Clutha District Council

TECHNICAL ASSESSMENT OF AIR QUALITY EFFECTS

MT COOEE LANDFILL

27 APRIL 2023

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TECHNICAL ASSESSMENT OF AIR QUALITY EFFECTS
MT COOEE LANDFILL

Clutha District Council

REV	DATE	DETAILS
A	27 April 2023	Final

	NAME	DATE	SIGNATURE
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1 INTRODUCTION

Clutha District Council (CDC) operate the Mt Cooee Landfill on Kaitangata Highway, on the outskirts of Balclutha. The site location is shown in Figure 4-1.

The landfill currently holds an air discharge consent (94510) that authorises the discharges of landfill gas (LFG) and dust to air until 1 October 2023. CDC is now seeking to apply for a resource consent to allow continued operation of the landfill.

WSP (NZ) Limited (WSP) has prepared this technical air quality assessment to support the resource consent application under Section 124 of the RMA to allow operation of existing landfill activities.

2 SITE ACTIVITIES

2.1 GENERAL

The Mt Cooee Landfill serves a population of approximately 17,550 and accepts refuse from residential, commercial and some industrial customers primarily via CDC's kerbside collection service and waste transfer stations. The landfill is also open to general public.

General facilities on the landfill include staff building, vehicle weigh bridge, staff and visitors' carpark area, temporary storage building for hazardous waste, rubber tyres area, green waste area, metal scraps receivable, ash pit, liquid waste disposal area, leachate and stormwater ponds, animal carcasses area (closed) and tip face for general municipal waste. The landfill also has several filled and capped areas.

Figure 2-1 shows a general location of these facilities on the site.

The landfill operates from Monday to Friday between 8.00 am and 4.30 pm and on Saturday and Sunday between 10.00 am and 4.30 pm.

Figure 2-1: Mt Cooee Landfill - Site Layout (current operations).

2.2 WASTE TYPES

The landfill accepts around 8,000 tonnes of refuse per annum. The common waste types accepted on the landfill include:

- Municipal solid waste of a domestic / household nature or from businesses and farms;
- Construction and demolition waste;
- Green waste such as lawn clippings, hedge clippings, leaves, tree trimmings, and garden weeds;
- Rubber tyres;
- Metal scraps;
- Plastic bottles;
- Septage and grease trap waste and occasionally other liquid organic wastes generated from food processing or nearby industries; and
- Hazardous wastes are generally not accepted at the Mt Cooee landfill. However, domestic, business and farm waste does, by nature, contain small quantities of hazardous wastes or special wastes. Hazardous and special wastes would normally constitute less than 1 % of the overall waste stream accepted at the landfill. Special wastes that require special measures in handling and disposal but are not necessarily hazardous (e.g., farm waste, including animal carcasses[1]) are not routinely accepted at the landfill but can be accepted with a Special Waste Permit approved under a licensing procedure through CDC.

The following wastes are not accepted at the Mt Cooee Landfill and are generally disposed of at the Green Island Landfill in Dunedin:

- Large quantities of cleanfill;
- Contaminated soil;
- Hazardous waste: Mainly liquid or solid waste but can be gaseous, and can be ignitable, explosive, corrosive, reactive, toxic, infectious or radioactive. It does not include wood painted with lead-based paint, treated timber, household batteries or household smoke detectors (which can be accepted at the Mt Cooee landfill); and
- Bulk loads of recycling materials.

[1] WSP understands that this type of waste has not been received in the past year.

2.3 RECEIVING AND HANDLING OF WASTE

Irrespective of the type of waste, all vehicles are weighed on arrival and navigate to the appropriate area of waste receivables for tipping their load. While leaving, the vehicles are weighed again and, if appropriate, charged for the rubbish based on the difference in weight.

The kerbside collection trucks (currently operated by WasteCo) bring in general waste to site at least twice a day. All waste is transported to the landfill in a fully enclosed vehicle / container within the site. Upon arrival, the trucks are weighed on the weighbridge and then these trucks pull onto the tip face of the landfill and tip their load.

Bulk load trucks and public can arrive at the site throughout the day. For general waste (or refuse), the cars or bulk load trucks drive onto the tip face of the landfill and unload.

All the general refuse received at the active face of the landfill is spread out and compacted multiple times during the day. At the end of each day, the active face of the landfill is covered with clay/topsoil or similar cleanfill material using a frontend loader or excavator.

For other waste types, including green waste, tyres, metal scraps, the incoming deliveries are directed to the dedicated areas on the site (Figure 2-1). Some of these areas are built on top of previously filled and capped areas of the landfill containing old refuse.

There is a dedicated area for animal carcasses on site as it is classified as special waste, however this area is currently closed, and in the last year, the site has not received any such waste.

Other special waste that requires isolated handling is septage or liquid waste and it is currently disposed by excavating pits into old landfill areas. Each pit is covered with old refuse or soil after each liquid disposal.

Disposal of ash is undertaken in an isolated area to ensure hot ash doesn't lead to refuse ignition.

2.4 STORMWATER AND LEACHATE COLLECTION

All stormwater flows from the site are discharged to the Clutha River/ Mata-Au. The site has two stormwater ponds (600 m^3 and 1000 m^3) collecting runoff from all locations on the site, except the active face of the landfill.

Liquid that leaches from the waste during its degradation process are called leachate. This is a combination of water and biosolids or toxic chemicals generated from the landfill waste.

At this site, leachate produced at the active and closed landfill faces is captured by a leachate control system. This comprises of a drainage system to collect the leachate from the site, which and transfer to the council sewage treatment plant using a pump station for further treatment. The site also has a 770 m^3 pond to provide emergency storage of leachate overflow. This pond is lined with a 600 mm layer of clay. From communication with site operators, WSP understands that this pond has not been used in the last ten years. Groundwater monitoring is undertaken around the site regularly to detect any leachate contamination.

2.5 CAPPED AREAS OF THE LANDFILL

The site has been operating since the late 1990s and has several areas on the site that have been filled and capped. As the currently operating cells reach fill capacity, these will also be capped. The current requirements for capping the landfill include 200 mm of final cover over refuse, followed by 500 mm of compacted silt and 150 to 200 mm of topsoil.

WSP understands that additional fill capacity has been identified in the previously capped areas on the landfill. Once the currently active face of the landfill reaches its capacity, it will be capped and the face of the landfill will move towards the east where capacity has been identified, heading towards the current liquid waste excavation pit (marked in Figure 2-1). This may require excavating the existing cap, landfilling, and recapping once filled to capacity. Procedures for undertaking this need to be confirmed.

The old refuse (solid and liquid) under the capped/filled landfill areas actively goes through waste biodegradation process for several years after being disposed. This results in a generation of landfill gas (LFG) that can have air quality effects.

