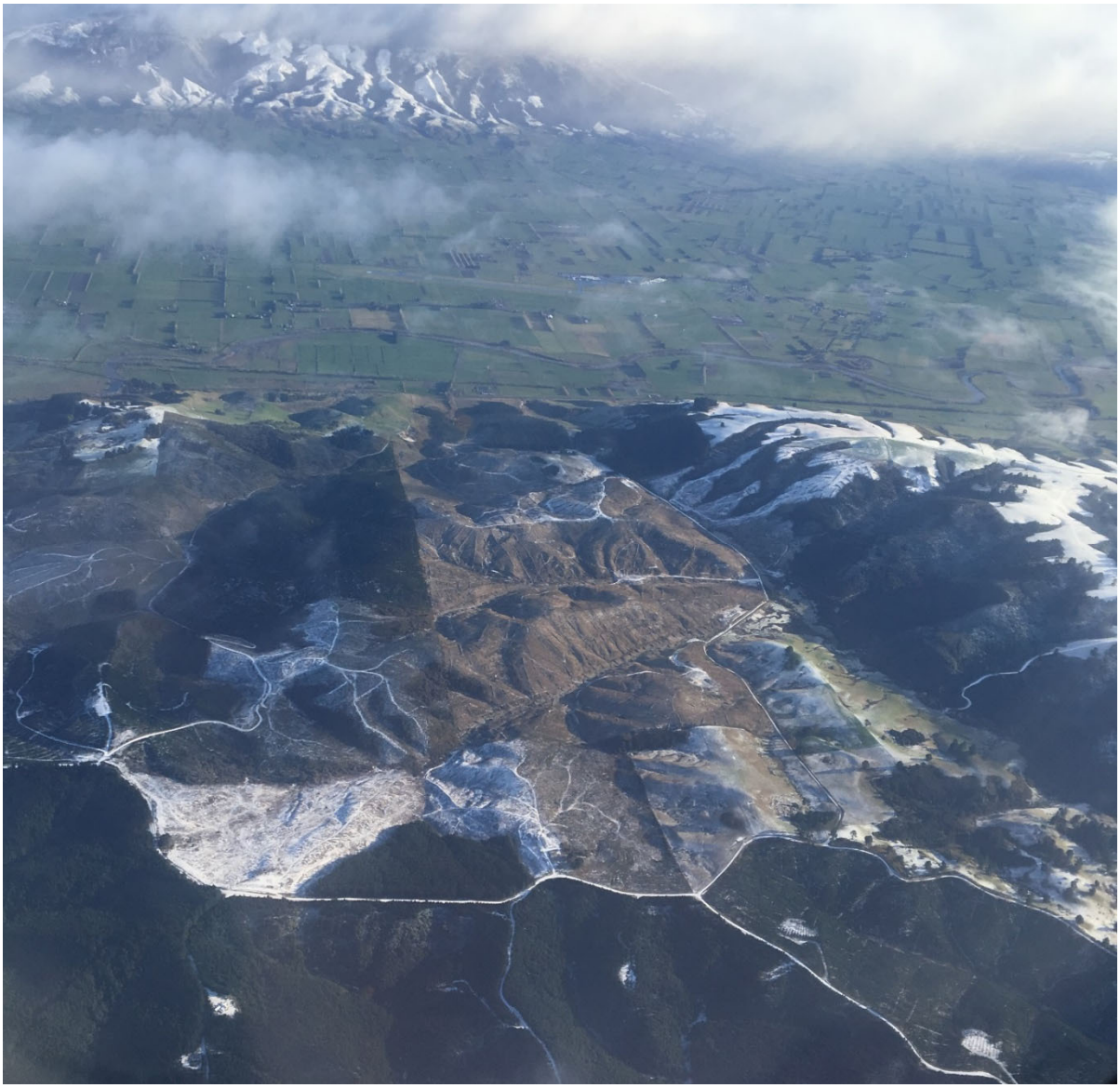
Appendix 16: Acoustic Assessment Report



Dunedin City Council

Waste Futures - Smooth Hill Landfill

Assessment of Acoustic Effects

August 2020 (updated May 2021)

