AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Contents

DRAFT

This version of the Landfill Management Plan is a draft to support resource consent applications (reference BUN60339589) for a proposed landfill at Wayby Valley. It presents drafts of key sections that relate to the consent applications. This version is not intended to be the complete Landfill Management Plan.

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Volume 1

Project Description and Introduction

DRAFT

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Document control

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AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Project description

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1. PROJECT DESCRIPTION

1.1 Project Description Summary

The landfill will be designed and operated in accordance with the latest guidance for New Zealand – the Technical Guidelines for Disposal to Land published by the Waste Management Institute New Zealand in 2018 ('the Landfill Guidelines'). These guidelines replace earlier guidance on landfills in New Zealand, and provide technical guidance on siting, design, operation and monitoring of landfills in New Zealand, based on local and international experience.

The landfill will be a Class 1 landfill, as defined by the Landfill Guidelines. A Class 1 landfill accepts municipal solid waste, as set out in the Landfill Guidelines, which includes residential and commercial waste, construction and demolition waste, some industrial wastes (that meet strict acceptance criteria) and contaminated soils.

WMNZ went through an extensive site identification and selection process over a period of more than ten years, which considered a range of factors including access, site size, buffer availability, geology and environmental and cultural factors. This process resulted in the identification of the Wayby Valley site as the preferred location for the landfill due to a number of features, including:

- Its proximity to State Highway 1;
- Ability to maintain separation distance from sensitive receivers;
- Potential longer term development capacity;
- Avoidance of identified sites of cultural significance;
- Avoidance of significant ecological features and other features identified in the Auckland Unitary Plan (AUP);
- Appropriate underlying geology.

The landholdings acquired comprise approximately 1020 ha, in order to secure a buffer from surrounding land-uses. The landfill footprint itself will occupy approximately 60 ha within this WMNZ landholdings. The term 'project footprint' is used in this application to refer to the approximate area within the WMNZ landholdings that will be subject to any work required as part of the project, an important distinction given the size of the WMNZ landholdings. Further, whilst there are a number of valleys present within the WMNZ landholdings, one valley has been identified for development for landfilling purposes – 'Valley 1'.

The original landholdings comprised a mix of predominantly pastoral farmland and plantation forestry. There are areas of ecological value on the landholdings, including wetlands, streams and pockets of native vegetation, some of which are outside of the notated features in the Unitary Plan. To the extent possible the project has been designed to avoid or minimise impacts on these areas and, where this is not possible, to provide compensation/ offsetting to minimise overall effects.

This Landfill Management Plan sets out the design features and operational measures for the landfill, provided to achieve a high level of containment in accordance with the Landfill Guidelines. These include engineered environmental protection provided by a lining and leachate collection system, capping system, and landfill gas management, all of which will be constructed under a rigorous quality assurance programme with independent review and signoff.

Controls on accepted waste materials will be imposed, as will be a rigorous programme of environmental monitoring and reporting including sediment runoff, surface water and groundwater

quality, leachate quality and quantity, and landfill gas, all of which will be undertaken in accordance with other recognised guidelines such as Auckland Council's GD05.

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Introduction

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CONTENTS

LMP Section 1.02

1. INTRODUCTION

1.1 Scope of LMP

A Landfill Management Plan (LMP) is required for Auckland Regional Landfill (ARL).

The LMP is organised as follows:

- Volume 1 – this introduction
- Volume 2 – summary of risks and risk management
- Volume 3 – implementation methods by topic and subtopic
- Volume 4 – procedures and checklists

The conditions of resource consents require a number of subject-specific plans which are each covered by Volumes 1, 2 and the subject-specific parts of Volumes 3 and 4.

1.2 LMP reviews

The LMP or any section within it will be revised when a revision is required which may be prompted by changes in regulatory requirements, by changes to operating procedures, by formal requests from peer reviewers, by review by authorities, or by need for clarifications.

The requirement for an LMP revision will be considered and advised to the Auckland Council no less often than annually.

The procedure will be as follows:

- Identify revisions.
- Prepare (a) a draft document in text format showing the proposed revisions as tracked changes (b) a draft document in pdf format including all proposed revisions accepted (c) a written description of the proposed changes. Submit the proposed revisions to a reviewer.
- If the reviewer requests further amendments, repeat the previous step.
- If the reviewer agrees with the proposed revisions, submit the proposed revisions to the Council.
- If the Council requests further amendments, start again.
- If the Council agrees with the proposed revisions, proceed to publishing.
- Publish and distribute the proposed revisions with appropriate date and document control.

1.3 Consents

Resource consent applications were lodged in May 2019 to construct and operate the landfill.

A Private Plan Change request was lodged in July 2019 to establish a precinct in the Auckland Unitary Plan.

During site investigations:

- ‘wildlife permits’ were sought and granted by DOC for investigations into frogs
- drilling permits were obtained and/or notifications of permitted activities were submitted

A tabulated list of consents is appended.

1.4 Consent conditions

A tabulated list of consent conditions is appended. The table is annotated to provide links to the relevant sections of the LMP where each consent condition is addressed.

1.5 Land ownership

The historical landowners or occupiers included

- Iwi - Their long term interest is described in Section xxx of this LMP
- The Crown
- Ex-European settlers
- Recent private landowners
- Recent forestry companies

The current landowners are (or will be, subject to consents) solely Waste Management NZ Ltd.

Parts of the landholdings are currently and will continue to be occupied and managed by a forestry rights holder.

The property titles are listed in Appendix 4.

1.6 Bond

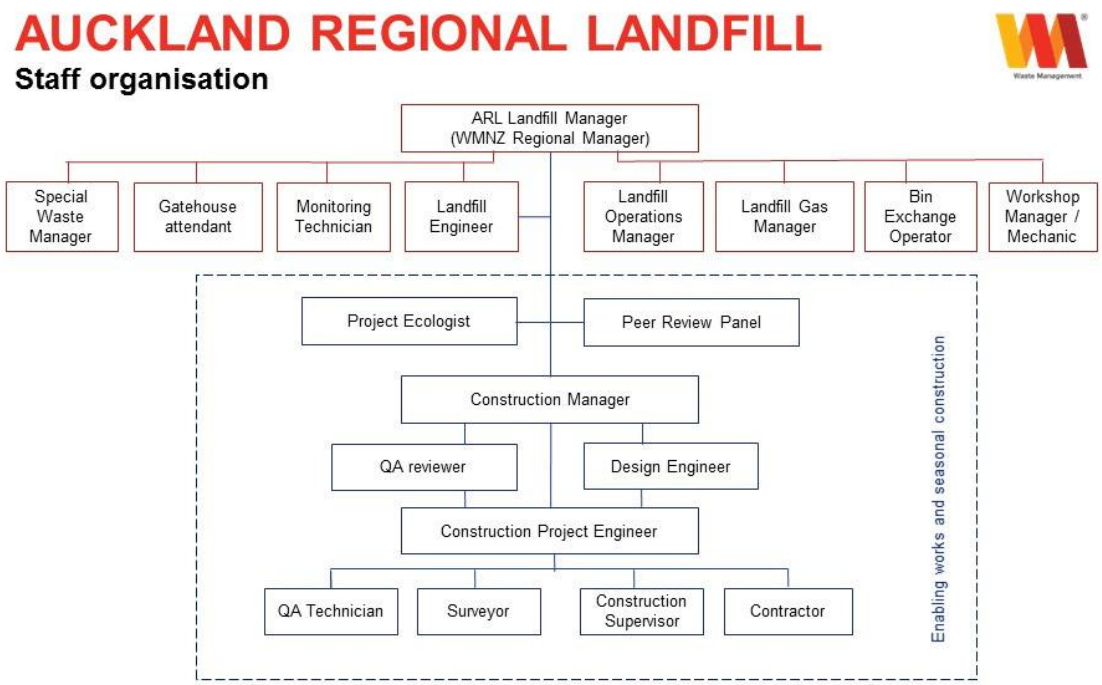
(section to be added)

LMP Section 1.02

1.7 Staff organisation

The staff and key external consultants will be organised as follows.

Figure 1: Staff Organisation Chart



1.8 Roles and Responsibilities

The principal roles and responsibilities described in this LMP are:

Landfill Manager

- overall running of the landfill
- employment of staff to fill direct reporting roles
- site policies

Special Waste Manager

- compliance with the landfill's waste acceptance criteria
- contracts to dispose of waste subject to operational constraints

Gatehouse Attendant

- recording the weight and type of waste for each truck
- recording the numbers of refuse vehicles and non-refuse vehicles inbound
- monthly summaries

Monitoring Technician

- screen testing of inbound waste for compliance with the waste acceptance criteria
- sampling of surfacewater and groundwater
- reporting of trigger level exceedances
- preparing annual summaries
- coordinating external agencies for ecological monitoring

Landfill Engineer

- oversight of operations with regard to potential environmental effects
- oversight of design and as-built construction records with regard to compliance with consent conditions and environmental risk
- engagement of and liaison with the peer review panel
- engagement of and liaison with the project ecologist
- engagement of and liaison with the cultural advisor
- engagement of an independent reviewer for Landfill Management Plan updates

Landfill Operations Manager

- proper management of waste handling and disposal

Landfill Gas Manager

- extraction of gas from the waste mass
- treatment of landfill gas
- extraction of leachate from the waste mass
- treatment and/or disposal of leachate
- utilisation of landfill gas including electricity generation
- standby systems

Bin Exchange Operator

- proper operation of the bin exchange facility

Workshop Manager / Mechanic

- procurement and maintenance of plant (machinery) for proper disposal and cover over the waste
- safe handling of fuels, oils and potential spill chemicals associated with mechanical plant

Project Ecologist

- Oversight of activities to monitor and protect native flora and fauna

Construction manager

- engagement of and liaison with specialist designers
- engagement of and liaison with specialist construction quality assurance reviewers
- submission of staged construction completion documentation to the peer review panel

Construction project engineer

- direction of construction contractors
- coordination of construction quality controls
- programme and reporting

1.9 Reporting

A summary list of report requirements is presented in Appendix 5. These are the regular reports that the site must submit to the authorities in accordance with the consent conditions.

1.10 Record keeping

Records will be kept to enable an assessment of the current status of the landfill at any time and the long term integrity of the landfill upon closure.

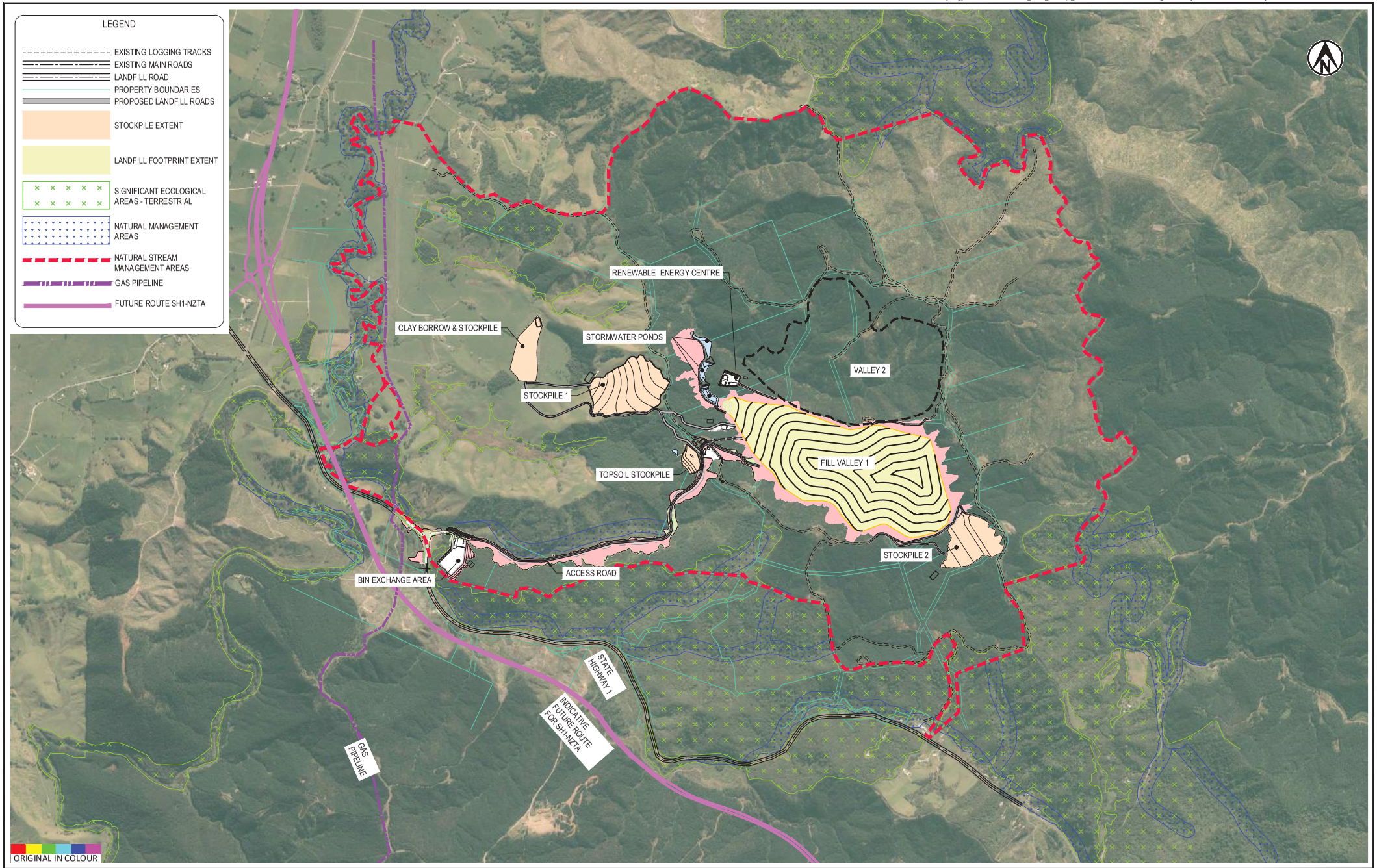
Table …

Document	**Record keeping**
Waste types and weights	Electronic database or spreadsheet maintained for the life of the landfill.
Construction stage completion reports	Electronic files kept for the life of the landfill.
Regular monitoring reports	Electronic files saved for minimum 10 years.
Current version of the LMP	Electronic copy of latest version provided to Council in accordance with consent conditions.

2. APPENDICES

2.1 Project layout drawings

C:\12dSynergy\data\ALBTCAD\Polaris_WOL_Concept_55\CAD\FIG\Polaris-AEE-F4.dwg 2019-May-30 7:50:46 AM Plotted By: JUAN CARLOS ABREGO CASTILLO



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SCALE 1:20,000

0 200 400 600 800 1000

Aerial photo sourced from Auckland Council GIS Website.

PROJECT No.	1005069.1200	
DESIGNED	RJB	May.19
DRAWN	JABR	May.19
CHECKED	ALB	May.19
APPROVED	DATE	

CLIENT **WASTE MANAGEMENT NZ LTD**

PROJECT **AUCKLAND REGIONAL LANDFILL**

TITLE ASSESSMENT OF ENVIRONMENTAL EFFECTS
Site Plan - WMNZ Landholdings

SCALE (A3) 1:20000 FIG No. Figure 4 REV 1

2.2 List of consents

CONSENTS

Consent	Status	Granted by	Granted to	Granted Date	Expiry Date	Purpose
BUN60339589 (bundle ref number)	Application processing	Auckland Council	WMNZ	TBA	TBA	BUN60339589 is the bundle number for all resource consents in this application package.
DIS60339670*	Application processing	Auckland Council	WMNZ	TBA	TBA	Discharge of Contaminants (E4) *DIS60339670 is also the bundle ref number for discharge consents.
DIS60343735	Application processing	Auckland Council	WMNZ	TBA	TBA	Stormwater – Discharge and Diversion (E8)
DIS60343736	Application processing	Auckland Council	WMNZ	TBA	TBA	Cleanfills, Managed Fills and Landfills (E13)
DIS60343780	Application processing	Auckland Council	WMNZ	TBA	TBA	Air Quality (E14)
DIS60343781	Application processing	Auckland Council	WMNZ	TBA	TBA	Industrial and Trade Activities (E33)
LUC60339671*	Application processing	Auckland Council	WMNZ	TBA	TBA	Land Disturbance – Regional (E11); Land Disturbance – District (E12); Vegetation Management and Biodiversity (E15); Infrastructure (E26); Transport (E27); Hazardous Substances (E31); Natural Hazards and Flooding (E36); Rural Zones (H19). *LUC60339671 is also the bundle ref number for district and land use consents.
LUS60339672*	Application processing	Auckland Council	WMNZ	TBA	TBA	Streamworks (E3). *LUS60339672 is also the bundle ref number for streamworks consents.
WAT60339673*	Application processing	Auckland Council	WMNZ	TBA	TBA	Taking, Using, Damming and Diversion of Water (E7). E7.4.1(A9) – the take and use of surface water from a proposed stormwater pond for non-potable water use, including for use as a dust suppressant, as a discretionary activity. *WAT60339673 is also the bundle ref number for water and damming consents)
WAT60343932	Application processing	Auckland Council	WMNZ	TBA	TBA	E7.4.1(A20 and A28) – the diversion and dewatering or groundwater associated with the proposed landfill excavations, as a restricted discretionary activity.
WAT60343935	Application processing	Auckland Council	WMNZ	TBA	TBA	E7.4.1(A26) – the take and use of 50m3 of groundwater per day for potable water supply, as a discretionary activity.
WAT60343937	Application processing	Auckland Council	WMNZ	TBA	TBA	E7.4.1(A35) – the creation of dams (three) through the formation of stormwater ponds in the base of Valley 1, as a discretionary activity.
WAT60343938	Application processing	Auckland Council	WMNZ	TBA	TBA	E7.4.1(A35) – the creation of dams (three) through the formation of stormwater ponds in the base of Valley 1, as a discretionary activity.
WAT60343939	Application processing	Auckland Council	WMNZ	TBA	TBA	E7.4.1(A35) – the creation of dams (three) through the formation of stormwater ponds in the base of Valley 1, as a discretionary activity.
Private Plan Change - ARL Precinct	Application processing	Auckland Council	WMNZ	TBA	No expiry date	Auckland Regional Landfill Precinct (I617)
RMA30830	Current	Rodney District Council	Izard Pastoral Ltd	2/03/2001	No expiry date	To the application for consent to a non complying activity for commercial flights averaging one or two flights per day over a monthly period; assembly of one aircraft per month on average, and aircraft maintenance, with up to three engineers; construction and use of hangars and administration buildings, and storage and use of aircraft by the occupiers of six adjoining lots. The property is situated as SH1 and Spindler Road, Wayby being legally described as Pt Allots 67, 68 and 70 Parish of Hoteo and zoned General Rural.
LUC60333281	Current	Auckland Council	Waste Management NZ Ltd	22/01/2019	No expiry date	Permitted Activity - Groundwater Investigation bores. Acknowledgment of Permitted Activity Notification.
BUN 20453910	Current	Auckland Council	Springhill Estate Limited	17/02/2017	No expiry date	To retrospectively authorise a second dwelling and undertake a subdivision creating 13 additional rural residential sites, all between 1 - 2 hectares in size. The subdivision works include approximately 7000m3 of earthworks over an area of 1.7 hectares to form a new right of way, the diversion and discharge of stormwater, the protection of wetlands (including buffer planting) and riparian planting.

2.3 List of consent conditions

(table in the following format)

CONSENT CONDITIONS

Consent	Condition	Requirement	LMP Section
ARL Multiple	C 001	(draft May 2019) 1 The activity shall be carried out in general accordance with the application comprising the following plans and reports: [to be completed]	1.00

2.4 List of property titles

LANDHOLDINGS

TITLE	Identifier	Pre-landfill Forestry (ha)	Pre-landfill Springhill (ha)
Allot NW15 Parish of Hoteo (SO732)	1149/48 (Limited as to Parcels)	32.3749	
Allot NM15 Parish of Hoteo (SO732)	643/294 (Limited as to Parcels)	25.5964	
Allot M15 Parish of Hoteo (SO732)	1149/48 (Limited as to Parcels)	10.5218	
Allot SE15 Parish of Hoteo (SO732)	599/299 (Limited as to Parcels)	16.1874	
Allot 14 Parish of Hoteo	1149/48 (Limited as to Parcels)	21.4484	
Allot 13 Parish of Hoteo	1149/48 (Limited as to Parcels)	39.6592	
Sec N12 SO 21653	NA28A/580	7.7851	
Sec 105 SO 22013	NA28A/580	1.6289	
Sec 11 SO 21653	NA28A/580	59.8935	
Southern Part Allotment 12 Parish of Hoteo	NA1149/47 (Limited as to Parcels)	14.9734	
Allot 103 Hoteo Parish	NA907/217	6.8898	
Part Southern Eastern Portion Allot 9 (SO 732)	NA50B/713 (Limited as to parcels)	9.7125	
Part North Western Portion Allot 7 Parish of Hoteo (SO 732)	NA50B/713 (Limited as to parcels)	21.6516	
Allot 17 Parish of Hoteo (SO732)	136/300	44.2043	
North Western Portion Allotment 16 Parish of Hoteo	NA31B/790 (Limited as to parcels)	24.2811	
Allotment 16 Parish of Hoteo	NA279/207	24.3317	
Southern Portion Allotment 16 Parish of Hoteo	NA599/296 (Limited as to parcels)	16.1874	
Part Allot 16 Parish of Hoteo	NA1937/63 (Limited as to parcels)	16.9968	
Part North Western Portion Allot 8 Parish of Hoteo (SO 732)	NA50B/713 (Limited as to parcels)	1.1340	
Sec 106 SO 22013	NA28A/580	1.6896	
Sec 177 SO 49052	NA28A/580	32.5038	
Sec 184 SO 49053	NA28A/580	0.3910	
Part Allot 117 Parish of Hoteo (SO 26411)	NA50B/713 (Limited as to parcels)	1.9459	
Allot 33 Parish of Hoteo	NA599/297 (Limited as to parcels)	25.4952	
North Western Portion Allot 34 Parish of Hoteo	NA761/222 (Limited as to parcels)	25.4952	
Allot S.E. 34 Parish of Hoteo	NA634/125	27.7210	
Allot 35 Parish of Hoteo	NA2D/102	25.4952	
Allot 36 Parish of Hoteo	NA26C/477 (Limited as to parcels)	33.4376	
Allot 37 Parish of Hoteo	NA26C/477 (Limited as to parcels)	25.2684	
Allot 38 Parish of Hoteo	NA26C/477 (Limited as to parcels)	25.7020	
Allot 39 Parish of Hoteo	NA870/214	34.4995	
Lot 2 DP 71574	27D/570	1.8387	
393450 (Limited as to parcels)	Lot 2 DP 398682		276.1722
NA138D/56	Lot 2 DP 210406		22.0314
NA42B/697	Part Allotment 94 Parish of Hoteo SO 84		9.4731
NA42B/698	Part Allotment 118 Parish of Hoteo		0.0043
278282	Section 28 Block XII Pakiri Survey District SO 44355		0.3766
NA781/62	Section 43 & 44 Block XII Pakiri Survey District SO 29601		0.8726
NA42B/699	Part Allotment 163 Parish of Hoteo		28.6046
NA939/169 (Limited as to parcels)	Pt Allot 68 & 69 Psh Of Hoteo SO 84 & Allot 69A Psh Of Hoteo SO 732		25.6975
NA939/170	Pt Allot 69A Psh Of Hoteo		0.2150
252010	Lot 1 DP 361849		0.1094
TOTALS (ha)		**656.9413**	**363.5567**
GRAND TOTAL (hectares)			**1020.4980**

2.5 Reporting schedule

REPORTING REQUIREMENTS

Location / Event / Topic	Report to	Method	Frequency
Landfill Management Plan for approval before Commencement Date.	Auckland Council	Email or file transfer.	At least 6 months before
Landfill Management Plan after approval.	Auckland Council	Email or file transfer.	Annually
Landfill Management Plan after approval.	Community Liaison Group.	Email to advise of its availability	Annually
Vehicle counts. Average (over one week) daily inbound waste and non-waste vehicles.	Auckland Council	Summary table sent by email or file transfer.	Annually
Erosion and Sediment Control Plan - Landfill Operations (ESCPO) to be submitted for certification before implementation.	Auckland Council	Email or file transfer.	Annually
Landfill gas monitoring summary.	Auckland Council	Email or file transfer.	Annually
Environmental report.	Auckland Council	Email or file transfer.	Annually

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Volume 2

Summaries

DRAFT

This version of the Landfill Management Plan is a draft to support resource consent applications (reference BUN60339589) for a proposed landfill at Wayby Valley. It presents drafts of key sections that relate to the consent applications. This version is not intended to be the complete Landfill Management Plan.

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AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Summary of Risks and Risk Management

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REPORT

Tonkin+Taylor

Auckland Regional Landfill - Landfill Management Plan

Volume 2

Prepared for
Waste Management NZ Ltd
Prepared by
Tonkin & Taylor Ltd
Date
February 2020
Job Number
1005069.3000

Exceptional thinking together
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Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
Feb 20	1	Volume 2 – draft for consent application	RVDM	SFE	SFE

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Table of contents

1 Scope of Landfill Management Plan Volume 2

A Landfill Management Plan (LMP) is required for Auckland Regional Landfill (ARL).

The LMP is organised as follows:

- Volume 1 – Introduction
- Volume 2 – summary of risks and risk management
- Volume 3 – implementation methods by topic and subtopic
- Volume 4 – procedures and checklists

The conditions of resource consents require a number of subject-specific plans which are each covered by Volumes 1, 2 and the subject-specific parts of Volumes 3 and 4.

The purpose of Volume 2 is to identify the different issues and risks and outline the overall approaches to managing these. Volume 2 also identifies where more detailed procedures or more specific measures are required. These more specific measures will be outlined in Volumes 3 and 4.

2 Waste Acceptance Criteria

2.1 Scope

The purpose of establishing Waste Acceptance Criteria (WAC) is to manage wastes being disposed to a landfill so that they are compatible with the siting, design and operation of the facility and do not lead to significant immediate or longer term adverse human health or environmental effects. In order to manage potential effects associated with leachate and LFG, the WAC outlines procedures that cover pre-acceptance, acceptance, testing, and monitoring. These procedures are outlined in further detail in the below sections.

2.2 Management measures

2.2.1 Approach to WAC

The proposed WAC are consistent with the WasteMINZ Guidelines for Class 1 municipal landfills. The approach to applying the WAC includes the option of using total concentrations as a possible way of demonstrating that the WAC are met. The approach to developing the WAC for the landfill comprises:

- Identifying a list of waste types accepted, which is broadly defined as Municipal Solid Waste (MSW);
- Identifying a list of prohibited wastes;
- Specifying that hazardous waste is not acceptable. To identify waste that is hazardous due to toxicity, maximum contaminant leachability limits (TCLP Limits) are set, which are maximum values that should not be exceeded.
- As a screen tool in lieu of leachability testing (TCLP), screening levels for total concentrations have been developed. The Total Concentration Values are values below which demonstrate TCLP limits will be met.
- Identify additional limits set to address potential effects of odour (e.g. sulphur content, Volatile Organic Compounds) or physical characteristics of waste (e.g. sloppiness, dustiness) or other operational considerations;
- Proposed waste control measures based on actions and historical performance at other landfills;

- A process for the development of WAC for new emerging contaminants.

Relevant plans:

- Waste Control Plan – Ref xxxx
- Bin Exchange Area Management Plan – Ref xxxx
- Odour Management Plan – Ref xxx

2.2.2 Waste control

The intention of the waste evaluation process is to minimise risks associated with complex wastes that will enter the landfill. Waste control measures are based on actions and performance at other modern landfills. The main elements are:

- Pre-acceptance testing (required for all special wastes and soils where contaminant concentrations cannot otherwise be appropriately assessed e.g. by observation);
- Pre-acceptance agreement (details of the waste and information regarding any potential contamination);
- Gatehouse controls (this requirement applies to all loads of special waste);
- On-site screen testing (for both the landfill and stockpiles, random load inspections will be carried out); and
- Regulatory reporting (Auckland Council will be notified within 48 hours if any waste is rejected at the gatehouse or removed because it is hazardous).

Relevant plans:

- Landfill Waste Acceptance Criteria – Ref xxxx

2.3 Monitoring and measurement

2.3.1 Pre-acceptance testing

Pre-acceptance testing is required for all special wastes and soils whose contaminant concentrations cannot otherwise be appropriately assessed e.g. by observation, relevant historical records, or good knowledge of the source.

The landfill must keep sufficient records to show that the waste is not hazardous.

In the case of any new special waste with potential ecotoxicity, the landfill will ask the customer to provide test results that show that the waste meets the TLCP limits or the total concentration limits, prior to accepting the application.

The requirements for testing are:

- The testing must be done by an accredited laboratory;
- The sample size must be sufficient to effectively characterise the material; and
- The sampling will typically include worst-case and average concentrations.

In addition to contaminant limits, the landfill operator would use discretion and experience to impose limits on any contaminant or apply customised disposal methods that they deem necessary.

2.3.2 Evaluation of odorous waste

In the case of a new special waste stream that is odorous, especially waste from a new source or process, the landfill will ask the customer to provide information that allows the landfill to assess the

odour potential of the waste. Potentially odorous waste will be evaluated on a case-by-case basis, by consideration of:

- The odour potential;
- The total volume, rate of delivery and timing of delivery and how this ties in with operations at the landfill at the proposed time of delivery; and
- Whether any pre-treatment has been done (e.g. mixing with lime). Potentially malodorous waste, such as egg wastes or wool scourings, must be pre-treated by the waste generator to reduce odour before delivery (e.g. mixing with lime).

A precautionary approach will be taken when accepting any new potentially malodorous waste streams, including trial disposal of small quantities before entering into longer term contracts.

Where waste is assessed as being excessively odorous, or has been identified as excessively odorous on-site, future loads will not be accepted unless the waste can be pre-treated to reduce odour to acceptable levels.

2.3.3 Leachate quality monitoring

After waste has been buried under daily cover, the next opportunity to find out information about the nature of the waste and effectiveness of waste control is to examine the leachate. Leachate chemistry provides an indicator of non-hazardous waste compliance, proper decomposition and good landfill management practices relating to stormwater and gas.

Leachate should be tested quarterly for the first three years of operation and no less often than annually after that.

The quarterly test suite will focus on common and soluble contaminants, as indicators of excessive leachability of special waste. Additional parameters for which there are no toxicity-related waste acceptance criteria (e.g. ammonia, conductivity, pH) will also be measured to assess leachate quality and decomposition rates in the waste mass.

A fuller suite of potential contaminants will be tested annually.

Relevant plans:

- Leachate Monitoring and Contingency Plan – Ref xxxx

3 Air Quality Management

3.1 Scope

Potential air quality effects from the landfill generally fall into two categories – amenity effects associated with odour and dust and potential human health effects associated with landfill gas generation and combustion. The below sections outline these effects and what mitigation measures are proposed to manage them.

3.2 Management measures

3.2.1 Odour management

3.2.1.1 Introduction

The main potential sources of odour at the landfill are from the inbound waste itself or LFG from buried waste which contains traces of odorous gases. LFG and waste odours are intrinsically offensive in character and, in combination with other factors, could potentially cause adverse amenity effects for surrounding receivers. There is potential for odour whenever waste is exposed to open air. This can occur when daily or intermediate cover is pulled back, when fresh waste is tipped or when excavating into old waste for gas extraction or leachate re-injection points.

3.2.1.2 Waste acceptance controls

Before any new waste stream is accepted, landfill management staff will assess the waste quality against the landfill's Waste Acceptance Criteria (WAC) in order to evaluate the odour potential of the waste.

Waste odour potential will be evaluated on a case by case basis and the WAC allow WMNZ to determine whether the waste can be accepted on site, based on the ability to manage its impacts. The Landfill will not accept known malodorous waste unless specific pre-acceptance criteria and procedures have been put in place to manage potential odours from these wastes. In most cases the landfill operator will ask for potentially malodorous waste, such as biosolids, egg wastes or wool scourings, to be pre-treated by the waste generator to reduce odours prior to delivery. In these examples, pre-treatment might include mixing the waste with lime, aeration, or mixing with an absorbent. A precautionary approach will be taken when accepting any new potentially malodorous waste streams, including trial disposal of small quantities before entering into longer term contracts.

Where waste is assessed under the WAC as being excessively odorous, or has been identified as excessively odorous on-site, future loads will not be accepted unless the waste can be pre-treated to reduce odour to acceptable levels.

Relevant plans:

- Waste Control Plan – Ref xxxx

3.2.1.3 Bin exchange area

The majority of waste that is delivered to the site from WMNZ operated transfer stations, including a portion of the kerbside collected wastes from the metropolitan Auckland Area, will be transported to the site in specifically designed bins. These bins will be off-loaded at the bin exchange area before being transferred to the working face by "mules" (small transfer trucks). Third Party operators will deliver waste directly to the working face, as is current practice at most landfills in New Zealand.

Use of a bin exchange system will provide buffer capacity to manage the rate at which waste is transferred to the working face. This will allow the working face at the landfill to be kept as small as possible. As the working face is a key potential source of odours at the site, the bin exchange system will provide significant benefits to overall site odour management.

The exchange bins will be fully enclosed and will remain closed until they are emptied at the working face. Waste bins will be emptied at the working face by the end of the following landfill working day. Therefore, provided the bins are maintained in good condition and do not have any leaks, they will not be an appreciable source of odours beyond the confines of the bin exchange area. This is consistent with observations at the Kate Valley Landfill in Canterbury where all waste deliveries

enter the site via a bin exchange area.

Relevant plans:

- Bin Exchange Area Operations Plan – Ref xxxx

3.2.1.4 Waste handling and working face management

Odour from the tipping pad and working face will be minimised by restricting the size of the active face, during operations and ensuring the placement of a layer of daily cover soil takes place at the end of each day. Odour neutralising sprayers will be started before removing cover to introduce neutraliser into the air before odour is released and odour suppressant will be used on all areas where intermediate cover is being removed and odour release potential is high.

Preparations for receiving known malodorous waste can include setting aside a reserve of general waste for mixing and burial or preparing specific disposal sites in advice. With advance notice, landfill staff can ensure adequate personnel and equipment are on hand to quickly bury waste. Any excavation will be timed so that disposal sites are not prepared too far in advanced, exposing potentially odorous material to air. Extra sprayers would also be used, including when excavating into old waste.

To minimise odour potential from bio-solids, controls on tipping of bio-solids will be set. The controls for bio-solids tipping include allowing only one load of bio-solids to be tipped at a time and controlling the proportion of bio-solids to total waste.

The site's procedure for managing the active working face will include practices for the management of site personnel, delivery contractors, site machinery and odour control equipment. These practices are essential for ensuring waste is buried in an effective and timely manner to control odour. All operators and leading hands on the landfill will be considered to be "Spotters" and required to take immediate action upon identifying any unacceptable (including odorous) waste brought to the Landfill.

Relevant plans:

- Working face disposal operations (section of the LMP) – Ref xxxx
- Waste Control Plan – Ref xxxx

3.2.1.5 Odour neutralising sprays

Odour neutralising sprays are not a substitute for odour minimising measures, however they can be effective in reducing odour in situations within the project footprint where some odour is inevitable.

Relevant plans:

- Working face disposal operations (section of the LMP) – Ref xxxx

3.2.2 Dust control

3.2.2.1 Introduction

Dust might be generated by daily landfilling operations, particularly during dry, windy conditions. This has the potential for nuisance effects if not well-controlled. Landfilling activities with the potential to generate dust include:

- On-going development of landfill cells;
- Stockpiling and removal of soil and clay within Stockpiles 1, 2 and the clay borrow area to provide soil and clay for development of landfill cells and cover;

- Traffic movements on unpaved roads within the landfill;
- Placement of dusty loads of waste at the working face under windy conditions; and
- Placement of interim and long term cover.

3.2.2.2 Dust management methods

A range of dust control measures will be implemented to minimise dust emissions, thereby reducing any potential nuisance or visual amenity effects. These measures include:

- Permanent paving of the access road and bin exchange area;
- Use of a vehicle wheel wash to remove dust from the access road (as necessary) to minimise tracking of mud from the site, which later becomes dust;
- Use of a water tanker vehicle in periods of dry, windy weather to dampen down areas of earthworks and unpaved site roadways and in periods of wet weather to clean off mud that would later become dust;
- Control of dusty loads tipping at the working face (by damping down and/or immediate coverage);
- Limiting vehicle speeds on unpaved roads to levels that do not raise excessive visible dust, particularly during dry or windy weather; and
- Reducing the area of exposed earthworks.

Relevant plans:

- Working face disposal operations (section of the LMP) – Ref xxxx
- Waste Control Plan – Ref xxxx
- Bin Exchange Area Operations Plan – Ref xxxx
- Traffic management plan - Ref xxxx
- Erosion And Sediment Control Plan – Landfill Operations – Ref xxxx

3.2.3 Landfill gas generation and combustion

3.2.3.1 Introduction

Combustion of LFG in the flares and generators at the Renewable Energy Centre will generate exhaust containing a number of contaminants. These contaminants are principally products of combustion (fine particulate, oxides of nitrogen (NOx), carbon monoxide (CO) and sulphur dioxide (SO2)) similar to those generated by burning natural gas or other hydrocarbon fuels. These products of combustion have the potential to cause adverse health effects if people are exposed to them at sufficiently high concentrations for sufficiently long periods.

3.2.3.2 Landfill gas management methods

In order to manage potential human health effects, a variety of initiatives will be taken in the design of the gas collection, reticulation and destruction systems. Also,landfill gas monitoring will be undertaken. The LFG composition will be monitored on at least a monthly basis at various points including well heads and recorded in order to ensure the total LFG flow rate remains within appropriate levels.

Relevant plans:

- Landfill Gas Management Plan – Ref xxxx

3.2.4 Monitoring and measurement

3.2.4.1 Landfill gas monitoring

The LFG composition (methane, carbon dioxide and oxygen in %v/v), temperature (°C) and pressure (mbar) will be monitored on at least a monthly basis at the flare station and at all extraction wellheads, and typically quarterly at monitoring probes outside the Landfill footprint and other monitoring points where appropriate in the LFG collection system (gas header pipes, leachate pipes). These parameters will be monitored using hand-held landfill gas analysis instruments. Monitoring may be carried out more frequently (typically fortnightly) when the LFG management system is being optimised at a new wellhead.

The total LFG flow rate (m^3/hour) will be monitored and recorded continuously at the Renewable Energy Centre. Combustion equipment will be provided by specialist designers of landfill gas treatment systems, and exhaust gases will be analysed regularly.

4 Erosion and sedimentation

4.1 Scope

Earthworks and on-site activities associated with the project will increase the risk of sediment loads in the surrounding waterways. Increased sediment loads can have adverse effects on freshwater ecology and channel morphology. Streams, the Hōteo River, and the Kaipara Harbour are sensitive to discharges of sediment.

