Appendix 1: Servicing (Hugh Blake-Manson)

In The Matter of the Resource Management Act 1991 ("the Act") And

In The Matter of Malvern Rezoning Hearings 0391 and 0395

MEMO of HUGH BLAKE-MANSON

Regarding Castle Hill Adventure Tours Ltd

Introduction

1. My name is **HUGH MAXWELL BLAKE-MANSON.** My qualifications are BE (Natural Resources) and I have Diplomas in Infrastructure Asset Management, Assessor (Drinking Water Networks) and Water Treatment (Operator). I am a Chartered Engineer. These qualifications allow me to design, manage and audit any of the three waters services; water, wastewater and stormwater. I am also completing a Masters in Freshwater Management at University of Canterbury.
2. I am an Infrastructure Advisor at Waugh Infrastructure Management Limited (Waugh). I was previously employed by City Care Ltd as their Three Waters Contract Manager (2012-2021) and prior to that, Selwyn District Councils Asset Manager Utilities (2004-2012) covering water, wastewater, stormwater, land drainage and waterrace services for the Council (Council).
3. I support the Council as an infrastructure advisor specialising in strategic, tactical and operational matters across the services identified.
4. I am authorised to present these comments on the Councils behalf.
5. I confirm that the matters on which I express my opinion are within my field of expertise.
6. I prepared this Statement of Evidence on 13 April 2023.

Scope of Memo

7. My comments relate to the impact the proposed rezoning may have on the community water services in Castle Hill – specifically drinking water, wastewater, stormwater and infrastructure, resulting from the submission of Castle Hill Adventure Tours Ltd – CHAT (the applicant) at Castle Hill.
8. The applicant seeks rezoning of the land to rural visitor zone (RVZ).
9. I have read the infrastructure review provided by Councils Mr M. England (22nd February 2023), Councils s42a Rezoning Report of 3rd March 2023 and infrastructure evidence provided by the applicant (17th March 2023 and 5th April 2023). Mr M. England and I have also met with the applicant on 5th April to better understand what their proposals requirements with on Councils water services may be.

Castle Hill Population

10. Water and wastewater services were designed in 1982 for a population of 1,220 persons at a 30% occupancy rate. This recognised that there could be a peak seasonal population, and capacity including storage and treatment should allow for this.
11. As at April 2023 there were 147 properties (approximately 370 people) who could access the water supply at any time. Council identified a further 221 sections within the village that have the potential to be developed. Of these, five are of sufficient size to yield 71 dwellings bring the total potential property based demand to 434 lots.
12. As at April 2023, there were 297 rated connections to the wastewater scheme. This includes 151 fully rated connections, which generally means there is a live connection made or about to be made to the network.
13. The values above do not include the applicant's land.
14. Castle Hill as a small permanently resident population. The population and demand on water and wastewater services varies significantly dependant on seasonal demand e.g. holidays, winter/summer recreation activities.

Climate Change

15. In 2020, Council undertook an assessment of possible climate change impacts on its community services.
16. It was noted that:
    - Alpine rainfall is projected to increase by 5% by 2050
    - Extreme rainfall events are projected to increase by 4-12% by 2050.
    - Castle Hill basin is projected to have an additional 10 dry days per year by 2050.
17. It was also noted that "*The main projected change that impacts on SDC assets is the increase in mean annual rainfall and flood flows. Higher alpine rainfall and flood flows may have some impact on … Castle Hill … water supplies. The exact impact will depend on the individual vulnerability of the sources to floods".*
18. Consideration of future water source reliability, quality and resilience along with wastewater treatment capacity, and stormwater system design and operation is relevant to this matter. This is because the infrastructure including connections to Councils water services must allow for utilisation and has a renewals lifetime of 50 years or greater. The impact of climate change must be considered by Council alongside consent conditions and its ability to service future customers needs.

Castle Hill Water Supply

19. The Castle Hill drinking water supply is currently a gravity fed with full firefighting capacity provided from one 500 m3 tank.
20. The Castle Hill drinking water supply consists of an intake from the Thomas Stream, raw water storage and selective abstraction. Shortly cartridge filtration, UV treatment and chlorination (when required) will be in place.
21. The water supply provides customers with 'on-demand' water at their point of connection through water meters.
22. Allowing for resilience in the supply is important. The remote location and harsh alpine environment present challenges for its operation and maintenance. The Castle Hill Village can be isolated following heavy snowfall and storm events that periodically close State Highway 73. It is located within the alpine fault line and is expected to

incur severe damage to its water infrastructure resulting from a 7.6 MMI event or greater.

