

**Before Independent Commissioners Appointed by the Canterbury Regional Council and Selwyn District Council**

**In the matter of**            The Resource Management Act 1991

**And**

**In the matter of**            Applications by **Fulton Hogan Limited** for all resource consents necessary to establish, operate, maintain and close an aggregate quarry (**Roydon Quarry**) between Curraghs, Dawsons, Maddisons and Jones Roads, Templeton

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**REBUTTAL EVIDENCE OF ROGER STEVEN CUDMORE ON BEHALF OF FULTON HOGAN LIMITED**

**AIR QUALITY**

**DATED: 21 OCTOBER 2019**

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## **Introduction**

1. My full name is Roger Steven Cudmore. I am a Principal of Golder Associates (NZ) Limited (Golder) and am the National Technical Leader for Golder's Environmental Services.
2. I have previously provided a written brief of evidence in relation to the Roydon Quarry Proposal. That evidence is dated 23 September 2019. I confirm my qualifications and experience as set out in paragraphs 4 to 8 of that evidence.
3. I also confirm I have read and agree to comply with those parts of the Environment Court Practice Note that bear on my role as an expert witness, in accordance with paragraphs 4 to 8 of my earlier evidence.

## **Scope**

4. In my rebuttal evidence I address the evidence of the following witnesses:
  - (a) Mr Charles Alexander Kirkby;
  - (b) Rhys Boswell;
  - (c) Devin Westley;
  - (d) Gareth James Mitchell;
  - (e) Brian John Reddington; and
  - (f) Jane Caroline Cartwright.
5. I will also identify matters not discussed in my primary evidence but which are raised by other witnesses and with which I agree.

## **Mr Kirkby**

6. I respond to specific paragraphs in Mr Kirkby's evidence below.
7. In paragraph 15, Mr Kirkby suggests that the perimeter bund should be set back 100 m from each of the dwellings at 319 Maddison Road and 153 Currags Road as well as quarry activities. I disagree with this. The sections of perimeter bund that would be within 100 m of these dwellings will require a relatively short time (several days to a week)<sup>1</sup> to construct as this

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<sup>1</sup> I have discussed the bund construction with Mr Jolly of Fulton Hogan who advises a 100 m section of bund would take only several days to construct.

involves appropriately 150 m of bund length. During this time, water suppression of dust can be readily employed to control dust emissions to minor levels. Requiring the bund to kink into the quarry, as result of Mr Kirkby's recommendation, is an unnecessary life-time restriction on the quarry, in response to a very short duration scenario during which dust emissions can be effectively mitigated.

8. At paragraph 16 he discusses the sealing of the entire access road. To avoid any confusion, the entire access road is the road for which trucks enter the site, circle the processing area and then exit the site. It does not include other site roads for which reject material is recommended. It also does not include areas where the trucks pull over and park whilst they are loaded with aggregate products.
9. At paragraph 25.8.1, Mr Kirkby makes the assumption that this means the entire site access road within the central processing area. To be clear, this is the main access road that circles the outer edge of the central processing area, it is not within the central processing area itself.
10. At paragraph 20, Mr Kirkby states that scaling factor of 0.1 is somewhat arbitrary and may be insufficiently conservative. This is in relation to the increase in PM10 measured during the Yaldhurst Air Quality Monitoring study reported by Mote (2018).<sup>2</sup> I disagree with this assessment of the scaling factor.
11. The assumption that a ten-fold reduction in the impact of the proposed Roydon quarry (the Proposal) on ambient PM10 compared to the multiple sites at Yaldhurst is based on a qualitative comparison of the physical features of the Proposal to the multiple contiguous sites at Yaldhurst, and specifically in relation to northwest wind conditions. These conditions were found to create the most significant increased ambient PM10 at the Yaldhurst quarry site (which is not a surprise given the hot, very dry and gusty character of these winds). During such conditions, the area active quarry available for generating dust is in the order 10x greater at Yaldhurst than it would be the Roydon site (230 ha versus 26 ha). However, this is not the key difference that supports the 0.1 scaling factor – it is the radically different design features of Roydon versus the Miners Block of quarries at Yaldhurst that is most significant.

