IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	an application by McPherson Quarry to obtain consent for their current operations, and to expand operations in several stages.

BRIEF OF EVIDENCE OF NEVIL IAN HEGLEY ON BEHALF OF MCPHERSON QUARRY

INTRODUCTION

1. My full name is Nevil Ian Hegley. I am the principal of Hegley Acoustic Consultants.

2. I am giving this evidence on behalf of McPherson Quarry.

3. I have the following qualifications relevant to the evidence I shall give.

   (a) I have specialised in acoustics for the last 40 years;

(b) I have an MSc from Southampton University where I undertook research in acoustics in 1975/76;

(c) I am a Member of the Institution of Professional Engineers New Zealand, the Institution of Civil Engineers London and the Acoustical Society of America;

(d) I have been on the majority of the Standards sub-committees dealing with sound issues since 1977 and I was the Chairman of both of the sub-committees that approved the 1984 and 1999 versions of the Construction Noise Standard NZS6803;

(e) In 2010, I received the Meritorious Award by Standards New Zealand for outstanding commitment to the development of New Zealand Acoustic Standards;

(f) I have been involved with the measurement and assessment of more than 75 quarries throughout the country; and

(g) I am familiar with the existing quarry and the surrounding noise environment.

4. Although this is not an Environment Court hearing, I have read and agree to comply with the code of conduct for expert witnesses in the Environment Court 2014 Practice Note.

BACKGROUND

5. McPherson Quarry is proposing to obtain resource consent for their existing operation and for the expansion of the quarry to extract up to 490,000 tonnes of quarry material annually.

6. This evidence considers the noise effects of the proposed expansion and how the noise will be controlled to within a reasonable level for the neighbours.

DISTRICT PLAN REQUIREMENTS

7. The site and all surrounding land are zoned Rural in the Operative Waikato District Plan (Franklin Section). The only noise controls for the Rural Zone are set out in Rule 23A.5.2.A which states:

> *8. Noise*
>
> *The extent to which the adverse effects of noise at a notional boundary of 20m from any dwelling house outside the site will be avoided, remedied or mitigated. This includes such effects associated with the use of particular access point to the site.*
>
> *9. Vibration and Blast Noise*
>
> *Whether there are activities in the vicinity, which could be sensitive to noise and vibration effects from blasting.*
>
> *The extent to which vibration from mineral extraction activities avoids significant nuisance or adverse effects, taking into consideration the following guidelines:*
>
> - *Measurement of blast noise (air blast) and ground vibration from representative blasts in accordance with Appendix J of Part 2 of Australian Standard AS2187:2:1993*
> - *Noise created by the use of explosives measured at a notional boundary of 20 metres from dwelling houses not exceeding a peak overall sound pressure of 128dB linear peak.*
> - *Restriction of blasting to between 1000 and 1600 hours Monday to Saturday except where blasting is necessary for safety reasons.*
> - *Confining blasting to two occasions per day except where blasting is necessary for safety reasons.*
> - *Recording blasts with particular attention to details of charge weight and delay practice. Monitoring representative of all blasts at varying distances and positions of different sensitivity.*

8. Field measurements of blast noise and vibration have been undertaken on site at a similar to the distance as to 231 Pinnacle Hill Road is from the closest expected blasting on site. The results of this testing gave an air blast noise of 109dBL with minimal screening included and up to 2.54mm/s vibration. Based on this and taking into account the relative ground screening of the blast noise the predicted level of 103dBL is at the upper level expected when including the relative screening effects that occurs at 231 Pinnacle Hill Road for the worst case scenario. These levels correlate well with the predicted vibration.

9. As both the blast noise and vibration levels are well within the requirements of Rule 23A.5.2.A, as set out above, blast noise and vibration is not addressed further in this evidence.

10. The current noise limits for the Rural Zone in the Proposed Waikato District Plan are set out in Rule 22.2.1.1 Noise – General in the Proposed Waikato District Plan and requires:

> *P2 (a) Noise measured at the notional boundary on any other site in the Rural Zone must not exceed:*
>
> *(i) 50dB (L_{Aeq}), 7am to 7pm every day;*
> *(ii) 45dB (L_{Aeq}), 7pm to 10pm every day;*
> *(iii) 40dB (L_{Aeq}) and 65dB (L_{Amax}), 10pm to 7am the following day.*
>
> *P3 (a) Noise measured within any site in any zone, other than the Rural Zone, must meet the permitted noise levels for that zone.*
>
> *P4 (a) Noise levels must be measured in accordance with the requirements of New Zealand Standard NZS 6801:2008 "Acoustics - Measurement of Environmental Sound".*
>
> *(b) Noise levels must be assessed in accordance with the requirements of New Zealand Standard NZS 6802:2008 "Acoustic- Environmental noise".*

11. I do note as a result of submissions, the Proposed District Plan has adopted a level 5dB L_{Aeq} above the limits adopted for a Rural Zone for extractive industries in a Rural Zone. However, it is also noted that although the quarry is an extractive industry, at this point the McPherson Quarry is not zoned as an extractive industry.

12. Due to the lack of specific noise limits in the Operative District Plan (Franklin section) the noise limits currently in the Proposed District Plan have been adopted for this site. It is noted these noise limits may change as a result of submissions to the Proposed District Plan although it is unlikely the limits will go any lower and there is the potential for them to be increased. Thus, adopting these levels will offer the lowest level likely to be adopted in the Proposed District Plan for the Rural Zone.

THE PROPOSAL

13. The assessment of the quarry noise has been undertaken assuming the following plant will operate:

- Cat 980H Loader
- Cat 980G Loader
- CatD10N Dozer
- Cat D8L Dozer
- Cat 336FL Excavator
- Cat 350A Excavator
- Cat 769D Dump Truck
- Rock drill
- Mitsubishi HD550 Grader
- Mack Metroliner Water Cart
- Finlayson 883 Screen
- Terex Finlay Jaw Crusher
- Sandvik QH331 Cone Crusher
- Road trucks and trailers

14. The assessment has assumed all of this plant will operate at the same time. In practice this is unlikely so there is a good factor of safety built into the noise modelling.

