Exemption Decision Paper

Exemption Number	EXE-00001003
Exemption Type	Residual Disinfection Exemption
Supply Name	Christchurch – Brooklands Kainga
Supply ID	CHR009 – CHR009BK
Date	01 November 2023 / te 1 o Whiringa-ā-rangi 2023
Applicant	Christchurch City Council
Exemption Team	Jim Graham, Principal Advisor, Drinking Water Noah Hensley, Senior Technical Advisor
International panel member	Charles Haas Dan Deere Laith Furatian

Recommendation

For the reasons set out in this paper, the Exemption Team recommends that you **decline** the residual disinfection exemption application for the Brooklands Kainga drinking water supply.

There are a number of matters set out below that outline why the Exemption Team is making this recommendation. The application and supporting documentation submitted by Christchurch City Council (CCC) lacked relevant information, critical analysis and details of risks specific to the Brooklands Kainga supply. While some matters could be worked into conditions for an exemption, many of the matters may take significant investment and time for CCC to address and, at this time, are not considered to be able to be worked into conditions for an exemption.

Executive summary

1. On 5 September 2022, CCC applied for a residual disinfection exemption in relation to the Christchurch City drinking water supply (supply ID CHR009). The application was made specifically for one of the distribution zones that CCC operates, the Brooklands Kainga distribution zone (distribution zone ID CHR009BK). The application sought an exemption to the requirement in section 31 of the Water Services Act 2021 (WSA) to provide for the use of residual disinfection in a water supply that includes reticulation. Section 31 requires the provision of residual disinfection to be set out in the supply drinking water safety plan. The application was made under section 58 of the WSA.

2. At the time of application, the Brooklands Kainga zone was registered as part of the Christchurch City supply. However, it has separate water sources, separate treatment plants and the distribution system is not connected to the rest of the Christchurch City supply. This has

implications for the exemption application because the current drinking water safety plan (DWSP) relates to the wider Christchurch supply and is not specific to the Brooklands Kainga supply. Section 58 of the WSA allows an application for a residual disinfection exemption to be made in relation to 'any part of a supply that includes reticulation'. For the purpose of assessing this application, the Brooklands Kainga zone has been considered as a separate supply. Since applying for the exemption, CCC has adjusted its registration information to reflect that Brooklands Kainga is a separate supply, with a new supply ID BRO013.

3. The Exemption Team considers that the Brooklands Kainga supply cannot currently be operated without residual disinfection in a way that is consistent with the main purpose of the WSA, i.e., to ensure that drinking water suppliers provide safe drinking water to consumers.

4. Further information along with a robust analysis would need to be submitted to provide confidence that the supply could safely provide drinking water without residual disinfection.

5. The key factors that underpin the Exemption Team's view are:

   (a) The supply does not meet the requirement that *drinking water supplied by the supplier will comply with all other legislative requirements and the drinking water safety plan on an ongoing basis.*[1] The Brooklands Kainga supply does not include a primary treatment barrier consistent with the requirements of the Drinking Water Quality Assurance Rules (DWQAR) and does not meet the requirements of section 31(2) of the WSA to provide a multi-barrier approach to drinking water safety. While substantial evidence of planning to meet legislative requirements has been submitted, none of the evidence submitted shows that CCC has funded, or planned to secure funding for, a programme of works for the Brooklands Kainga supply which will make it compliant. The Exemption Team cannot assess how the drinking water supplied will comply with the requirements in the DWQAR on an ongoing basis given the application submitted, nor given the additional information that Taumata Arowai requested and received. The failure to meet these other legislative requirements precludes the granting of an exemption to residual disinfection.

   (b) The Source Water Risk Management Plan (SWRMP) and DWSP outline how risks are managed generally across the Christchurch City supplies and distribution zones, but do not contain the specific details as to the risks that directly impact Brooklands Kainga supply.

   (c) The application lacks sufficient site and system information to be accurately assessed. Questions have arisen in the assessment of the application that cannot be answered from the information provided and the application contains statements that are not backed up with objective evidence.

   (d) CCC has invested significantly in the upgrading of well heads in recent years, and this addresses many risks associated with groundwater sources. However, other source

[1] WSA, s 58(3)(b).

water risks specifically relevant to the Brooklands Kainga supply have not been adequately assessed.

(e) Water loss is unacceptably high for the supply to safely operate without residual disinfection. A better understanding and reduction of water loss in a drinking water supply may also be relevant to giving effect to Te Mana o te Wai.

(f) The application has not outlined a satisfactory backflow prevention programme and backflow measures in the supply distribution system are considered inadequate for a supply to be operated without residual disinfection.

Supply information

6. The Brooklands Kainga drinking water supply sources drinking water from an underlying aquifer. It serves a population of 1,284[2] people in the northern suburbs of Christchurch. The main characteristics of the supply are briefly described below. More details about certain components are set out elsewhere in this paper, where relevant.

7. CCC's exemption application states that the reasons for seeking a residual disinfection exemption for the Brooklands Kainga supply are:

- the availability of safe drinking water that is untreated is a strong part of Christchurch residents' identity.

8. Community views may motivate a supplier to apply for a residual disinfection exemption. However, they do not displace the statutory requirements for the granting of an exemption, including the need for the chief executive to be satisfied that the exemption is consistent with the main purpose of the Act.

9. The Brooklands Kainga supply must comply with the general (G), source water (S3), treatment (T3) and distribution (D3) rule modules for large supplies as specified in the DWQAR and be the subject of a drinking water safety plan that demonstrates compliance with all other legislative requirements that aren't exempted.