4.2 Management measures

During the operation phase of the landfill, the potential sources of sediment are associated with cell construction, borrowing clay and moving earth fill into and out of the stockpiles. To manage the potential generation of sediment-laden water, a range of sediment control measures will be utilised. This includes the following:

- Development of site specific erosion and sediment controls plans;
- Implementation of erosion control measures to minimise or avoid generation of sediment;
- Implementation of sediment control measures to capture sediment from the works; and
- Receiving environment monitoring, to confirm the effectiveness of the measures and to ensure that future measures adapt wherever appropriate to minimise the generation and discharge of sediment.

Relevant plans:

- Erosion and Sediment Control Plan – Landfill Operations Ref XXX

4.3 Monitoring and measurement

On-going monitoring will be required to assist with the on-going sediment management. The monitoring will support an adaptive sediment management approach where monitoring can provide feedback on the effectiveness of sediment controls and the need for modified or additional controls.

Relevant plans:

- Erosion and Sediment Control Plan – Landfill Operations Ref xxx

4.3.1 Weather forecasting

Weather forecasting will be a key component of the project to ensure that fine weather windows are identified for high risk works such as works within stream beds, installation of culverts and bridge piling activities near stream beds.

In addition, forecasting can provide an early warning of upcoming rain events, which can allow for stabilisation works and inspections of key erosion and sediment control measures.

Both short term and long terms forecast maps will be reviewed daily by the project team, with the weather forecast used to plan works activities for upcoming periods. The monitoring results at the closest meteorological station (either an on-site weather station or the Mahurangi Mews station operated by Auckland Council) will also be reviewed and compared with the forecast predictions to better understand future rain events.

4.3.2 Visual inspections

The contractors will be responsible for undertaking regular visual inspections of the following aspects during the works:

- The sediment control devices routinely and following any significant rain events. This to ensure these devices are working effectively and identify any improvements or repairs;
- The environment both upstream and downstream during and after rain events at works locations to identify any noticeable changes in water clarity, sediment deposition within the streams, and erosion potential.

Any adverse changes in the receiving environment that are considered the result of the earthworks will require a review of the Construction Erosion and Sediment Control Plan or the Site Specific Erosion and Sediment Control Plan to identify if additional measures are necessary, such as additional stabilisation or additional sediment control measures.

4.3.3 Monitoring

Fixed turbidity monitoring will be installed downstream of the road access and bridge construction works to provide a trigger for investigation. In addition, manual sampling will be undertaken within works area. This will include the following monitoring locations:

- Permanent turbidity monitoring downstream of the access road;
- Turbidity monitoring during bridge works within the Waitarere Stream; and
- Manual sampling downstream of the stockpiles while significant works are being undertaken.

The monitoring results will be compared with trigger levels that will be developed as part of the Erosion and Sediment Control Plan.

4.3.4 Review and investigation (adaptive approach)

The results of the monitoring programme will be used to trigger the need to review and investigate both the effectiveness of measures and the potential effects of any sediment discharges. The review shall include the following key aspects:

- Evaluation of the performance of erosion and sediment control measures to manage sediment effects to identify measures that are most effective or whether measures were installed and/or operated correctly;
- The need for additional controls to avoid future discharges of sediment;
- Whether additional inspections and monitoring is required, including post event ecological monitoring of the receiving environment to establish the potential effects.

The monitoring programme provides for an effective feedback loop and allows for an adaptive approach to monitoring sediment discharges.

5 Stormwater and Industrial and Trade Activities

5.1 Scope

The potential effects on the environment from the ongoing discharge of surface water during the operation phase of the landfill include (before mitigation measures):

- Water quantity effects if there is a change in the volume and flow rate of stormwater discharge into the receiving environment;
- Stream bank stability and channel erosion if there are increased peak flows from impervious surfaces;
- Water quality effects if there is discharge of contaminants (other than sediment) into the receiving environment; and
- Potential discharge of contaminants from Industrial and Trade Activities (ITAs).

These effects are detailed further in the below sections, as well as the proposed management measures.

5.1.1 Effects

ITAs can result in discharges of environmentally hazardous substances associated with the activity onto or into land or water if not managed appropriately. These environmentally hazardous substances could potentially accumulate within receiving environments leading to adverse environmental effects.

The potential key contaminants of concern from the proposed landfill vary depending on the locations of the activities.

The access road and stockpile locations have a low to moderate risk of effects from contaminants. With respect to the access road, this is due to the limited vehicle numbers using the roads (and hence low contaminant loads), as well as the provision of filter strips. The main contaminants of concern relate to typical contaminants from roads, including copper and zinc.

The main effects with the bin exchange are the potential contaminants from the vehicles and waste bins, including spillages of both oils/ greases and waste material.

5.2 Management measures

The key methods for addressing the potential discharge of environmentally hazardous substances associated with the operation of the landfill are site-specific controls to avoid, remedy or mitigate effects from discharges. These includes the following measures:

- Design and procedures to contain, capture and treat run-off from ITA locations;
- Regular inspections;
- Clean-up of any spilled material; and
- Removal of any leaking bins.

Relevant plans:

- ITA Management Plan – Ref xxx

- Hazardous Substances Management Plan – Ref xxx
- Bin Exchange Area Management Plan – Ref xxx

5.3 Monitoring and measurement

The discharges from the wetland (and run-off from the landfill footprint) will be monitored throughout the operating life of the landfill. The monitoring serves two purposes. Firstly, it enables the determination of the quality of discharges from the landfill and assessment whether these are resulting in any significant effects on the receiving environment. Secondly, monitoring enables identification of potential leachate breakouts.

5.3.1 Long term monitoring

A baseline monitoring programme has already been undertaken for the project and a long term programme has been proposed in the consent conditions. The purposes of the monitoring programme are:

- To enable comparison with the baseline monitoring data to enable changes in water quality to be assessed once the landfill is operating;
- To inform the development and continuous improvement of the landfill operation monitoring regime; and
- To monitor discharges into and from the treatment systems on-site.

The monitoring programme will comprise of the following:

- Receiving environment monitoring;
- Continuous inlet monitoring into stormwater ponds; and
- Outlet and release monitoring.

The monitoring parameters for the surface water monitoring programme have been selected based on the following criteria:

- Relevance to the initial construction phase and on-going seasonal earthworks;
- Relevance to the Industrial and Trade Activities;
- Priority stormwater contaminants; and
- Indicators for leachate breakout or contamination.

Relevant plans:

- ITA Management Plan – Ref xxx
- Stormwater Monitoring and Contingency Plan – Ref xxx.

5.3.2 Trigger levels

The approach to developing trigger levels for the site will vary depending on the purpose of the monitoring, the potential effects and potential adverse effects.

In general terms, the trigger levels will be based on the one of the following approaches:

- Site specific trigger levels based on monitoring results from the baseline monitoring programme. This approach will be used for specific parameters where there may be direct effects on the immediate downstream environment including the biota present such as fish (e.g. banded Kōkopu) and macroinvertebrates;

- Screening trigger levels for parameters where there are broader catchment wide effects such as potential for nitrification and recreational use of the Hōteo River; and
- Identification trigger levels for contaminants and parameters which are monitored to identify the presence of leachate.

Relevant plans:

- ITA Management Plan – Ref xxx
- Stormwater Monitoring and Contingency Plan – Ref xxx

6 Hydrogeology

6.1 Scope

Groundwater levels and volumes can be affected by excavations which extend below the water table, by structures including the landfill mass which change or intercept the direction of groundwater flow and by direct extraction takes. Effects on hydrogeology from the operation of the landfill will arise in relation to the generation of leachate within the landfill. Potential effects include the following:

- Groundwater drawdown resulting from proposed subsoil drainage beneath the landfill;
- Groundwater drawdown associated with the proposed use of groundwater for potable/odour suppression supply;
- Groundwater take and diversion as a result of the excavation of weathered and residual soils for the construction of the landfill; and
- Discharge of contaminants into ground and groundwater as leachate in the unlikely event of underperformance of the landfill lining system once landfilling operation commences.

These effects and the measures proposed to manage them are discussed in the below sections.

6.1.1 Shallow groundwater take

Groundwater drawdown may occur during the flow of shallow groundwater into the subsoil drainage network beneath the landfill.

Based on the very low permeability of the weathered and residual soil and also the shallow unweathered rock, groundwater drawdown is likely to be local to the subsoil drains. On this basis, there is no potential for off-site adverse effects from groundwater drawdown associated with the subsoil drainage.

6.1.2 Discharge of contaminants into ground and groundwater

There is the potential for contaminants to discharge to groundwater via leachate seepage through the landfill lining system, although the design of the lining system is intended to prevent seepage. If (and only if) leachate seepage happened, the points of exposure could include:

- The nearby confluence with the Valley 1 and 2 stream;
- The Hōteo River via contaminant migration and regional groundwater flow;
- The farm bore; and
- The Waiteraire Stream via contaminant migration and regional groundwater flow.

Based on the results of groundwater risk assessment, which predicts that contaminant concentrations at all potential points of exposure will not exceed the relevant guidelines, even with the very conservative assumption of a constant input of leachate for a very long time, the potential

seepage of leachate through the landfill lining system is highly unlikely to have any adverse effects on the above points of exposure.

Relevant plans:

- Groundwater Monitoring and Contingency Plan – Ref xxx
- Leachate Monitoring and Contingency Plan – Ref xxx
- Hazardous Substances Management Plan – Ref xxx

6.2 Monitoring and measurement

The groundwater risk assessment indicates the potential adverse effects on contaminants in leachate entering the groundwater are nil. However, a number of groundwater observation bores are proposed to be installed and monitored at locations downgradient of the toe of the landfill to screen for the presence of leachate in the shallow groundwater.

The following contaminants that would indicate the presence of leachate will be monitored routinely:

- Ammoniacal nitrogen;
- Total organic carbon;
- Biological oxygen demand;
- Chemical oxygen demand; and
- Chloride.

Relevant plans:

- Leachate Monitoring and Contingency Plan – Ref xxx
- Groundwater Monitoring and Contingency Plan – Ref xxx
- Stormwater Monitoring and Contingency Plan – Ref xxx

7 Noise

There will be a number of potential noise sources throughout the operation of the project, including earthworks and construction of new landfill cells, operating of the bin exchange area, operation of the energy generation centre and operations at the landfill's working face. Excessive noise can have adverse effects on surrounding residents' amenity. Predictions of noise levels at receivers have been made and conclude that under a range of potential worst case scenarios during the project's operation, noise levels will comply with the relevant permitted activity standards for the rural zone. Further, for most receivers, noise generated by the project may be perceptible but will be less than the ambient noise levels. Therefore, for the majority of receivers, noise effects are considered to be negligible.

The closest receiver, located at 1207 State Highway 1, is the most exposed to noise from the landfill, due to proximity to the site entrance and bin exchange area. Although compliance with the relevant standards will be achieved, this receiver may be able to hear the bin exchange area operations. However, this will be in the context of high ambient background noise for this receiver, associated with traffic noise from State Highway 1.

To manage noise effects associated with landfill operations, the working face hours are proposed to be limited to between 0500-2200 hours, six days of the week and 0700-1700 hours on Sunday. Furthermore, to minimise noise associated with the tonal reverse alarms often fitted to earthmoving machines, it is proposed that all WMNZ vehicles operating on the landfill and in the bin exchange area are fitted with broadband reverse alarms.

8 Landscape and visual amenity

Effects on visual amenity will vary throughout the operation of the landfill, as progressive capping is undertaken. The greatest level of adverse visual effects are expected to be on two residential properties adjacent to Springhill Farm. Many viewing audiences in Wellsford township and surrounding areas will experience no effects, as landfill operations will not be visible. A limited number of properties near Wellsford may attain views of the project, at a distance of more than 4 kilometres. For these properties, minor adverse visual effects will remain during the operational life of the landfill.

Effects on landscape and visual amenity will be manage through mitigation measures such as hydroseeding, revegetation and screening.

Relevant plans:

- Landscape Mitigation and Restoration Plan – Ref xxx
- Post-Closure Management Plan – Ref xxx

9 Archaeology

No archaeological sites are recorded on the site and there is no evidence to date of potential archaeological values within the valley that contains the landfill footprint. Further, due to the low fertility nature of the soils and steep terrain, Maori occupation sites or settler cottages are initially considered unlikely to be present.

To manage the risk of uncovering unexpected archaeological features, the works will be undertaken in accordance with the accidental discovery protocol as set out in the AUP.

10 Applicability

This report has been prepared for the exclusive use of our client Waste Management New Zealand, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement. We understand and agree that this report will be submitted to Auckland Council in support of an application for resource consent for the works described herein and that council will rely on this report for the purpose of assessing that application.

Tonkin & Taylor Ltd

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
	
.....	.....
Rob van de Munckhof Senior Environmental Engineer	Simonne Eldridge Project Director

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Volume 3

Implementation Plans

DRAFT

This version of the Landfill Management Plan is a draft to support resource consent applications (reference BUN60339589) for a proposed landfill at Wayby Valley. It presents drafts of key sections that relate to the consent applications. This version is not intended to be the complete Landfill Management Plan.

Document control

Date	Status	Issued by	Issued to	Distribution method / upload site / link
30/01/2020	Draft d1	BH		

VOLUME 3 CONTENTS

LMP Section 3.00

3.72 • incl. Landscape Mitigation and Rehabilitation Management Plan (LMRMP)
3.73 Post-Closure Management Plan (PCMP)
3.74 • incl. Closure and Final Capping
3.75 • incl. Aftercare and End Use
3.80 **Stakeholder engagement**
3.81 Community Liaison Group
3.82 Complaint response
3.83 Iwi
3.84 Public access and recreation
3.85 DOC, WAC, NZTA
3.86 Forestry
3.90 **Emergency Management**
3.91 Site Emergency Management Plan (SEMP)
3.92 • incl. Spill Response Plan (SRP)

Shaded text = to be prepared after consent conditions (not included in consent application)

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Waste Control Plan

Document Control

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CONTENTS

1. INTRODUCTION

1.1 Scope of this section

This section of the LMP describes

- acceptable and unacceptable waste
- procedures to ensure that only acceptable waste will be landfilled
- monitoring of waste types and quantities
- reporting

2. WASTE ACCEPTANCE

2.1 Acceptable waste

The landfill will accept non-hazardous solid waste of these types:

- Clean fill material.
- Managed fill material.
- Construction and demolition (C&D) waste, subject to assessment of incidental contaminants if any that may have an adverse environmental or health effect.
- Municipal solid waste from transfer stations which reject or isolate hazardous waste if any before dispatch to the landfill.
- Municipal solid waste direct from sources that do not have hazardous waste.
- Household waste.
- Commercial waste.
- Industrial waste.
- Potentially hazardous waste that has been assessed, tested and/or treated to confirm that it's non-hazardous.
- Contaminated soil.
- Liquids and sludges derived solely from on-site processes (including leachate, leachate treatment sludge, wash water, on-site cess-pit cleanings, and gas condensate) provided that they are also non-hazardous.

Solid waste means that:

- Sludges must have an angle of repose of greater than 5 degrees i.e. 'spadeable'.
- Waste must have no free liquid at the point of loading into the truck that delivers it to the working face.

The landfill will accept particular wastes at the landfill operator's discretion:

- Packaged goods originally intended only for domestic use but would be regarded as hazardous if in bulk will be accepted provided that the quantity is less than 0.1% of the daily waste tonnage.
- Odorous waste will be accepted only if it will not cause objectionable odour at the site boundary.
- Some large volume wastes may be mono-filled or encapsulated within the waste mass to avoid particular mixing that leads to adverse effects like release of odour, suppression of decomposition (e.g., high sulphate and sulphur wastes), or hindrance to efficient gas collection.

- Oversize items (e.g., molds for fibreglass yachts, tree logs) will be accepted provided that they do not compromise the ability to apply daily cover and that they do not trap gas pockets that cause them to 'float' up through the waste to the surface.
- Dusty materials will be accepted subject to additional controls to manage safety at the tip face (e.g., pre-bagging, load covering, dampening at source, avoiding delivery in high winds).
- Soil from the development of a broad-acre horticultural HAIL site (reference below) will be accepted without pre-acceptance screen tests if (i) the amount from the site is less than 100 m^3 and (ii) the only reason that the site is a HAIL site is broad-acre pesticide application (i.e. this exemption from testing does not apply to soil from HAIL sites where there was intensive pesticide use).

(Reference: HAIL means Hazardous Activities and Industries List (MfE, 2011) as presented in Appendix J, Technical Guidelines for Disposal to Land, WasteMINZ)

The landfill will not accept:

- hazardous waste;
- excessively odorous waste;
- untreated sewage;
- bulk liquids.

Figure … : Acceptable Construction & Demolition waste

2.2 Hazardous waste

2.2.1 Prohibited waste

Waste is prohibited i.e. hazardous and therefore not acceptable for disposal if it is within one of the following categories.

(Reference: Appendix I, section I.1, Technical Guidelines for Disposal to Land, WasteMINZ, August 2018)

Class	Characteristic
H1	Explosives
H2	Gases
H3	Flammable liquids
H4.1	Flammable solids
H4.2	Substances or wastes liable to spontaneous combustion
H5.1	Oxidising substances
H5.2	Organic peroxides
H6.2	Infectious substances
H7	Radioactive materials
H8	Corrosives
H10	Liberation of toxic gases in contact with air or water
H13	Capable, by any means after disposal, of yielding another material (i.e., leachate which possesses any of the above characteristics).

More detailed descriptions of the characteristics will be adopted from USEPA (Appendix 4).

2.2.2 Potentially hazardous waste

Waste is unacceptable i.e. deemed to be hazardous (unless proven by testing to be non-hazardous) if it is within one of the follow categories.

(Reference: Appendix I, section I.2, Technical Guidelines for Disposal to Land, WasteMINZ, August 2018)

Class	Characteristic
H6.1	Poisonous substances
H11	Toxic substances (chronic or delayed effects)
H12	Eco-toxic

The eco-toxicity characteristic is important when assessing chemical sludges and highly contaminated soils. The procedure for measurement and the cut-offs for hazardous versus non-hazardous are described below ('toxicity test').

2.3 Toxicity test

Waste that is hazardous by the characteristic of toxicity is not acceptable. This characteristic is determined by the Toxicity Characteristic Leaching Procedure (TCLP) test.

If the waste 'passes' the test, then it can be accepted into the landfill. If the waste 'fails' the test, then it must be rejected as hazardous waste.

The samples to be tested will be taken by either the waste generator, their consultant or the landfill operator and analysed by a suitably qualified testing laboratory for a number of parameters. The list of parameters for analysis will be decided on a case by case basis depending on knowledge of the history of the waste. The landfill operator reserves the right to ask for more testing of any kind at any time it wishes to adequately confirm compliance with the landfill's waste acceptance criteria.

The TCLP limits are listed in Appendix 1.

The derivation of the limits and any variations from WasteMINZ guidelines are described in:

- 'Auckland Regional Landfill, Waste Acceptance Criteria', Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, Date May 2019, Job Number 1005069.1160
- … (subsequent submissions, correspondence, decisions)

2.4 Special waste

2.4.1 Definition

The term 'special waste' refers to any waste that either:

- cannot initially be satisfactorily described in terms of contaminant content by visual observation (including 'potentially hazardous' waste) which has therefore undergone a toxicity test and which has passed the toxicity test, or;
- requires particular handling precautions for worker safety.

2.4.2 Acid sulphate soils

Acid Sulphate soils are 'soils containing iron sulphide complexes (usually pyrite) which when oxidised, release sulphuric acid' (ANZECC 2000, 8.2.1.6).

No limit will be imposed at ARL because acid sulphate soils are present across only a small part of northern Auckland and southern Northland, and if sent to this landfill then they would comprise only a small proportion of the total waste. Then once in the landfill, oxidation will be slow due to anaerobic conditions. It is considered unlikely that the acidity of leachate would be adversely affected (leachate is well buffered i.e. maintains stable, near-neutral pH). The prompt for any review of this position would be if pH in leachate falls to below the trigger level.

The landfill operator may use discretion to restrict total Sulphur entering the landfill, to reduce wear on gas infrastructure associated with Sulphur and to reduce the release of Sulphides which are odorous.

2.4.3 Emerging contaminants

It is possible within the life of the consent, that a contaminant or group of contaminants may become a concern typically due to improvements over time in scientific knowledge about its effects and distribution. Additional Waste Acceptance Criteria (WAC) may be needed in due course. WAC will be reviewed as follows.

2.4.4 Review of WAC

A review of WAC will be conducted every 10 years during the lifetime of the landfill.

The aim of the review will be:

- to consider amendment to any existing WAC;

- to consider the addition of any new WAC to manage potential environmental harm or human health risk associated with emerging contaminants.

With regard to any contaminant that does not already have WAC in this management plan, the characteristics that may trigger its inclusion in a review are:

- evidence of greater potential harm presented in recent publications, and;
- known presence in a regional context, and;
- more frequent instances of waste disposal applications requiring assessment on a case-by-case basis.

The review steps for emerging contaminants will be:

a) Identify the contaminant and review the reasons for it to be a candidate for imposition of specific WAC.

b) Review New Zealand and international regulations and good practice guidelines to look for any existing WAC for the contaminant other landfills.

c) If there are existing WAC, then compare the conditions for which those WAC were developed against conditions applicable at ARL. If the assumptions made in developing the existing WAC are conservative for ARL, then the WAC can be adopted for ARL.

d) If there are no existing WAC, or if the existing WAC are based on assumptions that are inappropriate for ARL, then develop ARL-specific criteria.

e) When developing ARL-specific criteria for a contaminant, have regard to its mobility, persistence, degradation products, pathway to any receptor (fate), and published evidence of harm.

f) Measure or estimate the concentration and total mass of the contaminant in raw leachate, raw landfill gas, treated leachate, treated landfill gas and waste mass wherever relevant.

g) Consider the potential discharges from the landfill in the long term.

h) Recommend whether or not new WAC are justified (and if so, then reasonable parameter limits).

i) Recommend any worthwhile additional and/or alternative related monitoring.

j) Summarise the assumptions and findings of the review.

k) If new WAC or monitoring parameters are proposed, then follow the procedure for revision of the Landfill Management Plan.

2.4.5 Preliminary limits

Certain emerging contaminants will be named in this Landfill Management Plan, for which preliminary screening TCLP limits will apply to its concentration in inbound waste.

If the preliminary screening limit is exceeded in accepted waste, then

- it does not mean non-compliance
- it triggers the review described above to be brought forward

The currently named emerging contaminants are:

- PFAS (sum of sum of PFOS, PFHxS, PFOA)
- PFOA

2.4.6 Asbestos

The site will accept non-friable asbestos and asbestos-contaminated material for disposal. The procedure for disposal to landfill will be developed in liaison with health and safety authorities.

The procedure will include:

- Disposal practices for asbestos waste and asbestos-containing material (ACM) will be designed to prevent asbestos particles becoming airborne.
- Asbestos waste will be accepted at ARL only in non-friable condition, delivered in accordance with NZS 5433: 2012 Transport of dangerous goods on land. Friable asbestos will not be accepted.
- Asbestos waste awaiting disposal will be kept in containers that are (a) closed (b) impermeable to asbestos dust and (c) conspicuously marked as per the NZ Health and Safety at Work (Asbestos) Regulations 2016.
- In general, asbestos waste will be double wrapped in bags placed in a skip bin, or in large bags which can be lifted and lowered by 'HIAB'.
- Asbestos waste will be either taken straight to its place of disposal if it can be tipped without mobilising the asbestos (favoured because it avoids double handling) or taken to a dedicated lay-down area before removal with care to its place of disposal.
- Dampened ACM soil may be tipped from the truck direct into its place of disposal provided that the ACM is covered for transport and the working face is properly ready.
- The locations of asbestos waste will be recorded, so that precautions can be taken to avoid the possibility that they are dug up should it be necessary to excavate into the landfill at a future time.
- Customers must comply with the landfill's requirements with respect to pre-approval, giving advanced notice and arriving within agreed times frames.
- Any asbestos arriving without the proper documentation or treatment will be turned away, and the customer/haulier will be reminded of their responsibilities and warned that they will be refused further disposal contracts with WMNZ if it happens again.
- During tipping and burial, the area at or near the working face where the asbestos waste is being tipped will be evacuated of non-essential personnel.
- The drivers will be given clear instruction on where to tip from the gatehouse attendant and/or spotter.
- Proper PPE will be used by anyone outside of closed vehicle cabs at or near the working face for asbestos waste disposal. Driver's PPE will be checked at the gatehouse.
- The working face for asbestos waste will be staffed only by those who know the decontamination procedure if they become exposed.
- Asbestos waste (excluding soils) will be covered by at least 1 m of material including daily cover before daily close-down.

2.4.7 Automobile Shredder Residue

Automobile Shredder Residue (ASR, aka 'floc') is a special waste that is subject to confirmation that it is non-hazardous in accordance with this LMP.

The meaning of "floc" for the purposes of this Landfill Management Plan is Automobile Shredder Residue (ASR), Automotive Shredder Residue, or "flock", which is the residual material comprising rubber, textiles, plastics, glass, some metals and dirt, after all reasonably practical removal of recyclable and hazardous components including ferrous metal, non-ferrous metal, and automobile liquids, using a process that involves shredding down to fist-sized pieces, from waste comprising end-of-life motor vehicles, machinery and mechanical/electrical appliances.

The TCLP limit on Zinc in floc may be increased from 200 mg/l to 600 mg/l. This concession for floc alone is made on account of its relatively low environmental risk to a Class 1 landfill in regard to odour

potential, slope stability, variability, composition uncertainty, spillage, air emissions, and tracking away on truck wheels. Floc will not be exposed overnight as daily cover.

2.5 Soil stockpiles

The soil stockpiles are for soils derived within the site i.e. not for the receipt of material from off the site.

For the site-sourced materials being placed in permanent soil stockpiles, WMNZ will apply the Waste Acceptance Criteria for Class 4 fills described in the WasteMINZ Guidelines which require:

- Virgin excavated natural materials (VENM), including soil, clay, gravel and rock; and
- Maximum incidental inert manufactured materials (e.g. concrete, brick, tiles) to be no more than 5% by volume per load; and
- Maximum incidental or attached biodegradable materials (e.g. vegetation) to be no more than 2% by volume per load; and
- Maximum chemical contaminant limits are local natural background soil concentrations; and
- Incidental items or materials are those present in small quantities that cannot practically be separated from the materials intended for disposal.

2.6 Pre-acceptance

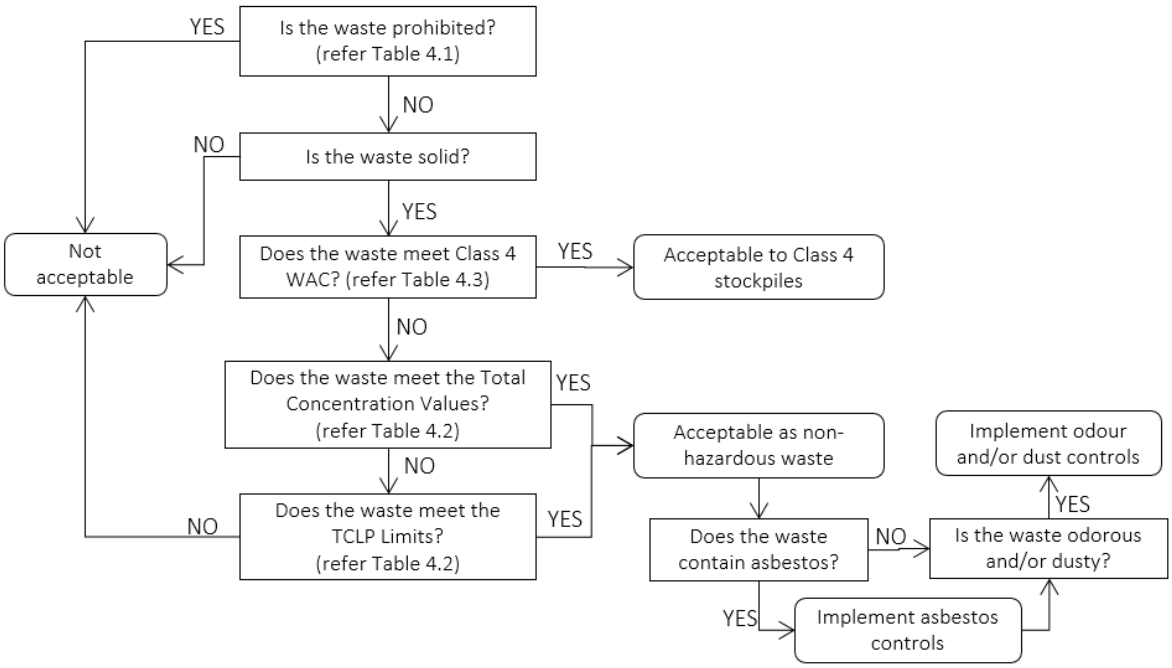
2.6.1 Procedure

The procedure for site staff to enter into a contract to take special waste will be as follows.

- Receive inquiries from prospective customers and existing customers proposing a new waste for disposal.
- Obtain details of the waste and the process which generated the waste.
- If the waste is not on the 'acceptable waste' list in this LMP, then ask for and obtain adequate test results to show that the waste is non-hazardous. This means obtaining test results for contaminants relevant to the source identified in the previous step. If the anticipated contaminants are not listed with limits in this LMP i.e. rare, then assess the waste case-by-case.
- If assessing case-by-case, then confirm that any risk of wider adverse effects is manageable. Consider the contaminant properties (harmfulness, mobility, attenuation, persistence, decomposition products) and the waste as a whole (concentration, relatively quantity, burial method, trials, pre-treatment, and potential effects on leachate, gas, and safety). Consider results for contaminants from this LMP's list that would typically accompany the rare contaminant.
- Obtain a 'compliance sign-off'.
- Assess odour potential.
- Send a quotation and agree on a waste acceptance contract. The agreement may include: a covering letter; the basis of acceptance (e.g. lab test results); conditions of acceptance (e.g. right to inspect loading of the waste onto trucks, daily truck limits, time-of-day limits, day-of-week limits); Commercial terms; Haulier rules; Site rules for customers; Notification Form.

2.6.2 Flowchart

(Extract from Waste Acceptance Criteria report by T+T May 2019).



2.7 Gatehouse control

2.7.1 Operating hours

Activity	Open	Close
Gatehouse	0500 (Monday - Saturday) 0700 (Sunday)	2200 (Monday - Saturday) 1700 (Sunday)
Working face disposal	0500 (Monday - Saturday) 0700 (Sunday)	2200 (Monday - Saturday) 1700 (Sunday)
Working face disposal - potentially odorous waste	0830 (Monday - Friday) Not open (Saturday - Sunday)	1430 (Monday - Friday) Not open (Saturday - Sunday)
Working face daily cover	0430 (Monday - Saturday) 0630 (Sunday)	2230 (Monday - Saturday) 1730 (Sunday)
Bin exchange area	Always open - restricted entry	Always open - restricted entry
Soil stockpiles and earth fills	0700 (Monday - Saturday) Not open (Sunday)	2000 (Monday - Saturday) Not open (Sunday)
Seasonal construction	0600 (Monday - Saturday) 0600 (Sunday) low noise only	2000 (Monday - Saturday) 2000 (Sunday) low noise only

The working face will open every day except Christmas Day, Easter Sunday and other days subject to notification in advance to customers.

2.7.2 Role of gatehouse attendant

There will be a gatehouse at the entrance to the landfill disposal area which will be attended during landfill tip face operating hours.

The gatehouse attendant will:

- Restrict entry onto the landfill to only authorised persons and vehicles;
- Issue site rules and other information to drivers and visitors;
- Run through a 'new driver induction' for every waste-haulage driver who has not been on site before (Appendix 3);
- Ensure that the required vehicle counts are kept;
- Verify that drivers have the correct documentation to proceed onto the landfill tip face e.g. a manifest form which is evidence of type of waste, source, any special handling requirements, waste acceptance contract, sample frequency, and odour potential;
- Record the details of the waste delivery, electronically, including weight, date, time, truck registration number and waste code - weighing and recording applies to all waste including mules with bins and third-party customers;
- Notify the landfill operations personnel of the arrival of waste which may have special handling instructions relating to health and safety, potential odour and/or certified burial;
- Inform the laboratory team when they are required to carry out screen tests, scheduled and random, on waste samples before burial to verify that the waste delivered is the same as the waste declared;
- Reject unacceptable waste and notify site management, and;
- Give directions to transporters of construction materials.

At the gatehouse and weighbridge, a traffic bypass lane will be available both inbound and outbound for vehicles not involved in haulage of waste or not carrying materials required to be weighed for Waste Levy purposes.

2.7.3 Recycling

A portion of the incoming waste can and will be recovered and put to a different use in the landfill. For example, contaminated gravel can be used in gas and leachate drains, some low-level contaminated soils can be used as daily soil cover, and road pavement millings can be used as temporary road surfacing. These recoveries will be tracked for Waste Levy reporting purposes.

2.7.4 Waste amounts

Weights of waste will be categorised as required by the Auckland Council Waste Bylaw 2019 (which itself does not provide categories) and legacy approvals (which require online entry of waste tonnages in the categories below), within the limitation that only one category will be assigned to the entire load of any one truck delivery.

Waste category (according to bylaw)
DW Domestic Waste

Waste category (according to bylaw)
INORG Other waste from Households (inorganic)
ICI Industrial/Commercial/Institutional
C&D Construction and Demolition waste
HW Hazardous Waste (Always zero because the landfill does not accept haz waste)
B Transfer Station Waste
NHFM Natural Hard Fill Material
FW Food Waste
GW Green Waste
RM Recyclable materials (Always zero because recycling if any takes place prior to arrival)

The weights reported to Auckland Council under the bylaw will be the weighed amounts by category less any recovered material from that category. Recovered material will include earth materials used for:

- daily cover
- intermediate cover
- topsoil over daily and intermediate cover
- final cap
- topsoil over final cap
- drainage aggregate
- road surfacing materials

The weights reported to MfE under the Waste Minimisation Act will be the weighed amounts by category less any eligible recoveries from that category. Recovered material will include earth materials (mainly soils) used in a manner consistent with their original use, for example:

- final cap
- topsoil over final cap
- drainage aggregate
- road surfacing materials

2.7.5 Vehicle counts

Inbound vehicles will be counted and weighed at the gatehouse and bin exchange area as follows.

Vehicle category
Landfill disposal operations / refuse (assessed against limits on vehicles carrying refuse for disposal) • solid waste • soils for use as daily cover, intermediate cover and topsoil on daily and intermediate cover

Vehicle category
Other / Construction, administration and servicing / non-refuse (assessed against limits on non-refuse vehicles) • Construction materials (e.g. pipes, gravel, liner, concrete) • Soils for final cap and topsoil on final cap • Machinery and prefabricated items • Light vehicles for staff, visitors, delivery couriers for consumables and spare parts, fuel supplies, technical services, etc.

Outbound vehicles will not be counted and weighed, except where weight difference is required for cost invoicing e.g. solid waste.

2.8 Screen testing

Capability will be maintained on site to take samples of special waste at short notice upon arrival of the waste at the site. Samples will be required for laboratory analytical testing to confirm that the waste complies with consent conditions and to confirm that the waste matches the description in the acceptance contract.

The assigned technician who takes the sample will either dispatch them for independent testing or conduct tests in-house at the on-site laboratory.

The list of parameters and frequency for screen testing will be set at the discretion of site management.

3. MONITORING

3.1 Monitoring parameters and schedule – specific to waste acceptance

Location / Event / Topic	Parameter	Frequency	TL1	TL2
Vehicle count	Initial Inbound vehicle count - refuse hauliers per day (average over one week)	Daily	Any single day: 300	Average per day over 7 consecutive days: 300
Vehicle count	Initial Inbound vehicle count - non-refuse vehicles per day (average over one week)	Daily	Any one day: 150	Average per day over 7 consecutive days: 150
Leachate removal from site	Leachate amount tankered off site as measured across weighbridge	Daily	No limit.	No limit.
Waste analysis survey	Waste category percentages	Every 5 years	No limit.	No limit.
Waste inbound weighing	Landfilled waste tonnes grouped as required by (i) bylaw (ii) consent condition (iii) Waste Minimisation Act	Monthly	No limit.	No limit.
Leachate chemistry test	Contaminant concentration	Quarterly	No limit. Monitored for information.	No limit. Monitored for information.

3.2 Monitoring procedures

Procedure	Key steps
Pre-acceptance of waste	• Procedure in LMP Vol. 4. • As in Section … above.
Solid Waste Analysis Protocol survey	• As per MfE SWAP (2002) procedure.
Screen testing of incoming waste	• Procedure in LMP Vol. 4.
Waste inbound weighing (for tonnage reporting)	• Each truck load is weighed on arrival. • The waste category of the truck load is all allocated to the largest waste category represented in the truck load. • The waste is assigned categories: from the bylaw; from the consent conditions; from the Waste Minimisation Act; OR recovered material. • Note: Inbound waste tonnes in the bylaw categories are reported to Council on a monthly basis via their online data entry system.

3.3 Reporting

LMP Section 3.01

Location / Event / Topic	Report to	Method	Frequency
Waste tonnes - WMA categories.	MfE.	Updated table sent by email or file transfer.	Annually
Waste volume.	In-house.	Electronic.	Annually
Vehicle counts. Average waste and non-waste vehicles per week at gatehouse.	Auckland Council.	Summary table sent by email or file transfer.	Annually
Vehicle counts. Average waste and non-waste vehicles per week at gatehouse.	In-house.	Electronic.	Daily
Site generated liquids and leachate disposed or recirculated into the waste pile.	In-house.	Electronic.	Monthly
Waste tonnes - bylaw categories.	Auckland Council.	AC's online system.	Monthly
Waste tonnes - consent categories.	Auckland Council.	Email.	Monthly
Screen testing results.	In-house.	Electronic. Kept for 5 years.	Monthly
Waste analysis survey.	Auckland Council.	Email or file transfer.	Within 3 months

4. CONTINGENCY

4.1 Trigger levels

Upon completion of a monitoring event, the results will be checked against the pre-specified response limits.

If no response limit is exceeded, the monitoring event will be routinely reported for example in an annual report to the regulator.

If any response limit is exceeded, then action will be taken immediately. The response limits are set at two levels, namely Trigger Level 1 (Lower response limit / warning level) and Trigger Level 2 (Upper response limit / alarm level).

Exceedance of TL1 warns of potential adverse effects, warns of potential future non-compliance with the resource consent conditions, requires investigation and reporting, and might require remedial action.