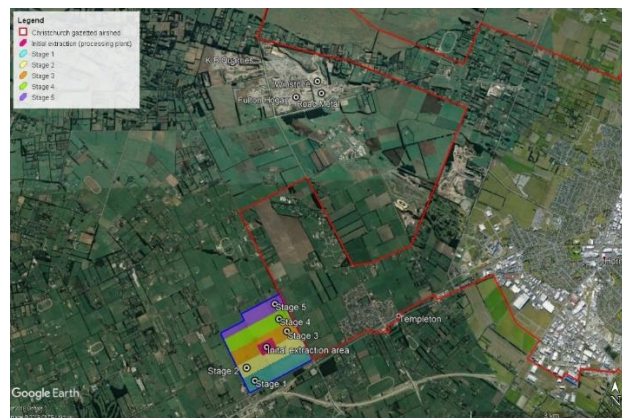
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<sup>2</sup> Mote (2018): *Yaldhurst Air Quality Monitoring – Summary Report 22 December – 21 April 2018*, June 2018, Paul Baynham.

12. The design features for Roydon will, without any doubt, result in dust generation per unit area that is at least an order of magnitude or more less than the dust generation per unit area at the Miners Block quarries at Yaldhurst. To reiterate my primary evidence, the key design features (from my perspective) include the use of a fully sealed, periodically vacuumed access ring road, conveying of extracted materials in-stead of multiple haul truck movements, reject material covering internal access lanes and open areas. Finally, the compact and simplified layout of the central processing plant with its high level of dust control effectively eliminates its influence on ambient PM10 levels.
13. As noted by Mr Kirkby (his paragraph 20), the ambient monitoring downwind of the Yaldhurst site was 100 m from the site boundary. However, this is a minor factor (i.e. causing a further reduction in PM10 within the order of only 10% down from levels occurring at that boundary). This is of very minor significance compared to the overriding impact of the relatively lower area and very low dust generation potential per unit area for the Roydon site.
14. Given the above, I consider that the scaling factor of 0.1 and much lower, is very likely to be conservative and this points to compliance with Regulation 17 (1) of the NESAQ, being practical to achieve given the compact layout, design features and proposed mitigation measures for the proposed Roydon quarry.
15. At paragraph 21, Mr Kirkby states that he does not agree with my estimates of increased ambient PM10 due to the proposal (Table 4 of my primary evidence), based on the scaled results from Yaldhurst that vary with wind directions. I understand Mr Kirkby's point of contention is that the variations in ambient PM10 effects at Yaldhurst will not necessarily apply to the Roydon site. His reasons for this are reasonable for sites of similar design features.
16. However, given the design features for the Roydon quarry (summarised in paragraph 12 above), I consider that the different characteristics of different types of winds will be most influential at Roydon as they were at Yaldhurst. Southerlies have the characteristic of being cold and associated with rainfall, and northwesterlies and to a lesser extent, northerly easterlies are associated with fine, dry conditions, which have a far greater potential to cause dust emissions compared to southerlies. Table 4 of my primary evidence reflects this.

17. The NESAQ for PM10 requires a maximum cumulative impact of 50  $\mu\text{g}/\text{m}^3$  (24 hour average) at the nearest house. Whichever incremental ambient PM10 values are used in Table 4 (for any wind direction), I conclude that this outcome is likely to be met.
18. Having considered the inherent conservatism within the 0.1 scale factor (discussed in paragraphs 11 to 14 above), and the range of results of estimated incremental ambient PM10 in Table 4 of my primary evidence, I also conclude that compliance with Regulation 17 for incremental ambient PM10 effects within the neighbouring gazetted airshed is likely to be met.
19. At paragraph 22, Mr Kirkby states his view that the applicant has not demonstrated that the Proposal will comply with the requirements of Regulation 17. I assume Mr Kirkby means that the Applicant has not demonstrated that it is *likely* that the Proposal will comply with Regulation 17, but in my view, Mr Kirkby has provided no basis for statement. Mr Kirkby has questioned the 0.1 scale factor's validity, but has not provided an alternative analysis of how the proposed Roydon quarry design will perform in terms of dust effects. Therefore, with due respect, I do not consider Mr Kirkby's evidence provides any material support for reaching the view that compliance with Regulation 17 is not achieved in this instance.
20. Irrespective of the above, it is my professional view that Regulation 17 is irrelevant to this proposal in terms of effects on air quality. There is a lack of case law regarding this matter, but this aside, there are rational reasons for not applying Regulation 17 to this application in my view. The main one being that doing so represents an unintended use of the regulation as it applies to a scenario where the air quality impacts are not within a polluted area of the Christchurch airshed. As such the PM10 emissions from the proposed quarry would not exacerbate existing ambient PM10 levels across the boundary that are non-compliant with the NESAQ.
21. Regulation 17 was designed to avoid applications for new air discharges being able for further exacerbate levels of ambient PM10 where these were at or near to the NESAQ limits and therefore causing adverse effects. Gazetted airshed boundaries should by definition apply to such areas. However, in this instance the Christchurch gazetted boundary extends well beyond significantly affected areas as it extends into rural land. This area is well to the east of Christchurch City's dense urban population and associated winter-time pollution issues.