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1. Introduction

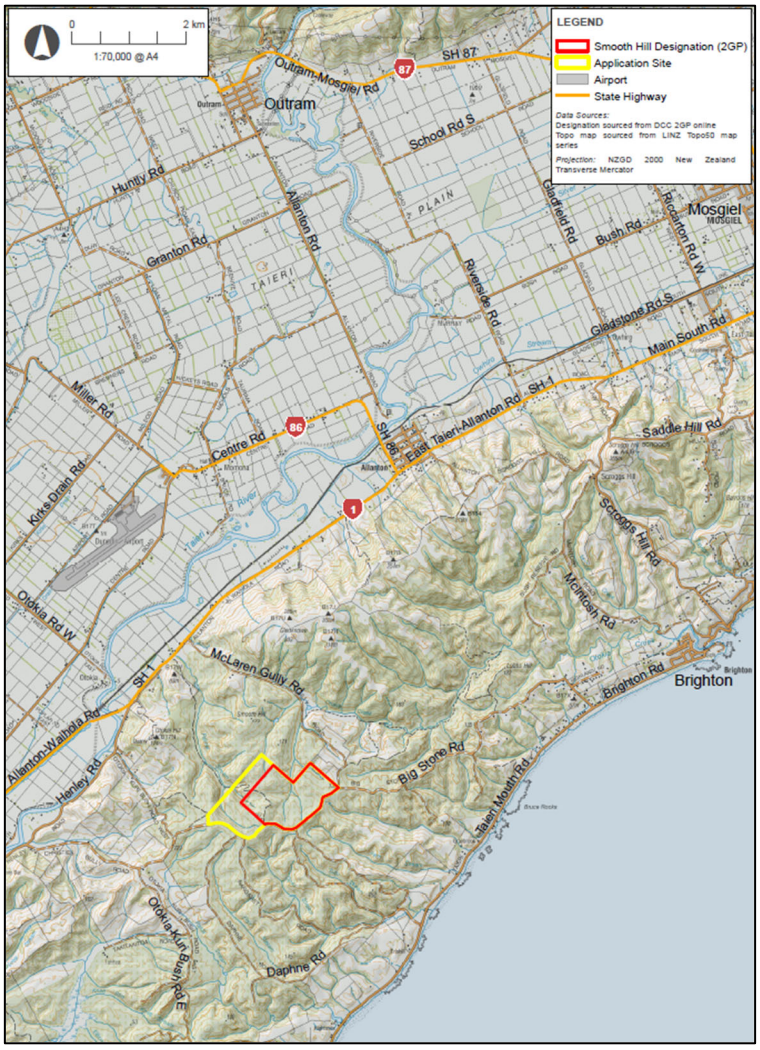
1.1 The project

The Dunedin City Council (Council) collects residential waste and manages the disposal of both residential and most commercial waste generated from 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 envisaged to reach full capacity in the next few years. Final closure could be around 2028 depending on the closure strategy adopted by the Council.

The Council commenced siting studies 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 location. 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 then landowner, Fulton Hogan Ltd, to purchase the land and the Council took ownership of the land in September 2020. Since the 1990's the Council extended the life of Green Island Landfill and further development of the Smooth Hill site has been on hold. The location and boundary of the site are shown in Figure 1 and 2.

Figure 1 Site location and boundary (Updated May 2021)



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 Council lodged applications for resource consents for Smooth Hill landfill with both the Otago Regional Council and Dunedin City Council in August 2020. The applications included an earlier version of this report. This report has now been updated to reflect both the changes in the design and in response to specific s92 questions. The key changes to the design are summarised below:

- The landfill size has been reduced. The revised landfill lies within the footprint of Stage 1 and Stage 2 of the original design, with the western Stages 3, 4 and 5 no longer included (for comparison see Drawings C102 and C104). In overall terms:
  - the footprint of the landfill is reduced from 44.5 ha to 18.6 ha
  - landfill (gross) capacity is reduced from approximately 7.9-million m^3 to 3.3-million m^3
  - net waste capacity is reduced from 6.2-million m^3 to 2.9-million m^3
  - the reduced landfill capacity has been offset by a reduction in predicted waste generation rates (from 90,000 T/yr to 60,000 T/yr)
  - the predicted landfill life has reduced from 55-years to 40-years
- Practical adjustments to the general construction of the landfill, including:
  - Landfill staging and construction sequencing, to a more typical 'bottom-up' filling methodology, which improves the intermediate and overall landform stability of the new design (Drawing C210 to C214)
  - Leachate containment and collection systems adjusted to reflect the revised construction sequencing
  - Construction phase systems for stormwater diversion, treatment and control
  - Relocation of the attenuation basin to the west of the revised landfill footprint rather than immediately downstream of the landfill toe.

1.2 Project Overview

The proposal includes the following key components:

- 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 C101 to C112).

1.3 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 advise 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.

1.4 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:

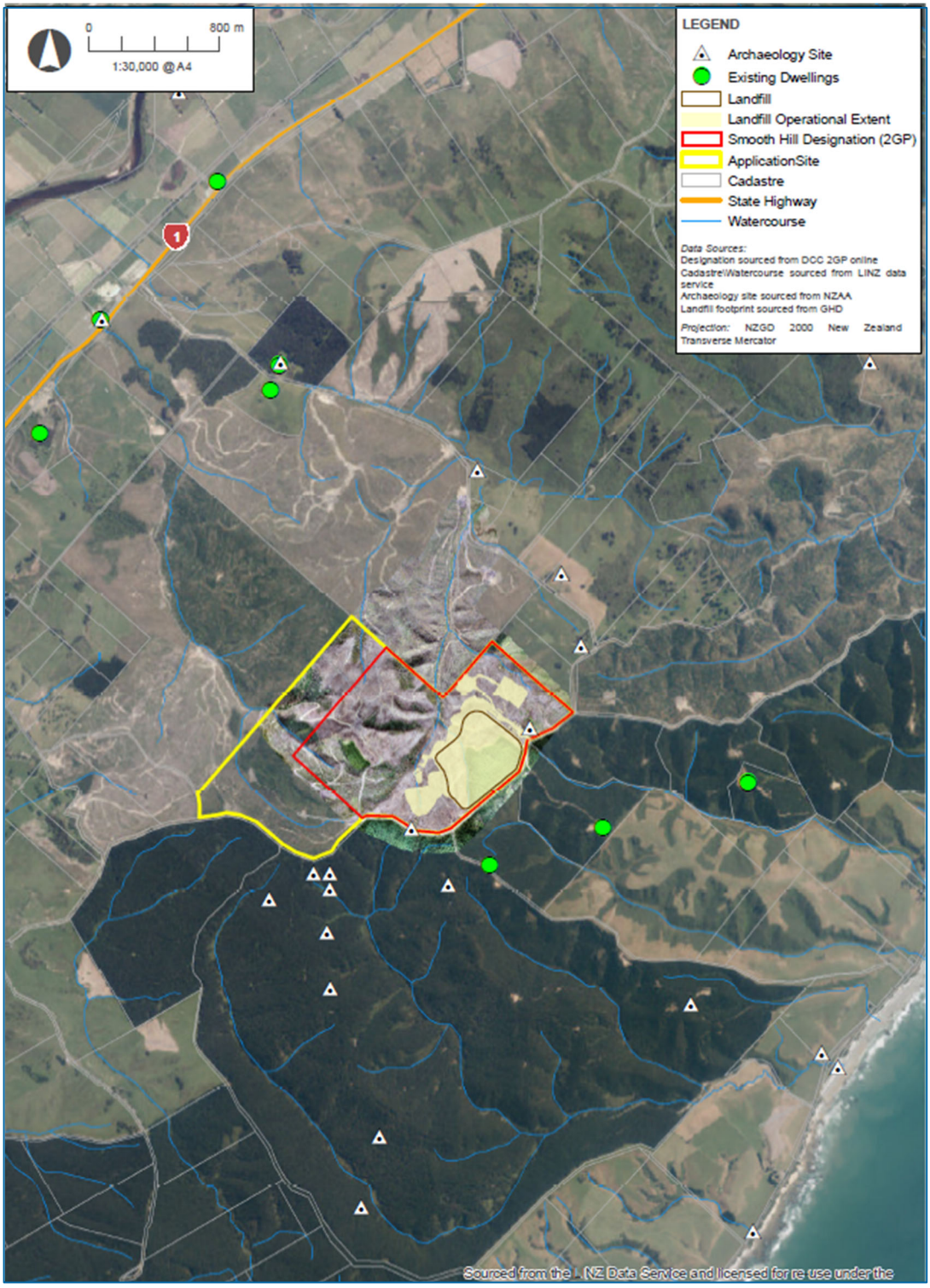
- GHD, Water Futures Phase 2 – Work stream 3 Smooth Hill Landfill, Landfill Concept Design Report (GHD, 2021)
- GHD, Smooth Hill Landfill - Integrated Transport Assessment (GHD, 2021)
- GHD, Smooth Hill Landfill - Drawings (GHD, 2021)

