

**ATTACHMENTS FOR THE EVIDENCE OF DONOVAN VAN KEKEM**

**ATTACHMENT A. LANDFILL AIR QUALITY MANAGEMENT PLAN**



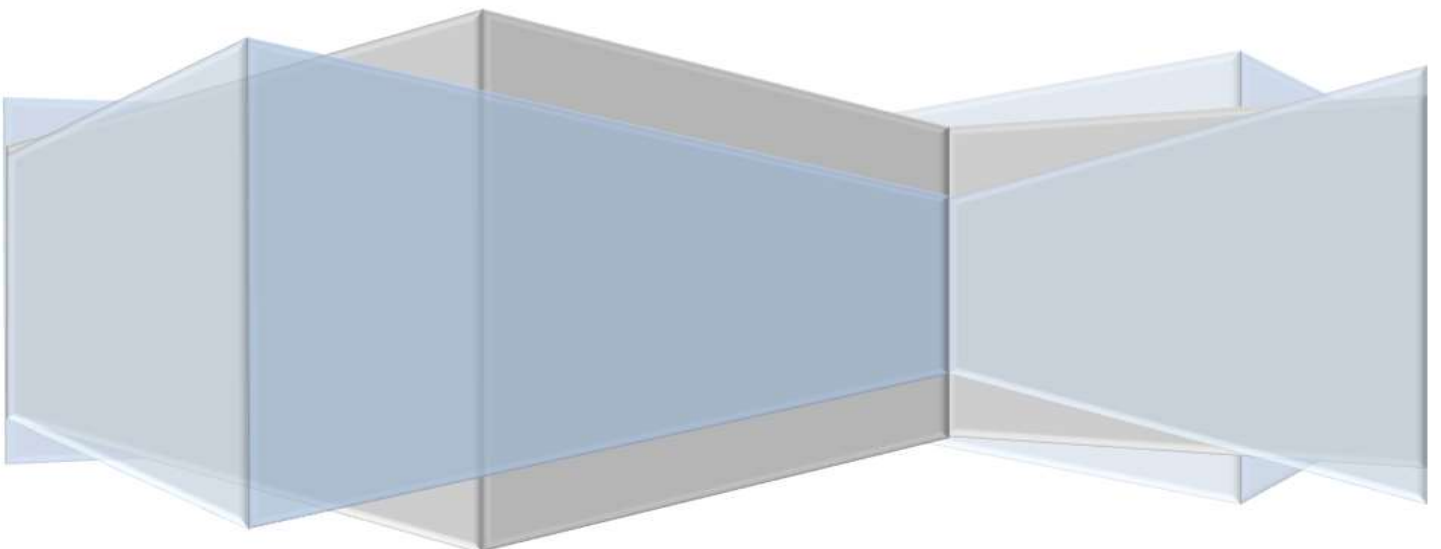
**AB Lime Landfill Air Quality Management Plan**

Landfill Air Quality Management Plan | 2

07 April 2021

**AB Lime Ltd**

**Draft for Consenting Purposes**



# AB Lime Landfill Air Quality Management Plan

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## AB Lime Limited

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## Attachment 1. Boundary Odour Monitoring



# 1. Introduction

## 1.1 Purpose/Objective of the Landfill Air Quality Management Plan

The purpose of this Landfill Air Quality Management Plan is to provide a framework for site operators and visiting contractors to minimise potential nuisance odour, dust, and toxic gas emissions from the site activities. These activities must be undertaken in a manner that will minimise the risk of adverse air quality effects beyond the boundary of the site during the hours of operation. Site personnel and contractors will be required to conform to the requirements of this Landfill Air Quality Management Plan. Specific controls are detailed to limit air discharges from each source on-site and are to be undertaken by designated site staff and checked by site management.

The goal is that by following the procedures outlined in this plan, the site-based activities will not result in the production of offensive or objectionable nuisance odour, dust, or toxic air quality effects beyond the boundary of the site.

It is intended that this document will be a 'living' document, which will be regularly referred to by site staff and management. It will also be updated to meet changing conditions on the site.

The Landfill Air Quality Management Plan is to manage the effects on landfill air quality in accordance with the corresponding legislative requirements outlined below in section 2. The Landfill Air Quality Management Plan covers the following matters:

- Odour Management;
- Hazardous Waste Handling;
- Crisis Waste Acceptance;
- Combustion Emissions;
- Dust Management;
- Maintenance Requirements;
- Monitoring Requirements; and
- Complaint Response.

The objectives of the Landfill Air Quality Management are as follows:

- i. To control odours so that there shall be no odour that causes an objectionable effect beyond the boundary of the land owned by the consent holder.
- ii. To ensure that the disposal of odorous loads only takes place when effective mitigation measures are in place.
- iii. To ensure effective daily cover of at least 150 mm of soil or equivalent alternative material.
- iv. To keep the working face as small as practicable.
- v. To avoid excavation into old areas of refuse as far as practicable.
- vi. To minimise water ingress to the working face.
- vii. To control dust so that there shall be no dust that causes an objectionable effect beyond the boundary of the land owned by the Consent Holder.
- viii. To minimise the extent of unvegetated areas.
- ix. To enforce vehicle speed limits on site.

- x. To keep unsealed road surfaces and working areas moist where potential for dust emissions beyond the boundary of the land owned by the Consent Holder exists.

### **1.1.1 Management Plan Structure**

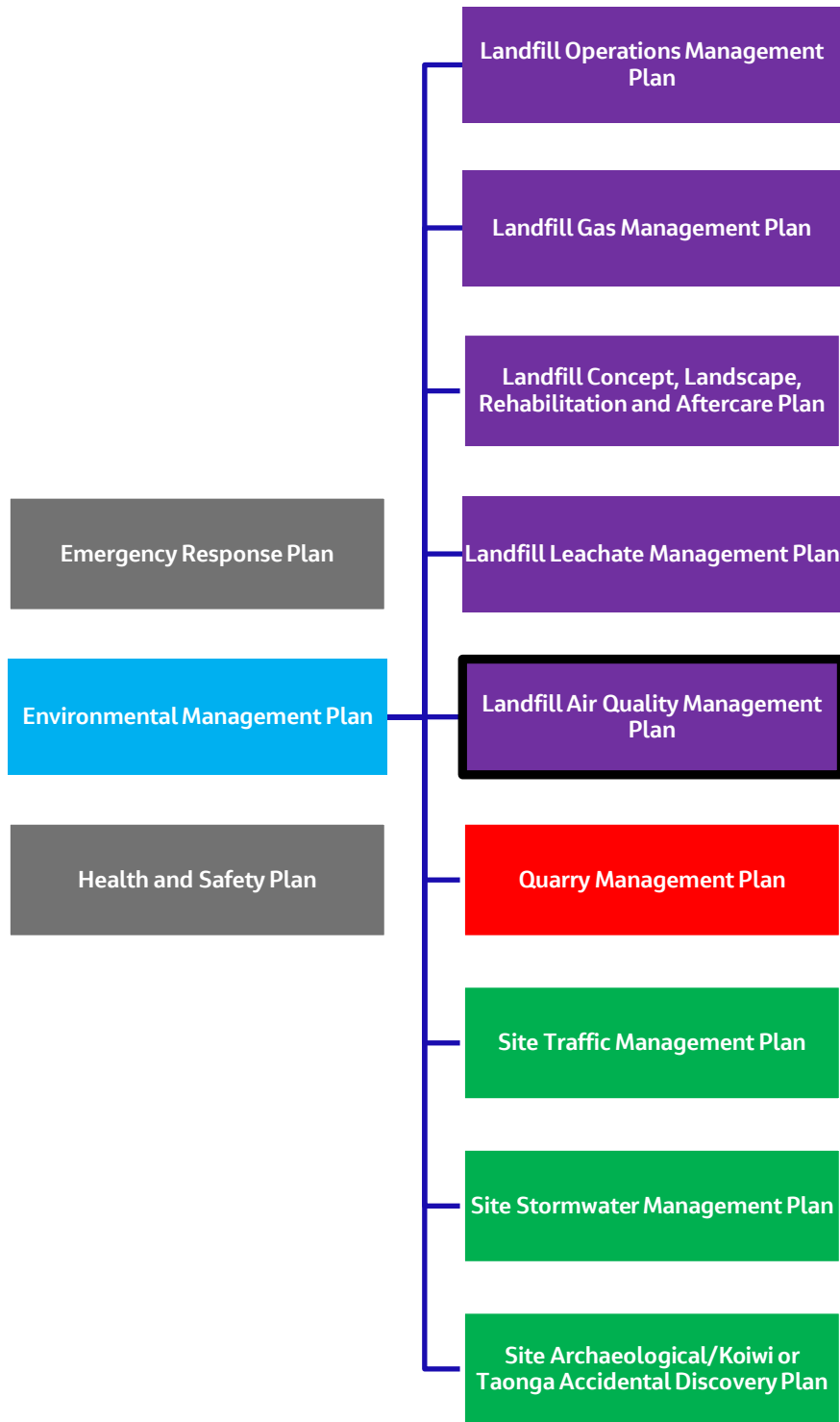
The operation of AB Lime landfill and quarry requires a suite of environmental management and mitigation plans to ensure the successful operation of the entire site. The Environmental Management Plan sets the overall framework for the operation of the site and is supported by a series of sub management plans focusing on specialist environmental areas to effectively run the landfill and quarry.

The Landfill Air Quality Management Plan is a sub management plan under this framework that manages the effects of landfill air quality. Figure 1.1 below illustrates the relationship between the Landfill Air Quality Management Plan and the remainder of the AB Lime management plan framework.

This plan has been prepared in accordance with the certification and submission process outlined in section 1 of the AB Lime Environmental Management Plan.



Figure 1.1: AB Lime Limited Management Plan Structure



Key:



## 2. Legislative Requirements

The legislative requirements of this Landfill Air Quality Management Plan outline the consent conditions that this plan is designed to assist with implementing.