22. In this instance the western extent of the gazetted airshed boundary has nothing to do with problematic ambient PM10 levels. This is highlighted by the following figure, which shows the boundary as a redline. From this it is clear that application of Regulation 17 in this instance, applies to rural land where people are not exposed for the relevant time frame and for which degraded urban air quality does not apply. This is not the purpose for which Regulation 17 was promulgated in my view. This means investigation of compliance by Fulton Hogan is necessary to address a technical issue but regardless, Fulton Hogan's discharges of PM10 are not very likely to cause, or exacerbate adverse effects that are related to elevated ambient PM10 during cold still days within polluted areas of Christchurch City's urban air shed.



23. At paragraph 25.1, Mr Kirkby suggests that meteorological monitoring should begin prior to earthmoving activities. I agree and it comes down to the meaning of quarrying activities, which I assumed to include any earth works at the site.

24. I agree with Mr Kirkby's suggestion (his paragraph 25.2) for a minimum stall speed for which acoustic based devices can readily achieve stall speeds below 0.5 m/s. I suggest a provisional stall speed of 0.5 m/s, based on that being confirmed by suppliers. However, for a short averaging time frame of 1-minute for wind direction values, a scalar average is accurate and more practical to implement. However, the intention is to calculate vector average values from the 1-minute scalar average data for wind speed and direction and record these results for longer averaging periods (e.g. ten minute and hourly).

25. I agree with Mr Kirkby's view (his paragraph 25.3) that SOPs are reviewed regularly as they form the essential components of the DMP.
26. I also agree with Mr Kirkby's suggestions (his paragraph 25.4) that PM10 monitoring is instead referred to as "particulate monitoring". Likewise, I agree with the suggested expansion to the wording of Condition 7(f) so this now refers to "*ambient particulate and meteorological monitoring equipment*" in place of PM10 monitoring equipment.
27. I accept the proposed expansion to the scope of the DMP review as suggested by Mr Kirkby (his paragraph 25.5) although in practice the key focus of the DMP should be the management of discharge of contaminants into air beyond the boundary to a level that is offensive, objectionable, noxious or dangerous.
28. At paragraph 25.8, Mr Kirkby refers to the site access/exit road in relation to proposed condition 18(a), however, this refers to haul roads that I consider to be internal roads (not the main access/edit loop). This can be clarified in Condition 18(a).
29. At paragraph 25.8.2, Mr Kirkby notes concerns with proposed condition 18(k). I agree this condition can be made more clear and enforceable. If there are any loads with fine dusty materials leaving the site, then they need to be covered as well as dampened.
30. I partly agree with Mr Kirkby in his paragraph 25.8.3 where he suggests that washing or vacuuming of paved areas is needed. I have recommended vacuuming only, as I consider water application is a waste of water and can lead to mud formation and creation of dust emissions at a later date.
31. At paragraph 25.8.4, Mr Kirkby notes a conflict between 18(a) and 18(x). As discussed, the former relates to haul roads and not the main access/exit ring road. Mr Kirkby's understanding that the site access road (a ring road into and out of the site) will be sealed. This is my understanding as well and also it is my recommendation that this is a key design feature that significantly reduces the dust potential from the Proposal compared to conventional quarries such as those located within the Miners Block.
32. At paragraph 25.10, Mr Kirkby notes confusion regarding the number of particulate monitors. To my mind the wording is clear that there is at least one PM<sub>10</sub> monitor (US EPA or NESAQ) compliant device to be operated at the eastern boundary. Regarding the number of non-compliant dust

monitors, the number required will be dedicated by meeting the requirements of the condition. Therefore, one device would be the minimum but at some stages, several devices may be required. That aside, the condition could be more clear in this respect and stipulate the use of a second device as originally proposed.

