REPORT

Tonkin+Taylor

For a comprehensive understanding of this report, please also refer to the relevant s92 responses

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
1005069.1170

Exceptional thinking together
www.tonkintaylor.co.nz

Document Control

Title: Auckland Regional Landfill, Stormwater and Industrial and Trade Activity					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
30/05/19	1.0	Final Version	R. van de Munckhof	T. Bassett	S. Eldridge

Table of contents

1 Introduction

1.1 General

Tonkin & Taylor Ltd (T+T) has been engaged by Waste Management NZ Ltd (WMNZ) to undertake an Assessment of Environmental Effects associated with the use of land for an Industrial or Trade Activity and discharges of stormwater from the proposed Auckland Regional Landfill.

This Stormwater and Industrial and Trade Activity Report describes the proposed stormwater and sediment management controls and the potential discharges from the proposed landfill development and on-going operation. This report is intended to inform feasibility level design of the proposed landfill including ancillary works and access road and to support an application for resource consent.

1.2 Scope of work

The scope of this report is to:

- Assess the potential effects associated with the use of land for an industrial and trade activity (ITA) and discharges of stormwater and sediment associated with the on-going operation of the landfill
- Identify stormwater management requirements including the need for permanent treatment and volume controls over the life of the landfill
- Prepare this technical assessment to support the Assessment of Environmental Effects

2 Project overview

2.1 Introduction

The project comprises the construction of landfill with a capacity of approximately 25.8Mm^3 to provide for the disposal of municipal solid waste for a period in excess of 35 years. The landfill will be designed to receive municipal solid waste in accordance with acceptance criteria described in the Waste Acceptance Report[1]. The overall project will comprise:

- An initial site establishment and construction programme to provide site access and construction of the initial infrastructure
- The on-going operation of the landfill.

This assessment addresses the ongoing operation of the landfill. The initial site establishment is described in a separate report (Technical Report R, Volume 2).

2.2 Site description

This section provides an overview of the natural environment and the human environment of the project footprint and wider landholding.

The landholding covers an area of approximately 1020 hectares that comprises a mixture of terrain and land use typologies, including pastoral farmland and plantation forestry. The topography of the landholding rises from the Hōteo Stream and farmland area in the west to a steep area covered with plantation forestry in the east. The landholding is zoned Rural Production zone in the AUP.

The landholding has been delineated into four areas based on topography and current land uses:

	Current landuse	Proposed activities
Western Block	Comprises the western area of the landholding including the Springhill Farm. The Hōteo River runs along a portion of its western boundary.	The main activities proposed in the Western Block are to establish a stockpile where material from the site establishment works can be stockpiled for use in the development of the landfill, and in addition, a clay borrow will be established to extract clay for use in the landfill.
Eastern Block	Comprises an area of approximately 350ha of plantation pine forestry. This area is predominantly steep ridges and valleys and includes Valley 1 which is the location of the proposed landfill footprint. A number of forestry access tracks run along the ridges,	The proposed landfill will be developed within Valley 1 of the Eastern Block. The remainder of the land will remain as plantation pine forestry.
Southern Block	Comprising a strip of land between Springhill Farm to the north and the Sunnybrook Reserve to the south-east and is a mix of native and non-native vegetation.	The access road will be constructed through the Southern Block. A bin exchange park will also be established at the base of the access road as the site access comes off State Highway 1.
Waiteraire Tributary Block	Comprises an area of plantation forestry and native vegetation at	A second stockpile will be located within the block.

[1] Tonkin & Taylor, Waste Acceptance, Auckland Regional Landfill, March 2019

	Current landuse	Proposed activities
	the south eastern extent of the landholding.	

2.3 Site establishment and initial construction

The development of the landfill and associated infrastructure including access road will require a number of construction activities which have the potential to generate sediment.

The initial establishment works will include the following:

- Earthworks for the construction of the landfill access road including a roundabout on SH1 and bridge over Waiteraire Stream
- The construction of the stockpiles and the clay borrow area (these will be used to place excess material from the earthworks)
- Earthworks associated with the construction of the landfill stormwater treatment ponds
- Earthworks associated with the bin exchange area platform

These activities are expected to be limited to a period of three to four years.

2.4 On-going landfill operation

The landfill activities are described in detail within the Engineering Report (Technical Report N, Volume 2). In summary the landfill activities include:

- On-going development of landfill cells during seasonal construction times
- 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
- Placement of waste within the completed cells
- Placement of interim soil cover and long term soil capping

3 Environmental setting

3.1 Receiving environment

3.1.1 Introduction

The project footprint contains a variety of watercourses, both permanent and intermittent, and how these are managed in relation to sediment and discharges as part of this project is a key component of this report.

The potential discharges of sediment from the proposed works could have impacts on the immediate downstream environment, and those discharges flow to the Hōteo River and ultimately the Kaipara Harbour. The different receiving environments differ in their sensitivity to sediment effects and characteristics, and therefore we have considered each environment in turn.

3.1.2 Immediate downstream environment

The project footprint will discharge into a number of tributaries of the Hōteo River including tributaries of the Waiteraire Stream on the western boundary of the project footprint.

A full ecological assessment has been undertaken as reported in the Assessment of Aquatic Ecological Values and Effects Report (Technical Report G, Volume 2). The key features of the receiving environment in relation to sensitivities are as follows:

- Despite much of the landholdings being in exotic forestry, the stream systems are relatively stable and ecological values high. Stream ecological valuation scores show that for the most part, streams within the WMNZ landholdings have high ecological function, driven primarily by high riparian shading, limited channel modification and high quality in-stream habitat.
- A Natural Stream Management Area (NSMA) identified in the AUP in the Southern Block has the highest ecological values as measured by standard ecological indices. However, the Eastern Block values are also high considering the land use of the catchment (being forestry).
- Much of the Western Block is in agricultural land, although two ecologically significant wetlands are located in the northern and southern parts of the block. Each of these is recognised as being a Wetland Management Area, and threatened bird species have been recorded within them. They are expected to be particularly susceptible to changes in hydrology and sedimentation.
- Stockpile 2 is proposed to be located in a valley system, which includes a tributary of the Waiteraire Stream, which is upstream of an NSMA and Significant Ecological Area (SEA). Across the area, hard bottom substrates dominate, which are relatively rare in the Auckland region and contribute to shaping the macroinvertebrate communities present. To the south, the project footprint is bound by native forest in the Sunnybrook Scenic Reserve, which is a designated SEA.
- Macroinvertebrate indices indicate that water and habitat quality within the Southern Block, Eastern Block and Stockpile 2 areas are of good to excellent quality, a result of intact riparian margins becoming established since the last harvest of trees, including plantation trees, in all these areas in recent decades and relatively stable catchment characteristics.

The proportion of pollution-sensitive EPT (Ephemeroptera, Plecoptera and Trichoptera) species was highest in the Southern Block. Seven species of native fish have been recorded within the wider catchment, including two ‘at risk-declining’ species (long fin eel and inanga) and banded kōkopu, which are particularly sensitive to suspended sediment. Freshwater mussels (kākahi) have also been recorded within the catchment; these are also classified as ‘at-risk declining’.

3.1.3 Hōteo River

The main channel of the Hōteo River is adjacent to and 2km to 3km downstream of the project footprint and is identified as an NSMA and SEA. The incised meanders of the Hōteo are identified as being an Outstanding Natural Feature (ONF). The Hōteo River mouth at the Kaipara Harbour is a marine SEA.

In 2014 Auckland Council commissioned an Environment and Socio-economic Review of the Hōteo River Catchment[2]. The Hōteo River has been identified as a priority catchment due to the threat posed by river sedimentation to the snapper breeding ground in the Kaipara Harbour.

The Hōteo River catchment comprises 405km^2, with the predominant land uses comprising pastoral land and exotic plantation forestry. The catchment has a low population with the only urban area falling in the catchment being Wellsford. The tributary that contains the project footprint is approximately mid-way down the Hōteo River.

The study has identified that the key drivers for erosion within the catchment are stream bank erosion, overland flow erosion, and mass movement (land slips) during rainfall events. The main sources of erosion in the catchment at present are reported as:

- Stream banks in the lower reaches of the Hōteo
- Stream banks within flood plains
- Pasture-covered steep land
- Rolling land on fractured sub-catchments which include the Wayby sub-catchment where the landfill tributary feeds into the Hōteo River is located

Water quality in the Hōteo River was reported by Auckland Council as ‘good’ in 2016, and ‘poor’ in 2015 and 2013. The causes of the ‘poor’ result are due to increased turbidity and phosphorus levels measured in the river.

The upper Hōteo River including the flat land at Wayby to the north of the site is a known flood plain. Auckland Council have published flood plain mapping for the Hōteo Catchment. The extent of the mapped 100 year flood plain is shown in Figure 3.1 below.

[2] Auckland Council, Hōteo River Catchment: Environment and Socio-economic Review, Technical Report 2014/021, August 2014.

Figure 3.1: Extent of 100 year flood plain mapped by Auckland Council

The modelled flood plain level is between RL 31 to 32 (m above sea level). This is consistent with flooding reported in the Wayby Valley, with access to Wayby Valley Road which is at RL 28 to 30 restricted during flood events. Photographs of flood waters have been provided by residents during consultation and show flooding consistent with these levels.

While flooding effects occur within the Hōteo catchment, the Auckland Council Environment and Socio-economic Review reports that flooding is not expected to put people or property at risk, although it does acknowledge that flooding was identified as an issue by landowners within the catchment.

3.1.4 Kaipara Harbour

The Kaipara Harbour is a large enclosed estuarine harbour, with the total area placing the harbour as one of the largest harbours in the world. The Kaipara Harbour has been identified as being sensitive to sedimentation effects due to the harbour providing a key snapper fish breeding ground, with large sea grass beds present including close to the mouth of the Hōteo River.