10. The source water for the Brooklands Kainga supply is drawn from Aquifer 2 (as defined in the exemption application) from two bores: Brooklands (Aquifer 2-Brooklands Stn-Well 01/ 1995) and Kainga (Aquifer 2-Kainga Stn-Well 01/ 1989). The bores at these pump stations are recorded as being 83 and 92 metres deep respectively. The screening depth of Brooklands Bore 1 is 78.6 metres. The screening depth of Kainga Bore 1 is 87 metres. Aquifer 2 is described in the exemption application as a Linwood gravel aquifer which is leaky (semi-confined). However, discrepancies exist within the documentation provided as to the confined nature of the bores.[3]

[2] A discrepancy between the registration details in Hinekōrako (population of 1,284) and the exemption application (population of 1,629) exists.

[3] Discrepancies exist in documentation as to whether Brooklands and Kainga bores are artesian, or not. The groundwater security modelling report by Aqualinc indicates that Kainga bore draws from Aquifer 3, but other CCC

11. The Exemption Team understands that there are there are two zones for Aquifer 2 which impacts the aquifer's vulnerability to surface water influences. The western zone is largely unconfined and prone to surface effects and the eastern zone is semi-confined and less prone to surface effects. Both the Brooklands and Kainga bores appear to be in the eastern zone of Aquifer 2.

12. A second bore near the Brooklands Bore 1 cannot be used in the condition it was in at the time of our site visit and is not scheduled to be put back into service. This bore is prone to flooding from the nearby Styx River and is in the process of being sealed.

13. The source water classes, including sanitary status, of the bores as required by the DWQAR for a large supply such as Brooklands Kainga were not initially apparent in the exemption application. However, CCC indicated during the site visit that the sources meet the Class 1 source requirements and, upon request, submitted 3 years of biological monitoring data as evidence. The monitoring data is consistent with Class 1 source requirements.

14. CCC submitted, in response to an Exemption Team request for further information, that the Brooklands and Kainga bores meet requirements of 'sanitary bore' as defined in the S3 Module of the DWQAR, which represents best practice for construction of bores and associated infrastructure. This best practice construction reduces the risk of contaminant intrusion into the bore.

15. The supply has been treated with chlorine since June 2023, noting this commenced after the application was lodged. While CCC has indicated that the supply meets protozoal requirements due to the Class 1 sources, the supply will not comply with the bacterial treatment requirements in the DWQAR if chlorine is removed. Options for bacterial barriers include chlorination, UV disinfection, ozone, or chlorine dioxide. Chlorine is currently the only treatment being used to treat the water in the Brooklands Kainga supply. In addition, chlorination will need to continue to be available at both pump stations in case of emergency (CCC claim to be ready to chlorinate at short notice (2-4 hours)). The temporary chlorination units as they are currently setup have significant process limitations.

16. The exemption application indicates that continuous monitoring equipment for pH, conductivity, turbidity, and free available chlorine (FAC) at each pump station will be installed from mid-November 2022, however, at the time of the site visit in February 2023, none of the continuous monitoring equipment had been installed.

17. The Kainga pump station supplies most of the water (93%) to the Brooklands Kainga distribution zone, with only 7% being supplied from the Brooklands pump station. The Kainga pump station is claimed to be able to solely supply and meet the demand of the Brooklands Kainga distribution zone.

documentation indicates the bore draws from Aquifer 2. CCC has confirmed that they are not free flowing artisan wells.

18. Pressure is maintained automatically using a duty/assist setup for the Kainga pump station. The Brooklands pump station has one variable speed pump operated manually with alarms on pressure. The DWSP indicates that the mains are primarily PVC and were installed in the 1980s to 2000s. Submains are primarily PE with the oldest pipes having been installed in the 1970s and 42% having been installed in the 1990s.

19. The exemption application indicates that treated water is distributed to 1,055 customer connections, however, this conflicts with the DWSP (Table 2-8) which reports 475 connections, (28 commercial and 447 metered residential water connections) with no other types of connections.[4] The typical annual consumption of the zone is 272,185 m^3. Unauthorised connections to the network have been identified as the cause of pressure fluctuations that breach critical limits.

20. The DWSP indicates the "Council has had a long running programme to audit and improve backflow prevention." The exemption application indicates that a network survey was undertaken to confirm that unknown backflow risks were not present. While general information about the CCC's backflow prevention programme is stated, specific information about the Brooklands Kainga supply was not provided with the exemption application.

21. Both *E. coli* and total coliforms have been detected in the Brooklands Kainga zone. A single record of *E. coli* was recorded on 18 April 2019. Since then, the bores have been upgraded. The exemption application indicates 9 records of total coliforms in the supply from 1 July 2017 until 1 July 2022, though this was not a compliance matter under the regime administered by the Ministry of Health through to November 2021. Total coliforms were detected on 11 May 2021 (at the same tap as the 18 April 2019 *E. coli* exceedance) which was attributed to poor sampling infrastructure, which was not fit for the purpose of microbiological sampling. New dedicated sampling bollards have been installed and are now in use in the distribution zone. A satisfactory explanation for the recorded presence of *E. coli* and total coliforms in the supply has been provided and it is considered that the causes of contamination have been rectified.

22. The exemption application included a proposed monitoring plan to operate the supply without chlorine which appears to meet the basic monitoring requirements of the DWQAR. While the monitoring plan proposes significantly more microbiological sampling than is required by the DWQAR, additional sampling and monitoring needs to be considered for other water quality parameters. Monitoring requirements could be worked through with CCC in conditions if an exemption were to be granted in the future.

