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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SUPPLEMENTARY EVIDENCE OF ERIC ROLAND VAN NIEUWKERK ON BEHALF OF FULTON HOGAN LIMITED

RESPONSE TO SUBMISSION BY MS DAVINA PENNY

DATED: 29 JANUARY 2019

Counsel Acting: David Caldwell
Email: david.caldwell@bridgesidechambers.co.nz
Telephone: 64 21 221 4113
P O Box 3180
Christchurch 8013

Introduction

1. My name is Eric Roland Van Nieuwkerk. I hold the position of Senior Hydrogeologist at Golder Associates (NZ) Limited (Golder).

2. I have previously provided evidence, rebuttal evidence and a summary statement in relation to the Roydon Quarry Proposal. My primary evidence is dated 23 September 2019 and rebuttal evidence is from 21 October 2019. I confirm my qualifications and experience as set out in paragraphs 4 to 8 of my primary 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 9 of my primary evidence.

4. Ms Davina Penny provided evidence on 9 December 2019 in which she raised concerns about several matters relating to the application's Assessment of Environmental Effects (**AEE**), my evidence in chief and my rebuttal evidence. I consider the following matters raised by Ms Penny are within my field of expertise:

   (a) Ms Penny disagrees with my assessment of the Highest Recorded Groundwater Level, or **HRGL** (which is the same as the Seasonal High Water Table for the purpose of this application).

   (b) Ms Penny raises several concerns about potential effects on groundwater quality.

   (c) Ms Penny considers the applicant's current groundwater take consent CRC182422 is insufficient to meet the water demand for the proposed quarry.

5. I understand the Commissioners' have sought a response from the applicant in respect of Ms Penny's concerns listed above. My supplementary evidence seeks to provide the technical information for that response and the necessary clarification with it.

Assessment of the Highest Recorded Groundwater Level (HRGL)

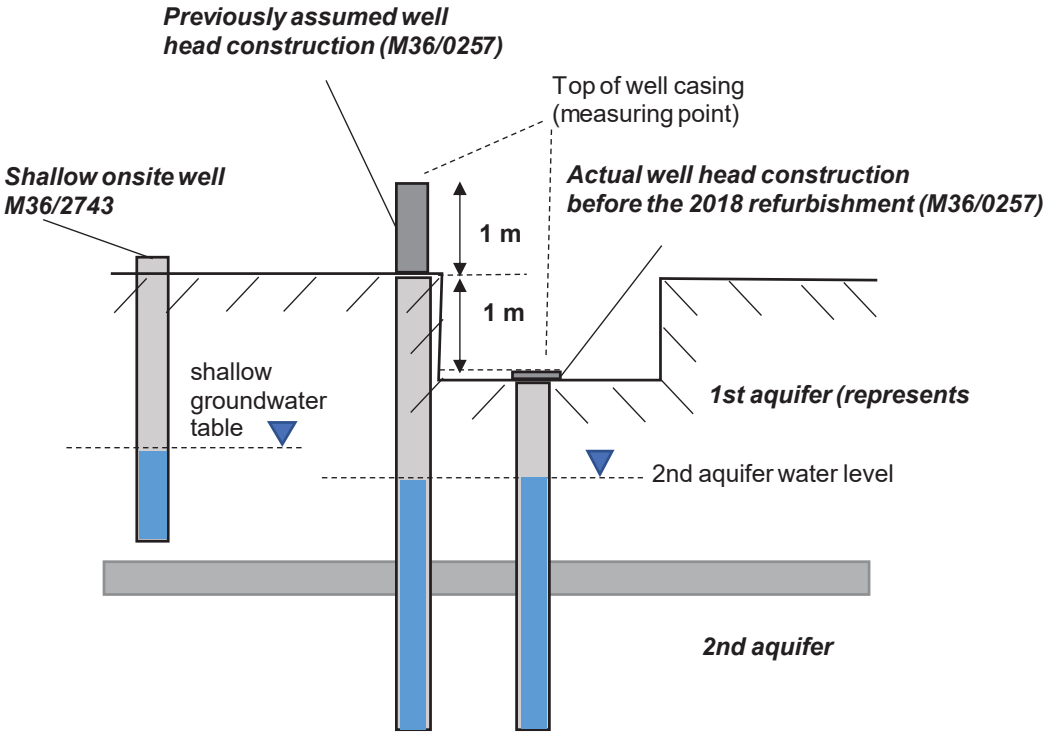
6. In paragraph 2 of Ms Penny's evidence,[1] Ms Penny notes that historic groundwater level records for the onsite water supply well M36/0257 are

[1] Evidence from Ms Davina Penny which was provided in writing on Monday 9 December 2019.

available on Canterbury Regional Council's (**CRC**) wells database, where the AEE states that they are not.

