



REPORT OF THE HAVELOCK NORTH DRINKING WATER INQUIRY: STAGE 1

MAY 2017

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HAVELOCK NORTH DRINKING WATER

INQUIRY: STAGE 1

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Kahungunu tangata,
Kahungunu whenua.
Tenei ka mihi ake ki a koutou
e noho mai na i te matomatotanga mai
o Heretaunga Haukunui.
He pukenga wai, he huinga tangata,
he whakawhitinga korero.
Hei konei matou te tuhi atu nei i tenei purongo.

Kahungunu people,
Kahungunu land.
We offer our greeting to you
who reside in the richness
of dew laden Heretaunga.
It is said that at the water's confluence, where people gather,
debate is joined.
At this confluence we have prepared our report.

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Government Inquiry into Havelock North Drinking Water

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SECTION ONE: INTRODUCTION AND CONTEXT

PART 1 – OVERVIEW, KEY FINDINGS AND HIGHLIGHTS

Introduction

[1] Safe drinking water is crucial to public health. The outbreak of gastroenteritis in Havelock North in August 2016 shook public confidence in this fundamental service. Some 5,500 of the town's 14,000 residents were estimated to have become ill with campylobacteriosis. Some 45 were subsequently hospitalised. It is possible that the outbreak contributed to three deaths, and an unknown number of residents continue to suffer health complications.

[2] The August 2016 outbreak was traced to contamination of the drinking water supplied by two bores in Brookvale Road, on the outskirts of Havelock North. This raised serious questions about the safety and security of New Zealand's drinking water.

[3] Accordingly, in September 2016, the Government established this Inquiry into the outbreak. The Inquiry has proceeded in two stages. This report, on Stage 1 of the Inquiry, focuses on identifying what happened, what caused the outbreak, and assessing the conduct of those responsible for providing safe drinking water to Havelock North. Stage 2 of the Inquiry will address lessons learned for the future and steps to be implemented to reduce the likelihood of such an outbreak occurring again.

Overview

[4] Hastings District Council ("District Council") supplies drinking water to consumers in Havelock North. The drinking water is sourced from an aquifer under the Heretaunga Plains (the Te Mata aquifer). The Te Mata aquifer was thought to be a confined aquifer and the water secure from contaminants and, as such, the District Council did not treat water drawn from it. Brookvale Road bores 1 and 2 were used to access the water from the aquifer and to pump it into the reticulation system, through which it was delivered to consumers.

[5] To be deemed safe, the drinking water needed to meet the requirements of the Drinking-water Standards for New Zealand 2005 (revised 2008) ("Drinking-water

Standards”). Drinking-water Assessors (“DWAs”) worked with the District Council to monitor compliance with those standards and to ensure the safety of drinking water.

[6] But, as this Inquiry has shown, meeting the Drinking-water Standards was only part of the story. Where the water source was an aquifer, the delivery of safe drinking water to consumers was dependent on the security of the source from contaminants. It was also dependent upon the water supplier being aware of and managing the risks of contamination of the water supply, and competent local authority administration of the broader resource management regime.

[7] This Inquiry has found that several of the parties with responsibility for the water supply regime for Havelock North (in particular the District Council, DWAs and Hawke’s Bay Regional Council (“Regional Council”)) failed to adhere to the high levels of care and diligence necessary to protect public health and to avoid outbreaks of serious illness. A higher standard of care needed to be embraced, akin to that applied in the fields of medicine and aviation where the consequences of a failure could similarly be illness, injury or death.

[8] The failings by those with responsibility for a safe water supply are summarised in the key findings section below. The Inquiry has found that none of the faults, omissions or breaches of standards directly caused the outbreak. However, had all or any of these failures not occurred, a different outcome may have resulted. It is generally accepted by those responsible for these failings that greater diligence and co-operation is needed to ensure that a much higher standard of care is reached, and soon.

[9] Responses to the August 2016 outbreak were generally well handled, particularly by the Hawke’s Bay District Health Board (“District Health Board”). There were, however, significant gaps in readiness, such as the District Council’s lack of an Emergency Response Plan, draft boil water notices, and up-to-date contact lists for vulnerable individuals, schools, and childcare centres.

Key Findings

[10] The Inquiry has made the following key findings:

- (a) Contaminated drinking water was the source of the campylobacter bacterium that caused the gastrointestinal illness campylobacteriosis among Havelock North residents in August 2016. Sheep faeces were the likely source of the campylobacter.
- (b) It is highly likely that heavy rain inundated paddocks neighbouring Brookvale Road causing contaminated water to flow into a pond about 90 metres from Brookvale Road bore 1. On 5 and 6 August 2016, water in the pond entered the aquifer and flowed across to Brookvale Road bore 1 where the bore pump drew contaminated water through the bore and into the reticulation system.
- (c) Contamination may also have occurred when water from neighbouring paddocks entered roadside drains adjacent to Brookvale Road bores 1 and/or 2 and then entered the bore chambers. If sufficient water had entered the chambers, it could have risen to a level where it overtopped the bore head cable holes and, because the cable seals were loose, travelled down the cables into the water supply. This scenario is regarded as much less likely than travel from the pond to the bore via the aquifer, as described above.
- (d) The failings, most notably by the Regional Council and the District Council, did not directly cause the outbreak, although a different outcome may have occurred in their absence.
- (e) The Regional Council failed to meet its responsibilities, as set out in the Resource Management Act 1991 ("RMA"), to act as guardian of the aquifers under the Heretaunga Plains. Protection of the water source, in this case the aquifer, was the first and a critical step in the multi-barrier approach to ensuring safe drinking water.
- (f) The Regional Council's knowledge and awareness of aquifer and catchment contamination risks near Brookvale Road fell below required standards. It failed to take specific and effective steps to assess the risks of contamination to the Te Mata aquifer near Brookvale Road and the attendant risks to drinking water-safety. This included through its resource consent processes; its management of the many uncapped or

disused bores in the vicinity; its State of the Environment and resource consent monitoring work; and its liaison with the District Council.

- (g) The Regional Council imposed a generic condition on the water take permits it granted to the District Council, related to the safe and serviceable state of the Brookvale Road bores. This condition failed to meet the necessary standard. It then failed adequately to monitor compliance with the conditions of the permits.
- (h) The District Council did not embrace or implement the high standard of care required of a public drinking-water supplier, particularly in light of its experience of a similar outbreak in 1998, and the significant history of transgressions (positive E.coli test results). As a consequence, it made key omissions, including in its assessment of risks to the drinking water supply, and it breached the Drinking-water Standards.
- (i) The District Council's failings applied especially to its mid-level managers, who delegated tasks but did not adequately supervise or ensure their implementation. This caused unacceptable delays to the preparation of a Water Safety Plan, which was fundamental in addressing the risks of an outbreak of this nature.
- (j) The District Council did not properly manage the maintenance of plant equipment or keep records of that work; and it carried out little or no supervision of necessary follow-up work. Specifically, it was slow to obtain a report on bore head security, a key plank in source water security, and it did not promptly carry out recommended improvements.
- (k) There was a critical lack of collaboration and liaison between the Regional Council and the District Council. The strained nature of this relationship, together with an absence of regular and meaningful cooperation, resulted in a number of missed opportunities that may have prevented the outbreak.
- (l) The DWAs were too hands-off in applying the Drinking-water Standards. They should have been stricter in ensuring the District Council complied

with its responsibilities, such as having an Emergency Response Plan and meeting the responsibilities of its Water Safety Plans.

- (m) The DWAs failed to press the District Council sufficiently about the lack of risk assessment, analysis of key aquifer catchment risks, including the link between the Brookvale Road bores and the nearby pond, and a meaningful working relationship between it and the Regional Council. They also failed to require a deeper and more holistic investigation into the unusually high rate of transgressions in the Havelock North and Hastings reticulation systems.
- (n) Contingency planning by the District Council was lacking. The District Council had no Contingency Plan (referred to in various contexts also as an Emergency Response Plan), draft boil water notices, or communications plans at the ready.
- (o) Consultancy firm MWH New Zealand Ltd (“MWH”), a technical adviser to the District Council, failed competently to assess and report on the security of the bore heads of Brookvale Road bores 1 and 2.

Highlights

[11] Five key highlights emerged from Stage 1 of the Inquiry, which are usefully outlined before turning to the substantive sections of the report.

1998 Outbreak

[12] The Inquiry has found that the August 2016 outbreak was not Havelock North’s first experience of drinking water contamination and that the lessons that should have been learned from an earlier contamination had been forgotten.

[13] In July 1998 the town had an outbreak of campylobacteriosis. Sampling of two of the Brookvale Road bores showed campylobacter in the bore heads. This was the same location that would feature in the August 2016 outbreak. An independent report by Stu Clark (“1998 Clark Report”) concluded that the two bores were a possible source of the campylobacteriosis, and that the likely point of entry for contaminated

surface water was a leaking power supply cable gland.¹ The Clark Report raised doubts about the confined status of the Te Mata aquifer from which the bores drew water.² It recommended testing the aquifer to establish whether it was confined, along with measures to ensure the security of both bore heads.

[14] Regrettably, while the two outbreaks shared remarkable similarities, it appears nothing was learned from the July 1998 outbreak. The District Council, as the water supplier, did not take the 1998 outbreak seriously enough and implement enduring, systemic changes. Memory of the earlier outbreak simply faded.

Aquifer Not Confined

[15] The Inquiry has found that the Te Mata aquifer, from which the Brookvale Road bores drew water, was vulnerable to contamination. The aquifer was not confined (as was assumed prior to the Inquiry's process). At best, it might have been characterised as "semi-confined", meaning its water was subject to surface influences and was vulnerable to penetrations of its rather thin and variable confining layer.

[16] The Inquiry found that near the Brookvale Road bores, the aquifer had been penetrated by a significant number of disused or uncapped bores, leaving it vulnerable to entry from contaminated water. Additionally, the confining layer (or aquitard) near Brookvale Road bore 3 had been affected by earthworks at the neighbouring Te Mata Mushrooms property, leaving it vulnerable to entry by contaminated water.

[17] The Te Mata aquifer is also no longer a source of aged water, meaning it is not a secure source of drinking water.³

[18] These facts have critical implications in terms of the compliance of the water supply with the Drinking-water Standards. The Inquiry's finding of a likely direct causal link between the pond and entry of contaminated water into the Havelock North drinking water system does not detract from these concerns. Until the security of the

¹ Stu Clark "Hastings District Council Water Supply Contamination Investigation" (13 September 1998). This report is document **CB048** of the "Core Bundle of Documents" and is accessible on the Inquiry website (<https://www.dia.govt.nz/Core-bundle-documents>).

² A confined aquifer is protected by a layer or layers of impermeable material.

³ A report in August 2016 by GNS found water from three of the bores in the area (Omahu and Wilson roads in Hastings and Brookvale Road bore 1 in Havelock North) contained water less than a year old: GNS "Groundwater Residence Time Assessment of Hastings District Council Water Supply Wells in the Context of the Drinking-water Standards for New Zealand" (2016) (**CB081**).

water source and the bores can be assured (and that may never happen), in the Inquiry's view, treatment of the water in Havelock North and Hastings is the only option.

High Transgression History

[19] The Inquiry has found that in recent years the Havelock North water supply had a relatively high number of positive E.coli readings, or "transgressions". The Hastings supply has also had a high number of positive E.coli readings. The Hastings water supply is drawn from nine bores at five locations in Hastings and Flaxmere. These bores also draw from part of the Heretaunga Plains aquifer system. There is a known "unconfined aquifer zone" close to Portsmouth and Wilson roads. Recent positive E.coli readings from the Hastings bores have resulted in a downgraded bore status for most Hastings bores under the Drinking-water Standards. This in turn has required chlorination of the Hastings supply.

[20] The Inquiry has found that the District Council tended to underestimate the significance of positive E.coli results. It sometimes ended treatment of water before clearly establishing the contamination source. While such an approach (after three subsequent clear test readings) technically meets the Drinking-water Standards, a more rigorous approach was needed with public safety at stake.

Poor Working Relationships

[21] The Inquiry has found that the Regional Council and the District Council did not work effectively and constructively together. This was at variance with the Ministry of Health's Guidelines for Drinking-water Quality Management for New Zealand ("Drinking-water Guidelines"), which required "maximum interaction and mutual support between the various stakeholders". Indeed, it is fair to say the relationship between the two local authorities before August 2016 was dysfunctional.

[22] While the lack of collaboration may not have contributed directly to the outbreak, at the very least it resulted in a number of missed opportunities. The uptake of such opportunities might well have prevented the outbreak.

[23] The relationship between the two Councils deteriorated further when, following the 2016 outbreak, the Regional Council began investigating the District Council's Brookvale Road bores. Subsequently, the Regional Council filed a criminal

prosecution against the District Council on 18 November 2016, which led to a lengthy delay in the Inquiry's work. In the Inquiry's view, such a proceeding was ill-advised and ought never to have been launched.

[24] On the evidence the Inquiry heard, the prosecution, based on proof to the criminal standard, was bound to fail. It was eventually dropped and replaced with two infringement notices. The money the Regional Council spent investigating the case, reportedly \$450,000, could have been more wisely applied to gaining a better understanding of the status of the aquifers beneath the Heretaunga Plains.

[25] The two authorities were subsequently induced to partner with the District Health Board and the DWAs to form a Joint Working Group focused on providing clean, safe drinking water for Havelock North and Hastings. This group, guided by recommendations from the Inquiry's interim measures hearing in December 2016, is making promising progress under an independent Chair. Its reports and action plans are available on the Inquiry website. Much work, however, remains to be done.

[26] The Joint Working Group's mandate and progress will be dealt with in Stage 2 when the Inquiry examines systemic issues and makes recommendations about managing water supply nationally. This approach may provide a blueprint for collaboration elsewhere. No structural or legislative changes are needed for the Group's operation, although the question of whether a regulatory framework should be developed will be part of the next stage.

Protozoa Risk

[27] The Inquiry has found that campylobacter was the cause of the illnesses in Havelock North. Nevertheless, where diarrhoea and vomiting symptoms are involved, the possibility of protozoan pathogens, such as cryptosporidium or giardia, cannot be ruled out without careful testing. The response to the outbreak did not sufficiently consider this risk.

[28] The Inquiry has learned that a number of the major outbreaks of waterborne illness overseas have involved cryptosporidiosis, for example Western Georgia in 1987, Milwaukee in 1993, and Northern Ireland in 2002. Waterborne protozoa outbreaks have also occurred in New Zealand in Masterton in 2003; the Waikato District in 1997; and the Tauranga District in 1995. Giardia outbreaks have been

recorded in Deniston in 1996, Auckland in 1993, and Dunedin in 1991. A table of waterborne outbreaks is at **Appendix 7** (page 192).

[29] Some managers at the District Council in the present case seemed to have little or no knowledge about protozoan pathogens and the significant risks associated with them. Gaining an awareness of, and education about, such risks (and how they might be identified at an early stage) will be an important part of Stage 2. The Annual Report on Drinking-water Quality 2015-2016⁴ states that achievement of protozoal standards was at a level of only 82 per cent across the whole population covered by the report. While this represented a 2 per cent improvement over the previous year, protozoal achievement is still well below optimum.

[30] The risks associated with waterborne diseases in New Zealand are well recognised. The Drinking-water Guidelines emphasise that “untreated drinking water contaminated with pathogens presents a significant risk to human health”. Such risk suggests it is vital that this time lessons must be permanently learned from the Havelock North campylobacteriosis outbreak.

⁴

PART 2: BACKGROUND AND CONTEXT

The Outbreak

[31] In August 2016, an outbreak of gastroenteritis occurred in Havelock North. Havelock North is a small town of around 14,000 inhabitants situated in the Hawke's Bay region. It is governed by the District Council whose local administration includes the nearby town of Hastings, which in turn has a population of around 52,000.

[32] Over 1,000 gastroenteritis cases were notified to the District Health Board but it estimates that many more people became ill, and that some 5,500 people were affected. This number comprises just under 40 per cent of Havelock North residents.

[33] The outbreak was traced to faecal contamination of water supplied by Brookvale Road bores 1 and 2. A map of the Brookvale Road area, including the bores, is at **Figure 1** (page 150). *Campylobacter* has been identified as the cause of the illness.

[34] The District Health Board first became aware of substantial numbers of gastroenteritis cases during the morning of Friday 12 August 2016. The same morning, the District Council was advised by its testing laboratory of an E.coli presence result from a water sample taken from a sampling tap in the Havelock North reticulation on 11 August 2016. The presence of E.coli indicated faecal contamination of the drinking water. The District Council promptly notified the District Health Board of the E.coli presence result and urgently arranged for numerous further samples to be taken from the bores and reticulation, and sent those samples for testing.

[35] District Health Board personnel continued to gather information about gastroenteritis cases throughout the morning of 12 August 2016. At about noon, the Ministry of Health was advised of the emerging situation and at 2.00 pm a meeting was held between the health authorities and District Council personnel. By this time, District Health Board personnel assessed that there was sufficient evidence of a serious emerging outbreak that required intensive management. While there was no certainty, the possibility of contamination of the drinking water was considered significant. A decision was made to chlorinate the Havelock North water supply.

[36] The District Council set in train procedures for the chlorination. These included extensive flushing of the reticulation network. Chlorination was commenced at

approximately 5.00 pm on 12 August 2016 and the Havelock North reticulation network was fully flushed by midnight. A boil water notice was released to media and social media at about 6.40 pm on 12 August 2016.

[37] Enumerated test results from the extra water samples taken on 12 August 2016 became available on Saturday 13 August 2016. These indicated high E.coli readings within the Havelock North reticulation, and at Brookvale Road bores 1 and 2. A positive connection between the outbreak of illness and the drinking water was thus established at a relatively early stage.

[38] On 13 August 2016, the District Health Board activated its emergency operation centre. Gastroenteritis cases continued to be reported at substantial levels between 13 and 17 August 2016. Campylobacter was identified as a pathogen on or about 17 August 2016. From 18 August 2016, there was a substantial reduction in cases notified, and by 25 August 2016 no further fresh cases were reported. The boil water notice was lifted on 3 September 2016.

[39] As a result of surveys, the District Health Board estimates that some 78 per cent of outbreak victims had to take time off work or school. Some 32 per cent of people had a recurrence of the illness and 4 per cent of victims were still experiencing ongoing symptoms as at late September 2016. The District Health Board was notified of 45 hospitalisations linked to the outbreak. Three people who had confirmed campylobacteriosis died, although it is understood that in all three cases other medical conditions existed, and that the waterborne illness was unlikely to have been the sole cause of death. Other effects from campylobacteriosis (such as reactive arthritis and Guillain-Barré Syndrome) have been reported. By any measure, given the relatively small population of the area, this was a significant outbreak.

[40] Many businesses in Havelock North and surrounding areas were affected when the owners, their staff or their customers became sick. Inevitably business owners lost income during the outbreak, adding to the costs that were borne by the community.

[41] From the evening of 12 August 2016 Havelock North water was chlorinated continuously until the Brookvale Road bores were deactivated on 24 August 2016. From 25 August 2016 Havelock North was supplied exclusively by water from bores in the Hastings bore fields. The Hastings water supply has been disinfected with chlorine since the August 2016 outbreak and the District Council intends to continue

chlorination for the foreseeable future. Given the evidence received by the Inquiry in relation to the unconfined nature of the aquifer and the security of the Hastings bores and the Brookvale Road bores, the Inquiry considers this was a necessary and prudent decision.

[42] On 7 March 2017 Brookvale Road bore 3 was reactivated to supplement the Hastings supply. The water from bore 3 is being treated to a high level by a triple treatment process.