Auckland Council and Northland Regional Councils have recently commissioned a study into sediment effects and mitigation options for the Kaipara Harbour[3] due to the concerns around increased sedimentation within the harbour.

3.2 Rainfall

The project footprint is located between Warkworth and Wellsford north of Auckland. The closest meteorological station is located approximately 3km south of the project footprint (Mahurangi

[3] Kaipara Harbour Sediment Mitigation Study: summary, Streamlined environmental, 30 January 2018.

RAWS @ Forest) and has been operating since February 2013. The project footprint is located on the edge of the Wayby Valley Catchment in the middle of the Dome Forest.

The annual recorded rainfalls for the previous five years are shown in Figure 3.2, as well as the long term average for the Auckland Region based on published data from NIWA.

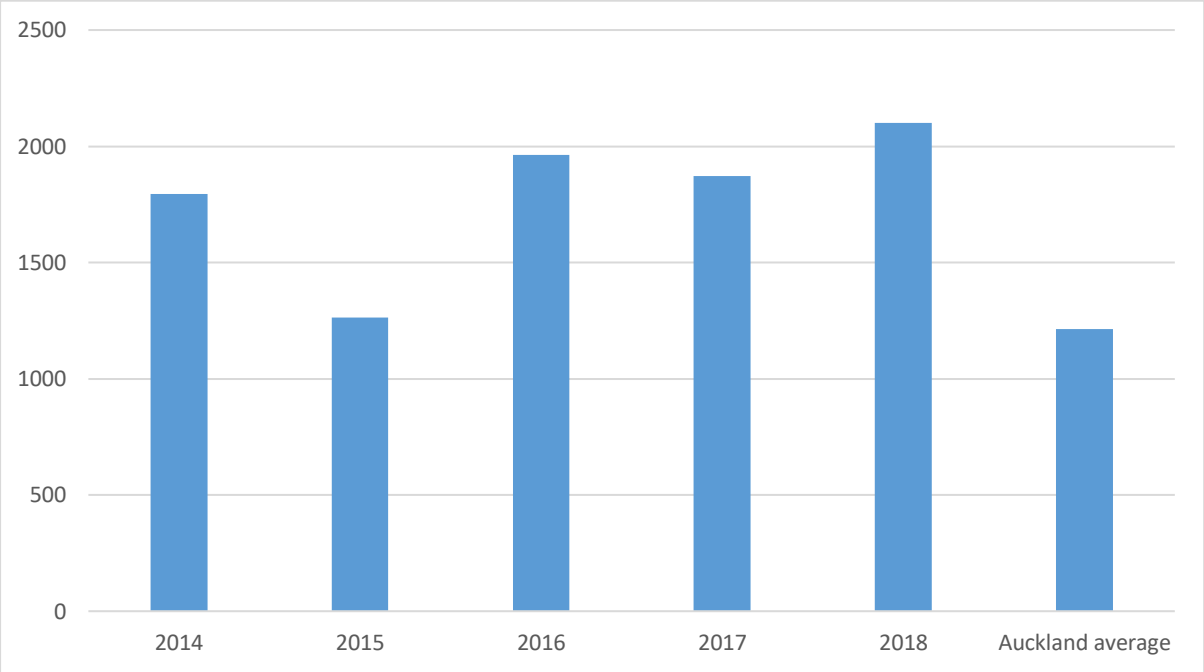

Figure 3.2: Annual rainfall (mm) Mahurangi Raws @ Forest 2014 to 2017 and NIWA

The meteorological data indicates that the annual rainfall within the Wayby Valley is greater than elsewhere in the Auckland Region, with annual rainfall rates of up to 2,000mm/ year compared to 1,200 to 1,300mm/ year elsewhere.

While the annual rainfall is higher within the Wayby Valley, a review of hourly rainfall rates shows that peak hourly intensities are similar to those within the broader region. The peak hourly rainfall intensity over the past five years was 41mm, which can be compared to the peak intensity within the Auckland Region of 40.4mm [4].

3.3 Topography and geomorphology

The geology and geomorphology are described in detail within the Geotechnical Interpretative report (Technical Report B, Volume 2).

In general terms, the project footprint is characterised by a ridge and gully topography, which has been deeply incised by west-north-west draining watercourses that form tributaries of the Hōteo River.

The majority of natural slopes encountered in the project area are gently (≤18°) to moderately (19° to 25°) inclined in geological terms. The south facing slopes are generally steeper than the north facing slopes indicating that the north facing slopes are bedding concordant (dip slopes) and the south facing slopes are bedding discordant (scarp slopes).

The project footprint is primarily underlain by Pākiri Formation sedimentary rocks of the Waitemata Group. Northland Allochthon has not been identified within Valley 1 but is present with reference to

[4] Chappell, P.R. 2013. The climate and weather of Auckland. NIWA Science and Technology Series 60

geological maps on the lowland of the Western Block. Tauranga Group alluvial sediments were encountered at the base of the road access valley, with these materials encountered around low-lying streams.

Existing terrain mapping from the 2006 Auckland Council Rural LIDAR survey is shown below in Figure 3.3. More recent aerial photographs indicate that the overall topography has not changed significantly since 2006.

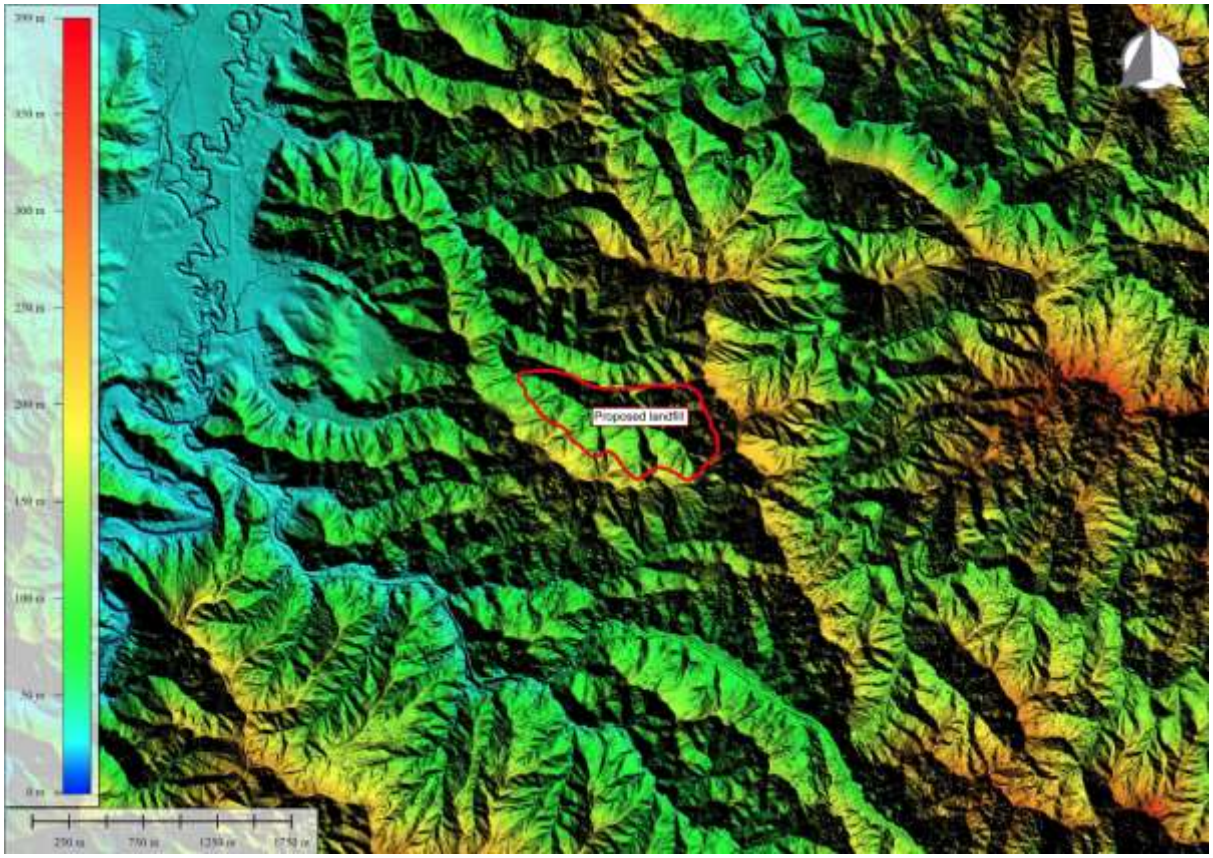

Figure 3.3: Project topography as at 2006 (elevations derived from Auckland Council LIDAR data)

3.4 Water quality

Baseline water quality monitoring within the project footprint has been undertaken to obtain information on the current water quality within the immediate catchments. The results to date are reported in the Baseline Monitoring report (Technical Report F, Volume 2).

To date 10 rounds of monitoring have been undertaken. Due to the limited monitoring data publicly available from nearby catchments, the results have been compared to Auckland Council monitoring data for the Mahurangi Redwoods Catchment. The monitoring results are within similar ranges to the Redwoods site and are generally indicative of excellent water quality. This is expected due to the relatively small upstream catchments, and limited other sources of contaminants in the area. An evaluation of the sensitivity of the different streams within the project footprint is also included in Section 8.2.

There is also on-going water quality monitoring in the Hōteo River by NIWA as part of the National River Water Quality Network. Data from the site are used by Auckland Council as part of the State of

the Environment Monitoring programme. The most recent published information is included in the State of the Environment Monitoring: River Water Quality Annual Report 2016[5]

The report includes a water quality index which considers the overall water quality for each stream. The Hōteo River water quality index class was Good for 2013 and 2016, and Poor for 2014 and 2015.

[5] Auckland Council, Technical Report 2018/003, State of the Environment Monitoring: River Water Quality Annual Report 2016, February 2018.