### 2.1 Resource Consent Requirements

Table 2.1: Relevant Conditions for Consents related to Landfill Air Quality Management Plan

Condition Number	Condition	Reference
<b>Schedule 1 – General Conditions AUTH 201346, 201347, 201348, 201349, 201350, 201351</b>		
26.	The consent holder shall prepare and maintain a Landfill Air Quality Management Plan (LAQMP). The LAQMP shall describe the air quality management for the landfill, including demonstrating how compliance with the relevant conditions of this consent will be achieved. The plan shall also achieve the following objectives:	
	i. To control odours so that there shall be no odour that causes an objectionable effect beyond the boundary of the land owned, or covenanted by the Consent Holder	Section 4
	ii. To manage the disposal of odorous loads to take place when effective mitigation measures are in place	Section 4
	iii. To manage effective daily cover of at least 150 mm of soil or equivalent alternative material;	Section 4
	iv. To keep the working face as small as practicable;	Section 4
	v. To limit excavation into old areas of refuse as far as practicable;	Section 4
	vi. To minimise water ingress to the working face;	Section 4
	<u>Dust:</u>	Section 8
	i. To control particulate matter that causes an objectionable effect beyond the boundary of the land owned, or covenanted by the Consent Holder.	
	ii. To minimise the extent of unvegetated areas	Section 8.3
	iii. To enforce vehicle speed limits on site;	Section 8.3
	iv. To keep unsealed road surfaces and working areas moist where potential for dust emissions beyond the boundary of the land owned, or covenanted by the Consent Holder exists.	Section 8.3
<b>Air Discharge Permit 201351</b>		
2.	The discharge into air shall only be contaminants, including particulate matter, odour, combustion products and landfill gas, from a landfill as described in the application documents. The consent does not authorise the burning of solid waste at the site.	Section 3

Condition Number	Condition	Reference
3.	<p>The discharges shall not cause odour or particulate matter that has an objectionable or offensive effect beyond the boundary of the land owned, or covenanted, by the Consent Holder, as determined by the Council (Manager of Compliance). The determination of an offensive or objectionable effect shall take into account the FIDOL factors and be made based on the guidance provided in Section 4.1.1 and Table 6 of the Ministry for the Environment Good Practice Guide for Assessing and Managing Odour (2016) or Section 4.2.1 and Table 8 of the Ministry for Environment Good Practice Guide for Assessing Dust (2016).</p>	Section 4 and Section 8
4.	<p>Where, during landfill operations, the Consent Holder is required to accept waste by a Government Agency as a crisis or emergency response, the following protocol shall apply:</p> <ul style="list-style-type: none"> <li>a) All crisis response waste acceptance shall trigger the protocol identified in the Crisis/Emergency Response chapter of the Landfill Operations Management Plan.</li> <li>b) The consent holder shall notify the Southland Regional Council Compliance Manager of this waste acceptance within 48 hours.</li> <li>c) A management response in line with the criteria identified within the Crisis/Emergency Response chapter of the Landfill Operations Management Plan shall be made available to the Southland Regional Council within 3 days of notification of condition (4)(b), above.</li> <li>d) All likely affected neighbours are to be notified of the crisis/emergency waste stream prior to acceptance on site, or as soon as practicable.</li> <li>e) Mitigation measures for crisis/emergency waste shall follow the guidelines identified in the Crisis/Emergency Response chapter of the Landfill Operations Management Plan.</li> </ul> <p><b>Advice Note:</b> <i>There may be instances when the consent holder is required to accept waste under the direction of a Government Agency. Where this is the case, despite the conditions of consent that ordinarily apply to the landfill, it is accepted that there may be effects associated with the waste that are beyond the control of the consent holder. This shall be taken into consideration by the Southland Regional Council when discharging its duties to monitor the conditions of consent.</i></p>	Section 6
5.	<p>To ensure compliance with Condition 3, odorous special wastes shall only be accepted by prior arrangement. The following mitigation measures shall be undertaken to minimise odorous emissions from these special wastes:</p> <ul style="list-style-type: none"> <li>(a) odorous wastes shall be covered immediately by at least 150mm of soil or overburden material;</li> <li>(b) highly odorous loads likely to cause a breach of Condition 3 shall only be accepted if the waste material has been pre-treated with odour suppressing chemicals or are received in air tight disposable containers;</li> <li>(c) the delivery of odorous loads shall be planned to occur during the typically windier period in the middle of the day, while allowing sufficient time for thorough covering prior to daily closure of the landfill; and</li> </ul>	Section 4

Condition Number	Condition	Reference
	(d) odour suppressing chemicals and lime shall be applied, as required.	
8.	Where exposure of existing landfill material is necessary, this shall occur for the minimum practicable time and odour spray or lime shall be applied, as required by the Landfill Air Quality Management Plan.	Section 4
10.	The site entrance, roading to the lime storage areas and the truck access road shall be sealed as near as practical to the landfill. These sealed road surfaces shall be cleaned by mechanical sweeper, as necessary to minimise dust emissions.	Section 8
11.	A wheel wash shall be used by all vehicles leaving the landfill site that have travelled on unsealed or potentially dusty surfaces.	Section 8
12.	Water shall be applied to unsealed internal roads and other potentially dusty surfaces, as necessary to minimise dust emissions.	Section 8
13.	Exposed soil surfaces shall be planted in grass as soon as possible after construction. Soil stockpiles that are kept for longer than 6 months shall be planted in grass.	Section 8
14.	Maximum vehicle speed limits shall be set and enforced within the landfill site to minimise dust emissions.	Section 8
15.	Dusty special wastes shall only be accepted by prior arrangement. The following mitigation measures shall be undertaken to minimise dust emissions from these special wastes:  (a) dusty wastes shall be dampened or enclosed in bags prior to delivery to the landfill, or controlled by water spray at the landfill; or  (b) emissions from potentially dusty loads tipped at the workface shall be controlled by applying water or immediately covering the waste material.	Section 8

## 2.2 Monitoring and Reporting the performance of the Landfill Air Quality Management Plan

Table 2.2: Monitoring and Reporting Requirements Related to the Landfill Air Quality Management Plan

Condition	Requirement	Relevant Regulatory Authority	Frequency	Date	Responsibility
<b>Schedule 1 – General Conditions AUTH 201346, 201347, 201348, 201349, 201350, 201351</b>					
29.	The EMP and sub-management plans (where applicable) shall include monitoring with respect to surface water, groundwater, leachate, landfill gas and nuisance. Each monitoring element shall include:  i. Monitoring locations; ii. Monitoring parameters;	Southland Regional Council	As deemed necessary in each management plan		Environmental Manager

AB Lime Landfill Air Quality Management Plan

Condition	Requirement	Relevant Regulatory Authority	Frequency	Date	Responsibility
	<ul style="list-style-type: none"> <li>iii. Monitoring frequency;</li> <li>iv. Detection limits;</li> <li>v. Reporting;</li> <li>vi. Trigger levels (for each monitoring location) for implementing contingency/remedial actions</li> </ul>				
<b>Air Discharge Permit 201351</b>					
26.	<p>An on-site meteorological monitoring station shall be established and operated. The following parameters shall be measured and recorded at least once each hour:</p> <ul style="list-style-type: none"> <li>(a) Wind velocity and direction;</li> <li>(b) Barometric pressure;</li> <li>(c) Rainfall; and</li> <li>(d) Temperature.</li> </ul>	Southland Regional Council	Continuous		Environmental Manager
28.	<p>A record of any complaints relating to odour or dust shall be kept, and shall include:</p> <ul style="list-style-type: none"> <li>(a) the location where the effect was detected by the complainant;</li> <li>(b) the date and time when the effect was detected;</li> <li>(c) a description of the wind speed and wind direction when the effect was detected by the complainant;</li> <li>(d) the most likely cause of the effect detected; and</li> <li>(e) Advise the complainant of any corrective action undertaken by the consent holder in accordance with any relevant Management Plan or condition to avoid, remedy or mitigate the effect detected by the complainant within 10 working days.</li> </ul> <p>A record of all complaints received shall be kept by the consent holder in a complaint register, be available for inspection on request, and shall be provided to Environment Southland annually for the period 1 May to 30 April each year.</p>	Southland Regional Council	As required		Environmental Manager

Condition	Requirement	Relevant Regulatory Authority	Frequency	Date	Responsibility
	<i>Advice Note: To help the Consent Holder in the management of complaints in accordance with this condition it is requested that all complaints received by the Southland Regional Council are passed on to the Consent Holder.</i>				
29.	<p>The Consent Holder is to document a procedure for responding to a validated complaint or determination of a breach of Condition 3 by Environment Southland in the Air Quality Management Plan.</p> <p><i>Advice note: Such procedures may include measures such as an odour diary survey and/or liaising with the established CLC.</i></p>	Southland Regional Council	As Required		Environmental Manager

### 2.2.1 Interaction Between Legislative Requirements and Landfill Air Quality Management Plan

If there is a conflict between the management plan and the corresponding legislative requirements, including consent conditions, then the legislative requirements must prevail.

## 3. Landfill Air Quality Management

### 3.1 Introduction

Discharges to air from the landfill operations include:

- **Nuisance odour and dust emissions** from the landfill operation which are mainly prevented through appropriate landfill operational practices. The primary control is through immediate effective compaction, daily cover, and minimisation of the working face, special handling of difficult waste and careful design and operation of leachate pond/gas system.
- **Landfill gas (LFG)** occurs as a result of decomposition of biodegradable material within a landfill, such as food, garden waste, paper, wood and cardboard. LFG consists of a mixture of carbon dioxide (CO<sub>2</sub>, approximately 40%), methane (CH<sub>4</sub>, approximately 60%), and trace gases including hydrogen sulphide (H<sub>2</sub>S), ammonia (NH<sub>3</sub>), hydrogen chloride (HCL), volatile organic compounds (VOC) and carbon monoxide (CO). H<sub>2</sub>S, NH<sub>4</sub>, HCL, CO and some VOC's are toxic gases which can result in adverse health effects if inhaled. CO<sub>2</sub>, and CH<sub>4</sub> displace oxygen in the air and in high enough concentrations can lead to asphyxiation.