7. I confirm that there are historic groundwater level records for M36/0257 and the AEE is incorrect in this regard. CRC's wells database lists 26 records for the period 23 February 1974 to 7 June 1989, and 2 records on 18 August and 12 September 2017 respectively. According to the well card shown on CRC's wells database (included in Appendix A of my evidence in chief) the measurement point elevation was estimated from topographic contours and has an accuracy of < 2.5 m. In my opinion then, the historic recorded groundwater levels cannot be accurately referenced to a height in m RL.

8. In addition, Dr Lisa Scott gave evidence on 11 December 2019, that the measurement point height of well M36/0257 at the time the historic records were taken, was listed incorrectly on CRC's wells database. The well head was installed in a manhole and the measurement point was in reality 1 m <u>below</u> ground level, and not above ground level as listed in CRC's wells database. This means that historic groundwater levels are 2 m deeper than presented by Ms Penny, as shown in the diagram below. I understand this has now been corrected on the well database.



9. The applicant refurbished the onsite well M36/0257 in 2018 and the ground elevation was surveyed. Groundwater levels have since been recorded

continuously every 15 minutes, and these are shown in Figure 1 of my evidence in chief.

10. However, the onsite water supply well M36/0257 has a depth of 63.4 m below ground level and is screened in a deeper aquifer, being the semi-confined Linwood Gravels Aquifer, according to the well card shown on CRC's wells database (included in Appendix A of my evidence in chief). Hence, this well does not represent the shallow Springston / Riccarton Gravel aquifer which holds the shallow groundwater table (see diagram in paragraph 7 above). Only wells drilled to a shallow depth into the Springston / Riccarton Gravel aquifer will show a water level that represents the shallow groundwater table. In my opinion, groundwater levels from well M36/0257 cannot be used to derive the highest recorded groundwater level on site. For this reason, I have not listed the historic records for M36/0257 from 1974 to 2017 in my evidence in chief.

11. In paragraphs 41 to 49 of my evidence in chief, I have therefore presented an analysis of the HRGL based on groundwater level records from nearby CRC monitoring well M36/0202 and the four onsite monitoring wells DRBH1, DRBH2, DRBH3 and DRBH4 - all of which are screened in the shallow Springston / Riccarton Gravel aquifer. The results of my analysis are shown in Figure 3 and the second map on the last page of my evidence in chief with title 'Maximum Quarry Floor Surface at 1 m above the Seasonal High Water Table'.

12. The bore logs and most of the technical details of these four onsite monitoring wells are listed on CRC's wells database. The technical details of well M36/0257 and the four designated monitoring wells are included in the table below. Groundwater levels for the four designated onsite monitoring wells are also recorded at 15-minute intervals and shown in Figure 1 of my evidence in chief.

Well Number	NZTMX	NZTMY	Survey Elevation[1] (ground level in m RL)	Collar Elevation[2] (ToC in m RL)	PVC Collar Stickup (m to ground level)	Depth (m)
DRBH1	1554615	5177019	50.5	51.14	0.58	21
DRBH2	1554917	5177690	51.3	51.91	0.61	21
DRBH3	1555394	5176413	44.7	45.31	0.37	21
DRBH4	1556065	5177049	45.2	45.76	0.67	21
M36/0257	1555089	5176711	47.4	-	-	64.5

[1] Measured to top of concrete plinth. Actual ground level is approximately 120 mm lower.
[2] TOC – Top of Casing. Measured to top of steel collar.

13. Ms Penny suggests (in paragraph 13 of her evidence presented on 9 December 2019) that only a small sample of groundwater level readings from the onsite monitoring wells were taken by the applicant and concludes my analysis should be disregarded. With approximately 40,000 groundwater level records taken for each of the four monitoring wells between May 2018 to present, I consider the available data is sufficient for an initial assessment of seasonal fluctuations and historic data correlations with CRC's monitoring well M36/0202. This in my view, provides for an acceptable initial assessment of the HRGL onsite for at least the first 5 years of quarrying. I note condition 6 of CRC192408 and 192409[2] requires that, should consent be granted, the consent holder shall provide a report from an independently qualified person every 5 years to confirm whether the extraction depth remains appropriate or requires revision. I therefore disagree with Ms Penny's statements in this matter.