Several large landfills in New Zealand have landfill gas collection and management systems in place which include of flaring or waste to energy operations. However, the annual processing capacity of Mt Cooee landfill is very small compared to these landfills and therefore flaring or energy generation is not considered practicable. Therefore, any produced LFG from the capped areas of the site is currently discharged directly to ambient air.

3 NATURE OF DISCHARGES

3.1 ODOUR

The main discharge from the site is expected to be odour that may become noticeable offsite at locations that are downwind of the landfill, especially during calm to light wind conditions that lead to poor dispersive conditions.

Odour expected from general refuse, particularly decomposing food and animal waste have a rotten fruit/vegetable or dead/decaying animal like character and liquid septage waste that has an ammonia like character.

Odour associated with LFG are likely to be of hydrogen sulphide or rotten egg like character.

The location and scale of expected odour sources are discussed further below.

Active face of the landfill:

The active face of the landfill where the waste is received daily is expected to have continuous low odour intensity and have a waste/decomposing waste like character associated with it.

The site operates in a manner to keep the active area to a minimum and spreading and compacting the waste regularly. The active face is also covered with topsoil at the end of each day. If these areas are kept open for long (multi-day) durations, there is a potential for odours to be observed offsite.

Liquid waste disposal areas, leachate ponds and pump station sump:

The odours associated with septage, and liquid waste disposal areas can be unpleasant and experience off site if the liquid waste area is left uncovered for extended periods. The site currently aims to cover such waste with soil as soon as practicable after each disposal, therefore reducing its potential to discharge odours.

Leachate is collected in the leachate collection system and pumped through the pump station to the sewage treatment plant. The pump sump has the potential to be an odour source depending on the storage capacity and duration.

The leachate ponds used for emergency use can also become odorous if the leachate is not pumped out quickly after use and becomes anaerobic. CDC has several management processes in place that are currently employed to ensure the leachate is management in aerobic conditions. This includes regular maintenance checks, preventive actions to avoid accumulation of leachate in the occurrence of heavy rain and regular landfill gas monitoring at the pump station sump. Subject to these management measures, the potential for odour from these sources is likely to be minor.

Landfill gas generated from capped/filled areas:

LFG is primarily comprised of methane and carbon dioxide and with trace levels of odorous compounds such as hydrogen sulphide (H_2S) and other reduced sulphur compounds. Due to their low odour threshold, reduced sulphide compounds can result in odour effects. Currently the odours associated with LFG generation from the landfill are managed through passive venting through the active fill area and intermediate capping. If these areas are kept open for long durations, there is a potential for odours associated with LFG to be noticed offsite. When

excavating the previously capped areas for landfilling in the future, there is a potential for release of LFG into ambient air resulting in short-term odour emissions. The potential for this occurrence needs to be confirmed.

Other sources:

The general waste from kerbside collection is brought in closed/covered trucks, therefore the potential for odour from the trucks is low except when the truck is opened and tipped over on the active face of the landfill. General public bringing in residential or small commercial waste is expected to be brought in small quantities. Therefore, the potential for these to result in significant odour emissions is also low.

The area where animal carcasses are landfilled are currently capped and therefore the likelihood of odours from these areas is low. Bulk loads of animal carcasses are infrequent and are only received on site in agreed circumstances and are managed to minimise potential for significant odour emissions. Other waste types received on site such as green waste, ash pit, tyres and special wastes have a very minor potential to result in any odour that would be observable off site.

3.2 DUST

There is a potential for dust discharges from capping stockpiles and vehicle movement on site on hot and dry days due to wind-driven dust erosion.

The nature of clay material that is stockpiled on site is generally damp and in a stable pile that are not prone to wind erosion.

The site roads are unsealed gravel roads. The number of trucks coming into site each day are between 2 to 6 and the number of cars/trailer units can be up to 40. Other heavy machinery on site includes front end loader or excavator and compactor. On occasion the site has used waste oil for dust suppression. The landfill also enforces a speed limit of less than 20 km/hr on site. These activities are considered to have a very minor potential of dust and likely to be contained within site boundary.

Based on a review of site activities and nature of discharges, the potential for dust effects from the site are expected to be very minor to negligible and therefore are not included further in the assessment.

4 ENVIRONMENTAL SETTING

4.1 SITE LOCATION AND LAND USE

The Mt Cooee Landfill is located approximately 1.2 km southeast of Balclutha's town centre. The site is bounded by the Main South Railway Line to the north and north-east, the Balclutha to Kaitangata Highway to the west and south-west, and a rural residential property to the southeast. The Balclutha Golf Course is located across the railway line to the north and the Clutha River / Mata-Au is located to the west across the Kaitangata Highway. The immediate land use to the east and south of the site is primarily farmland. There is a motocross track to the west of the site across the Clutha River/ Mata-Au.

There are 78 residential dwellings within 500 m of the landfill site boundary. The closest residence (125 Kaitangata Highway) is located approximately 90 m to the site's south-eastern boundary and approximately 280 m to 500 m to the active areas of the site. There are six residential dwellings around 250 m to the northwest of the site, located on Arthur Terrace.

Figure 4-1 shows the site location and surrounding environment.