PART 3: INQUIRY PROCESSES

Commencement of Inquiry

[43] The scale of the outbreak, and the issues it raised in relation to the need for safe drinking water, caused the Government to set up an inquiry under the Inquiries Act 2013 (“Inquiries Act”). Draft terms of reference were issued on 22 August 2016 and the Inquiry was formally established by Gazette notice dated 15 September 2016.

[44] The Terms of Reference, which are contained in full in **Appendix 1** (page 152), directed the Inquiry to investigate and report on how the Havelock North water supply became contaminated, how the outbreak was subsequently addressed, the adequacy of responses by all concerned, and how to reduce the risk of any recurrence of an outbreak of this nature.

[45] More particularly, the Terms of Reference required the Inquiry to investigate, report on, and provide recommendations on:

- (a) The cause(s) of the outbreak;
- (b) Whether any person or organisation was at fault or failed to meet required standards;
- (c) The adequacy and appropriateness of responses by all relevant parties to the outbreak;
- (d) The adequacy of the management of drinking water supplies for Havelock North, the implementation of the Drinking-water Standards,

contingency planning, preparedness and the responses of local and central government agencies, and any other relevant parties;

- (e) Any legal or regulatory changes or additions necessary and desirable to prevent or minimise similar incidents;
- (f) Any changes or additions to operational practices for monitoring, testing, reporting on and management of drinking water supplies, implementation of Drinking-water Standards, contingency planning and responses by local and central government, to address the lessons from this incident; and
- (g) Any other matters which the Inquiry believes may promote the safety of drinking water and/or prevent the recurrence of similar incidents.

[46] The Terms of Reference excluded from the Inquiry, and the scope of recommendations:

- (a) Any questions of civil, criminal or disciplinary liability;
- (b) The structural arrangements for local government; and
- (c) Issues relating to water, aquifer and catchment management which are unrelated to the contamination of specific sources of drinking water supplied to Havelock North.

Stages 1 and 2 of the Inquiry

[47] The Inquiry determined that it would be efficient and productive to hold the Inquiry in two stages. Stage 1 would address matters relating to the campylobacteriosis outbreak in August 2016, and Stage 2 would address systemic issues, lessons to be learned, and possible changes needed for the future.

[48] On 28 October 2016, the Inquiry issued a list of eight issues to be considered in Stage 1. On 30 March 2017, the Gazette notice establishing the Inquiry was amended to authorise reporting in two stages.

Stage 1 Issues

[49] The list of eight issues identified for Stage 1 naturally fell into two groups, namely:

- (a) Issues concerning prior knowledge, failures, and causation; and
- (b) Issues relating to the outbreak, contingency planning, and responses.

[50] For convenience the Inquiry has set out below the two groups of issues to which the evidence, documentation, and submissions were directed. This report addresses these two groups separately in Section Two and Section Three:

Section Two

1. What are the legal regimes in place in relation to drinking water. Which persons or organisations had responsibility for any aspect of the safety of the Havelock North drinking water, and what each responsibility was (this covers direct or indirect responsibilities, and responsibility in a practical as well as a legal sense, and includes contractors, agents and advisors).
2. Prior to 12 August 2016, what was known, or should reasonably have been known by all parties with any responsibility for drinking water about the risks applicable to the Havelock North drinking water supply, and about previous responses to any relevant events.
3. What was the source and cause of the contamination of the Havelock North drinking water supply in August 2016.
4. In relation to the contamination event in August 2016, did any person or organisation fail to meet any requirement, and was any person or organisation at fault and/or were there any systemic failures.

Section Three

5. What were the facts of the August 2016 campylobacteriosis outbreak, including its effects on those who became ill, and on the Havelock North community. How was the outbreak managed. What were the actions of all relevant persons or organisations in response to the outbreak (this includes interactions and co-ordination between persons or organisations).
6. Was the level of contingency planning and preparation for a drinking-water contamination event by all persons and organisations involved adequate and appropriate.

7. Were the responses to the outbreak by all persons and organisations involved adequate and appropriate.

[51] The eighth issue provided for consideration of “what actions or further actions should be taken to ensure a safe supply of drinking water to Havelock North”. This issue was considered urgently in December 2016 and was the subject of an interim measures hearing and report discussed below in Part 4.

[52] A key consideration for the Inquiry was the state of knowledge of each of the participants prior to the outbreak; this was a starting point for consideration of all questions relating to failures and it was embodied in issue two set out above.

Hearings and Preliminary Processes

[53] The Inquiry determined that there was a substantial general public interest in the matters to be considered. This was because of both the involvement of a range of local and central government entities, and the public health issues raised. Accordingly, the Inquiry determined that it would be appropriate to hold public hearings to enable evidence on potentially contentious matters to be called and tested. In respect of uncontentious matters, the Inquiry has exercised its inquisitorial powers to assemble extensive factual and documentary material through counsel assisting.⁵

[54] The Inquiry held an initial public hearing on 27 October 2016, and heard from interested parties to make an assessment of appropriate process. Public hearings were scheduled to commence in Hastings on 28 November 2016, with further hearings to take place in December 2016 with a view to completing the majority of the evidence required for Stage 1 by the end of 2016. A timetable was set for briefs of evidence and exhibits to be provided ahead of the hearings.

[55] The Inquiry deemed the following persons to be core participants in accordance with s 17 of the Inquiries Act:

- (a) The District Council;
- (b) The District Health Board;
- (c) MWH;

⁵ Mr Nathan Gedy QC and Ms Fionnghuala Cuncannon were appointed as counsel assisting.

- (d) The Regional Council;
- (e) The Ministry of Health;
- (f) The Ministry for the Environment;
- (g) The Department of Internal Affairs;
- (h) Local Government New Zealand;
- (i) Water New Zealand, and
- (j) The Institute of Geological and Nuclear Sciences Ltd (“GNS”).

[56] Public hearings for Stage 1 commenced on 30 January 2017 (having been postponed due to the Regional Council’s filing of a criminal prosecution against the District Council) and continued over eight days. Following the completion of evidence presentation and cross-examination, the Inquiry heard submissions from counsel assisting on 15 February 2017 addressing questions of possible fault, failure, omission, or breach of standards by some of the core participants. Counsel for the parties against whom such allegations were made filed written submissions in reply. The Inquiry has considered these carefully, together with submissions from other submitters relevant to Stage 1. A list of such submitters (including some who submitted wholly or partly in relation to Stage 2 matters) is in **Appendix 10** (page 230).

Expert Evidence

[57] The Inquiry was ably assisted by a number of experts including Dr Colin Fricker, the Institute of Environmental Science and Research Ltd (“ESR”), the Science Caucus, and GNS.

Dr Colin Fricker

[58] The Inquiry determined that it would be desirable to obtain independent expert advice in relation to a number of the issues within the Terms of Reference. In November 2016, the Inquiry appointed Dr Colin Fricker, an adjunct professor at Queens University, Kingston, Ontario, as an independent expert. Dr Fricker’s advice has been of great value to the Inquiry and, where his advice has raised matters of significance to core participants, it has been put to them for comment and/or submissions.

ESR

[59] The Inquiry also received information and evidence from ESR. ESR is a Crown Research Institute which, through its Risk and Response Group, maintains the Water Information for New Zealand website (at www.drinkingwater.esr.cri.nz) and databases. In New Zealand, ESR is the pre-eminent scientific adviser in relation to drinking water safety. Each year, it provides an annual review of drinking water safety to the Ministry of Health and has also produced a number of key reports and guides.⁶ ESR also assisted the agencies directly involved in the outbreak by attending the various outbreak meetings, advising the District Council staff on the requirements for campylobacter testing, and conducting the initial testing for campylobacter and the epidemiological analysis of the outbreak.

Science Caucus

[60] The Inquiry received significant assistance from what became known as the “Science Caucus”.

[61] During a hearing in December 2016 it emerged from the evidence already filed that the expert advisors to the District Council and Regional Council were strongly divided, particularly on the cause or causes of the contamination in August 2016.

[62] The Inquiry was concerned at the proliferation of expert evidence, some of which at times suggested a lack of objectivity. For some witnesses there appeared to be limited understanding of the role of an expert and minimal appreciation of the High Court Code of Conduct for Expert Witnesses requiring independence and objectivity. The Inquiry raised the prospect of the experts for the District Council and the Regional Council working together to identify the key areas on which agreement could be reached, particularly in relation to causation.

[63] This led the Inquiry to direct the establishment of the Science Caucus, comprising Mr Cussins of Tonkin & Taylor Ltd (“Tonkin & Taylor”) (retained by the District Council), Dr Gyopari (also retained by the District Council), Dr Swabey (an employee of the Regional Council) and Mr Hughes (retained by the Regional Council).

⁶ See for instance, the “Introduction to Drinking Water Contaminants, Treatment and Management” (**CB077**) and “A Guide to the Ministry of Health Drinking-water Standards for New Zealand” (Chris Nokes, June 2008), accessible in the Reference section of the Inquiry website and the production of the Annual Report on Drinking Water Quality: the 2015-2016 report is at **CB192**.

[64] The Science Caucus produced several interim reports for the Inquiry, which helpfully narrowed the issues in dispute. Members of the Science Caucus continued their joint endeavours, even during the first week of the evidence hearings. This resulted in the Science Caucus producing a report dated 2 February 2017 which recorded the agreement of the experts on issues central to the causation of contamination (“Science Caucus Report”). A copy of that Report is at **Appendix 3** (page 168). The Inquiry will refer to the Report below when dealing with causation.

GNS

[65] Brief mention should also be made of GNS. At its request, GNS was deemed a core participant and it filed a brief of evidence describing the processes and issues which relate to water-age testing. One of the three criteria for achieving the classification of secure bore water under the Drinking-water Standards is proof that bore water is not directly affected by surface or climate influences. One of the key ways of demonstrating compliance with that requirement is to show that no water younger than one year is detectable in the aquifer.

[66] In order to address this requirement, the District Council retained GNS to age-test the water and samples for this purpose were taken in 2001, 2011, and 2016 with resulting reports. The 2001 and 2011 reports advised the District Council that analysis of the information available at that time suggested there was no water younger than one year in the samples taken, thereby demonstrating compliance with that criterion in the Drinking-water Standards. However, the 2016 report indicated the likelihood of a significant ratio of young water in various parts of the aquifer⁷.

[67] The Regional Council filed evidence raising issues that were either actually or potentially critical of GNS’s work in 2011. The Inquiry was satisfied that any such criticism had no validity. The Inquiry was grateful to GNS for its comprehensive evidence. It is clear that water-age testing is a complex field, the relevant science has changed considerably and is still developing, and the role of water-age testing in classifying bore water is a matter that will need further consideration in Stage 2.

⁷ The 2001 report is **CB056**, the 2011 report is **CB056A** and the 2016 report is **CB081**.

Prosecution of the District Council

[68] On 18 November 2016, the Regional Council filed in the Hastings District Court, and served on the District Council, prosecution documents alleging breaches of the RMA. The Regional Council alleged that the District Council had failed adequately to maintain the bore works' structures for Brookvale Road bores 1 and 2. The Regional Council asserted that the failure to maintain the bores led to the contamination of the water that caused the outbreak. The summary of facts accompanying the charging documents traversed a number of matters that overlapped significantly with those being considered by the Inquiry. The District Council denied the charges and resolved to defend them.

[69] The District Council applied to the Inquiry for a postponement of the Inquiry hearings scheduled to commence on 28 November 2016. Having considered that application, and the effect of the prosecutions on the District Council's ability to be ready to participate fully in the hearings, the Inquiry determined that it would not be fair or appropriate to proceed with hearings on 28 November 2016.

[70] By a decision dated 22 November 2016, the Inquiry postponed the commencement of the hearings until 30 January 2017. A firm fixture for the hearing of the Regional Council prosecution against the District Council was known to be available in the Hastings District Court on 16 January 2017, and the Inquiry anticipated that the prosecution would be resolved by the end of January 2017.

[71] Between 22 November and 12 December 2016, the Regional Council had the benefit of further evidence, documents and test results relating to the contamination pathway. It also had an opportunity to consider aspects of the Solicitor-General's Prosecution Guidelines, drawn to its attention by the Inquiry.

[72] On 12 December 2016, the Regional Council advised the Inquiry that it had decided to withdraw the prosecution and issue infringement notices under the RMA instead. These notices were based upon a simple failure by the District Council to comply with condition 21 of its water take permit, in that the bore heads of Brookvale Road bores 1 and 2 were not maintained to the required standard. The District Council acknowledged responsibility and paid the fines of \$500 per infringement notice before the end of 2016.

[73] In light of the totality of the evidence that was filed with the Inquiry, and also the unanimous findings of the Science Caucus, including the Regional Council's own experts, the Inquiry observed that the Regional Council's decision to lay criminal charges against the District Council was both premature and ill-advised. The Regional Council's prosecution case was based upon the proposition that the sole pathway of contamination was through defective bore head seals but the Science Caucus eventually concluded that the most likely pathway was from the Mangateretere pond to Brookvale Road bore 1. While it could not be ruled out, bore head ingress was substantially less likely. See **Figure 1** for the respective position of Mangateretere pond and the Brookvale Road bores.

[74] The Regional Council's prosecution case was lacking in the level of factual, technical, and scientific evidential support that would have been needed to prove the charges beyond reasonable doubt. In short, it was bound to fail and ought never to have been brought.

PART 4: INTERIM SAFETY OF HAVELOCK NORTH DRINKING WATER AND JOINT WORKING GROUP

Interim Safety of Drinking Water

[75] In December 2016, the Inquiry identified an urgent need to address the safety of Havelock North drinking water over the next 12 months. The Inquiry has maintained an overview of this issue and considers it will provide valuable lessons to be considered, and reported on in Stage 2 of the Inquiry.

[76] In light of the outbreak, and earlier concerns in October 2015 about contamination of Brookvale Road bore 3, the District Council had ceased using all three Brookvale Road bores. The DWAs had notified the District Council that all Brookvale Road bores were to be considered "non-secure" in terms of the Drinking-water Standards. From 25 August 2016, the Hastings water supply was used as the sole source for the Havelock North reticulation.

[77] Shortly after issuing its decision postponing the Inquiry hearings due to the Regional Council's prosecution, however, the Inquiry became aware that the District Council was proposing to reopen Brookvale Road bore 3 in the summer to meet peak demand for water supply. Bore 3 had been shut down since 1 October 2015 following positive E.coli readings at the bore. This gave rise to important concerns about the

safety of the Havelock North drinking water supply over the summer period and beyond.

[78] As noted above, the Terms of Reference and issue eight of the Stage 1 issues, directed the Inquiry to consider “actions to ensure safe water supply can be provided to Havelock North”. The Inquiry took the view that it would be prudent to inquire into these developing supply issues urgently, as there were a range of concerns to be addressed before Brookvale Road bore 3 could be safely reactivated.

[79] Accordingly, on 24 November 2016, the Inquiry directed that a public hearing would take place on 12 and 13 December 2016 on the question of what actions were required to ensure a safe supply of drinking water to Havelock North for the 12 months commencing 12 December 2016.

[80] Core participants filed extensive briefs of evidence and technical reports that addressed every aspect of the safety of Havelock North’s drinking water from the aquifer to the tap.

Development of the Joint Working Group

[81] As the interim measures hearing approached, the Inquiry perceived a pressing need for key agencies to cooperate with each other in an effective and productive manner. Counsel assisting held preliminary discussions with the parties about the possibility of a joint working group.

[82] Dr Snee, Chief Executive of the District Health Board, proposed a tripartite working group, the Drinking Water Safety Joint Working Group (“Joint Working Group”). He proposed that the Joint Working Group would have two representatives from each of the District and Regional Councils and a representative from the District Health Board. A DWA, Mr P Wood, from the Central North Island Drinking Water Assessment Unit, would also attend. The first meeting of the Joint Working Group was convened in advance of the interim measures hearing on 7 December 2016. At that meeting an independent Chair, Mr Tremain, was appointed.

The Hearings and Interim Report

[83] The interim measures hearings proceeded on 12 and 13 December 2016 and resulted in a large measure of consensus between the core participants.

[84] On 15 December 2016, the Inquiry issued an interim report in relation to this issue (“Interim Report”) which is reproduced as **Appendix 2** (page 156). The Inquiry’s recommendations were not opposed by any party and the process led to rapid and substantial improvements to all aspects of the water supply.

Treatment of Water from Brookvale Road Bore 3

[85] The District Council had resolved ahead of the December 2016 hearings to implement a comprehensive treatment regime whereby water pumped from Brookvale Road bore 3 would be treated by filtration, ultraviolet light, and chlorination. This 3-stage process would provide a “Log 5” level of treatment.⁸

[86] The Interim Report endorsed the District Council’s decision to treat the water to be drawn from Brookvale Road bore 3. It also recommended the following key measures, which were accepted by the District Council:

- (a) Brookvale Road bore 3 would not be reactivated until the infrastructure for the Log 5 treatment regime had been constructed, commissioned, tested, and approved by the DWAs.
- (b) The Hastings water supply, which would continue to contribute to the Havelock North reticulation, would be chlorinated for at least the next 12 months.
- (c) Monitoring in accordance with, or in excess of, the Drinking-water Standards would continue, with an additional programme of investigative monitoring also put in place. This would involve larger samples (two litre), testing for total coliforms as well as E.coli, and extensive testing for protozoa using 1000 litre samples at each bore weekly.

Interim Report Recommendations

[87] In its Interim Report, the Inquiry also made a series of recommendations endorsing the Joint Working Group and its proposed operating methods. Those recommendations were essentially made without objection from any of the core participants. They sought to ensure that the Joint Working Group had effective

⁸ The Drinking-water Standards allocate Log ratings to treatment levels on a scale of 1-5, with Log 5 treatment being the most intensive.

oversight of drinking water safety matters, and that it would operate cooperatively and productively.

[88] The Interim Report recommended that a number of important matters concerning the reactivation of Brookvale Road bore 3, and the subsequent special monitoring, be subject to review and agreement by the Joint Working Group. The Joint Working Group oversaw key steps leading to the reactivation of Brookvale Road bore 3 including:

- (a) Design and specification of the treatment plant;
- (b) Validations required for the treatment plant;
- (c) Inspections of bore 3 and the verification of its condition and its fitness for purpose;
- (d) Putting in place a robust inspection and maintenance programme for the bore;
- (e) Planning and implementing the special investigative monitoring programme for both bore 3 and all of the Hastings bores;
- (f) Monitoring of test results from bore 3 and the Hastings bores;
- (g) Verifying that all persons carrying out sampling and testing were properly trained and competent;
- (h) Reviewing and approving the Emergency Response Plan for the District Council before activation of bore 3; and
- (i) Reviewing and approving changes to the District Council's Water Safety Plan.

[89] The Joint Working Group has met at least monthly since it was set up. Its minutes and action plans have been published on the Inquiry's website. The Inquiry observes that, under the leadership of Mr Tremain as Chair, the Joint Working Group has operated effectively and competently and has provided a great level of cooperation and assistance to the Inquiry. As one example, over a period of some two weeks at the end of February 2017, the Joint Working Group worked intensively with the Inquiry

in relation to all of the arrangements needed to commence operations for Brookvale Road bore 3 and its new treatment plant. The Inquiry records its gratitude.

[90] Stage 2 of the Inquiry will provide an opportunity to assess the benefits of such an entity more broadly in the drinking water context.

Implementation of the Interim Report Recommendations

[91] The Inquiry accepted an invitation to visit the treatment plant site to inspect the works in progress on 7 February 2017. Treatment of water passing through the plant involves cartridge filtration, exposure to ultraviolet light, and chlorination. Construction of the Brookvale Road bore 3 treatment plant took longer than expected and reactivation of bore 3 into the public supply did not occur until 7 March 2017.