PREDICTED NOISE

15. To predict the noise from the proposed quarry activities the predictions have been based on field measurements undertaken of quarry plant both at the McPherson Quarry and at other quarries. Full details of the plant

and measured sound levels are given in the original noise assessment so are not repeated here.

16. To predict the noise from the quarry activities all noise sources have been located at the most exposed position to the neighbours within the quarry for the existing conditions and Stages 1 and 3 as shown on Figure 1. That is, the location selected for the analysis is with the quarrying being undertaken early in the stage development when the plant is at the maximum height in the quarry and hence the minimum screening.

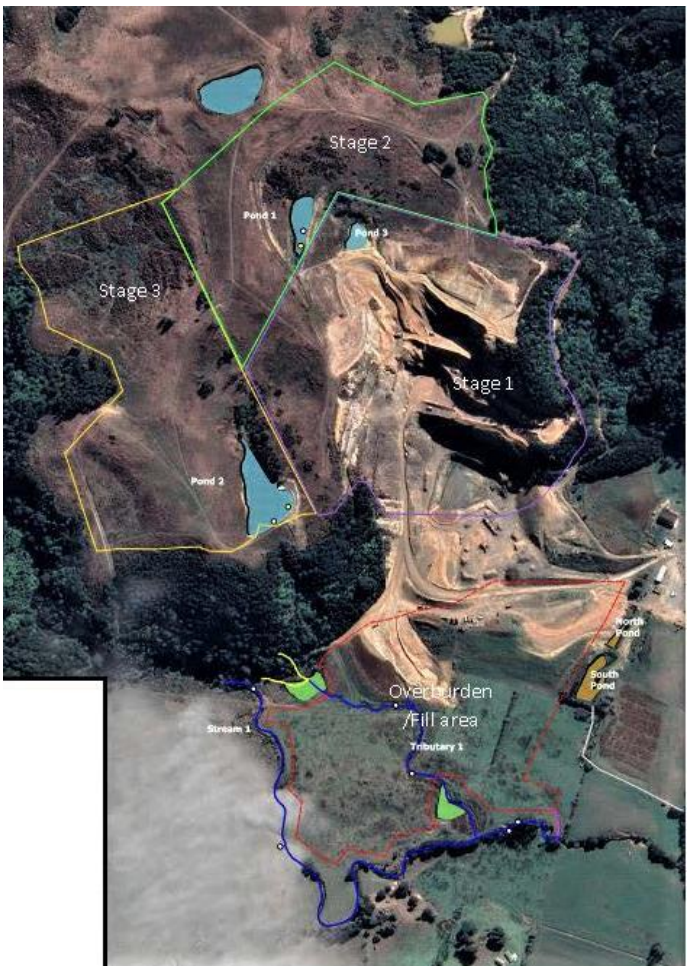

Figure 1. Quarry Stages

17. The noise has been predicted using the Brüel & Kjær Predictor program version 2021. This software package uses a digital terrain model and each of the noise sources operating have been added. Calculations are undertaken in accordance with the requirements of ISO 9613-1/2

Acoustics – Attenuation of Sound during Propagation Outdoors. A mild temperature inversion has been assumed with ground absorption of 0.7 and ground contours at 1m intervals over the area modelled. The grid size used to calculate the noise contours vary between 10m – 30m.