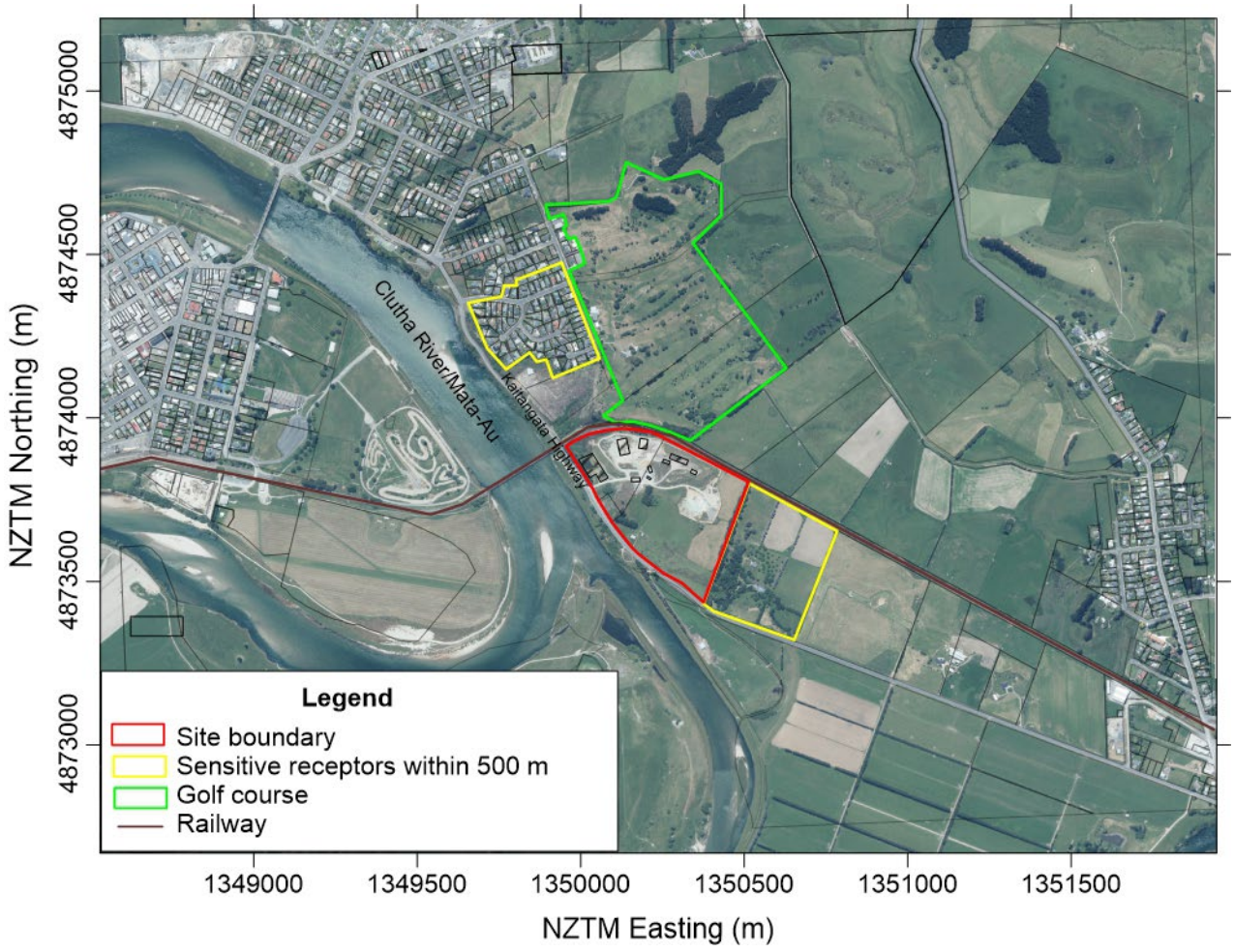

Figure 4-1: Site location and surrounding environment.

4.2 TERRAIN AND METEOROLOGY

The landfill occupies a shallow valley sloping towards the Clutha River / Mata-Au immediately to the south and west of the site and the township of Balclutha to the west of the site. The township of Balclutha lies on a generally flat land, with gently rolling hills to the north and to the southwest. The coast is approximately 13 km to the south and southeast of the site.

The local topography of the site influences the wind regime in the immediate vicinity. It is expected that during the night or early morning, low wind speed katabatic (air moving from high to low grounds, also known as drainage flows) flows of cooler air will tend to occur from the elevated areas north of the site, drifting in a south or south-easterly direction. These conditions direct airflow from the landfill across the Kaitangata Highway to the low land along Clutha River / Mata-Au and towards the coast.

The nearest weather station to the site is *Balclutha Telford EWS*, 5 km to the south of the landfill in the township of Finegand, where the terrain is also generally flat. Five years of hourly wind data from January 2016 to December 2021 was extracted from NIWA Climate Database for this weather station.

This weather station is relatively close to the site and is expected to be generally representative of general wind patterns experienced at the site. A wind rose depicting the wind patterns in the region are presented in Figure 4-2. Seasonal wind rose and wind rose varying with time of day are presented in Figure 4-3 and Figure 4-4.

The prevailing wind in the region is from the west to west-northwest (approximately 27 % of the total time) blowing generally down the Clutha Valley. Strong winds are mainly from the west and southwest and are more prevalent during the day and during summer and spring seasons. Autumn and winter months, along with morning and evening hours tend to have more light winds blowing from northwest and southwest.

Calm conditions are rare all year around (around 2.3 % of the year) and winds from the southeast and northeast quarters are less frequent overall. During the night and in early mornings (between midnight to 8 am), the wind patterns are similar to the one from the full data, except that there is a tendency for lower wind speeds at night and in the morning, when the north-westerly low wind speed flows are developed.

Drainage flow conditions occurring during early morning or night-time conditions are likely to result in minimal dispersion of any potential odours from the site and carry them towards low ground to the south or southeast of the site.

With regards to seasons, spring and summer typically have a much higher proportion of strong winds that would lead to relatively more active dispersion and dilution of any potential odour generated from the site compared to autumn and winter that are more characteristic of light wind conditions.

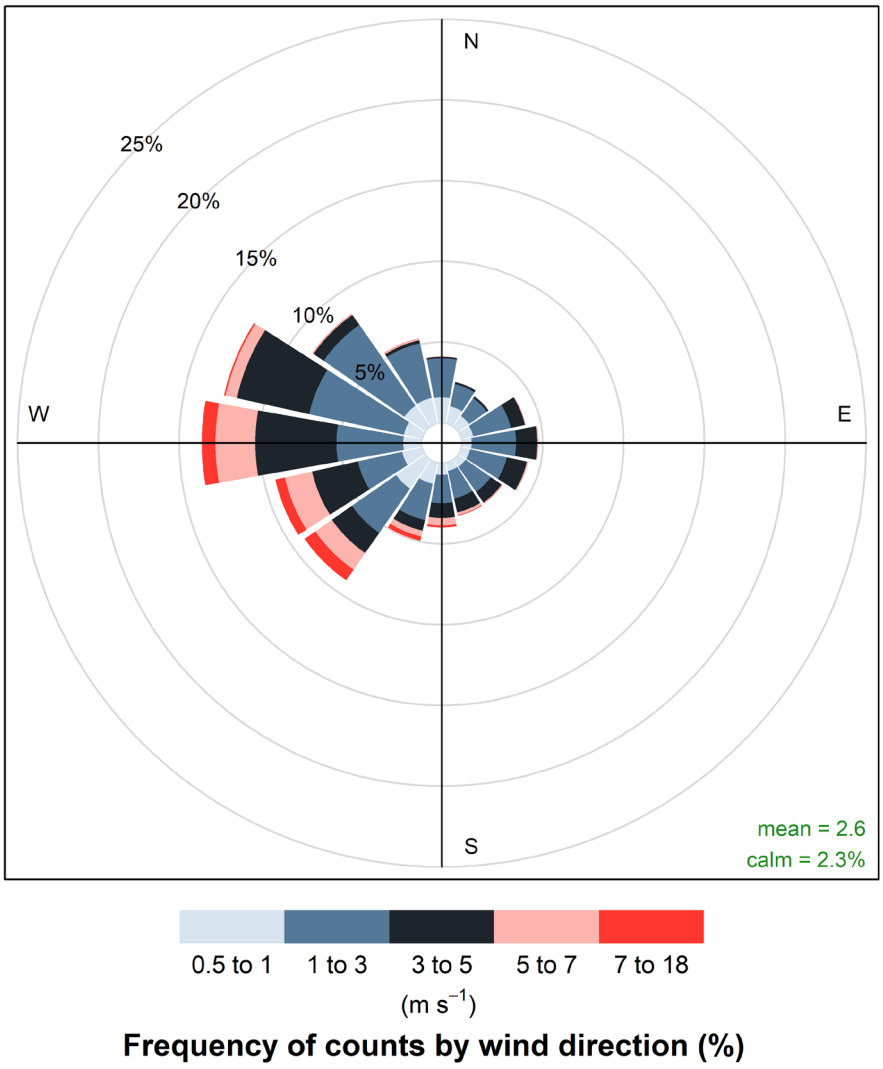

Figure 4-2: Wind rose based on hourly wind data from Balclutha Telford EWS for the period 2016 to 2021.