33. At paragraph 25.13, Mr Kirkby recommends refinements to the wording of Condition 22 and I consider these are useful and should be accepted.
34. I agree with Mr Kirkby's views, as expressed in paragraph 25.14 regarding the review of trigger levels.
35. At paragraph 25.15, Mr Kirkby expresses his view that the caveats expressed in Condition 24 for implementing the responses required under Condition 23 be restricted. Specifically, the proposed change recommended by Mr Kirkby would mean that if the trigger levels for ambient particulate were not being breached when a sensitive receptor is within 250 m downwind of active quarrying/clean-filling areas, then all quarrying activities must cease because the wind speed is above 7 m/s and following a period of 12 hours or more of there being no rain at the quarry site.
36. Mr Kirkby's recommendation may aim to reduce the risk of nuisance dust effects, but it is unduly conservative in my view. The condition as worded would require particulate trigger levels at the boundary to be complied with during such wind events, and there are to be no sign of dust plumes beyond the boundary dispersing towards a downwind dwelling. Also, it requires that there are no reports of such effects coming from the occupants during an event or similar other occasions. The design of the proposed quarry may well allow for such wind conditions to occur while the quarry operates and not cause nuisance effects on sensitive locations directly downwind.
37. At paragraph 25.16, Mr Kirkby recommends a change in wording in proposed Condition 25. This refers to visible dusty plumes more than 30 m beyond the site boundary. Mr Kirkby considers this should read as "*...dusty plumes more than 30 m at the site boundary*". I am not clear of the material difference this change would make. Having reconsidered the proposed condition 25, I considered its wording is appropriate.

### **Mr Boswell**

38. I note the photograph provided in Attachment 1 of the evidence provided by Mr Boswell. This shows atmospheric dust to the southwest of the



Christchurch airport during strong north westerly wind conditions. This photograph reinforces my earlier statements in response to Mr Kirkby's evidence. That is, north west winds have the greatest potential to generate dust from quarries in general when compared to other wind conditions.

39. As noted by Mr Boswell, I state in paragraphs 156 and 160 of my primary that I am unaware of quarries causing any material effects for pilots and I do not expect impairment of pilot visibility due the proposed Roydon quarry. This photograph does not change my view.
40. Mr Boswell's photograph shows a significant dust plume that is quite possibly due to the Yaldhurst quarry area (especially when considering the large areas of exposed gravel surface and haul roads within this 230 ha area). Nevertheless, it is not clear that this resulted in a material impairment to pilot visibility, or if this dust plume is derived from the Waimakariri River itself. Whatever the case, there is no doubt that pilots would clearly observe dust from local quarries (on some occasions) as they land and take off from Christchurch airport. Whether this materially impairs their visibility is not clear and Mr Boswell's photograph (as dramatic as it is) is not clear evidence of pilot visibility being materially impaired while approaching or taking off from Christchurch airport.
41. On the types of day that are highlighted in Mr Boswell's photograph (Attachment 1 to his evidence), it is likely that pilots landing aircraft or taking off from the airport, would have some impairment of visibility due to high background levels of atmospheric dust. But this would most likely be generated from the Waimakariri and Rakaia river-bed systems, which are well known for causing a wide-spread haze over large areas of the Canterbury plains on days of strong hot north west wind.

### **Mr Westley**

42. Mr Devin Westley provided evidence that outlines concern regarding the potential for dust discharges from the Proposal adversely effecting plants at the Southern Woods nursery. The nursery would be located approximately 300 m south to southwest of the nearest extent of future active quarrying areas. Given this distance downwind from the active quarry, the quarry design, mitigation and real-time monitoring then I consider there would be a low potential for plants at the nursery to receive significant dust deposition

(4 g/m<sup>2</sup>/month<sup>3</sup> above background levels) effects. It is particularly unlikely that dust deposition would occur at this distance to an extent that is visible and/or coats the leaves of plants to an extent that adversely affects leaf function.