18. Figure 2 shows the results of the noise modelling for the existing quarry with all plant operating on a busy day.

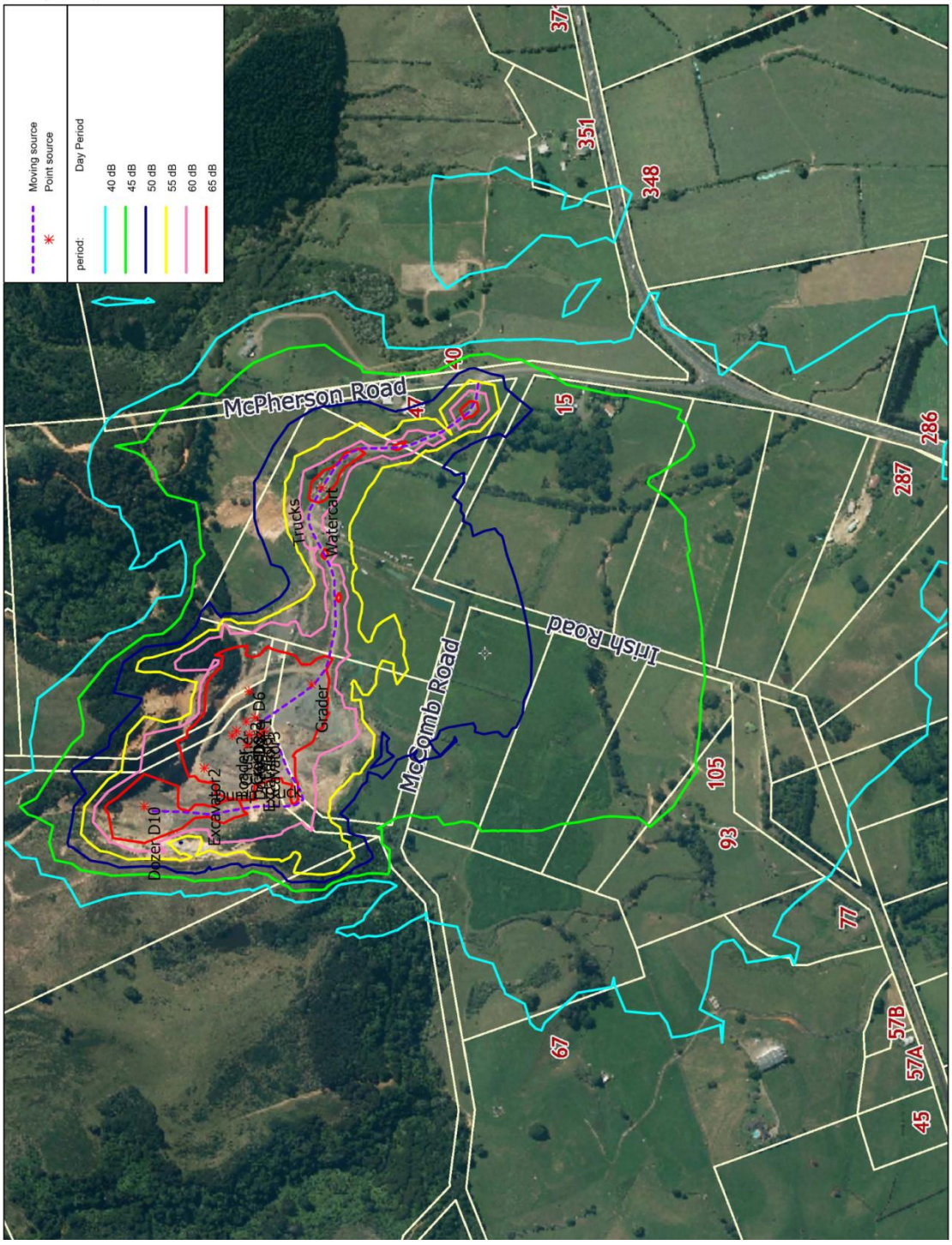

Figure 2. Noise Contours for Existing Quarry Operation - dB, L_{Aeq}

19. Figure 3 shows the results of the noise modelling with quarrying at the top of Stage 1 and closest to the dwellings on a busy day.

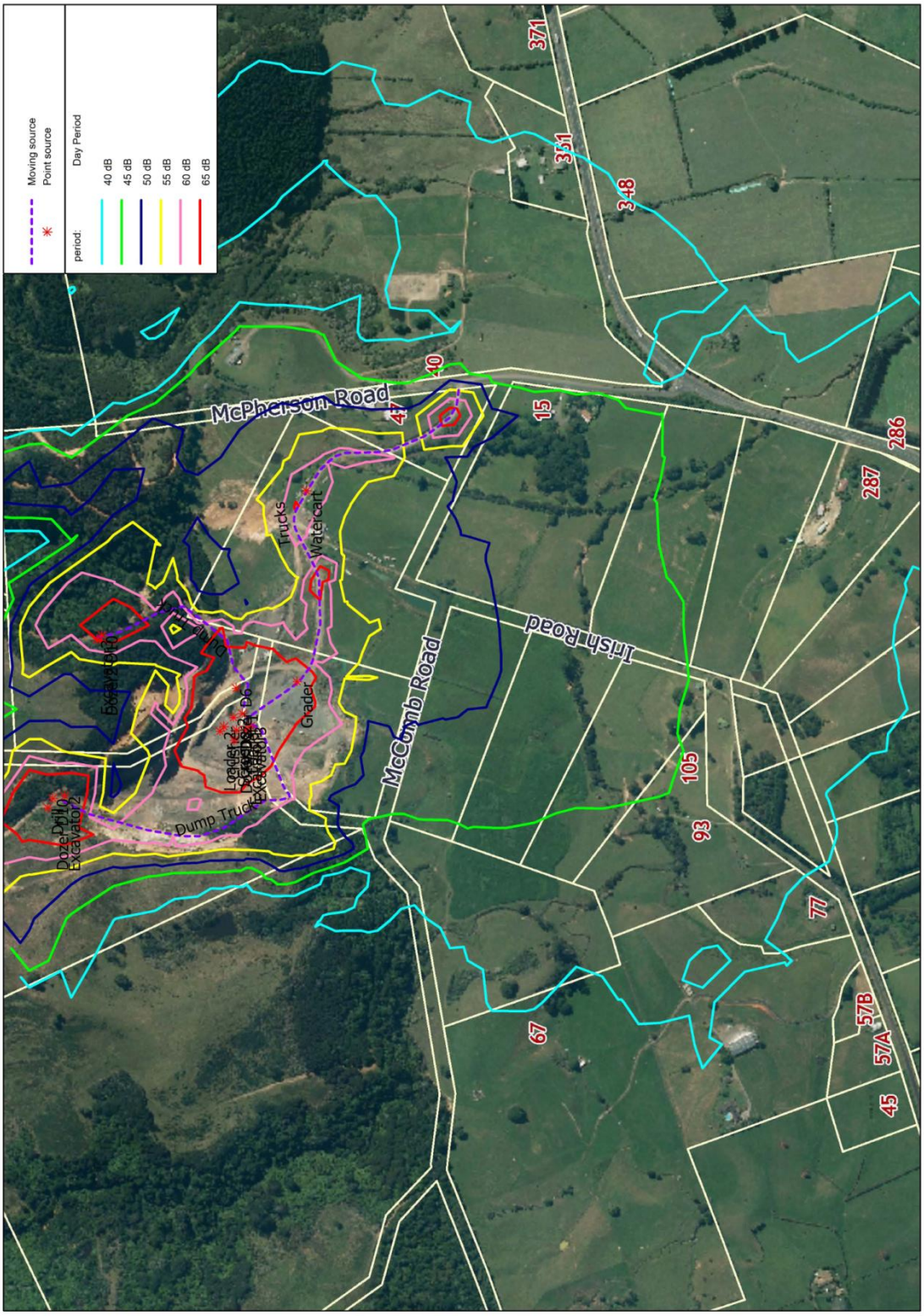

Figure 3. Noise Contours for Stage 1 Operation - dB, L_{Aeq}

20. Figure 4 shows the results of the noise modelling for a busy day with quarrying at the top of Stage 3 at the closest location to the dwellings.