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

3.1 General

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.

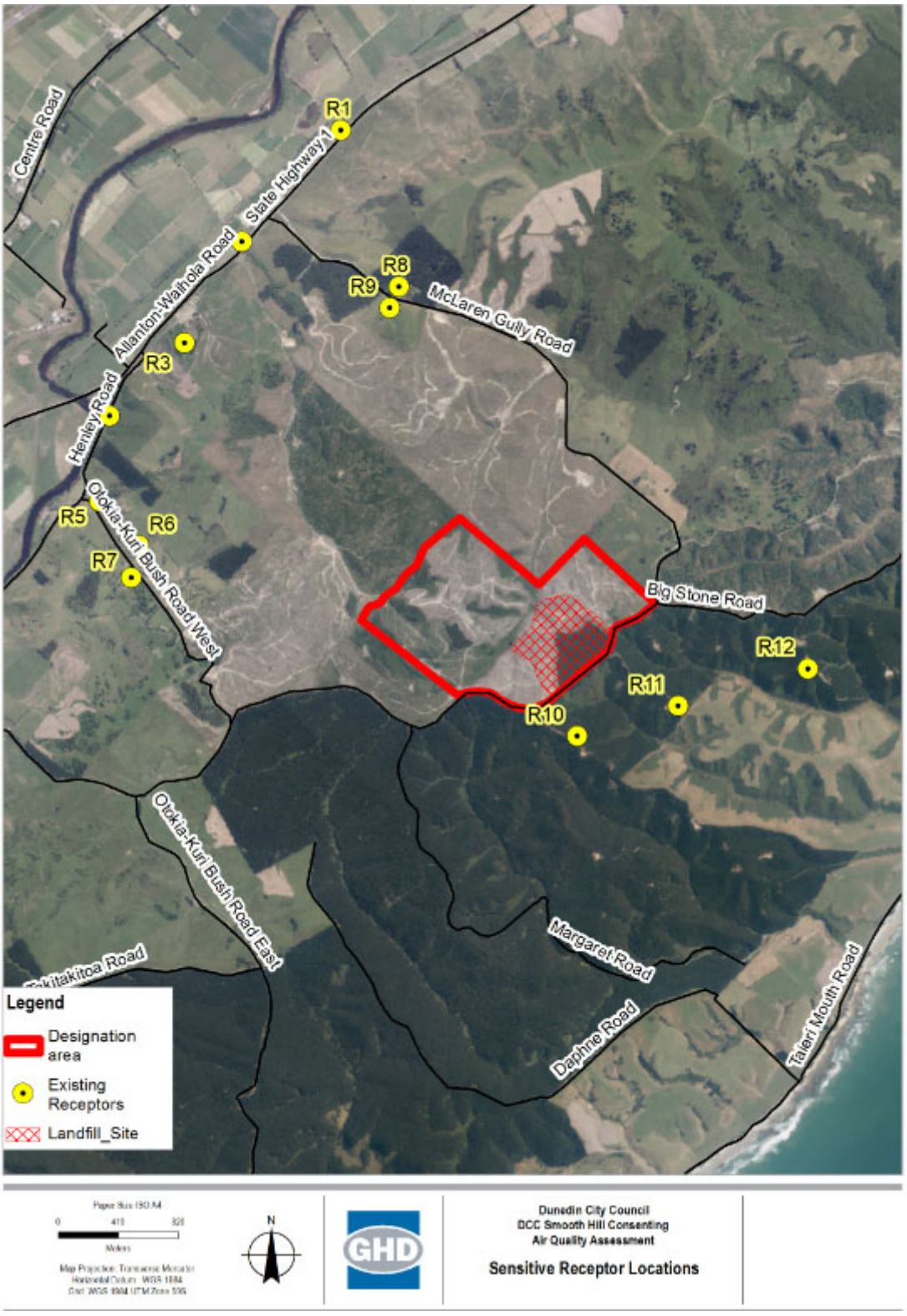
3.2 Designation area - operational and construction noise

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 (Updated May 2021)



3.3 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);

3.4 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:

   – 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
	0730 – 1800	55	85	55	85	55	85

