

Appendix 16: Acoustic Assessment Report



Dunedin City Council

Waste Futures - Smooth Hill Landfill Assessment of Acoustic Effects



August 2020

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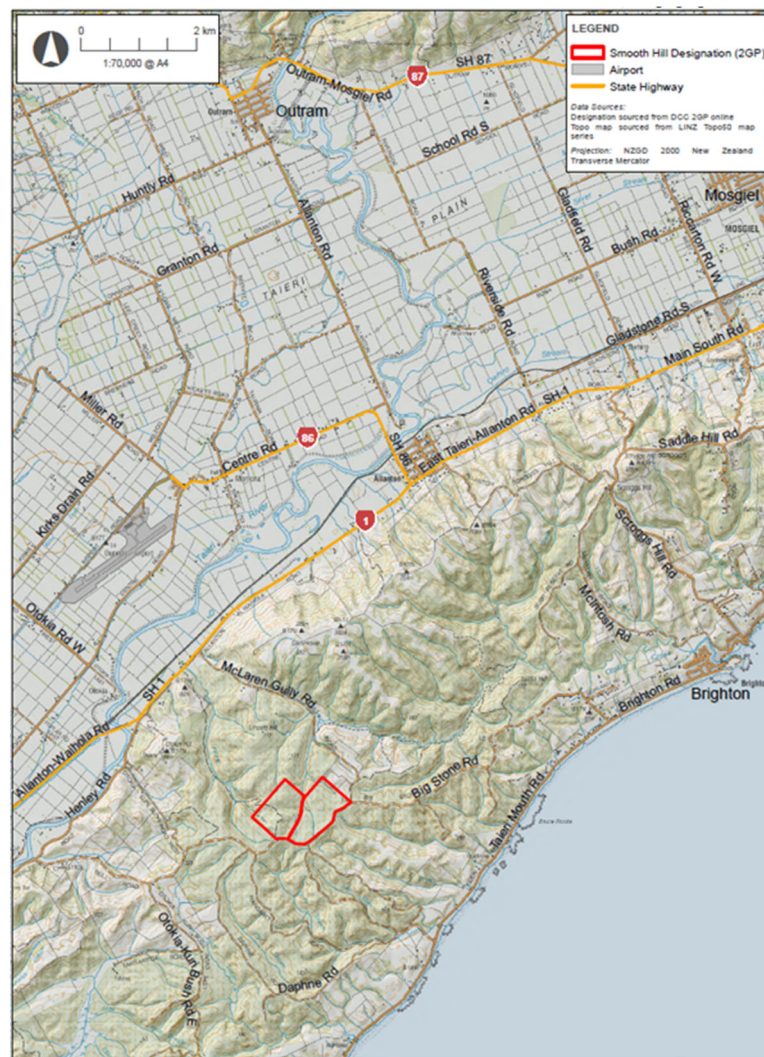
1. Introduction

1.1 The project

The Dunedin City Council (Council) collects residential waste and manages the disposal of both residential and the majority of commercial waste for the Dunedin City area and environs. The Council has embarked on the Waste Futures Project to develop an improved comprehensive waste management and diverted material system for Dunedin, including future kerbside collection and waste disposal options. As part of the project, the Council has confirmed the need to develop a new landfill to replace the Council's current Green Island Landfill which is likely to come to the end of its functional life somewhere between 2023 and 2028.

The Council commenced a search for a new landfill location in the late 1980's and early 1990 and selected the Smooth Hill site in south west Dunedin, as the preferred option. At that time the site was designated in the Dunedin District Plan, signalling and enabling its future use as a landfill site. The Council also secured an agreement with the current landowner, Fulton Hogan Ltd, to purchase the land. The location and boundary of the site are shown in Figure 1 and 2.

Figure 1 – Site location and boundary



Over the following period the Council extended the life of Green Island Landfill and further development of the Smooth Hill site has been on hold.

As part of the Waste Future's Project, the Council has reconfirmed the technical suitability of Smooth Hill for the disposal of waste, and developed a concept design for the landfill and associated road upgrades. The concept design for the landfill has been developed by GHD with technical input from Boffa Miskell, and represents contemporary good practice landfill design that meets adopted New Zealand landfill design standards.

The Council is now applying for the remaining RMA authorisations required to enable the construction, operation, and aftercare of the landfill, and construction of the associated roading upgrades. The proposal includes the following key components:

- The staged construction, operation, and closure of a class 1 landfill within the existing designated site to accept municipal solid waste. The landfill will have a capacity of approximately 6 million cubic metres (equivalent of 5 million tonnes), and expected life at current Dunedin disposal rates of approximately 55 years. The landfill will receive waste only from commercial waste companies or bulk loads.
- Infrastructure to safely contain, collect, manage, and dispose of leachate, landfill gas, groundwater, and stormwater so as to avoid consequential adverse effects on the receiving environment.
- Facilities supporting the operation of the landfill, including staff and maintenance facilities.
- Environmental monitoring systems
- Landscape and ecological mitigation including planting.
- Upgrades to McLaren Gully Road (including its intersection with State Highway 1), and Big Stone Road, to facilitate vehicle access to the site (see Drawings 51-12506381-01-C101 to C112).

1.2 Purpose of this report

GHD has been engaged by DCC to assess the potential noise effects of the construction and operation of the landfill and access roads upon nearby noise sensitive receivers and advice how best to manage effects if required. The purpose of this report is to:

- Assess that the activities on site can comply with the designation noise condition
- Assess the effects of the construction works along McLaren Gully Road and Big Stone Road for upgrading access to the site.