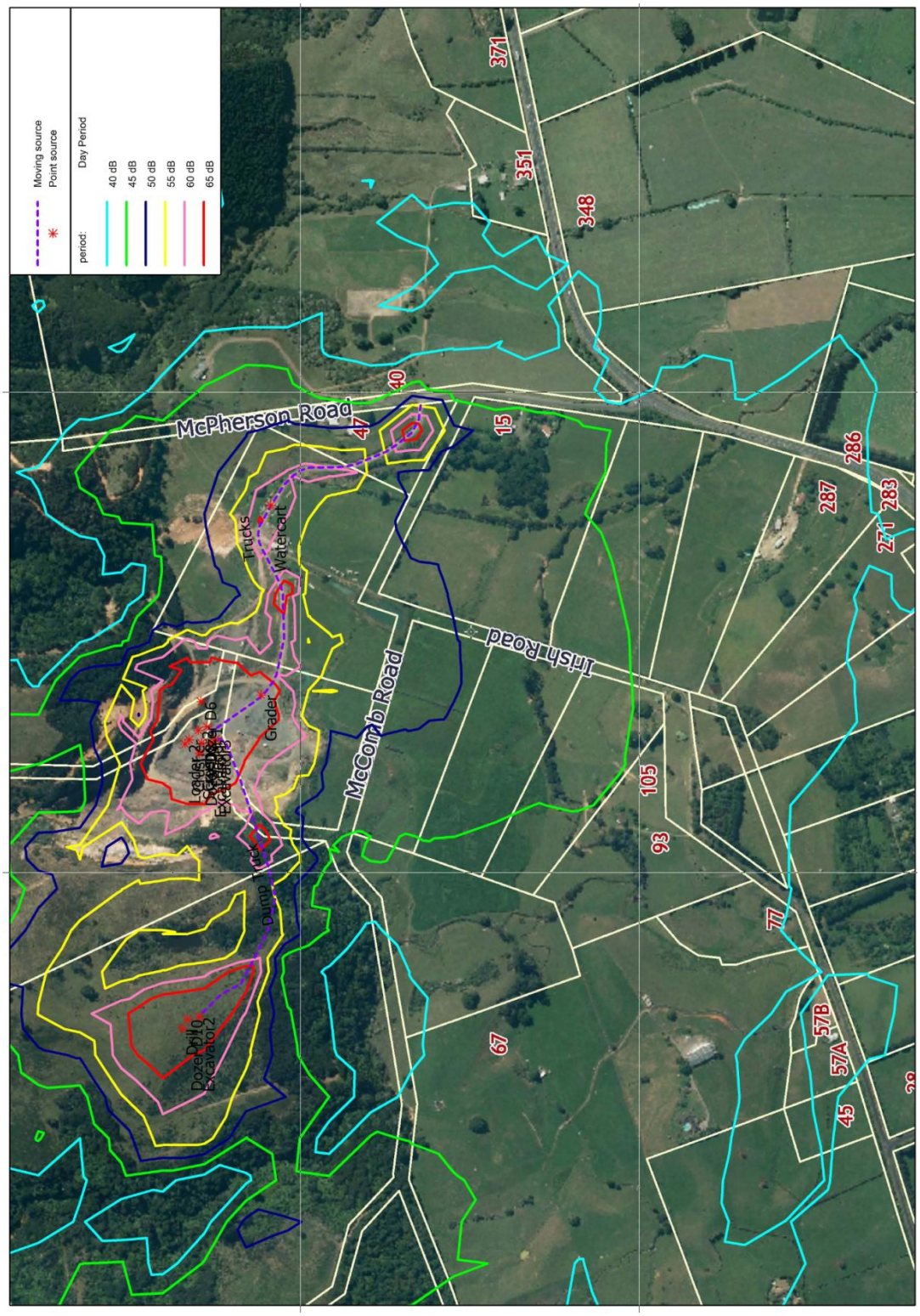

Figure 4. Noise Contours for Stage 3 Operation - dB, L_{Aeq}

21. Figure 5 shows the results of the noise modelling with bulldozer, excavator and rock drill at the most northern area which will generate the highest noise levels for the dwellings to the north of the quarry. No screening of the plant operating is included in this assessment although in practice the equipment will be operating behind a cut face so the levels for the residents will be reduced by a further 7 - 10dB L_{Aeq}.