23. Taumata Arowai has not received a notification of non-compliance or potentially unsafe drinking water in relation to the Brooklands Kainga sources and distributions zones since it became the regulator in mid-November 2021.

[4] Discrepancies exist in documentation as to how many connections are present. The exemption application indicates 1055 customer connections, however, Volume B of the Christchurch DWSP indicates that the Brooklands Kainga has 475 connections, all metered.

Information provided by the applicant.

24. CCC submitted the following documents, which contained relevant information, in support of its application for a residual disinfection exemption for the Brooklands Kainga supply:

- Exemption for Residual Disinfection – Application for: Brooklands Kainga (Revision 1.1).[5]
- Christchurch Water Supplies Water Safety Plan
    - Volume A: Components Common to All Water Supplies[6]
    - Volume B: Christchurch/Lyttelton Water Safety Plan[7]
    - Volume C: Christchurch/Lyttelton Source Water Risk Management Plan[8]
- Brooklands Pump Station Site Specific Risk Management Plan (September 2022 – Revision 3)[9]
- Kainga Pump Station Site Specific Risk Management Plan (September 2022 – Revision 3)[10]
- Kainga Well Head Security Assessment (23 November 2018)[11]
- WHSIP High Level Desk-based Contamination Assessment for Brooklands Pump Station (21 January 2019)[12]
- Brooklands Bore Head Security review (19 June 2019)[13]
- WHSIP Desk-based Contamination Assessment for Kainga Wellhead (5 July 2019)[14]
- Drinking Water Supply Security: Groundwater Bore Security Modelling Report (17 March 2022)[15]
- Assessment of Physico-Chemical Monitoring Requirements for CCC Water Supply Wells (September 2022)[16]
- Contractor's Plan – Temporary Chlorination Unit Operations and Maintenance (DRAFT)[17]
- Water Supply and Wastewater Bylaw 2022

[5] Exemption for residual disinfection - Brooklands Kainga - Current version.pdf.
[6] 22 438283 - Volume A Components Common to All CCC Supplies - Current version.pdf
[7] 22 438287 - Volume B Christchurch Lyttelton – Current Version.pdf
[8] 22 438290 Volume C Christchurch Lyttelton Source Water Risk Management Plan - Current version.pdf
[9] CCPwPS1067 Kainga Pump Station Site Specific Risk Management plan approved version.pdf
[10] CCPwPS1067 Kainga Pump Station Site Specific Risk Management plan approved version.pdf
[11] Kainga Well Head Security Assessment.pdf
[12] NZ1-15558633-WHSIP High Level Desk-based Contamination Assessment for Brooklands Wellhead.pdf
[13] NZ1-16248810-Brooklands Bore Head Security review – updated.pdf
[14] NZ1-15421576-WHSIP Desk-based Preliminary Site Investigation (PSI) for Kainga Wellhead.pdf
[15] Aqualinc CCC Drinking Water Supply Security_Final.pdf
[16] Assessment of Physico-Chemical Monitoring Requirements for CCC Water Supply Wells PDD.pdf
[17] Water Pump Station – Temporary Chlorination Unit Operations & Maintenance – Contractors Plan DRAFT.docx

- Wellhead and Bore O&M Manuals for Brooklands and Kainga Pump Stations
- Monitoring results for Brooklands and Kainga supplies
- Authorised Water Supply Install Terms and Conditions
- Water Supply Asset Management Plan – LTP 2021-2031
- CCC response to the draft exemption decision paper provided to CCC by the Exemption Team
- CCC response to the Exemption Team's request for additional information and clarification.

25. It is considered that the application lacks sufficient specific and detailed information about the site and systems to be accurately assessed. Questions have arisen during the assessment of the application that cannot be answered from the information provided and often in the application, statements are made without objective evidence. The evidence presented in the exemption application is inadequate to provide sufficient certainty about risks to source water, particularly the extent to which the source water is impacted by surface water.

26. For example, the aquifer is only described in a very general sense and at a regional scale. The specific recharge area relating to the bores that provide water to the Brooklands Kainga supply is not delineated, defined, or described and only limited evidence has been presented as to the confining (or otherwise) nature of the aquifer. The lithology of the strata that the bores are located in is not described in enough detail to understand the nature and risks of the aquifer, particularly with respect to surface water influences.

27. Only limited information has been provided regarding the bore casing materials, ages of existing infrastructure, depth and diameter of grouting, results of recent downhole camera inspections post seismic events or flow regimes. There is insufficient bore-specific water quality and depth to groundwater data – including variation over time and in response to pumping, river height, and rainfall.

28. Further examples relate to information about water loss in the system that need to be provided including accurate assessments of daily night flows, water loss targets and how it is intended to reduce water loss. Details of metering and metered volumes have not been provided.

Assessment process

29. Three international expert advisory panel members and the Exemption Team have considered documentation provided by CCC with a focus on material specifically referenced in the exemption application. Two members of the Exemption Team met on site with CCC to discuss the Brooklands Kainga supply and zone on 7 February 2023.

30. Queries and requests for clarification have been raised with CCC staff and responses provided to the Exemptions Team over the period that the exemption application was being assessed. Of particular note, additional documents were provided as a response to the Exemption Team's

request for additional specific information as a large amount of the information supplied was general and covered the whole of the Christchurch City supply.

31. Following assessment of the application, a draft of this decision paper was provided to CCC staff for comment and feedback. This feedback was provided on 30 June 2023. It has been considered and taken into account in this final decision paper.

Assessment factors

32. CCC's application has been assessed against the relevant factors arising under the WSA, Taumata Arowai policy and guidance material in relation to exemption applications, and other considerations relevant to decision-making by Taumata Arowai and its staff.