1.3 Assumptions

This assessment and the details provided in this report have been developed with reference to the following drawings and reports produced for the project:

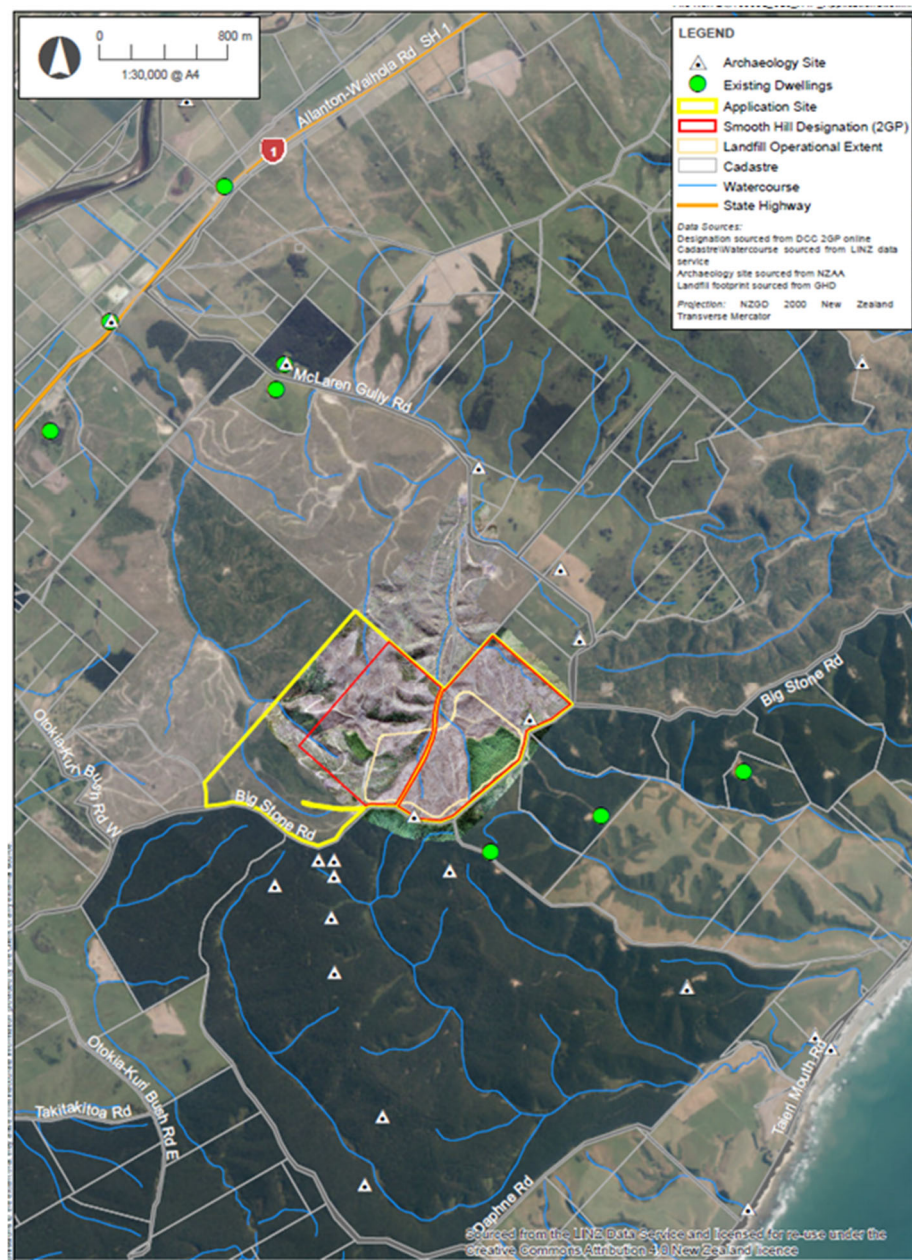
- Smooth Hill Design Report (GHD 2020)
- Integrated Transport Assessment (GHD 2020)
- GHD Drawings (GHD 2020)

2. Site description

2.1 Site location

The Smooth Hill Landfill site is located approximately 23 km south-west of Dunedin City. SH 1 runs from north to west of the subject site some 3 km away at it nearest point, with Dunedin International Airport a further 2 km (i.e. 4.5 km total) to the north-west. The coastline passes from east to south of the subject site some 2.7 km away at it nearest point. Figure 2 shows the proposed layout of the site, location and surrounds.

Figure 2 - Site Layout



3. Criteria

The subject site is located on land zoned as “coastal rural” under Dunedin City Council’s (DCC) 2nd Generation District Plan – Appeals Version Variation 1 (2GP-AP-1). All land in the proximate vicinity of the site is also zoned ‘coastal rural’.

Rural land zones are allocated within the plan to provide for primary production activities such as pastoral farming, forestry, mining and resource-based activities and also to protect ecosystem services such as water resources and indigenous habitat. Policy 16.2.1.5 sets out that residential activity in rural zones is typically required at a density no greater than that needed to support these activities.