LFG is often highly odorous and has a distinct 'rotten egg' odour due to the high concentrations of H<sub>2</sub>S in the gas. The primary control measure for reducing odour emissions from the LFG emissions from the landfill mass is the use of a permanent landfill gas flare. Nearly all of the H<sub>2</sub>S is converted to sulphur dioxide (SO<sub>2</sub>) when combusted at high temperature in the flare.

- **Products of combustion** result from LFG being extracted and piped to the on-site LFG flare. This flare burns the LFG at high temperature (greater than 750 deg C) and the resulting products of combustion include particulate matter less than 10 microns in diameter (PM10), SO<sub>2</sub>, nitrogen dioxide (NO<sub>2</sub>) and CO. These gases are toxic to human beings and there are ambient air quality National Environmental Standards (NES) for these air pollutants. As such, emission of these pollutants needs to be minimised to a practical minimum to ensure compliance with the NES and health-based air quality criteria.

There is to be no burning of solid waste on-site.

### 3.2 Receiving Environment

It is important for all site staff to be aware of the surrounding environment, prevailing wind directions and site topography.

Site staff are to be aware of the extent of the site and land owned by AB Lime and the off-site locations where adverse air quality effects could be experienced by neighbouring receptors/landowners.

AB Lime's quarry and landfill are well separated from neighbouring properties/off-site dwellings. Figure 3.1 illustrates the location of off-site dwellings relative to the site. Green markers indicate dwellings owned by AB Lime, and the yellow markers are the nearest dwellings not owned by AB Lime. The nearest dwelling not owned by AB Lime (R4) is approximately 1,240 m from the landfill operations. Neighbouring dwellings are primarily situated west – south of the site, and the land northwest – south east is sparsely populated. As such winds blowing from the north, northeast and east have the highest potential to generate off-site air quality effects.



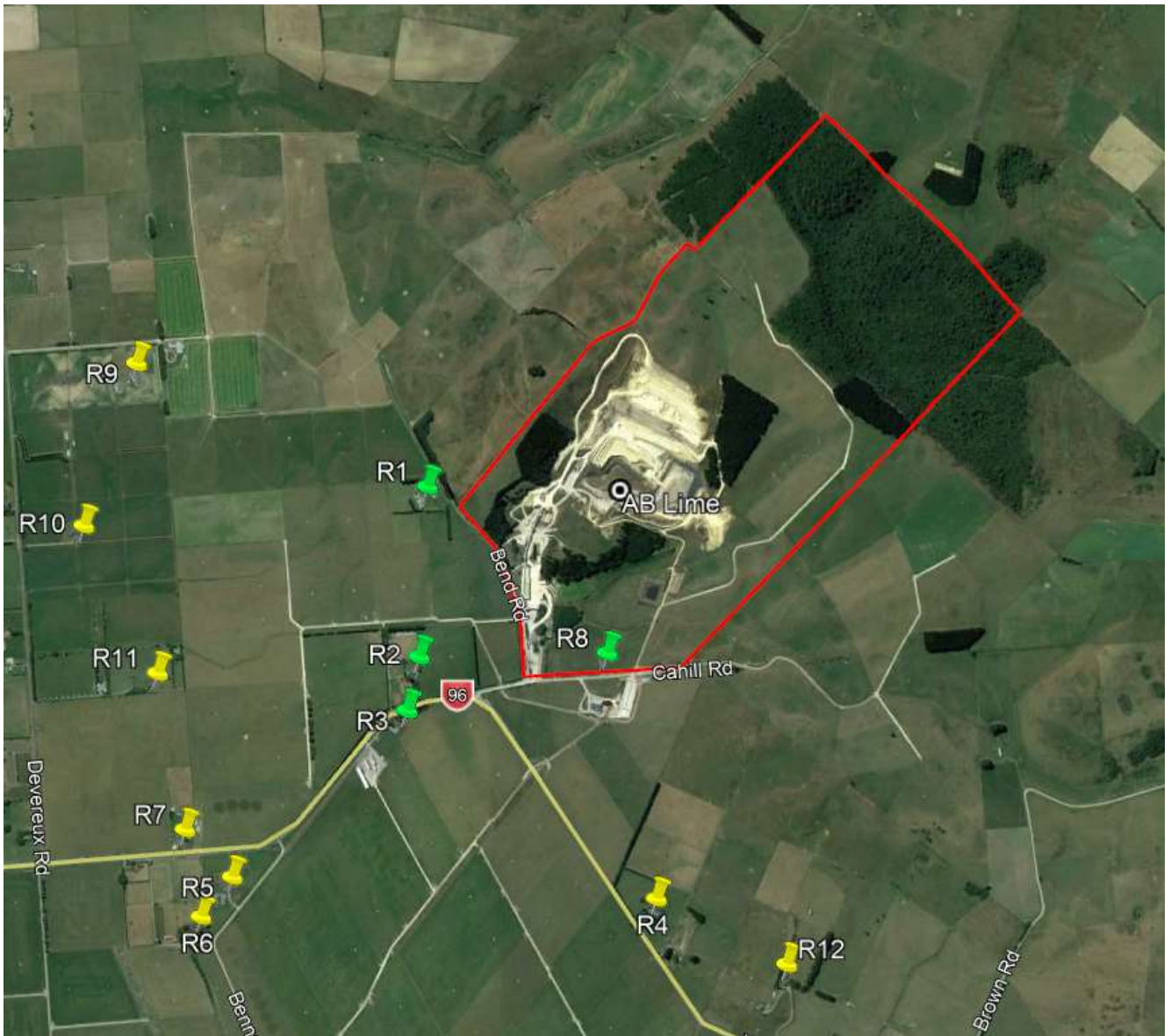


Figure 1 Neighbouring Receptors - As of April 2020

As shown in Figure 1 AB Lime also owns a large amount of the land surrounding the site. The land parcel to the north of the site is unoccupied and currently used for agricultural purposes. T

Whilst this management plan is focused on limiting the potential for adverse air quality effects at neighbouring dwellings, the proposed control measures will also limit the potential for adverse air quality effects at unoccupied land and adjacent public roads.

### 3.2.1 Topography

Historic complaints have occurred down valley from the landfill during cold air drainage conditions. The local topography dictates the flow of air during these cold air drainage effects. Site staff need to be aware of the local topography and associated airflows.

The site is also situated in a semi-circular valley on the site of a hill (see Figure 2). As the land cools overnight the cold air drains down this valley towards the closest neighbouring receptors (see blue arrows on Figure 2). Due to this local topography and the cold air drainage directionality, during poor air dispersion conditions (low wind speeds, low temperature inversion layers, early mornings/late evenings), there is a much higher potential for adverse off-site air quality effects.



Particular care needs to be applied by all site staff during these meteorological conditions, particularly for odour emitting activities. Meteorological conditions such as those that relate to cold air drainage conditions are measured by the on-site weather station. In Section 10 below there are specific triggers for additional mitigation measures to be applied to the site. As part of the complaint response procedure (Section 11) the Environmental Manager is to record the meteorological conditions and any observed cold air drainage conditions that are resulting in adverse off-site air quality effects.

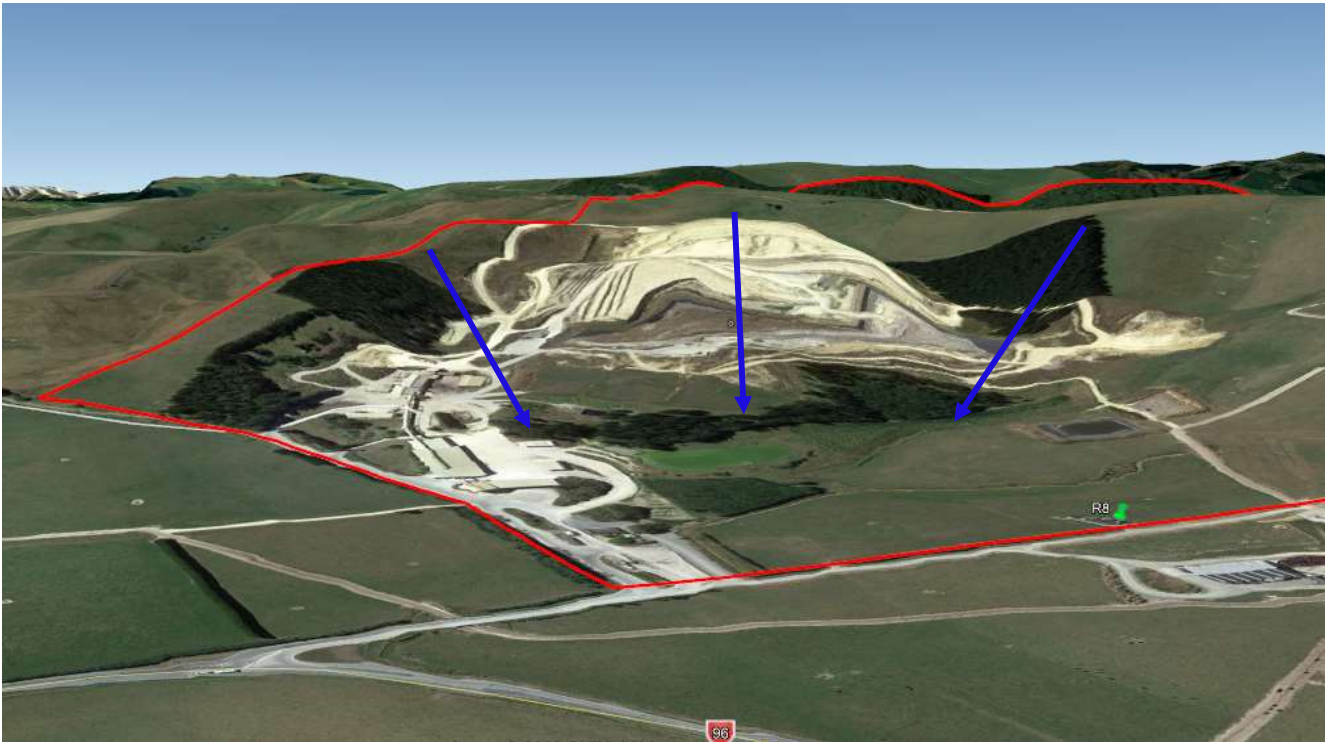


Figure 2 Topography - Cold Air Drainage

### 3.2.2 Local Meteorology

It is important for site staff to be aware of the weather conditions on-site as wind speed and wind direction play a very important part in the potential for adverse air quality effects off-site.