33. Those factors, which shape the structure and balance of this paper, are:

    (a) The scale, complexity and risk profile of the drinking water supply, which are applicable to the assessment of drinking water safety risks and also to the proportionality of regulation under the WSA.

    (b) The Treaty of Waitangi / te Tiriti o Waitangi and its principles, which are relevant considerations under section 19(1)(b) of the Taumata Arowai–the Water Services Regulator Act 2020 (**TAWSRA**).

    (c) Te Mana o te Wai, to the extent it applies to CCC's application and the associated decision-making of Taumata Arowai.

    (d) Consistency with the main purpose of the WSA: i.e. to ensure that drinking water suppliers provide safe drinking water to consumers. In accordance with section 58(3)(a) of the WSA, a residual disinfection exemption can only be granted if the decision-maker is satisfied that the exemption is consistent with the main purpose of the WSA.

    (e) Compliance with legislative requirements and the DWSP (including the SWRMP). In accordance with section 58(3)(b) of the WSA, a residual disinfection exemption can only be granted if the decision-maker is satisfied that drinking water supplied by the supplier will comply with all other legislative requirements and the drinking water safety plan on an ongoing basis.

    (f) The Taumata Arowai Compliance, Monitoring and Enforcement Strategy 2022-2025 (**CME Strategy**). This is a matter that the Taumata Arowai Chief Executive, and any delegate of the Chief Executive, must have regard to when determining exemption applications.[18]

Scale, complexity and risk

34. The Brooklands Kainga supply is categorised under the DWQAR as a large, networked supply (> 500 people).

[18] WSA, s 136(7); TAWSRA, s 11(2)(b).

35. Risks to the supply include high water loss, unauthorised connections, potential contamination of source water and integrity issues in the distribution system. These risks are of concern if the supply does not have residual disinfection.

36. The relative scale, complexity and risk of the supply has been factored into the Exemption Team's assessment of CCC's application and the commentary and recommendations in this paper.

The Treaty of Waitangi / te Tiriti o Waitangi and its principles

37. Taumata Arowai and its staff are required to uphold the Treaty of Waitangi (Te Tiriti o Waitangi) and its principles when carrying out their functions.[19]

38. What this means in practice varies from situation to situation, depending on the relevance of Treaty/te Tiriti provisions and associated principles, including: partnership, self-determination, mutual benefit, honour, active protection, options, right of development, informed decisions, equity and equal treatment, and other principles that may be developed or identified as relevant from time to time. There is also some overlap between these principles and aspects of Te Mana o te Wai, which is discussed in the next section of this paper.

39. CCC's application does include information about the interests of mana whenua, however it is not clear how or whether this directly relates to the Brooklands Kainga supply. The DWSP references "Te Wai Ora o Tāne – Integrated Water Strategy (2019)" which outlines the broad interests of mana whenua in the Christchurch area. The exemption application does not indicate that any engagement with Māori has occurred in direct preparation of the exemption application. This has a bearing on the Treaty/te Tiriti principle of informed decisions.[20] The absence of specific information means that consistency with this principle has not been able to be considered in anything other than a generalised way. This overlaps with the consideration of Te Mana o te Wai discussed below.

Te Mana o te Wai

40. For the purposes of the WSA, Te Mana o te Wai is currently defined in the National Policy Statement for Freshwater Management 2020[21] and applies to water as it is defined in the Resource Management Act 1991.[22] Everyone exercising or performing a function, power, or duty

[19] TAWSRA, s 19(1)(b)(i).
[20] That is, the onus to make a decision that is sufficiently informed as to the relevant facts and law so as to have regard to the impact (if any) on Treaty/te Tiriti principles. As a local authority, CCC is also subject to principles and requirements that relate to the Treaty of Waitangi and the involvement of Māori in its decision-making processes (as set out, for example, in s 4 of the Local Government Act 2002). However, CCC's approach to those principles and requirements is not relevant to the assessment of its exemption application or a matter for the decision-maker to enquire into, to the extent these fall outside the scope of the concept of Te Mana o te Wai.
[21] To be replaced by the national planning framework under the Natural and Built Environment Act 2023.
[22] The application of Te Mana o te Wai in s 14 of the WSA was amended in December 2022 by the Water Services Entities Act 2022. It has subsequently been further amended by both the Water Services Entities Amendment Act

under the WSA must give effect to Te Mana o te Wai when doing so, to the extent it applies to the function, power, or duty.

41. Te Mana o te Wai is a water-centric concept that refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of wai. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community.

42. The framework for Te Mana o te Wai involves 6 principles relating to the roles of tangata whenua and other New Zealanders in the management of freshwater, coupled with a hierarchy of obligations that prioritises:

    (a) first, the health and well-being of water bodies and freshwater ecosystems;

    (b) second, the health needs of people (such as drinking water); and

    (c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

43. When considering an exemption application, Te Mana o te Wai will be considered in terms of whether the supplier is meeting all other legislative requirements, to the extent that it applies. The chief executive of Taumata Arowai also must give effect to Te Mana o te Wai to the extent that it applies to making a decision on the application.

44. No reference to Te Mana o te Wai is included in the exemption application, rather it references the Te Wai Ora o Tāne strategy that the CCC has developed. This states "Water is a valued taonga, in all that we do". It is clear through the strategy that the CCC values water and has established a goal to protect and enhance water quality.

45. The Exemption Team acknowledges that CCC has a strategy to address concepts related to Te Mana o te Wai. The Exemption Team has limited assurance at this stage that CCC has given effect to Te Mana o te Wai in its application.