Sundays and public holidays	1800- 0730	45	75	45	75	45	75

b. Activities that contravene this performance standard by less than 5 dB $L_{Aeq(15\ min)}$ are discretionary activities.

c. Activities that contravene this performance standard by 5 dB $L_{Aeq(15\ min)}$ or more are non-complying activities.

d. 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	81Ж	Table C.5 Ref 17
Bulldozer	83Ж	Table C.5 Ref 15
Dozer	81	Table C.8 Ref 17
Vibratory roller	81Ж	Table C.5 Ref 22
Vibratory roller	77	Table C.5 Ref 26
Grader	86Ж	Table C.6 Ref 31
Asphalt paver + tipper lorry	75	Table C.5 Ref 30

Ж 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 (Table 1). The addresses for R8 and R9 are 108 and 109 McLaren Gully Road respectively. The distance between the edge of the existing carriageway for both R8 and R9 is approximately 65 metres. The nearest sensitive receptor to the landfill footprint is 731 Big Stone Road, approximately 380 m from the landfill footprint This assessment assumes that both of these residential 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 (CNMP) may be required to ensure that the Best Practicable Option (BPO) measures 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, a full quantitative assessment of road traffic noise from vehicles associated with the landfill site has not been assessed on SH1, McLaren Gully Road and Big Stone Road.

It is noted that Objectives 6.2.1 of DCC's 2GP-AP-1 addresses transportation infrastructure and that Policy 6.2.1.3 states:

Only allow new roads or additions or alterations to existing roads where:

a. The road is designed to provide for the needs of all users and to integrate with surrounding land uses as appropriate for the surrounding environment and road classification hierarchy mapped area; and

b. The location and design of the road:

   – Minimises, as far as practicable, adverse effects on surrounding residential or other sensitive activities, including severance effects, changes to drainage patterns, and vibration, noise, glare and fumes from vehicle movements; and

   – Maintains or enhances the safety and efficiency of the overall transport network.

Rule 9.3.6.7(h) is clear that vehicles operating on public roads are exempt from the noise standards in 9.3.6 and Policy 6.2.1.3 cannot override the specific exemption provided for in rule 9.3.6.7(h). Nonetheless it is noted that the existing road surface for McLaren Gully Road and Big Stone Road is unsealed 'gravel' (AP40/Ap20) wearing course whilst the proposed upgrading of these roads will include a chip sealed surface. The upgraded surface will significantly reduce road traffic noise.

It is also noted that the number of road traffic vehicles associated with the development is minimal i.e. approximately 25 truck movements per day. The Integrated Transport Assessment for the application estimates that at most 10 heavy vehicles will arrive and 6 depart within the busiest period of the day i.e. the AM peak between 7 am and 9 am.

Vehicles range from 6 to 8-wheel style trucks (e.g. with a drive-by maximum sound pressure level of L_{Amax} 78 dB at 10 metres (Table C.8 Ref 18/19)) up to semi-trailer/truck and trailers (e.g. with a drive-by maximum sound pressure level of L_{Amax} 82 dB at 10 metres (Table C.11 Ref 9)).

In order to provide a level of surety for adjacent landowners it has been estimated, assuming two vehicles' movements at a speed of 50km/hour occur within a 15 minute period, that noise levels at R8 and R9 could range between $L_{Aeq(15min)}$ 43/44 dB to 47/48 dB. These levels are likely to reduce yet further with a chip sealed surface. It is considered that these levels represent a low level of road traffic noise and demonstrate that adverse effects on surrounding residential activities from vehicle movements will be minimised in line with policy 6.2.1.3.

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 houses are R10 and R11. The house at 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 Table 2. 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	78Ж	Table C.8 Ref 18

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

Cross referencing of equipment sound levels between Table 1 and Table 2 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 Table 2 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 metres[1].

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.

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 Table 3.

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

[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.

[2] Department of Transport, Energy and Infrastructure (DTEI, Govt of South Australia) Infrastructure Works at Night operational Instruction 21.7, 2007 (DTEI); Line 90,

[3] 2007 DTEI; Line 91

[4] 2007 DTEI

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.

Earthworks make up the noisiest activity required following the clearing of trees. 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.

Table 4 Predicted noise levels

Works stage, location and activity	Receiver location (50 metres from dwelling)	Predicted noise level LAeq dB
Construction phase eastern portion – clearing	R10	48
	R11	48
Construction phase western portion – clearing	R10	54
	R11	46
Construction phase eastern portion – earthworks	R10	47
	R11	47
Construction phase western portion – earthworks	R10	54
	R11	44

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 and/or more evenly spread across the site for the vast majority, if not all of the time. It is also important to note that Big Stone Road runs along the ridge line so that the contours of the land fall away on both sides of the road. This means that the ridge line will provide a degree of acoustic screening (which will vary, depending on how far down the hill the clearing and earthworks are taking place) for almost all of the works thereby significantly reduce the noise levels shown in Table 4 which are only estimated to prevail over a very short period of time.

4.3.6 Special audible characteristics

New Zealand Standard 6802: 2008 Acoustics – Environmental noise (NZS 6802:2008) allows for an adjustment of + 5 dBA to be made where the sound being assessed has a distinctive character which may make the sound more annoying (e.g. impulsive or tonal) than another

sound of the same decibel level. This is referred to as a Special Audible Characteristic (SAC) adjustment.

Condition 3 pre-dates NZS 6802:2008 but allows for this adjustment, although it applies it in the form of a minus 5 dBA adjustment to the noise limits such that for the purposes of this assessment the daytime limit would be reduced to L_{Aeq} 50 dB. As such, if a SAC were to be applied to the works the noise levels predicted in Table 4 would be exceeded by up to 4 dBA at R10 for clearing and earthworks. However, GHD Acoustics does not consider that the predicted levels are subject to a SAC penalty.