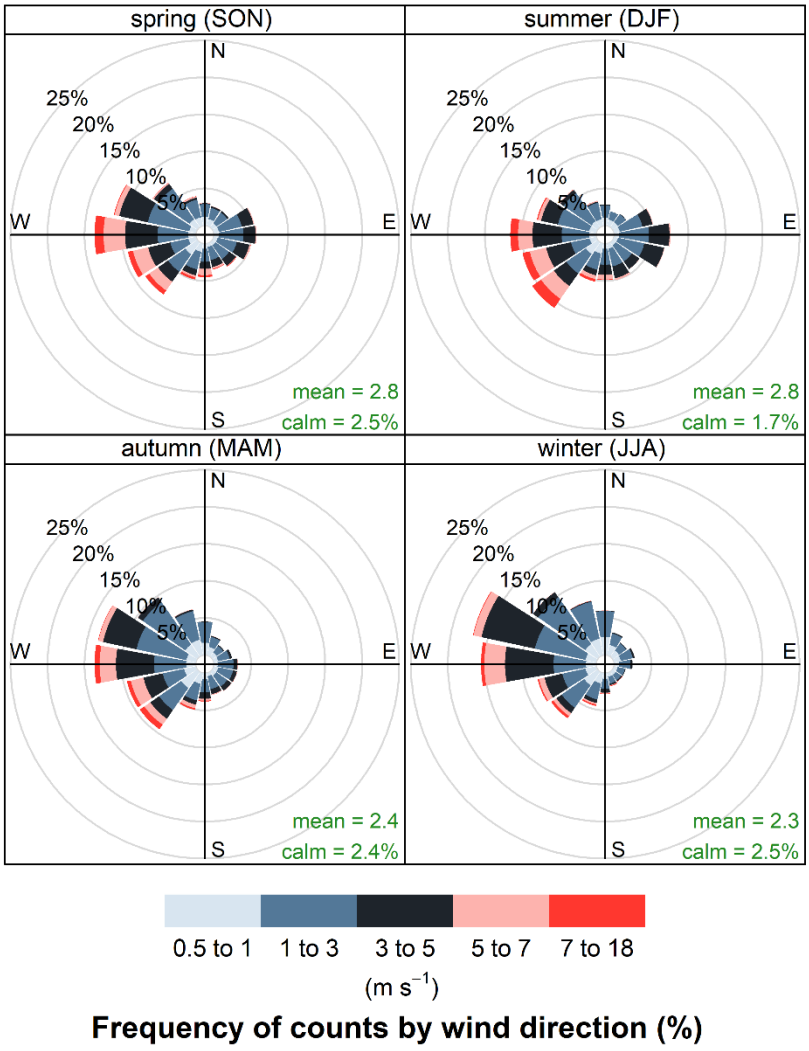

Figure 4-3: Seasonal wind rose.

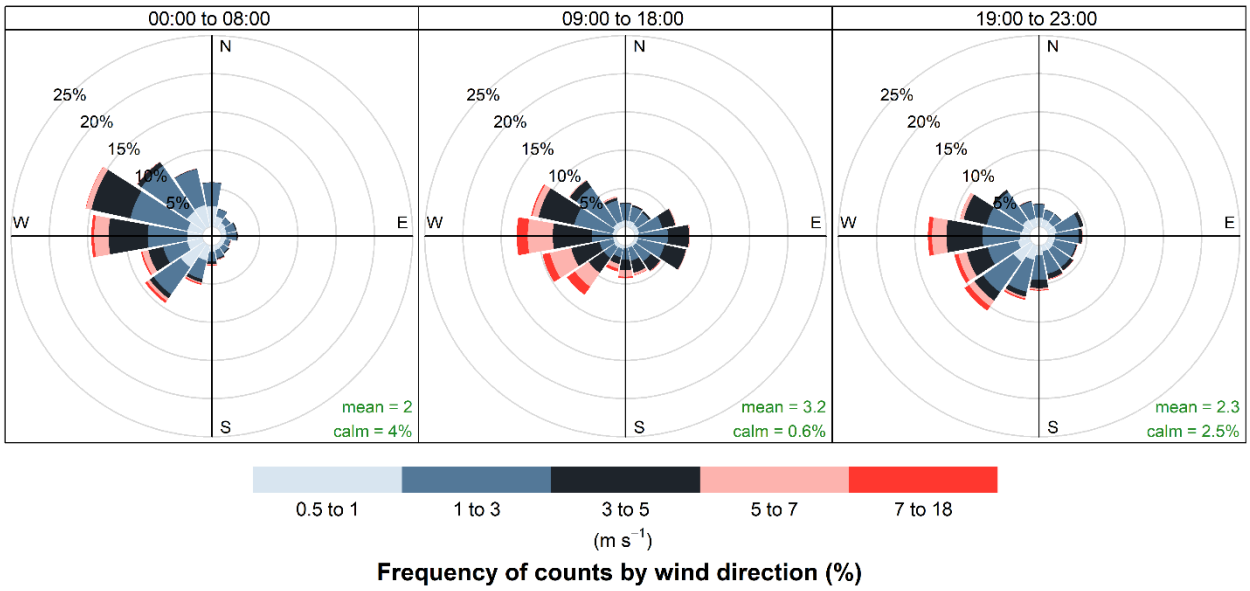

Figure 4-4: Wind rose for different times of day.