Exceedance of TL2 is a firm indication that significant adverse effects and breaches of consent conditions either are already occurring, or could have occurred, or are about to occur. The upper limit is typically set at the limit specified in the resource consent, so exceedance of the upper limit typically indicates non-compliance. Exceedance of TL2 will require one or more of: urgent mitigative actions; notification of authorities; calling of a specialist adviser (a qualified person or consultancy with experience in environmental management); prompt instigation of investigations, and; remedies.

Extreme exceedance of TL2 might require reference to the site emergency management plan.

Trigger Levels are provided in the monitoring table in the previous section.

4.2 Response guidelines

Contingency triggering event	**Response guidelines**
Vehicle count exceeds limit	• Notify the Landfill Manager / Special Waste Manager. • Confirm that the numbers are correct by checking the weighbridge record. • Review the weighbridge record to identify changes, for example short term infrastructure projects. • Review the upcoming inbound waste schedules, and notify customers of any required redistribution of allowable arrival times. • Divert waste customers to transfer stations if they are delivering small tonnages per vehicle. • Conduct similar review and restriction in the case of inbound non-refuse vehicles.
Hazardous waste identified pre-acceptance	• If hazardous waste is identified during the pre-acceptance stage, then avoid entering any agreement

Contingency triggering event	Response guidelines
	and advise the prospective customer of options like treatment on site or treatment at a proper facility.
Hazardous waste or non-complying waste discovered during tipping	• Safety first. • Notify the Landfill Site Supervisor and co-workers. • Cordon off the hazardous waste. • Track down the customer who delivered it. • Refuse any further deliveries from that customer until satisfactory resolution. • Ask the customer to remove the hazardous waste. • If removal will occur promptly, then assist the customer with removal. • If the response from the customer is slow, then consult with a specialist advisor and the regulator about alternative methods to address the hazardous waste. • Remove and/or treat as required. • Survey any burials. • Review the pre-acceptance process, the customer's systems, and the source before recommencing deliveries. • Ensure that the clean-up is satisfactory for worker safety and environmental containment.

4.3 Reporting

Location / Event / Topic	Report to	Method	Frequency
Cessation for further waste deliveries on account of excessive odour.	In-house.	In-house incident recording and resolution tracking system.	As required
Waste turned away at the gatehouse upon being found to be hazardous.	Auckland Council.	Email.	Within 2 days

5. TASK LISTS

5.1 Tasks and scheduled maintenance

TASKS AND SCHEDULED MAINTENANCE

Role	Task	Frequency
Gatehouse attendant	Ensure that the gatehouse is counting all vehicles including 'refuse' and 'non-refuse' as defined in the LMP.	Daily
Gatehouse attendant	Ensure that the bin exchange area access control is correctly counting all vehicles including 'refuse' and 'non-refuse'.	Daily
Gatehouse attendant	Weigh in all refuse vehicles. Hand out site rules. Notify spotter if odorous waste is arriving. Notify lab technician if screen testing is required. Give directions to transporters of construction materials. Complete the tasks listed in the LMP under 'Role of Gatehouse Attendant'.	Daily
Landfill Operations Manager	Arrange for calibration of the weighbridges.	Six-monthly
Special Waste Manager	Prepare and regularly update documentation for customers that spells out the landfill's waste acceptance criteria.	Annually
Special Waste Manager	Review emerging contaminants.	Every 10 years
Monitoring Technician	Prepare and regularly review the written sampling procedure and schedule of acceptable chemical analysis methods for special waste.	Annually

6. APPENDICES

6.1 TCLP Limits and Total Concentration Limits for Waste

(Extract from Waste Acceptance Criteria report by T+T, May 2019, updated as submitted with S.92 response, 6/12/19)

(1 page)

Table 86-1: Response to Question 86: Updated TCLP Limits

	Contaminant	TCLP Limit (mg/L)	Source of TCLP limits	Screen level (mg/kg)			Updated TCLP Limit for ARL (mg/L)
Metals	Antimony	0.6	1a	12			0.6
	Arsenic	5	1	500 [2]			5
	Barium	100	1	2,000			100
	Boron	20	1a	400			20
	Cadmium	1	1	100 [2]			1
	Chromium	5	1	500 [2]			5
	Lead	5	1	500 [2]			5
	Mercury	0.2	1	4			0.2
	Nickel	10	1a	200			10
	Selenium	1	1	20			1
	Silver	5	1	100			5
	Zinc - ASR	500	3	30,000			500
Other inorganics	Cyanides (reactive)	50	1	1,000			50
	Fluoride	200	1a	4,000			200
	Sulphides (reactive)	50	1	1,000			50
Aromatic hydrocarbons	Benzene	0.5	1	10			0.5
	Toluene	100	1a	2000			100
	Ethylbenzene	50	1a	1000			50
	Xylenes	100	1a	2000			6
	m-cresol	200	1	4,000			200
	o-cresol	200	1	4,000			200
	p-cresol	200	1	4,000			200
	Total cresol	200	1	4,000			200
Pesticides and herbicides	Aldrin + Dieldrin	0.00008	1c	0.008 [2]			0.00008
	Chlordane	0.03	1	3 [2]			0.03
	Dicofol	0.05	1b	5 [2]			0.05
	Endrin	0.02	1	2 [2]			0.02
	Heptachlor	0.008	1	0.8 [2]			0.008
	Lindane	0.4	1	40 [2]			0.4
	Methoxychlor	10	1	1,000 [2]			10
	Pentachlorophenol	100	1	10,000			100
	Toxaphene	0.5	1	50 [2]			0.5
	2,4-dichlorophenoxyacetic acid	10	1	200			10
	2,4,5-trichlorophenoxypropionic acid	1	1	20			1
Other organics	2,4-dinitrotoluene	0.13	1	2.6			0.13
	Nitrobenzene	2	1	40			2
	Methylethyl ketone	200	1	4,000			200
	Pyridine	5	1	100			5
	Styrene	6	1a	600 [2]			6
	Tributyl tin oxide	3	1	300 [2]			3
	PFAS	0.005	1d	0.1			0.005
	PFOA	0.02	1d	0.4			0.02
Chlorinated organics	Carbon tetrachloride	0.5	1	10			0.5
	Chloroform	6	1	120			6
	Tetrachlorethene	0.7	1	14			0.7
	Trichloroethene	0.7	1	14			0.7
	1,2-dichloroethane	0.5	1	10			0.5
	1,1-dichloroethene	0.7	1	14			0.7
	Vinyl chloride	0.2	1	20			0.2
	Chlorobenzene	100	1	2,000			100
	1,4-dichlorobenzene	7.5	1	150			7.5
	Hexachloro-1,3-butadiene	0.5	1	50 [2]			0.5
	Hexachlorobenzene	0.13	1	13 [2]			0.13
	Hexachloroethane	3	1	300 [2]			3
	Polychlorinated biphenyls	50	1	5,000 [2]			50
	2,4,5-trichlorophenol	400	1	8,000			400
	2,4,6-trichlorophenol	2	1	40			2

[1] WasteMINZ Guidelines Table D-1 Class 1 Waste Acceptance Criteria for Inorganic and organic Elements (based on US EPA 40 CFR 261.24)

[1a] WasteMINZ Guidelines Table D-2 Class 1 Waste Acceptance Criteria for Inorganic and Organic Elements (based on the MfE Class A guidelines)

[1b] TCLP limit is 100x water quality guidelines

[1c] MfE Class A guidelines

[1d] TCLP limits are based on 4x the expected leachate concentration for landfills accepting more than 50% municipal waste.

[2] for these contaminants, the screening value is 100 x TCLP, based on WMNZ data for metals, or K_{ow} > 10,000 and K_{oc} > 300 for organics.

All other screening limits are 20 x TCLP, based on MfE 2004 Class A guidelines and definition of TCLP test

[3] Limit for zinc in Automobile Shredder Residue is based on review of data for ASR waste received at Redvale Landfill

6.2 TCLP Limits and Total Concentration Limits for Soil Stockpiles

(Extract from Waste Acceptance Criteria report by T+T, May 2019)

(1 page)

Table 4.3: WAC for permanent stockpiles (WasteMINZ Class 4)

Contaminant	Background concentration (mg/kg)	Contaminant	Maximum allowable concentration (mg/kg)
Arsenic	12	TPH C7-C9	120
Cadmium	0.65	TPH C10-C14	58
Chromium	55	Benzene	0.0054
Copper	45	Ethylbenzene	1.1
Lead	65	Toluene	1.0
Mercury	0.45	Total xylene	0.61
Nickel	35	Benzo(a)pyrene eq.	2
Zinc	180	Total DDT	0.7

Benzo(a)pyrene eq. is the potency-weighted sum of nine carcinogenic PAHs, as follows: benzo(a)pyrene + dibenzo(a,h)anthracene + 0.1 x [benzo(a)anthracene + benzo(b)fluoranthene + benzo(j)fluoranthene + benzo(k)fluoranthene + indeno(1,2,3-cd) pyrene] + 0.01 x [chrysene + fluoranthene].

6.3 USEPA description of ignitability, corrosivity and reactivity

(3 pages)

§ 261.11 Criteria for listing hazardous waste.

(a) The Administrator shall list a solid waste as a hazardous waste only upon determining that the solid waste meets one of the following criteria:

(1) It exhibits any of the characteristics of hazardous waste identified in subpart C.

(2) It has been found to be fatal to humans in low doses or, in the absence of data on human toxicity, it has been shown in studies to have an oral LD 50 toxicity (rat) of less than 50 milligrams per kilogram, an inhalation LC 50 toxicity (rat) of less than 2 milligrams per liter, or a dermal LD 50 toxicity (rabbit) of less than 200 milligrams per kilogram or is otherwise capable of causing or significantly contributing to an increase in serious irreversible, or incapacitating reversible, illness. (Waste listed in accordance with these criteria will be designated Acute Hazardous Waste.)

(3) It contains any of the toxic constituents listed in appendix VIII and, after considering the following factors, the Administrator concludes that the waste is capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed:

(i) The nature of the toxicity presented by the constituent.

(ii) The concentration of the constituent in the waste.

(iii) The potential of the constituent or any toxic degradation product of the constituent to migrate from the waste into the environment under the types of improper management considered in paragraph (a)(3)(vii) of this section.

(iv) The persistence of the constituent or any toxic degradation product of the constituent.

(v) The potential for the constituent or any toxic degradation product of the constituent to degrade into non-harmful constituents and the rate of degradation.

(vi) The degree to which the constituent or any degradation product of the constituent bioaccumulates in ecosystems.

(vii) The plausible types of improper management to which the waste could be subjected.

(viii) The quantities of the waste generated at individual generation sites or on a regional or national basis.

(ix) The nature and severity of the human health and environmental damage that has occurred as a result of the improper management of wastes containing the constituent.

(x) Action taken by other governmental agencies or regulatory programs based on the health or environmental hazard posed by the waste or waste constituent.

(xi) Such other factors as may be appropriate.

Substances will be listed on appendix VIII only if they have been shown in scientific studies to have toxic, carcinogenic, mutagenic or teratogenic effects on humans or other life forms.

(Wastes listed in accordance with these criteria will be designated Toxic wastes.)

(b) The Administrator may list classes or types of solid waste as hazardous waste if he has reason to believe that individual wastes, within the class or type of waste, typically or frequently are hazardous under the definition of hazardous waste found in section 1004(5) of the Act.

(c) The Administrator will use the criteria for listing specified in this section to establish the exclusion limits referred to in § 261.5(c).

[45 FR 33119, May 19, 1980, as amended at 55 FR 18726, May 4, 1990; 57 FR 14, Jan. 2, 1992]

Subpart C—Characteristics of Hazardous Waste

§ 261.20 General.

(a) A solid waste, as defined in § 261.2, which is not excluded from regulation as a hazardous waste under § 261.4(b), is a hazardous waste if it exhibits any of the characteristics identified in this subpart.

[*Comment:* § 262.11 of this chapter sets forth the generator's responsibility to determine whether his waste exhibits one or more of the characteristics identified in this subpart]

(b) A hazardous waste which is identified by a characteristic in this subpart is assigned every EPA Hazardous Waste Number that is applicable as set forth in this subpart. This number

must be used in complying with the notification requirements of section 3010 of the Act and all applicable recordkeeping and reporting requirements under parts 262 through 265, 268, and 270 of this chapter.

(c) For purposes of this subpart, the Administrator will consider a sample obtained using any of the applicable sampling methods specified in appendix I to be a representative sample within the meaning of part 260 of this chapter.

[*Comment:* Since the appendix I sampling methods are not being formally adopted by the Administrator, a person who desires to employ an alternative sampling method is not required to demonstrate the equivalency of his method under the procedures set forth in §§ 260.20 and 260.21.]

[45 FR 33119, May 19, 1980, as amended at 51 FR 40636, Nov. 7, 1986; 55 FR 22684, June 1, 1990; 56 FR 3876, Jan. 31, 1991]

§ 261.21 Characteristic of ignitability.

(a) A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

(1) It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume and has flash point less than 60 °C (140 °F), as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D 93–79 or D 93–80 (incorporated by reference, see § 260.11), or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D 3278–78 (incorporated by reference, see § 260.11).

(2) It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

(3) It is an ignitable compressed gas.

(i) The term "compressed gas" shall designate any material or mixture having in the container an absolute pressure exceeding 40 p.s.i. at 70 °F or, regardless of the pressure at 70 °F, having an absolute pressure exceeding 104 p.s.i. at 130 °F; or any liquid flammable material having a vapor pressure exceeding 40 p.s.i. absolute at 100 °F as determined by ASTM Test D–323.

(ii) A compressed gas shall be characterized as ignitable if any one of the following occurs:

(A) Either a mixture of 13 percent or less (by volume) with air forms a flammable mixture or the flammable range with air is wider than 12 percent regardless of the lower limit. These limits shall be determined at atmospheric temperature and pressure. The method of sampling and test procedure shall be acceptable to the Bureau of Explosives and approved by the director, Pipeline and Hazardous Materials Technology, U.S. Department of Transportation (see Note 2).

(B) Using the Bureau of Explosives' Flame Projection Apparatus (see Note 1), the flame projects more than 18 inches beyond the ignition source with valve opened fully, or, the flame flashes back and burns at the valve with any degree of valve opening.

(C) Using the Bureau of Explosives' Open Drum Apparatus (see Note 1), there is any significant propagation of flame away from the ignition source.

(D) Using the Bureau of Explosives' Closed Drum Apparatus (see Note 1), there is any explosion of the vapor-air mixture in the drum.

(4) It is an oxidizer. An oxidizer for the purpose of this subchapter is a substance such as a chlorate, permanganate, inorganic peroxide, or a nitrate, that yields oxygen readily to stimulate the combustion of organic matter (see Note 4).

(i) An organic compound containing the bivalent -O-O- structure and which may be considered a derivative of hydrogen peroxide where one or more of the hydrogen atoms have been replaced by organic radicals must be classed as an organic peroxide unless:

(A) The material meets the definition of a Class A explosive or a Class B explosive, as defined in § 261.23(a)(8), in which case it must be classed as an explosive,

(B) The material is forbidden to be offered for transportation according to 49 CFR 172.101 and 49 CFR 173.21,

(C) It is determined that the predominant hazard of the material containing an organic peroxide is other than that of an organic peroxide, or

(D) According to data on file with the Pipeline and Hazardous Materials Safety Administration in the U.S. Department of Transportation (see Note 3), it has been determined that the material does not present a hazard in transportation.

(b) A solid waste that exhibits the characteristic of ignitability has the EPA Hazardous Waste Number of D001.

NOTE 1: A description of the Bureau of Explosives' Flame Projection Apparatus, Open Drum Apparatus, Closed Drum Apparatus, and method of tests may be procured from the Bureau of Explosives.

NOTE 2: As part of a U.S. Department of Transportation (DOT) reorganization, the Office of Hazardous Materials Technology (OHMT), which was the office listed in the 1980 publication of 49 CFR 173.300 for the purposes of approving sampling and test procedures for a flammable gas, ceased operations on February 20, 2005. OHMT programs have moved to the Pipeline and Hazardous Materials Safety Administration (PHMSA) in the DOT.

NOTE 3: As part of a U.S. Department of Transportation (DOT) reorganization, the Research and Special Programs Administration (RSPA), which was the office listed in the 1980 publication of 49 CFR 173.151a for the purposes of determining that a material does not present a hazard in transport, ceased operations on February 20, 2005. RSPA programs have moved to the Pipeline and Hazardous Materials Safety Administration (PHMSA) in the DOT.

NOTE 4: The DOT regulatory definition of an oxidizer was contained in §173.151 of 49 CFR, and the definition of an organic peroxide was contained in paragraph 173.151a. An organic peroxide is a type of oxidizer.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981; 55 FR 22684, June 1, 1990; 70 FR 34561, June 14, 2005; 71 FR 40259, July 14, 2006]

§261.22 Characteristic of corrosivity.

(a) A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

(1) It is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5, as determined by a pH meter using Method 9040C in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, as incorporated by reference in §260.11 of this chapter.

(2) It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55 °C (130 °F) as determined by Method 1110A in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, and as incorporated by reference in §260.11 of this chapter.

(b) A solid waste that exhibits the characteristic of corrosivity has the EPA Hazardous Waste Number of D002.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981; 55 FR 22684, June 1, 1990; 58 FR 46049, Aug. 31, 1993; 70 FR 34561, June 14, 2005]

§261.23 Characteristic of reactivity.

(a) A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has *any* of the following properties:

(1) It is normally unstable and readily undergoes violent change without detonating.

(2) It reacts violently with water.

(3) It forms potentially explosive mixtures with water.

(4) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(5) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(6) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

(7) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(8) It is a forbidden explosive as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53 or a Class B explosive as defined in 49 CFR 173.88.

(b) A solid waste that exhibits the characteristic of reactivity has the EPA Hazardous Waste Number of D003.

[45 FR 33119, May 19, 1980, as amended at 55 FR 22684, June 1, 1990]

§261.24 Toxicity characteristic.

(a) A solid waste (except manufactured gas plant waste) exhibits the characteristic of toxicity if, using the

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Working Face Waste Disposal

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CONTENTS

1. INTRODUCTION

1.1 Scope of this section

This section of the LMP describes

- procedures at the working face for refuse disposal
- contingencies upon the discovery of unacceptable waste

2. WORKING FACE

2.1 Risks

The potential environmental, safety and nuisance effects from the working face are:

- Odour from waste
- Odour from landfill gas
- Litter
- Dust
- Noise
- Stormwater ingress
- Nuisances - insects, birds, vermin
- Hazardous waste

2.2 Working face size

The area of refuse exposed at the working face will be restricted to 60 m by 60 m typically, or up to a maximum 80 m by 80 m for short periods of the most intensive use during the day.

The distance from the place where trucks tip their waste onto a hard-surfaced platform to the working face where the waste is buried will be kept to a practical minimum with due regard for odour potential, mixing of wastes, and safety.

2.3 Roading

On-site access roads for refuse hauliers will be constructed with all-weather surfaces from the landfill entrance to the working face. Culverts will be provided as required for drainage of surface water beneath and away from the access roads.

2.4 Tipping pad

An adequate turning area will be maintained at the working face for trucks to manoeuvre and tip. The tipping pad surface will be maintained for safe traffic movements and to reduce transport of mud out onto access roads. In fine weather, it is anticipated that the tipping pad will comprise a thick layer of compacted soil, part of which is sacrificial while bulldozers push waste off the pad and into the working face. In wet weather, it is to be expected that a greater amount of surface preparation of the tipping pad surface will be required.

2.5 Traffic control

Traffic control will be instigated as required for safety and for keeping vehicles to defined road surfaces which have been designated to reduce nuisances (dust, mud and noise).

Appropriate signs will be used to direct traffic through the landfill roads to and from the working face. On arrival at the working face, a spotter/ points-man or machine operator will direct the truck where to tip.

The speed limit on the site will be 30 km/hr. Road rules will apply.

Gates will be locked at night across the access road to the working face.

2.6 Drainage

Stormwater cut-off drains and diversions will be formed to avoid stormwater run-on to the working face and to divert it away to the stormwater system.

Open drains around the tipping pad will be formed to encourage stormwater run-off just from the tipping pad to soak into the waste and to minimise the generation of run-off from the tipping pad.

2.7 Minimum plant and personnel

A water cart and a compaction machine will be maintained at the landfill at all times. In addition to these two, various combinations of mobile plant will be used at the discretion of site management depending on factors at the time such as materials to be handled, nature of seasonal works, waste acceptance rate, type of waste, cover requirements, earth haul distances and grades, safety, and machine economics.

While waste is being placed at waste acceptance rates of approximately 1500 tonnes per operating day, the following absolute minimum list of mobile machines will be maintained readily available at all times on the site:

- 1 x Compactor
- 1 x Bulldozer
- 1 x Hydraulic excavator
- 1 x Dump truck
- 1 x Water truck
- 1 x 4WD utility vehicle

The landfill will periodically employ more equipment to improve efficiency of the operation, by hiring or buying. The typical ancillary mobile plant list which may change from time to time is:

- Additional Compactor(s)
- Additional Bulldozer(s)
- Additional Hydraulic excavator(s)
- Additional Dump truck(s)
- Additional Water truck(s)
- Additional 4WD utility vehicle(s)
- Tractor(s)
- Re-fueling truck
- Motor-grader
- Wheel loader

- Towable roller(s)

The working face will be manned at all times during open hours. A minimum of 2 persons will be allocated at all times to working face duties including during meal breaks of other staff.

2.8 Working face facilities

Additional facilities will be provided, operated and maintained when and as required at the working face or tipping pad, for example sentry box, ablutions, lighting tower, portable power supply, mains power supply, tarp removal pad, sampling gantry, sample jars, trailer park, bollards, stop logs, signs, litter fences, visual screens, noise screens, odour mitigation systems, road surfacing materials, drainage materials stockpiles, gas collection system materials, bird scaring systems, fire extinguishers, first aid kits, spare PPE, towing chains, alternative daily covers, tray wash water supply, hazardous waste isolation materials, re-fueling tanks, surveying instruments, level pegs, waste analysis survey equipment, etc.

2.9 Personal Protective Equipment

Operators and spotters will be provided with appropriate personal protective equipment and means of communication e.g. radio in accordance with the site's health and safety policy.

2.10 Nuisances, dust, litter, birds, vermin, noise, odour

Nuisances and their management are described individually in other sections of this Landfill Management Plan.

Landfill working face operators will have responsibilities assigned to them in regard to each of these nuisances. The responsibilities will be conveyed to them by job descriptions, meetings and training.

2.11 Second working face

The landfill may operate working faces with two alternative kinds of tipping pad at its discretion:

- level platform tipping pad
- stop log and retaining wall

2.12 Daily cover

Daily cover is described in a separate section of this Landfill Management Plan.

3. GENERAL WASTE

3.1 Tipping

General waste will be tipped where directed by a spotter/ points-man, on a tipping pad as close as practical to its final place of disposal in the working face, or direct into a special prepared place of burial.

Landfill operators will be responsible for reporting any abnormal loads. These will be recorded, by way of the landfill's incident reporting and resolution tracking system.

3.2 Compaction

The waste will be compacted with specialised heavy mobile compaction equipment. The equipment will be selected with due regard to efficiency and environmental factors such as noise and emissions.

Machines operating at the working face will use broadband reversing alarms.

For efficient compaction, the layers of waste will be generally flat to slightly sloping and will be spread as thin as practical e.g. 0.6 m before compaction.

The waste being compacted will be ramped up at the outside slope edge prior to cover to reduce potential for future leachate breakouts.

The target minimum density of compacted waste will be 0.85 tonne of refuse per cubic metre of airspace (airspace will occupied by refuse, daily cover, intermediate cover, roading and ancillary installations for leachate and gas, but not final cap which will be accounted for separately).

Topographic surveys will be conducted at least annually to review airspace consumption efficiency.

3.3 First lift

Selected refuse will be placed in the first lift of refuse placed onto the lining system i.e. top of the leachate drainage blanket. This first lift (aka 'fluff' layer) will be up to 5 m thickness. It may not be heavily compacted. The aim is to avoid any low permeability waste which might unnecessarily hamper the free movement of leachate by gravity towards leachate collection drains across the floor area of the landfill basegrade. Any general or special waste containing bulky and large hard refuse items (e.g. C&D timber, car bodies) will not be placed in the first lift, to avoid puncturing the liner.

Figure 1: First lift

3.4 Last lift

To avoid puncturing or differential settlement and distortion of the final cap, the following wastes will specifically not be allowed within 5 m underneath the final cap:

- Bulky items
- Tyres
- Compressible waste

To reduce potential odour from the final cap, and to reduce risk of encountering specific harmful waste in any post closure activity like underground services work, the following wastes will not be allowed with 3 m underneath the final cap:

- Odorous special waste
- Asbestos

4. SPECIAL WASTE

4.1 Handling instructions and manifests

Special wastes will be handled in accordance with instructions prepared by landfill management and agreed with the customer at the time of entering into the specific contract to take the waste. The instructions will deal with transport, handling (e.g. dust and odour control), burial and PPE. The instructions will be given in advance to the operators either verbally when the first load arrives or in documents which are readily accessible.

Every load of non-listed special waste for disposal at Redvale Landfill will be required to be accompanied by a portable manifest, which is a paper form showing all pertinent details of the waste origin, waste description, working face handling, health and safety precautions, transport, and certification of burial. The manifest may be in the form of a Notification of Special Waste Deliveries (Appendix 1). Working face operators will be responsible for confirming that the waste that has been tipped is the same as the waste that has been declared on the manifest.

4.2 Sampling

Samples for screen testing purposes will be taken at the discretion of site management to verify that the waste is:

- non-hazardous;
- in accordance with the description of the waste agreed in the customer contract;
- consistent with any advice given to or by the interested authorities (e.g. AC) about the waste.

4.3 Odorous waste

4.3.1 Identification

Odorous waste will be managed in a manner that complies with Air Discharge Consent requirements. The management of odorous waste, odour monitoring and odour control methods are outlined in a separate section of the Landfill Management Plan (3.41 Odour Management Plan). Odorous wastes will be managed by thinking of it in terms of three main types:

Known odorous waste	Example: sewage plant screenings. Known in advance to be odorous. Working face handling instructions specified in advance and recorded on the Special Waste Manifest.
Potentially odorous waste	Example: Treatment plant sludge or contaminated soil containing hydrocarbons. Suspected odorous waste (e.g. odorous bin identified by the gatehouse attendant), frequently odorous waste (sealed transfer bins from out of town), and slightly but variable odorous waste (inorganic solvent sludge). Working face preparedness for handling surprises in the same was as for known odorous waste.
Unexpected odorous waste	Examples: transfer vehicle load containing fish heads. Found unexpectedly to be odorous when tipped. Working face preparedness for handling surprises in the same was as for known odorous waste. Feedback to management to address any further deliveries.

4.3.2 Risks

Risk	**Mitigation / Control (& related section of LMP)**
Odour from the working face.	Pre-acceptance procedure to avoid unacceptable deliveries of odorous waste. (Ref LMP …) Preparation before opening up each day to make sure that enough persons, equipment and odour control systems are ready, available and in working order. Requirement for advanced notification of known odorous waste before of arrival. Restricted hours for known odorous waste arrival at gatehouse. Technician ready at working face if screen test sampling is proposed.

Risk	Mitigation / Control (& related section of LMP)
	Narrow size of working face at any one time e.g. 60 m or the width of 6 trucks tipping at once. Mobile odour neutraliser sprayers always available and operated as appropriate. Prompt placement of all waste into its final place. Bulldozer and compactor present at all times to achieve rapid burial. Quick mixing and/or burial by set-aside general waste or cover for any odorous waste. Tipping pad tidiness to minimise spreading waste especially odorous waste over a large distance or over places where it could be picked up by tracks of machines and wheels of trucks. Tipping waste as close as practical to its final place to avoid pushing and spreading that exposes more waste to the air. Awareness training for working face operators to avoid mixing of incompatible special waste (e.g. low pH and high pH). Early planning and installation of gas collection installations. (Ref LMP …) Daily cover. (Ref LMP …) Daily cover end-of-day sign-off. (Ref LMP …) Early application of intermediate cover and final cap. Open line of communication with customers and rapid escalation of attention to waste deliveries that cause odour events. (Ref LMP …)
Odour from known odorous waste	As above, plus:

4.3.3 Preparation

Immediately before tipping any known or potentially odorous load, preparations will be made including a combination of the following items where applicable:

- to have enough persons, equipment and odour suppressant systems ready;
- to have suitable odour control systems started and operating for example portable T-bar sprayers and fixed perimeter fence-line sprayers;

- to have manual sprayers, truck-mounted sprayers, mobile odour suppression units available on standby;
- to set aside general waste for immediate mixing and burial;
- to set aside cover soil for immediate burial;
- to form a concave shape on part of the active working face in readiness to receive and quickly bury the notified waste;
- to dig a hole for burial;
- to exercise care and survey before digging in waste for a burial, to avoid striking any previous special waste burials, gas wells and underground services;
- to hold each truck before tipping until the working face is ready;
- to hold back successive trucks carrying the same waste for the length of time required to achieve the most efficient burial and odour minimisation.

4.3.4 Burial

Burial of odorous waste will not be considered to have been completed until the odorous waste has been covered by either

(a) 300 mm thickness of general waste, or
(b) 150 mm thickness of daily cover soil, or
(c) effective sealing materials like foam,

and there is no objectionable odour.

4.3.5 Rejection

If an odorous load either is significantly more odorous than expected, or arrives outside the hours allowed in the Landfill Management Plan and agreed with the customer, then landfill staff will be under instructions to report the incident to the Landfill Manager. Landfill management will maintain an internal incident reporting and response action tracking system. Landfill management will investigate and either:

(a) continue accepting the waste with care; or
(b) advise the generator that approval is withdrawn until further pre-acceptance testing provides satisfactory results; or
(c) cease accepting waste from the contractor who more than twice jeopardises the site's compliance with odour control aspects of its consents.

Overall, WMNZ does not control behaviour of hauliers on the highway, but WMNZ is willing to take action with respect to any load on its property which includes the access road that has the potential to affect the site's compliance with consent conditions relating to odour.

4.4 Sludge waste

Sludges, which tend to have low strength, will be treated as for odorous waste as above. It's especially noted that:

- Sludge waste will have been already categorised as known odorous, potentially odorous or non-odorous in advance;

- Mixing sludge waste quickly with general waste may be performed not only for the reason of odour, but for reasons of health and safety for workers, and stability of compaction machines on the working face over possible ‘soft spots’.

4.5 Dusty waste

A water cart will be maintained in operating condition and be available at all times to suppress dust during tipping. The water cart will be in attendance at the working face during tipping of known dusty loads and suspected dusty loads, and will be available at all times to be called to the tipping pad for unexpected dusty loads.

4.6 Held waste

Periodically, waste will be taken on to the site but not accepted for immediate burial. For example, soil removed during a contaminated site clean-up may need to be "parked" safely until tests results have been obtained. In these instances, the waste will be covered by tarps to avoid rainfall and at a location to avoid stormwater run-on, until the waste is either removed or landfilled.

4.7 C&D waste

Construction and demolition (C&D) debris wastes which contain no unidentifiable contaminants will be treated as general waste, except:

- C&D waste such as rubble may preferentially be placed at particular locations to improve drainage conditions for leachate and gas;
- C&D waste containing large hard items will not be placed in the first lift of last lift as described above, to avoid puncturing of liner or final cap.

4.8 Certified burials

The landfill will offer a service in which a responsible person certifies that the load has been "crushed and buried" in the landfill, and a supplementary service in which the exact location of the waste is determined by land survey methods. Observation, surveying and certification would make no change to the disposal procedure which would otherwise occur.

Hazardous waste

Landfill operators will be trained to identify waste which is hazardous or unacceptable, and will be made responsible for reporting incidences to site management for a decision on action. Response guidelines in the Contingency section below will be followed if applicable.

4.9 Asbestos

The asbestos disposal procedure is described in the Waste Control section of this LMP.

5. MONITORING

5.1 Monitoring parameters and schedule

Location / Event / Topic	Parameter	Frequency	TL1	TL2
Working face	Size (m by m)	Daily	60 m by 60 m	80 m by 80 m

5.2 Monitoring procedures

5.2.1 Survey the working face

- Remote sensing survey method
- Middle of the day
- Entry into CAD data for as-built waste mass

5.3 Reporting

(awaiting final consent conditions)

6. CONTINGENCY

6.1 Trigger levels - general

Trigger levels are provided for all monitoring activities. A detailed description of the respective levels aka TL1 and TL2 is provided in sections of the LMP that specifically address environmental monitoring e.g. surface water.

6.2 Response guidelines

Contingency triggering event	Response guidelines
Working face size limit exceedance	• Daily pre-start meeting with working face operators • Confirmation by accurate field survey • Commencement of daily cover earlier in the day • Controlling the number of trucks tipping and therefore width of working face at any one time

Contingency triggering event	**Response guidelines**
Discovery of gas cylinder or fire extinguisher in waste	• Call the landfill's NSNO 'approved handler'. • Attempt to identify the customer and ask them to take it away or compensate for its safe removal. • Bury small items (<5 kg) with care to avoid damage that could cause uncontrolled depressurisation • Move the item to a secure place for removal later by a specialist contractor.
Arisings of • hazardous or unidentified liquid in a drum • laboratory chemicals • lead-acid batteries • agri-chemicals • rechargeable batteries in bulk • used radiator coolant • used oil (incompatible with landfill's own used oil removal service)	• Move the waste carefully to avoid spillage to a quarantine area on the landfill • Call WM Technical Services for removal to their hazardous waste treatment facility
Discovery of asbestos in waste	• Safety first - don PPE and close cab doors. • Notify everyone in the vicinity. • Wet the asbestos and bury it with least possible disturbance. • If the customer can be identified, warn or educate them.
Discovery of tyres in waste (tyres are not prohibited but are actively discouraged)	• Move the tyres to one side and ask the customer to take them away, and/or • Warn the customer that their future deliveries containing tyres may be rejected, and/or • Bury tyres more than 5 m beneath final cap level, and/or • Liaise with WM's tyre-shredding facility to remove the tyres.
Refrigerator	• Reject the load. Ask the customer to take it away. • Move the item to one side and liaise with a de-gassing contractor and/or appliance recycling contractor.
Bomb threat	• Site Emergency Management Plan.

6.3 Reporting

(awaiting final consent conditions)

7. TASK LISTS

7.1 Tasks and scheduled maintenance

Role	Responsibility	Frequency
Landfill Operations Manager	Open up the working face. Scrape off daily cover. Cut windows into the waste below.	Daily
Landfill Operations Manager	Form stormwater diversions around the tipping pad and working face.	Daily
Landfill Operations Manager	Apply daily cover - 150 mm soil thickness.	Daily
Landfill Operations	Prohibit any burning of waste.	Daily
Landfill Operations Manager	Ensure satisfactory dust suppression.	Daily
Landfill Operations Manager	LImit the working face size to 60 m by 60 m.	Daily
Landfill Operations Manager	Arrange litter patrols.	Weekly

8. APPENDICES

8.1 Notification of Special Waste Delivery

(Special Waste Manifest form)

(1 page)

Waste Management

S

To: **Accounts** / **Lab** / **Operations** / **Op Mg**r. From: Date:**10/03/2017**

Notification of Special Waste Deliveries - ARL

Arrival & Haulier Information

PLEASE ENSURE EACH TRUCK CARRIES THIS AND SHOWS IT TO REDVALE WEIGHBRIDGE
Haulier TBC
Acceptance Times 6AM-430PM Mon-Fri 7AM-2PM Sat/Public Holidays (Not 1/1, Easter Fri, 25/12)
Condition for Acceptance **As per quotation** / **Also Wrapped** / **Dampened Down** / **Covered** / **Spaced Loads**/ **Rate** / **No dust at tip-face** / **Other**

Generator Information

Generator name TBC
Site Address
Responsible Contact on Site TBC Cell Phone
Company to Charge TBC

Waste Information

Waste description Quantity t
Physical State **Soil** / **Soil-like** / **Sludge** / **Powder**/ **Other Sludge** Expected Odour
Method of Shipment **Truck and Trailer** / **Flat Deck** / **Hook/Gantry Bin** / **Other**

Sampling & Screen Testing Requirements

Sampling Frequency

Visual Check Odour Check
Paint Filter pH Water Reactivity
Flammability Solids Content Compact Density
Other #

Operator PPE Requirements & Handling at Landfill

Cell Operators **Gloves** / **Overalls** / **Safety Glasses** / **Goggles** / **Dust Mask** / **Respiratory mask** / **P4 if dusty**
P1 GREEN P2 BLUE P3 YELLOW P4 RED P5 ORANGE

Special precautions

Disposal instructions **Survey Disposal Coordinates** / **Place in prepared area** / **Apply direct odour spray** / **Cover Immediately** / **Water Spray before during tipping** / **Spread over tip face** / **Apply direct odour spray if smelly** / **Other** / **Nothing Special**

Approval for Disposal

Sales Specialist Landfill	Compliance Manager	Auckland Regional Operations Manager
Commercially acceptable	Complies with company environmental policy	Commercially Acceptable

Approval subject to / Notes

LMP Section 3.03

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LMP Section 3.03

CONTENTS

LMP Section 3.03

1. INTRODUCTION

1.1 Scope of this section

This section of the LMP describes:

- daily cover
- intermediate cover
- final cap

2. DAILY COVER

2.1 Purpose of daily cover

The purpose of daily cover is:

- to reduce nuisances (birds, vermin e.g. flying insects and rodents, litter, odour, dust);
- to reduce fugitive gas emissions;
- to reduce air intrusion when the waste is under vacuum for gas extraction, and;
- to reduce infiltration of stormwater that generates leachate.

2.2 Materials

Daily cover will comprise natural earth material. A minor organic content from vegetation will be acceptable. A minor amount of contamination or flagging with waste will be acceptable if the soil has been used previously as cover.

Natural earth materials which have a low level of contamination may be used as daily cover and left overnight without further daily cover provided that:

- it is machine-rolled to seal it against stormwater infiltration and erosion, or it is covered with an alternative daily cover e.g. tarp;
- there is no stormwater run-on;
- it is not odorous and will not become odorous;
- it will be covered regardless with clean daily cover if the forecast next delivery of the waste intended to overlie it is more than a fortnight away.

It will be the responsibility of landfill operations management to ensure that an adequate supply of soil cover is available and accessible at all times, either from stockpiles or borrow areas. This issue will be important in winter when the non-landfill parts of the site become inaccessible due to severe softening of the wet ground.

2.3 Methods

In dry weather, when the available soils are friable in nature, bulldozers will be used to spread the soils as daily cover. The daily cover will be track-rolled or otherwise compacted by rolling heavy equipment to seal and stabilise it.

In wet weather, when the available soils are saturated and plastic, hydraulic excavators (diggers) with wide buckets will be used, to spread and smooth the cover. No further compaction would be applied.