Predominantly winds measured on the site weather station blow from the west and the south (see windrose in Figure 3). These winds blow and air discharges on the site towards predominantly unoccupied land.

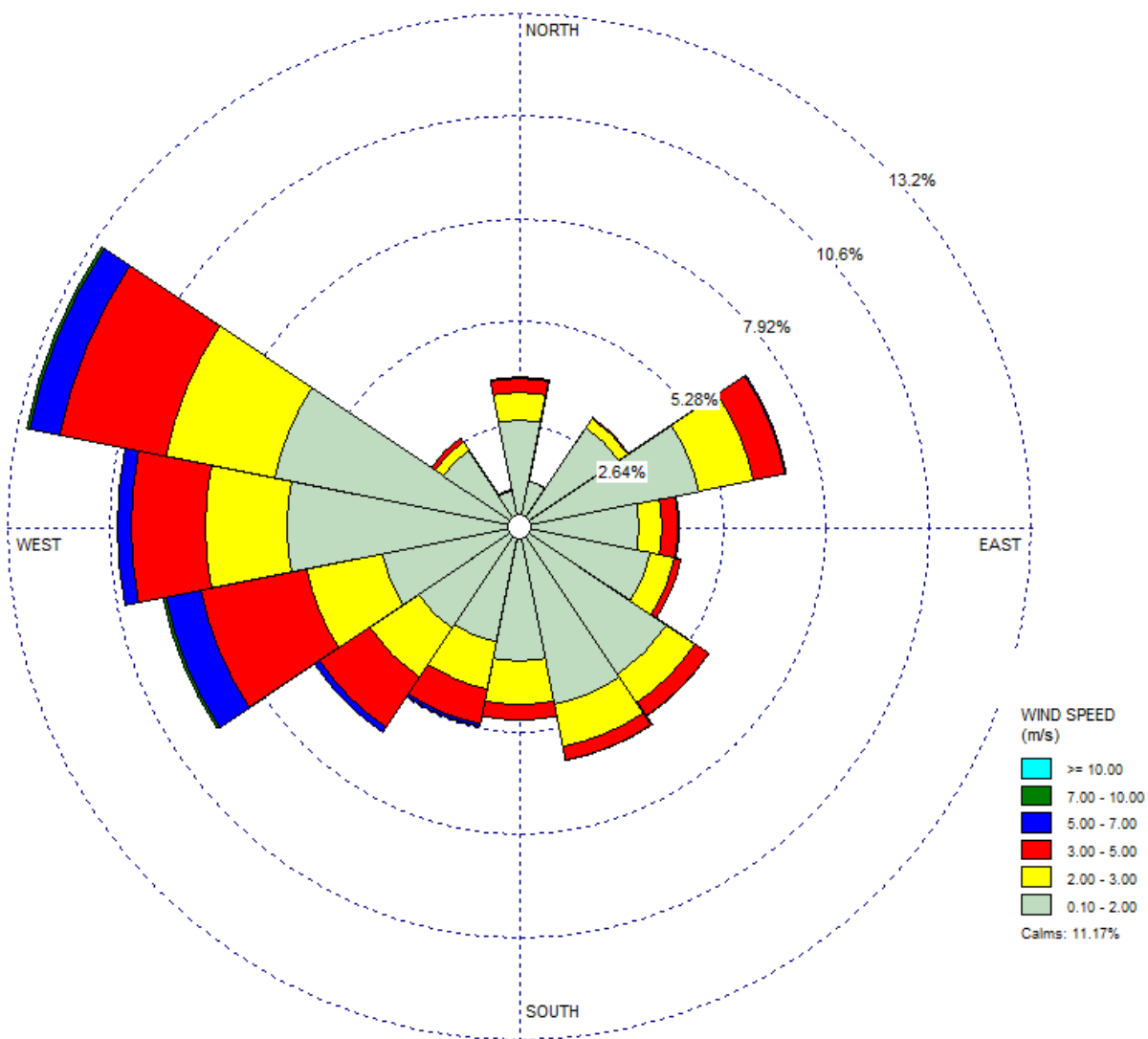


Figure 3 On-site Weather Station Windrose 2012-2014

Winds from the north – east (which would blow emissions from the site towards the nearest off-site dwellings) occur much less frequently.

Specific controls and activity restrictions with regard to site weather conditions are discussed further in Sections 4 and 10.

### 3.3 Air Quality Management Structure

Air discharges associated with the landfill operation can be discharged from a number of different sources/activities listed in the Sections 4, 5, 7 and 8 below. The proposed mitigation measures for each source are included under each potential source.

To provide for a high level of air discharge control from the landfill operation, this LAQMP includes a staged mitigation approach. This provides for multiple factors of safety. Mitigation/management procedures are broken down to three levels (Level 1, Level 2, and Level 3). It is expected that Level 1 mitigation will be sufficient to mitigate the potential for off-site air quality effects during normal operating conditions. However, should Level 1 mitigation be insufficient to control air discharges from the source/activity, then Level 2 mitigation will be applied. If Level 1 and Level 2 controls are still not controlling air discharges from the site, Level 3 mitigation will be applied. Level 3 mitigation is a final resort and, in many instances, involves ceasing the emitting activity. This staged mitigation approach will ensure that the air discharges are controlled to a point that the site activities are not causing an adverse effect at dwellings or sensitive locations beyond the boundary of the site.

Note that in many cases not all the Level 2 or Level 3 mitigation measures will need to be applied when boundary monitoring/off-site feedback triggers the requirement to increase the level of mitigation. The mitigation measures are a toolbox of available mitigation measures to be applied at the site management's discretion, dependant on the severity of the actual or potential effect.

The trigger points which mandate the requirement to increase the mitigation/management practices to a higher level are based on boundary and off-site monitoring results and/or community/Council feedback. Where one of the following occurs during the course of exercising mitigation in line with the specified level for the offending emission source(s), AB Lime is to consider increasing mitigation to the next level:

- Boundary nuisance odour or dust assessments indicate that there is detectable odour at the boundary of the site or observable dust crossing the boundary of the site;
- An adverse/observable nuisance odour/dust or toxic air quality effect is observed by an on-site staff member/contractor;
- Boundary H<sub>2</sub>S sensors exceed the trigger points in Section 10 below;
- An odour or dust observation has been called in from a neighbouring resident (as a part of the community engagement process);
- An air quality complaint has been made to the Regional Council or AB Lime has been called in from a neighbouring resident; and
- A Regional Council enforcement officer has observed nuisance odour or dust beyond the boundary of the site.

Ultimately the management plan structure is aimed at mitigating adverse effects before an off-site non-compliance occurs. This proactive management structure provides a buffer before non-compliance occurs.

This level of air quality management is considered to be consistent with or to exceed good practise air quality control for New Zealand landfill operations.

## 4. Odour

Nuisance odours generated from the landfill operations may cause offensive or objectionable effects beyond the boundary of the site if not managed carefully.

Based on current operations (as of April 2020) approximately 50% of the waste received on-site is organic waste. Organic waste has the potential to decompose and this decomposition process often releases offensive odours. Odour at the tip face and waste compaction zones is usually of a 'rotten cabbage' type odour. Site staff working in this environment will often become desensitised to the odour and therefore are less likely to notice odours associated with normal operations.

Currently, (as of April 2020) approximately 20% of the waste accepted at the landfill is 'special waste' which generally consists of highly odorous waste (Biosolids, animal hides, sump waste, dead animals, etc). Odour from these products is generally very offensive and as such a high level of odour mitigation is required for these products.

In short, the landfill receives waste that ranges from no odour emission potential to very odorous waste that is highly offensive.

Odour is also emitted from as a result of the anaerobic decomposition of the waste within the landfill. The principal odorous gas that is emitted from this process is H<sub>2</sub>S which has a characteristic 'rotten egg' like smell. H<sub>2</sub>S can be emitted from waste received at the tip face which has already begun to decompose anaerobically, from waste which is decomposing within the landfill cells (H<sub>2</sub>S is often present in high concentrations in the LFG), and from the leachate. The control and management of H<sub>2</sub>S emissions from a landfill is critical in managing off-site odour nuisance.

Essentially, landfill operations are inherently odorous and it is not possible to completely remove all odour emission from a landfill. Therefore, the control measures are critical to ensuring that nuisance effects do not occur beyond the boundary of the site.

### 4.1 Potential Odour Sources

The activities/processes which occur/will occur at the AB Lime landfill that have the potential to generate odour include:

- Transport of waste onto the site;
- Waste deposition, handling, and compaction at the tip face;
- Special waste handling;
- Landfill gas;
- Leachate collection and processing;
- Fugitive emissions from daily cover or final capping;
- Hazardous waste handling; and
- Combustion gases.

### 4.2 Site Wide Odour Mitigation

The following sitewide odour mitigation measures are to be applied by site staff. Additional activity specific measures are outlined in Table 1 below.

- Maintain planting and shelter trees around the landfill footprint. These trees help to encourage mixing of airflows and aid in plume dispersion.
- Where exposure of existing landfill material is necessary, this shall occur for the minimum practicable time and odour suppression spray or lime shall be applied.