Section 6.3 of NZS 6802:2008 instructs the application of the criteria under Appendix B4 is to be taken into account when assessing whether a source of noise includes a special audible characteristic that would incur a +5 dBA penalty. GHD Acoustics considers it is also important that the context within which the noise occurs is taken into account.

The subject site and all land within the proximate vicinity of the site is zoned 'coastal rural'. Rural land zones are allocated under the DCC's 2GP-AP-1 to provide for primary production activities such as pastoral farming, forestry, mining and resource-based activities. It is therefore considered that the clearing of trees and subsequent earthworks (including the use of chain saws, vegetation chipper and dozers) fall within the activities typically allowed for under the zoning of the subject site i.e. the characteristics of the noise sources are commensurate with the setting within which they occur.

It is our opinion that a SAC adjustment is not required for the character of the noise arising from the operation/construction of the fill provided that noise sources such as squealing dozer tracks, tonal reverse alarms and banging tailgates are not permitted on site. The best way to address potentially annoying sources of noise is through the application of the Best Practicable Option (BPO) mitigation measures (e.g. replacing tonal reversing alarms with broadband alarms) under noise management provisions to be included within the Landfill Management Plan (LMP).

4.3.7 Bird management plan

The draft Bird Management Plan (BMP) submitted with the application allows for methods to prevent birds from accessing waste at the active tip face. Potential dispersal methods proposed include using stockwhips, pyrotechnics, starter pistols and portable distress callers. These forms of bird dispersal rely upon short, intermittent bursts of noise to deter birds. The levels of acoustic energy that these practices typically give rise to will not be significant in terms of overall compliance of landfill activity with Condition 3 of the Designation and therefore they have not been included in the noise assessment and would not make any difference to those findings.

Landfill staff will be responsible for implementing dispersal methods during daylight operational hours (until end-of-day cover is applied). Provision is allowed for under the BMP for staff to be trained by a suitably qualified and experienced person. From a noise management perspective, it is recommended that methods of bird management that avoid noise-based bird dispersal methods are preferred whenever practicable e.g. anti-roosting strips to prevent birds landing and roosting on structures at the landfill, random-timer water sprinkling system(s) directed at active tip face.

~~4.3.7~~4.3.8 Landfill management plan

It is recommended that the management of noise forms part of the Landfill Management Plan (LMP), to ensure the BPO mitigation measures are incorporated into the works, in order to minimise noise emissions and ensure ongoing compliance is achieved at noise sensitive receivers. Items to be addressed and provisions allowed for under the noise section of the LMP are to include:

Condition 3 of Designation D659 to be met (with explanation of the practical interpretation of the noise limit to be complied with).

a. Equipment is to be selected, maintained and operated to minimise noise emissions and prevent noise sources that could potentially lead to annoyance e.g. squealing dozer tracks.

b. Movable equipment involved with the operation and/or construction of the landfill that typically stays on site for longer period(s) of time are to be fitted with broad-band reversing alarms. Note: this provision does not strictly apply to equipment that arrives and departs site on a daily basis (e.g. delivery vehicles), although installation of broad-band reversing sirens on such visiting equipment is to be encouraged whenever practical as good acoustics practice.

c. Noise training is to form part of the site-induction program and include procedures for managing noise e.g. prevention of tailgates banging.

d. Methods of bird management that avoid noise-based bird dispersal methods are preferred whenever practicable e.g. anti-roosting strips to prevent birds landing and roosting on structures at the landfill, random-timer water sprinkling system(s) directed at active tip face.~~Bird scare~~

e. A noise monitoring program is to include specification of noise measuring equipment, measurement duration, recommended weather conditions, required schedule of measurements (e.g. periodic and at the commencement of an activity), location(s) requiring measurement and reporting requirements.

f. An incident management procedure to include site contact details and name of person responsible for responding to and resolving complaint.

g. A record of all noise monitoring results and complaints received (including actions taken to resolve any matters) are to be submitted to DCC annually with a copy available on-site.

h. A program of community liaison to provide information on noise (and wider environmental) aspects of the operational activities, monitoring and future plans with an avenue for community feedback.

i. Procedure for amendments to the noise section of the management plan, including updating DCC.

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 is to form part of the Landfill Management Plan (LMP) to ensure the BPO mitigation measures are incorporated into the works in order to minimise noise emissions and ensure ongoing compliance is achieved at noise sensitive receivers.

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 measures 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. Notwithstanding, in order to provide a level of surety for adjacent landowners it has been estimated that noise levels at R8 and R9 could range between $L_{Aeq(15min)}$ 43/44 dB to 47/48 dB. These levels are likely to reduce yet further with a chip sealed surface. It is considered that these levels represent a low level of road traffic noise and demonstrate that adverse effects on surrounding residential activities from vehicle movements will be minimised in line with Policy 6.2.1.3.

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.