4 Operational surface water drainage

4.1 Landfill catchment

The landfill stormwater treatment system will vary over the different Stages of the landfill operations and seasonal construction after start-up. The overall approach to stormwater management as part of the landfill development is as follows:

- Any surface water that comes into contact with waste is treated as leachate and is kept separate from clean surface water
- Surface water from up-gradient of the landfill cells and development areas is diverted around the works areas to minimise potential for sediment generation
- All surface water (excluding any water treated as leachate because it has come in contact with waste) is to pass through the stormwater treatment system where it is monitored prior to release to the receiving environment

The stormwater treatment system will comprise a number of devices in series, including:

- A number of stormwater ponds for removal of coarse and fine sediment (there will always be at least two sediment ponds in a series)
- A final stormwater pond to provide removal of coarse and fine sediment and to provide stormwater detention
- An engineered stormwater wetland to provide a final stormwater quality polishing step including treatment for residual dissolved and organic compounds, if any, before final discharge to the receiving environment

The stormwater treatment system has been designed based on the guidance in the following documents:

- Auckland Council, Stormwater Management Devices in the Auckland Region, December 2017, (GD01)
- Auckland Council, Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region, June 2016 (GD05)

The design standard and size of the ponds and wetland from the relevant Auckland Council guidance documents are summarised in Table 4.1 below.

Table 4.1: Landfill stormwater system – Minimum design standard

Pond	Design standard GD05	Design standard GD01
Sediment Ponds	Minimum of 2%* of the contributing catchment (based on sites with slopes <18% or <200m in length). Minimum of 3% of the contributing catchment (based on sites with slopes >18% or >200m in length). *meaning 200m^3 of live storage per hectare of catchment, for sedimentation.	Detention of larger storm events 2, 10 and 100 year ARI) for flood mitigation
Wetland	N/A	Water quality treatment (based on the 90th percentile storm depth*)

Pond	Design standard GD05	Design standard GD01
		Extended detention for the 95th percentile storm depth for stream erosion protection. *mm of rainfall

While GD05 includes recommended minimum pond volumes based on the contributing catchments, these are minimums and do not represent a specific design standard. Due to the nature of the activities, and experience by WMNZ at other sites they operate, the total storage volume has been made higher than these minimums.

In general the landfill will be developed in three Stages which are described below. The different Stages are shown on Drawings ENG-401, 41 and 42.

Stage 1: Drainage

Filling of the landfill with waste will commence in the middle of the valley. This provides room for additional sediment ponds to increase the performance of the sediment control system during the initial landfill development works and early years of disposal operations. The drainage for Stage 1 will be as follows:

- Stormwater runoff from upstream of the first Stage of the landfill will be collected in a pond (Pond 5) on the upstream side of the landfill. This will drain via a stormwater pipe constructed beneath the landfill liner which will be sized to convey flows up to the 10 percent Annual Exceedence Probability(AEP). During rain events greater than the capacity of the stormwater pipe, the additional volume will be detained in Pond 5. This will be sized to contain up to the 1 percent AEP. The stormwater pipe will discharge into Pond 3.
- Drainage from the first Stage of the landfill including during seasonal earthworks will discharge into Pond 4. This will include the drainage from the access roads within Valley 1 and areas around the landfill footprint. Initially, the water level in Pond 3 will be lower than the final design level due to the invert required for the stormwater pipe discharging into the pond.
- Flows from Pond 4 will then discharge into Pond 3, before passing through Pond 2.
- Flows from Pond 2 up to the 95th percentile storm event will pass through the engineered wetland for final polishing and treatment. Flows greater than the 95th percentile storm event will discharge via a lined channel directly to the downstream watercourse, bypassing the wetland.

Stage 2: Drainage

Filling of the landfill will continue up the valley. The stormwater pipe underneath the landfill will be decommissioned, and flows will be directed around the landfill to Pond 4. Following the decommissioning of the stormwater pipe, the capacity of Pond 3 can be increased as it will no longer be constrained by the invert level of the stormwater pipe under the landfill.

The drainage for Stage 2 will be as follows:

- Surface water from the catchment above Pond 4, including the access roads, the covered landfill stages, and the development of the new stages in the upper valley, will be directed into Pond 4
- Surface water from areas downstream of the landfill, including the workshop and gas plant will be directed towards Pond 3
- The drainage will flow through each Pond in series

Stage 3: Drainage

Stage 3 involves the final stages of the landfill at the base of the valley. To enable construction of the Phase 7, Pond 4 will be decommissioned resulting in a lower overall pond volume, albeit still compliant volume, for sediment control, however a substantial area of the landfill will by then have been capped and grassed.

4.2 Access road

The access road will provide the main access to the landfill and will be used by trucks and staff vehicles. The road has been designed to take approximately 750 vehicle return trips per day corresponding to maximum estimates toward the later years of the landfill's life and with the intention of never having to re-disturb ground for any widening.

The access road has been divided into two sections for the purposes of stormwater management:

- Section 1: the extent of the access road within the Eastern Block
- Section 2: the sections of access road from State Highway 1 to the crossing of the ridgeline into the Eastern Block

All stormwater from Section 1 will discharge into the landfill pond system outlined above.

The stormwater system for Section 2 will comprise:

- All clean stormwater from slopes above the road will be intercepted in roadside drains on the upslope side of the road and will then be conveyed across the road by culverts.
- A channel drain on the downslope side of the road collects stormwater runoff from the road carriageway. For flows up the 95th percentile storm depth, stormwater will be collected in the drains and discharged via filter strips along the road to provide water quality treatment of the runoff. The filter strips will comprise a scruffy dome which will discharge via a spreader bar laid along the slope contours. Detention volumes for smaller rain events up to the 95th percentile storm depth will be held within the scruffy dome and channel to minimise stream erosion effects. Flows above the 95th percentile storm depth will overflow the scruffy dome and continue down gradient to the nearest culvert and discharge into the top of the rock protection structure for the culvert to minimise any erosion at the outlet.

4.3 Bin exchange area

The bin exchange area will be sealed and graded to direct all surface water to either one or two raingardens depending on the final surface gradients. The raingardens will be sized to provide water quality treatment for up to the 90th percentile storm depth and to hold and release the 95th percentile storm depth and discharge to the stream via a riprap outlet. Flows exceeding the 95th percentile will bypass the raingardens and discharge directly into the stream via the same outlet or a dedicated extreme-event riprap outlet.

4.4 Stockpiles and clay borrow

The stockpiles and clay borrow area are used to stockpile clay and soil from the initial construction works, as well as on-going stockpiling during the operation and development of the landfill. Initial placement will be part of the site establishment and initial construction phase of the development. Clay and soil will then be progressively placed and removed during the life of the landfill for use during the development of cells, and for intermediate cover and final capping.

Each stockpile and borrow area will include a permanent sediment pond which will be sized based on 3% of the total stockpile catchment based on the length of the catchment and recommendations in GD05.

5 Industrial and trade activities

5.1 Industrial and Trade Activity Area

The Industrial and Trade Activity Area has been calculated based on the definition within Chapter J of the Auckland Unitary Plan, Operative in Part. The definition is as follows:

Industrial or Trade Activity Area

"The area of land or coastal marine area where a particular industrial or trade activity is being undertaken, which may result in the discharge of environmentally hazardous substances associated with that activity onto or into land or water.

The calculation of the industrial or trade activity area must be based upon the following areas:

- *all roof areas onto which environmentally hazardous substances generated by the activity are deposited;*
- *all outdoor storage, handling or processing areas of materials and/or products that may contribute to the quality or quantity of environmentally hazardous substance discharges (including occasional or temporary use of areas);*
- *the area at risk from failure of the largest unbunded container used for the activity that may contribute to the quality or quantity of environmentally hazardous substance discharges: and*
- *all areas (including roofs) that contribute runoff to the Industrial or trade activity area.*

The calculation of the industrial or trade activity area excludes the following areas:

- *all areas that discharge lawfully into an authorised trade waste system;*
- *areas that are not used for or affected by the industrial or trade activity;*
- *all indoor or roofed areas which do not discharge onto or into land or water; and*
- *areas used for the storage of inert materials, provided that if suspended solids are generated by the materials and entrained in stormwater, the stormwater from such storage areas is treated in accordance with the best practicable option or is otherwise lawfully authorised."*

For the purposes of the assessment, the following areas are considered to be part of the Industrial or Trade Activity Area:

- The landfill access road and access roads within the landfill footprint itself due to potential deposition of refuse material and sediment from the hauling of waste to and from the working face
- The bin exchange area including parking areas, as these may be used for parking of waste transport vehicles
- The workshops
- The energy centre
- The wheel wash (although this will utilise a recycling system, excess water will be discharged into the stormwater ponds)
- All buildings within the Eastern Block catchment which will discharge into the landfill stormwater treatment ponds

The following areas of the site are not considered to be part of the Industrial or Trade Activity Area:

- The building at the bin exchange area (provided this does not discharge to the raingardens)
- The operational working face and associated areas (any runoff from this area will be treated as leachate and will not be discharged to the stormwater system)

- The stockpiles and clay borrow (these areas comprise stockpiling inert materials with treatment in accordance with the best practicable option)

The landfill cell seasonal construction and development would not typically be considered to be part of the Activity Area, but as the discharge is managed via the same treatment ponds and wetlands this has been included in the calculation of the Activity Area catchment.

5.2 Contaminant sources and controls

The activities with the potential to generate contaminants have been identified in Table 5.1.

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 5.1 below.