14. Ms Penny draws a comparison with a previous hearing in which an applicant proposed to extract materials below 1 m above the HRGL. To be clear, this is not proposed in this application.

15. Ms Penny notes quarry floor depths have been stated as both depths below ground level and in m RL in various application documents. As I state in paragraph 100.2 of my evidence in chief, I recommend no reference to depths should be made in relation to the quarry floor. The ground elevation on site is highly variable and can have localised differences of more than 1 m. Referencing a generalised depth below ground level can be ambiguous. Instead, I recommend a map is used, showing the proposed quarry floor surface as contours in m RL. Such a map was included on the last page of my evidence in chief and for reference I have attached this map as it would appear if appended to conditions (**Attachment 2**).

16. In paragraph 50 of my evidence in chief and in paragraph 10 to 14 of my rebuttal evidence I note that the future groundwater levels for this site are subject to some uncertainty due to various possible influences such as the Central Plains Water irrigation scheme (**CPW**). However, in the available records of nearby CRC monitoring wells M36/0202 and M36/0142, as shown in Figure 2 of my evidence in chief, there is no evidence that the anticipated groundwater level increase from CPW has already occurred. From Dr Scott's evidence on 11 December 2019, I understand the CPW command area has

[2] Of the draft conditions circulated on 11 December 2019

only recently been expanded to include the command area nearest the site. Therefore, effects on groundwater levels from CPW may not yet be occurring or reflected in records to date. I understand any anticipated relative rise in groundwater level from CPW would be in summer because a reduction of groundwater abstraction for irrigation use would occur during summer. The highest groundwater levels usually occur in winter or spring so an increase due to CPW is not likely to impact on the highest recordings. Dr Scott agrees with this in her evidence from 11 December 2019, where she states her expectation that if a groundwater level increase associated with CPW were to occur, it would mainly occur in summer and not in winter or spring.

17. To address the potential for the HRGL to change over time, I have recommended conditions of consent requiring the applicant to continue monitoring of groundwater levels throughout the lifetime of the quarry. As referenced in paragraph 11, I have also recommended that the maximum quarry pit floor depth is reviewed every 5 years (refer to amended draft condition 6 of CRC192408 and CRC192409). Immediate reviews will also be required should the actual groundwater level onsite rise to above the currently established HRGL at any time during quarrying (refer to amended draft condition 7 of CRC192408 and CRC192409). I therefore concluded in my rebuttal evidence that it is unnecessary to impose an additional separation distance between quarry floor and HRGL, above the 1 m required under the LWRP.

Potential effects on groundwater quality

18. Ms Penny expresses her concerns about the quality of fill material that is proposed to be used on site for backfilling. If only material is used for backfilling that complies with the definition of cleanfill under the LWRP, then I consider this would be unlikely to cause adverse effects on groundwater quality downgradient from the site. I have stated this in paragraph 62 of my evidence in chief and reiterated this in the Joint Witness Statement following expert conferencing with Dr Scott, Victor Mthamo and Nick Eldred on 6 November 2019.

19. I agree with Ms Penny that the acceptance of fill material should be properly managed so that only appropriate cleanfill materials are accepted. I have also recommended groundwater quality monitoring conditions to identify if groundwater contaminations caused by quarrying could affect groundwater quality downgradient from the site. This includes groundwater quality

monitoring in onsite wells as well as in water supply wells within a distance of 500 m downgradient of the site (refer to amended conditions 23 to 27 of CRC192408 and CRC192409).

20. In paragraph 37 of Ms Penny's evidence, Ms Penny raises concerns about nitrate contamination of the groundwater and it appears Ms Penny considers nitrate monitoring should be included with trigger levels in consent conditions related to the ongoing groundwater quality monitoring programme. Whilst I share Ms Penny's concern about high nitrate concentrations in shallow groundwater in Canterbury at a general level, I note that these are mainly associated with other activities (such as farming). I anticipate quarry activities will have very limited, if any, nitrate inputs. Setting trigger levels on a contaminant that is likely affected by upgradient activities and not the quarry activities does not make sense to me and I do not recommend this.

Groundwater Take and Quarry Water Demand

21. Ms Penny raises several concerns in relation to the water demand and water supply assessment, and I will address the following matters:

    (a) The area requiring dust suppression or irrigation; and

    (b) The availability of water to meet the quarry's water demand.