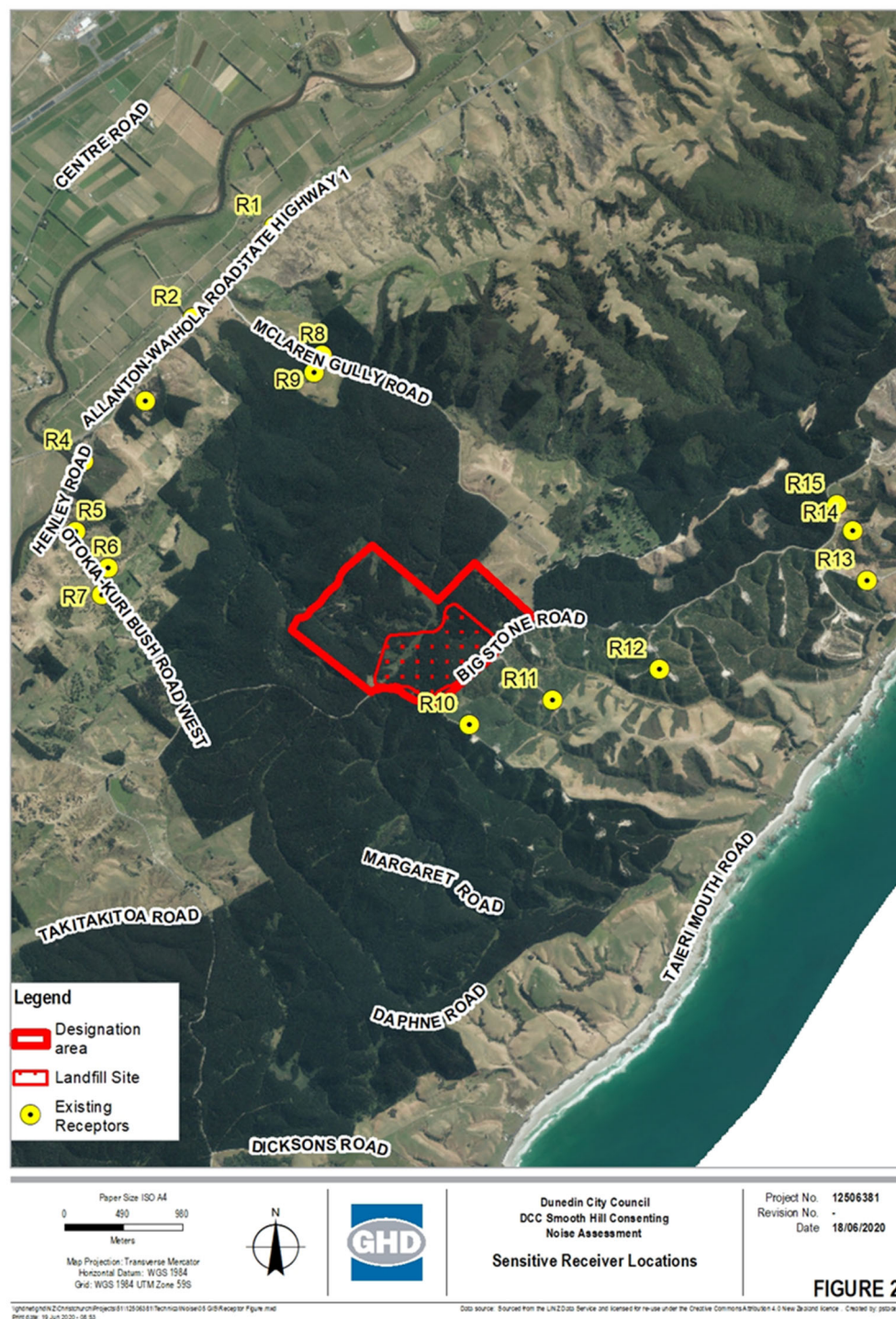
3.1 Designation area - operational and construction noise

The land upon which the proposed landfill facility will be located was designated for this purpose in 1996 under Decision DP27.2/38/1 – D659 (Proposed Smooth Hill Landfill). Operational noise is required to comply with Condition 3 of the designation. The designation has been incorporated within DCC’s 2GP-AP-1. Condition 3 of the designation is as follows:

Noise generated by any activity on the site shall comply with the following standards within 50 metres of the nearest house existing at the date on which this designation becomes operative – 55Dt/40Nt dBA. (NB These levels are subject to an adjustment of minus 5 dBA for noise emissions having special audible characteristics.)

The nomenclature under the condition does not define the metric for the noise levels shown. GHD Acoustics considers it reasonable to adopt and therefore be consistent with the nomenclature under Rule 9.3.6 Noise from DCC’s 2GP-AP-1 i.e. $L_{Aeq(15min)}$.

Figure 3 - Site Layout and Sensitive Receptors



3.2 Public roads - operational noise

Operational noise from vehicles travelling to and from the landfill site is required to comply with Rule 9.3.6 of DCC's 2GP-AP-1 for all existing and potential receivers. However, part 7 of the rule exempts vehicles operating on public roads. The pertinent parts of the rule are reproduced below for reference:

Rule 9.3.6 Noise

Land use activities, public amenity activities, network utility activities, and temporary activities must not exceed the following noise emission limits:

Zoning of receiving property		Noise level measured at the boundary of the receiving property or the notional boundary of noise sensitive activities in a rural, rural residential or Ashburn Clinic zone		
		a. 7.00 am to 7.00 pm	b. 7.00 pm to 10.00pm	c. 10.00 pm to 7.00 am
2.	Rural, rural residential, centres and Ashburn Clinic zones (at notional boundary of noise sensitive activities); except in those parts of rural zones that are within 350 m of the Industrial Zone	L _{Aeq} (15 min) 55 dB	L _{Aeq} (15 min) 50 dB	L _{Aeq} (15 min) 40 dB and L _{AFmax} 70 dB

7. Except, the following activities are exempt from this standard:
 - h. vehicles operating on public roads or trains on rail lines (including at railway yards, railway sidings or stations and level crossing warning devices);
8. For the purpose of this standard, noise levels will be measured at the boundary of the receiving property, or the notional boundary of a noise sensitive activity in a rural, rural residential or Ashburn Clinic zone. If it is not possible to measure noise levels at the boundary, noise levels will be measured at the closest practical point within the boundary. Unless stated otherwise noise must be measured in accordance with NZS 6801:2008 - Acoustics - Measurement of environmental sound, and assessed in accordance with NZS 6802:2008 Acoustics - Environmental noise.