5 ASSESSMENT METHODOLOGY

5.1 ASSESSMENT TOOLS

The Ministry for the Environment 'Good Practice Guide for Assessing and Managing Odour in New Zealand' provides guidance on the management of odour emissions from an industrial facilities and methods for assessing the likelihood that these emissions are likely to be objectionable or offensive to an ordinary person (MfE, 2016). It also states that whether an odour has an offensive or objectionable effect requires "an overall judgement that considers the frequency, intensity, duration, offensiveness/character, and location of the odour event". These are referred to as the "FIDOL" factors. Table 5 of the MfE (2016) guide describes a range of assessment techniques that indirectly account for FIDOL factors. It assigns a different priority to each technique, depending on whether the activity under consideration is an existing operation, an expanding operation, or a new operation. The priorities assigned by MfE (2016) to different odour assessment tools for an existing operation are listed in Table A2.3 in Appendix 2 of MfE (2016). The tools include the use of information from following:

- Community consultation,
- Odour diaries and/or surveys, complaint records
- Industry/council experience
- Meteorology and terrain assessment, and
- Review of emission control systems/odour management plan.

The MfE (2016) assigns high to moderate priority to these tools, while a moderate to low priority to odour dispersion modelling assessment for an existing activity. To establish the odour effects from the site, the assessment has been undertaken in a manner consistent with these recommendations by MfE (2016). The information collected using the tools, with consideration of FIDOL factors has allowed for an assessment of the extent of adverse impact on exposed people and whether or not this is likely to lead to an objectionable and/or offensive odour effects to be determined.

WSP staff visited the site and reviewed all site activities to identify potentially odour generating activities and their locations on the site. Trained WSP odour assessors also made odour observations downwind of the site, undertook a community survey and review of complaint records to determine the existing level of effects from this site. The methods used for undertaking downwind odour assessment are presented in Section 5.2. The questionnaire used during community survey is provided in Appendix A. Complaint records (provided Otago Regional Council) were also reviewed for this assessment.

Currently practiced mitigation measures to reduce the potential for offsite odour effects were reviewed during the site visit and through a review of the recently prepared draft landfill management plan (WSP 2021) for the site. Experience at other sites of a similar nature, scale, and location, including consideration of appropriate separation distance were also used to consider any further required mitigation and what can be considered good practice odour management for landfills. Further details on review of separation distance are provided in Section 5.3.

5.2 ODOUR DOWNWIND OBSERVATIONS

The odour downwind assessment method employed by WSP was in accordance with the approach recommended by the MfE guide. This approach utilises aspects of Verband Deutscher Ingenieure (VDI) standards[2] for ambient odour assessment. Undertaking fields surveys of ambient odour is an accepted method used to generate information on ambient odour levels over time at locations surrounding the site.

The Verein Deutscher Ingenieure standard 3940 Part 2 (VDI 3940)[2] was utilised for recording odour intensity in the field (every 10 seconds) as per Table 5-1. This follows the intensity scale specified by Verein Deutscher Ingenieure standard 3882 Part 1 (VDI 3882)[3] and also as recommended by MfE (2016).

Table 5-1: Odour intensity scale.

Intensity Description	Intensity Scale
Extremely strong	6
Very strong	5
Strong	4
Distinct	3
Weak	2
Very weak	1
No odour	0

On 21 and 22 September 2022, WSP's trained odour assessors[4] undertook downwind odour assessment at nearby receptor locations while being downwind of the landfill site. The downwind odour assessment recorded the character and intensity (as per Table 5-1) of ambient odour observed at every 10 seconds around the site for a ten-minute period. Assessments were undertaken at eight locations (by two assessors) over a period of two days. Results are discussed in Section 6.5 of the report.

2 VDI "Measurement of odour impact by field inspections - Measurement of the impact frequency of recognisable odours Plume measurement." 3940 (Part 2), February 2006.

3 VDI "Olfactometry - Determination of Odour Intensity" 3882 (Part 1) October 1992.

4 A Kachhara and T Verhulst

5.3 SEPARATION DISTANCE GUIDELINES

There is no New Zealand National or Otago regional guidance on separation distance for landfills. While there are some regions in New Zealand with separation distance publications, in WSP's experience the Australian criteria provide an appropriate upper limit distance for determining the extent of potential offsite odour effects for large landfills with good practice management.

A review of separation distance guidance for landfills was based on the following three Australian guidelines:

Victoria Environment Protection Authority (Vic EPA): *Best practice environmental management - Siting, design, operation and rehabilitation of landfills. August 2015 (Vic EPA 2015)*:

The Vic EPA published separation distance is 500 m measured between the edge of the landfill to buildings or structures for municipal solid waste landfills (a Type 2 landfill defined by Vic EPA). This distance also applies to residential dwellings to avoid LFG migration and adverse odour and dust effects. Vic EPA also advises that lesser buffer distances may be applied subject to a risk assessment that considers design and operational measures. No guidance on the size of landfill considered is provided.

Southern Australia EPA (SA EPA): *Evaluation distances for effective air quality and noise management (2019 version), March 2019 (SA EPA 2019)*:

The SA EPA buffer distance is 500 m from the landfills for sensitive uses (subdivisions) and 150 m for single residences. This criterion takes into account the fact that the LFG can cause odour effects and dust can be an issue due to vehicle movements, dusty waste and soil stockpiles. No guidance on the size of landfill considered is provided.

Western Australia EPA (WA EPA): *Separation distances between industrial and sensitive land use, June 2005 (WA EPA 2005)*:

The WA EPA buffer distance is 500 m for putrescible landfill sites when considering sensitive subdivisions. Putrescible wastes contain waste stream likely to become putrid, including municipal wastes. No guidance on the size of landfill considered is provided.

The appropriateness of the above separation distances for landfills has been considered in this assessment, given that the adverse effects can be influenced by scale, and site-specific topography and meteorological conditions.

6 ASSESSMENT OF EFFECTS

6.1 REVIEW OF SEPARATION DISTANCE GUIDELINES

A review of Australian separation distance guidelines indicates when there are sensitive receptors within 500 m of a solid waste landfill, a detailed investigation to confirm the level of adverse odour effects in the surrounding environment is appropriate.

These guidelines are based on larger landfills. In WSP's experience and based on a review of published assessment of odour effects for several other landfills, it is considered that a distance of 500 m is more applicable for landfills with waste receivables greater than 30,000 tonnes therefore a separation distance of 500 m is likely to be conservative for the site, given its smaller scale (receiving 8,000 tonnes waste per year).

As mentioned in Section 4.1, there are around 78 residential dwellings within this distance from the Mt Cooee Landfill.

Figure 6-1 shows a map with a separation distance of 500 m and locations of downwind odour observation and community consultation that were carried out by WSP.