Table 5.1: Contaminant Sources and controls

Site area	Activities	Potential contaminants	Physical controls	Procedural/ documentation controls in Draft ITA EMP
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. Concrete hardstand / floor. 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 of waste oil tank.	• Section 3.8 Storage of hydrocarbons and dangerous goods
	Compressor room	Hydrocarbons	Secondary containment.	• Section 3.8 Storage of hydrocarbons and dangerous goods
	Dangerous goods store	Oils/ greases	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	Bulk oil drums/ containers (20 L and 200 L) stored on plastic bunds.	• Section 3.5 Main workshop and outside covered workshop
	Outside covered workshop area	Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	Area covered. Runoff is directed to a sump. The sump will be pumped to the wash bay sump which passes through a grit chamber before being pumped to the stormwater ponds	• Section 3.5 Main workshop and outside covered workshop
	Primary wash-bay	Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	Main wash bay designed to capture coarse solids. Runoff directed through a grit chamber and is pumped to the stormwater ponds.	• Section 3.6 Washwater

Site area	Activities	Potential contaminants	Physical controls	Procedural/ documentation controls in Draft ITA EMP
Energy compound	Leachate collection tanks and evaporator	Heavy metals, oils/ greases, ammonia, COD/ BOD	Leachate collection and storage tanks and evaporator arebe bunded and overflow to the on-site stormwater treatment system. High level alarms are in place on the leachate tank as well as an alarm on the bund level. Any clean runoff is directed to the on-site stormwater treatment system and contaminated stormwater is processed on-site.	• Section 3.2 Leachate
	Landfill gas blowers and flare – leaks/ servicing of equipment	Oils/ greases, condensate	Runoff is directed to the on-site stormwater treatment system.	• Section 3.10 Maintenance of energy compound equipment
	Landfill gas generators	Oils/ greases, condensate, glycol coolant	Runoff outside the modular self-bunded 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	Runoff is directed to the on-site stormwater treatment system.	• Section 3.10 Maintenance of energy compound equipment
	Generator oil tanks (30,000 L oil tank and 6,000 L waste oil tank) plus unloading area	Hydrocarbons	Tanks and unloading area are bunded with isolation valves. Clean runoff will discharge to the on-site stormwater treatment system.	• Section 3.8 Storage of hydrocarbons and dangerous goods
	Future generator area	Oils/ greases, condensate, glycol coolant	Runoff will be directed to the on-site treatment system.	• Section 3.10 Maintenance of energy compound equipment
	Back-up diesel generator (2,000 L oil)	Hydrocarbons	The back-up generator will be self bunded.	• Section 3.10 Maintenance of energy compound equipment
	Generator workshop area	Oils/ greases, heavy metals	Bulk oil drums/ containers (20 L and 200 L) stored in a bunded area or on plastic bunds, or otherwise in a manner that minimises potential for stormwater	• Section 3.8 Storage of hydrocarbons and dangerous goods

Site area	Activities	Potential contaminants	Physical controls	Procedural/ documentation controls in Draft ITA EMP
			contamination from either routine handling or spills.	
	Flare site dangerous goods store	Oils/ greases, glycol coolant	DG store will be bunded and roofed.	• 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 stormwater treatment system.	• Section 3.2 Leachate
Landfill development area	Cell preparation including earthworks	Suspended solids, heavy metals	All runoff 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 runoff is directed to on-site treatment system.	• Section 3.11 Landfill disposal and development area
	Working face/ filling area	Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	Any stormwater is allowed to infiltrate the waste and is collected as part of the leachate system.	• Section 3.11 Landfill disposal and development area
	Daily cover, intermediate cover placement, and final capping construction including earthworks	Suspended solids, heavy metals, ammonia and contaminants from leachate breakout	All runoff is directed to the continuously monitored on-site treatment system.	• Section 3.11 Landfill disposal and development area
	Final capped landfill	Suspended solids, periodic pasture fertiliser	All runoff is directed to on-site treatment system.	• Section 3.11 Landfill disposal and development area
Wheel wash	Automated wheel washing by water jets	Oils/ greases, suspended solids, heavy	Runoff is directed to the wheel wash ponds. This is recycled for use in the wheel wash system.	• Section 3.1 Wheel wash

Site area	Activities	Potential contaminants	Physical controls	Procedural/ documentation controls in Draft ITA EMP
	within a wheel wash enclosure	metals, ammonia, COD/ BOD	If necessary, it can be discharged to the on-site treatment system following testing.	
Leachate tank	Leachate storage tank	Leachate including Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	Tank failure will be contained by bunds, backed up by the on-site treatment system where contaminated water can be removed for disposal or held for testing prior to release.	• Section 3.2 Leachate
	Filling of tankers for off-site disposal	Leachate including Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	Bunding of filling location. Filling of tanks will be supervised by tanker driver.	• Section 3.2 Leachate
Main roadway, office area and weigh bridge	Main roadway	Oils/ greases, suspended solids, heavy metals	Runoff is directed to the off-site system.	• 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	Runoff is directed to the on-site treatment system.	• Section 3.11 Landfill disposal and development area
Bin exchange area	Parking	Oils/ greases, suspended solids, heavy metals	All runoff is directed to on-site treatment system specific to the bin exchange area.	• Section 3.3 Bin exchange area
	Bin setting down area	Oils/ greases, suspended solids, heavy metals, ammonia, COD/ BOD	All runoff is directed to on-site treatment system specific to the bin exchange area.	• Section 3.3 Bin exchange area

5.3 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 landfill footprint and related construction zones. The wheel wash will comprise as a minimum, a ramp into a flooded basin through which vehicles drive. It may also include fixed water jets and/or a hand held water blaster for manual cleaning of vehicles, and rumble bars located where they won't hinder cleaning out.

Sediment from the wheel wash 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 or be pumped into the landfill stormwater management system including the ponds.

5.4 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 of waste to the landfill entrance and deposited in the exchange area. The road-haul trucks can then pick-up empty bins and depart the landfill. The full bins will be taken to the landfill tip face by site haulage/ tipper vehicles known as mules. This enables the transport of waste by dedicated road-haul trucks from source to the landfill entrance to be separated from the landfill tipping operations.

The bin exchange area will be used to deliver full bins of waste and to re-load empty bins onto trucks. No unloading of waste from 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 raingardens to provide water quality treatment for any runoff.

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

The bin exchange will be set above the current known extent of the flood plain as determined in the Engineering Report (Technical Report N, Volume 2). This will ensure the area is not vulnerable to any flooding, which could result in the mobilisation of any contaminants.

5.5 Energy Centre

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

- The landfill gas flare(s) and vacuum pumps aka blowers
- The electricity generators and transformers
- Standby diesel electricity generator
- Condensate removal system
- Leachate evaporator(s)
- Leachate storage tank
- A small workshop for gas generator maintenance

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

An example of the proposed size and scale of the energy centre is shown below.

Figure 5.1: Example energy centre, Redvale Landfill

5.6 Maintenance workshop

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

The runoff from the maintenance workshop area will be directed to the main landfill stormwater ponds and wetland.

5.7 Hazardous substance management

Hazardous substances will be used at the landfill and associated activities, including diesel and oils and greases.

The key structural controls in place to minimise discharges to stormwater from the storage of hazardous substances include:

- Areas where hazardous substances are routinely used are located indoors (e.g. maintenance workshops) in specific locations that have been designed for this purpose
- Storage containers for hazardous substances are housed in dedicated indoor/covered facilities with secondary containment (e.g. a bund or strip drain to capture any spill)
- Hazardous substances must only be stored in containers appropriate for the substance being stored (e.g. corrosion resistant), in sound structural condition, and adequately covered (i.e. by a lid)

The key procedural controls to minimise discharges to stormwater are as follows:

- Whenever possible, the use of hazardous substances shall only occur within appropriate designated areas for the activity being undertaken, and inside / undercover and within areas that are bunded
- 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 be clearly labelled with appropriate signage
- All work units (e.g. gas / leachate management team, general grounds maintenance group, workshop group, environmental monitoring group and disposal working face group) hold manifests and SDS sheets of the chemicals required for their operations
- Spill kits will be located in close proximity to all areas where hazardous substances are used or stored

- Any small leaks or drips of hazardous substances must be cleaned up as soon as practicable. The spill response plan will be implemented in the event of a larger spill

5.8 Leachate management

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).

The overall approach to leachate volume management is to keep leachate and stormwater separate. Any surface water that drains onto the open working face and associated areas including the tipping pad is treated as leachate and managed as such.

To minimise the generation of leachate, cut-off drains around the working areas are utilised to divert clean stormwater away from the working areas. No treatment or disposal of leachate via the stormwater ponds is proposed at the landfill.

Procedures or systems will also be implemented to monitor and identify potential leachate breakouts or contamination of surface water including:

- Weekly inspections of the landfill surface to look out for any evidence of leachate breakouts and any malfunctioning or leaking associated with the reticulation system
- Continuous monitoring of conductivity at the inlet to the ponds as an indicator of the presence of leachate in surface water, including automated notification from site-operated telemetry system if pond inlet conductivity exceeds the trigger limits
- Monitoring of contaminants at pond outlets

If a leachate breakout is identified, or leachate is identified in surface water, the landfill has contingency procedures in place, which are be included in the contingency section of the surface water section of the LMP and the Emergency Management Plan.

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

5.9 Industrial and Trade Activity Environmental Management Plan

A draft Industrial and Trade Activity Environmental Management Plan (ITAEMP) has been developed, and is included in Appendix A.

The purpose of the ITAEMP is:

- to satisfy resource consent conditions which require the site to have a management plan (once consent is granted)
- to describe the management, construction, operation and monitoring framework which will be employed at the site to satisfy consent conditions
- to provide pertinent reference information

5.10 Spill response

The landfill operation has potential for spills of liquids or refuse during hauling, hydraulic line failures, and spills of hazardous substances on-site.

WMNZ has developed a draft spill response plan which outlines the spill control procedures to be implemented including:

- Provision of spill kits and equipment

- Containment
- Disposal
- Communication and notification
- Follow-up

The Spill Response Plan forms part of the LMP.