[92] On the last day of the hearings in February 2017, the Inquiry heard further updating evidence in relation to the current safety of the Havelock North drinking water.

[93] The District Council's Group Manager, Asset Management, Mr Thew, advised the Inquiry that Brookvale Road bore 3 had been thoroughly inspected with satisfactory results; an inspection and maintenance schedule was in the final stages of being produced; and the Log 5 triple treatment processes would be applied from the date of reactivation. He also advised that plans were underway for the Joint Working Group to investigate the security of the aquifer and that the District Council was in the process of reviewing its management and accountability processes in relation to the operation of Brookvale Road bore 3, and the Hastings bores. An Emergency Response Plan and substantial changes to the District Council's Water Safety Plan were also under preparation. The District Council confirmed that Brookvale Road bore 1 was to be disestablished and that future use of Brookvale Road bore 2 was currently uncertain, but that any production from bore 2 would also be subjected to the same Log 5 treatment.

[94] The Inquiry was advised that the special investigative sampling procedures had commenced, albeit only in the week before. These were being pursued in accordance with the Inquiry's 15 December 2016 recommendations with the results being provided daily to the Joint Working Group and to the Inquiry.

[95] As part of the updating evidence, the Inquiry also received evidence from the Chief Executives of the District Council, Regional Council, and the District Health Board as to the workings of the Joint Working Group. In addition, the Inquiry heard from Mr Tremain. The Inquiry was satisfied that the Joint Working Group was working as intended and that it was functioning as a vital interface between the stakeholder agencies. Not only was the Joint Working Group giving effect to the Inquiry's interim recommendations, but it was reviewing and overseeing many practical and detailed matters.

Further Drinking Water Safety Issues

Use of Sodium Thiosulphate by Analytical Research Laboratories

[96] As part of its investigation of the interim safety of drinking water, the Inquiry on 20 December 2016 asked the District Council to confirm that post-chlorination sampling used sodium thiosulphate. The Drinking-water Standards specifically provide for the use of sodium thiosulphate to dechlorinate samples taken from chlorinated water and the Drinking-water Guidelines similarly mandate the use of this chemical. Without using this to neutralise chlorine, any bacteria in chlorinated samples would rapidly die and may not have been detected. The Inquiry was advised that the use of sodium thiosulphate for chlorinated samples was a well-known and basic requirement.

[97] On 5 January 2017, one of the two laboratories used by the District Council, Analytical Research Laboratories, advised that it had made an error with a number of chlorinated water samples. Analytical Research Laboratories had discovered that sodium thiosulphate bottles had not been used for all chlorinated samples taken and tested by it in the period 22 August 2016 to 2 January 2017. The District Council advised the Inquiry of this error on 24 January 2017.

[98] The error meant that all chlorinated samples taken from the reticulations of Hastings and Havelock North and tested by Analytical Research Laboratories during the above period could not be relied upon and the results had to be discarded. Some 1,318 samples were involved over a period of some four and a half months. The lack of test data immediately made the District Council non-compliant with the Drinking-water Standards for the relevant period.

[99] Analytical Research Laboratories advised the Inquiry that it had had very limited prior experience in sampling or testing chlorinated water, when it was asked by the

District Council, in circumstances of some urgency, to assist with water testing in the aftermath of the August 2016 outbreak. The requirement for sodium thiosulphate to be used in the collection bottles for chlorinated samples was contained in Analytical Research Laboratories' Test Method and Procedures Manual (an International Accreditation New Zealand-accredited document), and it was also stated in the Drinking-water Standards. However, unfortunately, in the circumstances obtaining in August 2016, Analytical Research Laboratories did not implement this requirement in its testing procedures.

[100] This error by Analytical Research Laboratories, and the consequent discarding of 1,318 test results taken over a critical period, was an unfortunate occurrence. The Inquiry has accepted that it arose in unusual circumstances and there is some dispute as to responsibility for guidance and training on the processes for sampling and testing chlorinated water. It is fundamental, however, that the sampling and testing procedures are observed with complete accuracy and diligence in all circumstances. The error therefore raised important issues about the accreditation of laboratories by International Accreditation New Zealand, and the processes for supervision, training and accountability of laboratories, including their implementation of testing methods and the proficiency of their staff and management.

[101] At present the performance of laboratories is largely reliant on internal quality assurance and their role is carried out as a somewhat independent part of the drinking water supply process. Their functions, oversight, and relationships with other participants will be the subject of further consideration in Stage 2.

[102] The error also raised related issues about the methods, training, competence, and oversight of water samplers, who are either within the purview of laboratories or are employed or contracted by the water supplier. These issues will similarly need further consideration in Stage 2.

Continued Transgressions

[103] Shortly after the investigative monitoring programme commenced, on 10 February 2017, an E.coli presence result was obtained from a two litre sample from Eastbourne bore 2 in Hastings. On the same date, a presence result was (necessarily) also obtained in relation to total coliforms at the same bore. Total coliform presence

results were also obtained from a neighbouring bore, Eastbourne bore 1, on 6 and 17 February 2017.

[104] These tests were carried out by a different laboratory, Water Testing Hawke's Bay. It advised the District Council that it was possible that cross-contamination may have been the cause of the presence reading. The Inquiry was concerned at the possibility that cross-contamination was being raised as a means to explain the presence readings, particularly as there had been evidence that this had been raised in the past. The Inquiry requested more information as to the basis upon which cross-contamination had been asserted. The laboratory advised that it had no proof of cross-contamination but that the equipment used for the test that produced the presence result had previously been used for the E.coli control sample testing. Such equipment is ordinarily disposed of or must be sufficiently cleaned before it can be used again.

[105] In the absence of genotyping or other testing between the control sample and the sample that produced the presence result, it was not possible to take the question of cross-contamination any further. It remains a possibility but no more than that. The Inquiry's view is that, unless cross-contamination can be positively established, it is necessary to err on the side of caution and to treat any presence result as legitimate, and as requiring an appropriate response. Dr Fricker advised the Inquiry that this is the same approach used by regulatory authorities around the world.

[106] These early indications of water quality problems in the Eastbourne borefield were of concern to the Inquiry. On 20 February 2016, the Inquiry requested that the Joint Working Group address these readings. The Joint Working Group responded promptly with a proposed plan of measures to carry out further testing and surveillance and to keep chlorination treatment of the relevant bores under review.

[107] Reviewing its 15 December 2016 interim recommendations for intensive, large-sample bacterial and protozoal testing at each of the bores supplying Hastings and Havelock North, the Inquiry remains of the view that this increased testing regime is necessary and important, and that it should continue.

[108] There remain a number of unanswered questions about the real level of security existing at each bore. The DWA has downgraded the status of a number of the bores and further water age-testing is being pursued. A review of the status and

compliance position of all bores within the District Council's jurisdiction, at **Appendix 9** (page 228), discloses a less than satisfactory position.

[109] The Joint Working Group has advised that the District Council has taken steps to retain independent expert water safety advice. The Inquiry will continue to request updates from the Joint Working Group on the overall position, and proposed future strategy, regarding the bores supplying Havelock North.

PART 5: GENERAL REGULATORY CONTEXT

Regulatory Framework

[110] The Inquiry sets out at **Appendix 4** (page 170) a summary of the regulatory frameworks applicable to drinking water under the RMA, the Local Government Act 2002 ("LGA") and the Health Act 1956 ("Health Act"). **Appendix 4** also covers aspects of the Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007 ("NES Regulations") and the Drinking-water Standards, which are issued by the Minister of Health and have the status of a statutory regulation.

[111] This part of the report highlights aspects of the regulatory framework that are of particular significance, but does not repeat the detail of **Appendix 4**. Rather, the focus is on explaining the complex multidisciplinary system and multiple barrier approach to drinking water safety created by the regulatory framework.

Multidisciplinary System

[112] New Zealand's multidisciplinary drinking water system has three principal components.

[113] The first component is the environment or, specifically, the water source. Both the Ministry for the Environment and the Regional Council have responsibilities under the RMA in relation to the sources of drinking water. In the case of Havelock North, the source is the Te Mata aquifer beneath Brookvale Road bores 1, 2 and 3. For Hastings the source is the Heretaunga aquifer.

[114] The second component is the drinking water supplier who extracts water from the aquifer and supplies it to consumers. This component primarily involves local

government. As supplier, the District Council had responsibilities under the LGA and, in particular, Part 2A of the Health Act.

[115] The third component is the public health system. The primary controlling legislation is the Health Act which places responsibility on the Ministry of Health to promote public health, including through ensuring the provision of safe drinking water. In practice, the Ministry of Health contracts these responsibilities to the relevant District Health Board.

Multiple Barrier Approach

[116] The above multidisciplinary system implements a multiple barrier approach to drinking water safety. Such an approach recognises that more than one barrier between consumers and possible sources of pollution reduces the likelihood of contaminated water being supplied. If one barrier fails, others remain in place.

[117] Clean, safe drinking water therefore requires protection of the source (whatever its nature); the operation by the water supplier of adequate and appropriate treatment and a secure distribution or reticulation system; and proper monitoring and testing for contaminants.⁹

[118] The Ministry of Health actively endorses and pursues the multiple barrier approach to drinking water safety.

NES Regulations

[119] The NES Regulations were enacted specifically to boost protection from the first of the multiple barriers.¹⁰ The Regulations came into effect on 20 June 2008 and were intended to plug a legislative gap where there was no express requirement for local authorities to consider the effects of activities on sources of human drinking water during their RMA decision-making processes.

⁹ This concept is discussed in the text by Steve and Elizabeth Hrudefy "Ensuring Safe Drinking Water" (American Water Works Association, 2014). There is also a useful discussion of the multiple barrier approach in "Dr Ioannis M Dokas "Safety Approaches in Water Utilities and Systems Safety Engineering: A Comparison" (University College Cork, 2009), at 11.

¹⁰ The NES Regulations Draft Users' Guide issued by the Ministry for the Environment has a clear and useful section on the multiple barrier approach at 1.4: Ministry for the Environment "Draft Users' Guide: National Environmental Standard for Sources of Human Drinking Water" (May 2009) (CB075).

[120] The NES Regulations set out requirements for protecting sources of human drinking water from becoming contaminated, by reference to whether existing treatment levels would need to be upgraded. They contain three components relating respectively to decisions on resource consents; permitted activity rules in plans; and emergency notification:

[121] The Inquiry has found deficiencies in the extent to which the Regional Council embraced, and implemented, the NES Regulations which are explained in Section Two of this report.

Drinking-water Standards and Health Act

[122] The Drinking-water Standards and Health Act provide the primary protections for the remaining barriers. These protections are described in detail in **Appendix 4**. In summary, the Drinking-water Standards specify requirements for monitoring and testing for contaminants, and providing treatment or responding to transgressions where necessary. The Health Act specifies that suppliers must develop a Water Safety Plan, which is intended to provide management procedures that reduce the likelihood of contaminants entering supplies in the first place and detail how a supplier will respond in the event of contamination.

Interaction Between Agencies: Partnerships and Collaboration

[123] The involvement of environmental, local government, and health agencies in the supply of drinking water gives rise to important issues as to how the agencies work together; how the large, multidisciplinary system performed in the case of Havelock North; and how it should perform in the future. The Inquiry considered cooperation between agencies, information-sharing, efficiency, and effectiveness.

[124] Where different agencies have overlapping and interacting responsibilities for the safety of drinking water, the Inquiry's view is that the concepts of partnership and collaboration are appropriate and necessary. In the case of the Havelock North drinking water supply, the Inquiry believes there should have been a partnership between the Regional Council, District Council, District Health Board and DWAs.

[125] The existing regulatory framework contemplated some of the elements of a partnership. The Drinking-water Guidelines referred to the various components of the multidisciplinary system as providing a set of tools which were "designed to promote

maximum interaction and mutual support between the various stakeholders, the public, the media, the drinking water supplier and the DWA". A significant level of liaison and cooperation between agencies in terms of risk management and the operation of the main barriers to contamination was also contemplated throughout the Drinking-water Guidelines. Similarly, the Ministry for the Environment's Draft Users' Guide for the NES Regulations suggested partnership and cooperation between the various organisations with responsibility for drinking water would be helpful to properly protect source water.

[126] The District Council's Water Safety Plans also contained extensive references to the need for liaison, information-sharing and co-operation between the District Council and the Regional Council.

[127] The Inquiry concludes that generally the interaction between the relevant agencies prior to and during the August 2016 outbreak fell short of the standards required. In particular, the relationship between the Regional Council and the District Council was in many respects strained and uncooperative. In the immediate aftermath of the outbreak the relationship deteriorated to the point where it was dysfunctional. The Inquiry identifies the following particular areas of deficiency:

- (a) A lack of processes or systems within any of the agencies to ensure that liaison, co-operation, and information-sharing occurred;
- (b) A lack of recognition and acceptance of the need for the environmental, health, and local government agencies to positively work together and embrace a partnership model; and
- (c) A general lack of positive commitment to actively working together, albeit with each agency taking ultimate responsibility for its own statutory responsibilities.

[128] These general criticisms will be elaborated on in the sections below dealing with failures and breaches of standards.

Practical Responsibilities for Havelock North Drinking Water

[129] In the case of the Havelock North drinking water supply, the key practical responsibilities resulting from the legal regime rested on the Regional Council, District Council, DWAs and, to a lesser extent, the District Health Board.

[130] The Regional Council was responsible under the RMA and NES Regulations for maintaining and monitoring the quality of the groundwater to achieve the RMA's sustainable management purpose. This included preventing contamination of groundwater. Under the NES Regulations, the Regional Council was required to decline any water or discharge permits for activities that might adversely affect a drinking water source, to ensure that its regional plan did not classify as "permitted" any activity with such effects, and to impose conditions on relevant consents requiring emergency notification of any occurrences which could adversely affect a drinking water source.

[131] In order to extract water from the aquifer, the District Council had to obtain a water permit from the Regional Council. The Regional Council needed to be satisfied that granting a consent was consistent with the RMA and the Regional Council's various planning documents, and could impose conditions on such a consent, including in relation to bore works security. The District Council was obliged to comply with all conditions imposed on a consent. The Regional Council was required to monitor such compliance and also any adverse effects resulting from the exercise of the consent.

[132] The District Council, as the drinking-water supplier, had duties under the Health Act to take reasonable or practicable steps to provide safe drinking water. This required the District Council to protect the source of its drinking water and also to install, operate, and monitor safe infrastructure. The primary mechanism through which the District Council managed the quality of its source water was through its Water Safety Plans. The District Council's Water Safety Plans were required to be approved, and their implementation monitored, by a DWA.

[133] Under the Drinking-water Standards the District Council was responsible for testing its water supply on an ongoing basis at the source and throughout the distribution zone. Specifically, it was required to test secure bore water at its source for E.coli monthly, with a maximum of 45 days between samples. If no E.coli was detected for 12 months, it was only obliged to test once per quarter, with a maximum of

135 days between testing. If E.coli was detected, the District Council had to test the source daily for 12 months, unless no E.coli was found for the first three months, in which case the testing frequency would be reduced to once per month, with a maximum of 45 days between testing.

[134] The District Council was also required to test for E.coli in the distribution zone at least 19 times per quarter. Testing had to be distributed evenly throughout the quarter, be carried out on different days of the week, and give a representative geographical coverage of the distribution system. In some instances, the District Council exceeded these Drinking-water Standards minima prior to August 2016.

[135] The District Council was required to include a contamination protocol in its Water Safety Plan detailing how it would respond to a positive E.coli sample. The District Council had to report any such sample to the DWA, who was required to reclassify the relevant bore as provisionally secure. The District Council was then required to obtain confirmation that its bore remained secure as soon as practicable and to follow more stringent monitoring requirements for 12 months. If E.coli was found again during this 12 month period, or if a certain level of E.coli was found in the first instance, the DWA had to reclassify the bore as non-secure. If no E.coli was found during the 12 month period the DWA had to reclassify the bore as secure. If a secure bore water source was classified as provisional more than twice in five years, the DWA had the discretion to reclassify it as non-secure.

[136] The District Council was responsible for ensuring its staff were properly trained and approved by a DWA to perform sampling. The District Council was required to outline in its Water Safety Plans, and implement, an ongoing training programme. It was also required to use an approved laboratory for testing, unless it had obtained an exception to use an alternative laboratory from the DWA. The DWA had no oversight of the laboratories, but was required to assess and authorise the competency of the District Council's water samplers.

[137] The competence and integrity of laboratories and their processes are a vital component of the drinking water regime. In the period preceding August 2016, the District Council used the services of two laboratories situated in Hawke's Bay: Analytical Research Laboratories and Water Testing Hawke's Bay. As with most laboratories in New Zealand, these were accredited by International Accreditation New Zealand. This body assesses and periodically checks laboratories on the basis of

testing methods, management systems, documentation, proficiency of staff, and complaints procedures. Laboratories are accredited for specific tests. The Drinking-water Standards prescribe how certain sampling and testing must be undertaken.

[138] Where any test or analysis indicates non-compliance with a Maximum Acceptable Value in the Drinking-water Standards, the laboratory is required to forward the results to the Director-General of Health; in practice such results are forwarded instead to a DWA.

[139] The District Council had to keep sufficient records of its testing to enable a DWA to assess its compliance with Part 2A of the Health Act, the Drinking-water Standards, and its Water Safety Plan.

[140] Along with approving and monitoring the implementation of the District Council's Water Safety Plans, the DWA was also required to monitor the District Council's records and to assess the District Council's compliance with the Health Act and Drinking-water Standards requirements. The DWA reported to the District Council annually on compliance and Water Safety Plan implementation.

[141] The District Health Board was obliged to deliver services relating to drinking water under its public health services contract with the Ministry of Health, which had oversight for the safe provision of drinking water. Where there was any ongoing risk to public health, the DWA, Health Protection Officers, and Medical Officer of Health were required to work together to determine what action was required to mitigate the risk to public health.

[142] The Ministry of Health, through its Public Health team, provided advice and support to District Health Boards, including to designated officers, in the discharge of their statutory duties. The Ministry of Health could, if it considered it necessary, declare a drinking water emergency and take over the response.

SECTION TWO: EVENTS AND ISSUES PRECEDING OUTBREAK

PART 6 – HISTORICAL EVENTS AND ISSUES

Background

[143] This part of the report explains, largely in chronological order, events and issues relating to the Brookvale Road bores and the Te Mata aquifer which preceded the August 2016 outbreak.

[144] In the period prior to the August 2016 event, Havelock North's drinking water was supplied from Brookvale Road bores 1 and 2. These bores extracted water from the Te Mata aquifer. A description of that aquifer, and also the Heretaunga aquifer beneath the Hastings bores, is contained in **Appendix 5** (page 186). Brookvale Road bore 1 was constructed in 1982, bore 2 in 1986, and bore 3 in 1998. A description of the Brookvale bores is set out in **Appendix 6** (page 188).

1998 Outbreak and Contamination of Brookvale Road Bore 2

[145] Eighteen years before the present outbreak, the District Council experienced a water contamination event which had remarkable similarities to the present event. On 27 July 1998 Health Care Hawke's Bay advised the District Council that a high number of campylobacteriosis cases had been recorded in Havelock North and parts of Hastings. The District Council carried out a review of its monitoring records for 1997 and 1998, and undertook extra testing. These samples detected no E.coli and no further action was taken in late July 1998.