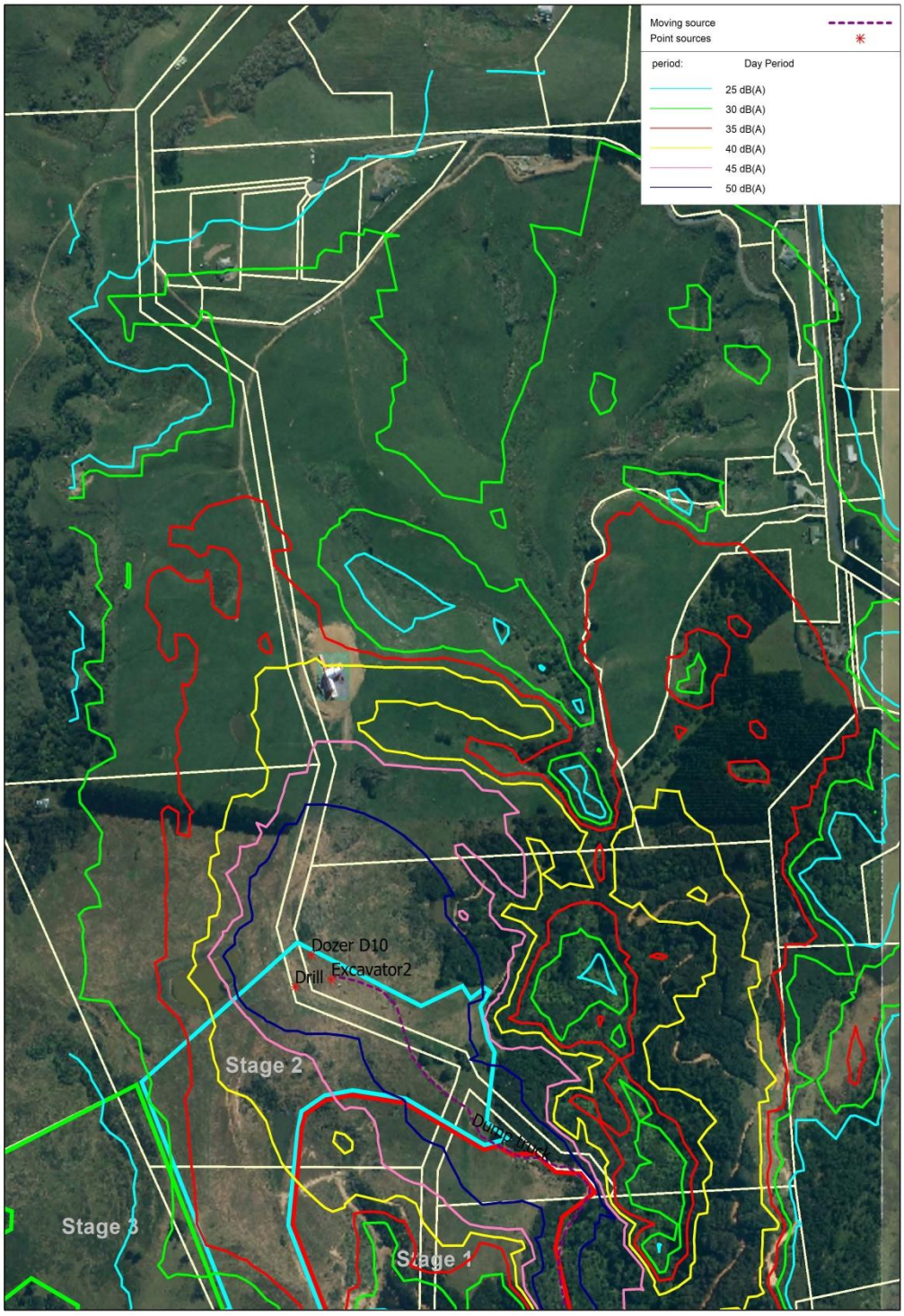

Figure 5. Quarrying (including rock drilling) in the most northern area

22. Figure 6 shows the noise contours when there is quarrying taking place without the rock drill operating.

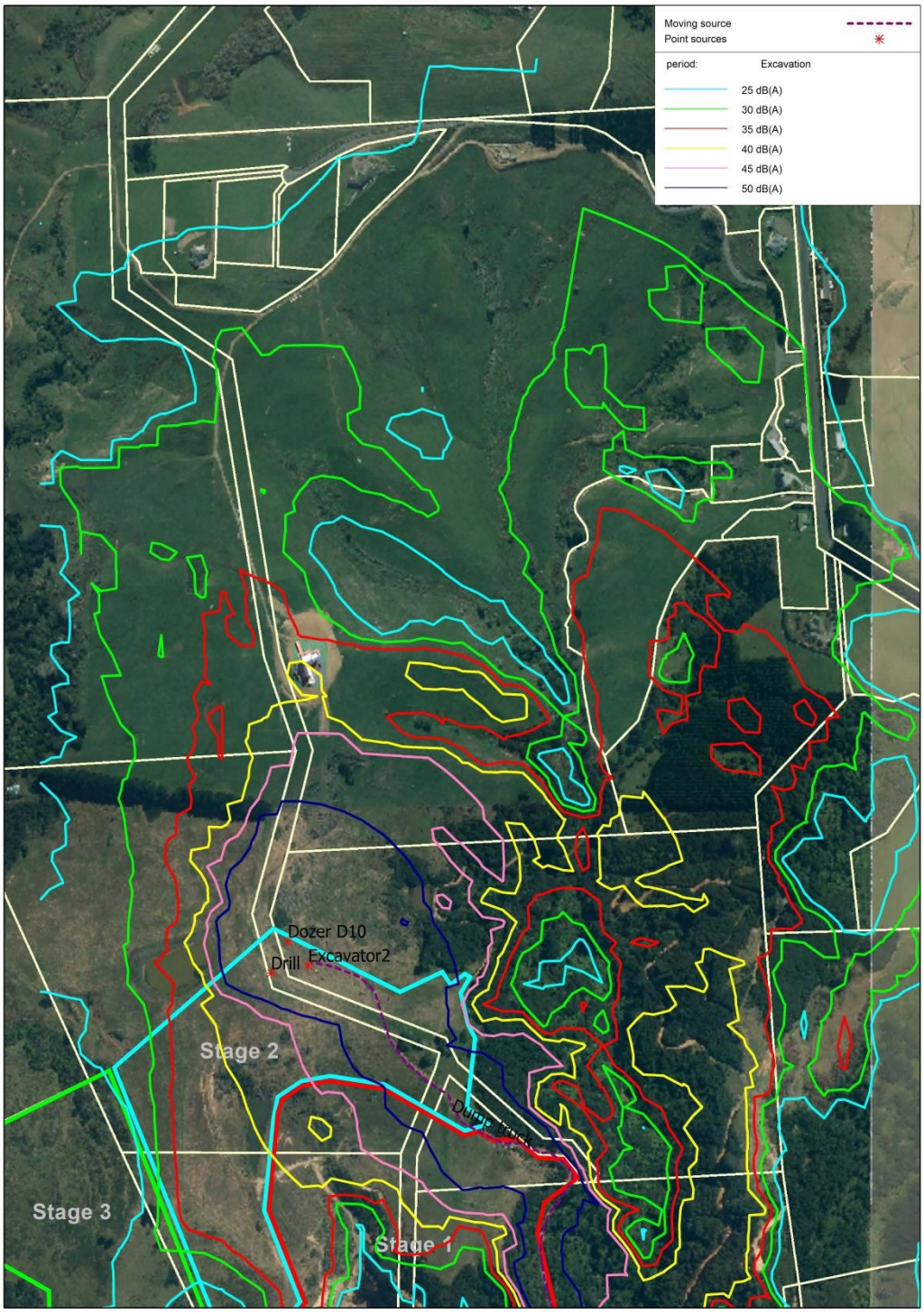

Figure 6. Quarrying (no rock drilling) in the most northern area

23. In addition, the noise levels at the most exposed notional boundary of the closer dwellings (as shown on Figures 7a and 7b) have been calculated at 1.5m above ground level and in the case of two storey houses, also at 1.5m above the first floor level. The results are shown in Tables 1 and 2.

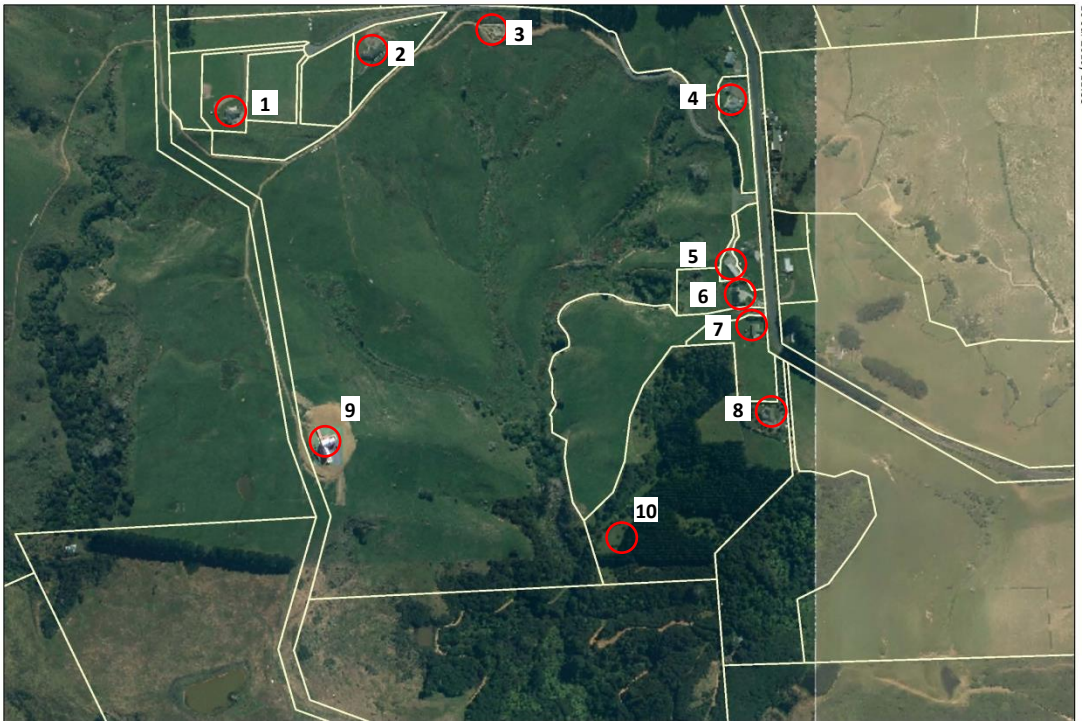

Figure 7a. Location of dwellings to the north

Figure 7b. Location of dwellings to the south

House Site	Noise Level – dB L_{Aeq}		
	Existing[1]	Stage 1[2]	Stage 3[3]
11	39	39	44
12	38	39	40
13	48	48	48
14	45/46[4]	48/49	45/46
15	39	41	40
16	35	37	36

1 Figure 2
2 Figure 3
3 Figure 4
4 Ground floor/First floor

Table 2. Predicted noise for houses to the north of the quarry

Dwelling	Quarrying + Drill[1]	Quarrying only[2]
1	31	29
2	30	28
3	29	28
4	31	29
5	33	32
6	33	32
7	34	33
8	36	35
9	42/45[3]	40/44
10	41/41	40/41

1 See Figure 5
2 See Figure 6
3 Ground floor/First floor

25. These levels represent the worst case scenario, which is unlikely to occur, and shows the level from the quarry operation is well within the daytime 50dB L_{Aeq} limit adopted for the rural zone as set out above. Generally, the level of noise from the quarry and processing area will be lower, as not all of the modelled noise sources will be operating at the same time and will be better screened than occurs for the initial quarrying.

26. In addition to the general quarry activities it is proposed to intermittently operate a surplus overburden and managed cleanfill to the south of the existing quarry as shown on Figure 8.