6 Operational sediment management

6.1 Approach to sediment management

As discussed in Section 2, the Hōteo River is sensitive to discharges of sediment with potential effects within both the river and its tributaries, as well as downstream in the Kaipara Harbour. The ecology assessment has also identified a number of fish and macroinvertebrate species within the streams which are sensitive to sedimentation. Although the Hōteo is sensitive to sedimentation, the ecological assessment did identify that the existing streams currently have evidence of high sediment loads, with areas of the streams having pools with deep layers of sanding sediment already in place. Considering the nature of the soils and geology, this is consistent with expectations for the catchment.

The proposed development will utilise a range of sediment control measures during the operation, including the provision of a number of sediment control ponds for the landfill and sediment ponds for the stockpile locations. In addition to the permanent sediment ponds, additional measures will include silt fences and cleanwater diversion drains and interim ponds within both the landfill and the stockpiles to provide additional sediment removal.

The proposed stockpiles will have permanent sediment ponds which will be designed in accordance with Auckland Council GD05. Due to the highly erodible nature of the soils, and the sensitivity of the receiving environment, each pond has been designed to provide storage for 3% of the catchment area (i.e. 300m^3 of storage per hectare). These will also be designed for the full extent of the stockpile areas where, in reality, the actual areas being worked at any time will be much lower with the remaining areas progressively stabilised.

Within the landfill catchment, sediment will be managed by first minimising the potential sediment runoff through the landfill including the use of clean water diversion drains and silt fences. All runoff from the landfill catchment will flow through a sequence of ponds. As outlined in Section 7.4 above, the number of ponds, pond sizing and layouts will vary during the different stages of the landfill.

Irrespective of the stage, surface water will pass through at least two sediment ponds and flows up to the 95th percentile rain depth will also pass through a final polishing wetland. The ponds have been sized to provide effective sediment removal based on good practice design outlined in GD05, and to achieve the necessary sediment removal required to minimise discharges of sediment.

6.2 Long term sediment loads

The sediment loads from the on-going operation will vary over time as the landfill develops. We have calculated the potential sediment loads based on the likely maximum extent of the earthworks during the operational phase of the landfill.

The landfill also has a number of sediment ponds which have been designed to reduce sediment loads from the landfill.

The sediment loads from areas of the landfill being developed have been estimated by Universal Soil Loss calculations (USLE, refer Appendix C for calculations). The USLE was developed by the United States Department of Agriculture to estimate erosion rates from different land use practices. The USLE calculation is commonly used in the Auckland Region to estimate sediment loads from earthworks activities.

Based on the USLE calculations, the annual sediment load from open areas of the landfill is 36,000 tonnes/km^2.

Table 6.1: Calculated sediment loads (landfill during stages of landfill) without treatment

	Plantation Forestry (tpa)	Open earthworks areas (tpa)	Stabilised grassed areas (based on farmland) (tpa)	Stabilised areas replanted with bush (tpa)	Total without treatment (tpa)
Landfill Stage 1	95	2,088	82	-	2,265
Landfill Stage 2	57	2,808	116	-	2,980
Landfill Stage 3	69	1,512	110	-	1,690

The proposed surface water treatment system comprises a number of ponds in series. The reduction in sediment loads has been based on the expected performance for each pond assuming 70%[6] (except Pond 3 during Stage 1) treatment efficiency as outlined in Table 16 below. For the purposes of calculating the long term sediment loads, the wetland has not been included in the calculation as only the flows up to the 95th percentile rain depth will pass through the wetland. Therefore, the calculations will overestimate the total sediment loads.

Table 6.2: Efficiency of sediment ponds

	Pond 2	Pond 3	Pond 4	Overall
Landfill Stage (A)	70%	20%	70%	93%
Landfill (Stage 2)	70%	70%	70%	97%
Landfill (Stage 3)	70%	70%	-	91%

The calculated sediment loads with the treatment in place has been calculated and summarised in Table 6.3 below.

Table 6.3: Annual sediment loads with treatment

	Total without treatment (tpa)	% removal	Total with treatment (tpa)
Landfill Stage 1	2,265	93%	159
Landfill Stage 2	2,980	97 %	89
Landfill Stage 3	1,690	91%	152

Based on the overall catchment, the calculated annual sediment loads with treatment is between 81 and 144 t/km^2/annum. This can be compared to reported sediment loads from catchments comprising forestry and farmland of between 167 and 172 t/km^2/annum[7].

6.3 Erosion & Sediment Control Plan - operations and seasonal construction

An ESC for the Landfill operation is included in the LMP. The aim of the ESC Plan is to set out how the Landfill minimises the amount of water-borne sediment in surface water leaving the site.

There are two main strategies:

[6] Based on the average removal efficiency from untreated pond, Performance of a Sediment Retention Pond Receiving Chemical Treatment, Auckland Regional Council, October 2008.
[7] Analysis of Sediment Yields within the Auckland Region, TR2009/064, Auckland Regional Council

- Erosion control - preventing the sediment from becoming mobilised in the first place
- Sediment control - providing measures to contain mobilised sediment on the site

The Erosion and Sediment Control Plan for Landfill Operations and Seasonal Construction (E&SC Plan) sets out temporary, semi-permanent and permanent sediment control measures for the site, in the specific control areas of seasonal (summertime) construction, operations and capping.

The E&SC Plan provides for a risk minimisation approach based on the following three first principles:

- Minimising surface erosion
- Promoting sedimentation of suspended solids before water leaves the site
- Controlling flows to minimise adverse effects of discharges on downstream biota

The measures to manage risk include:

1 Minimise land disturbance
2 Stage 3onstruction
3 Protect steep slopes
4 Protect water courses
5 Stabilise exposed areas promptly
6 Install perimeter controls
7 Employ detention devices
8 Get trained contractors
9 Assess and adjust (inspect, monitor, maintain)
10 Take response actions described in the monitoring and contingency sections

The methods used at the site are outlined in the E&SC Plan and include those outlined in Table 6.4 below.

Table 6.4: Erosion and sediment control measures

Control method	Description
Temporary methods	
Slope stabilisation, including: • minimisation of bare slopes • track rolling surfaces • tyre rolling surfaces • compaction • mulching • grass seeding • tarping • covering with slash • stockpile side tamping	Objective - prevent silt generation at source. Undertaken on: (a) temporarily unprotected soil surfaces before rain (b) completed slopes when work moves elsewhere (c) construction areas stabilised (d) any area that will be left bare for more than two months. The area of un-vegetated daily cover is to be minimised.
Coarse silt retention measures, including: • silt fences • hay bales	Objective - maximise capture of mobilised silt. Suitable at or near source. Details to be in accordance with GD05.

Control method	Description
Temporary methods	
• temporary settlement ponds close to source for primary particle settlement	
Cut off channels, including: • appropriate sizing • appropriate spacing • appropriate falls	Objective - reduce erosion potential. Suitable near source, with small flows cut-off channels reduce distances that water travels before entering the stormwater system, thereby reducing surface flow erosion potential.
Channel reinforcement / lining, including: • rock • geotextile • concrete • grass (sides, not invert)	Objective - reduce erosion potential. Suitable for steeper slopes for moderate flow velocities or volumes. Drains and stormwater channels may be lined to reduce erosion potential.
Velocity controls, Including: • flatter grades • intermediate ponds • baffles • rocks • channel invert sumps	Objective - minimise re-suspension of sediment. Suitable for use in most channels and drains. High flow velocities have the potential to pick up previously deposited silt and re-suspend the silt into the flow. Interrupting the flow by velocity controls will dissipate energy, reduce re-suspension, and reduce risk of new channel bed erosion.
Flow retention ponds, including: • ponds • flood plains • ponds sized to increase detention times	Objective - flow balancing to maximise time on site. Suitable on low or flat ground between channels. Water is held on site within ponds thereby providing greater time for sediment to settle before discharge from the site.
Road surfacing, including: • hard gravel • asphalt	Objective - to reduce amount of silt picked up on truck tyres.
Road washing	Objective - to keep silt on site where silt controls are in place.
Chutes, downspouts, culverts	Objective - to carry flows down steeper slopes. By using properly lined systems, erosion potential is eliminated.
Wheel wash, including: • long 'bath' • regular clean outs	Objective - to remove silt and mud from vehicle tyres and wheel arches prior to exiting site. Designed to prevent transfer of material to the local roads. It is vital that all trucks and vehicles that access the site while conditions are muddy travel through the wheel wash prior to exiting the site.
Permanent methods:	
Ponds	Objective - to provide sediment settling and maximise siltation. Primary water abstraction point for maintenance and operational requirements on site.

7 Stormwater catchments

7.1 Existing catchment

The proposed development will be within four tributary valleys of the Hōteo River. The current catchments include a mixture of plantation forestry, farmland and native bush.

The existing catchment characteristics have been assessed and are summarised in Table 7.1 below. In general terms, the main landfill valley is predominantly comprised of forestry with the exceptions of localised clearings. The main access valley currently comprises of a mix of both native and exotic vegetation.

Table 7.1: Pre-development catchments

Sub-catchment	Total catchment area (ha)	Land use (ha)			
		Grassed	Native Bush	Forestry	Impervious sealed
Valley 1 within Eastern Block (landfill)	110.0	-	-	110.0	-
Southern block (Access road)	85.4	6.6	78.8	-	-
Western block (Farm)	302.0	232.7	41.8	23.5	4.0
Upper Waiteraire block (Stockpile 2)	143.0	-	63.8	79.2	-

7.2 Proposed catchments – excluding landfill

The post-development scenario (immediately following the enabling works and commencement date of landfilling) has been based on the completion of the access road, and associated roads and the development of the stockpiles. Separate calculations have been undertaken for the landfill footprint as this will vary over time (attached in Appendix B).

The future scenario is summarised in Table 7.2 below.