[146] On 11 August 1998 Health Care Hawke's Bay advised the District Council that campylobacteriosis cases were rising again. The District Council took further samples and this time E.coli was detected in one sample from the reticulation. On 19 August 1998, a positive presumptive campylobacter test result was obtained from Brookvale Road bore 2. Subsequent testing of the chambers and bore heads of both Brookvale Road bores 1 and 2 showed positive for campylobacter. The pump in Brookvale Road bore 2 had been replaced in November 1997 and it appeared that the glands around the power supply cables had not been tightened and sealed properly at that time. Media coverage of the event attributed the cause to contaminated surface water running down the cables supplying the pumps. Health authorities estimated at least 80 people had contracted campylobacteriosis.

[147] The District Council commissioned the 1998 Clark Report.¹¹ This Report, and internal District Council reports at the time, attributed the outbreak to unusually heavy rainfall, causing flooding of water contaminated with sheep faeces. The Report referred to the roadside drains running next to the bore chambers. Contaminated water was said to have entered the supply through a leaking bore chamber and then via loose gland seals in the bore heads. An internal report from the District Council noted that, although the bore chambers had sump pumps installed, the pump in Brookvale Road bore 1 was found not to be working, and the pump in bore 2 did not activate early enough to stop water overtopping the bore head.¹²

[148] Importantly, the 1998 Clark Report also noted that there appeared to be doubt regarding the confined status of the source aquifer:

With respect to the long term status of the system under the [Drinking-water Standards], and need for continued chlorination, there appears to be doubt regarding the confined status of the source aquifer for the Brookvale Road borefield. Whether the aquifer is or is not confined, is however, not the crux of the issue. The important aspect is whether viable pathogens can be present in this aquifer at the point of abstraction, and demonstrating the aquifer is confined is one way to help impute this.

[149] The Report also stated that maintaining a non-chlorinated reticulated system required a higher level of hygienic operating procedures, greater control of possible sources of contaminant entry, and more monitoring and surveillance than with the chlorinated system. It made a series of recommendations, including several directed towards sealing the chambers. It also recommended pressure grouting the bore casing to a depth of five metres, referring in that regard to the Drinking-water Guidelines in place at the time.

[150] The bore heads of Brookvale Road bores 1 and 2 were situated below ground level in 1998. The District Council had constructed and activated Brookvale Road bore 3 in June 1998 about 100 metres away from Brookvale Road bore 2. Bore 3 had an above-ground bore head. The 1998 Clark Report did not specifically recommend raising the bore heads of bores 1 and 2 above ground. However, the District Council in August 1998 raised the height of the bore chambers and installed alarm systems designed to activate if water did enter and rise to an unsafe level. The bore heads remained below ground level.

¹¹ Stu Clark "Hastings District Council Water Supply Contamination Investigation" (13 September 1998) (**CB048**).

¹² Hastings District Council Reports (**CB153**, **CB154**).

[151] The District Council submitted to the Inquiry that, despite the views expressed in the 1998 Clark Report, the 1998 event may have been attributable to contamination flowing from the Mangateretere Stream (at the location of the pond) through the aquifer to the Brookvale Road bores, and that the suspicions of bore head entry via loose cables may have been misplaced.

[152] The 1998 Clark Report did point only to a possible cause and did not positively conclude that bore head entry was the source or sole source of contamination. However, regardless of the true cause of the 1998 outbreak, it was widely reported in the Report, internally within the District Council, and in the media at the time, that surface water contaminated with sheep faeces was believed to have entered through loose glands of the bore heads. This was the perceived risk at the time and it was this risk that should have been recorded in the District Council's institutional memory.

[153] The Inquiry has found that what was clear was that the state of Brookvale Road bores 1 and 2 was generally poor in terms of both construction and maintenance. Heavy rainfall and the presence of sheep grazing nearby were prominent factors. In addition, more fundamental concerns had been raised by the 1998 Clark Report about the security of the water source and whether the aquifer was confined.

Health Protection Officer Complaint 2002

[154] On 8 August 2002, Mr Inkson, a Health Protection Officer¹³ emailed the Regional Council, copying the District Council, with a complaint about a bore close to Brookvale Road bore 2 ("2002 Inkson Email").¹⁴ He referred to it as an insecure bore situated in a sheep paddock approximately 45 metres from bore 2. He complained that this bore contravened a rule in the Regional Council's Regional Resource Management Plan and that it could allow faecal material into the aquifer close to the drinking water bore.

[155] Neither the Regional Council nor the District Council had any record of their responses (if any) to this complaint and the Inquiry was left with no significant evidence other than the email itself. However, this written complaint warrants mention because it was a significant reminder by a health authority to both the Regional and District Councils of a particular form of catchment risk.

¹³ The forerunner to the role of DWA.

¹⁴ Ian Inkson "Email re Defective groundwater bore" (8 August 2002) (**CB065**).

[156] Had this complaint had been actioned adequately by the Regional Council in 2002, it should have led to the detection of numerous insecure bores in the vicinity of the District Council's drinking water bores. The Inquiry received evidence from the District Council's investigator Mr Mananui of at least 12 insecure bores in the vicinity of Brookvale Road. These clearly involved a contamination risk for the drinking water source. Mr Gordon of the Regional Council said he was shocked to learn of this evidence.

[157] Undoubtedly, the 2002 Inkson Email was another missed opportunity for both the Regional Council and the District Council. Neither organisation identified insecure bores as a significant area of risk to the aquifer used as the source for Havelock North drinking water.

July 2013 Contamination Incident

[158] In mid-July 2013, the District Council experienced a serious E.coli contamination incident at the Anderson Park sporting complex in Havelock North. Routine sampling on 14 July 2013 detected E.coli. Further investigations within the Anderson Park complex revealed a water connection with no backflow protection. This had allowed contamination from a stagnant water tank to enter the public water supply.

[159] This contamination event was potentially very serious because contamination had entered the reticulation (fortunately there is no record of any illnesses resulting). Although this event apparently did not involve the bores or the aquifer, it is worth particular mention because the District Council's investigation report at the time referred to unusually high rainfall and also earthworks at the Te Mata Mushrooms property close to Brookvale Road bore 3.¹⁵

[160] While the District Council later concluded that rainfall and the earthworks did not cause the 2013 outbreak, the suspicions about those two factors were logical and it would have been beneficial for the District Council to have investigated them both further. In particular, the possibility of disruption of the aquitard in the vicinity of Brookvale Road bore 3 by the earthworks meant that the issue should have been vigorously examined, regardless of whether it was thought to be relevant to the Anderson Park transgression. Given the potential implications for the aquifer, this was

¹⁵ District Council "Havelock North – 2013 E.coli Contamination, Assessment Report" (July 2013) (**CB062**).

also a matter about which the District Council should have contacted the Regional Council.

[161] Had the District Council carried out a proper investigation of the earthworks at the time, it would have discovered that, as recently as 9 July 2013, its consents personnel had detected substantial unconsented earthworks at Te Mata Mushrooms. This led to formal steps being taken, including a letter on 11 July 2013, and subsequent abatement and infringement notices against Te Mata Mushrooms. The need for a resource consent to be sought was identified by the District Council personnel but was not pursued at that time.

[162] Around the same time, on 24 July 2013, the Regional Council granted Te Mata Mushrooms discharge permits allowing the discharge onto land of dairy farm effluent from a herd of up to 80 cows, as well as waste water from a mushroom composting operation. Prima facie, this gave rise to NES Regulations considerations which, in turn, would have been assisted by information from the District Council as the water supplier.

[163] The District Council and Regional Council were unaware of each other's involvement in Te Mata Mushrooms' consent issues, despite the fact that this property is situated adjacent to Brookvale Road bore 3. The District Council was also not advised when on 13 April 2015, the Regional Council allowed an increase in the number of cows covered by Te Mata Mushrooms' dairy farm effluent permit. The District Council eventually granted a retrospective resource consent to Te Mata Mushrooms in 2015 but it contained no provisions relevant to drinking water protection.

[164] Suspicions in relation to the effect of earthworks at the property were to play a prominent part some two years later in investigations into the October 2015 bore 3 contamination event. It is regrettable that the District Council did not follow through in 2013 in relation to the earthworks. The 2013 incident is also notable for an apparent absence of any consideration by the District Council of protozoa risk.

October 2015 Brookvale Bore 3 Contamination Event

[165] In October 2015 the District Council discovered a contamination of Brookvale Road bore 3. While this had no direct causal connection with the August 2016 outbreak, the October 2015 contamination event was highly significant in terms of the

conduct, and the standards applied, by all relevant parties. The Brookvale Road bore 3 contamination event was potentially serious and yet the District Council, Regional Council, and the DWAs all failed to respond with the level of care and concern required.

[166] On 30 September 2015, the District Council advised the DWA of a positive E.coli result taken from the Havelock North reticulation. Extensive testing was commenced and on 1 October 2015, a high E.coli enumerated reading was obtained from Brookvale Road bore 3. The District Council noted to the DWA that contamination of the source was “concerning” and started chlorination. Reference was made by the District Council to possible causative effects of high rainfall and also the earthworks undertaken at Te Mata Mushrooms.

[167] Brookvale Road bore 3 was shut down on 1 October 2015 and Brookvale Road bore 1 was activated a few hours later on 2 October 2015. Brookvale Road bores 1, 2 and 3 draw water from the same Te Mata aquifer.

[168] Despite the obvious possibility of aquifer contamination, the District Council surprisingly did not contact the Regional Council in respect of the Brookvale Road bore 3 contamination. Rather, the Regional Council initiated contact with the District Council by email from its Principal Groundwater Scientist, Mr Gordon, on 6 October 2015. Mr Gordon’s approach was brief and informal indicating that he had heard there had been an E.coli non-compliance issue at a Brookvale Road bore. Brief further emails were also exchanged with the District Council on 12 and 13 October 2015. However, neither Council engaged properly or significantly with the other and no joint investigation ensued. This was, in the circumstances, seriously inadequate consultation and liaison.

December 2015 Test Bore Contamination Event

[169] The Brookvale Road bore 3 contamination incident in October 2015 was followed shortly after by the discovery of high E.coli readings by the Regional Council in its own test bore 10496. This bore is situated some 230 metres away from Brookvale Road bore 3 and next door to Te Mata Mushrooms.

[170] In the course of its routine State of the Environment monitoring programme, the Regional Council took a water sample from the test bore on 2 December 2015. This

produced an unusually high E.coli reading. The Regional Council followed up with a further sample on 14 December 2015, this one producing a lower, but still notable, E.coli reading.

[171] On 24 December 2015, Mr Gordon of the Regional Council advised the District Council's Water Operator, Mr Stuijt, of the elevated readings. On the same day Mr Stuijt replied by email that this was "concerning" news and asked to be kept informed by the Regional Council.

[172] The District Council commissioned Tonkin & Taylor to undertake an investigation of the 2013 and 2015 contamination events. Tonkin & Taylor's investigations proceeded at a very slow pace with an initial meeting on 12 February 2016 and no output for many months after. In fact, it was not until after the campylobacter outbreak in August 2016 that Tonkin & Taylor finally produced a report. However, this was in draft and was substantially unfinished. It pointed towards earthworks at Te Mata Mushrooms property, with consequent damage to the aquitard, as the likely source of contamination.

Other Transgressions

[173] In addition to the above contamination events, there was from 2007 onwards a history of sundry transgressions (E.coli readings) within the Havelock North water supply network. The District Council's reactions to these transgressions, both individually, and as a pattern, were the subject of evidence and submissions. So too, were the responses of the DWAs. The principal issue that arose was whether anyone involved should have become sufficiently concerned at the number of transgressions to embark on a much broader and more far-reaching investigation.

[174] Transgressions were experienced in the Havelock North distribution zone in March 2007, February 2010, December 2011, January, February and July 2012, July 2013, September 2015, and January and May 2016. Each was considered to be a problem in the distribution infrastructure or reticulation. Each was investigated by the District Council to determine the possible cause. In most cases, the problem was put down to a pressure drop in the main, resulting in backflow of untreated water from a non-secure source. In each instance the system was treated with chlorine and tested daily. Following three clear test results, chlorination was generally stopped.

[175] The Inquiry received helpful evidence on this issue from Mr P Wood. He had reviewed the transgressions reported from the Havelock North water supply and, based on his experience, thought the number was higher than he would have expected. He observed, and the Inquiry has accepted, that in each case, the District Council complied with the Drinking-water Standards. In addition, the District Council investigated each case, although there were a number of instances in which the cause was not found and in at least one case, faulty laboratory work was suspected.

[176] The Inquiry is conscious of the benefits of hindsight, and also the fact the District Council had a basis for believing that one area of the Havelock North reticulation, the Tauroa zone, was suffering from persistent, but localised, problems. Further, some of the transgressions were based upon a presence result that was followed by a clear enumerated result from the same or a following sample. The Inquiry noted counsel for the District Council's submission that a subsequent clear enumerated result indicates that the initial result was a "false positive". The Inquiry has had the benefit of Dr Fricker's insight into this matter and preferred his advice that, for reasons associated with the testing process, a subsequent clear enumerated result cannot serve to dispel an initial presence result. By September 2014, there was certainly an important opportunity to review transgressions more deeply and holistically, an opportunity that regrettably was missed.

[177] On 10 September 2014, an operations researcher at ESR, Mr D Wood, emailed the DWA stating that, in the process of writing up the annual drinking water report, he noticed Havelock North had excessive transgressions in 2013 and 2014. This followed earlier email exchanges in January 2013 with the DWA and Ministry of Health, and in August 2014 with the DWA. He had considered the previous four years' results and found an unusually high rate of transgressions, particularly for a supply with secure groundwater. He stated "[o]n average it has the highest rate of transgressions in the country for a large supply. Do you know what is going on?".

[178] The DWA, Ms Lynch, responded by email on 11 September 2014 seeking to explain the transgressions. She also referred the matter to Mr P Wood. Mr P Wood made a file note recording this discussion about the ESR email. He advised Ms Lynch to make full disclosure to the District Council. In her evidence Ms Lynch stated that she made disclosure to Mr Kersel of the District Council in a meeting. However, she could not recall his response. The Inquiry was not made aware of any response. It seems that unfortunately neither she nor the District Council took the matter any further

and, in particular, the matter was not drawn to the attention of senior management within the District Council.

[179] The extent of transgressions was also raised by the DWAs with the District Health Board's Dr Jones in his capacity as a Medical Officer of Health. Dr Jones accepted he had received notifications of transgressions at different times from various DWAs, usually by email and normally just for his information. Dr Jones referred to a query from the Ministry of Health by a person compiling the 2013 annual survey, as well as the query from ESR in September 2014 some 18 months later, in relation to the next annual survey. There were thus two indications from external reviews of the high transgression rates in 2013 and 2014.

[180] Dr Jones stated that the DWAs appeared to be satisfied that the transgressions were dealt with appropriately. He thought appropriate remediation measures were in place and that the transgressions had generally been identified as reticulation problems, such as lack of backflow prevention devices or mains breakages. He stated further that the Ministry of Health staff appeared to be satisfied with the DWAs' responses.

[181] When transgressions continued in February and May 2016, Dr Jones commented that transgressions did not seem to be reducing in frequency, despite risk reduction measures introduced by the District Council. He expressed concern about the ongoing transgression rates to the DWA. The problem continued into 2016 with the DWA's compliance report for the year ended 30 June 2016 noting that "while the transgressions appear to have been investigated and responded to appropriately there are ongoing concerns over the number of zone transgressions during this period. We consider the integrity of the distribution also needs further assessment". As recorded in the 2015-2015 Annual Report on Drinking-water Quality¹⁶, there was non-compliance with bacterial standards in the Havelock North zone (and 3 other smaller District Council supplies) as a result of transgressions in the year to 30 June 2016.

[182] The Inquiry considers it unfortunate that ESR's concerns in 2014 at the number of transgressions, apparently shared by the DWAs, were not pursued in a probing and effective manner by the DWAs, the District Council, or Dr Jones. The ESR email in September 2014 in particular, had logically raised a doubt about the supposedly secure

¹⁶ **CB192.** This report was published in April 2017 but the data was available before 30 June 2016.

nature of the groundwater source. This was an obvious issue for consideration by all concerned but it seems the District Council drinking water management did nothing about this important question. Continuing transgressions in the first half of 2016 still failed to provoke more extensive investigation.

District Council Bore Maintenance and Inspections

[183] Inadequate management and lack of attention to important details of infrastructure maintenance contributed to the failure of the bore system in Brookvale Road in August 2016.

[184] Notwithstanding the issues identified in the 1998 Clark Report, the District Council at no time prior to the 2016 outbreak had a written maintenance and inspection programme for the three Brookvale Road bores. The issues identified in 1998 with loose gland seals, leaking bore chambers, an inoperable sump pump, and the potential for contaminated surface water to enter the bore, all made it obvious that an effective inspection and maintenance programme was needed.

[185] Despite this, no such programme or schedule was created. The District Council did produce to the Inquiry a form of “maintenance schedule”.¹⁷ However, this was created after the August 2016 outbreak and it was not an operative or working schedule. It is notable that this document specifically required inspection for leaks at the bore head and attention to cable entries. It also required attention to sump pump operation and the operation of the alarm systems. Mr Chapman of the District Council accepted readily that the cable entries into the bore head were the most obvious source of risk of contaminant entry into the bore, and that these were the weakest point in the whole system.

[186] The District Council had for some years from 2009 expressed to the DWAs its intention to create an inspection and maintenance programme and to enter that into its Hansen Preventative Maintenance Schedule (“Hansen Schedule”). The DWAs had identified the lack of a maintenance and inspection programme as a risk needing to be addressed and in June 2013 noted that an inspection programme should be entered into the Hansen Schedule. This was repeated in July, August and October 2014 but, despite an indication by Mr Kersel of the District Council in January 2015 that the programme was about to be entered into the Hansen Schedule, this never occurred.

¹⁷ CB084.

[187] The District Council provided evidence that one of the water operators would carry out visual inspections of the bores from time to time. These were described by the water operator's manager, Mr Stuijt, as " cursory inspections" and he explained he was unaware of the details of the inspections carried out. No records of the inspections were kept and it seems they were not carried out at any particular frequency.

[188] The District Council accepted that it had a duty to keep its bore heads in the condition required by the Drinking-water Standards. It specifically acknowledged that the bores had to be kept as watertight as could be expected in the environment and that there was a need to ensure that the glands sealing the cable holes were firm and effective.

[189] The Inquiry has concluded there was no maintenance and inspection programme in place prior to August 2016. In the context of below ground level bore heads, the items which should have been regularly inspected and tested included the pumps and the alarms. The Inquiry considered that cursory visual inspections from time to time were not adequate or effective to determine the true state of the security of the bore works. This obvious risk to the safety of the drinking water was not properly managed.

[190] In June 2014 the District Council retained engineering consultancy firm MWH to carry out a bore security assessment for the purposes of establishing compliance with the Drinking-water Standards. Bore head security was the second of the three criteria that had to be satisfied under Drinking-water Standards to obtain a "secure" classification for the bores.

[191] MWH produced a report dated 8 August 2014 ("August 2014 MWH Report"). However, this Report made no mention of the gland seals in relation to Brookvale Road bores 1 and 2. As will be described later in Part 11, the Inquiry has found that the inspection and report were not competently carried out and that the District Council should have challenged aspects of the report as plainly inadequate.

Lack of Knowledge of Protozoa Risk

[192] Pathogenic organisms of concern in New Zealand include bacteria, viruses, and protozoa. Protozoa include parasites such as giardia and cryptosporidium and the

cysts and oocysts of those parasites. They are frequently found in water sources in New Zealand, especially in areas with intensive livestock farming.