46. The exemption application does report on matters relevant to residual disinfection: water loss and the associated risk of contamination of the supply. However, the reported water loss figures and lack of comprehensive site-specific risk management is arguably inconsistent with the concept of Te Mana o te Wai. The principles of governance, care and respect and stewardship are arguably relevant to water loss if it is causing wastage and greater extraction from the aquifer than necessary to meet the needs of the community.

2023 and the Natural and Built Environment Act 2023, with another amendment from 1 July 2024 by the Water Services Legislation Act 2023 pending. Due to transitional provisions in the Natural and Built Environment Act 2023 (Schedule 1, cl 85), the version of s 14 of the WSA that currently applies is that dated 23 August 2023. This means that Te Mana o te Wai applies to water as defined in the Resource Management Act 1991, but including water in any form while in any pipe, tank, or cistern. This is materially the same position that applied prior to the enactment of the Water Services Entities Act 2022 in December 2022 when CCC's exemption application was lodged.

Technical assessment

The following section sets out the assessment of technical factors that are relevant to the recommendation on the application.

47. There are a number of factors that affect the provision of safe drinking water to consumers and not all of these are adequately addressed in the supply set up, operation, or associated planning. In the Exemption Team's view, these matters prevent the Brooklands Kainga supply from being able to operate without residual disinfection in a manner consistent with the main purpose of the WSA.

Source water factors

Factor 1 – Lack of evidence supporting source water risk

48. The Exemption Team acknowledges that the source water modelling that has been completed recently appears conservative and robust. However, the source water modelling is confirmed with what appears to be a single test of water age for each source. The modelling report indicates that age testing can be unreliable as it only represents a moment in time.

49. The water quality data provided with the application shows irregular sampling of turbidity has been undertaken in the last 5 years and the results appear inconsistent with the quality of water that is suggested by modelling. For instance, a turbidity of 2.4 NTU is recorded in the reticulation, but the DWSP does not discuss high turbidity as being an issue in the supply. The DWSP also indicates high turbidity has been detected in both the Brooklands and Kainga bores in the past. The high turbidity (up to 40 NTU with an average above 1 NTU) reported in Aquifer 2 indicates the potential for variable water quality and possibly surface water ingress.

50. A sufficient history and critical summary of monitoring results was not provided with the application making it difficult to assess whether the groundwater quality is consistent with the source water modelling results.

51. Additional water quality monitoring that could be considered for determining whether the source is susceptible to surface influences includes monitoring of major solutes and trace constituents, photosynthetic pigment-bearing algae and/or diatoms, ammonia nitrogen, total organic carbon, UV absorbance (@ 254 nm), temperature, pH, and conductivity. These results could provide sufficient detail to describe baseline values year-round at a suitable timescale and indicate if the bores are unlikely to be affected by surface water.

Factor 2 – Continuous source water monitoring

52. Information has been provided to support both bores being Class 1 sources under the requirements of the DWQAR. The DWQAR do not require Class 1 sources to be monitored continuously, noting there are additional requirements to monitor treatment processes continuously.

53. It is important to note that the DWQAR provide minimum requirements for water supplies that include infrastructure to provide multiple barriers to contamination, including residual

disinfection. Where water supplies are operated or intended to be operated without multiple barriers and/or without residual disinfection, it is expected that additional measures will be put in place that exceed the requirements otherwise set out in the DWQAR, depending on the risk profile of the supply.

54. Continuous monitoring data is a key factor in the assessing the quality of source water. The source water monitoring results that have been presented consist only of grab samples and characterise the water quality of a very small sub-sample of water at discrete moments in time. Because of its intermittent nature, grab sampling is of limited value when attempting to demonstrate that water is and has been safe continuously, as grab sampling may miss infrequent events where contaminants are elevated.[23]

55. Continuous monitoring of water quality also allows for a better level of event-based monitoring and can provide assurance that weather and climate are not adversely impacting the supply in ways that affect treatment processes or water quality. The Exemption Team considers that 12 months of continuously monitored source water quality data would be appropriate to support a residual disinfection exemption application for a supply with the scale, complexity and risks of the Brooklands Kainga supply.

Factor 3 – References to old legislation

56. CCC references "secure" status of groundwater sources. This is inappropriate in the current regulatory framework which does not recognise bore water as being "secure" and has the potential for risks to have not been assessed effectively due to reliance on terms and ideas that are no longer applicable. See the more detailed discussion on the supply water safety plan below in relation to the transition from the *Drinking Water Standards for New Zealand 2005 (Revised 2018)* to the DWQAR.

Factor 4 – Source water risk management gaps

57. There are several risks identified in the DWSP or SWRMP that the Exemption Team considers are not addressed adequately:

    (a) Bore recharge areas that account for a full range of weather and event conditions do not appear to have been delineated for the Brooklands and Kainga bores, rather a general approach to defining source water protection zones is taken. The Exemption Team supports the defining of source water protection zones and protection of source water. However, without clearly defining where water in the aquifer comes from, pollution sources in the recharge zone cannot be determined and evaluated.

    (b) A critical analysis of Brooklands Kainga source water risks (particularly those related to human waste and particularly human enteric viruses) and robust risk management approach to such risks has not been provided.

[23] CCC has communicated they intend to upgrade monitoring at pump stations and include these upgrades in their long-term plan.

(c) Risks associated with surface water and other sources of human waste contaminating the groundwater, particularly from the wastewater pump station near the bore and from discharges to land and water bodies proximal to the bores.

(d) Risks associated with short-circuiting of contaminants within the recharge area of the bores which include, but are not limited to farm dams, culverts, utility conduits, seismic fissures, stormwater drainage systems, sub-surface components of buildings, quarries, tips, and other bores.