3.3 Public roads - construction noise

Section 4.5.4 Noise under DCC's 2GP-AP-1 sets out the noise limits at receivers to be complied with from construction activity within the road corridor. The pertinent parts of the rule are set out below for reference.

Rule 4.5.4.1 Construction

- a. Construction must not exceed the following limits and will be measured and assessed in accordance with NZS6803:1999 Acoustics Construction Noise:
 - i. Construction noise received in residential zones and dwellings in rural and rural residential zones, and buildings housing any noise sensitive activities in any other zone

Time of week	Time period	Duration of work					
		1. Typical duration dBA		2. Short-term duration, dBA		3. Long-term duration, dBA	
		L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}
Weekdays	0630 – 0730	60	75	65	75	55	75
	0730 – 1800	75	90	80	95	70	85
	1800- 2000	70	85	75	90	65	80
	2000 - 0630	45	75	45	75	45	75
Saturdays	0730 – 1800	75	90	80	95	70	85
	1800- 0730	45	75	45	75	45	75
Sundays and public holidays	0730 – 1800	55	85	55	85	55	85
	1800- 0730	45	75	45	75	45	75

- c. Activities that contravene this performance standard by less than 5 dB L_{Aeq(15 min)} are discretionary activities.
- d. Activities that contravene this performance standard by 5 dB L_{Aeq(15 min)} or more are non-complying activities.
- e. For the purposes of Rule 4.5.4.1 "short-term duration" means construction work at any one location for up to 14 calendar days per project; "typical duration" means construction work at any one location for more than 14 calendar days but less than 20 weeks per project; and "long-term duration" means construction work at any one location with a duration exceeding 20 weeks per project.

4. Assessment of effects

4.1 Public roads - construction noise

Construction works are required to upgrade existing public roads for access to the landfill. The following roadworks are proposed:

- a) widening of the approaches to and from the junction of SH1 and McLaren Gully Road
- b) widening and sealing of the McLaren Gully Road carriageway and Big Stone Road

The works will progress along the road alignments such that it is possible that no one receiver will be subject to noise for more than 14 calendar days. However, depending upon the construction programme potentially a receiver could be subject to noise in excess of 14 calendar days, but no more than 20 weeks. As such, this assessment assumes the noise limits under Rule 4.5.4.1 for a 'typical duration' e.g. $L_{Aeq(15min)}$ 75 dB and L_{Amax} 90 dB between Monday to Saturday 0730 and 1800 hours.

4.1.1 Equipment

Works are expected to include the use of the following equipment:

Table 1 Equipment sound pressure levels (SPL) for roadworks

Equipment	SPL at 10 metres L_{Aeq} dB	Reference*
Excavator	80	Table C.5 Ref 18
Road planer	82	Table C.5 Ref 7
Articulated dumptruck	81 [✕]	Table C.5 Ref 17
Bulldozer	83 [✕]	Table C.5 Ref 15
Dozer	81	Table C.8 Ref 17
Vibratory roller	81 [✕]	Table C.5 Ref 22
Vibratory roller	77	Table C.5 Ref 26
Grader	86 [✕]	Table C.6 Ref 31
Asphalt paver + tipper lorry	75	Table C.5 Ref 30

✕ Drive-by maximum sound pressure level in L_{Amax}

* BS 5228-1:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites – Part 1: Noise

4.1.2 Noise receivers

NZS 6803:1999 applies to receivers existing at the time of construction. As such, the nearest receivers to the road works are anticipated to be R8 and R9 on opposite sides of McLaren Gully Road (**Error! Reference source not found.**). The distance between the edge of the existing carriageway for both R8 and R9 is approximately 65 metres. This assessment assumes that both of the properties are occupied. Should neither of the properties be occupied then it stands to reason that no assessment of the effects need be considered further.

4.1.3 Assessment

The noisiest combination of equipment that could potentially operate simultaneously is an excavator (L_{Aeq} 80 dB at 10 metres) and a dozer (L_{Aeq} 81 dB at 10 metres). It is unclear at the time of writing exactly how much closer to the houses the road carriageway will extend or the separation distances between construction works and houses. However, as long as a minimum separation distance of 40 metres is maintained between the construction equipment and the

houses then compliance with $L_{Aeq(15min)}$ 75 dB and L_{Amax} 90 dB will be achieved. Maintaining a separation distance of 40 metres is practicable to observe and would allow for a nominal works area of 25 metres width on any one side of the existing road alignment. This assessment includes a correction for façade reflection as required under NZS 6803:1999.

‘Construction’ is defined under DCC’s 2GP-AP-1 as:

The use of plant, tools, gear or materials as part of the erection, installation, repair, maintenance, alteration, dismantling or demolition of any building or structure; or site development. This definition includes all work from site preparation to site restoration. This definition does not include any resultant buildings, structures or site development activities (including demolition or removal for relocation), which are separately defined under development activities or city-wide activities. Construction is an activity in the temporary activities category.