Daily cover will normally be stripped off at the beginning of each operating day, commencing half an hour before the posted operating hours for that day. Both bulldozers and diggers will be used as required. The removed soil will be stockpiled alongside the tip face for re-use.

If satisfactory removal of cover is impractical, 'windows' will be cut through the cover to permit future gas and leachate migration.

If the underlying waste or the cover soil itself is known to be or found to be unusually odorous, either the cover will not be stripped off at all (subject to provisions for future leachate and gas migration), or additional odour controls would be used during the cover stripping e.g. direct application of odour suppressant.

2.4 Thicknesses

Daily cover will be placed over all refuse that has been delivered that day to a minimum thickness of 150 mm.

Occasionally more daily cover soil may be added to create ‘thickened daily cover’ depending on timings as below.

2.5 Timing of daily cover

Daily cover will be placed each day. Daily cover placement may commence at any time during the day on areas of exposed refuse that will not be receiving more refuse that day.

Daily cover or interim soil cover will be placed immediately over unexpected odorous waste if no other control is immediately available to either neutralise or bury the odorous waste.

If no more refuse is expected to be placed within the next three months, then either another layer of uncontaminated daily cover soil will be placed (to create ‘thickened’ daily cover), or intermediate or final cap will be placed.

2.6 Alternative daily cover

While the consent condition requires soil to be used as daily cover, the use of alternative daily cover will not be excluded if it can be demonstrated that an alternative will perform as effectively as soil cover for compliance with respect to nuisances, stability, and environmental effects, subject to obtaining the necessary approvals.

3. INTERMEDIATE COVER

3.1 Purpose of intermediate cover

Intermediate cover is a sealing layer of earth material. The intermediate cover may be either:

- temporary (where more refuse will be placed at a later date), or;
- permanent (being either a sub-layer to or a preliminary part of the final cap).

The purpose of intermediate cover is:

- to enhance the daily cover in the short to medium term wherever further refuse placement or final cap is not scheduled for some time, and;
- to provide an interim base for topsoil and sowing which will improve erosion resistance.

3.2 Materials

Intermediate cover will comprise suitable uncontaminated earth fill materials capable of being compacted to achieve low permeability (typically < 1 x 10^{-7} m/s).

3.3 Methods

Intermediate cover will be placed by earthmoving machines. Temporary intermediate cover will be spread in layers of maximum 0.5 m loose thickness and will be compacted as a minimum by several passes of either a tracked machine i.e. a bulldozer or a wheeled compactor. Permanent intermediate cover will be placed in accordance with the requirements for final cap.

Temporary Intermediate cover soil will be removed, no more than approximately one week before refuse is due to be placed over the area. The intermediate cover soil will generally be used as daily cover, but the intermediate cover soil may also be selectively removed without contamination for re-use in clean fill situations such as other areas of intermediate cover.

Removal of intermediate cover potentially will release a burst of odour, both from the re-exposed waste and from the disturbed soil itself. Odour control will be exercised by managing the extent and rate of intermediate cover removal and by odour suppression methods considered appropriate at the time.

3.4 Thicknesses

Intermediate cover will be approximately 0.3 m thick.

3.5 Timing of intermediate cover

Intermediate cover will be placed on top of daily cover according to one of the following scenarios:

Scheduled further refuse placement	**Cover type (bottom layer first on list)**
Within the next 3 months	Daily cover Thickened daily cover only if necessary to control nuisances
Within 3 to 12 months	Daily cover Thickened daily cover or temporary intermediate cover
Over 12 months away	Daily cover Thickened daily cover at site's discretion Temporary intermediate cover Topsoil at site's discretion Sowing
No more refuse (final landfill)	Daily cover Thickened daily cover at site's discretion Permanent intermediate cover at site's discretion Final cap Topsoil Sowing

3.6 Planting

Intermediate cover will be stabilised wherever the intermediate cover is unlikely to be worked for a period in excess of 3 months. Stabilisation will comprise a combination of any one or more of top-soiling, sowing, hydroseeding and mulching as considered suitable at the time.

4. FINAL CAP

4.1 Purpose of final cap

The objectives of final cap are:

- to minimise infiltration of stormwater into the landfill and hence leachate generation;
- to minimise gas and odour emissions;
- to optimise gas extraction vacuum distribution in the waste. and;
- To provide a medium for restoration of vegetation - vegetation is for aesthetic effects, erosion resistance, leachate irrigation, end uses, and environment enhancement.

4.2 Materials

All layers	All final cap soils will be free from contamination and rubbish, and may be obtained from a combination of on-site and off-site sources.
Topsoil	Topsoil will be natural organic topsoil, containing negligible roots and stones that could hamper proper harrowing and sowing. Compost may be used to supplement topsoil.
Subsoil	Subsoil will be soil that is suitable for supporting growth of plant roots.
Compacted low permeability soil	• The material will be an inorganic soil, free from contamination and rubbish. • The soil's major fraction and subordinate fraction will both be silt and/or clay. • The minor fraction if any (<20%) may be any inert mineral including clay, silt, sand or gravel. • Soil will be clay-based material capable of achieving a permeability of 10-7 m/s. • The soil may be derived from any source, on or off site. It is to be anticipated that its parameters (fractions, plasticity, geological origin) may vary from load to load delivered by truck, however it is required to always meet the above specification.

4.3 Methods

4.3.1 Topsoil

Topsoil will be placed by tipping and spreading with no more than incidental compaction of the equipment used to deliver and spread the topsoil.

4.3.2 Subsoil

Subsoil must be placed in a way that will accommodate healthy plant growth.

Subsoil may be placed as part of a thicker topsoil layer in which case it will be placed with minimal compaction as for topsoil. Subsoil may be placed as a separate layer on its own in which case it will be lightly to moderately compacted by track rolling or wheel rolling.

4.3.3 Compacted low permeability clay layer

The compaction method steps will include:

- The soil will be either delivered at suitable water content or conditioned before compaction to achieve a suitable water content. Moisture conditioning will be undertaken as necessary.
- The soil will be spread in layers of up to 0.3 m loose thickness prior to compaction.
- Each layer will be compacted by multiple passes of an earthworks machine that is designed specifically for soil compaction including at least one steel wheel with protruding feet. Track compaction by a bulldozer on its own will not be considered sufficient.
- A minimum of two compacted layers will make up the full thickness.
- Compaction methods will aim to achieve a stiff to very stiff earth fill with hydraulic conductivity of 1×10^{-7} m/s or less.
- The top surface of each compacted layer will be scarified or roughened before placing the subsequent layer, which may be either another clay layer, or subsoil, or topsoil.
- Any fill surface that has deteriorated due to drying or erosion will be reworked before placing the next overlying layer of material.

The actual permeability achieved will depend on factors at the time including nature of the soil material, water content, weather conditions, types of compaction machines that are available, slope angle, disruption around installations such as gas well heads, joints with previous final cap, and presence of spongy refuse underneath.

Whenever final cap is being placed over large areas at a time, work will tend towards producing a smooth final contour rather than following any humps and hollows on top of the intermediate cover.

Towards the end of the landfill's operating life, there will be a greater demand for final cap materials (and to a lesser extent for liner materials). The completed landfill surfaces do not provide sufficient suitable space for stockpiling these materials in advance. Therefore, provision will be made in advance for earth material to be available, stockpiled in Zone 2 or Zone 3 or stockpiled off the site.

Testing to confirm these specified compaction methods is described in Section 33.4.

4.4 Thicknesses

The final cap will comprise (from the surface downwards) with minimum thicknesses as follows:

- Topsoil 100 mm
- Subsoil 0 - 300 mm
- Compacted low permeability soil 600 -900 mm
- Intermediate cover 0 – 300 mm
- Daily cover 150 mm

Final cap will be thickened, by adding at least another 600 mm thickness of subsoil, in areas where deeper rooting plants i.e. other than grasses are proposed.

4.5 Timing of final cap

The landfill surface will be progressively restored i.e. properly covered and grassed as areas reach final level. The aim will be to ensure that the objectives of final cap listed above will be met promptly and in a timely manner. In this way restoration will become an integral part of the landfill operation and experience gained during the early phases will be applied to the forward planning of cover construction in subsequent areas.

The advantages of placing final cap promptly outweigh the disadvantages, so it is not proposed to wait for settlement to occur first. This means however that more frequent repairs may be required to fix areas of final cap distressed due to differential settlement.

A map showing the locations of final cap placed will be regularly updated for reference.

All remaining final cap placement will proceed without delay upon final landfill closure.

4.6 Planting

Planting on final cap is discussed the 'Closure' section of this Landfill Management Plan.

5. MONITORING

5.1 Materials testing

(to be added)

5.2 Thickness measurement

(to be added)

5.3 Settlement monitoring

(to be added)

5.4 Inspections

(to be added)

6. CONTINGENCY

6.1 Trigger Levels

(to be added)

6.2 Response guidelines

(to be added)

7. APPENDICES

7.1 Plan of final cap completed

(to be added after progressive final cap construction has commenced)

(1 page)

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Erosion and Sediment Control Plan Landfill Operations and Seasonal Construction

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CONTENTS

1. INTRODUCTION

1.1 Scope of this section

Erosion and sediment control (ESC) will be implemented as described in:

- Erosion and Sediment Control Plan - landfill operations and seasonal construction - this section of the LMP (ESCPO).
- Construction Erosion and Sediment Management Plan - enabling works - separate document

This ESCPO aims to:

- identify potential locations and circumstances where erosion may occur
- describe erosion control methods
- describe sediment retention methods
- provide a list of tasks and responsibilities

1.1.1 Abbreviations

AC	Auckland Council
AUP	Auckland Unitary Plan Operative in Part
CLG	Community Liaison Group
CESMP	Construction Erosion and Sediment Management Plan
ESC	Erosion and Sediment Control
ESCP	Erosion and Sediment Control Plan
ESCPO	Erosion and Sediment Control Plan - Operations
GD05	Auckland Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016
LMP	Landfill Management Plan

1.2 Review

This ESCPO will be subject to the same review and amendment process that applies to the overall LMP.

1.3 Distribution

The ESCPO will be available to

- WMNZ - electronically by intranet
- Contractors engaged by WMNZ - electronically and printed on request
- Auckland Council - electronically and printed on request
- Other interested parties - on request

2. RISKS AND MITIGATIONS

2.1 Risks - landfill operations areas

Risks - landfill operations	Mitigations
Bin exchange area Accumulation of soil from mule trucks. Accumulation of waste-related grime. Surface water run-off contamination (the bin exchange area is close to Waiteraire Stream which flows to the Hoteo River).	Wheel wash for vehicles leaving the working face and operations earthworks areas e.g. cover stockpiles (there will be no additional wheel wash at the bin exchange area). Long access road for wheels to dry off first (site selection feature). Paved surface of bin exchange area for effective cleaning. Run-off flow from bin exchange area captured and diverted through a rain garden filter. Closed bin system for waste transfer (project design feature).
Access road and wheel wash Soil deposition on the working face access road from refuse trucks leaving working face. Residual soil deposition on the main access road from refuse trucks leaving the wheel wash.	Wheel wash. Paving of lead-in roads to the wheel wash coming from the working face. Stormwater run-off from roads from working face to gatehouse to be dispersed by way of 'spreaders' onto the slopes below or piped downslope towards the landfill valley's on-site sedimentation ponds. Stormwater run-off from the access road from the gatehouse to the bin exchange area to be dispersed by way of 'spreaders' onto the slopes below within the access road valley. Permanently available water cart to wash roads.
Daily cover stockpiles Mobilisation of soils forming internal unsealed haul roads to and from stockpiles used all year round by off-road dump trucks for daily cover. Mobilisation of soil and mud dropped by off-road trucks carting cover soils to and from stockpiles. Effect on NMA downstream which is sensitive to sediment.	Permanent sediment pond below stockpile, properly managed by the control methods and inspection/maintenance tasks outlined in this section of the LMP. Weekly ESC inspection. Minimisation of bare soil zone on stockpile in winter. Short term stockpiling of cover soils alongside the working face during drier weather.

	Favouring the use of soils from off-site going direct to the working face instead of double handling via stockpiles.
<u>Working face and tipping platform</u> Stormwater run-off carrying sediment away from the heavily-trafficked tipping platform. Mud pick-up and transport away on wheels of trucks.	Low gradients on the tipping platform to avoid erosive flows. Perimeter drains and bunds around the working face to avoid surface water run-on and to capture surface water run-off. Hard-surfaced tipping platform for soil wastes which don't require rapid burial. Silt fences or geosynthetic protection on slopes of more than 10 m vertical height below the working face and associated daily cover piles.
<u>Daily and intermediate cover</u> Erosion from relatively large areas of exposed bare soil until erosion protection is placed. Erosion in unlined or steep bench drains.	Cover placement in dry weather. Seeding or mulching within a short time. Intermediate cover to follow daily cover forthwith if no further refuse is due within the next 6 months. Unlined bench drain gradients set to avoid erosion but also to avoid silting (e.g. 3%). Limit on catchments of bench drains and/or spacing between bench drains (e.g. 20 m vertical). Provision of pipe drop structures and flumes if grades can't be achieved. Silt fences as described in 'Control methods' in this section of the LMP. Specific design for any catchment >5 ha. Sedimentation ponds 1, 2 and 3 designed with more than standard capacity.
<u>Downstream environments</u> Waterways with high ecological values and ultimately the Hoteo River are downstream from all project footprint areas. The fauna in these habitats are sensitive to sediment. NMAs or SEAs are downstream of the project footprint in the Southern Block, Western Block and Waiteraire Tributary Block, and high value reaches are downstream from the landfill footprint in the Eastern Block.	Fully specified ponds for sediment retention and stormwater flow attenuation. Riparian planting. Sediment controls as above. Chemical treatment of stormwater as a contingency measure. Monitoring of water quality and pre-specification of contingency responses in the Landfill Management Plan.

Sedimentation controls Sediment remobilisation while cleaning out or decommissioning a pond. Remobilisation of sediment if a control fails in a storm (silt fence, lined channel, chute, decant, coarse silt intercept pond, sump).	Clean-outs only during dry weather. Decommissioning only when all other stabilisations are established. Weekly ESC inspections across landfill operations areas. Tracking of inspection findings via an in-house on-line daily diary.

2.2 Risks - seasonal construction areas

Risks - seasonal construction	**Mitigations**
Vegetation clearance Land clearance could temporarily expose a large area of bare ground that is prone to erosion. Note: Management of slash and cuttings may lead to other effects (vermin, leachate, stability, noise) which are addressed elsewhere.	Coordination with forester for sediment trap installations. Inspection of cleared land immediately upon handover from the forester to determine priorities for additional ESC. Promptly and protectively replanting in riparian areas where the NESPF does not allow plantation re-planting.
Earth filling Erosion from earth filling and lining system construction work when large areas of bare earth are temporarily exposed. Remobilisation of sediment if a control fails in a storm (silt fence, lined channel, chute, decant, coarse silt intercept pond, sump, pump).	Annual pre-season construction drawings showing limits of work areas and locations of erosion controls. Specific Erosion and Sediment Control Plan (ESCP) for each work zone each construction season. Basegrade and stage layout specifically designed to accommodate stormwater diversions and erosion controls. Construction drawings by qualified civil engineering designer. Sedimentation ponds designed and built with ample size and shape for silt retention. Channel lining, sedimentation ponds and other works in accordance with GD05*. Lining of temporary flow diversion channels. Prompt erosion protection (e.g. planting) of completed earth fills, and placement method design for progressive, earliest possible completion.

	Notification to Council 2 weeks before starting work. Weekly ESC inspection. ESC inspection after heavy rain of more than ... in 24 hours. Entry of ESC inspection findings including recommended follow up work into an in-house on-line daily diary (which will include weekly and other ESC inspection events). Specific ESC inspection and sign-off by qualified person prior to work commencing in any area.
Haul roads - surface water Haul roads to stockpiles for bulk earth movement could erode and carry sediment away from the mitigation works in the seasonal construction zone.	Erosion-resistant haul road surface material like hard gravel on multi-season routes. Road-side drains of significant length or tenure to be lined to resist erosion. Diversion drain discharges via diffusers to avoid erosive flow concentrations.
Haul roads - dust Dust may occur from roads due to passage of trucks and machines in dry weather.	Hard surfacing of more heavily-trafficked routes. Dedicated full time water cart for construction works. Adequate water supply.
Stockpiles Soils stockpiles may have soil placement and removal activities all year round which have areas of bare ground prone to erosion.	Permanent sediment pond below stockpile, properly managed. Weekly ESC inspection. Minimisation of bare soil zone in winter. Lining of chutes or down-pipes for any steep constructed flow path or diversion drain where erosion would occur (e.g. >4%).
Final cap Final capping (earth filling) could temporarily expose a large area of bare earth fill that is prone to erosion.	As above for earth filling.
Sedimentation controls Sediment remobilisation while cleaning out or decommissioning a supplementary construction-related pond. Remobilisation of sediment if a control fails in a storm (silt fence, lined channel, chute, decant, coarse silt intercept pond, sump).	Clean-outs only during dry weather. Weekly ESC inspections across each seasonal construction works area. Tracking of inspection findings via an in-house on-line daily diary.

Sediment controls decommissioning When all works upstream of any sediment control installation are finally completed, removal of the sediment controls and flood controls could temporarily expose bare earth or mobilise soft sediment.	Prior verification that the catchment is stabilised. Pre-approval by Auckland Council. Completed in dry weather. Rapid re-stabilisation where the control has been removed.

*GD05 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016, Guideline Document 2016/005, Incorporating Amendment 1.

2.3 Control methods

Typical control - erosion prevention	**Features and customisation**
Specific Erosion and Sediment Control Plan (ESCP) for each work zone each construction season. Reference GD05 C1.4, 1.5	Prepared in advance. Site plan. Area of earthworks (hectares). Volumes of cut, fill, import and export (m3). Locations of erosion controls. Locations of sediment controls. Haul routes. Stages or sequence of work including progressive stabilisation of finished areas. Programme. Confirmation or allocation of responsibilities (inspections, maintenance, clean-up, reporting). Decommissioning.
Clean water diversion Reference GD05 E2.1	Diversion bunds and drains around the works. Stabilisation of bunds by geotextile, concrete, rubble or other material. Stabilisation of inverts by erosion-resistant material or liner. Minimum bund height 500mm. Link to existing stabilised flow paths.
Coarse sediment drop-out pits. Reference GD05 E2.2	Supplement to other methods. On line in diversion drains. Accessible for digging out.
Dirty water diversion. Reference GD05 E2.2, E2.3	Supplement to other methods. On line in diversion drains. Lined where needed to avoid invert erosion.
Check dams. Reference GD05 E2.4	On line in diversion drains. Lined spillway, or pipe outlet. Freeboard assuming full siltation. Accessible for digging out.
Downpipes Reference GD05 E2.5	Provision of pipe drop structures and flumes if bench drain grades and catchment limits can't be achieved.

Typical control - erosion prevention	**Features and customisation**
Stabilised haul routes Reference GD05 E2.6	Avoidance of activity that transports soils away e.g. when mud sticks to tyres during drying off after rain. Restricting access to defined entrances and exits, with bypass prevention. Hard-facing rubble or gravel on access ways. Speed humps to contain or divert wash off to silt traps.
Surface roughening Reference GD05 E2.7	
Stabilisation of exposed ground Reference GD05 E3.0	Stabilisation of large areas of bare ground, cuts or fills (e.g. >250 m^2) that are not due to be worked again for 2 weeks. Stabilisation methods to suit e.g. top-soiling and grass seeding, hydroseeding, mulching, geotextile or tarp covering, aggregate spreading, smooth rolling of unfinished earth fills.

Typical control - sediment control	**Features and customisation**
Sediment retention ponds Reference GD05 F1.1	For all larger earthworks areas. Minimum volume 300 m^3 per hectare of catchment ('3 %'). Length to width ratio of 3:1 to 5:1. Dead storage. Inlet structure. Outlet structure fully designed. Outlet penstock valve to shut down the discharge. Emergency spillway provided. Baffles across long wind-exposed reaches. Flocculant dosing if required. Additional temporary sedimentation ponds to trap coarse sediment before flow into formal sediment retention ponds.
Earth bunds Reference GD05 F1.2	Supplementary to other methods. Dead storage available. Minimum width 2 m. Length to width ratio 3:1 to 5:1. Minimum freeboard 0.5 m. Floating decant ideal but not essential since every supplementary silt trap will still help the final discharge. Lined spillway.

Typical control - sediment control	**Features and customisation**
Silt fences Reference GD05 F1.3	Around the perimeter of the work area. Separation of clean surface water (potential run-on) from dirty surface water (potentially in the works area). Fabric supported by a top-wire. Fabric trenched into ground with compacted backfill. Fabric butt joints.
Silt socks Reference GD05 F1.5	Placed to filter dirty water run-off from the work area around the perimeter of the work area. Limited catchment. Limited slope steepness. Overlap at joints. Continuous contact with the ground surface Secured with pegs or stakes.
Stormwater inlet protection (entry point to reticulated stormwater system within the working area) Reference GD05 F1.6	Temporarily decommission the inlet if practical. Minimise the catchment to the inlet. Silt fence and/or filter sock around the inlet. None expected at ARL.
Dewatering Reference GD05 G1.0	Ponding of water on earthworks areas is minimised. Water clarity is checked before starting the pump. Pump intake is set up to pump clearest water from the top. Pump intake is set up to minimise sediment disturbance at depth. Discharge to a place that has capacity to receive it. Discharge to a point that provides further treatment if required e.g. filter pipe sock or containment area formed specially. Sucker truck removal option if on-site pumping and disposal options aren't available and truck access is possible.
Monitoring	Weekly inspection. After-rain inspection. Record of time, date and findings. Record of response to findings.
Maintenance	Accumulated sediment cleaned out regularly. Sediment disposed of appropriately where it won't remobilise and can be left to dry out before re-use. Any damaged control fixed. Any underperforming control improved. Reference GD05 C1.5.7

Typical control - sediment control	**Features and customisation**
Decommissioning Reference GD05 C1.6	Work area all stabilised. Pre-approval. Dry weather. Affected area re-stabilised immediately. Recycling of materials if practical.
Flocculant dosing Reference GD05 F2.0	Dose is added to stormwater entering the primary sedimentation pond. Dosing is triggered only if final discharge flow suspended sediment load exceeds ... g/m^3. Dose rate is automatically adjusted by either rainfall intensity or stormwater water flow rate. Adequate permanent access is provided to the dosing station to safely carry in drums of flocculant chemical. Flocculant reserves are checked monthly.
Unexpected/ accidental discovery	Work cessation protocol in the event of discovery of 'sensitive material' (e.g. human remains, archaeological artefacts). Secure area 20 m around the discovery. Notification to Council and iwi.

Figure: Silt fence

Figure: Lined dirty water diversion on intermediate cover

Figure: Stabilised haul route

Figure: Mulch

Figure: Decant

Figure: Small on-line check dams

3. MONITORING

3.1 Monitoring parameters

Location / Event / Topic	Parameter	Frequency	TL1	TL2
Measurement of level of silt in each Sediment Retention Pond.	Pond volume occupied by silt.	Six-monthly	20%	>20% and not de-silted within subsequent six months.
Inspection of erosion and sediment controls.	Function according to design.	Weekly	Installation requires maintenance.	Installation has failed.

3.2 Monitoring procedures

Site specific sampling procedures will be developed and provided in a separate volume.

Selected key procedures are summarised below.

Suspended sediment measurement:

- Obtain a portable turbidity meter.
- Check calibration.
- Standard Operating Procedure for use of the relevant instrument.

3.3 Reporting

LMP Section 3.04

Location / Event / Topic	Report to	Method	Frequency
ESC certificate to be submitted prior to seasonal earthworks commencement each October.	Auckland Council	Email	At least 0 days before
Erosion and Sediment Control Plan - Landfill Operations (ESCPO) to be submitted prior to seasonal earthworks commencement each October.	Auckland Council	File drop	At least 0 days before
Earthworks May to September intentions advice to Council.	Auckland Council	Email	At least 10 days before
Unscheduled event likely to generate significant sediment e.g. landslip, dam break.	Auckland Council.	Email notification.	As required
Exceedance of a TL2 limit - ESC.	Auckland Council.	Email notification.	As required
Report 'summary details of all inspections and maintenance of the stormwater treatment devices for the preceding 12 months'.	Auckland Council	File drop	Annually
Accidential discovery of archaeological artefact, koiwi or taonga	Heritage NZ	Email	Within 1 day after
Accidential discovery of archaeological artefact, koiwi or taonga	Kaitiaki	Email	Within 1 day after

4. CONTINGENCY

4.1 Trigger levels - general

Upon completion of a monitoring event, the results will be checked against the pre-specified response limits.

If no response limit is exceeded, the monitoring event will be routinely reported for example in an annual report to the regulator.

If any response limit is exceeded, then action will be taken immediately. The response limits are set at two levels:

4.1.1 Trigger Level 1 (Lower response limit / warning level)

Exceedance of TL1 warns of potential adverse effects, warns of potential future non-compliance with the resource consent conditions, requires investigation and reporting, and might require remedial action.

4.1.2 Trigger Level 2 (Upper response limit / alarm level)

Exceedance of TL2 is a firm indication that significant adverse effects and breaches of consent conditions either are already occurring, or could have occurred, or are about to occur. The upper limit is typically set at the limit specified in the resource consent, so exceedance of the upper limit typically indicates non-compliance. Exceedance of TL2 will require one or more of: urgent mitigative actions; notification of authorities; calling of a specialist adviser (a qualified person or consultancy with experience in environmental management); prompt instigation of investigations, and; remedies.

Emergency

Extreme exceedance of TL2 might require reference to the Site Emergency Management Plan.

Trigger levels are listed in the monitoring section above.

4.2 Response guidelines

Contingency triggering event	Response guidelines
Excessively sediment-laden water in drains from bare earth areas.	• Revise the ESC Plan. • Fix any under-performing erosion and silt controls. • Provided additional controls. • Reduce and protect more bare ground area. • Consider floc dosing. • Maximise the retention of dirty water in the sediment retention ponds.

5. TASK LISTS

5.1 Tasks and scheduled maintenance

Role	Responsibility	Frequency
Construction Manager	Make the 'Erosion and Sediment Control Plan - Landfill Operations' available to every contractor with responsibility for soil disturbance work.	Six-monthly
Construction Manager	Identify the appropriate and required erosion and sediment controls in collaboration with the Landfill Manager and with contractors who have a responsibility for soil disturbance work. Prepare and agree the Erosion and Sediment Control Plan for each work area.	Six-monthly
Construction Project Engineer	Inspect all erosion and sediment controls in seasonal construction areas. Keep records.	Weekly
Construction Project Engineer	Maintain all erosion and sediment controls in seasonal construction areas. Keep records.	As Required
Construction Project Engineer	De-silt ponds relevant to seasonal earthworks when ponds are x% full of silt or annually.	Annually
Landfill Operations Manager	Identify the appropriate and required erosion and sediment controls for landfill operations areas in collaboration with the construction manager and with contractors who have a responsibility for soil disturbance work. Prepare and agree the Erosion and Sediment Control Plan for each disposal or cover work area.	Six-monthly
Landfill Operations Manager	Inspect all erosion and sediment controls in landfill operations areas. EROSION & SEDIMENT CONTROL (LANDFILL OPERATIONS) INSPECTION CHECKLIST.	Weekly
Landfill Operations Manager	Maintain all erosion and sediment controls - landfill operations areas.	As Required
Landfill Operations Manager	De-silt ponds relevant to landfill operations areas when ponds are x% full or annually.	Annually
Monitoring Technician	Measure stormwater turbidity immediately after storms.	As Required

6. APPENDICES

6.1 None

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Bin Exchange Management Plan

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CONTENTS

1. INTRODUCTION

1.1 Scope of this section

This section of the LMP describes how the landfill operator will operate the bin exchange facility and meet the related conditions of resource consents.

This section covers:

- Road-going bin haulage trucks
- Bin exchange area access control
- Bin exchange sequence
- Mule trucks for transfer of waste to the working face
- Monitoring - environmental and vehicle counts
- Contingency plans
- Tasks lists and maintenance schedules

2. BIN EXCHANGE

2.1 Bin exchange risks

Risk	**Mitigation**
Odour and litter release from refuse hauliers.	Containerised bin system. Trucks with open-tops covered with tarps. Time limit for full bins in the exchange area. Regular litter patrols. Pre-acceptance requirement to reject odour.
Control over access to the bin exchange area.	Swipe card or Dallas tag entry only. Auto closing gate. Truck RFID as required to support access cards. Bin RFID tags. System to identify bin tag failure and unauthorised entry while gate is open. Daily tally to confirm bin number compliance. CCTV. Turn-around provision for non-landfill vehicles inadvertently entering the access road.
Capacity for active trucks in bin exchange area.	Continuous tally of entrance and exit vehicle movements. Daily tally of full and empty bins. System for queuing. One-way flow of truck movements. Turning circles of sufficient width. Separation of mule truck entry/exit point.
Selection of trucks for transfer of bins to the working face. Issues: noise; mud.	Adoption of off-road mules for custom containers from urban transfer stations. Preference for electric mules.

Risk	**Mitigation**
	Simple design (no trailers). Off-road tyres. Muffled exhausts unless electric. Run-outs for brake failure incidents.
Selection of bin-lift system to remove and replace bins on road-haul trucks. Issues: Operational noise, working alone, adequate lighting	Dedicated trained operator. Good communication systems. Provision of good operational lighting both fixed and machine mounted.

3. MONITORING

3.1 Monitoring parameters and schedule

Location / Event / Topic	Parameter	Frequency	TL1	TL2
Bin exchange area - Noise measurement at relevant boundaries.	Noise	Annually	Limits tba.	Limits tba.
Bin exchange area - visual screening inspection	Screen planting integrity	Annually	Thinning vegetation screen planting.	Obviously ineffective vegetation screen planting.
Entrance to bin exchange area	Count of the number of trucks entering the bin exchange area	Continuous	12 per hour (to warn supervisor of possible inbound queuing or inappropriate convoying)	No limit
Bin exchange area - bin handling	Length of holding time for a full bin in the bin exchange area	Continuous	24 hr	TBA (awaiting final consent conditions)
Bin exchange area - odour at relevant boundaries.	Odour (Ref: LMP section on Odour, Appendices, reporting forms for intensity scale)	Daily	Odour detected at boundary.	Odour intensity extremely strong at boundary.
Bin exchange area - pavement inspection	Refuse debris, tree litter, mud, dust, loose gravel, oil.	Daily	Any refuse or litter, and/or widespread debris.	Refuse that isn't cleaned up within 24 hours.
Bin exchange area - stormwater run-off monitoring	Stormwater chemistry parameters (list tba).	Monthly	Limits tba.	Limits tba.
Bin exchange area - bin condition inspection	Bin condition	Quarterly	Damage that does not affect refuse containment in the bin.	Damage or wear that results in failure to contain refuse, litter, leachate and/or odour.

3.2 Monitoring procedures

Procedure	Key steps*
Daily inspection of bin exchange pad and bins.	• Take the RFID reader. • Inspect the entire pad. Include corners where wind might concentrate debris. • Record any debris that could cause injury or damage, and any dust, dirt, mud and loose waste. • Inspect bins. • Identify and tag damaged, defective or faulty bins e.g. mark them with coloured magnetic indicators.
Daily monitoring of truck and bin numbers in bin exchange area.	• Check that the RFID datalogged record matches the daily bin exchange area inspection record in terms of the count of full bins and empty bins. • Conduct spot checks on the counts of haulier trucks, bins and mules trucks within the compound and/or en-route to/from the tip face.

LMP Section 3.05

Procedure	Key steps*
	• Check for automated notifications from the datalogging system. • Visually count the number of full bins and empty bins in the bin exchange area at the times the tip face closes and opens.
Monitoring of screen planting	• Walk the screen planting border and off-site viewpoints. • Report any gaps or breaks in the screen planting via the site's incident recording and resolution tracking system.
Boundary monitoring for noise.	• Refer to the Noise Management Plan.
Boundary monitoring for odour.	• Refer to the Odour Management Plan.

* Health and Safety items to be added.

3.3 Reporting

Location / Event / Topic	Report to	Method	Frequency
Visual inspections of pavements and installations - bin exchange area.	In-house.	In-house records.	Weekly
Bin condition inspections - bin exchange area.	In-house.	In-house records.	Quarterly
Vehicle count of inbound waste and non-waste vehicles into the bin exchange area.	In-house.	In-house records.	Daily
Vehicle count of inbound waste and non-waste vehicles into the bin exchange area, reported as the average per day over the past 7 days.	Auckland Council	Email	Annually
Exceedance of a TL2 limit - bin exchange area stormwater.	Auckland Council	Email notification.	As required
Complaint - odour, noise, mud, traffic, litter, or other potential non-compliance or nuisance - bin exchange area.	Community Liaison Group.	Summary table sent by email or file transfer.	Quarterly
Complaint - odour, noise, mud, traffic, litter, or other potential non-compliance or nuisance - bin exchange area.	Auckland Council	Summary table sent by email or file transfer.	Quarterly

4. CONTINGENCY

4.1 Trigger levels

Upon completion of a monitoring event, the results will be checked against the pre-specified response limits (aka trigger levels). Detailed explanation of TL1 (warning level) and TL2 (alarm level) are provided in the LMP section on stormwater.

Trigger Levels for the current topic are presented in the monitoring parameters table above.

4.2 Response guidelines

Contingency triggering event	Response guidelines
Debris on the pad.	• Clean up.
Odour complaint.	• Investigation in accordance with complaint response procedure elsewhere in this LMP.
Full bins over their time limit in the bin exchange area.	• Restrict inbound deliveries until the backlog is cleared. • Extend tip face opening hours, if available within consented operating time limits.
Bin damage that renders the bin 'leaky'.	• Decommission the bin e.g. tag it out until fixed.

5. TASK LISTS

5.1 Tasks and scheduled maintenance

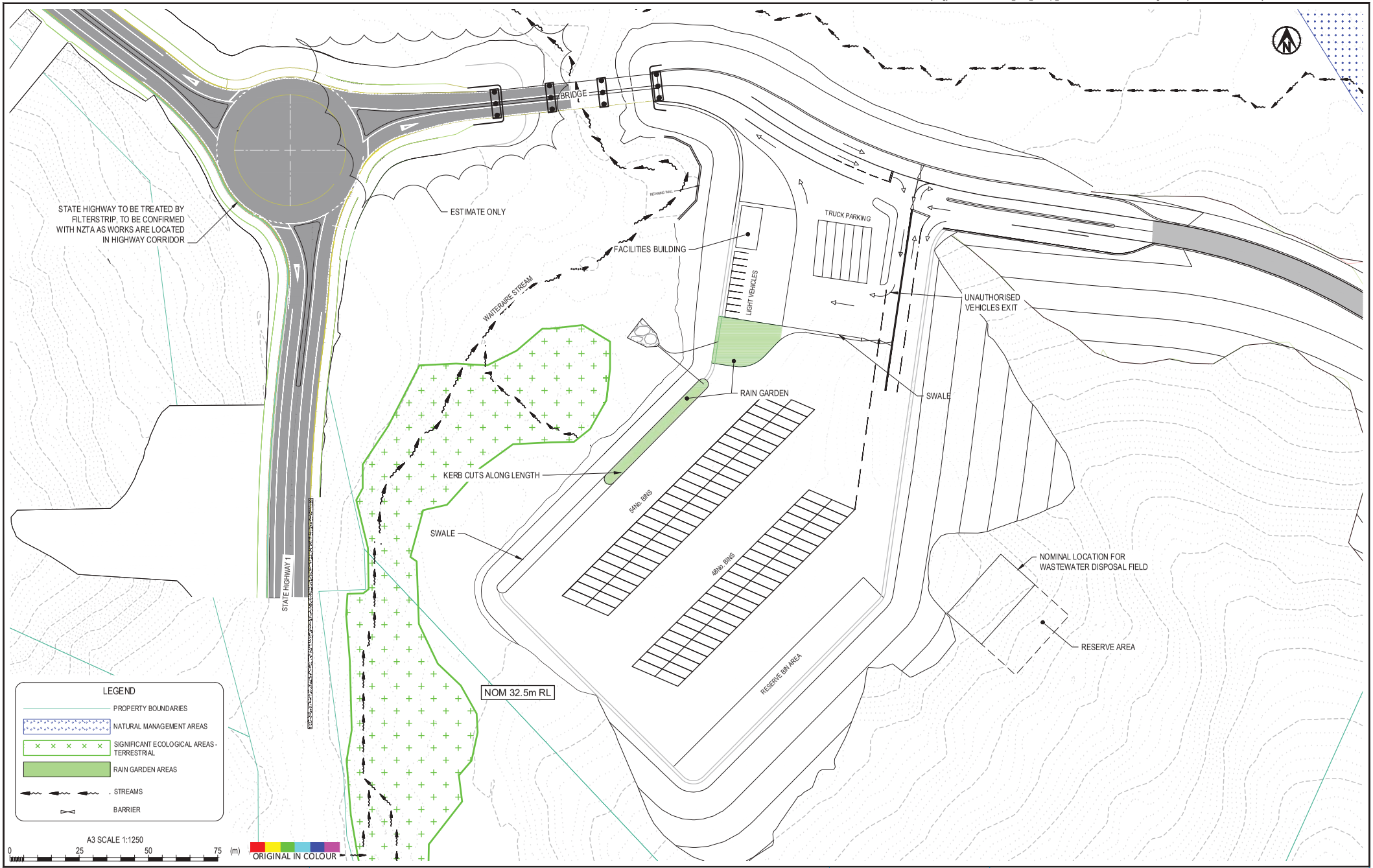
Role	Task	Frequency
Bin Exchange Operator	Clear the bin exchange pavement and surrounds of any debris, litter or mud.	Daily
Bin Exchange Operator	Check that the gate software is recording inbound and outbound vehicles at the bin exchange area.	Daily
Bin Exchange Operator	Check the condition of bins in the bin exchange area.	Quarterly
Bin Exchange Operator	Visually inspect structures around bin exchange area (lane dividers, buildings, walkways, barrier arms, fences, signs, pavement condition, rain-gardens, stormwater outfall, vegetation screen). Arrange any required maintenance. Keep a record.	Quarterly
Bin Exchange Operator	Carry out routine maintenance on the rain-gardens.	Annually
Construction Manager	Arrange for regular repair of the bin exchange area pavement.	Three yearly
Workshop Manager / Mechanic	Check that noise suppression on each mule truck or transfer unit is operating correctly, and schedule any required maintenance.	Annually

6. APPENDICES

6.1 Indicative layout plan of bin exchange area

Site plan (1 page)

C:\12dSynergy\data\ALBTCAD\Polaris_WOL_Concept_55\CAD\FIG\Polaris-GM-ENG-31.dwg 2019-May-29 5:25:31 PM Plotted By: JUAN CARLOS ABREGO CASTILLO



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PROJECT No.	1005069	
DESIGNED	AGBB	Jun.18
DRAWN	TORY	Aug.18
CHECKED	SFE	May.19
	Simonne F Eldridge	May.19
	APPROVED	DATE

CLIENT **WASTE MANAGEMENT NZ LTD**

PROJECT **AUCKLAND REGIONAL LANDFILL**

TITLE BIN EXCHANGE AREA AND LANDFILL ACCESS ROAD
BIN EXCHANGE AREA

SCALE (A3) 1:1250 FIG No. ENG-31 REV 1

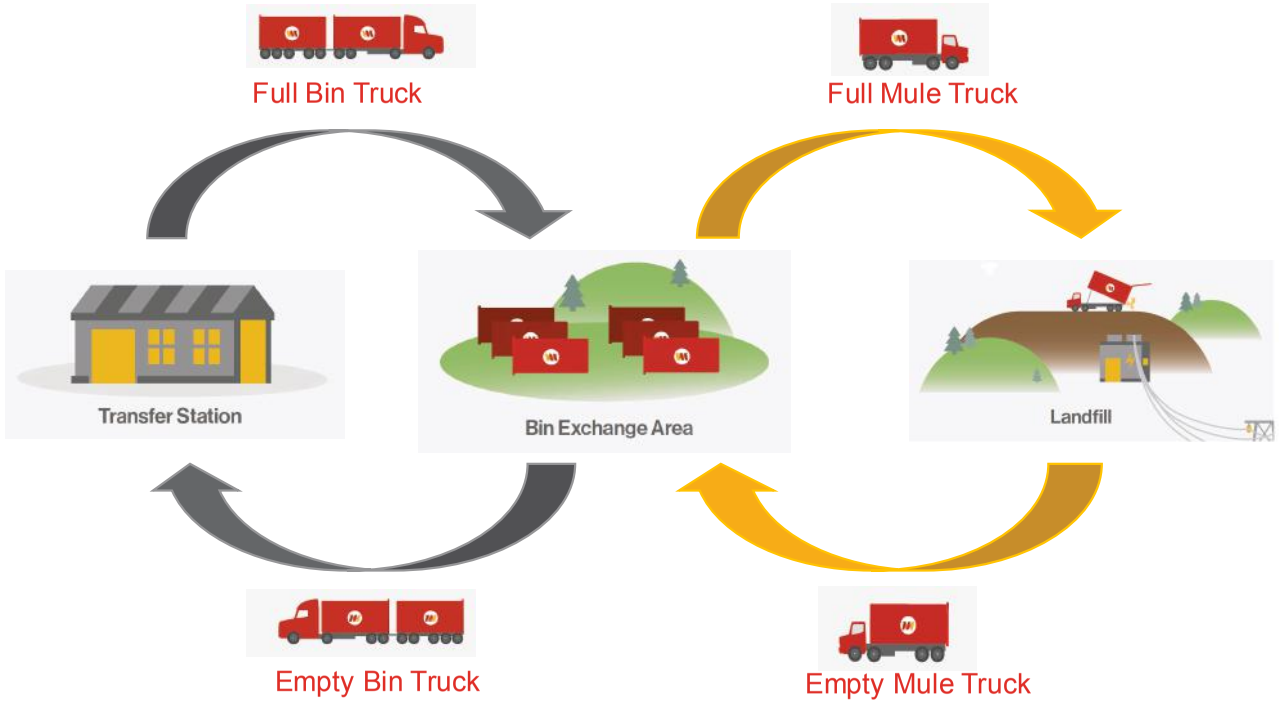
LMP Section 3.05

6.2 Bin exchange area flow chart

Diagram (1 page)

A bin truck delivers full bins to exchange area from the transfer station network

A mule truck transports full bins to the tip face, via the weighbridge, and deposits the waste



The empty bins are picked up by an outbound bin truck and taken to a transfer station for refilling

The emptied bins are returned to the exchange area by the mule truck

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Pest Control Plan – Landfill Operations

Document Control

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CONTENTS

1. INTRODUCTION

1.1 Scope of this section

The purpose of this 'Pest Control Plan – Landfill Operations' is to address only the pests associated with the operation of the landfill.