[193] In the decade after 1995, the understanding of the public health consequences of protozoa in drinking water increased rapidly, and the significance of cryptosporidium as a major new waterborne pathogen that was resistant to conventional disinfection procedures or practices rapidly overtook that of giardia. By 2000 it had become necessary to update the then applicable Drinking-water Standards (developed in 1995) to incorporate new knowledge about protozoan organisms. Cryptosporidium was selected as the representative protozoan because it is the most difficult to remove or inactivate from drinking water.

[194] Giardia and cryptosporidium are two protozoal pathogens that are widespread in many New Zealand water sources. They are endemic in livestock, birds, and domestic and feral animals. Therefore, surface waters, including shallow (particularly unconfined) groundwater, must be considered to be potentially contaminated.

[195] Some officials within the water supplier in the present case seemed to have had little or no knowledge about protozoan pathogens, and the significant risks associated with them. Gaining an awareness of and education about such risks, and how they might be identified at an early stage, will be an important part of Stage 2.

[196] E.coli is the microorganism used to indicate the bacterial quality of bore water drawn from a groundwater source. Although the presence of E.coli in the water shows that faecal contamination of the water has occurred recently, there is no reliable relationship between the presence of E.coli and protozoa in the water.¹⁸ Assurance that groundwater is free of pathogenic protozoa is obtained by demonstrating that the water quality is not directly influenced by events above ground.¹⁹

[197] The reasons why there is no direct correlation between the presence of E.coli and cryptosporidium or other protozoa are complex. Nonetheless where a positive E.coli result indicates the presence of faecal matter in water, then the risk of protozoa should be considered. Cryptosporidium can occur in contaminated water in the absence of E.coli because it survives in the environment for much longer periods than

¹⁸ The Inquiry is aware of one study that suggests that protozoa risk cannot be assessed on the basis of E.coli results (Massey University 1996) and it also heard evidence that no correlation can be drawn between the presence of faecal material and protozoa.

¹⁹ Drinking-water Guidelines 3.2.4.1.

E.coli. Conversely, E.coli can exist without the presence of cryptosporidium since not all faecal matter contains this organism. However in fresh faecal material contaminated with cryptosporidium, E.coli will also be present. Consequently, in the absence of data to demonstrate that cryptosporidium is absent, the conservative approach of assuming the presence of cryptosporidium should be adopted. Despite the lack of any direct correlation with E.coli, protozoal risk undoubtedly exists and these pathogens have been responsible for some of the most serious waterborne outbreaks on record, including a number of significant outbreaks in New Zealand.

[198] Given the general ineffectiveness of chlorine against protozoa, the Inquiry identified an apparent area of risk in relation to Drinking-water Standards procedures following a transgression. While dosing drinking water with chlorine following a transgression will generally be highly effective against bacterial organisms such as campylobacter, it may not kill or inactivate protozoa. Cryptosporidium is completely resistant to chlorine at levels used to disinfect drinking water. Giardia, while being more resistant to chlorine than most bacteria, can be inactivated provided the concentration of chlorine and the time in contact with the chlorine is high enough.

[199] Ultraviolet light has been shown to be effective in inactivating cryptosporidium and has been employed as a form of water treatment at many sites across the world. As the Havelock North bore water was not treated with ultraviolet light, there was, prior to August 2016, no effective measure to directly address the risk of protozoal infection as part of the responses to transgressions in the Havelock North system.

[200] Although the Hastings water has been chlorinated since 24 August 2016, the Inquiry identified an ongoing risk of protozoa infection and one of its key recommendations in its Interim Report was to put in place a programme of weekly protozoa testing at each bore in the Havelock North and Hastings systems. This testing was to use much larger water samples (involving 1,000 litres) than required in the Drinking-water Standards (10 litres), and the frequency of tests was much greater than required in the Drinking-water Standards.

[201] The protozoa risk at Brookvale Road bore 3 was addressed, prior to its reactivation on 7 March 2017, by the installation of an ultraviolet treatment system, as well as by cartridge filtration prior to the ultraviolet treatment.

[202] During hearings, counsel for the District Council cross-examined on the basis that the protozoa risk had been exaggerated and that the Drinking-water Standards did not aim to address that type of pathogen. He challenged the proposition that the presence of E.coli (and thus faecal material) gave rise to any presumption or likelihood that protozoa would also be present. The Inquiry accepted that there is no such presumption. It has, however, found that there is a risk, and that the risk is, in the short term, not amenable to quantification.

[203] The Inquiry will consider issues in relation to protozoa risk in Stage 2. Currently, in the absence of ultraviolet treatment, the only available responses in relation to protozoa risk following detection of E.coli are increased protozoal testing and/or a boil water notice.

PART 7 – FINDINGS AS TO SOURCE AND PATHWAY OF CONTAMINATION

The Inquiry's Findings

[204] The Inquiry was grateful to receive a report on the source of the pathogen involved in the outbreak from ESR ("ESR Report"), evidence from Dr Gilpin on the survival rates of campylobacter, and the Science Caucus Report. The Inquiry accepted the findings of the Science Caucus. A brief summary of this material, which greatly oversimplifies the work, follows. The material should be studied in full to provide a proper picture.²⁰

ESR Genotyping

[205] Dr Gilpin and the team assisting him from ESR and Massey University produced the ESR Report, dated 17 November 2016, which set out crucial evidence about the source of the pathogen involved in the August 2016 outbreak. ESR had been provided with samples of sheep faeces from paddocks neighbouring Brookvale Road, water and sedimentary matter taken from the Brookvale Road bore chambers, and human stool samples taken from victims of the illness. In many cases, these matched.

²⁰ These documents are available on the Inquiry website. See ESR "Analysis of water, sediment and animal faecal samples from Havelock North, August & September 2016" (17 November 2016) (**CB002**) and Report of the Science Caucus (2 February 2017) (**CB182**). The Science Caucus report is also reproduced as **Appendix 3** (page 168). The evidence of Dr Gilpin is available in the "Evidence Filed" section of the website: see Brent John Gilpin "Evidence in Reply" (30 January 2017).

[206] Campylobacter isolates from 198 cases were genotyped and 166 of these were allocated to outbreak-associated genotype clusters. Two main genotypes of campylobacter were observed among clinical cases: CJ-16-001 which was found in isolates from at least 49 per cent of clinical cases; and CJ-16-002 which was observed amongst at least 23 per cent of the clinical cases. At least four clinical cases had both of these genotypes of campylobacter isolated from human faeces. Another 21 clinical cases had genotypes observed less frequently (CJ-16-005, CJ-16-006, CJ-16-007) but which appeared, on the basis of genotyping, to also be linked to the common source.

[207] The ESR Report indicated that the data supported the hypothesis that clinical cases with one or both the two main genotypes had a common source of infection.

[208] To reduce the Report to its simplest terms, the Inquiry understood that there were a significant number of matches between the genotype clusters found in the sheep faeces in neighbouring paddocks, in samples taken from Brookvale Road bores 1 and 2, and in human samples taken from persons who had fallen ill.

[209] None of the core participants challenged the basic findings of the ESR Report and the Science Caucus proceeded on the basis that its findings were valid.

Dr Gilpin's Evidence of Campylobacter Survival

[210] The Inquiry received competing briefs of evidence from the Regional Council and the District Council witnesses on the question of whether campylobacter bacteria would have survived the journey from the pond to Brookvale Road bore 1 in sufficient numbers to have caused the outbreak. Dr Gilpin provided evidence on this topic in a way that the Inquiry found authoritative and satisfactory. In short, he concluded that sufficient bacteria could have survived, to have caused the observed illnesses.

[211] Dr Gilpin said that if campylobacter were washed into the pond or stream on 5 or 6 August 2016, some die-off would have occurred during transport, but survival of campylobacter in groundwater for at least a week was well supported by the literature. There would have been progressive dilution between 7 and 12 August 2016, but there could still have been sufficient bacteria in the drinking water to cause disease.

[212] Dr Gilpin also stated that the campylobacter bacteria would have survived in significant numbers during transport from the paddocks to the road drains and to the chambers of the bore head, if that was in fact a pathway that occurred.

Science Caucus Report

[213] The Science Caucus Report, which is at **Appendix 3** (page 168), discussed three possible pathways of contamination entry and assigned a level of probability to each.

[214] The first finding related to the bore head entry theory. This concerned faeces from sheep grazing in nearby paddocks, as shown in **Figure 1**, being transported as a result of high rainfall on 5 and 6 August 2016 from the paddocks into the roadside drains near Brookvale Road bores 1 and 2. As the drains, then the bore chambers, flooded, water was said to have flowed into the bore head cable holes (or ports) of Brookvale Road bore 1 via loose glands or seals. A photograph of the cable ports is in **Figure 2** (page 151). The Science Caucus attributed a probability of 20 per cent to this pathway, which it described as “less probable 20 per cent”.

[215] On the totality of the evidence the Inquiry considered that the probability was likely to fall at the lower end of the range, below 20 per cent. It was, however, impossible to ascribe a specific percentage and the Inquiry preferred simply to accept the Science Caucus finding of “less probable 20 per cent”. If this probability in fact applied, there were various significant implications for both the Regional Council and the District Council in terms of the faults and failures to be discussed below.

[216] The second finding addressed the same overland pathway of contaminated water, namely from the paddocks to the drains and then to the area surrounding the bore chambers. The second pathway postulated this surface water travelling down the outside of the casing (also known as the annulus) and then entering either through defects in the bore casing or through the screens (the normal entry point for water drawn from the aquifer). The agreed finding was that it was very unlikely to have happened (probability of 2 per cent).

[217] However, this finding was made by the Science Caucus before any testing of the casings had been completed. Following the completion of the evidence hearings, the Inquiry received a report on behalf of the District Council concerning a pressure test

carried out on the casing of Brookvale Road bore 1. The test report made it clear that the likelihood of the bore 1 casing having cracks or holes through the casing wall was “very remote”. The Inquiry considered that, had this report been known to the Science Caucus, the probability of entry via defects in the casing of Brookvale Road bore 1 would have been even lower than 2 per cent. In any case, the finding of the Science Caucus demonstrated the extreme remoteness of entry via the casing or screen as having been the pathway for the contamination.

[218] The third finding postulated the contamination pathway as follows. Faeces from sheep grazing in paddocks adjacent to the pond in the Mangateretere Stream were carried by heavy rainfall into the pond. The predominant run-off pathway of flood water in paddocks 2 and 3 was into the pond or stream. From the pond the contaminated water travelled into the aquifer and was then drawn into Brookvale Road bore 1 via the casing or screens. This pathway was assessed as “most probable 78 per cent”.

[219] The Science Caucus Report discussed the possibility of entry via defects in the casing. Subsequent pressure testing, as described above, has all but ruled out entry by that means.

[220] The Inquiry accepted the finding of the Science Caucus, but observed that the most likely means of entry would have been via the screens. The Inquiry heard evidence of the zone of influence around bores by which water in the zone may be drawn into the bore. Contaminated water from the pond, having entered the aquifer within such zone, would have been drawn up through the screens and then pumped into the reticulation system. The Inquiry has concluded on the totality of the evidence that this pathway for the contamination was most probable.

[221] The Inquiry has noted that the farmer(s) who grazed the sheep in paddocks 1, 2, and 3 neighbouring the Brookvale Road bores, as shown in **Figure 1**, were carrying out a permitted activity (i.e. one that did not require resource consent). As such, there was no basis for any criticism of them.

[222] The Inquiry has noted that the Drinking-water Standards required that animals be excluded from within five metres of the bore head. The August 2016 event demonstrated that not only is this requirement ineffective in terms of preventing animal contamination, but also that a wider exclusion zone may not meet the real risk from animal contamination. This issue will be reviewed in Stage 2.

Backflow Protection

[223] Several submitters²¹ raised the possibility of cross-contamination or backflow as being the cause of the contamination. The Inquiry did not consider cross-contamination or backflow issues to be causative here. As this issue will be considered further in Stage 2, it is appropriate to record some key facts and issues.

[224] Cross-contamination and backflow are recognised risks to reticulated water supplies. Paragraph 3.6.2 of the District Council's 2015 Water Safety Plan set out some of the key issues relating to back flow protection. As the public network is physically connected to pipework on private properties there are direct connections to numerous agricultural, horticultural and industrial facilities, and extensive private plumbing networks. Backflow risk is recognised in the Health Act (s 69ZZZ) and the Drinking-water Guidelines, which note:

Backflow and backsiphoning events are more common than most water suppliers and consumers realise or acknowledge. Overseas studies have indicated about 12,000 incidents per annum in a population of 1,200,000, a frequency of about 1 incident per year per hundred people served. Studies have not been reported in New Zealand but are probably similar. Not all of these events result in illness, but all represent a potential incident.

The American Backflow Prevention Association estimates the extent of backflow incidents in the USA to be around 100,000 per day where some type of contaminant infected a municipal water supply, including those where no harm was caused. The most common cross connections reported were from irrigation, followed by fire systems, garden/washdown hoses, and boilers.

[225] The Building Act 2004 ("Building Act") and the "Acceptable Solutions and Verification Methods for New Zealand Building Code Clause G12 Water Supplies", published in accordance with s 22 of the Building Act record that backflow protection "shall be provided where it is possible for water or contaminants to backflow into the potable water supply system". This is intended to not only protect the public supply but also the rest of the plumbing within a building.

[226] Backflow risk can be reduced by a multi-barrier approach comprising:

- (a) Careful design of the network, to minimise zones of low pressure, and enable maintenance with reduced backflow risk;

²¹ Doug Stewart & Fred Robinson; Gary Roselli; Plumbers, Gasfitters and Drainlayers Board.

- (b) Rigorous operations and maintenance practices, including minimising the reduction of pressure in the network (both by area and in time) and localised disinfection after repair;
- (c) The installation of mechanical backflow devices at the point of supply and points of risk;
- (d) A water quality monitoring programme of the distribution system; and
- (e) The maintenance of a residual disinfectant (usually chlorine) within the distribution system.

[227] Of these five barriers, the first three will reduce the probability of the risk, the fourth will alert of an incident having occurred, but only the last will reduce the consequence. A residual disinfectant also has the advantage of providing early warning of a contamination incident if the residual is regularly (or continuously) monitored.

[228] The District Council was aware of these risks and had an extant backflow policy. As part of its 2012 - 2022 Long Term Plan, the District Council made provisions for increasing the number of backflow preventers with the aim of eventually installing one at each point of supply. The programme has been maintained to date with approximately 50 per cent now installed.

[229] While of course desirable, this recognition of backflow issues created a risk that positive E.coli test results would too readily be attributed to backflow, preventing more holistic investigations into possible sources.

[230] This is an appropriate point to record the concern of the Inquiry that, generally speaking, the District Council did not adequately investigate and determine the source of contamination events. There was an over-reliance by the District Council on backflow being the cause. However, whether the cause was backflow, or contamination of the aquifer, maintenance of a residual disinfectant would have been an appropriate course of action.

PART 8: CAUSATION OF CONTAMINATION EVENT

[231] The Inquiry's discussion about causation of the outbreak starts with the Terms of Reference, which required it to report on whether any person or organisation was at fault or failed to meet required standards. Section 11(2) of the Inquiries Act specifically provides for inquiry into and findings of fault.

[232] Counsel assisting submitted that causation, in the nature of direct, or proximate, or substantial causative effect, was not required before the Inquiry could consider fault or failings. He submitted that the Terms of Reference provided for a wide and probing inquiry into all aspects of the outbreak. For example, the appointment clause stated:

This Inquiry will inquire into and report (making recommendations that the Inquiry considers fit) upon the following: Inquire into how the Havelock North water supply system became contaminated, how this was subsequently addressed, how local and central government agencies responded to the public health outbreak that occurred as a result of the contamination and how to reduce the risk of outbreaks of this nature recurring.

[233] Counsel assisting contended that the Terms of Reference required the Inquiry to investigate and report on failures to meet requirements, whether or not they had a causative effect on the outbreak. This was because they referred, amongst other things, to:

- (a) Whether relevant parties complied with their obligations;
- (b) The adequacy of steps taken by parties;
- (c) The adequacy of the management of drinking water supplies for Havelock North; and
- (d) Any other matter which the Inquiry believes may promote the safety of drinking water and/or prevent the recurrence of similar incidents.

[234] Counsel assisting also submitted that a broad approach to causation was required because any inadequacies needed to be fully addressed in Stage 1 in order to report in Stage 2 on lessons for the future and ways to enhance the safety of drinking water in Havelock North and throughout New Zealand.

[235] Counsel for the District Council responded by submitting it was wrong to deliberately divorce faults and failures from any causative connection with the outbreak

and its consequences. He submitted the Inquiry was not mandated to go on a general fault-finding mission. Any findings of fault had to be causally connected to the outbreak to be of relevance to the Inquiry, in particular to the issues in Stage 1.

[236] The Inquiry rejects the submission made on the District Council's behalf. The Inquiry is mandated by the Terms of Reference to investigate and report on acts or omissions, even if their causal effect was not proximate or direct. The Inquiry agreed with counsel assisting that, in the case of a complex investigation such as the present, it would be unwise to disregard any fault or failure on the basis it had no direct causal linkage with the outbreak.

[237] This approach is consistent with the concept of the "Swiss cheese" model devised by Professor James Reason of Manchester University.²² The main assumption of that model is that organisational accidents happen when multiple barriers and safeguards that separate injurious hazards from vulnerable people or assets are breached. Breaches create "holes" in the multiple barriers of defence, then the conjunction of a set of holes allows accidents to happen. The circumstances that lead to the conjunction of a set of holes, which allow an accident to happen, must be considered in their entirety and with due regard to all possible linkages.

[238] This Inquiry has revealed a cumulative set of acts, omissions or circumstances in which all of the holes aligned to enable the contamination of the drinking water system. While such acts or omissions may not have been proximate or direct causes, they were undoubtedly part of the circumstances that allowed the accident to happen. To that extent they are relevant to the Inquiry.

[239] Even if the Inquiry were wrong in taking this approach, it is satisfied that the Terms of Reference made it clear that a causal link with the outbreak event was not a prerequisite to its consideration of possible faults, failures or inadequacies. This is illustrated by the following statement in the "Background" section of the Terms of Reference:

This Inquiry is about determining the cause of the current contamination in Havelock North, whether relevant parties complied with their obligations, how local and central government agencies responded to the public health situation that occurred as a result of the contamination, and how to prevent future such occurrences (emphasis added).

²² In the context of drinking water, see, for example, "Safety Approaches in Water Utilities and Systems Safety Engineering: A Comparison", above n 9.

[240] The 10 topics listed in the Terms of Reference as the subject of inquiry were prefaced by the phrase, “In relation to this incident of contamination”. Most of these topics made it clear that there was no necessity for a strict causal relationship with the incident, and that a broad approach to relevance to the incident was intended.

[241] Further, the section of the Terms of Reference headed “Matters upon or for which recommendations are required” includes six broad topics. Only the first is expressed to relate to the cause of the outbreak. Topics 3, 4, 5 and 6 under that heading all encompass failings or inadequacies relating to the supply of drinking water that were not necessarily causally related to the outbreak.

[242] The Inquiry agreed with counsel assisting that the third exclusion from the Terms of Reference had the effect of confining the Inquiry’s investigation into water, aquifer and catchment management to the Brookvale Road aquifer area and related matters. However, there was a consistent theme in the Terms of Reference of learning lessons for the future. This is a principal goal of a public inquiry, and investigating past failures and inadequacies is an essential part of reporting on this theme. Future improvements cannot be addressed unless past failings are identified and understood.