58. It is necessary that CCC provides satisfactory evidence that the risks to source water are managed sufficiently to operate the supply safely without the continuous maintenance of a residual disinfectant. In order to operate without residual disinfection – which is ordinarily a critical barrier to bacteria and human viruses in drinking water supplies – the factors above need to be addressed.

59. Issues arising from source water risks may be mitigated through appropriate treatment processes. This is discussed in the next section.

Treatment Factors

60. Without a primary treatment barrier, the supply would provide untreated water to consumers and the exemption application has not indicated that any primary treatment barrier will be installed. It is noted that the supply does have an what is referred to as an "emergency chlorination" system installed. However, this system is does not include industry standard monitoring equipment including continuous monitoring for FAC and pH.

Factor 5 – Lack of a multi-barrier approach

61. The Brooklands Kainga supply does not have a primary bacterial treatment barrier that is compliant with the DWQAR. This is a key factor which precludes the granting of an exemption.

62. The DWQAR require that a bacteriological barrier be in place in a supply such as Brooklands Kainga, regardless of the source water. CCC have not indicated that a bacteriological barrier is planned and budgeted for the Brooklands Kainga supply, and thus the supply does not meet the requirements of the DWQAR and the WSA.

Factor 6 – Responsive chlorination

63. The Brooklands Kainga supply has equipment required to chlorinate at short notice. For a supply to manage ongoing operational risks without residual disinfection, clear and conservative response plans are a key factor in ensuring public health is protected.

64. To recommend an exemption be granted for this supply, the Exemption Team would expect the currently installed chlorination system to be setup in a way that complies with the DWQAR. This would include installing additional continuous monitoring equipment at a minimum and likely additional infrastructure to support the installation of that equipment.

65. Staff training is essential, particularly on rapid initiation of chlorine dosing and flushing to purge the entire distribution zone of water that may be or is unsafe (including health and safety at

work considerations for staff and contractors when administering chlorine dosing processes). The exemption application has not indicated that the system and processes to responsively chlorinate would meet the requirements of the DWQAR. No schedule for regularly testing equipment and processes was provided. This testing would include chlorination of the whole supply for a period and at a frequency decided by the supplier.

66. CCC has not provided sufficient information to demonstrate that it would reliably and rapidly respond by chlorinating the Brooklands Kainga to any indication of:

- a contamination event in the source (also overlaps with the issue of no continuous monitoring at the source or pump station)
- a treatment plant failure (including failure arising from excessive turbidity), or
- a suspected or confirmed failure of distribution system integrity.

Distribution Factors

Factor 7 – Distribution system integrity

67. Residual disinfection is a key barrier in the distribution system that suppliers can use to lower the risk of contamination of the distribution network. Where this key barrier is not present, additional measures must be in place to monitor and verify the integrity of the distribution system.

68. A portion of the Brooklands Kainga drinking water distribution pipes are over 50 years old, some having been installed in the 1970s and the leakage rates are high (hundreds of L per connection per day).

69. Maintaining continuous positive pressure is critical to the safety of water supplies that don't maintain a residual disinfectant as even very short negative transients present an opportunity for infiltration of contaminated water. The Brooklands Kainga supply is subject to reductions in pressure, which were suggested by staff to be linked to unauthorised access to the distribution network. The application has not made it clear what action CCC is taking in response to unauthorised access to the distribution system.

70. Currently the Brooklands Kainga supply appears to only have continuous pressure and flow monitoring at the pump stations. Consideration needs to be given to installing continuous monitoring within the distribution system (e.g. turbidity, conductivity, flow, temperature, pressure, etc.) as this type of distribution monitoring is considered best practice for supplies that do not maintain a residual disinfectant.

71. The risk from pathogens is likely to be material in the distribution zone which also has reticulated wastewater systems within meters of the distribution network. While the DWSP generally addresses risks of pathogens to the Christchurch supply, documentation containing site specific assessments of the risks to the Brooklands Kainga supply is not included in the application.

72. The exemption team considers that a summary and critical analysis of the state of the wastewater collection network in the vicinity of the drinking water distribution system is warranted. Monitoring of sewage exfiltration and leakage may also be considered as a part of a wider monitoring programme to verify wastewater system integrity and detect significant leaks.

Factor 8 – Insufficient backflow prevention

73. Backflow prevention in the Brooklands Kainga distribution system is not considered to align with best practice. Single check valves are mentioned, though not universally installed. Dual check valves have been the industry default for some time now and should be replaced roughly every ten years. A suitable programme would include implementation of complete backflow prevention of all service connections, using at a minimum non-testable double check valves for residential customers. In addition, the programme would need to include a planned replacement schedule for backflow prevention devices at an appropriate frequency and verification that backflow prevention devices are still working at the time of replacement.

Factor 9 – Hygiene practices

74. Hygienic practices when performing work on the Brooklands Kainga supply infrastructure should be implemented with the highest standard of care. This includes undertaking all work, where practicable, on the distribution system under positive pressure where ingress of contamination is a risk to the distribution system. A Hygiene Code of Practice for a supply that operates without a residual disinfectant should account for the change in risk profile associated with not having residual disinfection in the distribution system. There is no indication in the application that the hygienic practices developed by CCC are in accordance with an existing industry standard.

Factor 10 – Maintenance of distribution system

75. A regular flushing programme for a distribution system, whether a chlorine residual is present or not, is considered best practice. Evidence of regular flushing of the Brooklands Kainga supply was not provided.