A separate 'Pest Control Plan – Ecological Enhancement' will also be provided to address effects on ecological values.

The aim of this Pest Control Plan – Landfill Operations is to:

- summarise ecology baselines for reference by the landfill operator
- identify sensitive species
- identify threat species
- list suitable control methods
- provide task lists

1.2 Pest Control Area

The Pest Control Area for the purposes of this PCPLO is the project footprint and immediate surrounds within easy reach of pests connected with landfilling.

Pest control described in this section of the LMP will be conducted at appropriate levels during the enabling works, operating life of the landfill, and aftercare period, i.e. for the duration of resource consents.

2. BASELINE SURVEY SUMMARY

2.1 Flora

The following information is provided for quick reference by the landfill operations staff.

The baseline plant and habitat surveys are explained in a report with the consent applications:

Auckland Regional Landfill, Assessment of Aquatic and Terrestrial Ecological Values and Effects, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, Date May 2019, Job Number 1005069.

A summary of findings from that report is provided in the separate 'Pest Control Plan - Ecological Enhancement'.

Terms such as 'threatened' are defined in New Zealand Threat Classification System (NZTCS) available on the NZ Department of Conservation (DOC) website.

Plant species actually observed in the vicinity of the project footprint on site that are classified as threatened are:

- Kanuka
- Manuka
- Kauri
- White rata
- Swamp maire
- Pohutukawa

2.2 Fauna

The investigative surveys for sensitive animal species and for establishing baselines are explained in the consent application report (reference given above). Surveys included searching for:

- bats
- fernbird
- bittern
- other avifauna
- lizards
- frogs
- snails
- peripatus

A summary of findings from that report is provided in the separate 'Pest Control Plan - Ecological Enhancement'.

3. PEST CONTROL PLAN - LANDFILL THREATS

3.1 Aim

The pest control programme described in this section is intended to target only the new potential pest threats associated with operation of a landfill on the site, and is separate to any proposed pest control programme for ecological enhancement and compensation measures.

The aim of this section is

- to describe the pest control methods
- to set expectations
- to schedule tasks, monitoring and reporting

The overall pest control programmes will aim to

- Establish technologically advanced management practices which aim to prevent new pest problems arising.
- Use technologically advanced control methods which are effective from an economic, technical and public perspective.
- Use methods which eliminate, isolate and mitigate risk to health and safety of site personnel and neighbours.
- Record the control methods used (type, frequency) and their effectiveness.
- Facilitate cooperation to resolve matters of concern to the neighbours including Sunnybrook Reserve and the public including iwi in regard to specific pests.

The threat species in the following sections are only those which relate uniquely to the landfilling of waste and arise from the project footprint and landfilling activities, rather than pests in the wider landscape which impact on ecological values.

3.2 Plant weeds

3.2.1 Threats

Threat species	Threatened species
Noxious weeds. Examples: tradescantia; pampas; gorse; ginger.	Habitats for native fauna. Displacement of native flora.
Diseases affecting native plants.	Native flora.

3.2.2 Control methods

Pest control methods for plant diseases and weeds that are a widespread issue for rural land ownership are described instead in the Biosecurity section.

The following plant pest control methods relate specifically to landfill activity. Landfill activity often involves larger areas of bare earth which are prone to weed growth.

Method	Initial timing and frequency
Topsoiling and seeding of any bare earth area greater than 1 hectare to be left for more than 3 months, associated with any construction or operations activity. • For weed control reasons as well as other reasons. • Mulch alternative, especially if ground is too wet to run machines on.	Three-monthly.
Forming landfill cover and cap slopes that are suitable for grass growth and mowing (not too steep). • To reduce impediment to weed control by accommodating easier mowing.	Three-monthly in summer. Not longer than six-monthly in winter depending on ground conditions.
Substitution planting e.g. lotus where there is a longer interval between clearing of vegetation and the commencement project works.	Within 6 months after clearing and/or weed spraying if development works won't be entering that area within that time.

3.2.3 Performance standards

The standard for avoided plant disease and noxious weeds is:

- No finding of mature or established weed species on landfill or in landfill perimeter bush or wetland
- No dominant pest weed species on open ground

Monitoring and task lists are listed in a separate section below.

3.3 Feral cats and mustelids

3.3.1 Threats

Note: This section relates only to pests associated with the landfilling of waste, and the area of control relates to the project footprint and areas immediately surrounding the project footprint. Wider pest control on the WMNZ landholdings for ecological enhancement and compensation is addressed separately in the Pest Control Plan – Ecological Enhancement.

Threat species	**Threatened species**
Feral cats, mustelids (ferrets/fitches, stoats, weasels), possums, rabbits, rodents (rats). These pest animals arise due to their attraction to waste for possible food and possible shelter.	Threat to virtually all birds, chicks and eggs. Threat to native fauna by direct competition for food. Threat to human health by interference with equipment and water supplies, spread of disease, and intrusion on crops.

3.3.2 Control methods

Pest control methods for the landfill activities will be developed to align with the pest control methods for the ecological enhancement, to efficiently provide the desired outcomes.

The methods deployed may be amended over time depending on the results of monitoring as indicated in the section on ‘adaptive response’.

3.3.3 Performance standards

Feral cat and mustelid control targets (within the project footprint - landfill, stockpiles, buildings, access road) will be developed following consultation and alignment with the pest control programme for ecological enhancement.

Monitoring and task lists are listed in a separate section below.

3.4 Wild animals and livestock

3.4.1 Threats

Threat species	**Threatened species**
Stock: Cattle, goats, deer, pigs, horses. These pest animals arise due to their attraction to waste as a food source and attraction to undergrowth in pine forest, from where they could drift into native bush if inadequately fenced.	Threat to native plants. Threat to planted seedlings especially from goats.

3.4.2 Control methods

Pest control methods for the landfill activities will be developed to align with the pest control methods for the ecological enhancement, to efficiently provide the desired outcomes.

The methods deployed may be amended over time depending on the results of monitoring as indicated in the section on 'adaptive response'.

3.4.3 Performance standards

Wild animal and livestock control targets (within the project footprint - landfill, stockpiles, buildings, access road) will be developed following consultation and alignment with the pest control programme for ecological enhancement.

Monitoring and task lists are listed in a separate section below.

3.5 Birds

3.5.1 Threats

Threat species	**Threatened species**
Birds generally: Sparrow, Starling, Myna, Magpie, Gulls, Pukeko These arise due to their attraction to the landfill to scavenge for food or to ponds as a food source.	Threat to human activities and heath: Defacing of property; Damage to crops; Interference with equipment; Contamination of pond water supplies; Contamination of roof water supplies; Spread of disease.
Southern black-backed gull	Threats as from birds generally, but aviation is particularly threatened because of the gulls' size and high flight paths.
Red-billed gull	Threats as from birds generally and southern black-backed gull, but control methods may be different for protected species.
Pukeko	Threats as from birds generally, but particularly seedlings because pukeko eat and uproot them and other Pukeko diet including eggs, frogs, small fish, chicks and mammals, but control methods may be different for protected species.

3.5.2 Control methods

Method	**Timing and frequency**
Restricting access to allow only bulk haul vehicles. Managing the waste by making use of the transfer stations. Closing the tip face to the public, which otherwise may lead to greater availability of food scraps for birds.	Initial landfill establishment and ongoing arrangement throughout the landfill's operating life.
Operating machinery on the tip face continuously between the times of opening up and placing daily cover each day. Rapidly mixing and burying incoming waste to minimize the yield to any scavenger birds. Minimising the uncovered tipping face area by covering the refuse regularly and promptly with soil daily cover.	Initial landfill standard operating procedures continued throughout the landfill's operating life.
Avoiding shallow standing water on earth works which attracts birds. Providing vegetation cover such as long grass on inactive areas.	Landfill standard maintenance procedures continued throughout the landfill's operating life and aftercare.
Distress tapes Propane cannons Racket bombs Blank .22 calibre shells Athletics starter pistol Wire grid system Mobile net cover Falcon decoys Falconry	These are secondary controls which are not proposed initially.
Shooting - Black-backed gull	This secondary method would apply only to black-backed gulls and be used only if needed by competent personnel and contractors in accordance with the landowner's policy on H&S.
Shooting - Pukeko	As for shooting of black-backed gulls but only in duck-shooting season. https://www.doc.govt.nz/nature/native-animals/birds/birds-a-z/pukeko/

Method	Timing and frequency
Habitat engineering and recovery i.e. favouring diverse native planting whenever planting is undertaken, and periodic review of landscape planting design and maintenance programme, with the aim of displacing nuisance birds.	Annually.

The methods deployed may be amended depending on the results of monitoring as indicated in the section on 'adaptive response'.

3.5.3 Performance standards

Bird control targets will include:

- no more than small populations of mynas and sparrows than can only feed opportunely on exposed waste in the short time between tipping and burial
- no gulls in residence
- nuisance level agreeable by WMNZ landholding occupiers and neighbours
- minimal need for replacement of planted seedlings due to Pukeko activity

Monitoring and task lists are listed in a separate section below.

3.6 Insects

3.6.1 Threats

Threat species	Threatened species
Exotic moth	Threat to horticultural crops.
Insects: Flies, Midges, etc.	These pests arise due to their arrival in waste or establishment in waste if the waste isn't completely covered. Threat to human health: spread of disease; bites or stings; damage to crops and native plants; interference with equipment; contamination of water supplies.

3.6.2 Control methods

Method	Timing and frequency
Restricting access to working face to allow only bulk haul vehicles which provide for rapid burial of waste along with any vermin or insect, operating machinery on the tip face continuously between the times of opening up and placing daily cover each day, rapidly mixing and burying incoming waste, and minimising the uncovered tipping face area by covering the refuse regularly and promptly with soil daily cover, to minimize the potential for vermin and insects to escape or multiply.	Initial landfill standard operating procedures continued throughout the landfill's operating life.
Avoiding shallow standing water on earth works, and avoiding rough ground with incomplete soil cover over waste, which could otherwise host insects and vermin.	Landfill standard maintenance procedures continued throughout the landfill's operating life.
Preference for planting of native trees • potential for unwanted insects is a plant selection factor • exotics only for specific purposes	Timing as per consent conditions e.g. for landscape and visual mitigation.
Insecticide application by a qualified contractor	This secondary method would be used only if needed.

The methods deployed may be amended depending on the results of monitoring as indicated in the section on 'adaptive response'.

3.6.3 Performance standards

Insect control targets will include:

- no nuisance to workers on foot
- no finding in the landfill operations areas of nuisance densities of insects
- no reasonable complaint from the adjacent activities of farming and forestry.
- no finding of unwanted insect species listed by the government department for biosecurity

Monitoring and task lists are listed in a separate section below.

3.7 Adaptive response

If the outcome of monitoring indicates low success at achieving performance targets then the relevant part of the pest control plan will be reviewed.

For continuous improvement, the pest control methodology will be reviewed continually until the performance targets have been reached.

Prior to making any adjustment to performance targets, interested parties will be consulted like DOC, the CLG and iwi.

3.8 Use of contractors

Each contractor engaged for pest control will be asked to submit a Pest Management Operational Plan which will:

- be developed in consultation with Department of Conservation (DOC);
- define pest density performance targets consistent with those in this ARL Pest Control Plan and any others developed in consultation with interested parties;
- provide the intended timetable of field work and reporting;
- include health and safety provisions;
- provide details of any initiative to involve mana whenua.

4. BIOSECURITY - PLANT DISEASES AND NOXIOUS WEEDS

4.1 Aim

This section addresses invasive plants and diseases which are already present in the vicinity of the project footprint or likely to become present in the ordinary course of rural land ownership.

The aim of this section is

- to set appropriate targets that are better than the pre-landfill status on the land
- to describe the pest control methods (plant diseases and weeds)
- to schedule tasks, monitoring and reporting

4.2 Adaptive response

If the outcome of monitoring indicates low success at achieving performance targets then the relevant part of the pest and biosecurity methodology will be reviewed and continue to be reviewed until the performance targets have been reached.

4.3 Plant diseases

4.3.1 Threats

Threat species	**Threatened species**
Myrtle rust (fungal disease)	Native plants such as pohutukawa, manuka and rata. Both mature trees and new growth.
Kauri dieback (spread by people, pigs and goats)	Kauri. Other ecosystem parts that depend on Kauri.
Conifer blight (fungal disease)	Conifer trees such as radiata pine.

4.3.2 Control methods

Biosecurity control methods for threats potentially arising or increasing due to the landfill will be developed to align with the biosecurity methods described in the Ecology Management Plan:

DRAFT Ecological Management Plan, Auckland Regional Landfill, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, Date February 2020, Job Number 1005069.3000

4.3.3 Performance standards

The standards for avoided plant disease (within the project footprint - landfill, stockpiles, buildings, access road) will align with the biosecurity standards described in the Ecological Management Plan.

4.4 Weeds

4.4.1 Threats

Threat species	**Threatened species**
Noxious weeds. Examples: http://pestplants.aucklandcouncil.govt.nz/list-plants?pests=Unwanted Organism	Habitats for native animals.
Pampas. • Commonly mistaken for native toetoe.	Native plants, due to competition for habitat. Native fauna, due to pampas hosting other predator pests such as rats and possums. https://www.nrc.govt.nz/environment/weed-and-pest-control/pest-control-hub/Detail/?id=113
Gorse	Native plants displaced.

4.4.2 Control methods

Method	**Timing and frequency**
Physical control • shading, weeding, ring barking, grubbing, felling and mulching • releasing and trimming, around promoted plants	All year round.
Chemical control (herbicides) • spraying • methods to avoid harm to adjacent native species • avoidance of herbicides with excessively long residual time	Spring and summer.

Method	Timing and frequency
Pampas control methods • Physical control – remove pampas from the area – dig out small plants, remove sizeable plants with machinery, destroy flower heads through burial or burning. • Chemical control (herbicide) - Leave the plants until the roots have died off.	All year round.

4.4.3 Performance standards

The standard for avoided weed and noxious plant threats is

- No finding of mature or established weed species on landfill or in landfill perimeter bush or wetland
- No dominant pest weed species on open ground

Monitoring and task lists are listed in a separate section below.

5. MONITORING

The aim of monitoring is:

- to measure trends in threat species and threatened species
- to check if the performance standards have been met

Location / Event / Topic	Parameter	Frequency	TL1	TL2
Count of individual species caught on every day of entry on animal pest control business to landfill project footprint	Pest kill count of feral cats and mustelids.	Annually	tba (to tie in with separate 'pest control plan - ecological enhancement')	tba (to tie in with separate 'pest control plan - ecological enhancement')
Landfill perimeter fenceline condition	Continuity and consistency	Annually	Gaps	Evidence of animal passage
Plant disease according to a specialist inspector	Presence/absence	Annually	Not found	Present
Pampas	Area (ha)	Annually	1 ha	5 ha
Count of birds culled on landfill (waste placement area) footprint	Bird kill count on any one day	As required	No limit. Monitored for information.	No limit. Monitored for information.
Bare earth area on landfill and seasonal construction areas	Area (ha)	Six-monthly	10 ha	tba

6. CONTINGENCY

(to be added)

7. TASK LISTS

7.1 Tasks and scheduled maintenance

The aim of preparing pest control tasks lists is to:

- List tasks with directly measurable completion outcomes (yes/no)
- List tasks in a way that can be fed into compliance management software, be audited against, be used to create job descriptions, and be used for training.

Role	Task	Frequency
Landfill Operations Manager	Ensure that topsoil and grass establishment are in the Erosion and Sediment Control Plan for seasonal construction, and in the working face planning for the coming year, with the aim of pre-empting weed growth as well as avoiding mobilisation of sediment.	Annually
Landfill Operations Manager	Inpsect on foot and report the condition of all fences relevant to fully encompassing the landfill project footprint.	Annually
Landfill Operations Manager	Arrange for inspection of the Pest Control Area - Landfill Operations by a person trained to recognise plant disease threats.	Annually
Landfill Operations Manager	Use agreed procedures to control and remove weeds e.g. pampas.	Annually
Monitoring Technician	Record any weed species during scheduled Erosion and Sediment Control inspections and landfill cap walkover inspections.	Annually
Landfill Operations Manager	Log a count of individual species caught on every day of entry on animal pest control business.	Daily
Landfill Operations Manager	Log a count of individual species caught on every day of entry on bird control business.	Daily
Landfill Operations Manager	Record the observed number of seagulls and pest birds near the working face.	Daily
Construction Manager	Measure bare earth area across landfill and seasonal construction zones, with the aim of assessing and avoiding conditions that encourage pest plants.	Quarterly
Landfill Operations Manager	Mow grass on final cap and intermediate cover.	Two-monthly

8. REPORTING

Location / Event / Topic	Report to	Method	Frequency
Montoring report on pest control (landfill operations).	Auckland Council	Email or file tansfer.	Annually
Copy of any monitoring report on pest control (landfill operations) sent to Council.	Community Liaison Group.	Email or file tansfer.	Annually
Copy of any monitoring report on pest control (landfill operations) sent to Council.	Mana Whenua.	Email or file tansfer.	Annually
Notifiable use of weed killer or spraying of glyphosate over more than 1 ha.	Department of Conservation.	Email. In advance.	As required
Pest Control Plan - Landfill Operations to be submitted prior to Landfill Commencement Date.	Auckland Council	Email	At least 3 months before
Seagull hazard at airfield.	CAA.	Email.	As required
Finding of reportable plant disease.	MPI.	MPI Exotic Pest and Disease Hotline 0800 80 99 66.	As required

9. APPENDICES

9.1 Site Plan for Pest Control Area

(Mark-up of site plan referenced in Glossary)

(to be added)

9.2 Herbicide management plan

(to be added)

9.3 Fencing plan

(to be added)

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Industrial and Trade Activity Management Plan

Document Control

Date	Status	Issued by	Issued to	Distribution method / upload site / link
30/01/2020	Draft d1	BH (T+T document)		

CONTENTS

1. INTRODUCTION

1.1 Scope of this section

This section of the LMP describes

- industrial activity risks and controls

Reference: Auckland Regional Landfill, Stormwater and Industrial and Trade Activity, Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, Date May 2019, Job Number 1005069.117 (consent application 30/5/19 Technical Report P), Appendix A, Draft ITA Environmental Management Plan.

REPORT

Tonkin+Taylor

Auckland Regional Landfill

Draft Industrial and Trade Activity Environmental Management Plan

Prepared for
Waste Management NZ Ltd
Prepared by
Tonkin & Taylor Ltd
Date
May 2019
Job Number
1005069.1170

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Document Control

Title: Auckland Regional Landfill					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
30/05/19	1.0	Final Version	MATB	RVDM	SFE

Table of contents

1 Introduction

Tonkin & Taylor Ltd (T+T) has been engaged by Waste Management NZ Ltd (WMNZ) to prepare an Industrial or Trade Activity Environmental Management Plan (ITA EMP) for the proposed Auckland Regional Landfill.

1.1 Purpose of the ITA EMP

The Industrial or Trade Activity Environmental Management Plan (ITA EMP) has been prepared to manage the potential adverse effects relating to industrial and trade activities associated with the proposed landfill at Wayby Valley. Specifically, the purpose of the plan is to identify those activities to be undertaken at the landfill that may result in contamination of land and/or stormwater, and to document the procedures to be implemented to appropriately manage these risks.

The ITA EMP outlines the following:

- Identification of industrial and trade activities to be undertaken that may result in contamination of land and/or water;
- Identification of potential contaminants associated with these activities;
- The methods to be used to prevent identified contaminants from contacting with stormwater runoff and methods to manage environmental risks from on-site activities;
- An appropriate monitoring and auditing programme to ensure site performance is undertaken in accordance with this ITA EMP; and
- Staff training.

1.2 ITA EMP review and updates

This Plan is a living document that will be reviewed and updated if needed during the course of the Project to reflect material changes associated with construction techniques or the natural environment.

The ITA EMP will be reviewed within 90 days of opening the landfill for the disposal of waste, and then annually thereafter.

2 Activities and potential contaminant sources

The activities with the potential to generate contaminants have been identified in Table 2.1

A summary of these environmental aspects, the potential contaminants associated with these activities and physical and procedural controls in place to minimise environmental effects are outlined in Table 2.1 below.

Table 2.1: Contaminant sources and controls

Site area	Activities	Potential contaminants	Physical controls	Procedural/ documentation controls
Workshop	Diesel tank (40,000 L above ground)	Hydrocarbons	• Secondary containment of diesel tank.	• Section 3.8 Storage of hydrocarbons and dangerous goods
	Refuelling area	Hydrocarbons	• Refuelling area is roofed; • Any refuelling areas not on landfill footprint have sealed pavement • Runoff from roof-covered area directed to refuelling area sump which passes through interceptor.	• Section 3.7 Refuelling activities
	Waste oil tank	Hydrocarbons	• Secondary containment (e.g. bund) around waste oil tank.	• Section 3.8 Storage of hydrocarbons and dangerous goods
	Compressor room	Hydrocarbons	• Roof over the compressor; • System to isolate associated oily residues from stormwater.	• Section 3.8 Storage of hydrocarbons and dangerous goods
	Dangerous goods store	Oils/ greases	• DG store is roofed; • Secondary containment of dangerous goods store with standalone sump system.	• Section 3.8 Storage of hydrocarbons and dangerous goods
	Main workshop	Oils/ greases, suspended solids, heavy metals	• Main workshop is roofed; • Bulk oil drums/ containers (20L and 200L) stored on plastic bunds.	• Section 3.5 Main workshop and outside covered workshop

Site area	Activities	Potential contaminants	Physical controls	Procedural/ documentation controls
	Outside covered workshop area	Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	• Area covered; • Run-off is passed through an interceptor and directed to sump from which it will be pumped or flow to the site's on-site stormwater treatment system.	• Section 3.5 Main workshop and outside covered workshop
	Wash bay	Oils/ greases, suspended solids, heavy metals, COD/BOD	• Main wash bay designed to capture coarse solids. • Runoff directed through an interceptor and is pumped to the stormwater ponds.	• Section 3.6 Washwater
Energy compound	Leachate collection tanks and evaporator	Heavy metals, oils/ greases, ammonia, COD/ BOD	• Leachate collection and storage tanks and evaporator are bunded. Overflow if any will go to the on-site surface water treatment system. • High level alarms are in place on the leachate tank as well as on the bund level. • Any clean run-off is directed to the on-site treatment system and contaminated stormwater if any is processed on-site.	• Section 3.2 Leachate
	Landfill gas blowers and flare – leaks/ servicing of equipment	Oils/ greases, condensate	• Run-off is directed to the on-site surface water treatment system.	• Section 3.10 Maintenance of energy compound equipment
	Landfill gas generators	Oils/ greases, condensate, glycol coolant	• Run-off outside the modular container units is directed to the on-site treatment system. • Any spill is contained within the modular container units.	• Section 3.10 Maintenance of energy compound equipment
	Generator transformers	Oils	• Run-off is directed to the on-site treatment system.	• Section 3.10 Maintenance of energy compound equipment
	Generator oil tanks (30,000L oil tank and 6,000L waste oil	Hydrocarbons	• Tanks and unloading area are bunded with isolation valves.	• Section 3.8 Storage of hydrocarbons and dangerous goods

Site area	Activities	Potential contaminants	Physical controls	Procedural/ documentation controls
	tank) plus unloading area		• Run-off is directed through an interceptor before discharge to the on-site stormwater treatment system.	
	Future generator area	Oils/ greases, condensate, glycol coolant	• Run-off will be directed to the on-site treatment system.	• Section 3.10 Maintenance of energy compound equipment
	Back-up diesel generator (2,000L)	Hydrocarbons	• Self bunded diesel storage incorporated in generator	• Section 3.10 Maintenance of energy compound equipment
	Generator workshop area	Oils/ greases, heavy metals	• Bulk oil drums/ containers (20L and 200L) stored in a bunded area or on plastic bunds.	• Section 3.8 Storage of hydrocarbons and dangerous goods
	Flare site dangerous goods store	Oils/ greases, glycol coolant	• DG store will be bunded. • The DG store has a separate isolated sump.	• Section 3.8 Storage of hydrocarbons and dangerous goods
	Condensate drain system	Condensate, heavy metals, ammonia, COD/ BOD	• Landfill gas condensate is directed to the leachate system, any spills are directed to the on-site treatment system.	• Section 3.2 Leachate
Landfill waste disposal area	Cell preparation including earthworks	Suspended solids, heavy metals	• All run-off is directed to on-site treatment system.	• Section 3.11 Landfill disposal and development area
	Roadways	Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	• All run-off is directed to on-site treatment system.	• Section 3.11 Landfill disposal and development area
	Working face/ refuse filling area	Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	• Any contaminated stormwater or spillage is allowed to infiltrate the waste and is collected as part of the leachate system.	• Section 3.11 Landfill disposal and development area
	Preparing intermediate and	Suspended solids, heavy metals,	• All run-off is directed to on-site treatment system.	• Section 3.11 Landfill disposal and development area

Site area	Activities	Potential contaminants	Physical controls	Procedural/ documentation controls
	final cover including earthworks	mulch/straw/seed additives (if used)		
	Final covered cell area	Suspended solids, fertiliser	• All run-off is directed to on-site treatment system.	• Section 3.11 Landfill disposal and development area
Wheel wash	Wheel wash building	Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	• Run-off is directed to the wheel wash ponds. This is recycled for use in the wheel wash system. • If necessary, it can be discharged to the on-site treatment system following testing.	• Section 3.1 Wheel wash
Leachate tank	Leachate storage tank	Leachate including Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	• Tank failure will be contained by bunding where contaminated water can be removed for disposal or held for testing prior to treatment.	• Section 3.2 Leachate
	Filling of tankers for off-site disposal	Leachate including Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	• Filling of tanks will be supervised by tanker driver.	• Section 3.2 Leachate
Main roadway, office area and weighbridge	Main roadway	Oils/ greases, suspended solids, heavy metals	• Run-off directed through intermediate ponds before the main on-site stormwater treatment ponds; • Roadside cesspits to facilitate regular suck-out.	• Section 3.11 Landfill disposal and development area
	Office	Zinc and pathogens in roof runoff	Runoff is directed to the off-site system. • Low-Zinc roof paint.	-
	Weighbridge	Oils/ greases, suspended solids, heavy metals	• Run-off is directed to the on-site treatment system.	• Section 3.11 Landfill disposal and development area

Site area	Activities	Potential contaminants	Physical controls	Procedural/ documentation controls
Bin exchange area	Vehicle and Truck Parking	Oils/ greases, suspended solids, heavy metals	• All run-off is directed to on-site treatment system.	• Section 3.3 Bin exchange area
	Bin setting down area	Oils/ greases, suspended solids, heavy metals, COD/ BOD	• All run-off is directed to on-site treatment system; • Rain-garden for of treatment.	• Section 3.3 Bin exchange area

3 Management procedures for activities

3.1 Wheel wash

A wheel wash will be provided at the top of the landfill access road for cleaning the wheels of all vehicles leaving the working face and bare soil areas like stockpiles. The wheel wash will comprise as a minimum, a ramp into a flooded basin with rumble bars through which vehicles drive. It may also include fixed water jets and/or a hand held water blaster for manual cleaning of vehicles. The wheel wash system will be a closed system involving recirculation of water, containment, and testing before release.

Sediment from the wheel wash or a sump alongside will be removed from time to time by a front end loader and placed on the ground to dry within the landfill footprint. Overflows from the wheel wash will be diverted to a sediment pond adjacent to the wheel wash for settling of any sediment. Discharges from this sediment pond will flow, after testing, into the landfill stormwater management system including the ponds.

The key **physical controls** are:

- All washwater from the wheel wash will be held in a dedicated pond located adjacent to the wheel wash to hold collected and recycled wash water;
- The wheel wash pond will drain when released to the landfill stormwater ponds.

The key **procedural controls** are:

- All heavy vehicles leaving the site will pass through the wheel wash at all times when there would be transport of mud or soil onto the roadway;
- Sediment from the wheel wash sump will be removed regularly by a front end loader and placed on the ground to dry within the landfill footprint;
- Testing of the wheel washwater will be undertaken prior to discharge to the landfill stormwater ponds to ensure no significant contaminants are present.

3.2 Leachate

WMNZ will operate a comprehensive leachate management system at the landfill. The procedures for leachate management will be incorporated in the Landfill Management Plan (LMP).

A key approach to leachate management is to keep leachate and stormwater separate. Any surface water that drains onto the open working face and associated exposed waste areas is treated as leachate and managed as such.

Ultimately, any surface water with evidence of leachate will be held in the ponds for treatment or management. No discharge will occur from the ponds until monitoring demonstrates that the water quality is suitable for discharges.

The key **physical controls** are:

- Leachate collection and storage tanks and evaporator will be bunded. High level alarms will be in place on the leachate tanks as well as an alarm on the bund level;
- The leachate tanker filling location will have the facility to capture spillage;
- Landfill gas condensate is directed to the leachate system
- The arrangement will provide that any spills that are not caught are directed to the on-site treatment system.

The key **procedural controls** are:

- Filling of tankers will be undertaken in the designated area;
- Filling of tankers will be supervised at all times by a tanker driver trained in the filling procedure and site emergency management plan;
- Any water accumulated within bund areas that is contaminated with leachate will be pumped into the leachate tanks.

3.3 Bin exchange area

The bin exchange area will be located near the entrance to the landfill. The bin exchange area will enable standardised bins to be delivered full to the landfill and deposited in the exchange area. Trucks can then pick-up empty bins and depart the landfill. The full bins will be taken to the landfill working face by site haulage/ tipper vehicles, aka mules. This enables the transport of waste from source to the landfill entrance to be separated from the landfill working face operations.

The bin exchange area will be used to deliver and load bins onto trucks, and no emptying of bins or consolidation of waste will be undertaken in the bin exchange area.

In addition to the handling of bins, parking for trucks and landfill vehicles will be provided.

The bin exchange area will be sealed, with any surface water treated by two rain gardens to provide water quality treatment for any runoff.

No vehicle maintenance or servicing is proposed within the bin exchange area.

The key **physical controls** are:

- Stormwater treatment will be provided via raingardens for all runoff from the bin exchange area.

The key **procedural controls** are:

- No opening of bins or handling of refuse will be undertaken within the bin exchange area;
- Any spills of refuse or deposited material will be cleaned up routinely as described in the LMP;
- No vehicle servicing or maintenance will be undertaken within the bin exchange area;
- Any leaking bins will be taken promptly to the landfill footprint where the leakage will be contained and cleaned up (the quantities from this source would be relatively small).

3.4 Energy centre

The energy centre will be located on the ridge between the landfill valley and the adjacent valley to the north. The energy centre will include:

- The landfill gas flare(s);
- The electricity generators;
- Leachate evaporator(s);
- Leachate storage tank(s); and
- A small workshop for gas generator maintenance.
- An office and facilities for gas team members

Surface water runoff from the energy centre will drain to a sump and then to the main landfill ponds and wetland. In addition, any storage of hazardous substance and the leachate tanks will incorporate secondary containment.

The key **physical controls** are:

- Surface water runoff will be directed to a sump before being piped to the landfill stormwater ponds;
- Any hazardous substances will be stored inside, or within bunded areas.

The key **procedural controls** are:

- Any spills or leaks will be cleaned up in accordance with routine sump clean-outs or, if over-filled, in accordance with the spill response plan; and
- Storage of hazardous substances will be in accordance with Section 3.8.

3.5 Main workshop and outside covered workshop

A workshop will be provided for plant and general maintenance. This will comprise a building with a footprint of approximately 250 m^2 (25 x 10 m). A hardstand area for plant of approximately 1,000 m^2 will also be provided outside the building. The runoff from the maintenance workshop area will be directed to the main landfill ponds and wetland.

The activities undertaken in the workshop are considered to be an ITA. The specific controls for the management of discharges from each of these activities are detailed in the following section.

The key **physical controls** are:

- Bulk oil drums/ containers (20L, 200L and 1000L) stored on plastic bunds or within permanent bunded areas;
- Outside workshop area is covered;
- Stormwater runoff from the workshop area will be directed to a sump. The sump will be pumped to the stormwater system.

The key **procedural controls** are:

- The maintenance of vehicles and equipment is predominately carried out under cover;
- Drip trays must be used during maintenance activities to catch drips or small leaks;
- Work areas must be kept clean and tidy to reduce the probability of accidental spillages;
- Spill kits are located in close proximity to higher risk maintenance activities. Any small leaks or drips of hazardous substances during maintenance activities will be cleaned up (e.g. using absorbent materials) as soon as practicable. The spill response plan will be implemented in event of a larger spill.
- Indoor work areas must not be hosed down due to the risk of stormwater pollution. These work areas are to be cleaned by sweeping or mopping and the resultant washwater must be disposed of in the sewer system (e.g. an internal sink);
- Welding, sanding, grinding and painting shall be undertaken inside workshops where possible;
- All areas where vehicle and equipment maintenance is conducted shall be inspected weekly to ensure compliance with this procedure.

3.6 Washwater

A wash bay for vehicles and bulky items may be established at the workshop area to clean equipment prior to servicing or repair.

The key **physical controls** are:

- The wash bay is designed to capture coarse solids;

- Run-off directed to wash bay sump which passes through a grit separator and pumped to the landfill stormwater system.

The key **procedural controls** are:

- Vehicle and equipment washing shall only be undertaken within the designated washing areas;
- No wash chemicals/detergents are to be applied to vehicles or equipment outside the confines of the washing areas;
- A spill kit will be located in close proximity in case of washwater or spills of other potential pollutants discharge outside of the wash bay area. The spill response plan will be implemented in event of a larger spill (Section 4).

3.7 Refuelling activities

Refuelling for on-site equipment will be undertaken within the workshop area.

The key **physical controls** are:

- The workshop refuelling area will be roofed;
- Surface water run-off will be directed to an oil-water interceptor;
- Any refuelling areas not on the landfill footprint will have sealed pavement.

The key **procedural controls** are:

- Vehicle refuelling is to be undertaken at the designated refuelling areas. Mobile refuelling is to be avoided where possible;
- When mobile refuelling must be undertaken, it shall be carried out away from stormwater drains and a drip tray shall be used;
- If mobile refuelling must be undertaken in the vicinity of stormwater drains, filter socks shall be used to protect the drains;
- Ensure fuelling is completed using the automatic fill function, whereby the automatic cut off will be engaged (rather than manually assessing when tank may be full); and
- Spill kits are located in close proximity to all fuelling activity areas. Any small leaks or drips of fuel should be cleaned up (e.g. using absorbent materials) as soon as practicable. The spill response plan will be implemented in event of a larger spill (Section 4).

