BEFORE THE OTAGO REGIONAL COUNCIL AND CENTRAL OTAGO DISTRICT COUNCIL

IN THE MATTER OF	THE RESOURCE MANAGEMENT ACT 1991
AND	
IN THE MATTER OF	APPLICATIONS BY CROMWELL CERTIFIED CONCRETE LIMITED TO THE OTAGO REGIONAL COUNCIL AND CENTRAL OTAGO DISTRICT COUNCIL FOR DISCHARGE PERMITS, A WATER PERMIT AND A LAND USE CONSENT RELATING TO EXPANSION OF AN EXISTING QUARRY AT 1248 LUGGATE-CROMWELL ROAD
REFERENCE NUMBER(S)	RM20.360 AND RC200343

JOINT STATEMENT ARISING FROM EXPERT CONFERENCING (GROUNDWATER)

1*0 DECEMBER*, 2021

INTRODUCTION

1. This joint witness statement is the outcome of expert conferencing in relation to groundwater issues (quality and quantity) pertaining to RM20.360 and RC200343
2. The expert conferencing was held on 25th November, 2021 at the Landpro office in Cromwell and included a site visit to the Amisfield Quarry and the Amisfield Burn.
3. The experts who attended conferencing were:

    a. Ms. Alexandra Badenhop (e3Scientific Ltd) on behalf of Otago Regional Council
    b. Dr. Mike Freeman (Landpro Ltd) on behalf of Cromwell Certified Concrete Ltd.

4. This joint statement has been prepared in accordance with section 4.7 of the Environment Court Practice Note 2014.
5. All attendees have read, and agree to abide with, the Code of Conduct for Expert Witnesses included in Section 7 of the Environment Court Practice Note 2014.
6. In addition, all attendees have read, and agree to abide with, Appendix 3 to the Environment Court Practice Note 2014, which comprises the Protocol for Expert Witness Conferencing.
7. This joint witness statement sets out all matters agreed and disagreed by the relevant experts, with an outline of the reasons for disagreement provided where appropriate.

SITE VISIT

8. The site visit was completed on 25th November, 2021. Travis Allison conducted the tour of the Amisfield Quarry operations. However, the Amisfield Burn was visited only by Ms. Badenhop and Dr.Freeman.

9. Mr. Allison provided the following information during the Amisfield Quarry site visit:

a. Water from G41/0456 is used for all of the washing and crushing water supply. Water from G41/0127 is used for the other uses – irrigation, domestic supply and dust suppression.
b. The primary soakage pit is emptied of sediment approximately once every three weeks to a depth of 1.8 m below ground level. The silt is kept on site.
c. The secondary soakage pit was excavated to 10-12 m depth and did not intercept groundwater when it was excavated.
d. When gravel is excavated below groundwater level, it contains less fines and therefore less water will be used for washing. The working pit will be approximately 1 ha in extent at any given time as it will be progressively back-filled above the water table (but we understand that this may not be to the extent of completely refilling) with pea gravel left over from operations (4-7 mm).

GROUNDWATER AND SURFACE WATER CHARACTERISTICS

10. The lack of a recent full aquifer test may be significant as the short-term aquifer test may not accurately reflect the area of influence of pumping.
11. It would be useful to undertake some sensitivity/uncertainty modelling using a range of transmissivity and storage values that could illustrate the range of potential effects. For example, modelling the drawdown effects from just G41/0456 on G41/0238, using a range of values. It is agreed that if sensitivity analysis is used with a range of values then this will help understand the range of potential effects.
12. Based on surrounding bores, transmissivity is likely to range from 300 - 1500 m^2/day.
13. There are few measurements of storage properties. Specific yield values used for assessment of neighbouring bores range from 0.02 – 0.15. This seems reasonable given the aquifer materials.
14. Data from G41/0487 (Smiths Way, ORC groundwater level monitoring bore, which showed a groundwater level range of approximately 1.2 m) and Lake Dunstan lake level fluctuation (has a 1 m allowable height range) both indicate likely that background groundwater fluctuation will be approximately 1.2 m.

15. The general direction of natural groundwater flow is expected to be south easterly but pumping and the presence of the settling pond will affect local flow direction, but the extent of these effects is not known.

RECHARGE OF WATER – NON-CONSUMPTIVE

16. It was agreed that a significant proportion of the washing water is not returned at the point of washing but at the soakage pit locations.
17. Drawdown modelling needs to consider the location of the recharge.
18. The location of the recharge via the soakage pits should also be considered in stream depletion assessment for example, using the Hunt equation.

IMPACT ON NEIGHBOURING BORES – QUANTITY

19. To understand whether there will be adverse effects on neighbouring bores caused by the water level drawdown, several factors need to be considered:
    a. The saturated thickness of the aquifer in the vicinity of the bores;
        i. G41/0238 ≥10m
        ii. G41/0111 ~= 6m
    b. self drawdown;
    c. drawdowns from other bores;
    d. seasonal groundwater level fluctuation;
    e. lake level fluctuation; and
    f. recharge.

GROUNDWATER ALLOCATION

20. It is agreed that there is adequate groundwater allocation available.

STREAM DEPLETION ASSESSMENT

21. During the site visit, it was observed that the Amisfield Burn flows with a low gradient between the State Highway and Lake Dunstan and therefore groundwater-surface water connectivity needed further investigation. It was agreed that surveying would be an appropriate method to determine if stream depletion modelling was required.

22. On 26 November a survey was carried out of the height of the bed of the Amisfield Burn, the settling ponds and a point on the northern tributary of the burn. This survey showed that the bed of the stream is likely to be approximately 10 m above the bed of the creek at the confluence of the tributary and the main stem. Therefore it is highly unlikely that there would be a stream depletion effect on the Amisfield Burn.

GROUNDWATER QUALITY

23. Given the drawdown caused by pumping, and the driving head from the soakage pits, it is possible that suspended sediment in neighbouring bores may come from sediment in the soakage pits. However, it is also possible that the suspended sediment in neighbouring bores is caused by other processes but further investigation/monitoring would be required to confirm the source or sources.
24. Given that only total metals were analysed, the source of iron and manganese in neighbouring bores is unclear, as the redox state of the groundwater can not be assessed from the available information.
25. Water quality impacts from the Quarry should be assessed by sampling from a dedicated groundwater monitoring network.

CONDITIONS

26. It was agreed that a targeted groundwater monitoring network would best involve dedicated sets of nested piezometers with one screened across the water table and one at 10 m below the water table in each set. The locations would best be upgradient (2-3) of quarry activities and on south/southeast boundary (2-3) and at least one upgradient from G41/0321 i.e., one at the eastern “toe” of the property and one located at the boundary of the property on line between G41/0456 and G41/0111.
27. It was agreed that data from such bores would provide more robust information regarding potential effects.
28. Samples should be analysed for TSS, turbidity, pH, DO, EC, and “routine drinking water profile” that includes major cations and anions, and the metals iron and manganese. Samples for metal analysis should be total and field

filtered. These analyses should provide more definitive information on the likely source of both sediment and iron and manganese in groundwater.

*Date: 1**0 DECEMBER 2021***

Alexandra Badenhop

Mike Freeman