Factor 11 – Water loss

76. Water loss measurement and reduction in a distribution system are critical tools for managing risk. Daily measurement of night flows (when user demands typically reduce) is useful to identify increasing water loss and the identification of leakage. A water loss management plan which includes water loss targets, a programme for night flow assessment and analysis and leakage prioritisation and repair has not been provided with the application.[24]

77. The water loss estimate of 538.89 litres per connection per day is very high and indicates a significant risk for ingress of groundwater water during low pressure events. CCC needs to be able to demonstrate greater certainty and understanding of where, how and why water loss is occurring in the Brooklands Kainga supply. There is no indication of investigations into the

[24] CCC has communicated that they have a programme of leak detection through an annual contract. The details of this have not been provided through the application.

installation of smart meters which are now becoming standard and can provide useful information about water loss.

Factor 12 – Network renewals and assessment

78. The pipe work has not been installed recently and may be nearing the end of its expected life. The current pipe replacement methodology may not provide sufficient assurance that pipes will be replaced proactively before they fail and that allowing for failures and pipe bursts to determine when pipes should be replaced is not best practice in any drinking water supply, particularly in a supply that does not maintain a residual disinfectant.

Compliance with other legislative requirements under the Water Services Act 2021

79. Under s 58(3)(b) of the WSA, a residual disinfection exemption cannot be granted unless the decision-maker is satisfied that the drinking water supplied will comply with 'all other legislative requirements' (i.e. other than the usual requirement to provide for residual disinfection) and the relevant DWSP on an ongoing basis.

80. 'Legislative requirements' has a particular meaning[25] that covers requirements imposed by the WSA, most secondary legislation made under the WSA (such as drinking water standards and the DWQAR), and some enforcement instruments (directions or compliance orders issued under the WSA – of which there are no relevant examples in relation to the Brookland Kainga supply).

81. Without the current chlorine treatment, the Brooklands Kainga supply does not have a primary treatment barrier. It also does not include continuous monitoring equipment. This is inconsistent with the requirements of the treatment section of the DWQAR. The failure of the supply to meet these other legislative requirements precludes the granting of a residual disinfection exemption.

82. In its feedback on the draft of this decision paper, CCC expressed the view that the words 'will comply' in s 58(3)(b) allow the decision-maker to consider a future state of affairs when assessing an application for a residual disinfection exemption. CCC suggested:

> *… we consider the requirement in s 58(3)(b) is broader than what CCC is* currently *doing. The use of "will" versus "is" clearly connotates that it is future looking.*
>
> *Contrasted with s 58(3)(a) that the [decision-maker] must not grant the exemption unless satisfied that the exemption is consistent with the main purpose of [the WSA].*
>
> *Given the effect of s 58(3)(b) Taumata Arowai can consider its future compliance, with the Regulations and DWQAR … that have since come into effect after CCC applied. Based on the broad wording and future intent of s 58(3)(b), we also consider the [decision-maker] can be satisfied this limb is met even if the supplier was not yet fully compliant with all other legislative requirements i.e., by providing evidence that it is in progress.*

[25] WSA, s 5.

83. CCC referred to various statements of purpose in the WSA in support of the points above. It also suggested that the statutory power to impose conditions on a residual disinfection exemption would have no utility if full compliance with legislative requirements was required from the outset.

84. The Exemptions Team agrees that it is possible to consider proposed works and future compliance as part of the assessment of an application for a residual disinfection exemption, giving an applicant some certainty around the effectiveness of proposed investment.

85. However, an exemption of this nature would be conditional upon the proposed works being carried out, or compliance otherwise being achieved, before it could be relied on. This is a necessary consequence of the requirement for 'ongoing' compliance, which by necessary implication means 'ongoing' from the point when the exemption is relied on.

86. In order to assess whether a residual disinfection exemption can be granted on this basis, the decision-maker requires detailed information about the nature of any proposed future works or compliance solutions so this can be robustly assessed against the statutory tests in s 58(3) of the WSA. A general indication that compliance will be achieved in the future in unspecified ways is inadequate – even if supported by evidence of planning or progress in some selected areas – as it does not provide the decision-maker with the information necessary to be suitably satisfied in relation to the s 58(3) matters.

87. As indicated above, exemption conditions remain relevant even where future works or compliance are considered. This recognises that an exemption is a departure from normal legislative requirements that may result in new or amplified risks in some areas, notwithstanding that the overall purpose of the WSA is still achieved. That may conceptually require things to be done that are over and above ordinary requirements to address the risks arising, which can be supported through appropriate conditions.

Drinking Water Safety Plan

88. The DWSP, particularly sections referenced within CCC's residual disinfection application, has been reviewed.

89. There are various inconsistencies and discrepancies between some parts of the DWSP. The DWSP appears to be out of date, referring to the revoked DWSNZ and may not be fully implemented within the context of the Brooklands Kainga supply. It is noted that the DWSP is a relatively large, complex document for the size of the supply and it is considered that this is due to the supply originally being included as part of the Christchurch City supply.

90. The SWRMP and DWSP outline how risks are managed generally across Christchurch supplies, but do not contain the specific details as to the risks that directly impact the Brooklands Kainga supply. Beyond the site-specific risk assessments that were provided, information on the management of the specific risks of the Brooklands Kainga supply was not included in the DWSP.

The DWSP also refers to the *Drinking Water Standards for New Zealand 2005 (Revised 2018)* which have now been revoked indicating that updating of the DWSP is required.[26]

91. The lack of detail in the DWSP specific to the Brooklands Kainga supply has meant that it is not possible to assess whether the supply will comply with the DWSP on an ongoing basis. Risks including the contamination of source water from nearby grazing of stock, the Brooklands Well 2 providing a short-circuit to Aquifer 2, municipal wastewater pipe and pump station across the road from the Kainga pump station, flooding of the nearby Styx River, groundwater seepage into wet wells where chlorine dosing points are submerged are examples of matters not addressed in the DWSP.