3.8 Storage of hydrocarbons and dangerous goods

Hazardous substances will be used at the site including diesel, oils and greases, engine coolants, degreasers, paints and deodoriser concentrates. The site will have a number of dedicated hydrocarbon and dangerous goods storage areas. These are located in the following activity areas; the Main Workshop and the Energy Compound, and comprise of:

- Main Workshop:
  - Diesel tank
  - Waste oil tank
  - Compressor room
  - Dangerous goods store
  - General workshop area
- Energy Compound:

- Generator oil tanks (clean and used)
- Back-up diesel-powered generator
- Flare site dangerous goods store
- General workshop area

All environmentally hazardous substances are stored in a manner that prevents the entry of rainwater into the container and that prevents stormwater run-on entering into the storage area.

The key **physical controls** are:

- The diesel tank, waste oil tank, and dangerous goods store areas will have secondary containment;
- Compressors will be enclosed to isolate oily residues from stormwater;
- Generator oil tanks and unloading area are bunded with isolation valves;
- Run-off from the energy centre will discharge to the on-site stormwater system;
- In the general workshop area of the energy compound, bulk oil drums/ containers (20L, 200L and 1000L) are stored in a bunded area or on plastic bunds; or otherwise in a manner that minimises potential for stormwater contamination.

The key **procedural controls** are:

- Regular fuel reconciliation should be undertaken to ensure all product is accounted for;
- Fuel filling and transfer equipment should be regularly checked (e.g. as a minimum, equipment should be visually observed during each use) and maintained as required;
- Regular inspections will be made of structural controls e.g. tank, bund, valve, bung and tap/spigot integrity (weekly visual inspections should be undertaken and recorded);
- Any small leaks or drips of fuels must be cleaned up as soon as practicable. The spill response plan will be implemented in event of a larger spill (Section 4);
- Whenever possible, the use of hazardous substances will only occur within appropriate designated areas for the activity being undertaken, and inside / undercover and within bunded areas;
- Materials must not be stockpiled in outdoor areas unless they are inert (i.e. non-hazardous) or securely covered to prevent rainwater getting in;
- All storage containers for hazardous substances must be clearly labelled to identify their contents;
- All hazardous goods storage facilities must comply with HSNO, including requirements for adequate labelling, separation of chemical classes and secondary containment;
- All work units must hold manifests and MSDS sheets of the chemicals required for their operations and hold the minimum volumes practicable to allow operation;
- Spill kits will be located in close proximity to all areas where hazardous substances are used or stored. The spill response plan will be implemented in event of a larger spill (Section 4);
- Bunds must be checked for accumulated water/liquid frequently. The site supervisor or facilities management contractor is required to regularly drain water from the bunds. Any accumulated liquid must be removed from the bund by an appropriately licensed liquid waste removal contractor; and
- All hazardous good storage facilities must be checked regularly (at least weekly) to ensure the requirements of this EMP are being met.

3.9 Waste handling and disposal

This section refers to hazardous wastes generated on-site and does not relate to waste accepted for disposal.

Hazardous waste from ancillary activities includes waste oil, oily rags, and empty containers that once contained hazardous materials.

Hazardous waste is stored at the Hazardous Good Store prior to removal by authorised waste disposal contractors. Small work units (working face, site maintenance crew, workshop, energy centre) may also have temporary storage facilities for waste oil and other hazardous wastes for short-term storage prior to their relocation to the site's dedicated Hazardous Good Store.

The key **structural controls** are:

- Activities associated with the handling and storage of hazardous wastes will only occur in enclosed or bunded areas;
- A dedicated Hazardous Goods Store will be located on site where hazardous materials are stored (and wrapped if required) prior to removal off site; and
- A dedicated waste oil storage area using double skinned containers will be provided on site.

The key **procedural controls** are:

- Hazardous wastes (including empty containers) will be managed in the same manner as other hazardous materials and only stored in the appropriate hazardous goods or waste storage facilities (Section 4.6);
- Hazardous and non-hazardous wastes must be separated for disposal. Hazardous materials must be sealed e.g. in plastic bags prior to removal;
- Hazardous wastes will be kept in work areas for short periods only and promptly relocated to dedicated bunded waste storage areas (e.g. on a daily basis);
- Liquid waste will be stored in dedicated containers;
- Empty containers (including drums) that still contain residue must not be stored outside of the appropriate hazardous goods or waste storage facilities;
- All waste oil generated during work activities must be promptly stored in the dedicated waste oil storage area for pumping direct into used oil tanks or drums inside the main Hazardous Goods Store. Waste oil may be temporarily stored by work units, however this must only occur using appropriate containers (e.g. waste oil drums), within appropriately bunded areas;
- Hazardous wastes will be removed from the site on a regular basis and disposed to an appropriate facility authorised to accept such material. Disposal records must be maintained; and
- Spill kits will be located in close proximity to hazardous waste storage facilities at the landfill. The spill response plan will be implemented in event of a larger spill (Section 4).

3.10 Maintenance of energy compound equipment

The energy centre will be located on the ridge between the landfill valley and the adjacent valley to the east. Surface water runoff from the energy centre will drain to the main landfill ponds and wetland. The maintenance of the energy compound equipment is an ITA.

The key **physical controls** are:

- Run-off is directed to the on-site treatment system.

- For the back-up diesel generator, which is designed to be self-bunded as the primary measure, clean water will then be directed to on-site treatment system;
- Any spill from landfill gas generator will be contained within the modular container units.
- Run-off outside the landfill gas generator's modular container units will be directed to the on-site treatment system.

The key **procedural controls** are:

- Drip trays must be used during maintenance activities to catch drips or small leaks;
- Work areas must be kept clean and tidy to reduce the probability of accidental spillages;
- All work units should hold only the minimum volumes of hazardous substances practicable and chemicals must be stored as per Section 3.8;
- Spill kits will be located in close proximity to higher risk maintenance activities. Any small leaks or drips of hazardous substances during maintenance activities will be cleaned up (e.g. using absorbent materials) as soon as practicable. The spill response plan will be implemented in event of a larger spill (Section 4);
- All areas where the equipment maintenance is conducted will be inspected routinely e.g. weekly to ensure compliance with this procedure.

3.11 Landfill disposal and development area

The landfill cell construction and development would not typically be considered to be an ITA activity area but, as the discharge is managed via the same treatment ponds and wetlands, the landfill development area has been included in the calculation of the activity area. Potential activities of concern are:

- Cell preparation including earthworks;
- Preparing intermediate and final cover including earthworks;
- Roadways;
- Final capped cell area;
- Working face/ filling area.

The key **physical controls** are:

- All run-off from cover is directed to on-site treatment system;
- At the working face/filling area, any stormwater that has come in contact with waste is allowed to infiltrate the waste and is collected as part of the leachate system.

4 Emergency Spill Response Plan

4.1 Introduction

The landfill will maintain a Site Emergency Management Plan in accordance with the integrated management systems. In the event of an emergency, the Emergency Controllers will have responsibility and authority to call in staff and outsiders to form a targeted site emergency response team.

4.2 Spill procedures

The spill response plan is provided in **Appendix A**. Details regarding spill kits and training are included below.

1 Be Safe.

2 Stop the Source: turn off the pump; upright the container; plug the leak.

3 Protect Stormwater: confine the spill with earth/sand or other suitable material; block off access to the stormwater grates; plug or turn off valves at the pond outlet.

4 Notify: tell your supervisor. He/she will contact the Landfill Manager who will notify the authorities as appropriate.

5 Clean Up: absorb or call in vacuum tanker.

6 Dispose of non-hazardous contaminated absorbent material in landfill or arrange collection of liquid waste. Leachate may be directed back into the leachate system.

7 Restock and Review: restock spill kit if required. Log incident in the Company's incident and response tracking system. Undertake an investigation and enter findings into the relevant section.

If the cause of the spill was from plant or equipment, lock-out the unit so it cannot be used again until fixed.

Smaller spills can be cleaned up using spill kit materials, rags or dirt.

If there is eye or skin contact with any chemical substances, standard first aid measures apply. Contaminated clothing should be laundered prior to re-use.

4.2.1 Spill equipment components (spill kits) and locations

Spill kits must be clearly identifiable by signage and access to the spill kits must be unobstructed at all times. The spill kits should consist of the following items:

- Oil absorbent pads
- Loose absorbent material
- 2 x Small booms
- Sand and sandbags to create a temporary bund
- Appropriate personal protective equipment
- A laminated copy of the spill response plan

Spades, shovels and other general site equipment may also be used in case of an emergency. Spill kits will be located at the bin exchange area, the workshop, refuelling area and the energy centre.

4.2.2 Training

Emergency Spill Response training will be conducted by the Site Manager and a basic training guide will be included in **Appendix B.**

Staff will be taken around the site and given an illustration of the spill kits and given an introduction between the difference between sewer and stormwater and where each is located on the site.

4.2.3 Disposal of contained material

In the event that a leaked hazardous substance is found within a secondary containment bund, the spilled substance should be cleaned up with the appropriate absorbent material from the spill kit, placed into contaminated waste bags, and the instructions on the MSDS should be followed for disposal. Any material in damaged containers should be transferred to secure containment and the incident reported to the site manager.

5 Monitoring and corrective/preventative action

5.1 Resource Consents held by WMNZ

WMNZ will hold several consents for the discharges to the environment associated with various processes at the site. Monitoring conditions are imposed under various consent conditions. Please note that this ITAEMP is being submitted as part of the industrial discharge consent application and as such no monitoring conditions have been imposed for this consent.

Table 5.1: Relevant resource consents for the site [to be confirmed at later date]

Consent type	Consent status	Permit no.	Expiry date
Industrial or Trade Process Consent			

5.2 Corrective/preventative action

All monitoring requirements will have been assigned to positions held within the Site, and will be provided in this plan as a task sheet after site commissioning. Staff responsible for monitoring is also responsible for presenting the results at each monthly site meeting. Any potential exceedance issues will be discussed during the meeting with the Site Manager and an appropriate course of action will be decided upon to prevent future reoccurrence.

6 Environmental audits

The purpose of the environmental audit is to check the implementation of and compliance with environmental management procedures and control, including those outlined in the ITA EMP. The environmental audit findings will be reported accordingly to enable any discrepancies to be identified and actioned accordingly.

An environmental audit will be undertaken on an annual basis. This audit may be part of the annual LMP review and/or annual compliance monitoring report to the Council. This audit may take the form of a commentary on the compliance status against each section of the ITA EMP and against each of the conditions of the consent.

7 Applicability

This report has been prepared for the exclusive use of our client Waste Management NZ Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
	
.....	.....
Matt Bevington	Simonne Eldridge
Senior Environmental Scientist	Project Director

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AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Stormwater Monitoring and Contingency Plan

+

Stormwater Monitoring Programme

Document Control

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CONTENTS

LMP Section 3.23

1. INTRODUCTION

1.1 Scope of this section

This section of the Landfill Management Plan (LMP) describes:

- the stormwater system
- stormwater monitoring
- contingency responses

This section is the Stormwater Monitoring and Contingency Plan (SMCP), and embodies the Stormwater Monitoring Programme (SMP), required by consent condition ….

Revision of this section would follow the general procedure for any revision of the LMP.

2. STORMWATER REGIME

2.1 Overview

2.1.1 Eastern Block

Description

- pine forest in the head of Valley 1
- central stream and tributaries
- downstream to neighbours' farmland near Spindler Road
- further downstream to the Hoteo River and beyond to the Kaipara Harbour

Landfill activity

- landfill footprint (where the waste will be placed – Valley 1)
- internal access roads
- working face
- daily cover and intermediate cover
- workshops
- re-fueling facility
- wheel wash
- leachate treatment plant
- gas treatment plant and gas-to-energy plant
- goods storage

Other activity

- existing forestry operations will continue.

2.1.2 Western Block

Description

- farm
- pine forest blocks

- wetlands
- native bush blocks
- downstream direct into the Hoteo River

Landfill activity

- soil stockpile 1
- ecological enhancement planting

Other activity

- existing forestry operations (on part of Springhill farm) will continue
- off-set pine forestry replaces a limited area of bare farmland

The Western Block will not be used for waste disposal.

2.1.3 Southern Block

Description

- pine forest
- wattle forest
- native bush
- stream
- downstream to NMA and Waiteraire Stream

Landfill activity

- main access road
- bin exchange area
- culvert over stream
- bridge over Waiteraire Stream

The Southern Block will not be used for waste disposal.

2.1.4 Waiteraire Tributary Block

Description

- pine forest
- streams
- downstream to SEA, Sunnybrook Reserve and Waiteraire Stream

Landfill activity

- soil stockpile

Other activity

- existing forestry operations will continue

The Waiteraire Tributary Block will not be used for waste disposal.

2.1.5 Waiwhiu Stream

Description

- pine forest
- downstream to Waiwhiu Stream

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Landfill activity

- cutting of walking tracks

Other activity

- existing forestry operations will continue

The Waiwhiu Stream catchment will not be used for waste disposal.

2.1.6 Hōteo River

The Hōteo River ultimately receives stormwater from all the above sources.

2.2 Baseline monitoring

Table …

Location	Baseline monitoring reason	Ongoing
MC1	Water quality (as indicated by macroinvertebrate health) in NMA. Downstream from access road.	Scheduled
MC2	Supplementary to MC1. Downstream from part of access road.	As required for investigations or periodic reassessment.
MC3	Water quality (as indicated by macroinvertebrate health). Downstream from landfill.	Scheduled
MC4	Water quality (as indicated by macroinvertebrate health). Control site for landfill.	Scheduled
MC5	Water quality (as indicated by macroinvertebrate health). Downstream from Stockpile 1. Downstream from areas of land use change from farm to forestry.	Scheduled
MC6	Water quality (as indicated by macroinvertebrate health). Downstream from area of land use change from farm to forestry.	Scheduled
SW1	Water quality (chemistry). Downstream from access road just before confluence with W Stream (downstream of access road bridge).	Scheduled

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Location	Baseline monitoring reason	Ongoing
SW2	Water quality (chemistry). Control site upstream of access road.	As required for investigations or periodic reassessment.
SW3	Water quality (chemistry). Downstream from landfill.	Scheduled
SW4	Water quality (chemistry). Control site for landfill.	Scheduled
H1, H2, H3 (Hoteo River and Waiteraire Stream)	Water quality (chemistry). Background information.	At landfill's discretion, and if required in response to an incident.

A summary of the findings of baseline monitoring to May 2019 is provided in:

Auckland Regional Landfill, Water Quality Baseline Monitoring Report, Prepared for Waste Management NZ Ltd. Prepared by Tonkin & Taylor Ltd. Date May 2019. Job Number 1005069.1170.

2.3 Risks - stormwater

Table …

Risks - landfill operations	Mitigations
<u>Sediment</u> Any excessively silt-laden water and sedimentation could have an effect on stream organisms. The potential sediment generating activities are the landfill operations (Eastern Block), soil stockpiles (Western Block and Waiteraire Tributary Block), and forestry (parts of all blocks) Waterways with high ecological values and ultimately the Hoteo River are downstream from all project footprint areas. The fauna in these habitats are sensitive to sediment. Some areas of NMAs, SEAs and wetlands are downstream of the project footprint (Southern Block, Western Block and Waiteraire Tributary Block), and high value reaches are downstream from the landfill footprint (Eastern Block).	Physical works described in LMP … ESCPO. • methods for avoiding erosion • primary silt traps • permanent sediment ponds • riparian planting - part of the aquatic ecological mitigation and enhancement package. • terrestrial planting - part of the ecological mitigation and enhancement package. Maintenance described in LMP … SOMP and LMP … ESCPO. • de-silting of ponds • repair of fences and riparian planting • suck out sumps alongside access road Tasks described in LMP sections on disposal, erosion and sediment control for landfill operations, and industrial and trade activity. • regular inspections • planting of bare ground

LMP Section 3.23

Risks - landfill operations	**Mitigations**
	Monitoring listed here and in LMP …. • suspended sediment measurements • aquatic fauna surveys
<u>Flooding</u> Downstream neighbours on Spindler Road have been affected by log jams, and a number of properties are affected by flooding at Hoteo bridge. Climate change is thought to be exacerbating the issues. For design of stormwater ponds and channels, rainfall intensities have been taken from Auckland Council's design standards that show that the Dome forest area has very high rainfall compared to elsewhere in the Auckland region, and this is confirmed anecdotally by neighbours.	Design described in the consent application. • permanent ponds which spread out the flow to avoid flash flooding • allowance for increasing rainfall intensities due to climate change • dams that will capture logs from upstream • restrictions on replanting of pines on stream banks
<u>Contamination - Landfill</u> The waste and other sources pose a risk, albeit unlikely with proper care, that they might affect water quality downstream.	Physical works described in LMP … ITA. Procedural controls described in the waste control section LMP … Tasks described in LMP sections on waste control, disposal, and industrial and trade activity. Monitoring listed here in this section LMP …. • Continuous electronic measurements • Grab sampling for chemistry tests • Stream fauna surveys
<u>Sediment – forestry</u> Harvest inevitably temporarily exposes the ground to more erosion and therefore more sediment.	Physical works • silt dams created prior to harvest in Valley 1 • restrictions on replanting on main stream banks or in defined wetland
<u>Contamination - Bin exchange area</u> Potential contamination from trucks, bin exchange vehicles and unsealed bins.	Design and physical works described in consent application … • sealed pavement • rain garden for stormwater run-off Tasks described in LMP … BEAMP. • regular inspections of site • regular inspections of bins

LMP Section 3.23

Risks - landfill operations	**Mitigations**
	Maintenance described in LMP … SOMP. • re-conditioning of rain garden
<u>Contamination - Access Road</u> Potential contamination related to roads generally could occur on the access road e.g. oil drips, surface wear, tyre wear, and mud dropping from truck wheels, all of which could wash off towards the nearby stream.	Design and physical works described in the consent application … • wheel wash • road-side drains and spreader discharge Tasks and scheduled maintenance described in this LMP section and LMP sections … ESCPO, SOMP, … Monitoring listed here in LMP …. SMCP
<u>Sediment - Waiwhiu Stream catchment</u> Sediment could be generated by forestry at harvest time. No landfill-related activity will take place in the Waiwhiu stream catchment part of the landholdings.	The WMNZ landholding in the Waiwhiu catchment will be under the operational control of a separate forestry rights holder who will be obliged to adhere to the National Environmental Standard for Plantation Forestry.

3. MONITORING (STORMWATER MONITORING PROGRAMME)

3.1 Monitoring parameters and schedule

This Section 4, in combination with the Appendices to this LMP section, is the 'Stormwater Monitoring Programme' (SMP) required by consent condition … .

Surface water chemistry parameters are presented in a table in Appendix 7.

Sampling locations are shown on site plans in Appendices 1, 2 and 6.

Baseline monitoring in the streams has a more extensive parameter list and more frequent monitoring for a limited time as indicated in the table in Appendix 7.

The landfill operator may add parameters for supplementary information at its discretion.

The monitoring programme is summarised in the table below (database extract) and in the list of parameters (Appendix 7).

Table …

LMP Section 3.23

Location / Event / Topic	Parameter	Frequency	TL1	TL2
Stormwater pond system OUTLET (wetland)	Surface water parameters from LMP SMCP App 6.	Fortnightly	Limits tba.	Limits tba.
Stormwater pond system OUTLET (wetland)	Conductivity and temperature	Continuous	Limits tba.	Limits tba.
Stormwater pond system OUTLET (wetland)	Turbidity	Continuous	Limits tba.	Limits tba.
Stormwater pond system OUTLET (wetland)	Flow rate	Continuous	No limit. Monitored for essential information.	No limit. Monitored for essential information.
Stormwater pond system OUTLET (storm bypass)	Surface water parameters from LMP SMCP App 6.	As required	Limits tba.	Limits tba.
Stormwater pond system OUTLET (storm bypass)	Flow rate	As required	35.1 m3/s (to be confirmed in final design).	37.5 m3/s (to be confirmed in final design).
Stormwater pond system INFLOW	Conductivity and temperature	Continuous	Limits tba.	Limits tba.
Streams downstream from project footprint, and control sites	Surface water parameters from LMP SMCP App 6.	Quarterly	Limits tba.	Limits tba.
Soil stockpiles 1 & 2 sedimentation pond outlets	Surface water parameters from LMP SMCP App 6.	Weekly	Limits tba.	Limits tba.
Soil stockpiles 1 & 2 sedimentation pond outlets	Turbidity	Continuous	Limits tba.	Limits tba.
Bin exchange area stormwater run-off via rain garden	Surface water parameters from LMP SMCP App 6.	Weekly	Limits tba.	Limits tba.

3.2 Monitoring procedures

Separate detailed step-by-step procedures will be used for monitoring events (variously known as work instructions, standard operating procedures, and safe work method statements). Procedures will be provided in a separate volume. Only the key features of those procedures are highlighted here.

Table …

Procedure	Key steps
Continuous monitoring of conductivity, turbidity and pond level in the landfill valley	• Electronic measurements datalogged • Radio telemetry - web recording • Automated notifications of trigger level exceedances • Primary and/or secondary calibration schedule • Weekly inspection • Corrective action tracking • Maintenance records • Function check on installation design
Grab sample for chemical analysis	• Pre-ordered bottles • Field parameter measurements • Field preservative and handling precautions • Avoidance of sample spoiling e.g. by floating matter • Chain of custody documentation • Time restrictions

LMP Section 3.23

Procedure	Key steps
Laboratory test methods and Limits of Detection	• Listed in Appendix 4
Annual Environmental Report	• Include items required by LMP … ITAMP • Stormwater monitoring results • Summary of contingency actions • Objective evaluation of the site's environmental performance relating to water

3.3 Reporting

Table …

Location / Event / Topic	Report to	Method	Frequency
Environmental report	Auckland Council	Email	Annually
Environmental report copy	Community Liaison Group	Email to advise of its availability	Annually
Stormwater Monitoring and Contingency Plan to be submitted prior to Landfill Commencement Date	Auckland Council	Email or filedrop	At least 3 months before
Any spill into stormwater and TL2 exceedance.	Auckland Council	Email	Immediately
Stormwater contamination investigation	Auckland Council	Email	Within 5 days after

4. CONTINGENCY

4.1 Trigger Levels - general

4.1.1 Trigger Levels

Response limits (or trigger levels) are values for the monitoring parameters which, if exceeded, require a course of action to be taken. Upon completion of a monitoring event, the results will be checked against the pre-specified response limits. If no response limit is exceeded, the monitoring event will be routinely reported in due course. If any response limit is exceeded, action will be taken immediately as described in this contingency plan.

Response guidelines are summarised in the next section below.

The limits are set at two levels (TL1 and TL2) as follows.

4.1.2 Trigger Level 1 (Lower response limit)

Exceedance of TL1 warns of potential adverse effects, warns of potential future non-compliance with the resource consent conditions, requires investigation and reporting, and might require remedial action. For surface water, TL1 is reached if one or more individual parameters exceed the listed TL1 limits (Table ...).

4.1.3 Trigger Level 2 (Upper response limit)

Exceedance of TL2 will be regarded as an indication that significant environmental harm and breaches of consent conditions either have occurred, are currently occurring, or are about to occur. The upper limits will be set either at the limits (if any) specified in the resource consent, or at limits which if exceeded indicate non-compliance. Exceedance of TL2 usually requires urgent mitigative actions, notification of authorities, calling for or reference to recent relevant independent advice, and prompt investigations and remedies. For surface water, TL2 is reached if one or more individual parameters exceed the listed TL2 limits (Table 5.2 below).

4.1.4 Emergency

Extreme exceedance of TL2 might require reference to the emergency plan.

4.1.5 Definition of leachate contamination

“Leachate contamination”, "contamination" and “contaminant … discharge to water” are referred to in consent conditions ... .

For the purposes of this LMP these terms are taken to mean:

- TL2 has been exceeded in monitoring, and;
- There is observed or measured evidence of the presence of leachate or site-derived liquid contaminant in a watercourse or pond somewhere outside the landfill footprint, and;
- Independent specialist advice is that a significant change has occurred to the quality of surface water discharging from the site due to leachate.

This definition aims to encompass all events for which the regulator expects notification and liaison in regard to response actions. If investigation of a monitoring result or observation subsequently reaches a different conclusion from the first call, i.e. that leachate either was or was not the cause, then the event may be re-rated retrospectively accordingly.

4.1.6 Flowchart

The procedure to be followed upon receipt of monitoring results is illustrated in Appendix 8.

4.2 Response guidelines

Table …

Contingency triggering event	**Response guidelines**
Pond conductivity/ turbidity	Verification of readings (TL1 and TL2) • Inspect the monitoring site to check that the instrument is functioning correctly • Inspect the monitoring site to check that there is flow (zero flow means TLs won't apply, but will still be reported with explanations in the annual environmental report) • Check the telemetric monitoring outputs for consistency across the site • Use portable meters to repeat or take parallel readings • If not already done, take a grab sample from the pond discharge flow and analyse it for indicator parameters - Add metals and other parameters considered likely to help identify whether or not the source is leachate. Urgent remedial and precautionary action (TL2 only) • Close the pond outlet decant valve, so that discharge will only occur over the service spillway after the pond is full i.e. dilution is maximised and impact if any on the stream is minimised • Turn off (or turn on) leachate extraction pumps according to observations • Follow emergency procedures as for a spill or a stormwater control structure failure • Close off any water inputs to the surface water system • Use site resources to immediately take field measurements at the monitoring site, pond outlet and upstream to find and assess the source of the TL2 • If the source is reasonably assessed as leachate breakout regardless of flow rate, proceed in accordance with the response guidelines in the relevant LMP sections on cover and leachate. • If the source is land management activity and the flow rate is very low (less than approximately 2.0 litres/minute), then complete the investigations and sampling for confirmation. • Note: Very low flow rate may be combined with conductivity TL exceedance due to land management activities e.g.: spreading freshly excavated clay as cover; exposing natural ground which initially yields run-off high in soluble ions; placing topsoil; seeding and fertilising; animal grazing; spreading gravel such as limestone on road surfaces; passing of a water truck

Contingency triggering event	Response guidelines
	washing the adjacent road; natural vegetation die-off; stagnation of water in dry weather. • Note: The final discharge sluice valves might not be perfectly water-tight when closed. These valves may be closed with the aim of preventing discharge while pond water is being held to allow greater sedimentation to occur within the site, but there may be a residual small "trickle" discharge. If the discharge flow rate from the pond is very low i.e. a trickle, then the impact on the receiving water will likely be too small to measure. • In all cases, record findings for the regular annual report. Planned corrective and preventative action (TL1 and TL2) • Alter the pond discharge flow rate to allow for dilution into the stream before stream conductivity/ turbidity reaches its TL1 • Close the decant valve to cease discharging from the pond altogether before the pond discharge conductivity/ turbidity reaches its TL1 • Open the decant valve only when the stream is in flood, to avoid specific environmental harm, and to provide capacity to increase detention time to reduce sediment load for cleaner discharge during sensitive low flow periods. • Isolate any identified sources of contaminated water.
Pond discharge water quality	Urgent remedial and precautionary action (TL2 only) • Close the service spillway gate • Go to the spill response plan if applicable Verification of measurements and investigation (TL1 and TL2) • Follow the previous advice of the specialist adviser if a previous equivalent exceedance occurred in the past three years, otherwise re-seek advice • Inspect catchments to identify significant contributing sources and their possible relationship with the triggered parameters e.g. freshly excavated natural ground, landfill, farmland, etc. (response actions will depend on whether the parameters relate to contaminants like leachate instead of other sources) • Take samples and/or field parameter measurements within the site as well as at the point of discharge Planned corrective and preventative action (TL2) If a water contamination event is confirmed, remedial actions will be tailored according to the investigation findings. Possible actions include: • Chemical treatment of contaminated water in the ponds themselves

Contingency triggering event	Response guidelines
	• Aeration of the pond water by any practical means e.g. jetting into the air back over the ponds - This might suffice in some instances • Pumping of contaminated water back to ponds at the heads of the catchments • Treatment of contaminated water by spray irrigation back onto landfill cover or vegetated final cap • Closure of the wheel wash • Disposal of contaminated water back into the landfill working face, soakage pit, or leachate system • Trucking contaminated water to a wastewater treatment plant • Pumping of pond water to a holding pond to be formed on the existing landfill where the contaminated water will partly soak in and partly be progressively treated as leachate. • Pumping pond water out to another sedimentation pond in small amounts for assimilation. • Pumping of water in from another sedimentation pond for rejuvenation. • Use of contaminated water for moisture conditioning of earth materials for landfill construction • Repairing the source of the issue e.g. leachate breakout • Changing work procedures to manage risk of recurrence • Afterwards, excavating contaminated pond sediment and disposing of it in the landfill.
Wheel wash holding pond water quality	Urgent remedial and precautionary action (TL2 only) • Hold water in the holding pond without discharge Verification of measurements and investigation (TL1 and TL2) • Calculate whether discharge from the holding pond, after dilution into the on-site pond system, will cause pond water to exceed its TL1 while discharging • Review sources of water input and nature of vehicles which have been washed • Analyse for additional parameters Planned corrective and preventative action (TL1) • Discharge to the pond only if calculations for dilution into the pond system are acceptable and the pond would not discharge TL1 water as a result. • Dispose of the water by irrigation onto grassed cover or landfill roads Planned corrective and preventative action (TL2) • Chemically treat the water in the holding pond, and dispose of sludges in the landfill

Contingency triggering event	Response guidelines
	• Treat the water as leachate, e.g. by injection into the landfill or by carting off-site to a proper treatment facility.
Downstream water quality	Urgent remedial and precautionary action (TL2 only) • Notify the authority. Ph (09) 301 0101 24hr or (09) 3773107 Pollution Hotline. Verification of measurements and investigation (TL1 and TL2) • Investigate whether the landfill could be the source of stream contamination, by observation, review of test results, and by additional testing if appropriate of landfill site sources. Planned corrective and preventative action (TL2) • If a leachate contamination event is confirmed, remedial actions will be tailored according to the investigation findings - the same as for pond discharge water quality as above. • If the source is not conclusive, assist Council as requested.

5. TASK LISTS

5.1 Tasks and scheduled maintenance

Table …

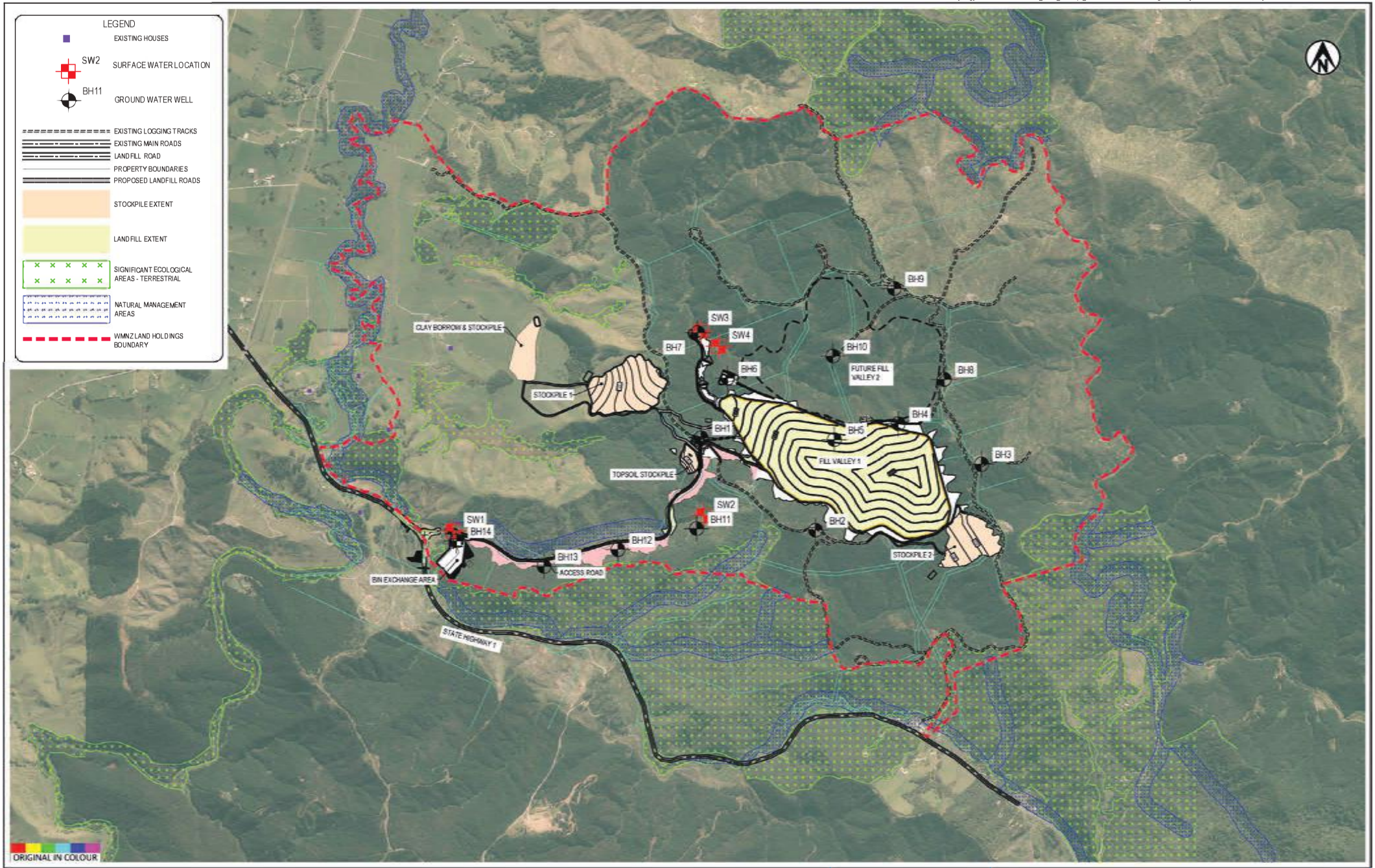
Role	Task	Frequency
Landfill Engineer	Prepare and submit the annual Environmental Report.	Annually
Monitoring Technician	Take water quality grab samples from streams.	Six-monthly
Monitoring Technician	Take macroinvertebrate samples from streams.	Annually
Monitoring Technician	Review readings from fixed meters in pond inflow (coming from landfill footprint).	Daily
Monitoring Technician	Review readings from fixed meters in pond outflow (wetland).	Daily
Monitoring Technician	Review readings from fixed meters in soil stockpile outflows.	Daily
Monitoring Technician	Take water quality grab samples from the pond system outflows (wetland and storm by-pass).	Monthly
Monitoring Technician	Calibrate fixed meters for stormwater monitoring.	Annually
Monitoring Technician	Calibrate portable meters for stormwater monitoring.	Annually

6. APPENDICES

6.1 Surfacewater monitoring locations site plan

(one page)

C:\12dSynergy\data\ALBTCAD\Polaris_WOL_Concept_55\CAD\FIG\Polaris-F1.dwg 2019-May-21 9:39:47 AM Plotted By: JUAN CARLOS ABREGO CASTILLO



A3 SCALE 1:20000

0 200 400 600 800 1000

Aerial photo sourced from Auckland Council GIS Website.

