .....	4
3.4	Associated Hazards.....	4
<b>4</b>	<b>General Site Management Implementation Strategy .....</b>	<b>5</b>
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
<b>5</b>	<b>General Management Measures .....</b>	<b>7</b>
<b>6</b>	<b>Specific Management Measures .....</b>	<b>8</b>
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

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# 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**

<b>Land Use</b>	<b>Depth (m)</b>	<b>DDX (total DDT, DDD, DDE) (mg/kg)</b>	<b>Aldrin + Dieldrin + 10% Lindane3 (mg/kg)</b>	<b>Copper</b>
<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 5m<sup>3</sup> 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

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- 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.
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- 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