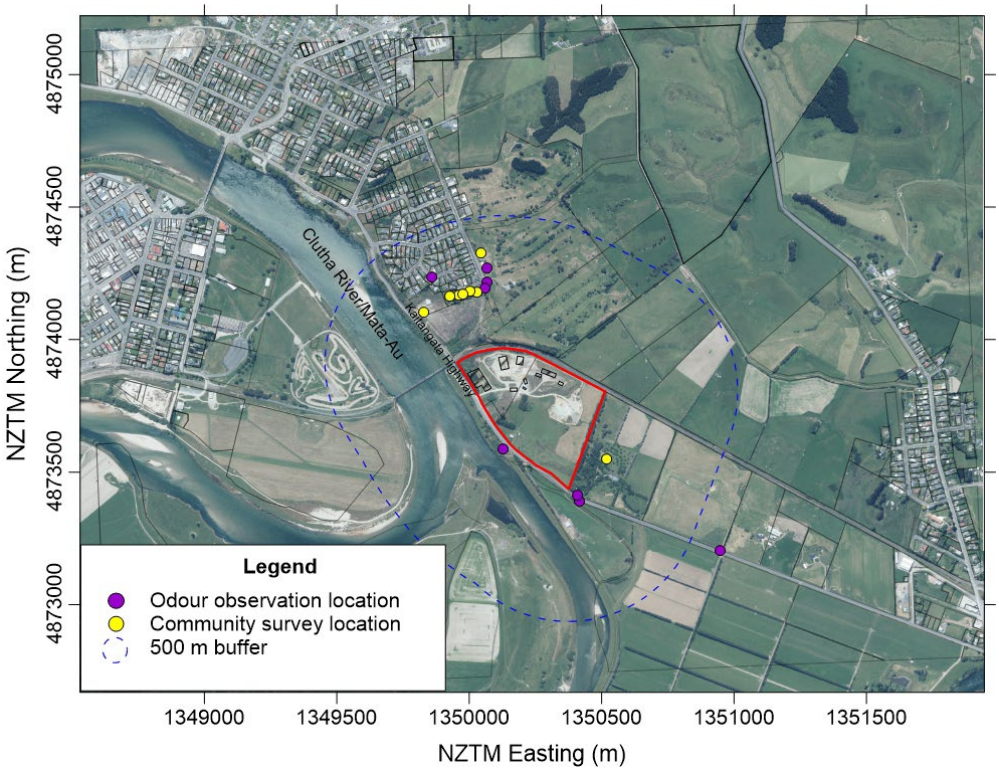

Figure 6-1: A separation distance of 500 m and locations of WSP's odour observation and community survey.

6.2 SITE OBSERVATIONS

WSP staff[4] visited the landfill on 21 and 22 September 2022. On 21 September, the weather was cool with cloudy skies and occasional showers. The winds ranged from light to moderate speeds mainly from the south to southeast direction.

During the site visit, WSP staff obtained information about day-to-day operation on the landfill as well as observed odour around different waste types on site. During a general walk around the site, the observed odour was of very weak to weak intensity around most areas on the landfill. The odour character was mainly putrid/rotten fruit/food waste like odour. Odour while standing close to the tip face was a distinct putrid waste type odour. There were no noticeable odours from the liquid waste disposal excavation pit, covered off animal carcasses that had been previously landfilled, the leachate pond or the pump station sump.

It was understood that the compactor on site had been broken down for more than two weeks and therefore, the general refuse on active face of the landfill had not been compacted for several weeks before the site visit. The compactor was due to be fixed in the afternoon of 21 September. Other than this, it was a normal operating day at the site. A kerbside collection truck had pulled in during the site visit and odour observation was made during the tipping of waste from the truck. While standing within 50 m of the tip face, the observed odour was of rotten fruit/vegetable like character with a distinct intensity. The odour intensity dropped to very weak to weak levels within 100 m from the tip face.

WSP staff re-visited the site in the morning of 22 September 2022 when the winds were calm and from the northwest. The broken compactor had been fixed and was operating on site at the time of the visit. A very weak intensity odour was observed at the tip face of the landfill while standing directly downwind at a 100 m distance. WSP staff walked around the tip face during compacting to observe odour. The odour was intermittent, and the observed intensity reduced very quickly with increasing distance from the tip face. No odour was noticeable within 150 m from the tip face.

6.3 LOCAL METEOROLOGICAL AND TERRAIN EFFECTS

Meteorological data obtained from Balclutha Telford EWS was examined in Section 4.2 and shows the predominant wind patterns and their distribution through the daytime and through different seasons. The assessment identifies prevailing westerlies and west-north westerlies which persist through the year. Wind speeds less than 0.5 m/s occur for approximately 2.3 % of the time and are expected to result in downslope drainage flows from the site to the south to south-southeast towards the coast. These low wind speed conditions minimise the dispersion of odour and thereby can result in elevated odour levels at locations downwind from the site even at distances beyond 250 m.

The winds are also expected to be of light to moderate wind speeds in the region thus readily dispersing the odour on most days.

The frequency of wind directions for which identified sensitive locations within 500 m and are downwind of the site is summarized in Table 6-1. The location of the current active face and liquid waste excavation pit is such that they provide a full range of distances between sensitive locations and all active areas on site. Therefore, the table also provides distances to the liquid waste excavation pit. In the future, it is also understood that the active face of the landfill will move towards the liquid excavation pit. Therefore, the distance to liquid excavation pit also provides an indication of how much the distance between the active face of landfill and nearby sensitive locations likely to change as the active face moves.

Table 6-1: Percentage of time in a year any identified sensitive receptor is downwind of the landfill.

Wind direction when sensitive locations downwind of the site	Minimum distance to key active landfill areas(m)	Percentage of time downwind of landfill (%)	
		All wind speeds	Wind speeds between 0.5 and 1 m/s
Northwest (on Kaitangata Highway)	500 (active face) 280 (liquid waste)	26	5
Southeast	250 (active face) 460 (liquid waste)	10	1
South to southwest (golf course)	50 (active face) 100 (liquid waste)	20	4

The nearest residential dwelling to the site boundary, located on Kaitangata Highway is 500 m to the southeast of the current active face of the landfill. As the active face moves towards east in the future, the distance could be as low as the current distance of 280 m between the dwelling and the liquid waste excavation pit. It is downwind of the site during predominant westerly and north-westerly winds. This dwelling is likely to be the most sensitive to the potential odour effects due to the landfill operation. In light wind (less than 1 m/s) and thereby poor dispersive conditions, the dwelling could be downwind of the site for around 5% of the year. This dwelling is likely to miss being impacted by site odours during drainage flows as it is to the southeast of the existing active face. Based on this if odours are not well controlled, offsite odour maybe observed at this location.

Residences to the northwest of the site (shown in Figure 4-1) are expected to be downwind of the site in light south-easterly wind conditions for up to 1 % of the year (10 % overall). These residential dwellings are at a higher elevation than the active face on the landfill. Therefore, there is a low likelihood of odour effects at these locations, provided odours on site are well controlled. Odour effects may occur at these locations during continuous streams of light to moderate winds blowing from the site towards these receptors.