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PROJECT No.	1005069.1200	
DESIGNED	RCR	Feb.19
DRAWN	RBS	Feb.19
CHECKED	SFE	May.19
	Simonne F Eldridge	May.19
	APPROVED	DATE

CLIENT **WASTE MANAGEMENT NZ LTD**

PROJECT **AUCKLAND REGIONAL LANDFILL**

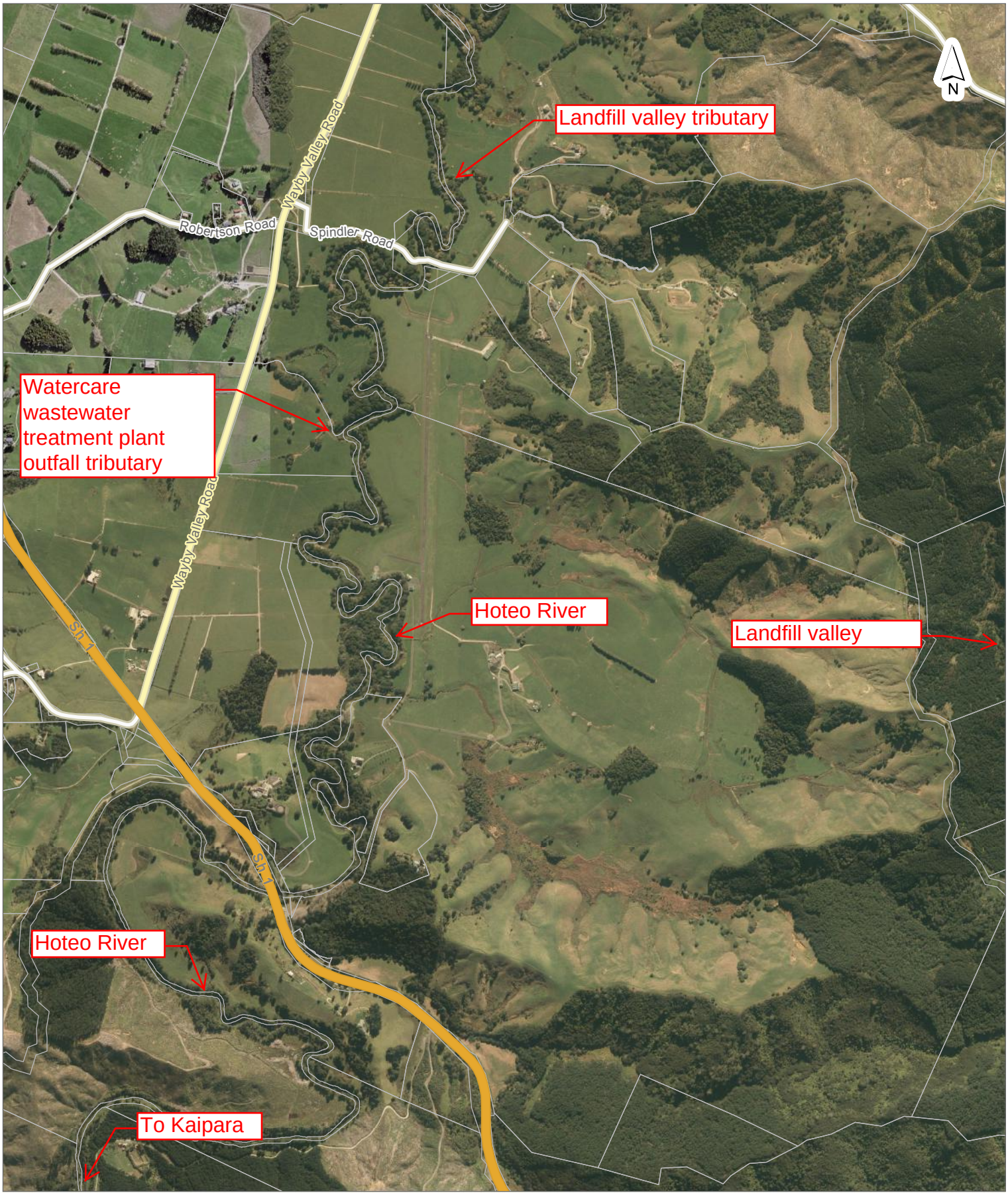
TITLE GROUNDWATER AND SURFACE WATER SAMPLING LOCATIONS

SCALE (A3) 1:20000 FIG No. Figure 1 REV 1

6.2 Hoteo River monitoring site plan

(one page)

Map



DISCLAIMER:
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Hoteo River sampling sites
(Sampling sites are not yet shown)

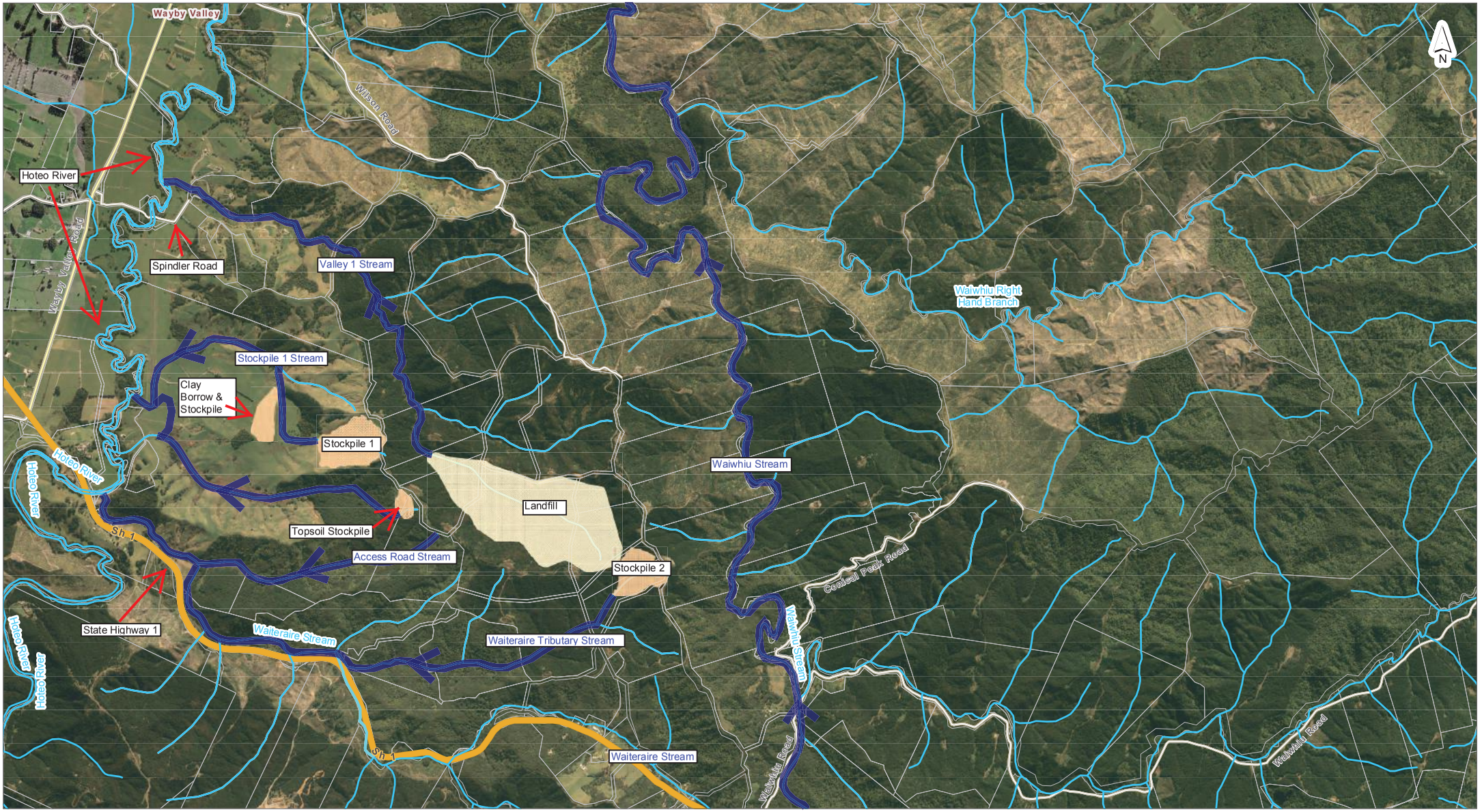
0 75 150 225
Meters

Scale @ A4
= 1:15,000

Date Printed:
14/06/2019

6.3 Hoteo tributaries site plan

(one page)



Stormwater run-off from landfill works to Hoteo River

0 275 550 825
Meters

Scale @ A3
= 1:25,000

Date Printed:
26/07/2019

6.4 Approved test methods for water quality

(representative laboratory report - 4 pages)

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	Waste Management NZ Limited	**Lab No:**	2182835	SPv1
Contact:	Hemanta Yadav	**Date Received:**	28-May-2019	
	C/- Waste Management NZ Limited	**Date Reported:**	04-Jun-2019	
	PO Box 228	**Quote No:**	84162	
	Silverdale	**Order No:**	1729530 ON 620	
	Auckland 0944	**Client Reference:**	4176	
		Add. Client Ref:	List C	
		Submitted By:	Hemanta Yadav	

Sample Type: Aqueous

Sample Name:		List C 5795 27-May-2019	List C 5796 27-May-2019	List C 5797 27-May-2019	List C 5798 27-May-2019	List C 5799 27-May-2019
Lab Number:		2182835.1	2182835.2	2182835.3	2182835.4	2182835.5
Individual Tests						
Sum of Anions	meq/L	8.8	3.4	4.5	5.7	2.6
Sum of Cations	meq/L	10.1	3.8	5.0	6.1	2.9
Turbidity	NTU	4.9	11.3	30	3.8	2.1
pH	pH Units	8.0	8.0	8.2	8.0	7.2
Total Alkalinity	g/m³ as $CaCO_3$	142	85	122	94	44
Total Hardness	g/m³ as $CaCO_3$	320	132	175	210	92
Electrical Conductivity (EC)	mS/m	93.3	36.5	45.6	58.2	30.8
Total Suspended Solids	g/m³	6	16	48	5	< 3
Dissolved Aluminium	g/m³	< 0.003	0.007	0.006	0.003	0.005
Dissolved Calcium	g/m³	99	42	56	66	27
Dissolved Iron	g/m³	< 0.02	< 0.02	< 0.02	< 0.02	0.21
Total Iron	g/m³	0.112	0.23	0.65	0.092	0.48
Dissolved Magnesium	g/m³	16.3	6.7	8.3	9.9	6.0
Dissolved Manganese	g/m³	0.055	0.0007	0.0006	0.0008	0.025
Dissolved Potassium	g/m³	9.8	5.9	6.6	5.9	2.6
Dissolved Sodium	g/m³	82	23	31	43	24
Sodium Absorption Ratio (SAR)*	$(mmol/L)^{0.5}$	2.0	0.9	1.0	1.3	1.1
Total Zinc	g/m³	0.0093	0.0028	0.0041	0.0013	0.0012
Chloride	g/m³	68	17.7	17.3	25	32
Total Ammoniacal-N	g/m³	0.091	0.040	< 0.010	< 0.010	< 0.010
Nitrite-N	g/m³	0.008	0.002	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m³	0.055	0.005	< 0.002	< 0.002	0.010
Nitrate-N + Nitrite-N	g/m³	0.064	0.007	< 0.002	0.003	0.011
Total Kjeldahl Nitrogen (TKN)	g/m³	0.64	0.86	1.05	0.65	0.23
Sulphate	g/m³	193	59	76	149	42
Chemical Oxygen Demand (COD)	g O_2/m³	25	28	38	20	12
Oil and Grease	g/m³	< 2	< 2	< 2	< 2	< 2
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	0.0013	< 0.0010	< 0.0010	0.0025	< 0.0010
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper	g/m³	< 0.0005	< 0.0005	< 0.0005	0.0011	< 0.0005
Dissolved Lead	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m³	0.0070	0.0020	0.0024	0.0039	0.0006
Dissolved Zinc	g/m³	0.0041	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Sample Type: Aqueous						
Sample Name:		List C 5795 27-May-2019	List C 5796 27-May-2019	List C 5797 27-May-2019	List C 5798 27-May-2019	List C 5799 27-May-2019
Lab Number:		2182835.1	2182835.2	2182835.3	2182835.4	2182835.5
Total Petroleum Hydrocarbons in Water						
C7 - C9	g/m^3	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
C10 - C14	g/m^3	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
C15 - C36	g/m^3	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7

Sample Name:		List C 5800 27-May-2019	List C 5801 27-May-2019			
Lab Number:		2182835.6	2182835.7			
Individual Tests						
Sum of Anions	meq/L	3.5	3.9	-	-	-
Sum of Cations	meq/L	3.9	4.5	-	-	-
Turbidity	NTU	9.3	4.3	-	-	-
pH	pH Units	7.1	7.2	-	-	-
Total Alkalinity	g/m^3 as $CaCO_3$	74	98	-	-	-
Total Hardness	g/m^3 as $CaCO_3$	123	144	-	-	-
Electrical Conductivity (EC)	mS/m	39.2	45.1	-	-	-
Total Suspended Solids	g/m^3	9	4	-	-	-
Dissolved Aluminium	g/m^3	0.008	0.007	-	-	-
Dissolved Calcium	g/m^3	37	46	-	-	-
Dissolved Iron	g/m^3	0.34	0.49	-	-	-
Total Iron	g/m^3	1.55	1.62	-	-	-
Dissolved Magnesium	g/m^3	7.5	7.3	-	-	-
Dissolved Manganese	g/m^3	0.24	0.64	-	-	-
Dissolved Potassium	g/m^3	3.8	4.9	-	-	-
Dissolved Sodium	g/m^3	30	34	-	-	-
Sodium Absorption Ratio (SAR)*	$(mmol/L)^{0.5}$	1.2	1.2	-	-	-
Total Zinc	g/m^3	0.0017	0.0013	-	-	-
Chloride	g/m^3	35	37	-	-	-
Total Ammoniacal-N	g/m^3	< 0.010	0.048	-	-	-
Nitrite-N	g/m^3	< 0.002	< 0.002	-	-	-
Nitrate-N	g/m^3	< 0.002	< 0.002	-	-	-
Nitrate-N + Nitrite-N	g/m^3	< 0.002	< 0.002	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m^3	0.37	0.52	-	-	-
Sulphate	g/m^3	50	45	-	-	-
Chemical Oxygen Demand (COD)	$g\ O_2/m^3$	21	26	-	-	-
Oil and Grease	g/m^3	< 2	< 2	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m^3	< 0.0010	< 0.0010	-	-	-
Dissolved Cadmium	g/m^3	< 0.00005	< 0.00005	-	-	-
Dissolved Chromium	g/m^3	< 0.0005	< 0.0005	-	-	-
Dissolved Copper	g/m^3	< 0.0005	< 0.0005	-	-	-
Dissolved Lead	g/m^3	< 0.00010	< 0.00010	-	-	-
Dissolved Nickel	g/m^3	0.0011	0.0014	-	-	-
Dissolved Zinc	g/m^3	< 0.0010	< 0.0010	-	-	-
Total Petroleum Hydrocarbons in Water						
C7 - C9	g/m^3	< 0.06	< 0.06	-	-	-
C10 - C14	g/m^3	< 0.2	< 0.2	-	-	-
C15 - C36	g/m^3	< 0.4	< 0.4	-	-	-
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7	< 0.7	-	-	-

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 clean 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.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm filtration, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00005 - 0.0010 g/m^3	1-7
Total Petroleum Hydrocarbons in Water	Solvent Hexane extraction, GC-FID analysis, Headspace GC-MS FS analysis US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:2803,10734;26687,3629]	0.06 - 0.7 g/m^3	1-7
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-7
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) 23rd ed. 2017.	-	1-7
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 23rd ed. 2017.	0.07 meq/L	1-7
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 23rd ed. 2017.	0.05 meq/L	1-7
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 23rd ed. 2017.	0.05 NTU	1-7
pH	pH meter. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-7
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) 23rd ed. 2017.	1.0 g/m^3 as $CaCO_3$	1-7
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 23rd ed. 2017.	1.0 g/m^3 as $CaCO_3$	1-7
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 23rd ed. 2017.	0.1 mS/m	1-7
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m^3	1-7
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 23rd ed. 2017.	-	1-7
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.003 g/m^3	1-7
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.05 g/m^3	1-7
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.02 g/m^3	1-7
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.021 g/m^3	1-7
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.02 g/m^3	1-7
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.0005 g/m^3	1-7
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.05 g/m^3	1-7
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.02 g/m^3	1-7
Sodium Absorption Ratio (Dissolved)*	Calculation; from sodium, calcium and magnesium, as follows; (Na / 23) / [(Ca / 20 + Mg / 12.15)/2]$^{0.5}$ where the concentrations for these ions (Na, Ca and Mg) are expressed as g/m^3.	0.2 (mmol/L)$^{0.5}$	1-7
Total Zinc	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017 / US EPA 200.8.	0.0011 g/m^3	1-7
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m^3	1-7
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 23rd ed. 2017.	0.010 g/m^3	1-7
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.002 g/m^3	1-7
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-7
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.002 g/m^3	1-7

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D (modified) 4500 NH_3 F (modified) 23rd ed. 2017.	0.10 g/m^3	1-7
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m^3	1-7
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 23rd ed. 2017.	6 g O_2/m^3	1-7
Oil and Grease (trace level)	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease.	2 g/m^3	1-7
C7 - C9	Head Space, GCMS analysis.	0.06 g/m^3	1-7

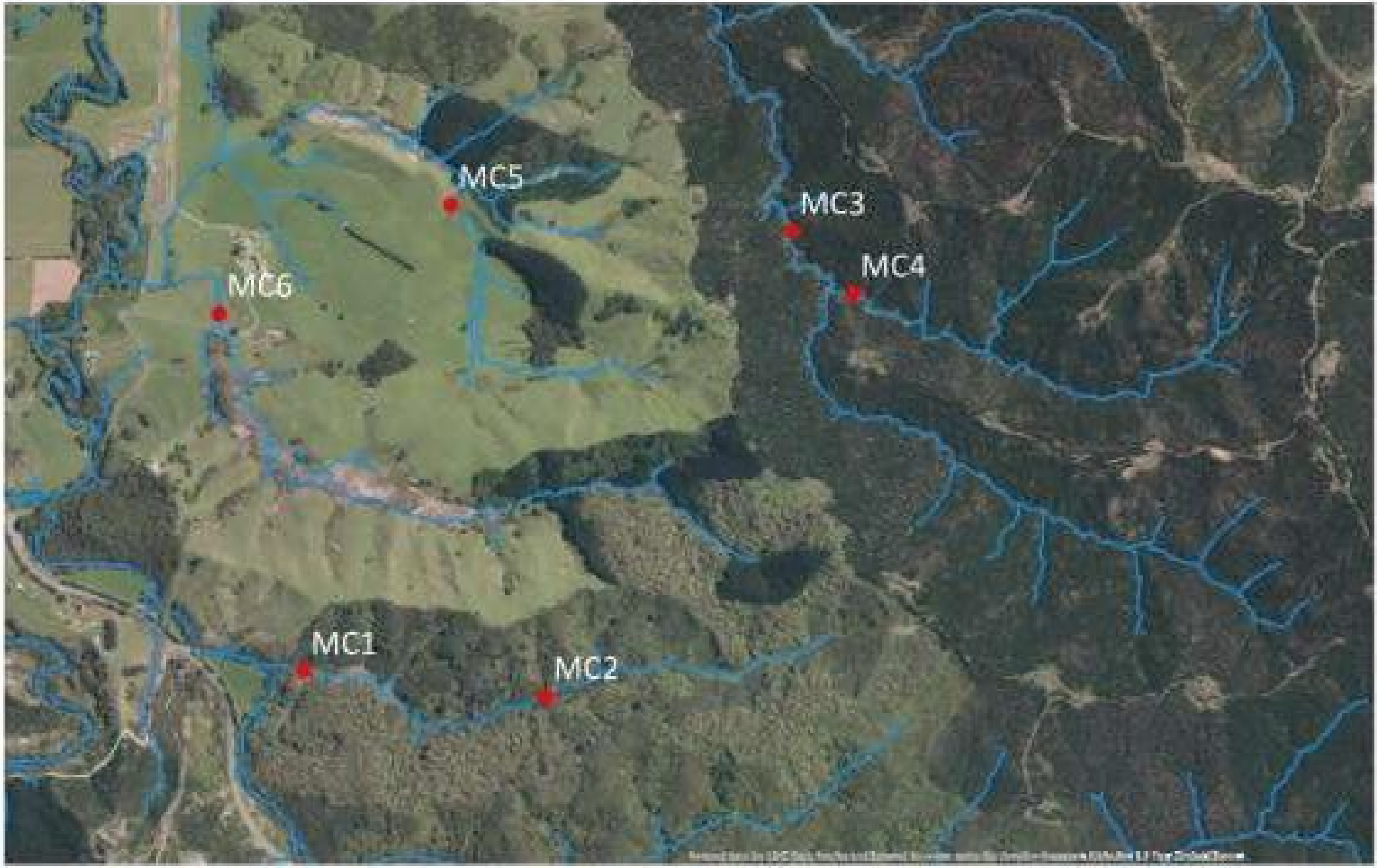
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

6.5 Macroinvertebrate monitoring site plan

(1 page)


MC5
MC3
MC4
MC6
MC1
MC2

6.6 Monitoring parameter lists

(2 pages)

AUCKLAND REGIONAL LANDFILL
WATER QUALITY ANALYSIS PARAMETER LISTS

Location >	Surfacewater pond OUTLET #1 (wetland)	Surfacewater pond OUTLET #1 (wetland)	Surfacewater pond OUTLET #1 (wetland)	Surfacewater pond OUTLET #2 (bypass only in storm)	Surfacewater pond OUTLET #1 (wetland)	Surfacewater pond INFLOW #1 (from landfill)	Surfacewater pond INFLOW #2 (pipe from upstream pond 5)
List >	PBL	P1	P2	P3	P4	C1	C2
Frequency >	quarterly for 2 yrs baseline only	fortnightly	quarterly	Per occurrence	If conductivity TL2 is exceeded	continuous	continuous
Consent # >	tba	tba	tba	tba	tba	tba	tba
Condition # >	C 019	C 169d	C 169d+169e	tba	C 143	C 142	C 142
Alkalinity	y	y	y				
Aluminium dissolved	**						
Aluminium total							
Ammonia N total	y	y	y	**	y		
Antimony							
Arsenic dissolved	y						
Barium							
BOD5							
Boron	y						
Cadmium dissolved	**		y				
Calcium	y						
Chloride	y	y	y		y		
Chromium dissolved	**		y				
COD	y		y		y		
Conductivity field	y	y	y	**			
Conductivity lab	y						
Conductivity continuous						y	y
Copper dissolved	y		y				
Cyanide							
Hardness	y						
Iron dissolved	y						
Iron total							
Lead dissolved	y		y				
Magnesium	y						
Manganese dissolved	y						
Mercury							
Molybdenum							
Nickel dissolved	y		y				
Nitrate N	y						
Nitrite N							
Oxygen diss. field	**	y	y				
pH field	y	y	y		y		
pH lab	y	y	y		y		
Phosphorus total	**						
Potassium	y						
Selenium							
Silver							
Sodium	y						
Sulphate	y						
Suspended solids		y	y	**			
Temperature field	y	y	y		y	y	y
Turbidity field	**						
Turbidity continuous							
Zinc dissolved	y		y				
Zinc total							
Cation/Anion balance	**						
Oil & grease			y				
Volatile Acids	**						
Phenols total	**						
Volatile Organic Compounds (Note 1)	y						
Semi Volatile Organic Compounds (Note 2)	y						
Total Petroleum Hydrocarbons (TPH)			y				
Polycyclic Aromatic Hydrocarbons (PAH)							
1,4-dioxane							
Poly-fluoroalkyl Substances (PFAS suite)							
Macroinvertebrates							
Flow rate estimate - field				**		y	y
Water depth - field				**			
Results required within	2 weeks	1 week	2 weeks	1 day	1 day	on-line	on-line
"Field" = measurement by site staff either at the sample site or in the on-site laboratory.							
"Dissolved" = either field-filtered by site staff or filtered by the analytical lab if the sample is delivered in a short time.							
* = Measurement specifically required by conditions of consent							
** = Added at site's discretion to aid interpretation of results							
? = In Baseline Monitoring Report May 2019; not in draft conditions; not scheduled for regular testing.							
Note 1 = VOC includes BTEX and chlorinated solvents							
Note 2 = SVOC includes organochlorine pesticides and DDT compounds							

AUCKLAND REGIONAL LANDFILL
WATER QUALITY ANALYSIS PARAMETER LISTS

Location >	Wheelwash holding pond prior to discharge	Surfacewater soil stockpiles pond outlets	Surfacewater industrial treatment outlets (bin exchange, energy centre, wash bay)	Stream water quality sites (SW1 SW2 SW4)	Stream water ecology sites (MC1-MC6)	Stream water Hoteo sites (H1-H3)
List >	A	S1	S2	SW	SM	H
Frequency >	Per release	weekly	weekly	quarterly	quarterly for 2 yrs then six-monthly	annually
Consent # >	tba	tba	tba	tba	tba	tba
Condition # >	C 169g	tba	tba	C 019	C 018, 168i	tba
Alkalinity				y		**
Aluminium dissolved				**		**
Aluminium total				?		
Ammonia N total	y		**	y		**
Antimony						
Arsenic dissolved				y		**
Barium						
BOD5				?		
Boron				y		**
Cadmium dissolved				**		**
Calcium				y		**
Chloride				y		**
Chromium dissolved				**		**
COD				y		**
Conductivity field	y		**	y		**
Conductivity lab				y		**
Conductivity continuous						
Copper dissolved				y		**
Cyanide						
Hardness				y		**
Iron dissolved				y		**
Iron total				?		
Lead dissolved				y		**
Magnesium				y		**
Manganese dissolved				y		**
Mercury						
Molybdenum						
Nickel dissolved				y		**
Nitrate N				y		**
Nitrite N						
Oxygen diss. field				**		**
pH field	y		**	y		**
pH lab				y		**
Phosphorus total				**		**
Potassium				y		**
Selenium						
Silver						
Sodium				y		**
Sulphate				y		**
Suspended solids	y	y		?		
Temperature field	y		**	y		**
Turbidity field				**		**
Turbidity continuous		y				
Zinc dissolved				y		**
Zinc total			**	?		
Cation/Anion balance				**		**
Oil & grease	y			?		
Volatile Acids						
Phenols total				?		
Volatile Organic Compounds (Note 1)				?		
Semi Volatile Organic Compounds (Note 2)						
Total Petroleum Hydrocarbons (TPH)						
Polycyclic Aromatic Hydrocarbons (PAH)						
1,4-dioxane						
Poly-fluoroalkyl Substances (PFAS suite)						
Macroinvertebrates					y	
Flow rate estimate - field				**	**	**
Water depth - field				**	**	**
Results required within	3 days	1 week	1 week	2 weeks	2 weeks	2 weeks
"Field" = measurement by site staff either at the sample site or in the on-site laboratory.						
"Dissolved" = either field-filtered by site staff or filtered by the analytical lab if the sample is delivered in a short time.						
* = Measurement specifically required by conditions of consent						
** = Added at site's discretion to aid interpretation of results						
? = In Baseline Monitoring Report May 2019; not in draft conditions; not scheduled for regular testing.						
Note 1 = VOC includes BTEX and chlorinated solvents						
Note 2 = SVOC includes organochlorine pesticides and DDT compounds						

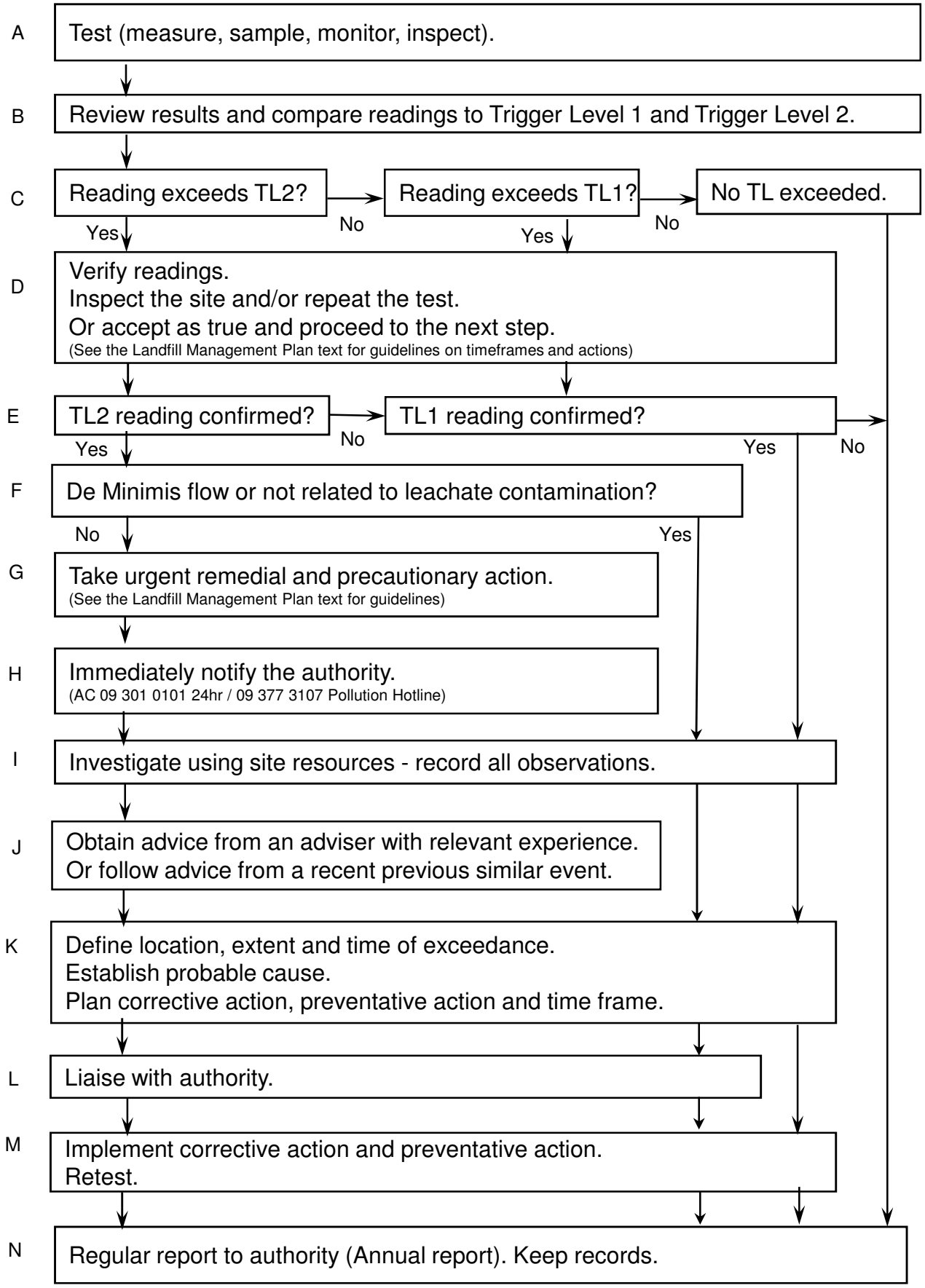
6.7 Contingency Plan Flowchart

(1 page)

AUCKLAND REGIONAL LANDFILL

Contingency Plan Flowchart

Surface Water and Ground Water



AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Groundwater Monitoring and Contingency Plan

Document Control

Date	Status	Issued by	Issued to	Distribution method / upload site / link
30/01/2020	Draft d1	BH		

CONTENTS

1. INTRODUCTION

1.1 Scope of this section

This section of the Landfill Management Plan (LMP) describes:

- the groundwater system
- groundwater monitoring
- contingency responses

Revision of this section would follow the general procedure for any revision of the LMP.

2. GROUNDWATER SYSTEM

2.1 Site Geology

The ground beneath the Landfill footprint and surrounding ridges is Pakiri Formation, a member of the Waitemata Group series. Weathered rock and residual soils i.e. silty sands or silty clays extend typically to depths of 0.3 m to 12.5 m. The Pakiri Formation bedrock is comprised of prominently weak to moderately strong sandstone and weak siltstone. Fracture zones were encountered throughout the bedrock.

Northland Allochthon geology is observed on the low-lying land towards the Hoteo River.

No geological fault lines have been found beneath the landfill footprint or elsewhere beneath the project footprint.

2.2 Shallow groundwater system

Groundwater is recharged by rainfall infiltration. The annual rainfall within Dome Valley is greater than the Auckland Region on average, with an annual rainfall of 1,200 to 2,000 mm/year compared to 1,200 to 1,300 mm/year for the Auckland Region.

Shallow perched groundwater layers around Valley 1 were observed by finding water in hand auger tests holes and machine boreholes that went down to approximately 50 m depth from the ridge tops which are 140 m to 240 m above sea level.

The perched groundwater layers contribute to stream flows in Valley 1, the floor of which is 80 m to 100 m above sea level.

The water levels in some wells respond quickly to rainfall, whereas others have steadier seasonal variation.

2.3 Deep groundwater system

Groundwater level data logging has revealed evidence of two groundwater systems – shallow and deep. The deeper regional water table is at 30 m to 40 m above sea level. It contributes to the stream flows in the Hoteo River which is 20 m to 25 m above sea level and in the Waiteraire Stream.

Groundwater flows at Valley 1 and the wider site are a reflection of the topography of the site. The steep terrain around the valley will dictate groundwater flows toward the valley floor streams. Percolation through the rock mass of the high elevation Pakiri Formation is expected to enter the

regional groundwater table, albeit at a relatively low rate due to the low permeability of the rock mass. The regional groundwater table is inferred to flow to the Hoteo River and potentially the Waiteraire Stream depending on the location.

The rock mass has a low hydraulic conductivity of between 1 x 10^{-9} and 3 x 10^{-6} m/s while the weathered soil has a low conductivity in the order of 10^{-10} m/s. The fractured zones have a higher hydraulic conductivity of 8.3 x 10^{-6} m/s. There is no evidence of any vertical pathways of fractured zones, however it is unclear if there are lengthy horizontal pathways.

The hydraulic gradient between the steep valley sides in Pakiri Formation and Valley 1 floor is estimated to up to 0.25 as groundwater flows inwards towards the Valley 1 centreline, while the hydraulic gradient towards Hoteo River and Waiteraire Stream is quite gentle and between 0.005 and 0.006.

2.4 Groundwater Quality

Baseline groundwater quality samples have been taken from monitoring wells. Results have been compared to ANZECC limits and drinking water standards to assess the ecological impact and potential effects on health.

The groundwater can be described being moderately alkaline and tending toward a bicarbonate type (sodium and magnesium). The natural groundwater has ANZECC exceedances in zinc and hexavalent chromium, however these natural exceedances are not at levels that would pose a risk to human health or the environment.

2.5 Baseline monitoring

A summary of the findings of baseline monitoring to May 2019 is provided in:

Auckland Regional Landfill, …. , Prepared for Waste Management NZ Ltd, Prepared by Tonkin & Taylor Ltd, Date May 2019, Job Number 1005069.1170 (consent application 30/5/19 Technical Reports A, B and E).

The following machine-drilled boreholes have undergone a baseline monitoring programme. The boreholes for the future ongoing monitoring programme are listed in the Schedules in Appendix 4.

Table …

Location	**Baseline monitoring GW chemistry**	**Baseline monitoring GW levels**
BH1	Yes	Yes
BH2	Yes	Yes
BH3	Yes	Yes
BH4	Yes	Yes
BH5	Yes	Yes
BH6	Yes	Yes
BH7	Yes	Yes
BH8	Yes	Yes
BH9	Yes	Yes

Location	Baseline monitoring GW chemistry	Baseline monitoring GW levels
BH10	Yes	Yes
BH11	Yes	Yes
BH12	Yes	Yes
BH13	Yes	Yes
BH14	Yes	Yes
BH15	Yes – commenced 2020	Yes – commenced 2020
TB01 (potable)	Yes	Yes

2.6 Risks - groundwater

Risks to groundwater relate primarily to the waste mass in Valley 1.

Table …

Risks - groundwater	Mitigations
Failure of temporary stormwater pipe under the landfill. If the stormwater pipe under the lining system crushes under the weight of waste, then the lining system could be damaged allowing leachate to reach stormwater and groundwater systems.	Design and construction to support the weight and to avoid piping erosion of backfill; quality control during construction; backfill of the pipe when it becomes obsolete. Monitoring of subsoil drains and groundwater wells.
Blockage of the main leachate collection pipe. If blockage occurs in the leachate collection pipe that is the principal point of discharge of leachate from the landfill by gravity drainage then leachate removal could be more difficult and leachate head on the liner could rise.	Design and construction with redundancy in the leachate collection system including a wide drainage blanket over the lining system and installation of a pump sump prior to waste placement as backup place to remove leachate. Monitoring of leachate levels in the landfill and monitoring of discharge flowrates of leachate from the landfill.
Failure of the structural earth fill toe bund. If the structural toe bund of the landfill fails then any free liquid leachate could escape into surfacewater and groundwater systems.	Proper geotechnical design and quality control during construction of the landfill's toe bund; liner design detailing to accommodate some differential movement of the base. Regular 'erosion and sediment control' inspections. Monitoring of groundwater in a borehole downstream.

Risks - groundwater	**Mitigations**
Failure of the lining system – short term. If the lining system fails, then leachate could pass through into the underlying ground and groundwater.	Lining system design including leachate drainage blanket to remove leachate off the lining system, extremely low permeability HDPE liner with protective geotextile cushion, geosynthetic clay liner (GCL) that would swell and seal up upon contact with leachate, compacted clay which has natural contaminant attenuation properties. Independent quality control of lining system construction. Groundwater quality monitoring in boreholes and subsoil drains.
Failure of the lining system – long term. If the lining system fails for example due to degradation over hundreds of years, then leachate could pass through into the underlying ground and groundwater.	As above, plus: Use of best available man-made technology in choice of high density poly ethylene liner, and best available natural soil materials i.e. clay and GCL to capture contaminants if any. Waste acceptance criteria which exclude hazardous waste and chemicals that might degrade the lining system layers. Aftercare monitoring programme, with provision to define it at that time. Final capping which will entomb the waste, and by keeping stormwater out, and by keeping the waste drained of leachate, there will eventually be a limited presence of liquid leachate to find a way out if any. Provision of buffer distance - Analyses show that if (and only if) this scenario occurs then it may take hundreds or thousands of years for any trace to be detectable in boreholes, streams or the river, by which time the contamination source (leachate in landfill) will have greatly weakened or ceased, and further that the traces will never reach levels that could affect food gathering or human health.
Excessive leachate generation due to poor cover. If the quality of daily and intermediate cover is poor then rain water infiltration would increase and more leachate would be generated. Increasing amounts of leachate leads to	Daily and intermediate cover protocols as described in LMP section …

Risks - groundwater	Mitigations
increasing risks of escape to stormwater and groundwater.	
Landfill instability If the landfill waste mass slumps or slips then waste could end up outside the footprint protected by the lining system.	Geotechnical design of the permanent slopes, capping layers, and temporary slopes on the waste. Regular walkover inspections.
Subsoil drain blockage. If subsoil drains beneath the lining system block up before the weight of waste is in place then groundwater uplift pressures could damage the lining system and groundwater inflows into the waste could increase leachate amounts.	Design of subsoil drains to be flushable and groutable; programming of construction and waste placement to avoid long periods that might allow uplift pressures to develop. Monitoring of flowrates and water quality in subsoil drains and leachate drains.
Lining system damage due to fire If a fire occurs deep in the waste or near the edge of the waste then heat could damage the lining system and potentially affect the containment of leachate and contamination of groundwater.	Proper waste placement procedures that reduce risk of fire e.g. diligent placement of daily cover and regular monitoring of gases that might indicate fire. Composite lining system that has non-flammable natural material i.e. clay to back up manufactured materials. Emergency management plan that includes de-brief to assess damage if any.
Oil spill If oil or hydrocarbon fuel spills onto the ground then some of it could reach stormwater or groundwater depending on clean-up. The same applies to leachate stored in tanks ready for treatment or removal.	Bunded and certified fuel and oil facilities. Spill response plan. Perpetual presence of machinery and staff that can respond quickly to a spill emergency.

3. MONITORING

3.1 Monitoring parameters and schedule

Sampling locations are shown on the site plan in Appendix 1.

Groundwater chemistry parameters are listed in the table in Appendix 2.

The monitoring programme is summarised in the table below (database extract).

Table …

Location / Event / Topic	Parameter	Frequency	TL1	TL2
Schedule One boreholes	Groundwater chemistry samples	Quarterly	tba	tba
Schedule Two boreholes	Groundwater level measurements	Quarterly	tba	tba
Subsoil drains beneath landfill footprint	Groundwater chemistry samples	Quarterly	tba	tba
Subsoil drains beneath landfill footprint	Flow rate	Quarterly	tba	tba

3.2 Monitoring procedures

Separate detailed step-by-step procedures will be used for monitoring events (variously known as work instructions, standard operating procedures, and safe work method statements). Only the key features of those procedures are highlighted here.

Table …

Procedure	**Key steps**
Groundwater sample	• Boreholes listed in Schedule One • Purging protocol • Pre-ordered bottles • Field filtering • Field parameter measurements • Field preservative and handling precautions • Avoidance of cross-contamination • Chain of custody documentation
Groundwater levels	• Boreholes listed in Schedule Two • Clean equipment • Locking and unlocking of well heads • Recording device
Laboratory test methods and Limits of Detection	• Listed in Appendix 3.
Subsoil drain flow rate measurement	• Identification of pipe • Direct method (jug and stopwatch) v flow meter • Recording device
Annual Environmental Report	• Groundwater monitoring results • Objective assessment of results

Figure … : Well head of borehole with dedicated pneumatic pump installed

3.3 Reporting

Table …

Location / Event / Topic	Report to	Method	Frequency
Groundwater Monitoring and Contingency Plan to be submitted prior to Landfill Commencement Date.	Auckland Council	Email	At least 3 months before
Groundwater contamination detected.	Auckland Council	Email	Within 5 days after
Post Closure Management Plan to be submitted prior to ceasing waste disposal.	Auckland Council	Email	At least 12 months before
Environmental report.	Auckland Council	Email	Annually
Environmental report.	Community Liaison Group	Email to advise of its availability	Annually

4. CONTINGENCY

4.1 Trigger Levels - explanation

4.1.1 Trigger Levels

Response limits (or trigger levels) are values for the monitoring parameters which, if exceeded, require a course of action to be taken. Upon completion of a monitoring event, the results will be checked against the pre-specified response limits. If no response limit is exceeded, the monitoring event will be routinely reported in due course. If any response limit is exceeded, action will be taken immediately as described in this contingency plan.