[243] The approach taken above is consistent with ss 11, 14(3) and 17 of the Inquiries Act. It also applies the findings of the Court of Appeal in *Fay Richwhite & Co Ltd v Davison*,²³ namely, it is primarily for the Inquiry to interpret its terms of reference and to determine questions of relevance. The Court will be reluctant to intervene. Additionally, the Courts have repeatedly accepted that conclusions as to blame or impropriety are legitimate where they are within the terms of reference of a lawful inquiry.²⁴

[244] The Inquiry also notes that the narrow approach to causation advocated by counsel for the District Council is inconsistent with the opening remarks he made on its behalf. He said on 27 October 2016:

The Council is, of course, as anxious and probably more anxious than anyone to establish what happened and why and as to what lessons can be learned to

²³ *Fay Richwhite & Co Ltd v Davison* [1995] 1 NZLR 517 (CA). The Court approached relevance in that case on a very broad basis pointing to the public confidence element of the Inquiry.

²⁴ See *Cock v Attorney-General* [1909] 2 NZLR 405 (CA); *Fitzgerald v Commission of Inquiry into Marginal Lands Board* [1980] 2 NZLR 368 (HC); *Re Royal Commission on Thomas Case* [1982] 1 NZLR 252 (CA). See also Law Commission *A New Inquiries Act* (NZLC R102, 2008) at [3.9]-[3.10].

ensure that the likes of this never happens again and not just in its community, but anywhere in New Zealand. So it fully supports this Inquiry, it fully supports the terms of reference and it will be doing its utmost to assist this Inquiry with what information and input it can provide. You have that assurance.

[245] Finally, the submissions of counsel for the District Council in relation to fault seemed to assume that the bore head ingress pathway of contamination had been excluded. That is not the case. The Science Caucus (which included the District Council's experts, Mr Cussins and Dr Gyopari) unanimously concluded that a 20 per cent probability should be ascribed to the bore head ingress pathway. While the Inquiry regards this pathway as less probable than the pond pathway, it was not excluded. A 20 per cent (or less) probability remains significant.

[246] As a result, all issues relating to bore head inspection and maintenance remained relevant to the Inquiry. Bore works issues were of central importance to the risk of contamination of source water, particularly with a below-ground bore installation, as was the case for Brookvale Road bores 1 and 2. A large part of the evidence concerned bore works installations, the adequacy of bore works systems and acts or omissions relating to them, and the rules applying to them. This topic occupied much hearing time. The Inquiry considers it would not meet its Terms of Reference if it did not address failings and inadequacies in relation to bore works, and the risk of bore head ingress.

[247] Counsel for the District Health Board and the DWAs submitted that a broad approach to relevance was appropriate. In particular, she submitted that the Inquiry should include within its purview failings or poor practices that were unrelated to cause.

[248] For all the above reasons, the Inquiry rejects the narrow approach to causation and relevance advocated for the District Council. This report will therefore deal with causation on the basis of the broader view submitted by counsel assisting.

PART 9: DISTRICT COUNCIL FAILURES TO MEET REQUIRED STANDARDS

Background

[249] The District Council as the relevant water supplier was required to implement a high standard of care in carrying out this role. Its failings in relation to its knowledge of past events and transgressions, risk assessment, maintenance and inspection works, and responses and liaison with other participants are addressed below.

Alleged Faults, Failures and Breaches of Standards

The 1998 Contamination Event

[250] Counsel assisting submitted that the District Council fell below required standards in relation to the 1998 contamination event by failing at the time to recognise adequately the potential for public health risks in the future. He also submitted the District Council failed to put in place durable safeguards following the 1998 incident, escalate the incident internally, and embed important safety learnings in its institutional memory. The District Council accepted these criticisms.

[251] The Inquiry considers that the District Council should have treated the 1998 event as a salutary lesson in the risks associated with the Brookvale Road bores 1 and 2. The 1998 event exposed a whole range of vulnerabilities. Unfortunately, the District Council failed to create a clear institutional record of those lessons and vulnerabilities. Prior to the outbreak in 2016, the District Council's manuals and training processes contained no reference to the 1998 outbreak. It was not mentioned in the District Council's Water Safety Plans. Both the District Council's Water Services Manager, Mr Chapman, and Water Supply Manager, Mr Stuijt, knew nothing about it. Nor did the District Council make details of the 1998 event known to the Regional Council during the 2008 resource consent process for water takes from the Brookvale Road bores.

[252] At the time of the 2016 outbreak, aspects of the condition of Brookvale Road bores 1 and 2 remained at least as deficient as they were in 1998. The August 2014 MWH Report, which addressed bore head security, recorded that the chambers of bores 1 and 2 were dirty with debris and cables lying on the floor. Some of the cable glands were loose and would not prevent the ingress of water through the bore heads. Both bore heads remained below ground level. There were no protocols in place to keep track of the existence of livestock in nearby paddocks or to record, and react to, heavy rainfall in the catchment area. Moreover, the five metre livestock exclusion zone mandated by the Drinking-water Standards was not met.

[253] The similarities between the 1998 and 2016 events (suspected or actual) are remarkable: suspected sump pump failure, suspected loose cable glands, presence of sheep faeces, heavy rainfall, and doubts about the confined nature of the aquifer and the security of the source. The 1998 Clark Report and internal District Council correspondence in 1998 clearly identified public health risks and issues that needed to

be addressed. While the District Council followed some of the recommendations in the 1998 Clark Report, it did not carry out the recommended pressure grouting around the casing and its explanations for not doing so were inadequate. The District Council then failed to maintain the Brookvale Road bores properly in the years preceding the 2016 event.

[254] The Inquiry was not made aware of any adequate or systematic investigation of the confined nature of the aquifer or the secure status of the water as a result of the observations in the 1998 Clark Report. The most obvious step that ought to have been taken at the time by the District Council's senior executive or Water Supply Manager was to ensure that this recommendation was referred to, and then actually followed up by, the Regional Council. The District Council instead proceeded on the basis that the aquifer was secure, such that water extracted from it did not need to be treated. Undoubtedly the District Council's failure to permanently record and act on the 1998 event was a substantial missed opportunity.

[255] Of particular concern to the Inquiry was the District Council's failure to record the 1998 incident, and the learnings available from it, in its Water Safety Plans. Mr Stuijt, the District Council's Water Supply Manager accepted in evidence that the District Council had failed to capture and preserve this important institutional knowledge. Although the District Council personnel in the period 2009 to 2016 may not have been personally familiar with the 1998 incident, there was a lengthy series of repetitive references to it in reports and letters from the DWAs. These were either overlooked or simply ignored by the District Council. Mr Stuijt stated that the references to the 1998 event in reports from the DWA led him to question one of his operators who was involved in drinking water in 1998, but this operator did not think that outbreak related to the drinking water supply. He also "tried to look in our record system" but there was nothing there. The Inquiry does not accept that Mr Stuijt made any effective inquiries, and, in particular, he failed to take the obvious step of asking the DWAs about the 1998 event.

[256] The DWA documents made clear that an important event had occurred in 1998. They noted that groundwater contaminated with campylobacter bacteria was found to be leaking into Brookvale Road bore 2 via the bore chamber; that there had been a campylobacter outbreak in the Havelock North distribution zone; that an insecure bore head was identified as contributing; and that contaminated water running off an adjacent stocked paddock and roadway drain could have entered into the bore's

chamber. The 1998 event was also referred to in connection with the issue of raising the Brookvale Road bore heads.

[257] The Inquiry finds that the District Council's failure to record the 1998 event in its Water Safety Plans between 2009 and 2016 was a missed opportunity. A water supplier in these circumstances should have investigated and captured all possible learnings from the 1998 incident as part of the Water Safety Plan process. A serious bore contamination event which caused an outbreak of illness in the community, and which showed a range of clear vulnerabilities to the source water, was a matter of utmost importance for the District Council (and the DWAs) to address in the risk assessments required for all Water Safety Plans.

Risk Assessment and Liaison

[258] Even though the District Council's decision not to treat its water supply was based on an assumed absence of risks, counsel assisting submitted that the District Council had no system for acquiring the knowledge needed to safely make an assessment of relevant risks to the drinking water and source water.

[259] The District Council as drinking water supplier had a duty to carry out competent risk assessments in respect of the source and supply of its drinking water. In particular, it was required to identify the public health risks (if any) associated with the drinking water supply, critical points in the drinking water supply, and mechanisms for preventing or reducing those risks if they did arise.

[260] Counsel assisting submitted that the District Council fell short of the required standard in characterising the key contamination risks in its Water Safety Plans. He also submitted that the District Council had no adequate general risk assessment system for the catchment area surrounding the Brookvale Road bores and failed to liaise with the Regional Council in relation to aquifer and catchment risks that might affect its water supply. The Inquiry accepts these criticisms.

[261] The risk tables in the Water Safety Plans required an assessment of the risk from: contaminated sites in the recharge zone that might affect groundwater quality; incomplete knowledge of activities in the recharge zone; contamination arising from unmonitored permitted activities; and incomplete knowledge of wells located close to the recharge zone.

[262] In respect of each of these risks, the District Council in its 2008 Water Safety Plan rated the probability of the risk occurring as “unlikely”, and the consequences of such risk as “moderate”. Given the state of the District Council’s knowledge in 2008, the Inquiry finds that these risk assessments were inadequate and not based on any meaningful process. In particular, the “moderate” rating for the consequences of contamination substantially underrated the impact of a waterborne contamination incident on the community. The District Council’s description of the various risks of contaminant entry into the drinking water as simply “unlikely” was also unjustified, given the range and nature of the vulnerabilities which existed.

[263] In its 2015 Water Safety Plan the District Council re-rated these contamination risks as “possible” (in other words, an increase in probability). However, the description of the likely consequences became “minor”. While the increased probability was, in the Inquiry’s view, more (although not completely) accurate, the description of consequences as “minor” was even more erroneous than the previous version. The Inquiry received no documentary material demonstrating that the District Council had undertaken any proper, let alone rigorous, assessment of these important risks. The District Council’s Water Services Manager, Mr Chapman, accepted in light of the August 2016 event that these risk ratings were seriously incorrect.

[264] The District Council similarly had no system for assessing the risks to its water source in the catchment area surrounding Brookvale Road. For example, it had little useful knowledge of the state of the aquitards, one of the factors fundamental to a secure water supply. In fact, the aquitard was weak or non-existent in places. Nor did it have any knowledge of the numerous uncapped or risky bores in the vicinity of Brookvale Road which were described in the post-event investigation evidence of the District Council’s Mr Mananui. However, it did rate the probability of the presence of such bores in its Water Safety Plan risk tables as “likely”.

[265] The District Council did not make any adequate assessment of the risks from livestock in paddocks close to the Brookvale Road bores, even though animals are a well-known source of campylobacter and other pathogens. The risk tables in the District Council’s 2015 Water Safety Plan recorded that the presence of farm animals was “almost certain” but gave this the lowest consequences rating, being “insignificant”. The August 2016 outbreak demonstrates that the presence of sheep near Brookvale Road was in fact a risk factor of the utmost importance. This had been clear in the

1998 event when many people fell ill, probably as a result of ingesting ovine faecal material containing campylobacter.

[266] Part of these failures by the District Council involved a lack of collaboration and liaison with the Regional Council in relation to aquifer and catchment risks. The need for such liaison was noted in the 2008 and 2015 Water Safety Plans. However, this did not occur. The Inquiry does not accept as sufficient the type of contact described by Mr Chapman from the District Council, that he would periodically have a coffee informally with one of the representatives of the Regional Council.

[267] As noted above, the Drinking-water Guidelines exhorted “maximum interaction and mutual support between the various stakeholders” in the drinking water supply, and emphasised the need for risk management planning techniques. The Draft User’s Guide for the NES Regulations similarly urged partnerships and co-operation between Regional Councils and District Councils. Quite apart from these regulatory guides, the Inquiry considers liaison by the District Council with the Regional Council was desirable and necessary on a common sense basis. The District Council’s witnesses accepted the desirability of such liaison.

[268] Counsel for the District Council submitted that it had not failed to foster and maintain good working relationships with the Regional Council prior to the August 2016 event. The Inquiry heard extensive evidence of poor relations between the two parties in the period preceding the event. The Inquiry finds that there was no significant level of useful liaison in respect of drinking water risks. A key example was the July 2013 granting of resource consents relating to earthworks to Te Mata Mushrooms by each of the Councils respectively, without any knowledge of the other’s activities. The Inquiry finds that prior to August 2016 there was nothing that approached the description of “partnership” or “collaboration” in relation to catchment and aquifer risks.

Pond to Bore Water Travel

[269] The question of a connection between the Mangateretere Stream and Brookvale Road bores 1 and 2 was highly material to the issue of direct causation of the 2016 outbreak, and a matter of central importance to the Inquiry.

[270] Counsel assisting argued that the possible connection ought to have been identified much earlier. He submitted that the District Council fell below the required

standard in not identifying the possible connection in 2008, and subsequently. The Drinking-water Standards required the District Council's Water Safety Plan to address contaminant sources and contaminant migration pathways. On this basis, the District Council should have thoroughly investigated the risk from the Mangateretere Stream, at the location of the nearby pond.

[271] Counsel assisting made this submission on two principal bases. First, evidence provided to the Inquiry by Dr Gyopari and Mr Hughes, experts for the District Council and Regional Council respectively, made it clear that the pond could in some circumstances have been a "losing pond", that is, water could have flowed from the pond into the aquifer.

[272] Mr Hughes explained that when the stage height in the pond was higher than the adjacent groundwater level, this would produce a positive gradient between the pond and the aquifer. The rate of flow into the aquifer would be governed by the relative difference in head between the pond and the aquifer, as well as the permeability of intervening sediment. The drawdown from pumping action at the bores could also potentially reverse the natural discharge of water to the stream and induce flow loss from the stream. Rapid decreases in the level of the pond had been observed on occasion shortly following the commencement of the pumping.

[273] Mr Hughes' evidence concluded that it appeared appropriate to classify the Mangateretere Stream as a losing stream upstream of Brookvale Road (i.e. at the location of the pond). Extensive evidence produced in relation to the District Council's 2008 consent application demonstrated a hydraulic connection with the Brookvale Road bores. Had he, or another hydrogeologist, been asked to report on the possibility of a losing stream during that consenting process, he would presumably have provided the same evidence then, as he recently did to the Inquiry.

[274] Second, in less scientific terms, the pond was: very close to Brookvale Road bore 1; visibly and obviously a body of surface water open to wildfowl and livestock; and subject to inundation from neighbouring lands in the event of high rainfall. On a layperson's level, the possibility of a connection between the two was an obvious source of drinking water risk.

[275] Counsel for the District Council disputed these assertions, pointing out that the District Council obtained advice and evidence from Dr Gyopari in 2008, which indicated

that the stream depletion effect was limited to reducing the inflow into the stream. He indicated that there was some evidence in 2008 that extraction by the bores did not take water from the stream and that, far from being a very obvious source of risk, it was not one that had been identified by anyone in the whole 35 year history of the Brookvale Road bores. He submitted that for large parts of the year, there was no body of water in the pond area, as the relevant area dried up without rainfall. However, the evidence showed that the District Council was aware of the existence of a pond at various times.

[276] The Inquiry finds it regrettable that all concerned with the 2008 resource consent application were focussed primarily, if not exclusively, on the stream depletion effects of pumping from the Brookvale Road bores, particularly given the District Council's obligations as consent applicant to provide a full assessment of the effects of the proposed activity.

[277] Mr Lew, who was responsible for Resource Consents and Compliance at the Regional Council in 2008, frankly admitted that the Regional Council at that time paid no regard to drinking water risks. As a result, it appears that there was no expert evidence or other material in the consenting process directed towards the possibility of water travelling from the pond to the bores. Mr Lew said that he did consider the possibility of a "losing" effect at the time, and that there was some conjecture by him about this. However, there is no evidence that he shared that possibility with the District Council or thought to raise the possible need for expert evidence on the topic.

[278] The Inquiry preferred the submissions of counsel assisting on this matter and considers it is not entirely hindsight that has raised a legitimate question about what would happen if the water level in the pond exceeded that at the Brookvale Road bores. A thorough and probing consideration of catchment risks by the District Council, as required by the Drinking-water Standards and, in turn, the Water Safety Plans, would surely have included careful consideration of such a very close body of open surface water.

[279] Nevertheless, the Inquiry acknowledges that the District Council's own expert, and also the Regional Council personnel examining the matter, all failed to identify the risk in 2008. It was reasonable for the District Council to rely on the experts it retained. Counsel for the District Council submitted that possible flow from the pond into the aquifer had, in fact, been negated by experts. The Inquiry finds there was one

sentence in a 2002 East Coast Environmental and Associates Ltd Report stating that the bores did not take surface water from the stream (“ECE Report”).²⁵ But it is highly unlikely that anyone involved in the 2008 consent process focussed on that specific sentence. In any event, the ECE Report did not address the scenario that the Inquiry believes occurred in August 2016, namely natural flow out of the pond rather than extracted flow as a result of pumping.

[280] The Inquiry has concluded, on balance, that it is not appropriate to be critical of the District Council in this regard, even though a failure by all concerned to identify and address the pond risks was another significant missed opportunity.

Maintenance and Implementation of Adequate Water Safety Plan

[281] The District Council’s Water Safety Plans were the central source and record of risk assessment and risk reduction measures. Yet the District Council did not accord the necessary priority or application in complying with its Water Safety Plan requirements.²⁶ There was a significant history of persistent reminders by the DWAs in relation to such matters as bore head security reports, raising the bore heads, a contingency plan and a bore maintenance and inspection programme. Generally, the District Council’s responses were slow and, in many cases, ineffectual.

[282] Frustrated at the lack of progress, on 10 May 2013 the DWAs escalated matters to Dr Jones as Medical Officer of Health and he wrote a letter to the District Council requiring prompt attention to securing approval of its Water Safety Plan (then known as a Public Health Risk Management Plan). In October 2014, the DWAs’ report to the District Council on implementation contained a strong recommendation that the overdue review of its Water Safety Plan be undertaken as soon as possible. The report also noted that the District Council did not consider it a priority to address previous recommendations. The District Council’s Mr Stuijt admitted that, on occasions, he left communications from the DWAs in his in-tray and did not promptly action them. Mr Stuijt accepted that by October 2014 he was getting much more frequent correspondence from the DWAs and that there was a level of slackness and

²⁵ Which was repeated by MWH in a May 2016 report on alternative water supplies: MWH “Havelock North Water Supply Sources, Operational Review Strategy” (May 2016) (CB009).

²⁶ The obligation to prepare and implement a water safety plan is contained in section 69Z Health Act.

non-compliance by the District Council. Mr Stuijt accepted at that point that matters of safety of the public and compliance with the law were being ignored.

[283] In addition, the Inquiry finds that there was a failure by the District Council to “own” the Water Safety Plans at more senior management levels. Mr Chapman delegated responsibility to Mr Stuijt, who in turn delegated Water Safety Plan tasks to Mr Kersel. Mr Stuijt did not manage the delegation to Mr Kersel. Mr Chapman did not properly manage Mr Stuijt. Nor did Mr Chapman ensure that more senior management understood the requirements of, and obligations arising under, the Water Safety Plan. Additionally there was no process to ensure that risks identified in the Water Safety Plan were included in the District Council's corporate risk register.

[284] Had there been a proper focus on Water Safety Plan risks and contingency planning, the District Council could have developed a genuine multi-barrier approach for its water supply network even without chlorination. For example, the District Council could have considered using turbidity monitoring (whether upstream of its bores or at source or both) or a greater frequency of testing at source (including after heavy rainfall and when a bore was brought back into operation). Instead, the District Council appears to have had a misplaced confidence in the security of its source water and a relaxed approach to multiple positive E.coli readings, or transgressions, in its reticulation network, which District Council management attributed to “backflow” issues.