GHD Acoustics defines ‘noisy’ construction works as those using the equipment identified under Table 1 and recommends that noisy roadworks are limited to between 0730 and 1800 hours Monday to Saturday. Notwithstanding, should works need to encroach upon the 40 metre buffer zone or should the hours of noisy works need to extend beyond those recommended this must be reviewed by a suitably qualified and experienced acoustician to advise on how this could be achieved whilst still maintaining compliance with Rule 4.5.4.1 of DCC’s 2GP-AP-1. For example, under these circumstances a construction noise management plan may be required to ensure that the Best Practicable Option(s) are employed to minimise noise levels and mitigate effects.

4.2 Public roads - operational noise

Rule 9.3.6.7.a of DCC’s 2GP-AP-1 states that vehicles operating on public roads are exempt from the noise limits specified under the rule. As such, road traffic noise from vehicles associated with the landfill site has not been assessed on SH1, McLaren Gully Road and Big Stone Road.

4.3 Landfill activity

Condition 3 stipulates that noise generated by ‘any activity’ on the site shall comply with the limits detailed. The condition does not distinguish between noise associated with establishment of the infrastructure to enable operation of the landfill, and the noise from the day-to-day operation of the landfill.

4.3.1 Noise receivers

The noise limits under Condition 3 need only to be met at houses existing at the date upon which the designation became operative under DCC’s 2GP-AP-1 i.e. December 2019. Should any residential dwellings be constructed after this date they do not require assessment. As such, there is no requirement under Condition 3 to consider ‘potential’ receivers that may be established in the future.

The closest receivers are R10 and R11. R12 is significantly further away with receivers R6 to R9 in excess of 2 km away from the nearest part of the landfill.

4.3.2 Operational noise - sound sources

The equipment anticipated to be used onsite (based on similar projects GHD has been involved with) during the operation of the landfill is shown in **Error! Reference source not found.** along with the corresponding sound pressure levels referenced from BS 5228-1:2009+A1:2014.

Ultimately the contractor may use different equipment, however similar noise emissions are anticipated. It is noted that additional equipment may be installed on site in the future including LFG power generation plant which may have additional operational noise issues. However, such equipment is not part of this application and will be addressed when required through a separate future process.

Table 2 Equipment sound pressure levels (SPL) for operational activity

Equipment	SPL at 10 metres L _{Aeq} dB	Reference
Excavator	69	Table C.8 Ref 10
Dozer	75	Table C.8 Ref 8
Waste compactor	80	Table C.8 Ref 1
Water pump	71	Table C.8 Ref 22
Refuse wagon	78 [✱]	Table C.8 Ref 18

✱ Drive-by maximum sound pressure level in L_{Amax}

Cross referencing of equipment sound levels between the tables within this report may appear to show discrepancies between the sound levels for the same type of equipment. However, the noise levels provided are specific to the activity being undertaken and the corresponding size and power of the equipment necessary to undertake that activity. No inconsistency therefore exists.

4.3.3 Operational noise - assessment

The proposed operational hours of the landfill site are between 7.00am to 7.00pm Monday to Sunday. Condition 3 does not provide the timeframes denoted by “Dt” (i.e. Daytime) and “Nt” (i.e. Night-time). However, it is reasonable to assume the same timeframe of 7am to 7pm detailed under Rule 9.3.6.2, which in turn is consistent with Condition 3 in specifying a limit of 55 dBA.

In practice, the equipment listed in **Error! Reference source not found.** will be spread across the landfill site. However, if we assume an excavator, bulldozer and waste compactor are all operating in close proximity to each other the cumulative noise level complies with the daytime noise limit of L_{Aeq} 55 dB at approximately 215 metres from the equipment. Condition 3 requires the noise limit to be complied with at a point 50 metres from the nearest house. The shortest distance between the location of potential operational activity on the landfill and the façade of the closest receiver (R10) is approximately 400 metres, minus 50 metres, equals 350 metres¹.

These calculations are considered conservative as they do not allow for any barrier attenuation from the intervening topography (which will significantly reduce noise levels for the vast majority of the landfills lifetime), ground absorption including foliage between source and receiver or atmospheric attenuation. GHD does not consider that the predicted levels are subject to a special audible characteristic penalty.

The levels of noise resulting from refuse wagon movements on the landfill site will be so low they will be of no material consequence, either on their own or cumulatively, to the noise received by any receivers identified on **Error! Reference source not found.**

¹ Note the Odour Assessment and Acoustic Assessment use different locations for compliance/assessment on properties. Therefore, the distances quoted in both reports for the same receptors are different.

4.3.4 Construction noise - sound sources

Works are expected to include the use of the following equipment:

Table 3 Construction equipment sound pressure levels (SPL) for landfill

Equipment	SPL at 10 metres L _{Aeq} dB	Reference*
Chainsaw	86	GHD In-house database ²
Excavator	78	Table C.8 Ref 11
Dozer	81	Table C.8 Ref 17
Vegetation chipper	88	GHD In-house database ³
Motor Scraper	87	GHD In-house database ⁴

* BS 5228-1:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, except where otherwise noted

4.3.5 Construction noise - assessment

Construction works are required to establish access roads, leachate systems, sediment ponds, landfill cells, etc. in order to enable the operation of the landfill. The initial construction phase is anticipated to last for 6 months per year over two construction seasons with subsequent construction phases reoccurring every 2 to 5 years depending on demand with an estimated duration of 4 months.

Much of the land has already been cleared of trees. However, clearance of the recently planted trees will be required prior to construction. The noisiest combination of equipment anticipated are two chainsaws (each assumed to be operating for 50% of the time), two excavators, two dozers and one vegetation chipper within Stage 2 (Drawing No:51-12506381-01-C308 Rev D).