- Highly odorous waste (special waste) is only to be accepted on-site under permit from AB Lime. The permit application and approval process are described in the Landfill Operations Management Plan.
- Boundary odour observations for informing odour management are to be made at least once a week during winds blowing from the north, northeast and east (winds blowing from 0 - 90 degrees azimuth), or during still cold air drainage conditions. Where practicable these odour observations are to be made during the first occurrence of these meteorological conditions during the working week. Where these meteorological conditions do not occur during the week, downwind odour observations are optional.
- These boundary odour observations are to be made in accordance with the procedures outlined in Attachment 1 (in general accordance with the Ministry for the Environment good practice guidance).
- Activities with a higher potential for odour emission are only to occur during favourable meteorological conditions (where practicable) and not during poor air dispersion conditions. Favourable meteorological conditions are winds which are not blowing from the north, northeast and east (winds blowing from 0 – 90 degrees azimuth). Poor dispersion conditions include inversion layers, low windspeeds, overcast conditions (where thermal convective cells are less likely), and cool temperatures.
- Automated weather station alerts (from the existing on-site weather station) are to be observable to all site staff during wind directions from north, northeast and east (winds blowing from 0 - 90 degrees azimuth). These will be visualised by a wind sock and flashing light central to the site, and text message/e-mail alerts sent to site management/staff.
- Boundary H<sub>2</sub>S sensors are to be installed on the site boundary as described in Section 10.5. Automated alerts from the boundary H<sub>2</sub>S sensors are to be sent to site management so that additional mitigation can be implemented as soon as possible.
- The tip face and exposed waste area is to be limited to the smallest practicable size. The tip face is not to be greater than 1,000 m<sup>2</sup>.
- All emission control equipment (landfill gas flare, odour suppressant sprays, leachate pond aerator, landfill gas monitoring equipment, boundary H<sub>2</sub>S sensors, etc) is to be regularly inspected and maintained to ensure effective/consistent performance (see Section 9).
- The odour potential of any waste stream that a new client may propose to bring on to site needs to be assessed by AB Lime. AB Lime is to ensure that appropriate controls are in place for this client's waste stream and work with the client to ensure that these controls are maintained for the duration of the contract. Where required these controls can be revised in response to actual or potential odour emissions.
- All site staff, waste delivery drivers, and contractors are to know their responsibilities under this Plan. In particular, the requirements for special waste handling and odour mitigation procedures. Failure to follow the procedures in this Plan will result in consequences.

Table 1 Staged Odour Mitigation

Activity	Level 1	Level 2	Level 3
<p><b>Transport of waste to site</b></p> <p>Odour or dust can be discharged to air during the transport of waste to the site.</p> <p>Odorous or dusty wastes are only accepted by prior arrangement.</p>	<ul style="list-style-type: none"> <li>- All waste acceptance on-site is to occur via the documented procedure in the Landfill Operations Management Plan.</li> <li>- AB Lime will only accept potentially odorous waste streams that are delivered to site in covered trucks/containers.</li> <li>- All delivery drivers are to be aware of the composition of the waste they are carting. Records of the waste compositions and source are to be provided to AB Lime upon arrival at site.</li> <li>- AB Lime’s weighbridge operators are to ensure that trucks carrying waste which is potentially odorous are fully enclosed.</li> <li>- Open trucks which contain odorous waste are to be rejected by AB Lime, and the number plate of the truck and client contact details are to be recorded. The client is to be warned that continued breaches of the AB Lime procedures will result in termination of the contract.</li> </ul>	<ul style="list-style-type: none"> <li>- Should fugitive odours still be escaping out of the truck covers and be detectable off-site, then AB Lime is to stipulate to delivery drivers that the offending waste materials are only to be transported to site in air tight sealed containers. An investigation is to be undertaken by AB Lime as to the products that are generating nuisance odour effects during transport. Where possible AB Lime is to provide education and limits to customers/contractors as to the required condition of waste prior to transport.</li> <li>- AB Lime is to advise clients delivering the waste to investigate pre-treating the waste to reduce its odour emission potential prior to delivering it to site.</li> <li>- Trucks delivering odorous waste are to consider utilising bin liners to prevent waste residue remaining in the truck after tipping.</li> </ul>	<ul style="list-style-type: none"> <li>- If waste transport is still generating offensive odour beyond the boundary of the site, consider moving the site access point and or truck transport route further from the nearest off-site receptors.</li> <li>- No raw materials which have produced detectable odour at off-site locations during transport to or through the site are allowed to be transported to site.</li> <li>- Customers/contractors whom have been supplying these materials are to be notified of the ban and should they continue to transport the offending products to site, be prohibited from transporting any material to site.</li> </ul>
<p><b>Waste deposition, handling and compaction at the tip face</b></p> <p>The tip face is a key odour emission point at the site. During operational hours odour is emitted constantly in varying degrees from this emission point.</p> <p>Waste spreading and compaction disturbs the waste profile and can result in elevated odour emissions from odorous waste. It can also enlarge the odour plume resulting in a higher potential for off-site effects.</p>	<ul style="list-style-type: none"> <li>- Waste placement, compaction and cover shall occur in accordance with the methodology stipulated in the Landfill Operations Management Plan.</li> <li>- Fence line odour neutralising sprays are to be operational at all times during working hours. This spray system is to be checked for correct and effective operation three times a day.</li> <li>- The tip face area is to be limited to the smallest area possible. It is not to be more than 1000 m<sup>2</sup> at any time.</li> <li>- Operational procedures adopted at the tipping face to aim to prevent surface ponding of water that which can potentially emit odours (refer to the Landfill Operations Management Plan).</li> <li>- No special waste is to be tipped or handled at the general tip face.</li> <li>- The weighbridge is to notify tip face staff of any special waste loads entering the pit. A description of the truck is to be provided such that tip face staff can direct the special waste loads to the designated special waste disposal area (refer to the Landfill Operations Management Plan).</li> <li>- Systematic compaction and cover is to occur in accordance with the Landfill Operations Management Plan.</li> <li>- Trucks delivering known odorous waste (that is not classified as special waste) are to be directed to a designated tipping bay where non-odorous waste or daily</li> </ul>	<ul style="list-style-type: none"> <li>- The size of tipping face is to be reduced.</li> <li>- Odorous waste loads being deposited at the tip face/special waste area are to be staggered such that cumulative odour emissions are reduced.</li> <li>- Odorous material is to be treated in situ with lime or odour suppressing chemicals.</li> <li>- Increase the thickness of cover material to inhibit odour emissions from previously tipped waste and continue to use cover on top of any subsequent odorous waste deposits.</li> <li>- Use less permeable cover material when covering odorous loads (i.e. ConCover Proguard, clay, etc). No longer use porous non-odorous waste as cover material for odorous waste.</li> <li>- Increase boundary odour observations to hourly, to ensure that Level 2 mitigation is being effective. Level 2 mitigation measures can only cease when two consecutive hours of odour observations do not detect offensive odour at the downwind boundary of the site.</li> <li>- Restrict waste spreading and compaction activities to a smaller area.</li> <li>- Use localised odour neutralising fogging cannons at active areas of the tip face.</li> </ul>	<ul style="list-style-type: none"> <li>- Odorous waste deposition or waste spreading/compaction at the tip face is not to occur during wind directions which trigger the automated alarm system (see Section 10). Odorous waste deposition is only to recommence when these wind triggers cease, or other control measures become effective at managing odour emissions from the tip face.</li> <li>- Continue hourly boundary odour observations.</li> <li>- Consider redesigning tip face operations such that odour emissions can be further minimised.</li> </ul>



Activity	Level 1	Level 2	Level 3
	<p>cover is readily available to immediately cover the waste with at least 150 mm of cover material.</p> <ul style="list-style-type: none"> <li>- Ensure that there is a readily available stock pile of non-odorous cover material present at the tip face at all times for the purposes of covering any odorous waste tipped at the face.</li> <li>- All site staff are to be used as spotters, and where a highly odorous load is dumped on the active tip face (but not in the designated odorous waste tipping bay), the tip face manager is to be notified immediately and the material is to be covered with the available non-odorous waste/cover material.</li> <li>- Notify clients who are delivering known odorous waste to avoid scheduling waste deliveries in the early morning or late evening hours where air dispersion conditions are poorer.</li> <li>- Where waste spreading or compaction disturbs odorous waste resulting in a noticeably higher odour emission from the activity, immediately cover the source of the odour with non-odorous waste or cover material.</li> <li>- Avoid spreading odorous waste deposited at the tip face across a larger area. Where possible compact this waste in situ.</li> <li>- Ensure appropriate landfill gas extraction is occurring surrounding the tip face as detailed in the Landfill Gas Management Plan.</li> </ul>		
<p><b>Special waste</b></p> <p>Special Wastes are wastes that come in on permit and generally classified as Special Waste/ Difficult Waste/ Discretionary. These wastes include putrescible waste from commercial or industrial sources, such as produce, fish or animal waste; sludge, septage, mud trap and grease trap waste; odorous green waste and woody waste. Treated Hazardous Waste also becomes acceptable if it meets that Hazardous Waste criteria in the Landfill Operations Management Plan. Discretionary waste becomes acceptable waste with the issue of a Special Permit.</p> <p>Hazardous waste streams that are consented to be received by AB Lime are discussed in the Landfill Operations Management Plan.</p> <p>Special waste must be deposited in the landfill in accordance with the conditions and protocols outlined in the Landfill Operations Management Plan.</p>	<ul style="list-style-type: none"> <li>- All special waste is only to be accepted by special permit. Clients delivering the waste must notify AB Lime of the expected date and time which special waste will be delivered.</li> <li>- Special waste is only to be deposited in dedicated special waste pits, which are to be pre-prepared in advance of the delivery.</li> <li>- The GPS co-ordinates of the special waste pit, quantity and type of material being deposited are to be recorded and held on file.</li> <li>- Delivery truck drivers are to be directed to the dedicated special waste pit by the weigh bridge staff and the pointsman at the tipface. The road to the special waste pit is to be clearly sign posted.</li> <li>- The weighbridge is to radio the tip face staff at the time of arrival such that staff can be available to immediately cover/treat the load tipped.</li> <li>- The tip height of the load is to be limited to as low as practicable to minimise disturbance of the load.</li> <li>- There is to be no spreading, compaction, or disturbance of the waste prior to covering.</li> </ul>	<ul style="list-style-type: none"> <li>- Increase boundary odour observations to hourly, to ensure that Level 2 mitigation is being effective. Level 2 mitigation measures can only cease when two consecutive hours of odour observations do not detect offensive odour at the downwind boundary of the site.</li> <li>- Special waste deposition is not to occur during wind directions which trigger the automated alarm system (see Section 10). Special waste deposition is only to recommence when these wind triggers cease, or other control measures become effective at managing odour emissions from this activity.</li> <li>- Increase the amount of cover material to better capture odour being released from the waste deposited.</li> <li>- Use less permeable cover material when covering special waste (i.e. ConCover Progaard, clay, etc).</li> <li>- Require a higher level of pre-treatment with odour suppressants of all odorous special waste prior to delivery to site.</li> <li>- Odorous waste loads being deposited at the tip face/special waste area are to occur concurrently</li> </ul>	<ul style="list-style-type: none"> <li>- Continue hourly boundary odour observations.</li> <li>- Require all odorous special waste delivered to site to be in air tight containers such that there is no or very limited potential for odour to be released when these sealed containers are placed in the special waste disposal pit.</li> </ul>