[285] The Inquiry was disappointed to note that, despite all of the attention drawn to safety issues in the Inquiry process, as at late April 2017, the District Council still did not have a revised and properly updated Water Safety Plan in place. It may be that many large suppliers do not accord sufficient priority and importance to Water Safety Plans - the Annual Report on Drinking-water Quality 2015-2016²⁷ states that 5.4 per cent of large suppliers (159,000 people) had their plans lapse under the Health Act through the supplier failing to review or revise them as required. The Inquiry will be considering compliance with Water Safety Plan requirements, and the adequacy of those requirements, further in Stage 2.

Condition, Inspection and Maintenance of the Brookvale Road Bores

[286] Counsel assisting submitted that the District Council fell below the required standard in relation to the condition of the Brookvale Road bores. He submitted that

²⁷ CB192.

the District Council failed to maintain the bores to a level compliant with the Drinking-water Standards, did not have in place a programme for bore inspection and maintenance, and should have raised the bore heads of Brookvale Road bores 1 and 2 above the ground. He also submitted that the District Council was wrong to treat the leaking bore chambers on bores 1 and 2 as acceptable, and that the August 2014 and August 2016 MWH Reports about bore security were on their face defective and should have been challenged and improved.

[287] For context, the Drinking-water Standards required the bore heads to be sealed at the surface to prevent the ingress of surface water and contaminants. They also required the bore casing to be in a state that would not allow ingress of shallow groundwater, and the construction of the bores needed to comply with the bore construction standards in NZS 4411²⁸. Although the construction of the Brookvale Road bores pre-dated this standard, the Drinking-water Standards stipulated a mandatory requirement for ongoing compliance with the bore construction standards. The Inquiry is satisfied that its requirements were applicable to Brookvale Road bores 1 and 2. Section 69V Health Act imposes on a drinking-water supplier a duty to take all practicable steps to comply with the Drinking-water Standards, and the Inquiry acknowledges that the duty to comply is not absolute. However, the District Council did not assert in response to this issue that it was not practicable to comply with the Drinking-water Standards in respect of bore head security. Furthermore, the Council did not adduce any evidence addressing the elements of “practicability” in section 69H, and the Inquiry’s view is that the District Council could have, and should have, complied.

[288] In addition, it was a condition of the water permit resource consent granted by the Regional Council in 2008 (and varied in 2014 and 2015) that all works and structures relating to the consent were designed and constructed to conform to the best engineering practices and at all times maintained to a safe and serviceable standard. An advice note in the consent stated that well head works should have no openings through which contaminants might enter the well, including no gaps around pipe works and cables at the well head.

[289] The Regional Council provided extensive evidence to the Inquiry on the condition of Brookvale Road bores 1 and 2 in August and September 2016. This

²⁸ NZS4411:2001 Environmental Standard for Drilling of Soil and Rock (**CB173**).

evidence disclosed that the bore chambers in both bores 1 and 2 were in poor condition, with the bore 1 chamber particularly dirty and ill-kempt. The glands or seals around the cables in bore 1 were in a poor state of repair and the holes on top of the bore head works freely allowed water to flow down the bore during testing. The bore chambers for both bores 1 and 2 readily admitted surrounding water through various holes and conduits, such that large volumes of water could leak into both bore chambers. The bore 2 cable glands did not hold a vacuum when tested on 5 September 2016. The cable glands were in such poor condition on bore 1 that a vacuum test could not be performed.

[290] In response to some of the challenges to the evidence concerning the bore conditions, the Regional Council produced two briefs of evidence from Mr Baylis, an expert well-driller. Mr Baylis' detailed evidence described the poor state of Brookvale Road bores 1 and 2 shortly after the outbreak. In particular, he indicated that at least one of the glands in bore 1 was incorrect for the cable size it had to carry. This meant it was too large in size and could never have made the cable hole watertight.

[291] The Regional Council concluded that both bore chambers had weaknesses in their head works through which water could have passed into the bore casing and to the water supply pumps. This view was supported by the well head security report prepared by Mr B Hughes and the testing carried out on 2 to 6 September 2016 by Baylis Bros, Well-drilling Engineers. These reports were amply supported by clear photographic evidence.

[292] There was dispute between the District Council and the Regional Council at the hearing in relation to some of the finer details of the condition of the Brookvale Road bores. For example, the Regional Council reported that the upper sump pump in bore 1 was found to be non-operational in September 2016, as a result of a loose wire. The District Council submitted that it was not clear when this occurred. Telemetry records showed that the pump had not operated since May 2012 but, as the District Council pointed out, that could have been because water at no stage reached the relevant level. As well, there was considerable debate about whether the alarm system was operational; this matter was resolved by the Science Caucus' finding that it was effective and operable on 5-6 August 2016 as set out in **Appendix 3** (page 168).

[293] The Inquiry finds that the preponderance of the evidence showed that, at least in bore 1, water could readily have entered the chamber and, if it reached a sufficient

level, could also have travelled down the cable holes into the bore. It was also clear that bore 2 leaked readily. The bore head works were not constructed or maintained so as to prevent surface water entering the bore or annulus. There was no grouting around the upper part of the casings, or any sloping concrete apron, as is recommended in the Drinking-water Guidelines. As such, it can be stated with confidence that, at the time of the outbreak, Brookvale Road bores 1 and 2 were not compliant with the Drinking-water Standards.

[294] The District Council had no inspection records with which to rebut the evidence that Brookvale Road bores 1 and 2 were not in a compliant condition at the time of the outbreak. In addition, as has been noted, the District Council paid both infringement notices issued against it by the Regional Council on the basis that bores 1 and 2 were not maintained to a safe or serviceable standard, in accordance with the conditions of its resource consent.

[295] Extensive evidence, including expert evidence, was produced on the question of what the telemetry records and systems for Brookvale Road bores 1 and 2 showed. Much of this evidence concerned the sump pumps and alarm systems. In the end, however, all of this material was considered by the Science Caucus and brought to bear in its findings and the Inquiry did not therefore need to venture into it. None of this evidence directly concerned the physical condition of the two bores in terms of vulnerability to ingress of surface water.

[296] The Inquiry also heard evidence about the bore casing, which penetrates down into the aquifer. Examination of this part of the infrastructure is not possible without a degree of disassembly and the use of cameras, non-destructive testing techniques, and other forms of more demanding testing. The Drinking-water Guidelines advised that where there is doubt about bore integrity, a number of techniques such as casing pressure tests and downhole photography could be used on the casing. However, these are not a normal requirement and, in general, an aboveground visual inspection and bore construction data would provide sufficient information.

[297] Brookvale Road bore 1 had been in the ground some 32 years at the time MWH carried out its June 2014 inspection. The District Council had no specific data or modelling to guide it on the correct approach to aging in-ground casings. The lifespan of a casing and appropriate procedures for considering the condition of older casings will be matters potentially to be considered in Stage 2 of the Inquiry.

[298] The Regional Council's evidence sought to demonstrate that the casing of Brookvale Road bore 1 was in such poor condition that it was likely to have admitted water from the aquifer through holes or cracks or other such defects. The Regional Council saw merit in advancing that theory, even though water surrounding the casing would normally enter through the screens, particularly as the pumping action would entrain water vertically downwards towards the screens.

[299] The Science Caucus was unable to reach clear consensus on the probability of a casing defect having admitted water. After the February 2017 hearings, pressure tests were carried out on the casing of Brookvale Road bore 1 and, despite some challenges to the results, the Inquiry concludes that there was no significant hole or crack in the casing of bore 1 that would have admitted any water.

[300] Turning to inspections and maintenance, it is axiomatic that a water supplier should operate an effective maintenance and inspection programme for bore works. This would ordinarily be the case with machinery of this type, but it was many times more important here, given the public safety issues attaching to drinking water bores.

[301] Ongoing compliance with the Drinking-water Standards requirements would not have been possible without an inspection and maintenance programme. The District Council's Water Safety Plans should have incorporated such a programme and should have made clear the risks of failing to have, and to implement, such a programme. However, apart from some limited references to the state of the bores, the Water Safety Plans did not meet this requirement.

[302] The District Council also needed a maintenance and inspection programme to be able to comply with its consent condition and to heed the advice note, which although not creating a legal obligation, did point in obvious terms to a specific source of risk.

[303] The Drinking-water Guidelines recommended that the status of the bore heads should have been reported to the DWAs annually, with significant detail including in particular as to the state of seals. The Inquiry finds this was not done.

[304] Both the 2008 and 2015 Water Safety Plans provided that the District Council should "regularly check well head condition and well site for potential contamination risks (ongoing)". Despite comprehensive and clear requirements to check the bores

periodically, and that the chambers and bore heads be sealed (as discussed above), the District Council failed to meet these requirements for Brookvale Road bores 1 and 2. The DWA made repeated efforts to persuade the District Council to comply and, in particular, to enter an inspection and maintenance programme into its Hansen System. However, these Water Safety Plan requirements were not adequately met. These failures were significant to drinking water safety, because the bore heads were situated below ground level and this gave rise to increased risks. The Inquiry has been unable to find any justification for this ongoing failure by the District Council to address matters that were fundamental to public safety, and that the DWAs obviously thought important enough to mention year after year.

[305] Counsel for the District Council submitted that its water operators did carry out inspections. These were irregular at best and comprised ad hoc visual inspections by the water operators from the outside of the borehead chambers. This was not adequate to identify and address deficiencies in the bore works. These inspections, which were described by the District Council itself as “cursory”, were wholly inadequate for the purposes of the Drinking-water Standards and Water Safety Plans, given the public safety context. Nor was any record kept of them.

[306] The Inquiry finds that the District Council was also negligent in not raising the bore heads in Brookvale Road bores 1 and 2 above ground. While this was not a method of sealing per se, it was a measure that would have substantially reduced the risk of water reaching the bore heads. Counsel for the District Council submitted the DWAs did not issue any mandatory requirement for this to be done. The Inquiry has found that this was no justification for the District Council’s inaction. The Water Safety Plans recorded this risk and mentioned the prospect of raising the bore heads. The District Council in fact recorded in the Water Safety Plans that it had a programme of work to make improvements to the well heads including extending the heads above the surface to prevent surface water ingress.

[307] The District Council gave no clear explanation as to why the simple, expedient step of raising the bore heads did not occur. Mr Stuijt gave evidence that one of the DWAs, Mr Inkson, had verbally acknowledged that raising the heads was not required. The Inquiry does not accept this evidence. It is inherently lacking in credibility and contrary to repeated written requests by the DWAs. Ms Lynch, the most recent DWA, specifically rebutted this suggestion.

[308] The District Council adduced some evidence under cross-examination claiming that raising the bore heads would have been an expensive and difficult operation. Mr Stuijt initially suggested likely costs of some \$500,000 to raise the two bore heads. The District Council subsequently advised that the actual costs for raising three bore heads in Hastings had been in the vicinity of \$109,000. The Inquiry finds that raising the bore heads of Brookvale Road bores 1 and 2 would have been relatively inexpensive and also technically straightforward.

[309] There was some evidence that the District Council's awareness of the relatively short expiry date for the water take consent (May 2018) was instrumental in dissuading it from further expenditure on the Brookvale Road bores. For example, Ms Lynch, the DWA, stated in evidence that she understood that the District Council was reluctant to raise the bores because they were likely to be no longer required after 2018. The District Council's 2015 Water Safety Plan noted that the current resource consent for the Brookvale Road bore site was due to expire in 2018 and that this meant that bores 1 and 2 were likely to be abandoned, and that the District Council was reluctant to acquire neighbouring land in light of that. The Inquiry finds that the District Council took an unacceptable risk in this respect.

[310] The District Council sought to justify leaving the bore heads below ground level on the basis of "risk management". The concept of "risk management" was raised a number of times by different parties as a justification for a course of action or a lack of it. In this vein, the District Council made submissions that the supply of drinking water was not intended or required to be completely free of risk and that value judgments frequently had to be made as to acceptable risk levels. The Inquiry accepted this may be so in some respects. However, where the Drinking-water Standards contained an express stipulation, the concept of risk assessment had no place. Nor should it be used to justify a standard that was lower than that required to protect public health and safety. The Inquiry firmly rejects the notion that "risk management" justified leaving the bore heads below ground level.

[311] After considering all of the evidence, and the submissions on behalf of the District Council, the Inquiry accepts all of the District Council's failings asserted by counsel assisting in this respect.

Bore Head Condition Reports

[312] For the purposes of satisfying the second criterion in the Drinking-water Standards for the classification of bore water as “secure” (bore head protection) the District Council commissioned the August 2014 MWH Report. However, this provided no answer to the above failures in relation to bore conditions. As will be explained in the section addressing MWH’s failings below, the inspection carried out by MWH in June 2014 for the purposes of the report was superficial and inadequate.

[313] While this was primarily a failing by MWH, the District Council failed to apply any critical scrutiny to MWH’s work or to retain any “ownership” of the bore head security issues. It also failed to provide its Water Safety Plan to MWH and failed to escalate a review of MWH’s work to more senior managers within the District Council.

[314] Counsel for the District Council submitted that it retained a consultant chosen for its expertise for the task and it was wrong to be criticised for not then carrying out a parallel assessment of its own. The Inquiry accepted this proposition to a point. However, some aspects of the state of the bores were so important and some elements of risk so obvious, that the District Council should not have blindly accepted whatever MWH reported without its own critical assessment. The state of the bore head gland seals fell within this category.

“Secure” Classification

[315] From at least 1999 the District Council supplied untreated drinking water on the basis that the Brookvale Road bores were “secure”. Over time, there were various changes to the Drinking-water Standards, and the definition of “secure”, but by 1 July 2012, the District Council was required to comply with the three criteria outlined above if it wanted to keep supplying bore water deemed to be “secure”, and thus not needing treatment.

[316] The District Council’s 2008 Water Safety Plan had noted that the supply wells had not yet been granted fully secure status in accordance with the Drinking-water Standards. Correspondence from the DWAs to the District Council from 2009 referred repeatedly to the need to provide satisfactory bore head protection, and noted that there was no evidence in DWA files that the second security criterion (bore head protection) had been met. The District Council was asked to provide evidence of this. This request was repeated over an extended period but by 22 August 2014, the DWAs

were pressing more firmly, indicating that it had been due since 31 December 2013. The DWAs noted a non-conformance in relation to the timeframe specified in the Water Safety Plan.

[317] It was not until the 10 August 2016 MWH Report (two days before the outbreak) that the DWA had the means with which to satisfy the second security criterion. In fact, the DWA who had previously chased the District Council for satisfaction of criterion two had no opportunity to classify the supplies as “secure” before the outbreak.²⁹

[318] Counsel for the District Council submitted that the bores were noted as secure in each of the annual reports issued by the Ministry of Health, and that the DWAs’ annual compliance reports also assessed Havelock North as “compliant”. The Ministry of Health annual reports did not contain any statement of the security classification of the Brookvale Road bores. The annual DWA reports on compliance with the Drinking-water Standards contained a table on protozoa compliance which indicated “secure groundwater” for the Brookvale Road bores. However, the Inquiry does not accept it was reasonable for the District Council to treat this as assessing Havelock North as a secure supply. The text under the table expressly stated that the DWAs had not received evidence of criterion two satisfaction. The District Council also knew that no assessment or classification process had occurred, and that the DWAs were chasing it.

[319] The Inquiry has found that the District Council’s approach to obtaining a secure classification was wholly unacceptable. The District Council failed to recognise the central importance of this classification.

October 2015 Brookvale Road Bore 3 Event

[320] Counsel assisting submitted the District Council fell below the required standard in its basic failure to appreciate the potential seriousness of the October 2015 Brookvale Road bore 3 event or the resultant adverse change in the risk landscape in and around Brookvale Road.

[321] In light of the positive E.coli results, it was undoubtedly correct for the District Council to switch off Brookvale Road bore 3 on 1 October 2015. However, the Inquiry has taken the view that switching almost immediately to Brookvale Road bore 1 as the

²⁹ The Inquiry appreciates there is a lack of clarity under the Drinking-water Standards on who was to confer secure status, and by what process the classification was to be obtained. The Inquiry will address those issues in Stage 2.

source of Havelock North's drinking water, without positively ruling out a connection between these bores, was negligent and risky, particularly given that, as of 5 October 2015 the chlorination of Havelock North drinking water ceased, and there was no other form of treatment being implemented.

[322] Any risk assessment in relation to Brookvale Road bores 1 and 2 was carried out by District Council staff, without reference to senior management or to any external advice. Moreover, there was no meaningful history of clear test results before Brookvale Road bores 1 and 2 were used to supply the Havelock North reticulation. The decision to switch to these bores was, at best, rudimentary and cursory. Although the District Council continued to test Brookvale Road bores 1 and 2 daily after 1 October 2015, any contamination would have been in the supply for some 24 hours before any positive result was advised by the relevant laboratory to the District Council.

[323] The District Council submitted that Brookvale Road bores 1 and 2 had a long clean history and that this supported the decision to switch to them. The Inquiry disagreed with this submission. Brookvale Road bore 3 also had the same clean history, before it became contaminated. The District Council did not confer with the DWA or the Regional Council before switching to Brookvale Road bore 1.

[324] Although the Inquiry heard some (limited) evidence of separate areas within the aquifer between Brookvale Road bores 1 and 2, and 3, the Inquiry considered that, in October 2015, the District Council had no information to dispel the possibility of a connection between the three Brookvale Road bores. Absent clear and satisfactory evidence to the contrary, the District Council should have assumed that there could have been a level of connection between Brookvale Road bore 3 and bore 1. This should have been the case until a full investigation of the cause of the contamination had been completed. Furthermore, the Inquiry records that all three bores in Brookfield Road drew from the same Te Mata aquifer, were in close proximity, and had been treated as one for the purposes of age tests carried out on aquifer water by GNS in both 2001 and 2011.

[325] A related criticism was the District Council's failure to carry out any thorough checks of the condition of Brookvale Road bores 1 and 2 before switching to them. The Drinking-water Standards required a bore head security report as soon as practicable in the event of E.coli detection in bore water. This did not literally apply to the substitute Brookvale Road bores 1 and 2. However, it would have been prudent

and in the public interest to carry out such a check in relation to these bores, as well as in relation to Brookvale Road bore 3, even though it was at that point switched off. The August 2014 MWH Report was sixteen months' old at that point, MWH's bore head reporting had not been finalised, and the recommended work had not been carried out.

[326] As mentioned, the Inquiry is also critical of the District Council's decision to stop chlorination only four days after it had been started, in the context of probable aquifer contamination, where the source and pathway were unknown. There was no operational or health reason to stop chlorination so quickly. It was a highly beneficial protective measure that was available and practical. The Inquiry considers it should have been continued until the source and pathway of the contamination were determined. The Drinking-water Standards minima were inappropriate on this particular occasion.

[327] Furthermore, the District Council was in October 2015, and following, apparently not aware of, and did not consider, the risk of infection from protozoa. This was also imprudent, given that faecal material may also contain protozoa, and given the extraordinarily high rate of giardia in New Zealand waters.³⁰ At the least, intensive sampling and testing for protozoa should have occurred at all three Brookvale Road bores.

[328] Earthworks at Te Mata Mushrooms' property were regarded as a strong contamination suspect and this should have led the District Council to an urgent and robust investigation of all relevant matters pertaining to that property. Despite its suspicions, the District Council had no basis for certainty about the source and pathway of contamination. It did not carry out any urgent or effective investigation of the Te Mata Mushroom earthworks, including through tracer studies.