Earthworks make up the noisiest activity required for the remainder of the land e.g. Stage 3. The equipment combination anticipated are two excavators, two dozers and one motorscraper.

Table 4 below shows the noise levels predicted using proprietary noise modelling software Datakustik Cadna A. Refer to the Appendix to this report for the noise prediction maps. The coloured lines shown on the maps provide noise contour lines to illustrate both the spread and the attenuation of noise as it propagates from the source. Such maps are often open to interpolation of noise levels for a specific receiver, especially if a legend denoting noise levels for each contour is provided. The noise contour lines are provided for illustration purposes only and it is important that the specific noise levels detailed for each receiver within Table 4 are referred to.

² Department of Transport, Energy and Infrastructure (DTEI, Govt of South Australia) Infrastructure Works at Night operational Instruction 21.7, 2007 (DTEI); Line 90, N:\AU\Newcastle\Service\Environment & Water Business Group\Air & Noise\01 CONTROLLED\02 Technical\02 Noise\02 Tools\03 Spreadsheets

³ 2007 DTEI; Line 91

⁴ 2007 DTEI

Table 4 Predicted noise levels

Works stage, location and activity	Receiver location (50 metres from dwelling)	Predicted noise level L _{Aeq} dB
Stage 2 (east) – clearing	R10	48
	R11	48
Stage 2 (west) – clearing	R10	54
	R11	46
Stage 3 – earthworks	R10	55
	R11	40

The levels predicted in Table 4 show that noise from construction activity on the site will comply with the daytime noise limit under Condition 3 at all receivers. This assessment is conservative as it assumes a worst case scenario where the equipment is all located in close proximity to Big Stone Road. In reality, the equipment will more typically either be set back further from the road edge or more evenly spread across the site for the vast majority, if not all of the time.

5. Conclusions and recommendations

The conclusions of the assessment are as follows:

Landfill Activity

It is practicable for noise resulting from activities associated with the construction of the infrastructure and the day-to-day operation of the site to comply with Condition 3 of designation D659.

The management of noise from any activity on the site should form part of the Landfill Management Plan (LMP) to ensure the best practicable option(s) is incorporated into any works in order to minimise noise and ensure ongoing compliance is achieved at noise sensitive receivers e.g. periodic noise monitoring 50 metres from dwellings at R10 and R11.

Public roads - construction noise

Construction noise from the works required to upgrade existing roads can comply with the noise limits for construction activities undertaken over a 'typical duration' specified under Rule 4.5.4.1 of DCC's 2GP-AP-1 as long as:

- a) noisy roadworks are limited to between 0730 to 1800 Monday to Saturday with no works on Sundays or public holidays; and
- b) a minimum separation distance of 40 metres is maintained between construction equipment and residential dwellings

Should works need to encroach upon the 40 metre buffer zone or should the hours of noisy works need to extend beyond those recommended this must be reviewed by a suitably qualified and experienced acoustician to advise on how this can be achieved whilst still maintaining compliance with Rule 4.5.4.1. For example, under these circumstances a construction noise management plan may be required to ensure that the Best Practicable Option(s) are employed to minimise noise levels and mitigate effects.

Public roads – operational noise

Rule 9.3.6.7.a of DCC's 2GP-AP states that vehicles operating on public roads are exempt from the noise limits specified under the rule.

6. Limitations

This report has been prepared by GHD for Dunedin City Council and may only be used and relied on by Client for the purpose agreed between GHD and the Client as set out in Section 1 of this report.

GHD otherwise disclaims responsibility to any person other than the Client and Council officers, consultants, the hearings panel and submitters associated with the resource consent and notice of requirement process for the Smooth Hill Landfill Project arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