Table 7.2: Future scenario – excluding landfill

Sub-catchment	Total catchment area (ha)	Land use (ha)			
		Grassed	Native Bush	Forestry	Impervious sealed
Southern block (Access road)	85.4	9.5	67.8	4.1	4.0
Western block (Springhill Farm)	302.0	155.0	41.8	99.5	5.7
Upper Waiteraire block (stockpile 2)	143.0	7.2	63.8	71.7	0.3

7.3 Stormwater runoff calculations

We calculated the pre-development and post-development runoff, as follows:

- Water quality volumes based on the 90th percentile storm depth
- Stream erosion flows based on the 95th percentile storm depth
- 50% AEP
- 10% AEP

- 1% AEP

The calculations are in accordance with Auckland Council Technical Publication 108, Guidelines for stormwater runoff modelling in the Auckland Region, April 1999. However, rainfall rates have been obtained from the NIWA High Intensity Rainfall Design System (HIRDSv4) which provides specific rainfall rates for the proposed landfill location.

Results are summarised in Table 7.5 and Table 7.6. The calculations have included consideration of climate change in accordance with Auckland Council Code of Practice for Land Development and Subdivision, Chapter 4 - Stormwater. The 24 hour rainfall depths have been adjusted to account for the increase in rainfall due to future climate change based on a 2.1^{o} increase in temperature for the 2090 climate change scenario. The 2090 scenario is considered appropriate, as the landfill will have been closed during this period. Table 7.3 summarises the rainfall data used in this analysis.

Table 7.3: Design rainfall depths

AEP	Rainfall depth (mm)	Climate change factor	Design rainfall depth (mm)
50%	98.8	9.0%	108
10%	152	13.2%	172
1%	233	16.8%	272

SCS curve numbers (CN) were used to represent runoff potential. It has been assumed that the sub-catchments contributing to the landfill are similar to soil group C. The following curve numbers have been used in accordance with Auckland Regional Council (ARC) TP108 Appendix B –SCS Guideline for Runoff Curve Numbers.

Table 7.4: Runoff curve numbers

Cover description	Curve Number	Soil group	Reference	
Grass	74	C	Pasture, grassland, good condition	Table 2-2c
Plantation forestry	72	C	Woods-grass combination, good condition	Table 2-2c
Bush	70	C	Woods, good condition	Table 2-2c
Paved	98	C	Impervious areas	Table 2-2a
Gravel	89	C	Gravel (including right-of-way)	Table 2-2a
Open earthworks	91	C	Newly graded areas	Table 2-2a

The time of concentration has been determined using the empirical lag equation given in ARC TP108.

Catchment slopes were calculated using the equal area method based on the longest drainage path.

Table 7.5: Runoff volumes pre and post-development

AEP	Southern Block (Access road)			Western Block (Springhill farm)			(Upper Waiteraire Block) Stockpile 2		
	Pre-development (m^3)	Post-development (m^3)	% change	Pre-development (m^3)	Post-development (m^3)	Change	Pre-development (m^3)	Post-development (m^3)	Change
50%	42,895	45,255	5.5%	165,033	163,836	-0.7%	73,242	73,574	0.5%
10%	86,887	89,900	3.5%	326,995	324,974	-0.6%	147,675	148,138	0.3%
1%	162,782	166,389	2.2%	601,856	598,980	-0.5%	275,560	276,153	0.2%

The runoff calculations show the proposed development will have a negligible change in the runoff volumes from the Western Block and Upper Waiteraire Block catchments.

Only the Southern Block catchment shows greater than 1 % increase in total annual volume of runoff. As outlined in Section 4 above, the access road valley discharges into the Waiteraire Stream which then discharges into the Hōteo River, approximately 1km downstream. To understand the potential impacts on flooding within the Waiteraire Stream and the Hōteo River at Wayby Valley, we have calculated the change in volumes within the full extent of the Waiteraire Stream catchment. This shows that while the proposal will increase the peak flows between 2.2% and 5.5% within the Southern Block tributary of the Waiteraire Stream, the overall change in flows for the entire Waiteraire Stream catchment from the Southern Block tributary upwards (including Dome Valley) are negligible.

Table 7.6: Runoff volumes pre and post-development Waiteraire Stream Catchment

AEP	Waiteraire Stream Catchment		
	Pre-development (m^3)	Post-development (m^3)	Change
50%	924,125	925,686	0.2%
10%	1,784,779	1,786,693	0.1%
1%	3,676,246	3,678,469	0.1%

7.4 Eastern Block (landfill catchment)

The post development peak flow rates and volumes will vary over the landfill operation due to the different layout of the ponds and areas developed. We have calculated the post stage development runoff for each of the different landfill stages without consideration of the landfill treatment ponds. The calculations are summarised inTable 7.7 and Table 7.8.

Table 7.7: Peak flow pre and post development

AEP	Peak flow (m^3/s)							Maximum difference between pre and post
	Pre-development	EW-Stage 1	EW-Stage 2	EW-Stage 3	Final Stage 1	Final Stage 2	Final Stage 3	
50%	5.8	10.3	8.4	6.8	9.5	8.1	6.7	4.5 m^3/s
10%	11.7	20.5	16.7	13.6	19.0	16.2	13.5	8.8 m^3/s
1%	21.9	37.5	30.3	25.1	35.1	29.7	25.0	15.6 m^3/s

Table 7.8: 24 hour volume pre and post development

AEP	Volume (m^3/s)							Maximum difference between pre and post
	Pre-development	EW-Stage 1	EW-Stage 2	EW-Stage 3	Final Stage 1	Final Stage 2	Final Stage 3	
50%	54,891	56,941	59,908	58,706	55,402	57,222	57,699	5,017 m^3
10%	109,551	112,023	115,976	114,564	110,068	112,563	113,284	6,425m^3
1%	203,472	206,262	211,133	209,578	203,949	207,092	208,063	7,661 m^3

The difference between the pre-development and post-development peak flows will be detained in Pond 2, with the live storage set at a level to provide sufficient detention up to 1% AEP. The design of the outfall structure will ensure the post-development peak flows do not exceed the pre-development peak flows.

7.5 Access road filter strip design

The proposed stormwater treatment devices for the access roads outside of the landfill catchment are filter strips, notably in the Southern Block containing the access road. The filter strips have been designed based on the New Zealand Transport Agency, Stormwater Treatment Standard for State Highway Infrastructure, May 2010.

A number of filter strips will be required along the length of the access road, and a typical design has been undertaken for the filter strips for each 2,000m2 which will treat up to approximately 200m of road. The calculation worksheet is attached in Appendix B, and a typical filter strip design is included in the drawings attached to the Engineering Report (Technical Report N, Volume 2). The calculated filter strip size is summarised in Table 7.9.

Table 7.9: Filter strip size

Total catchment area	2,000m^2
Filter strip width	40m
Filter strip length	22m
Minimum residence time	9 minutes
Minimum detention volume for stream erosion protection	65 m^3

7.6 Wetland design

The proposed wetland has been designed in accordance with Auckland Council GD01, with calculations included in Appendix B. These are summarised in Table 7.10.

Table 7.10: Summary of wetland sizing

Design criteria	Value
Water Quality Volume [m^3]	6,089
Depth Co-efficient (between 0.5 and 1.5)	1.00
Is stream protection required?	Y
Permanent Water Quality Volume (PWV) [m^3]	3,044
Permanent water level area [m^2]	3,044
Extended Detention Volume for stream protection (EDV) [m^3]	1,206
PWV + EDV	4,250
Forebay volume [m^3] (15% PWV)	913
Forebay depth (m) (minimum 1.5)	1.5
Forebay area [m^2]	609
Forebay length [m]	35
Forebay width [m]	17
Outlet discharge rate (m^3/s)	0.025 (maximum)

7.7 Raingarden design

The proposed stormwater treatment devices for the bin exchange area are raingardens. The design of the raingardens has been undertaken in accordance with Auckland Council GD01.

A copy of the full calculation worksheet is attached in Appendix B). The raingarden calculations are summarised in Table 7.11.

Table 7.11: Summary of raingarden sizing

Total catchment area	22,200m^2	
90th percentile 24 hour rainfall volume	30mm	
95th percentile 24 hour rainfall volume	42 mm	
Raingarden sizing	Raingarden 1	Raingarden 2
Raingarden area	500 m^2	610m^2

7.8 Stormwater pond design

A copy of the full calculation worksheets is attached in Appendix B. The pond sizing calculations are summarised in Table 7.11 and Table 7.13.

Table 7.12: Stormwater pond volumes

Ponds	Total maximum volume (m^3)
Pond 2	15,600
Pond 3 (Stage 1)	4,500
Pond 3 (Stage 2 and 3)	24,400
Pond 4	44,000
Upstream pond	8,700

Table 7.13: Design criteria

Design criteria	
Peak outlet velocity (from Pond 2) 2 year	5.8m^3/
Peak outlet velocity (from Pond 2) 10 year	11.7m^3/s
Peak outlet velocity (from Pond 2) 100 year	21.9m^3/
Total detention volume (live storage) in Pond 2	7,661m^3

8 Approach to assessment

8.1 Risk-based approach

We have developed a surface water strategy for the development based on the specific requirements for each area. This has been undertaken using a risk-based approach which considers the sensitivity of the receiving environment both immediate and further downstream and the activities undertaken in each catchment.

The purpose of the strategy is to assist in the identification of areas of the site and activities which may have a high risk of adverse effects if not effectively managed. This assists in identifying the level of controls required, and increased confidence that the proposed controls will be effective.

The strategy has been based on the key parameters outlined in Table 8.1 and Table 8.2 below.