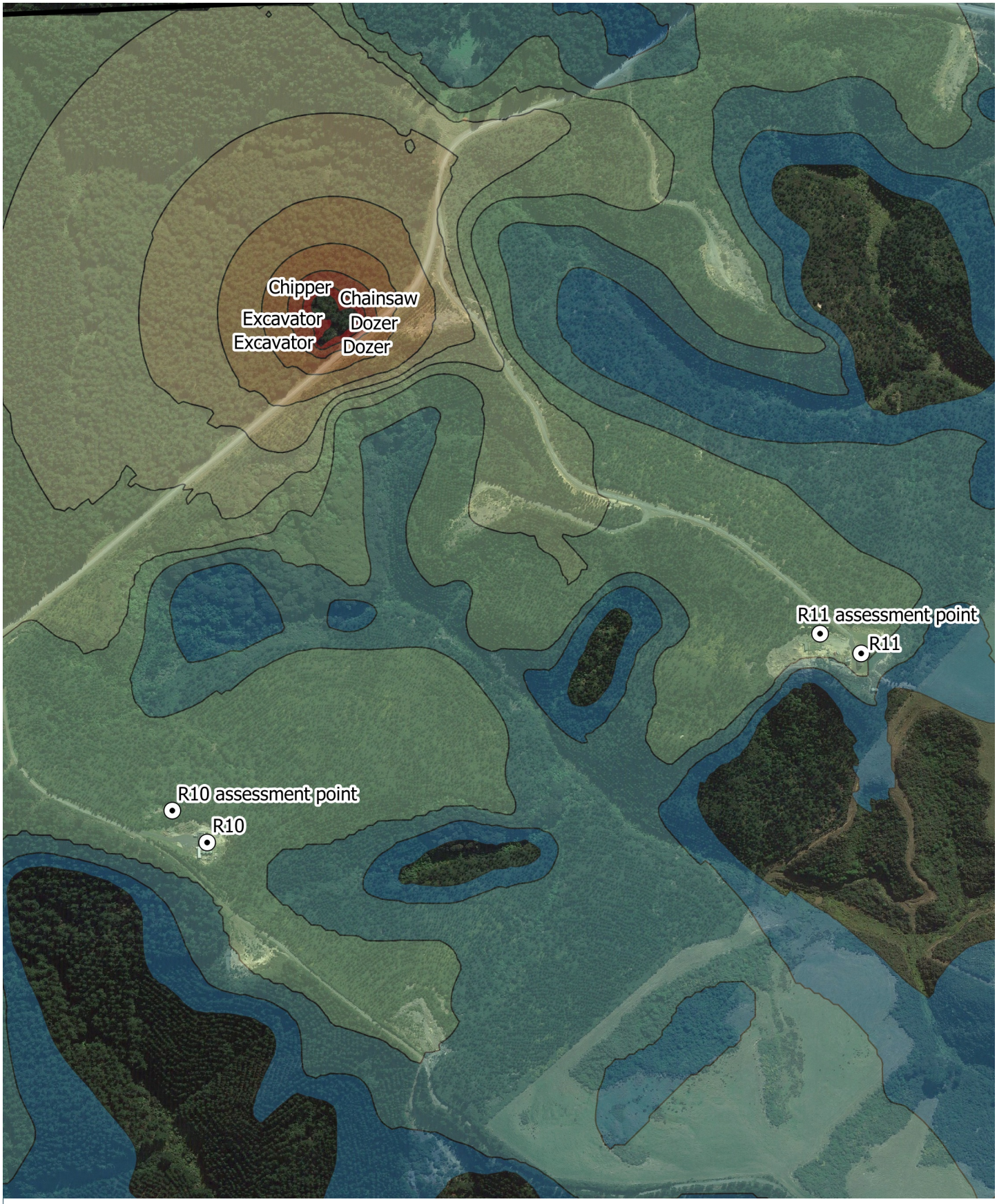
The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

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.

Appendices

Appendix A – Noise prediction maps

1. Construction – Clearing Works (East)
2. Construction – Clearing Works (West)
3. Construction – Earthworks (West)
4. Construction – Earthworks (East)



Noise contours, LAeq15min, dBA

35 - 40 | 40 - 45 | 45 - 50 | 50 - 55 | 55 - 60 | 60 - 65 | 65 - 70 | 70 - 75 | 75 - 80 | >80

Paper Size ISO

0 100 200 m

Map Projection: Mercator Auxillary Sphere
Horizontal Datum: WGS 1984

GHD

Dunedin City Council
DCC Smooth Hill
Consenting

Construction – Clearing Works (East)

Project No. **12506381**
Revision No. **-**
Date. **11/05/2021**

FIGURE A1

Document Path: \
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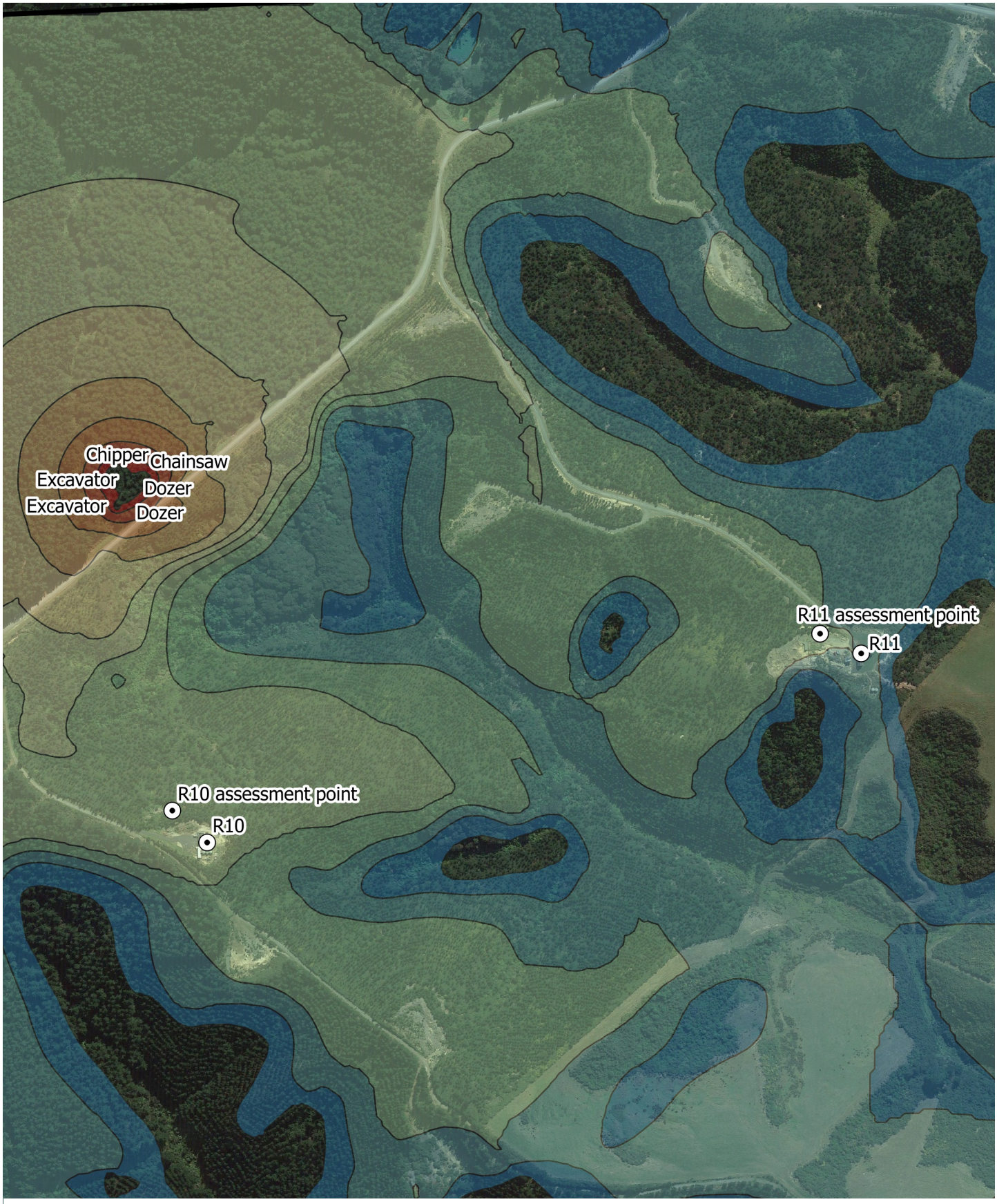
Created By: Rosy Browell