22. Whilst the active quarry area will not be more than 26 ha at any time, a much smaller area will require water application for suppressing dust or irrigation at any given time. Mr Cudmore has advised me that the design would only include a dust-prone area of 5 ha, which would require dust suppression on occasions. For my water demand assessment for the proposal, I assumed 6 ha of dust prone area. Therefore, the water demand estimation is likely to be conservative.

23. Ms Penny has interpreted the 'peak daily demand' of 1,482 m^3 listed in the table below paragraph 35 of my evidence in chief, as being required each single day. This is not at all the case. Most of the time the daily demand is far less, with median daily water demand expected to be 188 m^3 and median annual water demand to be 83,635 m^3. It is only for a few days during a very dry period, in which both water take restrictions apply[3] and the full effect of increased evapotranspiration from climate change occurs, that higher daily volumes of up to 1,482 m^3 would be required.

[3] Refer Conditions 2 (b) and (c) of CRC182422.

24. I assessed that with 2,500 m^3 of storage, the quarry would not run out of water even under those circumstances. Notwithstanding this, I understand from Mr Cudmore and Mr Chittock, that the applicant also has the option of using chemical dust suppressants and/or reducing or ceasing crushing operations for the time required.

25. My daily and annual water demand assessment is based on GoldSim modelling, in which a 30 year time series of rainfall, evaporation, evapotranspiration and groundwater levels in trigger level well M36/0217 (which governs the water restrictions) as well as the effects of climate change, have been taken into account. This is described in paragraph 27 to 36 in my evidence in chief and in detail in Appendix D of my evidence in chief.

26. In addition, I have included a graph in this evidence (**Attachment 1**) which shows the GoldSim water balance modelling results for a cumulative 9-day water consumption, which is the period on which the groundwater take consent volumes are based. In this graph the following is shown:

    (a) The 9-day water demand: this is the volume required to meet the quarry's water demand, during the 30 years' of time series data and with the full effect of climate change incorporated (i.e. up to 30% more evapotranspiration and seasonal changes in rainfall with a net increase of 6%).

    (b) The 9-day water availability: this represents the volume that is permitted to be taken from the onsite well M36/0257. When no restrictions apply, this volume is 6,779 m^3 in 9 days. The first tier restriction has applied on several occasions in the past 30 years when groundwater levels in M36/0217 fell below 33.08 m RL. The 9-day available water would have then been limited to 4,515 m^3 during those occasions. Groundwater levels in M36/0217 have never fallen below 31.28 m RL and the second tier of restriction was never triggered.

    (c) The volume in storage: this shows how much water is in storage on site at any time, assuming a storage volume of 2,500 m^3 is installed on site. It also shows how much storage would be needed to meet the quarry's water demand, assuming there was no other mitigation used (such as chemical dust suppressants). For example, up to 500 m^3 is required every second year, whereas more than 1,000 m^3 would not be required more than 5 times in the next 30 years, assuming the full effect of

predicted climate change occurs. A storage volume of 2,500 m^3 would only be required 3 times in a 30 year period fully affected by the predicted increase in evapotranspiration due to climate change.

27. Ms Penny's water demand assessment is based on the incorrect assumption that the quarry's water demand would be 1,482 m^3 every day. It appears her evidence also assumes that water is the only dust suppressant used. I have assessed this volume would be required for only a few times in the next 30 years and for only a single day at the time, and only when the full effect of climate change occurs and only when no other dust suppression is used. I could not compare Ms Penny's tables with my assessment because Ms Penny's tables represent a case that is highly unlikely to ever occur. Her conclusions are based on misinterpretation and should in my opinion, be disregarded.