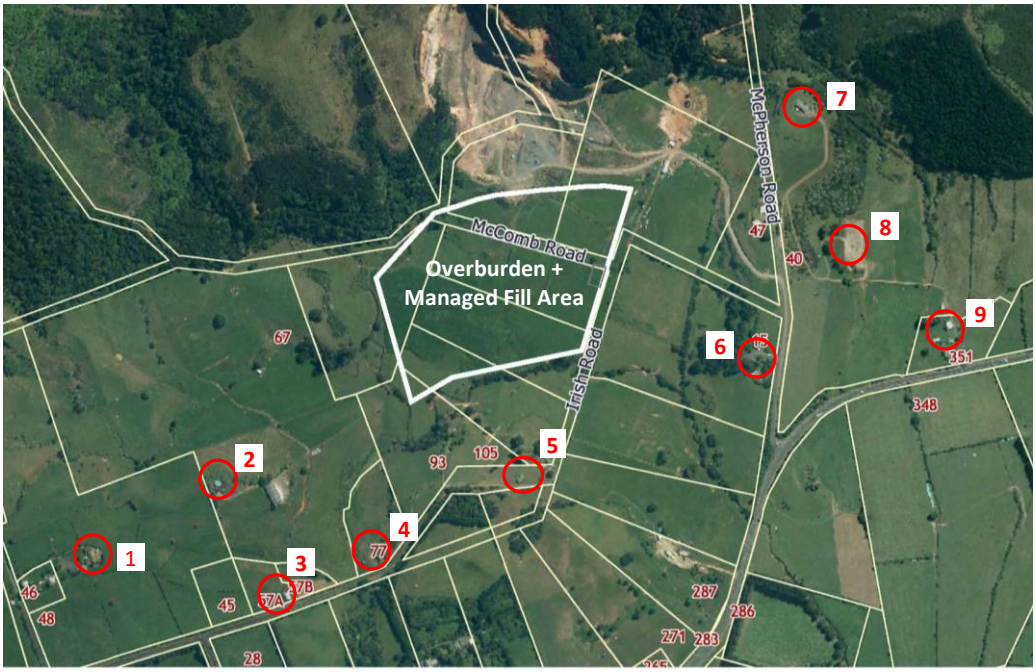

Figure 8. Overburden and managed fill area

27. The managed fill will not generate any additional truck movements, as fill material will be from trucks backloading the import of the fill. The fill will be tipped at a tip head and pushed to the fill position using up to a D10 bulldozer. The assessment has assumed the noisiest machine (D10) pushing the maximum distance to a point closest to the dwellings. At the closest point to the dwellings the managed fill will be lower than further back where there is more height to the fill.

28. The predicted noise contours when operating the managed fill, as set out above plus the quarry operating, are shown on Figure 9. As the quarry and fill both progress to the north the noise that will be experienced by the residents in this area will reduce to the level shown on Figure 9.

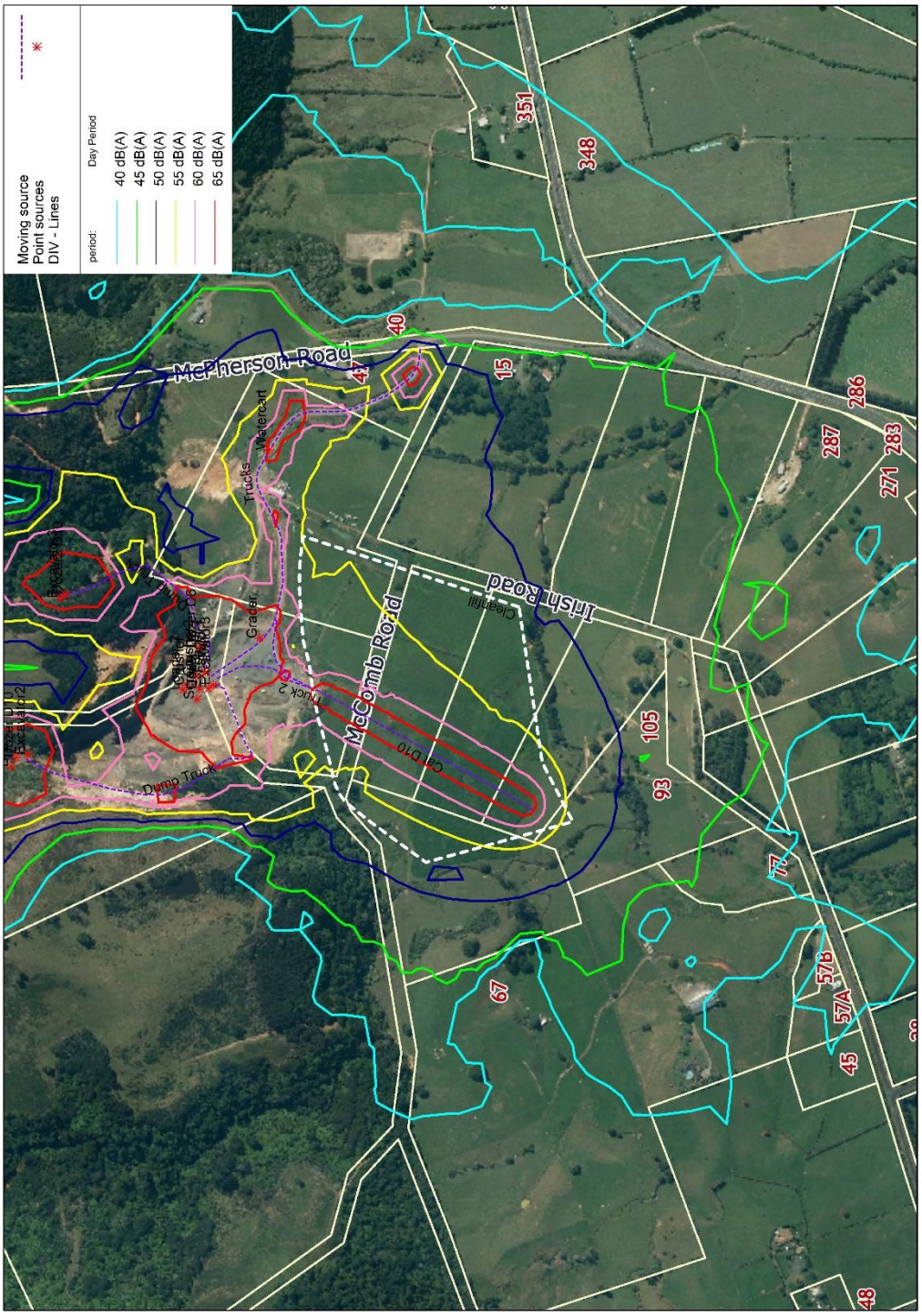

Figure 9. Managed fil + quarry operating, dB L_{Aeq}

29. In addition to the noise contours the level has been predicted at the most exposed notional boundary of each dwelling shown on Figure 8 with the levels as set in Table 3. To enable a comparison with the quarry

operating on its own, the noise for just the quarry operating has been included in Table 3.