Activity	Level 1	Level 2	Level 3
	<ul style="list-style-type: none"> <li>- Special wastes are to be covered immediately by at least 150mm of non-porous soil, lime or overburden material. Sufficient quantities of cover material are to be stored directly adjacent to the special waste pit.</li> <li>- Highly odorous loads are only accepted if the material has been pre-treated with lime or odour suppressing chemicals.</li> <li>- The delivery of odours loads is to be planned to occur during the typically windy period in the middle of the day, while allowing sufficient time for thorough covering prior to daily closure of the landfill.</li> <li>- Additional odour suppressing materials or lime is applied to the waste as it is deposited as required.</li> <li>- Intermediate cover over special waste pits is to be prioritised over other areas of the landfill.</li> </ul>	<p>such that cumulative odour emissions are reduced.</p> <ul style="list-style-type: none"> <li>- To reduce migration of odour out the sides/bottom of the pit, partially or fully line the special waste pit with a nonporous material prior to special waste being deposited into the pit.</li> </ul>	
<p><b>Leachate</b></p> <p>Odour emissions from the leachate are most associated with the anaerobic state of the leachate when it drains out of the waste mass. The anaerobic decomposition of the organic material in the water results in the evolution of odorous gases, primarily H<sub>2</sub>S.</p> <p>Leachate drains by gravity from the collection systems in the landfill to the concrete leachate storage tank.</p> <p>The tank is sized for average flows after 35 years of waste filling and for peak flow in the early phases of the landfill. The leachate tank has an aerator to maintain aerobic conditions within the leachate, reducing odours associated with any further anaerobic decomposition.</p> <p>For transport off-site, leachate is pumped from a sump in the concrete tank to a tanker loading point. The tanker loading bay has a drain back to the leachate tank.</p> <p>Leachate is occasionally recirculated into the landfill to make use of the absorptive capacity of the waste and enhance microbial degradation. The re-injection system is designed to allow leachate to be pumped from the leachate tank directly to the landfill.</p> <p>Dissolved oxygen (DO) levels are monitored continually within the leachate tank to ensure that oxygen levels are sufficient to avoid odours.</p> <p>The procedures for handling and managing leachate on-site are described in the Landfill Leachate Management Plan.</p>	<ul style="list-style-type: none"> <li>- Weekly checks to ensure that the aerator and dissolved oxygen meter are operating within the manufacturer's guidelines.</li> <li>- Leachate storage tank is to be routinely checked by site staff (weekly) for observable odour emissions.</li> <li>- Automated alarm on the DO meter to detect when DO levels fall below 1% to indicate that either the aerator is not working or there is some other malfunction in the system.</li> <li>- Continuous H<sub>2</sub>S meter is to be installed within a low-lying area next to the leachate tank to indicate potentially dangerous working conditions and presence of strong odour. An alarm for this continuous monitor is to be set at 1 ppm. Notification of this alarm being triggered is to be visualised by a flashing light at the leachate pond and/or e-mail notification to site management.</li> <li>- Ensure spills are minimised during transfer to the tanker truck.</li> <li>- Monitor H<sub>2</sub>S boundary sensor data. If boundary H<sub>2</sub>S concentrations exceed 200 ppb investigate source (using portable H<sub>2</sub>S sensor) and move to Level 2 controls for H<sub>2</sub>S emitting activities.</li> <li>- Leachate infrastructure such as sumps, wells and vertical risers to be effectively sealed only retaining any necessary access for monitoring and maintenance.</li> <li>- Leachate irrigation and reinjection controls</li> </ul>	<ul style="list-style-type: none"> <li>- Increase frequency of leachate removal from the leachate tank (ideally empty it completely as frequent as possible).</li> <li>- Increase boundary odour observations to hourly, to ensure that Level 2 mitigation is being effective. Level 2 mitigation measures can only cease when two consecutive hours of odour observations do not detect offensive odour at the downwind boundary of the site.</li> <li>- Where DO levels are lower than 1%, increase aeration (either by increasing frequency of aerator operation or increasing airflow rates).</li> </ul>	<ul style="list-style-type: none"> <li>- Investigate installation of additional aerators.</li> <li>- Leachate collection and off-site transport is not to occur during wind directions which trigger the automated wind direction alarm system (see Section 10). Leachate collection and off-site transport is only to recommence when these wind triggers cease, or other control measures become effective at managing odour emissions.</li> <li>- Investigate installation of cover/roof for the leachate holding tank with extraction of the headspace gas to an odour treatment system (i.e. a biofilter).</li> </ul>



Activity	Level 1	Level 2	Level 3
<p><b>Capping</b></p> <p>A full description of the landfill cover/capping design and process is included in the Landfill Operations Management Plan.</p> <p>If the daily cover, intermediate cover, or final capping does not remain airtight then odour and/or landfill gas can be released from the waste mass below.</p>	<ul style="list-style-type: none"> <li>- Undertake landfill gas management in accordance with the Landfill Gas Management Plan.</li> <li>- Undertake weekly capping inspections as outlined above.</li> <li>- Measure any gas release from cracks using a portable gas detector. If more than 1 ppm of H<sub>2</sub>S or 0.5% CH<sub>4</sub> is detected at ground level, immediately repair the crack.</li> <li>- Check the edges of the cells with the portable gas detector for gas leaks up the wall of the cell.</li> <li>- Calibrate/tune the landfill gas extraction system such that the highest percentage possible of landfill gas being produced by the waste mass is being captured and destroyed.</li> <li>- If fugitive gas emissions are passing through intermediate cover, apply an additional 200 mm of cover material.</li> <li>- If fugitive landfill gas emissions are occurring through the daily or intermediate cover, increase the thickness of the cover and calibrate the landfill gas extraction wells near the tip face.</li> <li>- If odour is being detected at or beyond the boundary as a result of breaking up the daily cover at the start of each day, use daily cover that does not need to be broken up at the start of the day (i.e. Cleanfill).</li> </ul>	<p>If the Level 1 mitigation is not sufficient to control off-site nuisance odour effects, identify the source of the odour emissions using portable gas sensors and odour scout monitoring. Then apply additional mitigation to the source of the emission points, such as:</p> <ul style="list-style-type: none"> <li>- Increase the amount of landfill gas extraction in the offending cell(s).</li> <li>- Investigate alternate daily, intermediate and/or final capping materials.</li> <li>- Investigate alternate crack repair methodology.</li> <li>- Add additional landfill gas extraction well(s).</li> <li>- Install a temporary candlestick flare to burn excess landfill gas at the source of emission.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce the area of intermediate cover by either applying final capping to the area or completing the cell as soon as possible.</li> <li>- Install a temporary biofilter blanket (~400 mm thick mature compost or similar) over the odour source.</li> <li>- Engage suitably qualified experts/consultants to review and if necessary re-design the capping and cover methodology.</li> </ul>

## 5. Air Discharges from Hazardous Waste Handling

Hazardous waste streams that are consented to be received by AB Lime include:

- Medical waste – in accordance with "Healthcare Waste Management" standards;
- Asbestos – In accordance with NZ Health and Safety at Work (Asbestos) Regulations 2016;
- Methamphetamine contaminated furnishings; and
- ~~Aluminium dress.~~

The procedures and process for receiving and depositing hazardous waste streams are outlined in the Landfill Operations Management Plan.

Potential discharges to air from this process include:

- Airborne pathogens from medical waste;
- Methamphetamine and toxic volatile organic compounds (VOCs) such as: acetone, benzene, isopropanol, from meth contaminated waste;
- Airborne asbestos fibres; and
- ~~Toxic fumes and dust from aluminium dress.~~

Most asbestos and all medical waste-streams are delivered to site in appropriately labelled and sealed containers. Therefore, there is a very limited potential for discharges to air from these waste streams.

Asbestos contaminated soil/mixed fill material arrives in a double wrapped 'pillow'. The pillow can rupture during placement in the dedicated special waste pit. Specific controls for the handling and management of asbestos containing waste (including asbestos contaminated soil/mixed fill pillows) are detailed in the Landfill Operations Management Plan.