Raw Water Turbidity

23. The Castle Hill water supply relies on extraction of surface water from the Thomas Stream. Flood flows increase raw water turbidity, which in turn restricts the volume of production water.
24. A review of the raw water quality against turbidity (NTU) over the period July 2017 to August 2022 was undertaken by Council. Turbidity ranged from 0.09 to 59.3 units, with an average of 1.18 units. Councils UV system has an alarm set point of 1 NTU, above which water treatment would stop until the level drops.
25. There are records of three to four day periods when raw water turbidity has been higher than acceptable levels for UV treatment and would also result in pre-UV filtration "blinding".
26. Council relies on sufficient raw water and post treatment storage at the treatment plant site to mitigate the periods the UV system is offline. Both storage tanks have a capacity of approximately 500 cubic metres (m3).

Water Demand

27. Demand has been calculated - refer Table One

Table One: Castle Hill Water Supply – Demand Analysis

Water Demand (m3) (December 2022 - April 2023)		
Average Daily	Peak Daily	Minimum Daily
168	226	113

28. There is a factor of two between the minimum and peak daily demand, which aligns with a seasonal increase in population.
29. The peak per property demand assuming 70% occupancy is approximately 2.2 m3/hhold. Council must also allow for and allocate water for rated connections and then appropriate reasonable future development.

30. Assuming an additional 146 lots were developed (total rated wastewater connections less current fully rated water connections) at 70% occupancy then the peak daily demand could be 457 m3/day.

Consents

31. The Castle Hill water supply provides surface water to the community from an infiltration gallery (intake) K34/0027 in the Thomas Stream.
32. Water take consent CRC991053 has the following limitations – refer Table 2.

Table Two: Water Take and Use Consent Conditions

Castle Hills Water Take and Use CRC991053 Consent Limits		
Maximum Instantaneous (litres/second)	Daily Volume (m3)	Weekly & Annual Volume (m3)
13.8	1,192	Not specified

33. The peak daily volume in 2022-2023 was 20% of the consented daily volume. At that peak daily demand, the production reservoir utilisation was 45% of its capacity. At a future connected 297 households with 70% occupancy, these values would double.
34. The target level of service pressure at the point of connection is 310 kilopascals (kPa).

Water Supply Improvement Programme

35. Council has recently upgraded the infiltration (intake) gallery and pipeline to the sediment settling chamber. Council intends to continue with replacement of the network with PVC (plastic) pipe, which will result in reduced network losses. It is also preparing to assess the bulk delivery pipeline from the sediment settling chamber near the Thomas Stream to the raw water tank, with the intention that it can deliver up to 13.8 litres per second to the raw water tank should that be required.

The Applicants Water Requirements

36. The applicant has stated that it intends to provide for 100 tourist accommodation units with restaurant facilities. In addition, it has noted that 32 caravan sites would be included in its outline development plan (ODP). It was unable to provide demand calculations at the time of our meeting, and we have not calculated those here.

37. Any reticulated water supply for the proposed rezoning area will need to be designed to meet Fire Fighting Code of Practice guidelines as stated in the Engineering Code of Practice.

38. Given the proposed nature of the development, firefighting demand is likely to be the dominant requirement. The applicant was not able to determine the scale and extent of this requirement at the time of our meeting but indicated that this would be determined by the fire service in time.

39. Council's water infrastructure growth plans do not cover extension of the network to the applicant's property located across the State Highway. Councils nearest network infrastructure is small diameter pipe, located inside the existing developed community area.

40. It is feasible to extend the network across to this property. Council has a preference for providing a restricted supply to the property boundary. This would allow it to provide for the existing communities current and future needs while also providing treated water to the boundary of the proposed rezoned land.

41. Any infrastructure installed would be at the applicants cost and to Councils Engineering Code of Practice requirements. Dependant on the infrastructure proposed, this may remain under the ownership, management and maintenance of the applicant from the point of supply.

42. There is an agreement in place regarding access and costs for connection to infrastructure, which the applicant has noted. That agreement includes that the applicant will cover all costs to access Councils infrastructure were required.

Conclusion - Water

43. The applicant has not provided details of the water demand. There is capacity within the existing network to meeting daily and firefighting demand. In the absence of demand data including fire flow information from the applicant, Council could provide a restricted supply (restricted daily volume and instantaneous flow rate) to the property boundary.

44. The volume and rate of water take will need to be agreed subject to information from the applicant.

45. Costs for any infrastructure works to achieve a water connection will be fully covered by the applicant. Works should be undertaken in accordance with Councils Engineering Code of Practice requirements.

46. Water service ownership including operations, maintenance and renewal of infrastructure within the applicants property will fall to it unless otherwise noted and agreed e.g. water sample test points.

Wastewater

47. Wastewater is conveyed via gravity network facilities to an oxidation pond and discharge field near the applicant's property. The oxidation pond provides treatment of all wastewater. There is currently no screening out of gross solids including plastics, with sludge removal allowing for this.