Response guidelines are summarised in the next section below.

The limits are set at two levels (TL1 and TL2) as follows.

Trigger Level 1 (Lower response limit)

Exceedance of TL1 warns of potential adverse effects, warns of potential future non-compliance with the resource consent conditions, requires investigation and reporting, and might require remedial action. For surface water, TL1 is reached if one or more individual parameters exceed the listed TL1 limits (Table ...).

Trigger Level 2 (Upper response limit)

TL2 is reached if one or more individual parameters exceed the listed TL2 limits (Table 5.2 below).

Exceedance of TL2 is a firm indication that significant adverse effects and breaches of consent conditions either are already occurring, or could have occurred, or are about to occur. The upper limit is typically set at the limit specified in the resource consent, so exceedance of the upper limit typically indicates non-compliance. Exceedance of TL2 will require one or more of: urgent mitigative actions; notification of authorities; calling of a specialist adviser (a qualified person or consultancy with experience in environmental management); prompt instigation of investigations, and; remedies. TL2 is reached if one or more individual parameters exceed the listed TL2 limits (Table in monitoring section above).

4.1.2 Emergency

Extreme exceedance of TL2 might require reference to the site emergency management plan.

4.1.3 Flowchart

The procedure to be followed upon receipt of monitoring results is illustrated in Appendix 5.

4.1.4 Definition of leachate contamination

“Leachate contamination”, "contamination" and “contaminant … discharge to water” are referred to in consent conditions ...

For the purposes of this LMP these terms are taken to mean:

- TL2 has been exceeded in monitoring, and;
- There is observed or measured evidence of the presence of leachate or site-derived liquid contaminant in a watercourse or pond somewhere outside the landfill footprint, and;
- Independent specialist advice is that a significant change has occurred to the quality of surface water discharging from the site due to leachate.

This definition aims to encompass all events for which the regulator expects notification and liaison in regard to response actions. If investigation of a monitoring result or observation subsequently reaches a different conclusion from the first call, i.e. that leachate either was or was not the cause, then the event may be re-rated retrospectively accordingly.

4.2 Response guidelines

Table …

Contingency triggering event	**Response guidelines**
Leachate contamination in groundwater	• Confirm that the steps in the contingency plan flowchart have been followed. • Expand the monitoring programme which might include more locations, more parameters and more often.

Contingency triggering event	Response guidelines
	• Ensure that the contaminant is also measured in leachate (conversely if a contaminant concentration in leachate rises significantly, then consider adding that contaminant to the monitoring parameter list for groundwater). • Design and implement any case-specific remediation e.g. de-watering wells, liner redesign, subsurface grout curtains, reconfiguration of daily waste placement to reduce leachate.

5. TASK LISTS

5.1 Tasks and scheduled maintenance

Table …

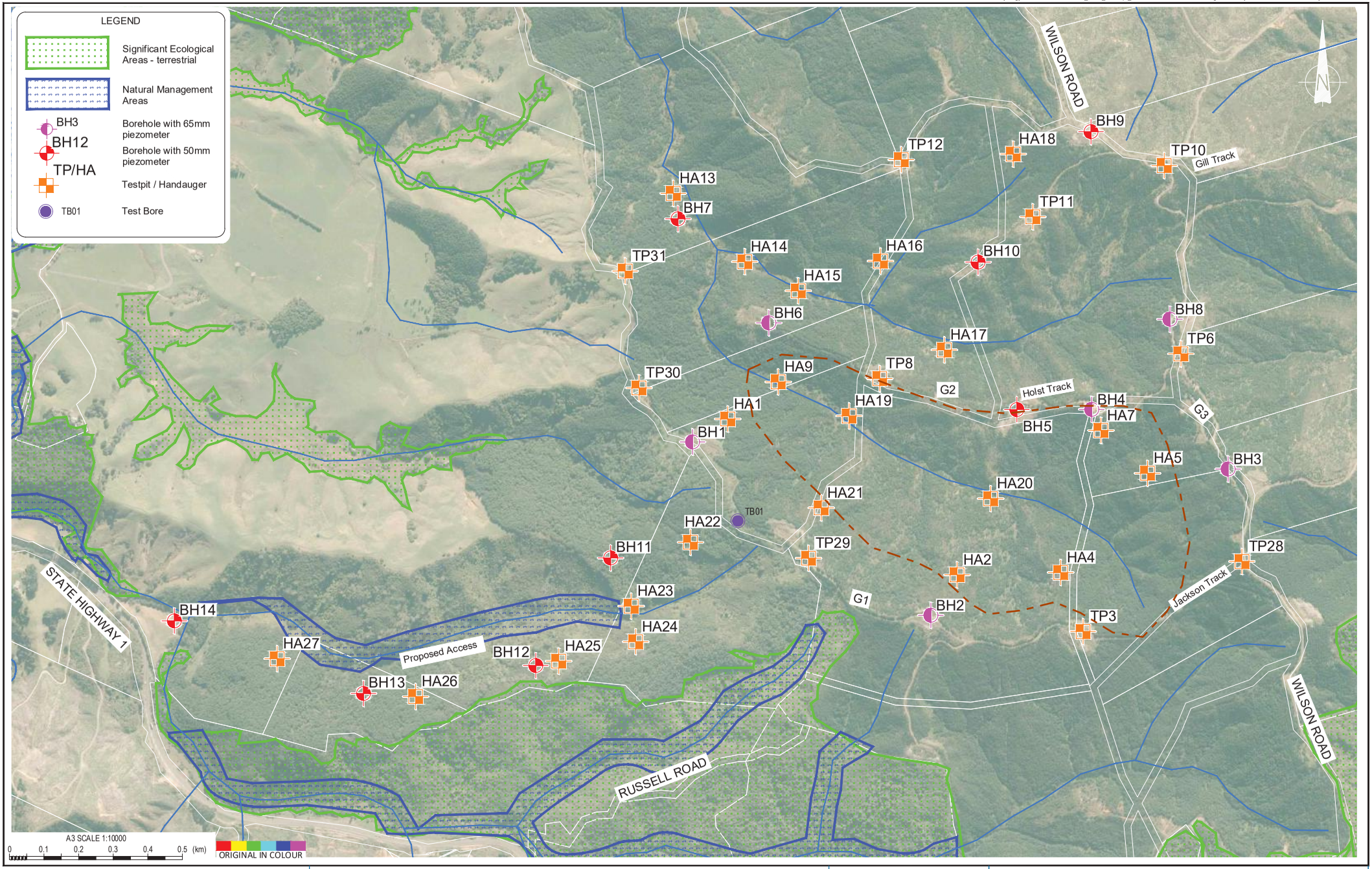
Role	Task	Frequency
Monitoring Technician	Take groundwater samples (Schedule One).	Quarterly
Monitoring Technician	Measure groundwater levels (Schedule Two).	Quarterly
Monitoring Technician	Download groundwater level data from remote (non-telemetry) monitoring devices including level loggers. Check battery and memory space at the same time.	Monthly
Monitoring Technician	Backup groundwater data collected by the web-based (telemetry) monitoring service.	Monthly
Landfill Engineer	Prepare the annual Environmental Report (include groundwater).	Annually
Monitoring Technician	Inspect and maintain pneumatic and/or electric groundwater pumping equipment.	Quarterly

6. APPENDICES

6.1 Site plan - groundwater

(one page)

C:\12dSynergy\data\ALBTCAD\Polaris_WOL_Concept_55\CAD\FIG\Polaris-HG-F2.dwg 2019-May-17 2:59:53 PM Plotted By: LOVE JADVANI



Aerial photo sourced from Auckland Council GIS Website.
Property boundaries sourced from Land Information New Zealand data as at 16-Feb-2017 (Crown Copyright Reserved).

PROJECT No.	1005069.113	
DESIGNED	TC	Sep.18
DRAWN	TORY	Sep.18
CHECKED		
APPROVED		DATE

CLIENT **WASTE MANAGEMENT NZ LTD**
PROJECT **AUCKLAND REGIONAL LANDFILL**
TITLE HYDROGEOLOGICAL ASSESSMENT
SITE INVESTIGATION LOCATIONS
SCALE (A3) 1:10,000 FIG No. HG-F2 REV 1

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6.2 Monitoring parameters - groundwater

(one page)

AUCKLAND REGIONAL LANDFILL
WATER QUALITY ANALYSIS PARAMETER LISTS

Location >	Groundwater quality wells (BH1, 2, 3, 5, 7, 9, 10 & TB01)	Groundwater quality wells (BH1, 2, 3, 5, 7, 9, 10 & TB01)	Groundwater quality wells (BH1, 2, 3, 5, 7, 9, 10 & TB01)	Groundwater level wells (BH1-BH15)	Leachate	Leachate
List >	GBL	G1	G2	GWL	L1	L2
Frequency >	quarterly for 2 yrs baseline only	quarterly	annually	quarterly	quarterly	annually
Consent # >	tba	tba	tba	tba	tba	tba
Condition # >	C 019 & BLMR	C 172c	tba	C 172c	C 177	C 177
Alkalinity	y		**			
Aluminium dissolved	**		**			
Aluminium total						
Ammonia N total	y		**		y	y
Antimony					y	y
Arsenic dissolved	y	y	y		y	y
Barium						y
BOD5	?					
Boron	y		**		y	y
Cadmium dissolved	**	y	y		y	y
Calcium	y		**			
Chloride	y		**		y	y
Chromium dissolved	**	y	y		y	y
COD	y		**		y	y
Conductivity field	y		**		y	y
Conductivity lab	y		**		y	y
Conductivity continuous						
Copper dissolved	y	y	y		y	y
Cyanide						y
Hardness	y		**			
Iron dissolved	y		**			y
Iron total						
Lead dissolved	y	y	y		y	y
Magnesium	y		**			
Manganese dissolved	y		**			y
Mercury					y	y
Molybdenum						y
Nickel dissolved	y	y	y		y	y
Nitrate N	y		**		y	y
Nitrite N	?				y	y
Oxygen diss. field						
pH field	y		**		y	y
pH lab	y		**		y	y
Phosphorus total						
Potassium	y		**		y	y
Selenium					y	y
Silver					y	y
Sodium	y		**			y
Sulphate	y		**			y
Suspended solids						
Temperature field	y		**			
Turbidity field	**		**			
Turbidity continuous						
Zinc dissolved	y	y	y		y	y
Zinc total						
Cation/Anion balance	**		**			
Oil & grease						
Volatile Acids	**		**			
Phenols total	**		**			
Volatile Organic Compounds (Note 1)						y
Semi Volatile Organic Compounds (Note 2)		y	y			
Total Petroleum Hydrocarbons (TPH)	?	y	y		y	y
Polycyclic Aromatic Hydrocarbons (PAH)	?	y	y			
1,4-dioxane						y
Poly-fluoroalkyl Substances (PFAS suite)						y
Macroinvertebrates						
Flow rate estimate - field						
Water depth - field				y		
Results required within	2 weeks	3 weeks	3 weeks	1 week	2 weeks	3 weeks
"Field" = measurement by site staff either at the sample site or in the on-site laboratory.						
"Dissolved" = either field-filtered by site staff or filtered by the analytical lab if the sample is delivered in a short time.						
* = Measurement specifically required by conditions of consent						
** = Added at site's discretion to aid interpretation of results						
? = In Baseline Monitoring Report May 2019; not in draft conditions; not scheduled for regular testing.						
Note 1 = VOC includes BTEX and chlorinated solvents						
Note 2 = SVOC includes organochlorine pesticides and DDT compounds						

6.3 Laboratory test methods

(one page)

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	Waste Management NZ Limited	**Lab No:**	2182835	SPv1
Contact:	Hemanta Yadav	**Date Received:**	28-May-2019	
	C/- Waste Management NZ Limited	**Date Reported:**	04-Jun-2019	
	PO Box 228	**Quote No:**	84162	
	Silverdale	**Order No:**	1729530 ON 620	
	Auckland 0944	**Client Reference:**	4176	
		Add. Client Ref:	List C	
		Submitted By:	Hemanta Yadav	

Sample Type: Aqueous

Sample Name:		List C 5795 27-May-2019	List C 5796 27-May-2019	List C 5797 27-May-2019	List C 5798 27-May-2019	List C 5799 27-May-2019
Lab Number:		2182835.1	2182835.2	2182835.3	2182835.4	2182835.5
Individual Tests						
Sum of Anions	meq/L	8.8	3.4	4.5	5.7	2.6
Sum of Cations	meq/L	10.1	3.8	5.0	6.1	2.9
Turbidity	NTU	4.9	11.3	30	3.8	2.1
pH	pH Units	8.0	8.0	8.2	8.0	7.2
Total Alkalinity	g/m³ as $CaCO_3$	142	85	122	94	44
Total Hardness	g/m³ as $CaCO_3$	320	132	175	210	92
Electrical Conductivity (EC)	mS/m	93.3	36.5	45.6	58.2	30.8
Total Suspended Solids	g/m³	6	16	48	5	< 3
Dissolved Aluminium	g/m³	< 0.003	0.007	0.006	0.003	0.005
Dissolved Calcium	g/m³	99	42	56	66	27
Dissolved Iron	g/m³	< 0.02	< 0.02	< 0.02	< 0.02	0.21
Total Iron	g/m³	0.112	0.23	0.65	0.092	0.48
Dissolved Magnesium	g/m³	16.3	6.7	8.3	9.9	6.0
Dissolved Manganese	g/m³	0.055	0.0007	0.0006	0.0008	0.025
Dissolved Potassium	g/m³	9.8	5.9	6.6	5.9	2.6
Dissolved Sodium	g/m³	82	23	31	43	24
Sodium Absorption Ratio (SAR)*	$(mmol/L)^{0.5}$	2.0	0.9	1.0	1.3	1.1
Total Zinc	g/m³	0.0093	0.0028	0.0041	0.0013	0.0012
Chloride	g/m³	68	17.7	17.3	25	32
Total Ammoniacal-N	g/m³	0.091	0.040	< 0.010	< 0.010	< 0.010
Nitrite-N	g/m³	0.008	0.002	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m³	0.055	0.005	< 0.002	< 0.002	0.010
Nitrate-N + Nitrite-N	g/m³	0.064	0.007	< 0.002	0.003	0.011
Total Kjeldahl Nitrogen (TKN)	g/m³	0.64	0.86	1.05	0.65	0.23
Sulphate	g/m³	193	59	76	149	42
Chemical Oxygen Demand (COD)	g O_2/m³	25	28	38	20	12
Oil and Grease	g/m³	< 2	< 2	< 2	< 2	< 2
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	0.0013	< 0.0010	< 0.0010	0.0025	< 0.0010
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper	g/m³	< 0.0005	< 0.0005	< 0.0005	0.0011	< 0.0005
Dissolved Lead	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m³	0.0070	0.0020	0.0024	0.0039	0.0006
Dissolved Zinc	g/m³	0.0041	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Sample Type: Aqueous						
Sample Name:		List C 5795 27-May-2019	List C 5796 27-May-2019	List C 5797 27-May-2019	List C 5798 27-May-2019	List C 5799 27-May-2019
Lab Number:		2182835.1	2182835.2	2182835.3	2182835.4	2182835.5
Total Petroleum Hydrocarbons in Water						
C7 - C9	g/m^3	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
C10 - C14	g/m^3	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
C15 - C36	g/m^3	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7

Sample Name:		List C 5800 27-May-2019	List C 5801 27-May-2019			
Lab Number:		2182835.6	2182835.7			
Individual Tests						
Sum of Anions	meq/L	3.5	3.9	-	-	-
Sum of Cations	meq/L	3.9	4.5	-	-	-
Turbidity	NTU	9.3	4.3	-	-	-
pH	pH Units	7.1	7.2	-	-	-
Total Alkalinity	g/m^3 as $CaCO_3$	74	98	-	-	-
Total Hardness	g/m^3 as $CaCO_3$	123	144	-	-	-
Electrical Conductivity (EC)	mS/m	39.2	45.1	-	-	-
Total Suspended Solids	g/m^3	9	4	-	-	-
Dissolved Aluminium	g/m^3	0.008	0.007	-	-	-
Dissolved Calcium	g/m^3	37	46	-	-	-
Dissolved Iron	g/m^3	0.34	0.49	-	-	-
Total Iron	g/m^3	1.55	1.62	-	-	-
Dissolved Magnesium	g/m^3	7.5	7.3	-	-	-
Dissolved Manganese	g/m^3	0.24	0.64	-	-	-
Dissolved Potassium	g/m^3	3.8	4.9	-	-	-
Dissolved Sodium	g/m^3	30	34	-	-	-
Sodium Absorption Ratio (SAR)*	$(mmol/L)^{0.5}$	1.2	1.2	-	-	-
Total Zinc	g/m^3	0.0017	0.0013	-	-	-
Chloride	g/m^3	35	37	-	-	-
Total Ammoniacal-N	g/m^3	< 0.010	0.048	-	-	-
Nitrite-N	g/m^3	< 0.002	< 0.002	-	-	-
Nitrate-N	g/m^3	< 0.002	< 0.002	-	-	-
Nitrate-N + Nitrite-N	g/m^3	< 0.002	< 0.002	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m^3	0.37	0.52	-	-	-
Sulphate	g/m^3	50	45	-	-	-
Chemical Oxygen Demand (COD)	$g\ O_2/m^3$	21	26	-	-	-
Oil and Grease	g/m^3	< 2	< 2	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m^3	< 0.0010	< 0.0010	-	-	-
Dissolved Cadmium	g/m^3	< 0.00005	< 0.00005	-	-	-
Dissolved Chromium	g/m^3	< 0.0005	< 0.0005	-	-	-
Dissolved Copper	g/m^3	< 0.0005	< 0.0005	-	-	-
Dissolved Lead	g/m^3	< 0.00010	< 0.00010	-	-	-
Dissolved Nickel	g/m^3	0.0011	0.0014	-	-	-
Dissolved Zinc	g/m^3	< 0.0010	< 0.0010	-	-	-
Total Petroleum Hydrocarbons in Water						
C7 - C9	g/m^3	< 0.06	< 0.06	-	-	-
C10 - C14	g/m^3	< 0.2	< 0.2	-	-	-
C15 - C36	g/m^3	< 0.4	< 0.4	-	-	-
Total hydrocarbons (C7 - C36)	g/m^3	< 0.7	< 0.7	-	-	-

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 clean 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.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm filtration, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00005 - 0.0010 g/m^3	1-7
Total Petroleum Hydrocarbons in Water	Solvent Hexane extraction, GC-FID analysis, Headspace GC-MS FS analysis US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:2803,10734;26687,3629]	0.06 - 0.7 g/m^3	1-7
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-7
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) 23rd ed. 2017.	-	1-7
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 23rd ed. 2017.	0.07 meq/L	1-7
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 23rd ed. 2017.	0.05 meq/L	1-7
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 23rd ed. 2017.	0.05 NTU	1-7
pH	pH meter. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-7
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) 23rd ed. 2017.	1.0 g/m^3 as $CaCO_3$	1-7
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 23rd ed. 2017.	1.0 g/m^3 as $CaCO_3$	1-7
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 23rd ed. 2017.	0.1 mS/m	1-7
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m^3	1-7
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 23rd ed. 2017.	-	1-7
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.003 g/m^3	1-7
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.05 g/m^3	1-7
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.02 g/m^3	1-7
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.021 g/m^3	1-7
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.02 g/m^3	1-7
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.0005 g/m^3	1-7
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.05 g/m^3	1-7
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017.	0.02 g/m^3	1-7
Sodium Absorption Ratio (Dissolved)*	Calculation; from sodium, calcium and magnesium, as follows; (Na / 23) / [(Ca / 20 + Mg / 12.15)/2]$^{0.5}$ where the concentrations for these ions (Na, Ca and Mg) are expressed as g/m^3.	0.2 (mmol/L)$^{0.5}$	1-7
Total Zinc	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23rd ed. 2017 / US EPA 200.8.	0.0011 g/m^3	1-7
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m^3	1-7
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 23rd ed. 2017.	0.010 g/m^3	1-7
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.002 g/m^3	1-7
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-7
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) 23rd ed. 2017.	0.002 g/m^3	1-7

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D (modified) 4500 NH_3 F (modified) 23rd ed. 2017.	0.10 g/m^3	1-7
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23rd ed. 2017.	0.5 g/m^3	1-7
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 23rd ed. 2017.	6 g O_2/m^3	1-7
Oil and Grease (trace level)	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease.	2 g/m^3	1-7
C7 - C9	Head Space, GCMS analysis.	0.06 g/m^3	1-7

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

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

6.4 Borehole schedules

(one page)

LMP Section 3.26

Schedule One

Boreholes for ongoing monitoring of groundwater quality

BH1
BH2
BH3
BH5
BH7
BH9
BH10
BH15 – until overtaken by advancing landfill construction
TB01 (potable)

Schedule Two

Boreholes for ongoing monitoring of groundwater levels

BH1
BH2
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12
BH13
BH14
BH15 – until overtaken by advancing landfill construction
TB01 (potable)

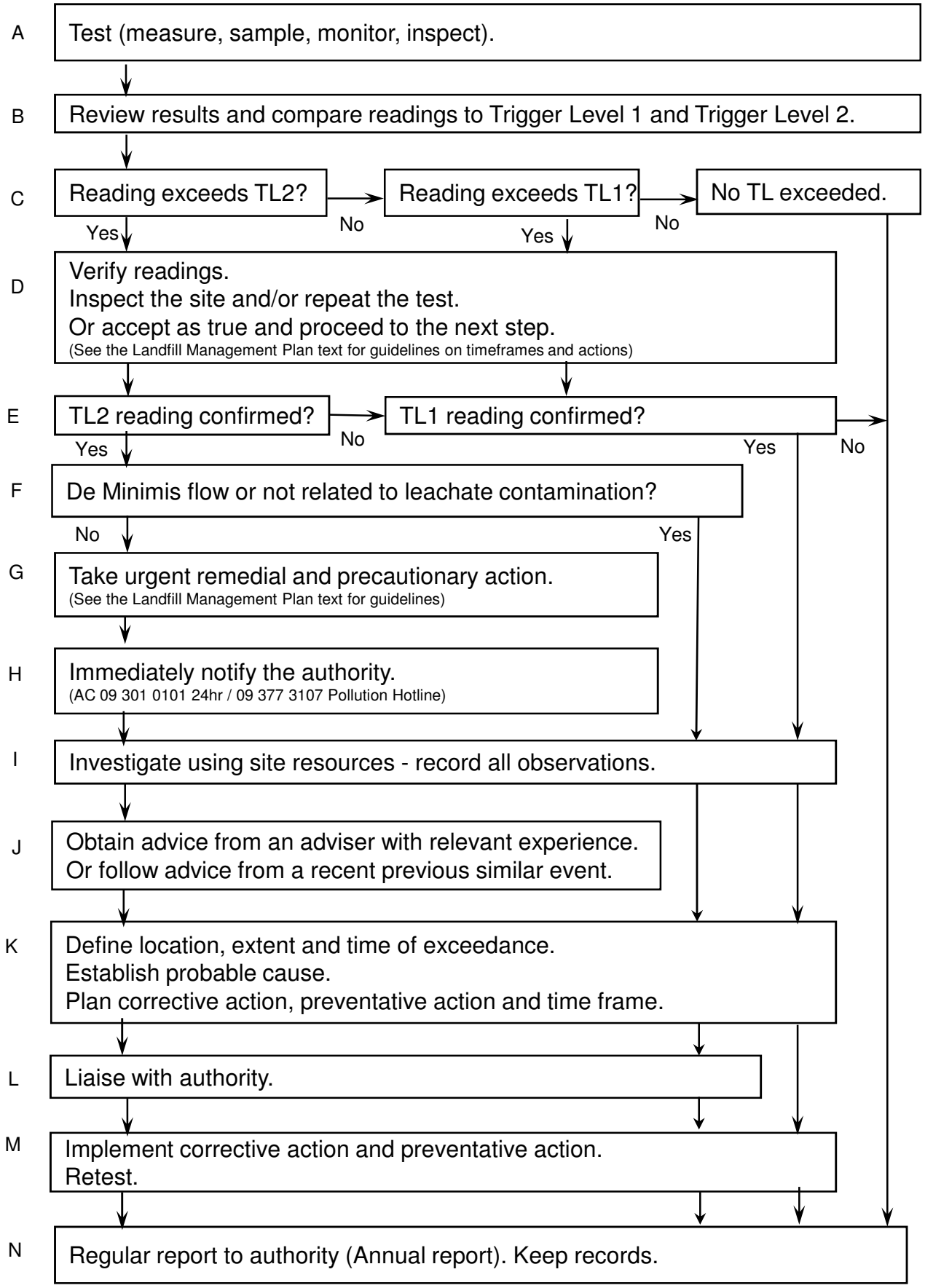
6.5 Contingency plan flow chart - groundwater

(one page)

AUCKLAND REGIONAL LANDFILL

Contingency Plan Flowchart

Surface Water and Ground Water



AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Off-Site Stream Compensation Plan

Document Control

Date	Status	Issued by	Issued to	Distribution method / upload site / link
20/12/2019	Draft d1	BH (T+T document)		S.92 response tranche 3

LMP Section 3.34

(Refer to T+T document presented in S.92 response tranche 3)

AUCKLAND REGIONAL LANDFILL

LANDFILL MANAGEMENT PLAN

Odour Management Plan

Document Control

Date	Status	Issued by	Issued to	Distribution method / upload site / link
30/01/2020	Draft d1	BH		

LMP Section 3.41

CONTENTS

LMP Section 3.41

1. INTRODUCTION

1.1 Scope of this section

This section describes

- odour sources
- mitigation methods
- odour monitoring
- reporting

2. ODOUR SOURCES

2.1 General waste

General waste from transfer stations and commercial collections involving putrescible waste has a characteristic 'fresh' waste or rubbish odour. General waste tipping requires the greatest attention by daily operations to avoid an odour 'hit'. WMNZ's experience is that tipping of odorous general waste is the most common source of odour events.

2.2 Landfill gas

Landfill gas is naturally produced in landfills as organic waste materials decompose under anaerobic conditions. It comprises mostly Methane and Carbon Dioxide (both odorless), but it also contains trace gases which give it a characteristic odour e.g. Hydrogen Sulphide. Landfill gas controls require attention to cover practices, gas well installation and gas vacuum maintenance to avoid fugitive emissions. WMNZ's understanding is that landfill gas is potentially the most potent source of odour events but on the other had landfill gas is easier to minimise in a properly controlled landfill operation.

2.3 Leachate

When leachate emerges from the waste, it can release odour by releasing dissolved landfill gas dissolved volatile organic compounds, and by decomposition of organic matter upon exposure to air.

2.4 Cover soil

When soils are disturbed after laying as cover over waste for a period of time, these soils may release an odour for a short time to disperse any tainting after having been in contact with waste.

2.5 Trucks

Fresh waste odour will follow any trucks carrying waste in unsealed containers and open-topped trays. However, due to open air movement the intensity would unlikely ever be as strong as standing alongside a tipped pile of the same waste.

2.6 Special waste

Some wastes like sludges from chemical waste treatment plants will contain compounds which are volatile and odorous, which are released by evaporation or sublimation while the tipped waste is being buried in the landfill.

2.7 Incompatible waste mixing

Treated chemical wastes commonly have elevated pH and will react chemically in some instances with other wastes with lower pH at the working face, releasing Sulphides and in some cases Ammonia which are both odorous.

2.8 Combustion exhaust

The extracted landfill gas will be treated for example by burning in a flare, but any incomplete combustion or non-oxidation of trace odorous compounds may lead to odour from the exhausts. WMNZ experience is that this source is small and not discernable from all the other sources provided that the combustion devices are made to proper specifications and then operated and maintained correctly.

2.9 Topsoil

When topsoil is excavated from stockpile, some of it may have been buried long enough for organic material to start anaerobic decomposition, which may result in a rotting vegetation odour when the topsoil is being excavated. The odour may last for a few days, is common on earthworks projects, but is not a landfill waste odour.

2.10 Farming and forestry

While rural activities may have their own odours, they are part of the background and are not addressed in this LMP.

2.11 Risks

Risk	**Mitigation / Control (& related section of LMP)**
Odour from the working face.	Minimised width of working face at any one time – never more than 60 m wide or the width of 6 trucks tipping at once. Mobile odour neutraliser sprayers. Tipping waste as close as practical to its final place of burial to avoid pushing and spreading that exposes more waste to the air. Rapid burial - bulldozer and compactor present at all times. Early planning and installation of gas collection installations. Daily cover. Early application of intermediate cover and final cap. Open line of communication with customers and rapid escalation of attention to waste deliveries that cause odour events.

LMP Section 3.41

Risk	Mitigation / Control (& related section of LMP)
Odour from landfill gas through cover.	Soil cover layers over the waste. Extra soil cover if needed to avoid desiccation cracking or erosion. Elimination of trees and plants with deep roots. Far-reaching gas extraction and collection pipe network in the waste, and installation as-you-go during waste placement. Placement of relatively inert, soil-like wastes as mono-fills around the edges of the landfill waste mass to improve the seal against the wall lining system. Continuous vacuum. Containment and collection methods described in the Landfill Gas Management Plan including the priority principle. Odour controls for any excavation down through cover into waste e.g. for gas wells.
Odour from special waste (including biosolids)	Require an odour assessment as part of the Waste Pre-Acceptance procedure. Hold some less-odorous waste alongside the working face to quickly bury wastes found to be odorous. Requirement for hauliers to notify landfill in advance of delivery of known odorous waste. Requirement for hauliers to adequately cover or use sealed containers for odorous waste loads. Gatehouse control and communications with working face personnel. Restricted hours of acceptance of known odorous waste. Techniques for clean and full tipping out of trucks e.g. disposable tray liners for sticky special waste. Wheel wash for outbound trucks from the working face.
Odour from the landfill generally.	Buffer distance. On-site weather station.

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Risk	**Mitigation / Control (& related section of LMP)**
	Identified staff member with first priority responsibility for odour systems management and rapid response to odour events. Perimeter odour neutraliser sprayers.
Odour from leachate	Minimal exposure to air, by way of small sumps and lidded storage tanks. Storage tanks located away from receptors. Gas-tight cover over leachate re-injection ports. Regular walkover and water monitoring to detect leachate breakout and rapid response protocol.
Odour from re-excavation of cover soil	Minimise amount of odorous soil excavations at any one time. Minimise the time of exposure of old waste when tying into an old cell. Avoid weather conditions that are less favourable for dispersion of odour (commonly in early morning). Select times of day which have less chance of being a nuisance to receptors. Attention to design detail at temporary edges of the waste e.g. soil bunds.
Odour from trucks	Specifically require via contract terms that known and suspected odorous waste types are to be well covered or sealed in containers for road transport. Reject third party customers without covered loads.
Odour from mixing of incompatible wastes	Separately bury high pH wastes - special operator training and particular procedures may be required.
Odour from combustion exhaust	Design for optimal combustion efficiency. Routine maintenance. Elevated discharge points (stacks) to aid dispersion.
Passive venting through gas collection system and flare during a power outage	Flame-out auto-dial. Auto slam-shut valve upon flame out. Auto flame reignition.

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Risk	**Mitigation / Control (& related section of LMP)**
Odour from old topsoil	Minimise the extent of topsoil excavations at any one time. Consider odour nuisance potential when selecting locations for topsoil stockpiles.
Desensitisation of staff	Rotation of staff allocated to assess odour.

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3. MONITORING

3.1 Monitoring parameters and schedule

Location / Event / Topic	Parameter	Frequency	TL1	TL2
Odour patrol within the buffer zone landholdings	Odour	Monthly	Odour Intensity >3.	No limit for odour on the landholdings. Recorded for internal management and response purposes.
Monthly walk-over inspection on landfill cover and cap	Odour	Monthly	Odour Intensity >4.	No limit for odour on the landfill waste footprint. Recorded for internal management and response purposes.

3.2 Monitoring procedures

Procedure	Key steps (with reference to odour)
Walkover inspection	• As described in the Landfill Gas Management Plan (Ref LMP …)
Pre-acceptance of waste	• Odour assessment (Ref LMP …) • Documentation by way of 'Notification of Special Waste Delivery' form • Documentation of allowable hours of delivery and any pre-notification before arrival • Gatehouse control
Opening up the working face	• Positioning of sprayers (cannons and T-bars) • Limits on stripping of older smelly cover • Windows cut through daily cover soil to provide gas/odour connectability to the gas extraction system • Announcement 'all-clear' when ready to receive waste
Odour patrol within the buffer zone landholdings	• Safety precautions (PPE, means of communication, notice of intentions) • Check on wind direction and meteorological conditions • Check on complaints history • Check which odour controls are working • Check what odorous wastes have come in • Carry a site plan • Go to upwind points first to avoid desensitisation

Procedure	Key steps (with reference to odour)
	• Go to strategic odour monitoring points within the site including points in the downwind quadrant • Record odour by a scientific logging method e.g. frequency, intensity, duration, offensiveness/character, location (FIDOL) • Go to off-site locations to investigate whenever odour at the boundary exceeds TL1 • Report findings immediately to the site supervisor who has authority to immediately adjust procedures or commence maintenance • Re-check wind direction and speed after the patrol • Finish logging and reporting by end of shift
Escorted odorous loads	• Call from gatehouse when classified odour loads arrive • Check allowable arrival times and accept/reject if outside those times • Odour technician goes to a downwind observation point • Spotter confirms when the working face is ready including odour sprayers, standby low-odour cover, and access up close to final burial place • Excessive odour reported back to sales team to cease or adjust customer's future deliveries
Daily cover	• As described elsewhere (Ref LMP ….) • End-of-day sign-off that sprayer locations and cover removal plans are in place for the next day's opening up
Response to a complaint	• As described elsewhere (Ref LMP ….)

3.3 Reporting

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Location / Event / Topic	Report to	Method	Frequency
Odour patrol within the buffer zone landholdings.	In-house	Odour Patrol record sheet and Gas Event Log.	Monthly
Walkover inspection on landfill cover and cap.	Auckland Council	Email or file transfer.	Annually
Odour complaint.	Community Liaison Group	Summary table sent by email or file transfer.	Quarterly
Odour complaint.	Auckland Council	Email notification. May be automated from online entry or manual from telecoms record.	Within 1 day

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4. CONTINGENCY

4.1 Trigger Levels - general

Upon completion of a monitoring event, the results will be checked against the pre-specified response limits.

If no response limit is exceeded, the monitoring event will be routinely reported for example in an annual report to the regulator.

If any response limit is exceeded, then action will be taken immediately as described in the Contingency Plan Flowchart. The response limits are set at two levels:

Trigger Level 1 (Lower response limit / warning level)

Exceedance of TL1 warns of potential adverse effects, warns of potential future non-compliance with the resource consent conditions, requires investigation and reporting, and might require remedial action.

Trigger Level 2 (Upper response limit / alarm level)

Exceedance of TL2 is a firm indication that significant adverse effects and breaches of consent conditions either are already occurring, or could have occurred, or are about to occur. The upper limit is typically set at the limit specified in the resource consent, so exceedance of the upper limit typically indicates non-compliance. Exceedance of TL2 will require one or more of: urgent mitigative actions; notification of authorities; calling of a specialist adviser (a qualified person or consultancy with experience in environmental management); prompt instigation of investigations, and; remedies.

Extreme exceedance of TL2 might require reference to the Site Emergency Management Plan.

4.2 Response guidelines

Table ….

Contingency triggering event	**Response guidelines**
Odour	Possible urgent remedial and precautionary actions include: • Spray and / or cover odorous waste; • Repair obvious leaks in gas system; • Repair obvious deficiencies in the landfill cover. Response times for reporting to AC: • Within 24 hours for odour TL2 • as soon as practical for significant discharge Possible investigative actions include • Verify the odour in person. • Follow the complaints procedures if a complaint has been received. • Check wind speed, wind direction and barometric pressure;

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Contingency triggering event	**Response guidelines**
	• Check daily tipping operations; • Check any odorous load history (type, age, number, disposal method, timing); • Check daily, intermediate and final cover; • Check gas systems and flare for proper operation. • Check evaporator unit for proper operation. • Check LFG generators for proper operation. • Ask a different person to do a round of landfill gas monitoring including surface emissions survey. • Review descriptors for the odour intensity scale.
Findings from weekly walk-over inspection.	Possible investigative actions include: • Use portable gas meter to define extent of concern; • Review design drawings of affected features. • Check exposed pipeline for damage, leaking joints and note areas where gurgling can be heard (namely condensate is accumulating and interfering with gas flows).

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5. TASK LISTS

5.1 Tasks - database extract

Role	Task	Frequency
Landfill Operations Manager	Track progress on resolution of odour events (using the landfill's incident response tracking system).	As Required
Gas Technician	Walkover inspection on daily cover, intermediate cover and final cap (for odour).	Monthly
Gatehouse attendant	Notify working face spotter of arrival of classified odorous waste and suspected odorous waste.	As Required
Landfill Manager	Provide training for staff to assess odour.	Annually
Landfill Manager	Provide any information requested by an enforcement officer.	As Required
Landfill Operations Manager	Fix soil cover, leaking pipes, leachate breakouts and any other sources of odour found in need of repair, maintenance or improvement.	As Required
Landfill Operations Manager	Confirm that tip face opening and closing procedures have been carried out in the manner required to address odour potential.	Daily

6. APPENDICES

6.1 Odour patrol sectors site plan

(to be developed)

6.2 Odour Patrol record form

(1 page)

ODOUR PATROL RECORD SHEET

Name _____ **Date** _____

Weather conditions (Fine / Cloudy / Overcast / Drizzle / Showers / Rain / Storm / Windy / Frost / Fog / Overnight rain) _____

Time	Sector	Distance	Odour Yes/No	Intensity	Character / hedonic tone	Duration	Wind direction	Wind speed m/s*	Odour systems operating	Notable activity	Investigation findings / Comments.

1	On site	6 Extremely Strong	Rubbish	Short	Calm	T bar tip face	Gen waste tipping
2	Perim road	5 Very Strong	Gas (LFG)	Intermittent	Light breeze	Litter fence	Special waste
...	Site bndry	4 Strong	Solvent	Continuous	Mod. breeze	Perimeter fence	Gas work
16	ADC NOB	3 Distinct	Grassy		*Telemetry	Bypass road	Cover work
	Outside NOB	2 Weak	Earthy			Mobile unit	
		1 Very Weak	Burning				
		0 Non-perceptive	Odour spray				
			Other / uncertain				