Methamphetamine waste can arrive at site in loads which are not fully enclosed. Most the meth/VOCs that are available to be aerosolised will have been released during removal/transport or are no longer unlikely to be aerosolised during waste placement, so there is a minimal potential for significant discharge of these air pollutants. Mitigation measures (including air discharge mitigation) associated with the handling and deposition of methamphetamine are outline in detail in the Landfill Operations Management Plan.

## 6. Air Discharges from Crisis Waste Acceptance

In the instance of a local, regional or national biosecurity emergency or disaster, AB Lime may be required to accept a substantial volume of waste over a relatively short period of time.

Due to the organic nature of some of these wastes, their acceptance at the landfill site is likely to cause a heightened loss of amenity or nuisance associated with odour.

A special procedure for the acceptance and management of this waste is included in the Landfill Operations Management Plan.

To control potential odour emissions from the receipt and disposal of crisis waste, the existing odour mitigation measures and controls for acceptance of highly odorous waste described in Section 4 are to be applied, along with the following additional controls:

- AB Lime is to stipulate to the waste provider that wherever possible the waste is to be pre-treated or delivered in airtight disposable containers/bags. This will reduce odour emissions during disposal. Examples of pre-treatment include:
  - Mix with lime or an alternate chemical odour suppressant;
  - Mix the material in with a bulking agent – i.e. sawdust;
  - Slit stomachs of deceased animals to reduce the potential for bloat and gas production; and
  - Refrigerate the material prior to/during delivery to slow down the decomposition process.
- Crisis waste deliveries are to be made to site as early as possible such that any organic material is as 'fresh' as possible.
- AB Lime is to notify the community liaison group and/or neighbouring residents/landowners of the requirement to receive this emergency waste, the date and time when waste will be received, and the control measures that will be implemented to reduce the potential for nuisance odour emissions. AB Lime is to notify the neighbours that despite the additional odour controls, nuisance odour may still travel beyond the boundary of the site. As such the neighbours may wish to leave windows closed, not hang washing outside, or plan to be away from home during the times that the waste is proposed to be delivered.
- AB Lime is to provide neighbours with the contact phone number of the site Environmental Manager such that they can notify AB Lime if any offensive odour is observed off-site.
- AB Lime are to undertake hourly boundary odour observations during crisis waste deposition. Where applicable off-site odour scouting is to occur to identify the extent of any off-site odour plume. This information is to be retained and provided to Environment Southland on request.
- AB Lime are to invite an Environment Southland representative to be present during the crisis waste deposition to monitor any off-site nuisance effects and communicate with local residents/land owners.
- If any complaints are observed during the crisis waste acceptance, the complaint response procedures in the Environmental Management Plan are to be instigated.

## 7. Combustion Emissions

As discussed in Section 3, combustion emissions contain toxic air pollutants that are hazardous to human health and regulated by national environmental standards.

Products of combustion (CO, PM<sub>10</sub>, NO<sub>2</sub> and SO<sub>2</sub>) are emitted from the following sources on-site:

- Motor vehicle exhausts;
- The landfill gas flare;
- Portable temporary candlestick landfill gas flares; and
- The coal fired lime kilns (covered in a separate air discharge consent).

There are a limited number of site vehicles and delivery trucks on-site at any one time, as such exhaust emissions from these vehicles are minimal contributors to discharges of controlled pollutants from the site.

Air dispersion modelling has demonstrated that at peak operating conditions the combustion emissions from the operation of the gas flare and coal fired lime kilns result in low off-site concentrations of CO, PM<sub>10</sub>, NO<sub>2</sub> and SO<sub>2</sub> beyond the boundary of the site. Nevertheless, the following good practise mitigation measures are to be implemented on-site.

### 7.1 Mitigation

The primary method for reducing the concentration of toxic products of combustion from the site is to ensure that the combustion equipment is well tuned and efficient combustion is occurring. Inefficient combustion results in higher emission rates of controlled pollutants.

The Landfill Gas Management Plan contains a full description of the landfill gas flare operations and associated mitigation and controls.

- The landfill gas flare is to be maintained and calibrated by an appropriately qualified technician at least annually to meet the requirement that at least 98% of non-methane organic compounds are destroyed. These procedures also ensure that effective efficient combustion of landfill gas occurs which minimises toxic products of combustion emission.
- The landfill site also contains a lime drying kiln which uses coal but can also utilise landfill gas – details associated with the operation of the drying kiln are covered in the Quarry Management Plan.

Contingency measures associated with reducing ground level concentrations of pollutants emitted from the flare/coal fired kilns include:

- Increasing the stack heights.
- Installing reducing cones on the stack tip to increase the exit velocity.
- Installing secondary scrubbers/after burners.
- Replacing the flare with a larger/more efficient flare.

## 8. Dust

AB Lime has a requirement to ensure there is no offensive or objectionable dust discharged beyond the boundary of the site.

### 8.1 Emissions Sources

The main sources of nuisance dust emission at the landfill are:

- Disturbance of surface fines on access roads as a result of traffic movements;
- Earthworks and material handling activities - such as the placement of cover material during dry periods;
- Filling and compaction of dusty waste;
- Fugitive dust emissions from exposed surfaces;
- Material being tracked off-site onto Cahill Road by vehicle movements; and
- Dust from material stockpiles.

### 8.2 Factors Influencing Dust Generation

The major factors that influence dust emissions from surfaces are:

- Wind speeds across the site; increased pickup of dust from exposed surfaces occurs at windspeeds above 7 m/s;
- The percentage of fine particles in the material;
- Moisture content of the material;
- The area of exposed surfaces;
- Disturbances such as vehicle movements, materials handling activities, etc; and
- The height of the dust source above the surrounding ground level.

The separation distances between the primary dust generating activities and the site boundary are generally greater than 300 m. The main access road is sealed for a length of approximately 400 m reducing the potential for material to be tracked off-site. The nearest unsealed road is ~400 m from the nearest public road.

Given these large separation distances and the presence of mature planting mostly surrounding the operations, there is a limited potential for off-site nuisance dust effects. However, to ensure that the site remains compliant with its consent requirements the following dust mitigation measures are to be applied on-site.

### 8.3 Mitigation Measures

Two levels of mitigation measures for dust emissions are set out in Table 8.1. If the measures in level 1 are not sufficient to control dust emissions from the site, the level 2 contingency measures are to be considered by AB Lime management.

Table 8.1: Dust mitigation measures

Level 1	Level 2
<ul style="list-style-type: none"> <li>• Dust control procedures and responsibilities are to be included in site induction training for all new staff/regular contractors on-site.</li> <li>• All site staff are to report any visible dust emissions (particularly those at or beyond the site boundary) to the site management so that additional mitigation can be applied to the source of the emission.</li> <li>• The main landfill entrance shall be permanently sealed.</li> <li>• Regular maintenance of unsealed haul roads with fresh coarse chip to ensure that the amount of surface fines on the road is limited.</li> <li>• Dust emissions from vehicle movements are directly related to vehicle speed. Control vehicle speeds (limit 30 km/hr on sealed roads and 15 km/hr on unsealed roads). Speed limits are to be signposted on all internal roads.</li> <li>• A water-cart will be used to reduce dust on both unsealed and sealed roads. Where required a sweeper truck is to be used to assist in cleaning sealed roads.</li> <li>• All vehicles/waste transporters leaving the site that have been off-road or at the working face shall use the wheel-wash facilities.</li> <li>• Dusty special wastes shall only be accepted by prior arrangement. The following mitigation measures shall be undertaken to minimise dust emissions from these special wastes:             <ul style="list-style-type: none"> <li>a) dusty wastes shall be dampened or enclosed in bags prior to delivery to the landfill, or controlled by water spray at the landfill.</li> <li>b) emissions from potentially dusty loads tipped at the workface shall be controlled by applying water or immediately covering the waste material.</li> </ul> </li> <li>• Dust emissions from material disturbance activities are to be mitigated as follows:             <ul style="list-style-type: none"> <li>a) Ensure that there is a readily available source of water for dust mitigation measures within the active area of the landfill.</li> <li>b) Stockpiles of dusty/dry cover and capping material are to be limited to that which is needed for normal/immediate operations.</li> <li>c) Where required, during dry windy conditions, wet down cover and capping material prior to disturbance and/or during placement.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Consider sealing more internal site roads.</li> <li>• Use a chemical dust suppressant on exposed unconsolidated surfaces.</li> <li>• Install fixed and or mobile sprinkler systems (i.e. k-line sprinklers) along/over dust emission points.</li> <li>• Increase the frequency of water cart operation or add a second water cart for dust control.</li> <li>• Further limit the size of unconsolidated surfaces and dusty stockpiles.</li> <li>• Grass or hydroseed stockpiles or unconsolidated surfaces which are not in active use.</li> </ul>

Level 1	Level 2
<ul style="list-style-type: none"> <li>d) Limit the drop height of all potentially dusty material placement, loading, and unloading activities to a practical minimum.</li> <li>e) Where required wet down dusty loads before and during tipping.</li> <li>• Dust from unconsolidated surfaces can be emitted during dry windy conditions. To mitigate the potential for these emissions, site staff are to apply the following mitigation measures:               <ul style="list-style-type: none"> <li>a) Keep the amount of open ground/unconsolidated surfaces to a practicable minimum.</li> <li>b) Traffic access to exposed areas is to be limited to a practical minimum. Where applicable isolation bunds are to be used to prevent vehicle access to exposed areas. Exposed areas with no or low traffic access will be watered to form a crust over the surface and limit the amount of fine particles on the surface.</li> <li>c) Progressive rehabilitation and re-grassing of capped areas of the site is to occur as soon as practically possible to limit the amount of exposed surface.</li> <li>d) Where dust emissions are not being controlled by the above measures, consider using additional controls such as hydroseeding, temporary covering with a course non-dusty material, or installing fixed/mobile sprinkler systems.</li> </ul> </li> <li>• To limit dust emissions from material stockpiles, keep the volume of stockpiled material to a practical minimum. Where required water the sides of stockpiles to form a crust on the surface.</li> <li>• Grass large stockpiles that are not proposed to be used for long periods of time (&gt;6 months) as soon as practicable.</li> <li>• Where practicable store fine/dusty material stockpiles below natural ground level.</li> </ul>	

## 9. Maintenance

All critical air discharge control equipment and plant on-site is to be checked and maintained in accordance with the manufacturer's guidance and site procedures.