Noise contours, LAeq15min, dBA

35 - 40 | 40 - 45 | 45 - 50 | 50 - 55 | 55 - 60 | 60 - 65 | 65 - 70 | 70 - 75 | 75 - 80 | >80

Paper Size ISO

0 100 200 m

Map Projection: Mercator Auxillary Sphere
Horizontal Datum: WGS 1984

Dunedin City Council
DCC Smooth Hill
Consenting

Construction – Clearing Works (West)

Project No. **12506381**
Revision No. **-**
Date. **11/05/2021**

FIGURE A2

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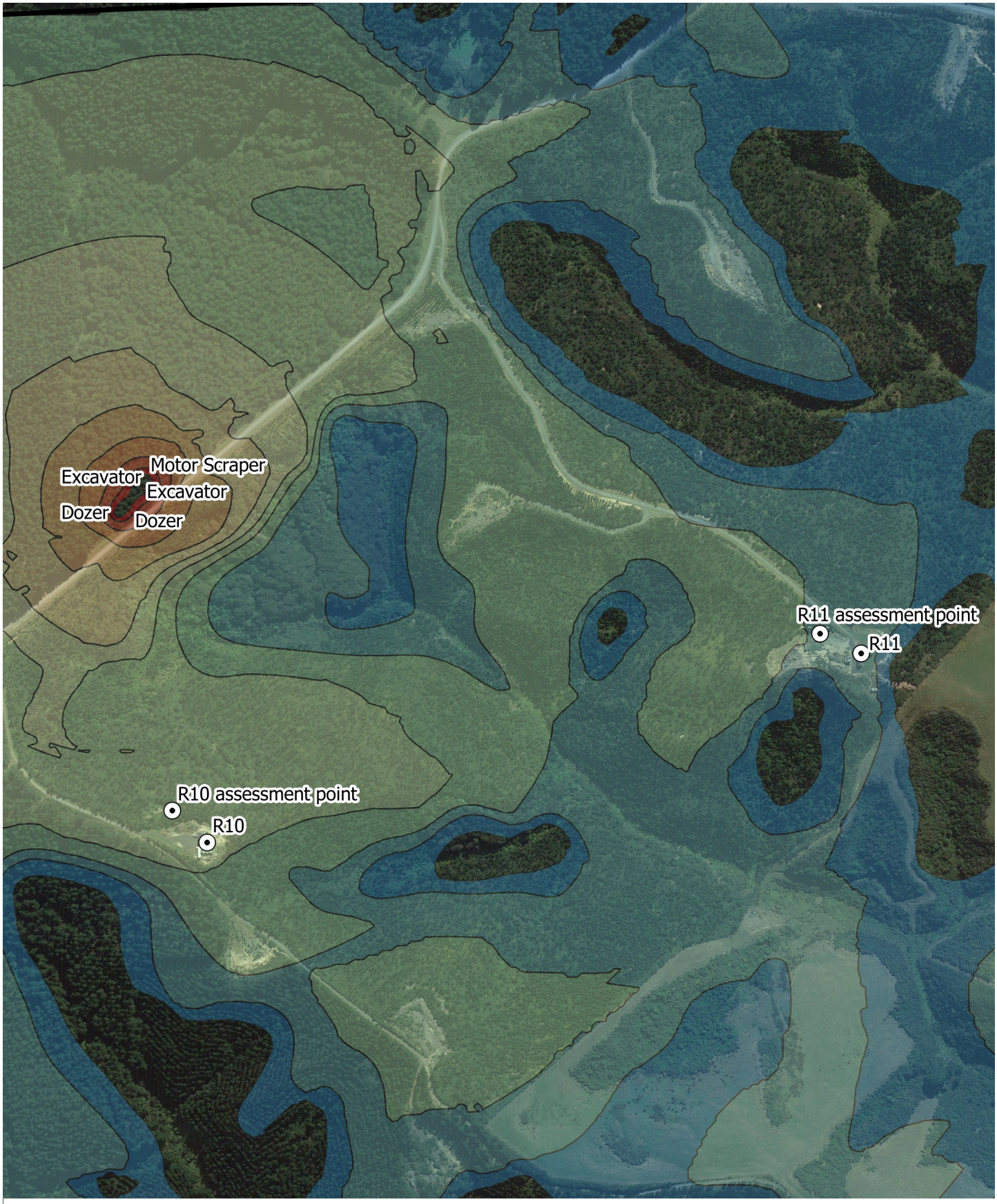