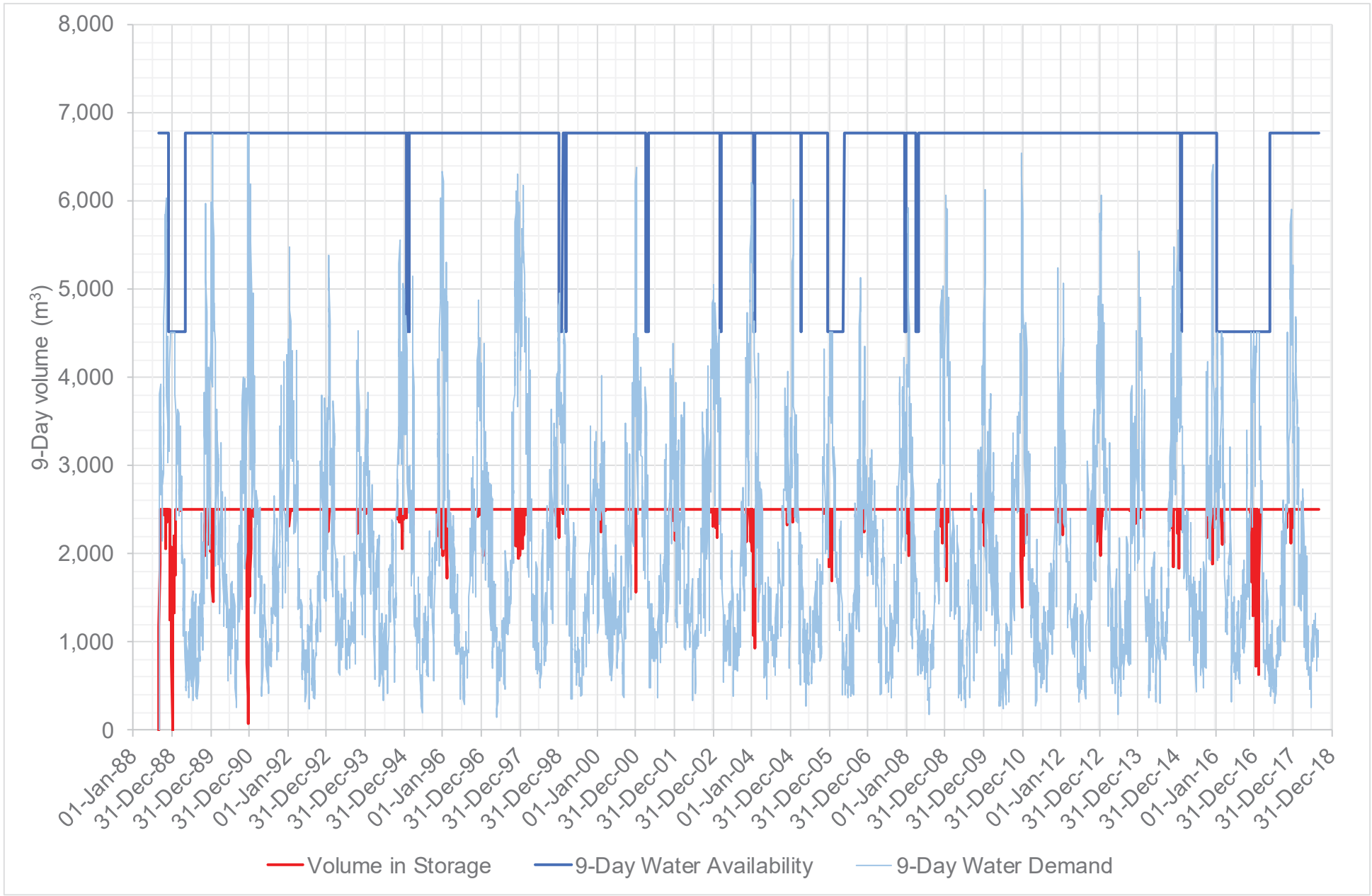
Conclusion

28. In this supplementary evidence I have tried to further clarify matters addressed in the AEE, my evidence in chief, my rebuttal evidence and joint witness statements I have been part of. I have also attempted to respond to those aspects of Ms Penny's presentation that the Panel sought further comment on.

29. I can confirm nothing in this supplementary statement alters my earlier evidence or conclusions.

Eric van Nieuwkerk
29 January 2020

Attachment 1: Expected Roydon Quarry 9-Day Water Demand and Supply assuming Full Effects of Climate Change



Attachment 2: Proposed Quarry Floor Surface Contour Map

LEGEND

- Canterbury Regional Council (CRC) Observation Wells
- Fulton Hogan Observation Wells and Site Well
- Site boundary
- Maximum quarry depth (m RL)
- Parcel boundary

NOTES

1. Aerial: LINZ and Eagle Technology, CC-BY-3.0-NZ.
2. Map image: © OpenStreetMap (and) contributors, CC-BY-SA
3. Schematic only, not to be interpreted as an engineering design or construction drawing.

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0 250 500 METRES

REFERENCE SCALE: 1:10,000 (at A3)

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

CLIENT
FULTON HOGAN

PROJECT
RESOURCE CONSENT APPLICATION, 'ROYDON QUARRY', TEMPLETON

TITLE
192408B

CONSULTANT
GOLDER

YYYY-MM-DD	2019-12-11
PREPARED	ZM
REVIEW	EVN
APPROVED	KB

PROJECT NO.	REPORT	REV.	FIGURE
1781870			05