43. I expect that the construction earth works in recent years associated with the Southern Motorway Project occurring within 50 to 100 m of the nursery would have had a far greater potential for adverse vegetation effects at the nursery compared to the Proposal. Mr Westley does not state whether or not the nursery plants experienced such effects from this construction project, although I note that Mr Mitchell's evidence (discussed below) refers to disruptions from this and the Canterbury earthquakes.
44. In paragraph 22 of his evidence, Mr Westley notes that his research confirmed that solid low permeability shelter belts, such as the existing conifer hedges are not hugely effective at filtering dust. That can be true when dust plumes are associated with stronger winds – a situation that the Proposal is likely to avoid in the first instance. However, during light wind conditions, a dense mix of native bushes and trees on the perimeter bund will help filter out dust particles and successive rainfall events ensure these are incorporated into the bund's soil structure.

### **Mr Mitchell**

45. Mr Mitchell also provides evidence on behalf of the Southern Woods nursery. In paragraph 4 of his evidence Mr Mitchell refers to disruptions that the nursery has withstood including those from the Southern Motorway Project. As indicated in my response in paragraph 43 to Mr Westley's evidence, the potential of the Proposal to cause adverse effects on vegetation at the nursery would be very low compared to the motorway project.
46. In paragraph 16 of his evidence Mr Mitchell states that there cannot be too much monitoring or reporting and there needs to be specific and certain responses to any evidence of issues arising. I agree with the latter statement and consider the proposed monitoring and reporting for the Proposal is likely to ensure effective actions are taken during the proposal quarry operation as soon as real-time particulate monitoring data, or other information comes to hand. In that sense the proposed DMP for this application represents a

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<sup>3</sup> Recommended trigger level for deposited solids in the Ministry for the Environment's *Good Practice for Assessing and Managing Dust*. Publication No. ME 1277, November 2016.

significant advancement over what has been the norm for the quarry sector in Canterbury.

47. I disagree with Mr Mitchell's assertion there cannot be too much monitoring and reporting. My view is that air discharge consents can often have excessive monitoring and reporting that is pointless and provides a very poor return to the applicant or the community given the resources that goes into them. For this application, I have recommended monitoring and reporting that I consider to be important and effective, but not excessive and overwhelming. Burdening owners of air consents with excessive environmental monitoring and reporting requirements works against effective environmental management, rather than enhances it.

#### **Jane Cartwright**

48. In paragraph 5 of her evidence, Ms Cartwright states her view that the proposed quarry is too close to where people live and that the mitigations are inadequate given the vulnerability of people they provide services to. I sympathise with the concerns Ms Cartwright has with the proposal and the vulnerability of people at Brackenridge to ambient stressors such as dust. However, I am of the firm view that the proposal site is sufficiently distant from Brackenridge to cause a negligible or less potential for any deposited or ambient dust exposure due to the Proposal.

#### **Mr Reddington**

49. In paragraph 8, Mr Reddington indicates his request that the Commissioners take cognisance of the unique effect that the approval of the application to quarry at Templeton by Fulton Hogan Limited (the Application) would have on the physical, mental and sensory wellbeing of these people.
50. I consider that the Proposal is highly likely to have negligible or less effects on physical or sensory wellbeing upon the residents of Brackenridge due to any dust discharges. This is because of the 1.15 km distance between the Proposal and Brackenridge and mitigating factors including the proposed scale and design of the Roydon quarry and the mitigation of dust generated.
51. In paragraph 9 of his evidence, Mr Reddington confirms that when the Brackenridge Services Ltd (formerly Templeton Hospital) was incorporated in 1999 that the Government of the day gave an undertaking that the clients had a home for life on the site.

52. In paragraph 10 of his evidence, Mr Reddington states his opinion that the potential adverse environmental effects of a quarry operation with 1.15 kms, place the quality of this lifelong undertaking, at risk. However, the risk to Brackenridge residents as a result of dust discharges caused by the Proposal would be negligible in practice.

**Roger Cudmore**

21 October 2019