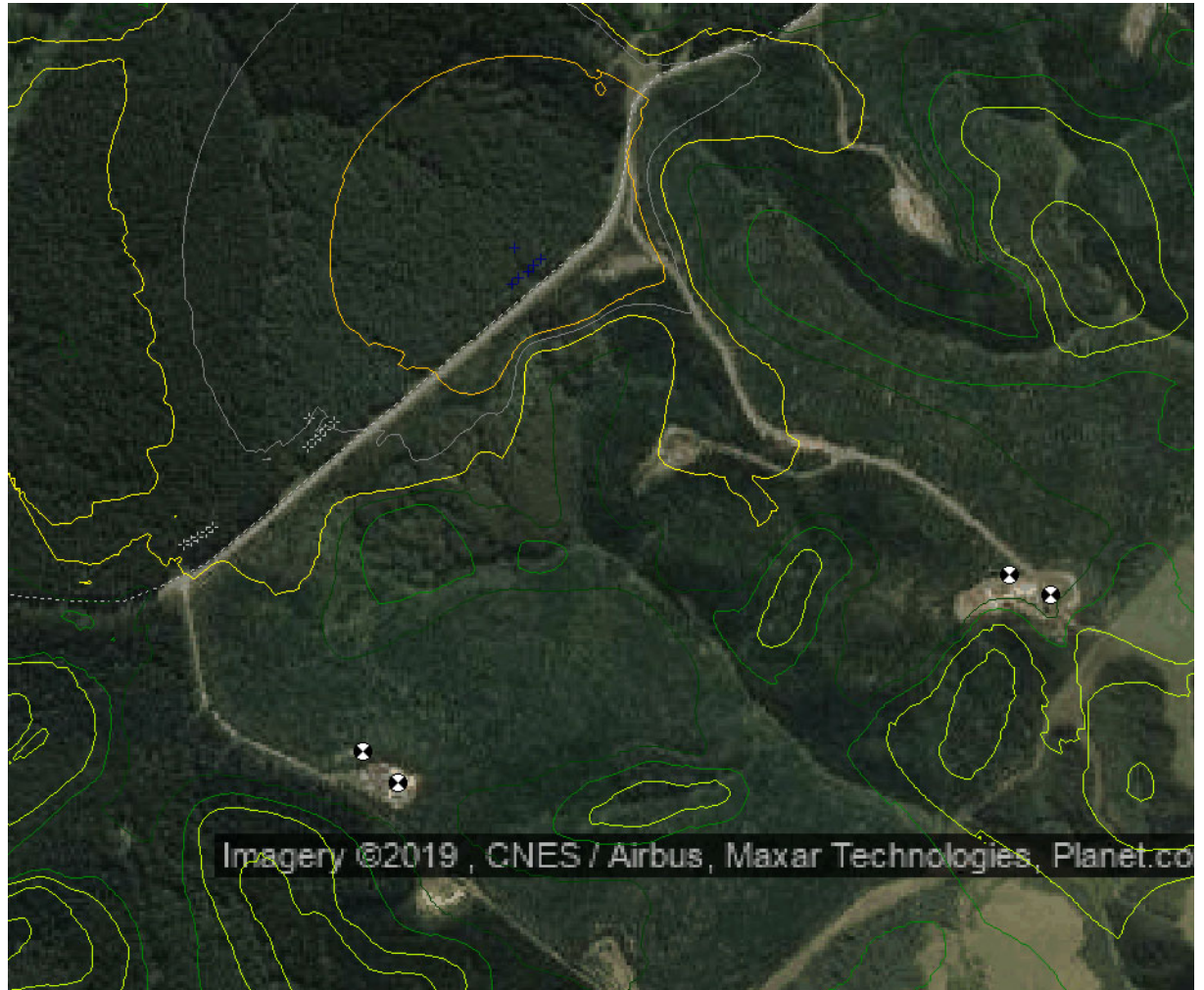
The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Client and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

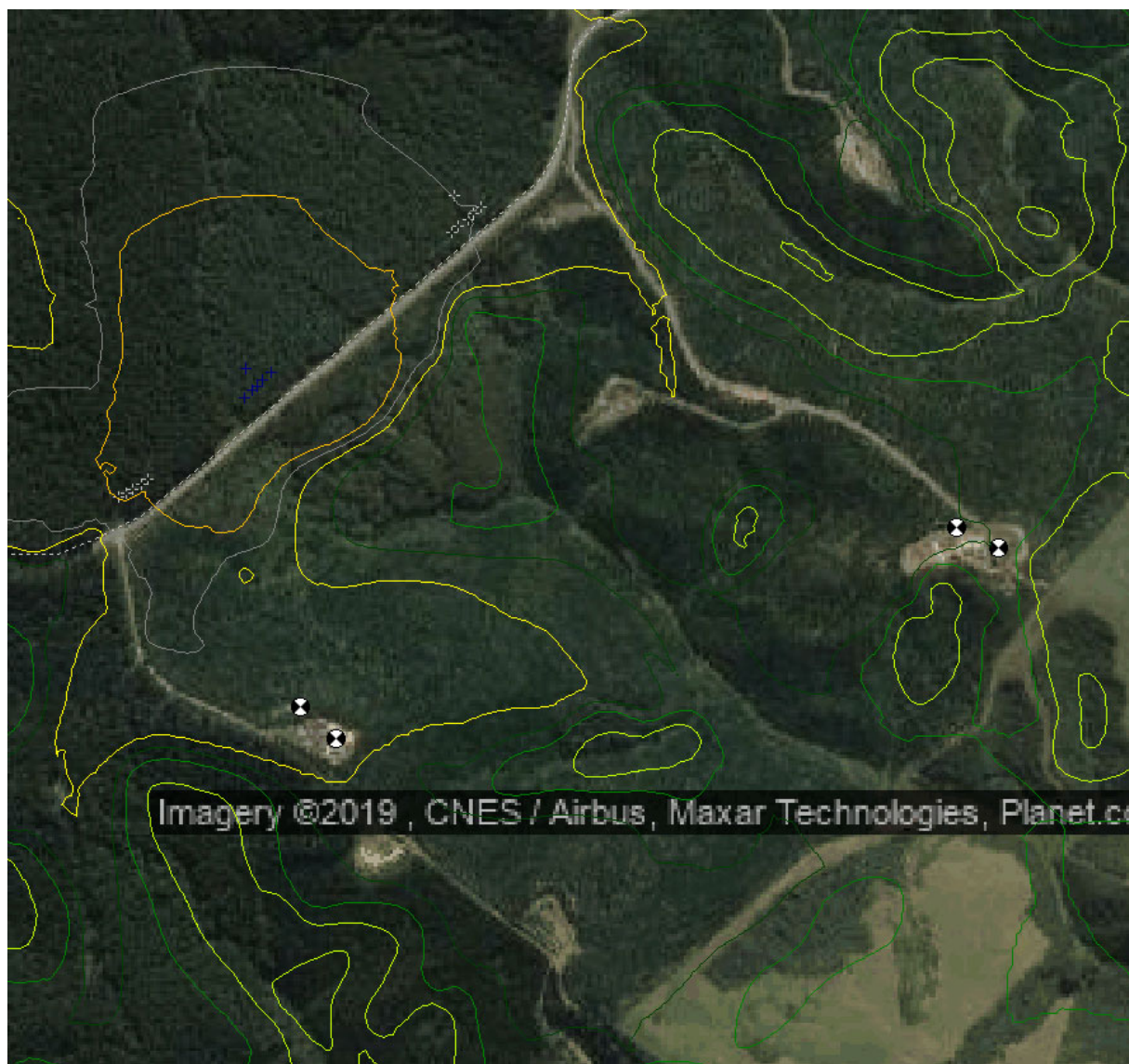
Appendix A – Noise prediction maps

See Table 4 and associated text for a description of these figures.