The golf course is likely to be downwind of the site during light south to south-westerly wind conditions for 4 % of the year. The golf course also operates only during the day, whereas the light wind conditions are more likely to occur during night-time or early mornings. Therefore, the visitors of the golf course are not expected to be downwind of the site very frequently. Similar to the residential dwellings, the golf course is also at a higher elevation than the landfill. Based on this, if odours are well controlled, there is very low likelihood of odours at the golf course.

6.4 COMPLAINT RECORDS AND COMMUNITY FEEDBACK

Based on the information provided by Otago Regional Council, WSP understands that there have been no odour or dust complaints associated with the landfill in the recent five years (2017 to 2022).

WSP staff surveyed the nearest residents during their site visit on 21 and 22 September to assist in understanding whether odour or dust from the landfill was noticeable or of concern for these neighbouring locations. The locations of these dwellings are shown on Figure 6-1. A standard questionnaire that closely follows the MfE (2016) recommendations was used (provided in Appendix A) covering dust and odour related questions to survey their experiences.

In general, the community feedback was positive about the landfill operation and reported no odour or dust concerns. The primary feedback raised by the Golf course and some of the neighbours on Golfers Drive and Arthur Terrace was that rubbish (paper, plastic) had blown into their backyards. However, on such occasions, the community reported that the landfill operators responded to the issue and picked up any rubbish blowing over these properties promptly.

As discussed earlier, the compactor on site had not been operating for more than two weeks prior to site visit. During the community survey, it was found that the community was generally aware of the maintenance issue on site and had not observed any unusual odours or dust effects from the site during this period.

Based on the review of complaints records and community consultation, the existing level of odour and dust effect is very low.

6.5 DOWNWIND ODOUR OBSERVATIONS

WSP odour specialists[4] undertook downwind odour observations during the site visit on 21 and 22 September. In total, 16 odour surveys (eight by each specialist) were undertaken at eight locations that were identified to be downwind of the site. These locations are shown in Figure 6-1.

In the afternoon of 21 September, during light to moderate south to southeasterly winds with cloudy skies and occasional showers, WSP staff completed VDIs at four different locations. During one of the VDIs, a very weak intensity rotten fruit like odour was observed at 36 Golfers Drive, which is also the closest residence to the active face of the landfill in this direction at around 250 m distance. This odour was also observed fleetingly (a few seconds) in the general vicinity of Golfers Drive and Arthur Terrace. During the other VDIs, no odour was noticeable from the site by either of the assessors.

It was identified that the odour was being discharged by the movement of accumulated waste by the compactor on site that was operational for the first time in more than two weeks due to equipment issues. This is an unusual occurrence, as the compactor typically operates several times during a day to avoid waste accumulation and to keep the area of active face to a minimum.

In the morning of 22 September, during calm conditions, cold and foggy weather, drainage flow conditions were occurring, and air flow was from the north-northwest towards the Clutha River/ Mata-Au. As discussed in Section 4, these are expected to be worst-case dispersion conditions that lead to the potential for high odour concentrations downwind of a source.

WSP scouted for odour on several locations around Kaitangata Highway that was downwind of the landfill in these wind conditions. Odour observations using VDI approach were undertaken at four locations (shown in Figure 4-1) starting at the farthest distance of around 900 m from the active face of the landfill and coming towards the landfill to up to a distance of 250 m from the active face of the landfill. Two VDIs were undertaken at the nearest residential dwelling located at 125 Kaitangata Highway. A very weak rotten fruit like odour was observed for less than 5 seconds during one of the VDIs undertaken at this location. No odour was observed for any other VDIs or during odour scouting on this morning.

In summary the odour observations downwind of the site indicate there is a low frequency of observing very weak to weak intensity odours downwind of the landfill. The character of the odours observed was associated with those observed at the active face of the landfill.

6.6 REVIEW OF CURRENT MITIGATION, MONITORING AND MANAGEMENT PLAN

6.6.1 MANAGEMENT PRACTICES

Management of the active face and other waste disposal areas, capping of the filled material and leachate management are the primary odour mitigation methods. Key procedures for these are as follows:

Based on the draft landfill management plan (WSP 2021), the refuse is spread to achieve around 0.5 m of thickness and compacted several times a day. At the end of the day, it is covered with a layer of topsoil or clay. As the active face is a potential odour source area, keeping the open fill area to a minimum and covered daily is key to preventing occurrences of offsite odour effects.

Another potential odorous waste type and area on landfill is the liquid waste disposal area. Based on observations, the site excavates around 2 m deep pits for liquid waste (classified under special waste) in old landfill areas. Excavation of pits in areas where there can be odorous waste is avoided. According to WSP (2021), after each disposal of liquid waste, the waste is covered with old refuse or topsoil/clay material. The frequent covering of these pits after each disposal is a key mitigation measure to minimise odour emissions and it is recommended that this is continued.

Special and hazardous waste make up 1 % of the total landfill refuse. Special waste, including odorous waste is also only accepted by prior arrangement. This allow the site to ensure that the material can be covered immediately with sufficient cover or refuse.

When the active cell is completely filled, the process followed for capping the landfill includes using 200 mm of final cover over refuse, followed by 500 mm of compacted silt and 150 to 200 mm of topsoil. WSP (2021) recommends that capping of a finished cell is undertaken within 6 months of final refuse placement. The land is then used for receipt of other waste types (such as green waste) or covered with vegetation. The capping of landfill cells is designed so that, once the landfill is closed, the land could be repurposed for grazing. Based on site observations and LFG monitoring, this covering process appears to be effective at minimising offsite odour and it is recommended that a similar level of covering is maintained.

Any leachate collected from the active fill area, liquid waste excavation pit and other areas on site is pumped off site routinely for further treatment at the Balclutha's sewage treatment plant. The pump station operation, volumes and level of leachate in the ponds are inspected every day. After a period of heavy rain, the leachate levels are checked and pumped out of site as necessary to avoid accumulation on site.

6.6.2 LANDFILL GAS MONITORING

As part of the existing consent, landfill gas monitoring is undertaken on site on a quarterly basis inside the manholes at the active face of the landfill and the pump station sump. The monitoring includes detection of methane and H_2S concentrations. Although the other reduced sulphide compounds of the LFG are likely to be more odorous, H_2S is most practical to measure routinely and provides a good indication of the state of the LFG on site and thereby its potential to result in offsite odours. The latest quarterly monitoring report (WSP 2022) was reviewed for methane and H_2S results. Methane results were compared against Table 6.4 of Vic EPA that provide a

concentration threshold that could be used as a trigger for further mitigation. The applicable limit for the measurement technique at Mt Cooee would be 10,000 ppm[5].