92. In broad terms, it is not clear how CCC, through its current DWSP or any future DWSP, will manage the additional risk associated with operating the Brooklands Kainga supply without a residual disinfectant.

Response Plans

93. The operational procedures for emergency disinfection were provided in draft form along with other information. The DWSP also contains general information on how CCC responds to incidents and emergencies. Specific detail related to emergency disinfection for the Brooklands Kainga supply was not provided in a coherent manner that allowed the Exemption Team to assess whether the response plans are appropriate to operate a supply without residual disinfection.

94. Table 3.2 in Volume A of the DWSP describes levels of incidents and emergencies. The Exemption Team does not consider the table to be appropriate for the operation of a supply without residual disinfection. For instance, under level 3, the "detection of *E. coli* (<10) or significant increase in background concentrations of other indicators (e.g., Total Coliforms)" is considered as a moderate consequence. The Exemption Team considers this inappropriate as any detection of faecal matter in a drinking water supply indicates that a serious risk to public health is present.

[26] At the time that this application was received, the *Drinking Water Standards for New Zealand 2005 (Revised 2018)* were still in force. The DWQAR were consulted on in early 2022, published on 25 July 2022 and came into effect on 14 November 2022. The *Drinking Water Standards for New Zealand 2005 (Revised 2018)* were revoked on that date. The final version of the DWQAR was confirmed and publicly available prior to the receipt of this application. A residual disinfection exemption can only be granted if the decision-maker is satisfied that the supply will comply with all other legislative requirements and the drinking water safety plan on an ongoing basis. This requires a forward-looking assessment against the legislative requirements that will apply during the active lifetime of a proposed exemption, including known legislative requirements that have yet to commence. Comments made by the Court of Appeal in *Foodstuffs (Auckland) Limited v Commerce Commission* [2002] 1 NZLR 353 (CA) are consistent with this and have a bearing on the application of ss 9(1)(b) and 33(1)(c) of the Legislation Act 2019. CCC's feedback on the draft of this decision paper recognise the relevance of the changed legislative requirements. CCC had the opportunity to provide further information to address planned compliance with the DWQAR during the assessment process.

Monitoring Plans

95. An assessment of physico-chemical monitoring requirements for the CCC water supply bores has been submitted along with the application. The DWSP does not appear to reflect this assessment yet and monitoring in the DWSP does not appear to be based on the DWQAR, but rather the now revoked DWSNZ.[27]

96. The assessment bases the proposed monitoring on the DWQAR. The Exemption Team does not consider that the proposed monitoring requirements are suitable to meet the DWQAR in full.

97. For instance, the assessment proposes that bores that are far away from each other that access the same aquifer could be representative of each other. While footnote 34 in the DWQAR allows for some flexibility around the representative nature of bores, the Exemption Team considers the interpretation of this footnote in the assessment is inappropriate. The exemption application lacks the robust evidence required to demonstrate that bores are representative of each other. The exemption application does not elaborate on the assessment and there is insufficient information to determine how CCC is monitoring or intends to monitor the Brooklands Kainga supply in a way that is consistent with the DWQAR.

98. It is expected that additional monitoring is undertaken at water supplies that do not maintain a residual disinfectant, for example, monitoring heterotrophic plate counts. This should be provided for as part of regular monitoring and also in response to total coliform or *E. coli* detection or other incidents.

Compliance, Monitoring and Enforcement Strategy

99. The CME Strategy outlines the approach Taumata Arowai will take to exemption applications. It provides part of the backdrop for the more detailed provisions in other Taumata Arowai policy and guidance material.

100. Amongst other things, the CME Strategy provides that Taumata Arowai will be guided by the following principles when determining exemption applications:

- consumption of safe drinking water by consumers is paramount; and
- the scale, complexity and degree of risk associated with a drinking water supply will affect the assessment of whether an exemption is consistent with the main purpose of the WSA, to ensure that drinking water suppliers provide safe drinking water to consumers.

101. The Exemption Team has had regard to the relevant parts of the CME Strategy when conducting its assessment and preparing this paper. The principles recorded in the CME Strategy are reflected in the discussion above.

[27] Revoked and replaced from 14 November 2022 by the Water Services (Drinking Water Standards for New Zealand) Regulations 2022, the DWQAR, and the Aesthetic Values for Drinking Water Notice 2022.

Approval

The Exemption Team recommends that you:

(a) **note** the Exemptions Team's views that, having regard to the scale, complexity and risk profile of the Brooklands Kainga supply:

- the supply cannot currently be operated without residual disinfection in a way that is consistent with the main purpose of the WSA;
- the drinking water supplied by the supply will not comply with all other legislative requirements on an ongoing basis;
- the application, and further information provided by the applicant, do not provide sufficiently detailed evidence about the supply and risks related to residual disinfection to allow a full consideration of the safety of the supply;
- there are significant risks associated with the supply that are not appropriately managed, including source water risk, a lack of a primary bacterial treatment barrier, water loss and backflow prevention which indicate a need for the supply to be operated with residual disinfection; and
- on the information available, granting a residual disinfection exemption would arguably be inconsistent with, and therefore not give effect to, Te Mana o te Wai.

(b) **agree** to decline the residual disinfection exemption application for the Brooklands Kainga drinking water supply. Yes / ~~No~~

Date: 7/11/2023

Steve Taylor
Head of Regulatory