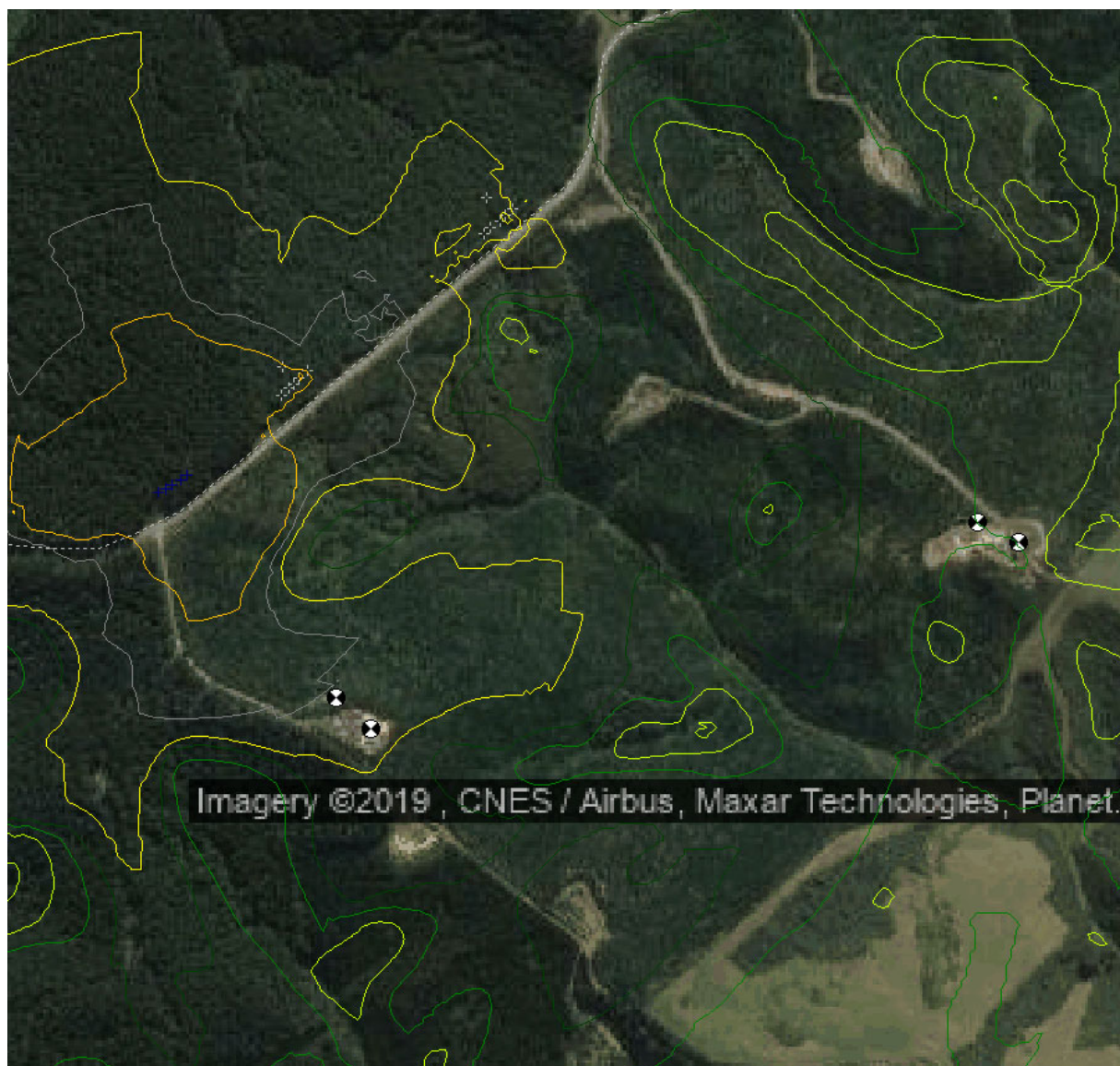
Stage 2 Clearing Works (East)



Stage 2 Clearing Works (West)



Stage 3 Clearing Works



Imagery ©2019 , CNES / Airbus , Maxar Technologies , Planet.

This report has been prepared by Marco Velasco under the direction of Christian Vossart, a Technical Director and Acoustics Specialist with GHD Ltd. Marco has 5 years as an acoustics specialist. Christian has over 18 years in all aspects of acoustic engineering and has the following qualifications and institutional memberships:

- BSc (Hons), Environmental Technology Management
- Institute of Acoustics (IOA) Diploma in Acoustics & Noise Control
- Acoustical Society of New Zealand (MASNZ)
- Resource Management Law Association
- NZ Institute of Architects

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57106/https://projects.ghd.com/oc/NewZealand1/dccsmoothhillconsent/Delivery/Documents/12506381_REP_Smooth_Hill_Noise_Impact_Assessment.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
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VER01	M.Velasco	C.Vossart		S.Douglass		12-08-20

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