The results show very low concentrations of both methane (50 to 80 ppm) and H_2S (0 to 1 ppm) at both these locations compared to the Vic EPA threshold guideline values. As mentioned before, these measurements are undertaken within a manhole, below ground level to assess the LFG at source. Given the low concentrations at source, it is expected that the LFG concentrations in ambient air will be negligible provided good mitigation measures are routinely practiced.

6.6.3 OTHER MONITORING METHODS

The site has several monitoring methods in place to proactively manage any potential for odour discharge from the site. These include:

- Daily site inspections, including inspections of active fill area (extent and size of the active face), leachate drains, ponds, special waste areas and general inspection
- Daily check for odour at the Kaitangata Road gate and at the kiosk
- If odour is noticeable at any locations around site, scout around the fill itself to see if there is any obvious source/cause
- Use the weather forecasts and known wind flows to time any potentially odour releasing operations.
- Preparedness to apply additional cover on the active fill area in the form of stockpile on the tip face.
- Maintain surface drainage away from the active tip face.
- Do not allow leachate to pool on the fill surface. If necessary, excavate pits to break through any sealing layers that are preventing drainage.

WSP recommends that these monitoring methods are maintained to minimise odour discharge from the site.

6.7 SUMMARY OF ASSESSMENT OF EFFECTS

All waste types and areas on the Mt Cooee landfill were assessed for the potential to discharge odour and result in adverse odour effects in the receiving environment around the site. The assessment was based on a review of site activities and management/monitoring practices, receiving environment, meteorology and terrain effects, industry experience, field odour observations, review of community feedback.

Based on the site visit and WSP's experience the key potential odour sources identified on site include the active fill area of the landfill, the liquid disposal area, and the leachate collection system (including the leachate pond). Based on the throughput and landfill gas monitoring results, landfill gas is expected to result in negligible offsite odour effects.

Based on a review of the receiving environment and local terrain, the sensitive locations are at least 250 m from the potential odour sources and not downwind frequently or in drainage flow conditions.

[5] Measurement at subsurface levels on and adjacent to the landfill site.

WSP has evaluated community feedback including complaint records and direct surveying of nearest neighbours. There have been no odour or dust complaints in the last five years and all respondents to community survey did not report any odour or dust effects. This feedback in combination with WSP's own offsite observations of odour indicates that there are currently less than minor odour effect at all offsite locations.

Therefore, given the application is for continued operation of the landfill no differently than it is currently operated, then it is concluded that there is only a less than minor potential for adverse odour effects at all offsite location for the future operation of the landfill provided the mitigation measures described in section 6.6 are implemented.

7 CONCLUSION

CDC operate Mt Cooee landfill in the outskirts of Balclutha. Discharges to air from the landfill are currently authorised by consent that is due to expire in October 2023 and CDC wish to apply for a consent to continue operation of the current landfill. WSP has undertaken a technical assessment of air quality effects from the landfill to support the resource consent application.

The main discharges to air from the landfill are odour and to a much lesser extent dust. To assess the effects from the landfill operation, WSP undertook an air quality assessment in line with recommendation in MfE (2016). This assessment included review of community feedback, current and proposed mitigation as well as WSP's own observations of operational practices and offsite odour.

Subject to site management being maintained, particularly with regard to the daily covering of both solid and liquid waste, and the good practice monitoring being continued, the operation of the Mt Cooee Landfill is expected to have less than minor potential for causing adverse odour effects at all offsite locations. Dust effects are expected to be negligible.

8 REFERENCES

WSP (2022). Mount Cooee Draft Landfill Management Plan. WSP Report Number: 2-34090.03. Prepared for Clutha District Council, August 2022.

WSP (2022). Mt Cooee Landfill April 2022 Quarterly Environmental Monitoring Report. Prepared for WasteCo (NZ) Limited, WSP Report Number:6-XZ714.00-ENV-REP-002-Rev2

MfE (2016). Good Practice Guide for Assessing and Managing Odour in New Zealand. Publication number: ME1278. Ministry for the Environment. November 2016.

SA EPA (2019). Evaluation distances for effective air quality and noise management (2019 version). Issued in August 2016. Updated in March 2019.

Vic EPA (2015). Best practice environmental management - Siting, design, operation and rehabilitation of landfills. Publication 788.3*. August 2015.

WA EPA (2005). Separation distances between industrial and sensitive land use. June 2005.

APPENDIX A

QUESTIONAIRRE FOR COMMUNITY CONSULTATION

QUESTIONNAIRE FOR ENVIRONMENTAL SURVEY

Mt Cooee Landfill (the landfill) wishes to establish the extent, to which you may notice odour, dust or noise from their processing site particularly during the last twelve months. We would be very grateful if you could assist us by filling out this questionnaire and sending back to WSP (NZ) Limited (our consultant)

1. How often do you notice any odour, dust or noise from the landfill in or around your home?

	Daily	Weekly	Monthly	Several times per year	Once or twice a year	Never
Odour						
Dust						
Noise						

2. How long do dust, odour or noise events typically last for and vary with time when it occurs.

	<15 min	15-45 min	~1 hour	2 – 3 hours	Half a day	Other
Odour						
Dust						
Noise						

3. For a typical odour, dust, or noise event, how did the presence of it vary with time?

	Present continuously	Present for most of the time	Present less than 50% of the time	Infrequent
Odour				
Dust				
Noise				

4. For a typical odour, dust, or noise events, what times of day do they typically occur?

	Early Morning	Mid-morning	Midday	Early afternoon	Late afternoon	Early evening	Late evening	At night
Odour								
Dust								
Noise								

5. On those days you that notice odour, dust or noise, are there typical atmospheric conditions that were present?

	Cold and calm	Clear sky and sunny	Warm and light winds	Overcast and still	Light cloud with breeze	Windy	Other
Odour							
Dust							
Noise							

6. During an odour event, what is the typical strength when odour is present?

	Very weak	Weak	Distinct	Strong	Very Strong	Extremely Strong
Odour						
Dust						
Noise						

7. Out of all the environmental effects that you experience at your house, can you rank (1 = most frequently noticed) to 5 (least noticed odour) out of the following sources?

	Landfill areas	Refuse Trucks/Rubbish Collection Trucks	Other sources
Odour			
Dust			
Noise			

8. Can you describe the odour most commonly experienced during the typical odour events?

_____

_____

_____

9. Can you describe the dust most commonly experienced during the typical odour events?

_____

_____

_____

10. Can you describe the noise most commonly experienced during the typical odour events?

_____

_____

_____

Please note that these final few questions provide assist us in determining how often you are at home and your location relative to the landfill. However, we fully respect your right to not provide answers to these should that be your decision.

11. How long have you lived in the area for?_____

12. How often are you home during daytime hours?

_____

13. Address: _____

14. Any Other Comments?