Table 8.1: Sensitivity of receiving environment

	Water quality	Sediment	Stream erosion	Flooding
Low	Receiving environment has a large catchment to provide mixing; large number of existing sources of contaminants; limited evidence of ecological values sensitive to changes in water quality.	Receiving environment has a large catchment to provide mixing; large number of existing sources of sediment; limited evidence of ecological values sensitive to changes in sediment quality.	Hard bottom stream with large existing contributing catchment.	No existing on-site flooding effects. Some downstream, flooding but no dwellings likely to be impacted by flooding. Large contributing catchment with contribution from site limited.
Medium	Receiving environment has a moderate size catchment to provide mixing; other sources of contaminants but no significant sources; some evidence of ecological values sensitive to changes in water quality.	Receiving environment has a moderate size catchment to provide mixing; other sources of sediment but no significant sources; some evidence of ecological values sensitive to changes in sediment quality.	Soft bottom stream with large existing contributing catchment. Hard bottom stream with small existing contributing catchment.	Evidence of downstream flooding effects. No downstream dwellings potentially impacted by flooding. Small or medium size contributing catchment with moderate contribution from site.
High	Receiving environment has limited catchment size reducing level of mixing; limited sources of contaminants; ecological values having a high sensitivity to changes in water quality.	Receiving environment has limited catchment size reducing level of mixing; limited sources of sediment; ecological values having a high sensitivity to changes in sediment quality.	Soft bottom stream with small existing contributing catchment and having a high sensitivity to increased flows.	Significant downstream flooding effects. Downstream properties currently impacted by flooding. Small catchment with significant contributions from site.

Table 8.2: Generation potential

	Contaminants	Sediment	Quantity
Low	Limited activities undertaken with potential to generate contaminants (e.g. roadways with low vehicle numbers; parking areas).	Areas used for clean vehicles (non-landfill vehicles), or limited vehicle use (e.g. office areas).	Limited increases in impervious areas or minor contribution to the overall flows within catchment.
Medium	Some potential for contaminants including regular trafficked access roads and heavy vehicle parking.	Areas of the site with landfill vehicles after any truck wash.	Areas of new impervious area, but with flows distributed over a number of discharge locations or via existing streams.
High	Areas of the site where maintenance activities or leachate may be present.	Areas of the site which are currently being earth worked, roadways with landfill vehicles prior to truck wash.	Significant areas of new impervious areas with concentrated flows to limited discharge points.

The overall risk can then be identified for each of the different potential effects based on the overall risk in Table 8.3 below.

Table 8.3: Overall risk

		Sensitivity of receiving environment		
		Low	**Medium**	**High**
Generation potential	**Low**	Very low	Low	Moderate
	Medium	Low	Moderate	High
	High	Moderate	High	Very High

8.2 Risk evaluation

Based on the risk-based approach outlined above, we have evaluated each catchment and overall activity. Physical controls are identified to reduce sediment and contaminant generation potential, and thus reduce the risk.

Table 8.4: Risk evaluation

Area		Generation potential	Sensitivity of receiving environment	Initial risk	Physical controls	Modified generation potential	Modified risk with standard controls
Southern Block (Access road)	**Water quality**	Medium	High	High	Filter strips	Low	Moderate
	Sediment	Low	High	Moderate	None	Low	Moderate
	Stream erosion	Medium	High	High	Extended detention storage	Low	Moderate
	Flooding	Low	Medium	Low	None	Low	Low
Eastern Block (Landfill)	**Water quality**	High	Medium	High	Wetland	Low	Low
	Sediment	High	Medium	Very High	Sediment ponds and wetland	Low	Low
	Stream erosion	High	High	Very High	Extended detention storage	Low	Moderate
	Leachate breakout	Medium	Medium	Moderate	Bunding of leachate tanks	Low	Low
	Flooding	Medium	Low	Low	Stormwater detention	Low	Very low
Western Block (Stockpile 1)	**Water quality**	Low	Medium	Low	Sediment ponds	Low	Low
	Sediment	High	High	Very High	Sediment ponds	Low	Moderate
	Stream erosion	High	High	Very High	Extended detention storage	Low	Moderate
	Flooding	Medium	Low	Low	None	Medium	Low
Upper Waiteraire Block (Stockpile 2)	**Water quality**	Low	Medium	Low	Sediment ponds	Low	Low
	Sediment	High	High	Very High	Sediment ponds	Low	Moderate
	Stream erosion	High	High	Very High	Extended detention storage	Low	Moderate
	Flooding	Medium	Low	Low	None	Medium	Low
Western Block (Topsoil stockpile)	**Water quality**	Low	High	Moderate	Sediment ponds	Low	Low
	Sediment	High	High	Very High	Sediment ponds	Low	Moderate

Area		Generation potential	Sensitivity of receiving environment	Initial risk	Physical controls	Modified generation potential	Modified risk with standard controls
	Stream erosion	High	High	Very High	Extended detention storage	Low	Moderate
	Flooding	Medium	Low	Low	None	Medium	Low
Western Block (Clay burrow)	**Water quality**	Low	Medium	Low	Sediment ponds	Low	Low
	Sediment	High	High	Very High	Sediment ponds	Low	Moderate
	Stream erosion	High	High	Very High	Extended detention storage	Low	Moderate
	Flooding	Medium	Low	Low	None	Medium	Low
Southern Block (Bin exchange area)	**Water quality**	High	Medium	High	Raingarden	Low	Low
	Sediment	Low	Medium	Moderate	Raingarden	Low	Low
	Stream erosion	Medium	Medium	Moderate	Extended detention storage	Low	Low
	Flooding	Low	Low	Very low	None	Low	Very low

Based on the risk evaluation, the key risks are effects associated with water quality, sediment and stream erosion. The risk assessment identifies a number of catchments with a very high risk of effects from the proposal without mitigation. These include effects from sediment and stream erosion within the Western Block (where a number of natural wetlands are present), and the Southern and Waiteraire Tributary Blocks where the ecological investigation has identified that the existing streams have high ecological values. With proposed mitigation in place, the risks are mitigated to between Very Low to Moderate.

9 Assessment of effects on the environment

9.1 Flooding effects

The risk-based approach has identified that the potential risk of flooding effects associated with the proposal are Very Low to Low. As discussed in Section 3.1.3 above, while there is existing flooding within the Hōteo Catchment there are no reported risks to people or property. Further, the contribution from the proposed development is low with large overall contributing catchments.

The runoff calculations show the proposed development will have a negligible change in the runoff volumes from the Western Block and Waiteraire Tributary Block.

The only catchment which shows potential increases in volumes above 1% is the Southern Block. As outlined in Section 4 above, the access road valley discharges into the Waiteraire Stream which then discharges into the Hōteo River, approximately 1km downstream. To understand the potential impacts on flooding within the Waiteraire Stream and the Hōteo River at Wayby Valley, the change in volumes within the Waiteraire Stream associated with the proposed works was assessed. This identified that the increase in peak volumes associated with discharges from the project into the Waiteraire Stream is between 0.1 and 0.2% depending on the specific storm event.

We have also reviewed the Auckland Council flood maps for the Wayby Valley downstream. The Wayby Valley flood plain is approximately 430 hectares. Based on the difference between the calculated pre-development and post-development volumes for a 100 year storm event the total additional volume contributing to the existing flood plain is 4,771m^3. This represents a potential increase in the depth of the flood plain of 1mm.

Therefore, any effects on flooding are considered to be less than minor.

9.2 Stream stability and erosion

Runoff from the project footprint will discharge into a number of tributaries at the head of the Hōteo River. The ecology assessment has identified all of the streams are sensitive to bank erosion and instability.

In particular the assessment has identified:

- The streams are generally formed on bedrock, with large boulders, deep pools and waterfalls within the stream channels as well as shallow sandy/ rocky riffles
- Within the flatter sections of the streams, there is sediment accumulation within pools which in some areas is comprised of deep layers of sediment over the bedrock layers
- The stream banks are comprised of silty sands, with evidence of stream bank erosion and incision
- The stream banks and accumulated sediment comprise a mixture of sandy silts

The Hōteo River itself is characterised by pools and riffles with silt and gravel substrate. Further down the river, it is characterised by shallow bedrock reaches with deeper pools.

As all catchments have been identified as being prone to erosion, provision for holding and releasing runoff has been included in the design. Auckland Council GD01 provides guidance on stream erosion protection by holding and releasing the 95th percentile storm depth. This replaces previous Auckland Council guidance which required holding and releasing the first 34.5mm of rain. At the proposed landfill location, the 95th percentile storm depth is 42mm.

The 95th percentile storm depth will be managed for each area of the project footprint as follows:

- Within the main landfill, the 95th percentile storm depth will be held within the wetland and released over a 24 hour period
- The sediment ponds for the stockpile locations will be designed to provide extended detention to hold and release the 95th percentile volume (this is approximately a third of the storage volume required for sediment management)
- The bin exchange area will incorporate a ponding area above the raingarden
- The road channels will be designed to provide storage, and to discharge via the filter strips and spreader bars

9.3 Industrial and Trade Activity

9.3.1 Water quality

The potential key contaminants of concern from the proposed landfill vary depending on the area of the project footprint and the activities and the management measures implemented.

As outlined in Section 8.2, 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 road (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 and the filter strip provides effective treatment of these contaminants.

The stockpiles have been assessed as having a Low risk of effects from contaminants due to limited activities with the potential to generate contaminants. All runoff from the stockpiles will also pass through the sediment ponds before being discharged.

Both the landfill and the bin exchange area have been assessed as having a Moderate risk of effects from contaminants if they are not effectively managed.

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. The potential effects will be managed through operational controls, which will be outlined in the LMP. These will include regular cleaning of the site, daily inspections, clean-up of any spilled material and removal of any leaking bins.

In addition to good management practices, bin exchange area runoff will be treated by a raingarden, designed in accordance with Auckland Council GD01.

The potential contaminants entering the landfill ponds are primarily copper and zinc associated with vehicle movements on-site, as well as potential for oils and grease from the workshop and the wheel wash. All runoff from the landfill catchment will be directed to the sediment ponds before discharge to the Stream via the wetland. The sediment ponds have been designed to provide effective removal of sediment within the landfill, including any suspended heavy metals. Stormwater flows up to the 95th percentile rainfall will also pass through a constructed wetland. This will provide polishing treatment for contaminants including any organics and dissolved contaminants.