Wastewater Scheme Improvement Programme

48. Council has a programme of wastewater network replacement. It is continuing to replace the existing asbestos cement gravity network with PVC (plastic) pipe. At the same time this should result in a reduction of inflow and infiltration.

49. Council completed an upgrade of the oxidation pond in 2022-2023. This increased the operational capacity to 24,700 m3.

50. Council is planning to replace the overland border dyke disposal system (post oxidation pond treatment) with a pressurized sub surface dripper system. This should be completed by late 2025. It is also planning to install a pre-treatment waste screening system.

Wastewater Treatment and Disposal

51. Consent CRC991052 (including A, B) allows for 785 cubic metres per day of wastewater to be discharged to the border dyke area. There are restrictions to discharge including only occurring between September to April and while there is less than 40mm of rainfall.

52. Outside this period, being a minimum of four months, Council must store wastewater in the oxidation pond.

53. I note that this restriction may be addressed in part through installation of the dripper system in the future – allowing for additional discharge during this four month period refer CRC220485.

54. On the basis there are 151 fully rated connections with 70% utilisation, and a per household discharge of 0.2 m3/per person per day (2.5 persons per household), the discharge would be 53 m3/day.

55. Recorded flows have peaked at 1,100 m3/day, with an average of 695 m/day over a six day period (July 2021). These flows were linked to significant rainfall. This high flow rate has not been considered further, given network renewal works were completed to address inflow areas. Instead, the August 2022 period with an average inflow of 193 m3/day and has been used as a current peak value.

56. Using the peak daily discharge, the equivalent per household wastewater discharge is 1.3 m3/hhold. On a prorata basis over 434 lots this is 554 m3/day.

57. The oxidation pond has an operating capacity of 24,700 m3 which under a worst case event could be fully utilised over the four month period at a sustained peak inflow being 23,546 m3.

58. While there is capacity to manage peak flows at the current flow rates, careful consideration of future additional connections will be required as these will need to be allowed for in full.

Oxidation Pond Treatment Resilience

59. The oxidation pond is a facultative system. There are two zones – an aerobic zone at the top and an anerobic “oxygen starved” sludge zone at the bottom. In between these is a facultative zone where biological activity occurs. Wind mixing with the wastewater at the surface provides for the aerobic treatment.

60. Oxidation ponds are designed for treatment of domestic wastewater, but can manage limited quantities commercial wastewater within certain chemical and biological conditions e.g., common detergents and cleaning agents.

61. The applicant has identified that commercial discharges e.g., restaurant services are to be included in the proposed development. If that is the case, then removal of gross contaminants particularly fats, oils and greases (FOG) will be required before entering the oxidation pond.

62. The applicant has also identified that caravan waste dumping facilities will be included as part of the infrastructure. It is likely that biological inhibitor chemicals will be part of the caravan wastewater stream. The likely composition, scale and impact on the oxidation pond should be assessed by the applicant, with information provided to Council on how this will be managed to ensure that oxidation pond treatment is maintained.

63. Council's current and consistent approach is conveyance of all wastewater via gravity to the treatment plant and disposal. Infrastructure should be designed around this which may require that a direct discharge to the treatment plant is installed.

Conclusion - Wastewater

64. Costs for any infrastructure works to achieve connection to the inlet to the gravity wastewater network will be fully covered by the applicant. Works should be undertaken in accordance with Councils Engineering Code of Practice requirements.

65. Wastewater service ownership including operations, maintenance and renewal of infrastructure within the applicant's property will fall to it unless otherwise noted and agreed.

66. The composition of caravan waste including chemical loads and flows should be provided by the applicant. It should also provide an assessment from an appropriately qualified person/s regarding its impact on the oxidation pond treatment system and how this will be mitigated to ensure consent compliance.

Stormwater

67. Council has a consent - CRC064128.1 for stormwater treatment and discharge over part of the community.

68. The applicant considers that soakage of stormwater to ground is feasible in this area.

69. Whilst subject to obtaining the necessary consents, in my experience treatment and disposal of stormwater to ground is a standard solution for stormwater management for Selwyn townships where the groundwater levels are sufficiently low. Subject to engineering design work, this should be possible over the site.

70. Stormwater management will be subject to further investigations, design and review should the proposal be approved and the development progress to engineering approval stage.

71. A consent to manage stormwater during construction and for final treated discharge will be required from the Canterbury Regional Council as part of any consent application.

Stormwater - Conclusion

72. The applicant will be responsible for designing, obtaining consent, constructing and commissioning the stormwater system.

73. Stormwater consent and service ownership including operations, maintenance and renewal of infrastructure within the applicant's property will fall to it unless otherwise noted and agreed.

Hugh Blake-Manson

13 April 2023