Table 3. Predicted noise level at the notional boundaries

Dwelling Site[1]	Noise Level – dB L_{Aeq}	
	Fill + quarry	Quarry only
1	39	37
2	42	39
3	41	39
4	39	38
5	48	45
6	49	48
7	49	48
8	39	39
9	41	41

1 As shown on Figure 8

30. As can be seen from Table 3 the cumulative noise effects from the managed fill will increase the level of noise by a maximum of 3dB L_{Aeq}. Such an increase will be just noticeable.

EXISTING NOISE ENVIRONMENT

31. The existing ambient sound levels were measured in July 2019 and again in October 2020. The weather during the measurement period was fine and mild and the wind varied from calm to a 2m/s south westerly wind at the monitoring positions.

32. For the dwellings 1, 2 and 3, as shown on Figure 7a, the existing noise environment was 44dB L_{Aeq} with a background level of 40dB L_{A90}. The controlling noise at this site was from traffic on State Highway 2. State Highway 1 was also visible from the site and the noise from the highway influenced the measured level.

33. For dwellings 4 – 7 in Pinnacle Hill Road (Figure 7a) the existing noise environment was measured at typically 38 – 40dB L_{Aeq} with a background level of 34 – 36dB L_{A90}. These levels were controlled by general noise in the environment.

34. The existing noise environment in Irish Road was measured at typically 49dB L_{Aeq} and 46dB L_{A90} on a fine, calm day in the early afternoon period. These levels are higher than measured to the north of the quarry and this is due mainly to traffic noise on State Highway 2, which is only 380m from Irish Road.

35. Based on the above noise measurements undertaken in ideal weather conditions the noise from the quarry when operating at the upper level of noise expected will generally be at or below the existing noise environment. As shown in Tables 1, 2 and 3 the quarry noise will be up to about 3dB L_{Aeq} above the existing noise environment at some houses. The noise from any quarry activities will always remain within the proposed daytime limit of 50dB L_{Aeq}.

36. It is noted that while quarry noise is generally at or below the existing noise environment this does not mean the quarry will not be heard, as sounds below both the L_{Aeq} and background sound (L_{A90}) can be heard. However, it does mean the noise is not expected to cause any adverse effects for the neighbours.

SUBMISSIONS

37. The submissions generally express concern about the noise and vibration effects of the quarry operation.

38. As set out above, noise from the highest expected quarry operation will be typically at or below the existing noise environment. At the most exposed dwellings the quarry noise will be up to 3dB L_{Aeq} above the existing noise environment. As a guide, an increase of 3dB would be just

noticeable. At all times, the noise will be below the proposed limit of 50dB L_{Aeq} and this is generally considered to be a reasonable daytime noise limit.

39. Blast noise and vibration from the quarry will always be controlled to well within a reasonable level for the neighbours. Blast noise may be heard by residents although it is unlikely there will be any vibration effects beyond the site boundary. To provide certainty for the neighbours a noise and vibration condition is recommended. Blast noise is already addressed in the District plan at 128dB linear peak although the vibration limits are not as specific in the District Plan. It is recommended a vibration limit for any quarry activity should not exceed 5mm/s PPV at any building not on the same site. This limit will satisfy the submitters' concerns.

40. The noise from trucks on Pinnacle Hill Road has been mentioned. Noise from vehicles on roads is not controlled via the District Plan. In terms of how traffic noise is assessed, any cumulative noise effects from the quarry trucks on the roads will be well within a limit generally accepted as reasonable.

41. One submission has suggested adopting the site boundary as the control point. The aim of any noise control is to protect the area where residents live and hence the notional boundary has been adopted to protect the dwelling and land within 20m of the dwelling. The rural land is a commercial / industrial activity and if that land is to have a noise limit placed on it the level would need to reflect the work environment on rural land. That is, a higher noise level would need to be adopted for rural land.

42. It would be unusual to adopt a noise limit within the rural zone that did not reflect the protection of dwellings. No such control is recommended, as it would also set a precedence for the control of all rural activities

regardless of there being any noise sensitive receiver points. Such a control would set unreasonable expectations and unnecessarily limit the use of rural land, regardless of the use of that land.

43. The proposed noise and vibration controls are expected to satisfy the concerns raised by submitters.

OFFICER'S SECTION 42A REPORT

44. I have read the Officer's s.42A report and with respect to noise and vibration and agree with her findings and recommended conditions without any change. This includes recommended conditions 53 – 58 inclusive

CONCLUSIONS

45. The noise from the increase in quarry production has been predicted based on all of the equipment identified in the quarry and at the proposed stockpile area operating in an exposed location at the same time to reflect the upper level of noise ever likely to be experienced by the neighbours. For most of the time, there will be less equipment operating in the quarry and processing area than has been assumed in the analysis, and hence less noise to the neighbours.

46. Based on all quarry and processing plant operating throughout the day, the noise level that will be experienced within the notional boundary of all existing rural dwellings in the area will be well within the recommended 50dB L_{Aeq}. There are no noise limits for the site in the Operative District Plan.

47. When taking all of the above into account, the noise effects of the existing and proposed quarry production are considered to be less than minor in terms of the requirements of the Resource Management Act.

Nevil Hegley
10 November 2020