In addition to the treatment of stormwater, discharges from the wetland (and up and downstream of the landfill) will be monitored over the life of the landfill. The monitoring serves two purposes. Firstly, it enables 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.

A separate baseline monitoring report has been prepared which summarises the monitoring results to date (Technical Report F, Volume 2). The monitoring has confirmed that the project footprint

currently has low levels of contaminants, which is expected due to the lack of existing sources upstream and in the catchment generally.

The following locations will be monitored:

- The outlet of the wetland
- A control site located upstream of the landfill discharge location (landfill control site) (MC4)
- A site downstream of the landfill discharge point and the control site (MC3)

Monitoring locations both upstream and downstream of the discharge location will enable comparison of runoff water quality, and ensure any increase in contaminant levels can be readily identified.

WMNZ currently operates two landfills within the Auckland Region, data from which can inform the potential contaminant concentrations in discharges from the landfill. As part of the 2013 re-consenting of the Redvale landfill, the contaminant discharges from the landfill as well as water quality in the downstream watercourse were assessed [8].

This included a detailed assessment of pH, COD, Conductivity, Ammonia and heavy metals including aluminium, zinc and copper, over a period of more than two decades. The only contaminant of concern which exceeded the relevant ANZECC guideline or trigger level was copper. In the case of Redvale landfill, copper results were elevated at both the upstream and downstream receiving environment monitoring sites indicating that the elevated concentrations were from alternative sources.

The potential for leachate to be discharged from the site has also been considered. The potential risk has been assessed as low due to the proposed controls in place including the use of bunding of the leachate tanks, continuous monitoring of the inlet to the stormwater ponds and the contingency measures in the unlikely event that leachate did get into the stormwater ponds. The only scenario where leachate has the potential to be discharged via the stormwater system would be in the event of a leachate breakout or tank and bund failure during a significant storm event where there is insufficient capacity in the ponds to contain the leachate. In this extreme circumstance, the leachate would be significantly diluted with the surface water from the runoff within the Eastern Block catchment and any effects on the receiving environment would be difficult to detect.

9.3.2 Management methods

Inappropriate management practices from Industrial or Trade Activities can result in discharges of environmentally hazardous substances associated with the activity onto or into land or water. These environmentally hazardous substances potentially accumulate within receiving environments leading to adverse environmental effects.

The key method for addressing this issue is the preparation and implementation of site-specific environmental management plans (EMP), which identify the environmentally hazardous substances associated with a particular Industrial or Trade Activity, and set out methods to avoid, remedy or mitigate the effects from discharges.

As outlined above, the LMP identifies the activities with the potential to generate contaminants and outlines methods to avoid or minimise potential effects.

[8] Redvale Landill consent renewal – Stormwater, Sediment and Industrial and Trade Activity Report, December 2013

9.4 Operational sediment

As discussed in Section 3.1.3 the Hōteo River is sensitive to discharges of sediment with potential effects in the watercourses of the river and its tributaries as well as in the Kaipara Harbour. Nearby tributaries include a number of wetlands downstream sensitive to sedimentation, although the ecological assessment has identified evidence of high levels of sediment present already.

The risk assessment has identified that the Southern Block, Western Block, Waiteraire Tributary Block and Western Block, have a Moderate risk of sediment effects. Although activities within the Southern Block have only a low sediment generation potential.

To minimise the long term discharge of sediment, as outlined in Sections 5 and 7 the operational landfill will utilise a range of sediment control measures, including stormwater ponds for the landfill and sediment ponds for the stockpile locations. Additionally, use of silt fences and clean water diversion drains will reduce sediment entrainment within both the landfill and the stockpiles will provide a degree of sediment removal upstream of the permanent ponds.

To provide confidence in the performance of the stormwater ponds, we have compared the proposed pond sizes and capacity to those at the existing WMNZ landfill in Redvale. The proposed ponds for the landfill will provide between 40,000m^3 to 84,000m^3 depending on the specific stage which represent between 4% and 8% of the total catchment area. This can be compared to Redvale Landfill where the site has a total pond capacity of approximately 47,000m^3 for a landfill area of 80 hectares which represents 6% of the catchment area.

During the re-consenting of the Redvale Landfill, assessment of sediment monitoring over the period between 2005 and 2013 identified that the lower trigger level of 50mg/L was not exceeded in 95% of the samples taken and the long term average was approximately 30mg/L[9].

Monitoring in the receiving environment (Rangitopuni Stream) also identified that suspended solids concentrations were predominantly under 20g/m^3 except for periods when elevated suspended solids were recorded at all sites including the up-stream control site, and that overall, there was no significant difference in suspended solids readings between the upstream and downstream sites.

Over the period 2005 and 2013, there were only three exceedances of 50mg/L at the monitoring sites within the stream. Of the three exceedances only two were recorded downstream of the landfill pond discharges with concentrations of 57mg/L and 62mg/L.

Therefore, it can be expected that due to the similar size of the proposed ponds, and the implementation of the management methods utilised at Redvale, that the discharge from the site would be similar to those from Redvale and that on-going discharges will be below 50mg/L the majority of the time with a long term average around 30mg/L.

Based on an average discharge from the landfill of 30mg/L, it is expected that due to mixing with the runoff from the adjacent catchment that concentrations downstream of the landfill discharge location would be on average below 20mg/L. This can be compared to the results of the baseline monitoring undertaken to date at the site, with recorded sediment concentrations during normal non-storm low flows of up to 14mg/L with higher sediment concentrations expected during rainfall events.

Due to the large catchment upstream of the discharge location into the Hōteo River, it is expected that any sediment effects on the Hōteo River will be less than minor.

[9] Redvale Landill consent renewal – Stormwater, Sediment and Industrial and Trade Activity Report, December 2013

10 Long term monitoring

10.1 Monitoring programme

A monitoring programme has already been established for the project. 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 of the landfill operation monitoring regime
- To monitor discharges into and from the treatment systems on-site

The monitoring programme will comprise

- Receiving environment monitoring
- Continuous inlet monitoring into the stormwater ponds
- 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 earthworks
- Relevance to the Industrial and Trade Activities
- Priority stormwater contaminants
- Indicators for leachate breakthrough or contamination

The surface water monitoring parameters selected and the monitoring purpose are outlined in Table 10.1 below.

Table 10.1: Summary of monitoring parameters

Parameter	Source	Monitoring purpose
Turbidity	Earthworks	Effects on receiving environment
Total Suspended Solids	Earthworks	Effects on receiving environment
Temperature	Presence of ponds	Effects on receiving environment
pH	Leachate, ITA Activities	Effects on receiving environment, presence of leachate
Oil and Grease	ITA Activities	Effects on receiving environment
Chemical Oxygen Demand (COD)	ITA Activities, Leachate	Effects on receiving environment
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	ITA Activities, Leachate	Effects on receiving environment
Heavy metals, totals, trace As, Cd, Cr, Cu, Ni, Pb, Zn	ITA Activities, Leachate	Effects on receiving environment
Metals, totals Al, Ca, Fe, Mg, Mn, K, Na	ITA Activities, Leachate	Effects on receiving environment
Electrical Conductivity (EC)	Leachate	Presence of leachate
Total Phenols	Leachate	

Parameter	Source	Monitoring purpose
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Leachate	
Total Alkalinity	Leachate	
Total Hardness	Leachate	
Chloride	Leachate	
Nitrate-N	Leachate	
Total Ammoniacal-N	Leachate	
Sulphate	Leachate	
Total Phosphorus	Leachate	

10.2 Trigger levels

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

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

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

A Surface Water Monitoring Plan (SWMP) will set out the approach to developing the trigger levels.

11 Conclusions

This Stormwater and Industrial and Trade Activity assessment has been prepared to support an application for resource consent to establish the proposed Auckland Regional Landfill at a location in the Wayby Valley.

The key issues that have been identified are:

- The receiving environment including the immediate receiving environment in particular due to a number of sensitive wetlands, the Hōteo River and the Kaipara Harbour are sensitive to increased sedimentation. In particular, concerns due to smothering of sea grass beds in the Kaipara Harbour, potentially impacting on snapper breeding grounds, is a key concern in the region.
- The immediate receiving environments are sensitive to changes in contaminant loads, with a number of species present which are likely to be sensitive to changes in heavy metals and contaminants.
- The project footprint is upstream of areas which flood during heavy rain events including the Wayby Valley.

The following potential effects have been assessed:

- Potential effects associated with flooding from discharges of stormwater from the site have been assessed as less than minor, due to the detention of stormwater runoff within the landfill catchment and the less than minor contribution flows from the project footprint will have on the overall flood volumes.
- Potential effects on stream stability and erosion have been assessed as less than minor, due to the incorporation of detention of the 95th percentile storm depth.
- Subject to the effective implementation of the management controls and procedures for the Industrial or Trade Activities on-site, potential effects associated with the use of land and discharge of contaminants have been assessed as less than minor. The procedural and physical controls include measures to avoid or minimise any discharges, and the treatment of runoff through the use of raingardens, filter strips and a wetland before discharge to the receiving environment.
- Potential adverse effects from the discharge of sediment have been assessed as no more than minor, subject to the effective implementation of the proposed controls and the use of sediment ponds for the stockpiles and landfill.

12 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:
	
.....	.....
Rob van de Munckhof	Simonne Eldridge
Principal Environmental Engineer	Project Director

rvdm
p:\1005069\issued documents\final application for lodgement may 2019\volume 2 - technical reports\technical report p - stormwater and industrial and trade activity report\technical report p - stormwater and industrial.docx

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

Exceptional thinking together
www.tonkintaylor.co.nz

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

p:\1005069\issued documents\final application for lodgement may 2019\volume 2 - technical reports\technical report p - stormwater and industrial and trade activity report\appendix a - draft ita environmental management plan.docx

Appendix A: Spill Response Plan

This page has been intentionally left blank

Appendix B: Emergency response training

This page has been intentionally left blank

www.tonkintaylor.co.nz