This includes:

- Daily pre-start checks are to be made on all site vehicles and the water cart. Vehicles are to be regularly serviced in accordance with the manufacturer's service and maintenance requirements.
- The fence line odour suppressant system and the portable odour fogging unit are to be checked/maintained at least monthly for correct and efficient operation.
- The on-site weather station and associated automatic alarm system is to be audited and calibrated annually.
- The boundary and onsite H<sub>2</sub>S sensors are to be bump tested monthly and calibrated in accordance with the manufacturer's requirements.
- The landfill gas meter is to be bump tested at least monthly and calibrated in accordance with the manufacturer's requirements.
- The methane Flame Ionisation Detector (FID) is to be audited and calibrated in accordance with the manufacturer's requirements.
- The landfill gas flare(s) are to be maintained and monitored in accordance with the procedures outlined in the Landfill Gas Management Plan.
- The leachate tank aerator is to be monitored and maintained in accordance with the requirements in the Landfill Leachate Management Plan.



## 10. Monitoring

### 10.1 Landfill Gas Monitoring

Careful management and monitoring of the landfill gas system is required to minimise the potential for objectionable odours and the risk of explosion, combustion, asphyxiation, underground fires or vegetation damage within the landfill and beyond the site boundary. The landfill gas monitoring procedures are outlined in the Landfill Gas Management Plan.

### 10.2 Leachate Tank Monitoring

The Leachate Management Plan contains monitoring requirements for the DO levels in the leachate tank.

### 10.3 Site Weather Conditions

Currently AB Lime has a weather station located relatively central to the site. A backup station is located on the adjacent dairy farm (down valley of the farm).

Site weather conditions including rainfall, wind velocity and direction, barometric pressure and temperature are to continue to be monitored continuously (at least once every hour). The information will be used to assist investigations and response to any odour complaints and interpretation of gas monitoring results.

The weather station is to remain located in an area central to the site where the observations are representative of the site wind conditions. The height of the mast should be no less than 6 m above ground level, but ideally 10 m above ground level. The monitoring station is to not to be situated next to large structures or trees which would influence local airflows.

The weather station is to log measured parameters continuously. The weather station is to be connected to an automated alarm system that triggers an on-site flashing light and email/text message alerts to inform site staff of wind directions from the north, northeast and east (winds blowing from 0 - 90 degrees azimuth).

### 10.4 Boundary Odour Observations

Boundary odour observations are to be made once a week during winds blowing from the north, northeast and east (winds blowing from 0 - 90 degrees azimuth), or during still cold air drainage conditions. Where practicable these odour observations are to be made during the first occurrence of these meteorological conditions during the working week. Where these meteorological conditions do not occur during the week, downwind odour observations are optional.

The monitoring frequency is to be increased if offensive odour emitted from the landfill is detected at the site boundary or an off-site complaint/observation is received as described in Section 4 and 11. The methodology for undertaking the boundary odour monitoring is explained in Attachment 1.

### 10.5 H<sub>2</sub>S boundary monitoring

At least two low range continuous datalogging H<sub>2</sub>S monitors are to be installed along the south western boundary of the site (for example, one at the site office and one near R8). The continuous monitors are to have a minimum H<sub>2</sub>S detection limit of 100 ppb (i.e. an OdaLog Low Range H<sub>2</sub>S Logger).

Data from these two monitors is to be logged and automated alarms are to be set at 200 ppb (0.2 ppm) such that additional mitigation measures discussed above can be implemented.

The monitors are to be installed as close to ground level as possible (without being at risk of flooding), as H<sub>2</sub>S is heavier than air.

Where required, a low range H<sub>2</sub>S sensor can be used in 'survey mode' to scan upwind and detect the source(s) of the H<sub>2</sub>S emissions where an alarm has occurred.

## 11. Complaints

The process for managing complaints is detailed in the Environmental Management Plan. The following sections provide additional details when the complaints relate to air quality.

### 11.1 Response to Air Quality Complaints

The Environmental Manager will contact the complaint by telephone, or if this is not possible by sending a letter or email on the same day as the complaint is received.

To validate and investigate the source of the complaint undertake the following as appropriate:

- Correlate complaint with weather conditions.
- For a dust complaint, undertake off-site and on-site observations to determine the location and extent of the dust plume. Work upwind to identify the source(s) of the dust emissions.
- For an odour complaint, undertake odour scout survey to ascertain the extent, intensity, and character of the odour plume. Start at the area where the complaint was received and work upwind to identify the source of the odour. Where appropriate utilise an OdaLog low range H<sub>2</sub>S sensor (or similar) to identify any measurable concentrations of H<sub>2</sub>S within the plume/at the source.
- Check and record current tipping operations.
- Check and record any odorous/dusty load history (type, age, number, disposal method, timing).
- Check daily, intermediate and final cover.
- Check gas collection systems and flare for proper operation.
- Check leachate tank aerator unit for proper operation.
- Check leachate tank H<sub>2</sub>S sensor readings.
- Record all odour scout and investigation observations in the AB Lime incident response forms.

If the cause of the complaint is identifiable, measures that have to/will be put in place to avoid a recurrence will be recorded and provided to external parties as required. If there is uncertainty as to the nature or cause of the complaint the Environmental Manager will seek clarification. A meeting may be required to discuss the complaint and if possible, will be arranged as soon as is practicable.

All complaints will be responded to in writing, and in some cases this may be after clarification.

Copies of the written responses will be filed in the complaints register.

All complaints will be reported to Environment Southland as soon as possible and no longer than one working day after the complaint is received.

### 11.2 Validated Complaints

Should investigation of odour/dust complaints indicate that discharges from the landfill are causing objectionable or offensive effects beyond the boundary, site staff are to instigate Level 2 or Level 3 mitigation measures for the source of the emission.

AB Lime will offer the complainant(s) and any other concerned neighbouring residents the opportunity to participate in an odour diary program. The design of the odour diary programme shall be in accordance with recognised good practice.

An odour diary record sheet is to be provided to all participants. The odour diary program is to continue for a minimum period of three weeks (pending participant approval). Contact details of the Environmental Manager are to be supplied to the participants of the odour diary program such that direct feedback can be provided to AB

Lime if and when landfill odour is detected beyond the boundary of the site. This feedback will be used by AB Lime to further investigate odour sources on-site and implement additional controls where required.

Where appropriate, AB Lime shall notify Environment Southland of the odour diary program and provide a summary of the results on request.

### **11.3 Ongoing Air Quality Complaints**

If a complainant is dissatisfied with a response to a complaint, every reasonable attempt is to be made to find a satisfactory solution. If all reasonable measures are rejected, the complainant will be referred to Environment Southland. Details of the measures offered will be sent to the regulatory authority at the same time as being offered to the complainant or if offered verbally as soon afterwards as is practical.

## Attachment 1. Boundary Odour Monitoring

The methodology for the boundary odour scouting and monitoring are based on the current (2016) version of the Ministry for Environment Good Practice Guide for Assessing and Managing Odour (<https://www.mfe.govt.nz/publications/air/good-practice-guide-assessing-and-managing-odour>). Where an updated version of this guidance exists, AB Lime is to update this methodology accordingly.

### Definitions

*Objectionable* – The term objectionable is used in AB Lime’s consent conditions and is an ingredient of any subsequent enforcement action. It is a subjective term and is open to interpretation. There is guidance from case law which defines objectionable as: unpleasant or repugnant; open to objection or undesirable or disapproved, or; noxious or dangerous. A test will be applied by the court that the term objectionable will be as it applies to “the minds of a significant cross section of reasonable people in the community”. The assessor must bear this test in mind when completing their assessment.

*Intensity* – The strength of the odour (e.g. 3 ‘distinct’)

*Character* – What the odour smells like – describe the smell (e.g. fishy)

*Hedonic tone* – The degree to which an odour is perceived as pleasant or unpleasant (e.g. -4 ‘extremely unpleasant’)

### Methodology

The ambient odour monitoring is to be undertaken by someone that has not spent a significant amount of time in the active landfill just prior to the monitoring. For example, the person could be office staff or other staff prior to starting work on the site, or after leaving the site for some time. The purpose of this requirement is to avoid the effects of desensitisation affecting the effectiveness of the odour monitoring.

Field sheets for recording the odour observations are included in the ‘field sheets’ section below.

The assessor is to start by recording the meteorological parameters (ideally as measured by the on-site weather station(s)). Based on the measured and observed ground level wind direction, select a representative downwind assessment site on the boundary of the site. It may be appropriate to walk along the section of the downwind boundary to check if any initial odour is present on this boundary.

Record the location of the sampling site both on the field sheet and an aerial image.

Undertake the 10-minute assessment by recording an observation of the intensity and character of odour observed at the monitoring location every 10 seconds. Use the intensity and character descriptors listed on page two of the field sheets. Breathe normally, don’t sniff or breathe only through the nose. Record your observations in the 60 boxes (one for each 10 second observation) on the first page of the field sheets.

Record all odour observations (i.e. earthy, or fresh cut grass), not just odours associated with the landfill.

Record the hedonic tone of any odour detected. Note that this may be variable over the course of the assessment.

Where landfill odour is detected undertake a 360-odour observation of the landfill to ensure that there are no off-site or upwind odour sources contributing to the observed odour. Also move through the odour plume to record the extent of the plume (i.e. how wide it is, and how far it is observable off-site).

If the odour character/hedonic tone is offensive and consistent with that from the landfill and has an intensity at or above 3 'distinct', instigate the odour source. The investigation and associated response procedure outlined in Section 11 of the Plan. Immediately notify the Environmental Manager and Site Manager.