

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

SUPPLEMENTARY EVIDENCE OF AUDREY WAGENAAR ON BEHALF OF FULTON HOGAN LIMITED

RESPONSE TO PANEL REQUEST FOR ELABORATION

DATED: 28 NOVEMBER 2019

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Introduction

1. My full name is Audrey Kathleen Wagenaar. I am an Associate and a Senior Environmental Scientist at Golder Associates Ltd.
2. I have previously provided a written brief of evidence and two briefs of rebuttal evidence in relation to the Roydon Quarry Proposal. My primary evidence is dated 23 September 2019. I confirm my qualifications and experience as set out in paragraphs 5 to 15 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 paragraph 7 of my primary evidence.

Scope

4. This supplementary evidence responds to a request made by Commissioner McGarry in the course of my evidence being heard during the first week of hearing.
5. In particular, I have been asked to expand upon paragraphs 44 to 48 of my primary evidence and explain further why the guidelines for particulate matter are based on an “acceptable or tolerable” level of risk as opposed to a “completely negligible” risk.
6. The audio transcript of my evidence presentation can be found on the file relating to Tuesday (19 November) morning, at approximately 2 hours and 50 minutes into the Tuesday morning session.

Guidelines for Particulate Matter

7. The World Health Organization (WHO) states that for airborne particulate matter a threshold concentration below which no adverse effects are expected is not likely to exist (WHO 2006)¹. Particulate matter is considered to be a stressor that can cause negative health outcomes at any exposure

¹ World Health Organization (WHO). 2006. *WHO Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide, Global update 2005, Summary of risk assessment*. WHO, Geneva, Switzerland.

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- level and therefore lacks a threshold that can be used to set a guideline (WHO 2006).
8. The WHO (2006) therefore suggests that a guideline for particulate matter should be set based on achieving the lowest particulate matter concentration possible, given the local context and priorities of the region.
 9. Therefore, for particulate matter, the guideline values are concentrations that correspond to a tolerable or acceptable level of risk (e.g., the guideline is set at the lowest particulate matter concentration possible considering typical local background levels) and rather than a negligible risk that would be fully protective of human health (WHO 2006).
 10. The WHO acute (e.g., 24-hour) air quality guidelines for PM_{2.5} and PM₁₀ based on a number of studies in North America, Asia and Europe that suggest there is an increase in mortality of approximately 0.5% for every 10 µg/m³ increase in 24-hour PM₁₀ concentration. The WHO guideline acute air quality guideline for PM_{2.5} is based on based on the relationship between PM_{2.5}: PM₁₀ air concentration ratios in developing and developed countries (e.g., a factor is used to convert the PM₁₀ guideline to a PM_{2.5} guideline).
 11. The WHO (2006) chronic (e.g., long term or annual) air quality guidelines are based on a PM_{2.5} concentration that is just below the lower level of the range at which significant effects on survival were observed in several large international studies on cardiovascular and respiratory effects.
 12. WHO (2006) indicated that “Although adverse effects on health cannot be entirely ruled out below these levels, the annual average WHO air quality guideline value represents that concentration of PM_{2.5} that has not only been shown to be achievable in large urban areas in highly developed countries, but also the attainment of which is expected to significantly reduce the health risks.”
 13. Similar to the WHO (2006) acute air quality guidelines, a factor representing the ratio of PM_{2.5}/PM₁₀ in air in developed and developing countries is used to convert the PM_{2.5} air quality guideline to a PM₁₀ guideline.

Audrey Wagenaar

28 November 2019