Noise contours, LAeq15min, dBA

35 - 40 | 40 - 45 | 45 - 50 | 50 - 55 | 55 - 60 | 60 - 65 | 65 - 70 | 70 - 75 | 75 - 80 | >80

Paper Size ISO

0 100 200 m

Map Projection: Mercator Auxillary Sphere
Horizontal Datum: WGS 1984

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FIGURE A3

Document Path: \
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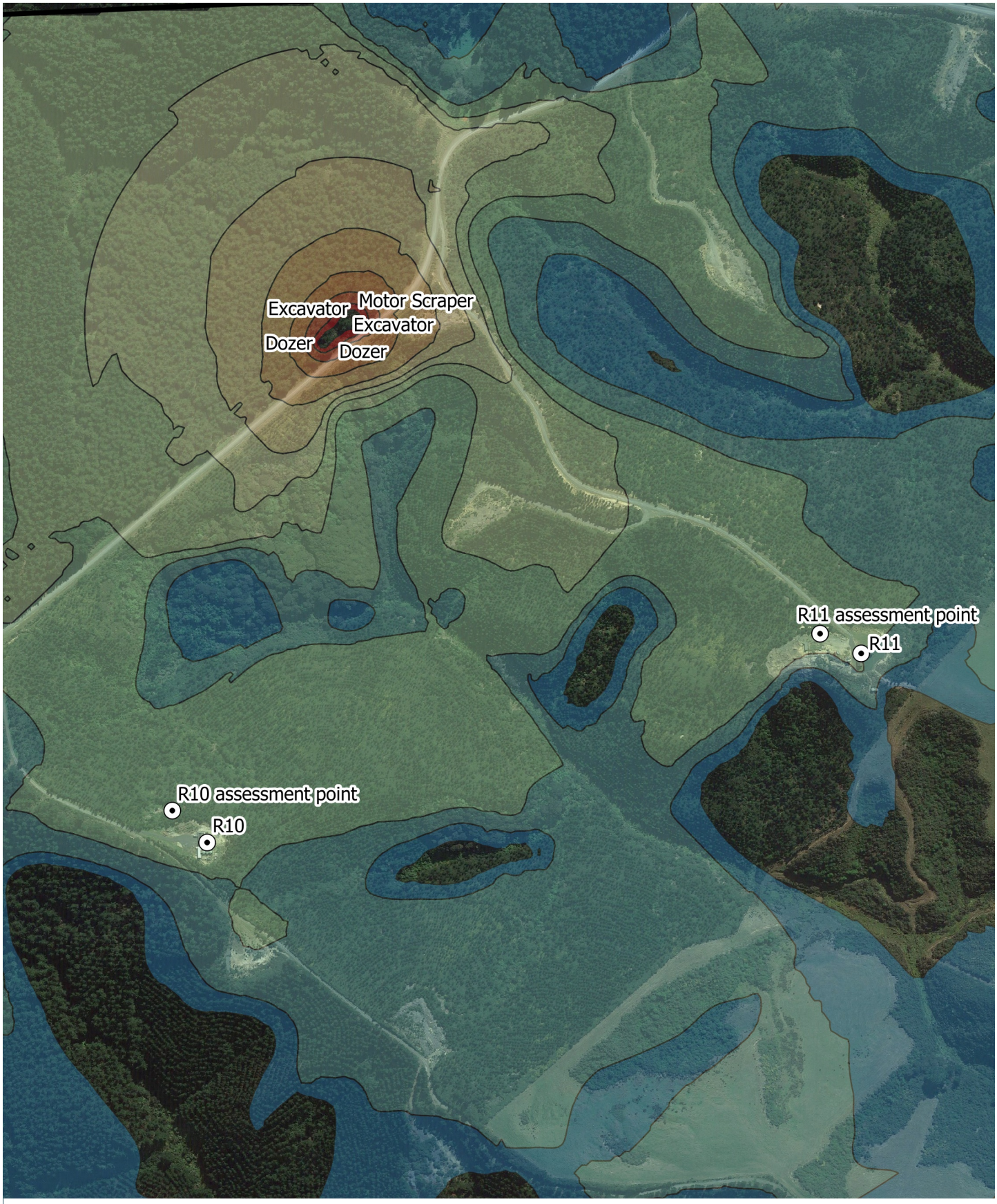

Noise contours, LAeq15min, dBA

35 - 40 | 40 - 45 | 45 - 50 | 50 - 55 | 55 - 60 | 60 - 65 | 65 - 70 | 70 - 75 | 75 - 80 | >80

Paper Size ISO

0 100 200 m

Map Projection: Mercator Auxillary Sphere
Horizontal Datum: WGS 1984

Dunedin City Council
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Construction – Earthworks (East)

Project No. **12506381**
Revision No. **-**
Date. **11/05/2021**

FIGURE A4

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Data Source:

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This report has been prepared by Chris Gordon under the direction of Christian Vossart, a Technical Director and Acoustics Specialist with GHD Ltd. Chris has 10 years as an acoustics specialist. Christian has 19 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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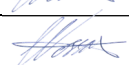
Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Ver01	C Gordon	C.Vossart		S.Douglass		29-08-20
Ver02	C Gordon	C Vossart		S. Douglass		26-05-21

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