[329] The Brookvale Road bore 3 and test bore 10496 occurrences were cumulative facts that should have led to a more intensive response by both the District Council and the Regional Council. In relation to the Brookvale Road bore 3 incident, the District

³⁰ See Saskia Snell and others "The epidemiology of giardiasis in New Zealand, 1997-2006" (2009) 122 NZMJ 1290 explaining that New Zealand's high rate of giardiasis (44.1 cases per 100,000) compared poorly with the rate in the United Kingdom (5.5 per 100,000 in 2005), Germany (5.5 per 100,000 in 2005, and the United States (7.1 per 100,000). New Zealand's rates of giardiasis remain extraordinarily high. In 2015 for instance, New Zealand had 32.9 cases of giardiasis per 100,000 compared to the United Kingdom's 7.58 cases per 100,000: ESR *Notifiable Diseases in New Zealand: Annual Report 2015* (11 November 2016) at p 30; Public Health England *Giardia data 2006 to 2015* (January 2017) at p 4.

Council retained engineering consultants, Tonkin & Taylor, to investigate and produce a report. By itself, this was a reasonable response. However it did not relieve the District Council of all responsibility, particularly given that chlorination had been stopped. The District Council should have retained ownership of the issues and it should have liaised effectively with the Regional Council about them. Waiting 10 months for an incomplete draft report from Tonkin & Taylor was not an adequate response, particularly once the issues concerning test bore 10496 were identified in December 2015.

[330] Importantly the District Council did not carry out any effective or useful liaison with the Regional Council in late 2015 or in 2016 in relation to the obvious aquifer issues, and what they could mean for the safety of the drinking water supply. The Inquiry considers that one meeting with Tonkin & Taylor on 12 February 2016, with limited follow up and some data-sharing thereafter, was grossly inadequate and fell well short of the level of cooperation required. Both the Regional Council and the District Council needed to take ownership of the aquifer issues and actively pursue, and support, investigation of catchment risks.

[331] In October 2015, there was an obvious change to the bore risk profile in the Brookvale Road area. As indicated in the Drinking-water Guidelines, a change in the security of bore water could be caused at any time by many different things, and a competent water supplier should have been alert to such a change. A source (bore) contamination involved much more significant issues than the reticulation transgressions the District Council had faced previously. Detecting contamination in a bore was a serious and hitherto unprecedented event (after 1998). An active and substantial response was needed by the District Council. This did not occur.

[332] The District Council should have ceased using all of the Brookvale Road bores from 1 October 2015, switching instead to the Hastings supply, as occurred after the August 2016 event. Urgent and probing investigations should have been carried out jointly by the two councils. A marked contrast can be made with the intensive investigations carried out by both organisations after the August 2016 event.

[333] The District Council submitted that “Counsel assisting’s unrelenting focus on this event as a platform for finding fault is entirely misplaced”. The Inquiry rejects this submission. Valuable lessons for the future could be learned from the District Council’s failures on that occasion. Had a holistic and searching review of the whole of the

catchment and aquifer risks in the vicinity of Brookvale Road been undertaken jointly by the District Council and the Regional Council in late 2015, the prospects of the August 2016 event may have been lower. While no direct causal link was drawn between the two events, the Inquiry considers attention to issues such as heavy rainfall (which preceded the Brookvale Road bore 3 event), the pond in the Mangateretere Stream, and livestock risks, may well have lowered the chances of the outbreak occurring. Moreover, if chlorination had been continued pending the outcome of all investigations, this disinfectant treatment should have inactivated any campylobacter bacteria entering the bores in August 2016.

High Transgression Rates

[334] The Inquiry finds that the District Council did not meet required standards in failing to conduct a comprehensive review of the history of transgressions in the reticulation between March 2007 and May 2016. It would of course be unreasonable to attribute this failure to the earlier stages in the pattern of transgressions. However, by September 2014 the specific communication of concerns by the DWAs should have led the District Council to carry out a thorough review. Entering into detailed discussions with the DWA would have been desirable, as would liaison with the Regional Council. Retention of independent expert advice would also have been a prudent and proper step.

[335] It was put to the District Council's Water Supply Manager, Mr Stuijt, that almost every time a transgression was mentioned, the mindset within the District Council appeared to be to explain it away. The Inquiry considers Mr Stuijt's response to this unsatisfactory. The strong impression exists that, on each occasion when a transgression was detected, the District Council's primary motivation was to "clear the transgression" with the DWA and that a real sense of curiosity and concern about the pattern of transgressions was lacking.

[336] The District Council submitted that, in respect of every transgression, it complied with the Drinking-water Standards. It also argued that presence readings were not always followed by a positive enumerated result and that three consecutive days of clear samples were always ensured. The District Council refuted the allegation that it had not taken seriously enough the requirements of the Drinking-water Standards in relation to transgressions. Counsel for the District Council traversed a

history of transgressions from 24 February 2010 onwards and sought to explain and characterise each as not requiring further investigation.

[337] However, the Inquiry finds that such an approach fell into the error of discrete and piecemeal assessments. A thorough, high level and sceptical inquiry was clearly needed by the time of Ms Lynch's discussion with the District Council in September 2014. ESR's concerns at the high level of transgressions relative to other suppliers should have prompted the District Council to take the matter further at that time. District Council management could have drawn on the collective experience and skills of ESR, the DWAs, the Regional Council and external independent advice, had it so desired. The District Council failed at a fundamental level to appreciate the level of risk in continuing to supply untreated water.

District Council Management

[338] The Inquiry considers that the District Council's management and governance fell well short of the standards required for a public drinking water supplier. Mr Stuijt was not sufficiently aware of all activities being carried out (or not) by the water operators and he did not supervise them or ensure they were sufficiently trained and educated. Mr Chapman was similarly unengaged with, and unaware of, the activities of his subordinates. He was not alive to the need to alert senior management to the risks associated with the District Council's drinking water supplies. For example, his senior managers had no role in relation to the Water Safety Plans, the difficulties which the DWAs encountered in obtaining responses from the District Council, the pattern of transgressions, and the fact that ESR and the DWAs had expressed concerns about that pattern in September 2014.

[339] There was no quality assurance person within the District Council responsible for drinking water safety issues. The District Council's Audit and Risk Committee did not include drinking water safety on its agenda and the councillors did not have any adequate visibility of drinking water risks. Nor did they address those risks with the community.

PART 10: REGIONAL COUNCIL FAILURES TO MEET REQUIRED STANDARDS

Background

[340] The Regional Council was broadly responsible for the protection of the water source in the first instance, management of activities in the vicinity of the Brookvale Road bores, and liaison with the District Council in relation to aquifer and catchment contamination risks. Its various faults and failings are addressed in the sections below.

Alleged Faults, Failures and Breaches of Standards

Knowledge about Contamination Risks

[341] Counsel assisting submitted that the Regional Council fell below required standards in relation to its knowledge and awareness of aquifer and catchment contamination risks in the vicinity of Brookvale Road. In most cases, these would also represent risks to the first barrier of ensuring safe drinking water, protection of the water source. He also submitted that the Regional Council failed to liaise with the District Council in relation to those risks.

[342] In 2008, the Regional Council received a great deal of expert and other evidence in support of the District Council's application to take water from the Brookvale Road bores. This gave the Regional Council the opportunity to assess and manage aquifer contamination risks relating to the water take, in accordance with its functions under the RMA. These functions relevantly included maintaining the quality of water in aquifers.

[343] As consent authority, the Regional Council was required to be satisfied that it had all necessary information before it to assess the actual and potential effects on the environment of allowing the water take. However, as indicated earlier, almost all of the information provided to the Regional Council in 2008 related to depletion effects on the Mangateretere Stream. The Regional Council did not then obtain or require specific material on aquifer contamination risk.

[344] The Inquiry finds that from 2008 to 2016 the Regional Council failed to identify or engage with aquifer contamination risks arising from the District Council's water extraction activities in Brookvale Road, despite some clear indications of such risks. The District Council had three bores, each with bore works and a substantial casing

penetrating into the aquifer, and each with pumping occurring. These represented an obvious and direct risk in relation to contaminant entry into the aquifer, especially if the bore works were not kept in good condition.

[345] The Regional Council had substantial scientific resources and a clear duty to manage and address aquifer contamination arising from its functions under the RMA. The Inquiry concludes that the Regional Council failed to take effective steps to monitor and assess the real risks of contamination to the aquifer in the vicinity of Brookvale Road. It maintained its State of the Environment monitoring programme but this was at a high level. It was not designed to address specific forms of risk attaching to the activities in and around drinking water extraction from the bores in Brookvale Road. This issue is discussed further below in the context of other catchment risks.

Pond to Bore Water Travel

[346] In relation to risks arising from the Mangateretere Stream and pond, counsel assisting submitted that the Regional Council had information, or at least indications, that water could flow from the pond or stream into the aquifer in some circumstances.

[347] Counsel assisting relied, in particular, on evidence from Mr Lew, which stated that there was conjecture by him in the 2008 consent process about a possible “losing connection” between the stream or pond and the aquifer. Counsel assisting submitted that the Regional Council’s failure to follow up on that conjecture was negligent because of the potential risks arising from such a losing connection. He also submitted that the Regional Council could have called for expert evidence on this issue in 2008. It would then have obtained evidence similar to that provided to the Inquiry by Mr Hughes and Dr Gyopari. When these experts were asked to address pond to aquifer water movement for the Inquiry, their evidence clearly indicated the potential for a “losing” effect.

[348] Counsel for the Regional Council submitted that in 2008 Dr Gyopari did not advance any evidence indicating a hydrological connection. In the Inquiry’s view, he probably did not turn his mind to it as he was focussing on the depletion effects on the stream, i.e. reduced flow in the stream. His evidence in 2008 did not address the pond specifically, other than noting that it regularly dried up during summer.

[349] The Inquiry acknowledges, as submitted by counsel for the Regional Council, that there was some evidence available in 2008 indicating that flow out of the pond was unlikely, but this was very limited. The Inquiry concludes from the evidence that this was not positively excluded. Rather, it was considered by Mr Lew only briefly and in a cursory way.

[350] While the Inquiry has stopped short of criticising the District Council on this issue, it was the Regional Council's role, as consent authority, to be satisfied that it had assessed all possible consequences of the granting of the water permits. In evidence to the Inquiry, Mr Lew stressed that it was "absolute practice" to get all necessary scientific input to fully understand the effects of a consent application. The Inquiry finds it was the Regional Council's ultimate responsibility to ensure that contaminant entry into the aquifer via the pond, as a result of the water take, had been considered. An absence of evidence on this matter did not justify the Regional Council's lack of consideration of it.

[351] There was also a simpler and somewhat obvious basis for considering the connection. As the Inquiry has outlined in relation to the District Council, the pond was: very close to and upgradient of Brookvale Road bore 1, visibly a body of surface water open to wildfowl and livestock, and subject to inundation from neighbouring lands in the event of high rainfall. On a layperson's level, this was a clear potential source of contamination risk.

[352] The Inquiry concludes that the Regional Council should have followed up Mr Lew's conjecture about the losing effect from the stream and pond. The Inquiry does not accept the Regional Council's surprising submission that a hydrological connection between the pond and aquifer would only be of interest if it implied "a general and systemic contamination inhabiting the aquifer on a protracted basis". The Inquiry does not accept the Regional Council's characterisation of any pond to aquifer contamination as "localised source contamination", or its suggestion that such contamination would not engage RMA concerns.

[353] A proper investigation of this phenomenon by the Regional Council, likely with the assistance of dye tracer testing, would have taken into account, among other things, the effect of pumping and extraction from the bores and their zones of influence, and also the potential for, and implications of, a higher water level at the pond than Brookvale Road bore 1. Any investigation would not have been divorced from the

context involved, namely a public drinking water bore situated only some 70 metres distant from the stream, and 90 metres distant from the pond. In this context, an effect of low probability would have had high consequences and, as such, needed to be considered. While the Inquiry has resisted inappropriate levels of speculation, pursuing a deeper understanding about the connection between Brookvale Road bore 1 and the pond in 2008 would have been at the very least beneficial, and quite possibly revelatory. The tracer tests carried out in early 2017 readily demonstrated a connection.

Non-secure Bores

[354] Counsel assisting submitted the Regional Council failed to address the contamination risks from the many uncapped, disused or otherwise risky bores in the vicinity of Brookvale Road. Mr Gordon, the Regional Council's Principal Groundwater Scientist, was taken through 12 examples in the evidence of the District Council's Mr Mananui, who had investigated and photographed numerous of these bores. Mr Gordon said that he was concerned at the open pipes and agreed that the proliferation of these risks in the catchment area was "shocking".

[355] Counsel for the Regional Council submitted, in summary, that it was impracticable for it to monitor and keep a record of large numbers of bores within its area of jurisdiction. The Regional Council had a record of consented bores in its WellStor System; as at 12 September 2016, this contained records for 7,937 bores. However, the Regional Council had no record of the unconsented bores, and said it was too difficult to keep track of them.

[356] The Inquiry acknowledges these submissions in general terms. But the critical factor is that the Regional Council's responsibilities in respect of uncapped or disused bores arose in the context of a geographical area where drinking water was extracted from the Te Mata aquifer. Regional Council officials accepted that this part of the aquifer was not "confined".

[357] The Inquiry finds that such factors combined to require the Regional Council to assess the vicinity of Brookvale Road for risky bores. This would not have been unduly burdensome. This was evident from Mr Mananui's investigation, which took place over only a few days. Even during a site visit in October 2016, the Inquiry members were readily able to see several apparently disused bores within metres of Brookvale Road.

Moreover, the matter had been raised as far back as 2002 by Mr Inkson. (Refer to paragraph [154] above.)

[358] Counsel for the Regional Council submitted that it had a comprehensive system in place for educating itself about risks arising out of the drilling of bores, including in its Regional Resource Management Plan. The Inquiry accepts that the Regional Council did have a regime in place for addressing general bore drilling risks and for the decommissioning of bores. However, this did not translate into any specific risk assessment or enforcement in the Brookvale Road area. Nor did it address the ongoing state of bores after construction.

[359] The Inquiry finds that the Regional Council fell below the required standard in relation to addressing the unsafe and disused bores in the vicinity of Brookvale Road. It notes that the Regional Council is now improving its processes for the discovery of unconsented and abandoned bores close to drinking water supply bores.

Other Catchment Risks

[360] In an area containing bores used for the extraction of drinking water, the Regional Council obviously needed a proper understanding of the key features and activities to allow it to consider contamination risks to the aquifer. Counsel assisting submitted the Regional Council did not have adequate knowledge of the state of aquitards in the catchment area near Brookvale Road. Mr Lew advised the Inquiry that he was aware of a thinning of the aquitard in the region of the Mangateretere Stream. However, despite this knowledge, the Regional Council undertook no investigation or consideration of the aquitards.

[361] In the vicinity of the Brookvale Road bores there were many paddocks, as demonstrated in **Figure 1**. The Inquiry learned that the Regional Council had no process for keeping track of and monitoring the presence and effects of livestock in the area. Given the various possible pathways for contamination into the aquifer, and the well-known co-existence of pathogens with livestock, this was an obvious form of contamination risk.

[362] The Inquiry finds that the Regional Council equally failed to identify and provide for heavy rainfall as a contamination risk. Counsel for the Regional Council submitted that, if heavy rainfall was a risk factor, then regional councils would be faced with

deploying resources every time it rained in any quantity. This submission misses the point. At Brookvale Road, livestock were known to graze in paddocks adjacent to roadside drains, which in turn were adjacent to bore works that penetrated the aquifer. Inundation of the paddocks from heavy rainfall was thus a potentially risky event.

[363] Following heavy rainfall, there was also a risk that contaminated water from the paddocks could flow readily into the nearby pond and stream. Modelling carried out for the Inquiry showed that most of the water from paddocks 2 and 3 drained into the pond. As has been noted, there were also many insecure bores in the area into which contaminated water could enter.

[364] Importantly, there was a pattern of heavy rainfall associated with contamination events, which in some cases was, or should have been, known to the Regional Council, at least from October 2015 when Mr Stuijt raised this subject in connection with the Brookvale Road bore 3 event. The Inquiry finds that had the Regional Council investigated aquifer and catchment area risks more fully, it may well have become aware of this historical pattern.

[365] The causative role of heavy rainfall in the August 2016 event has been recorded. The Inquiry has difficulty with a submission by the Regional Council that “rapid transit of rainfall carrying contamination to the Brookvale Road bores was of low likelihood”, given the depth of the screens and the existence of aquifer materials, which the Regional Council believed had cleaning effects on pathogens. The Regional Council’s Dr Swabey filed extensive evidence arguing that pathogens would not have survived the trip from the pond to the bore. Dr Gilpin’s evidence was to the contrary, and the Science Caucus findings implicitly accepted his evidence. The Inquiry also accepts Dr Gilpin’s evidence in preference to Dr Swabey’s on this point.

[366] While it is speculative, the Inquiry considers it is at least possible that an earlier identification by the Regional Council of heavy rainfall as a substantial risk factor may have led to a different outcome in August 2016. This could have led to a focus on the ability of contaminated water from the paddocks to travel to either the leaking bore chambers or to the pond, with other steps in a potentially causal chain also being discovered in the process.

[367] In addition, the Regional Council would have learned that the District Council’s bore heads were below ground in two cases; the bore chambers readily admitted

water; and other lines of defence, such as sump pumps and alarms, may have been inherently prone to failure. The Regional Council may well have turned its attention to compliance with the “safe and serviceable” condition of the 2008 water permit it granted to the District Council. This can be stated with some confidence because that was precisely the outcome of the investigation the Regional Council pursued after the August 2016 outbreak.

[368] The Regional Council sought to downplay the seriousness of this alleged failure by saying that, while it accepted that factors such as livestock, rainfall, uncapped bores and so on may have increased the likelihood of “localised source contaminations”, there was no evidence supporting a contention that these factors generated a risk of widespread, systemic and persistent presence of contaminants.

[369] As indicated earlier, the Inquiry does not accept that there is any valid distinction in this context between “localised” and “widespread” contamination. Dr Swabey’s evidence emphasised how small amounts of animal faeces could cause widespread illness in the community. Based on 1,600 sheep being present in the neighbouring paddocks, he estimated that 370 billion campylobacter cells would have been deposited on the paddocks upgradient of Brookvale Road in one day. Also, 7,076 kilograms of faeces would have been deposited by the 1,600 sheep over a nominal five day period. He also estimated that less than one kilogram of sheep faeces would have been required to cause the number of illnesses resulting from the August 2016 event. The Inquiry did not find it necessary to enter further into these numerical computations.

[370] The Inquiry finds that a “localised source contamination”, for example, a slug of animal faeces entering the aquifer at a single point, could have had disastrous consequences for the population. And, in RMA terms, such localised contamination is no less actionable or important, than widespread contamination.

[371] The Inquiry firmly rejects the Regional Council’s argument that “localised” contamination meant that it was not involved or that it made the District Council more responsible. Any contamination in the aquifer, or capable, potentially or actually, of entering the aquifer, was fairly and squarely within Regional Council’s area of interest and responsibility.

Liaison with the District Council

[372] The Inquiry learned that the Regional Council generally had a great deal of aquifer and catchment knowledge, including through its substantial scientific resources and the ongoing learnings from its State of the Environment monitoring programme. Compared to the District Council, the Regional Council was “information-heavy” in relation to general aquifer and catchment matters. At the same time, the Regional Council lacked knowledge about the District Council’s infrastructure and water take operations. The Inquiry finds that a substantial and effective level of liaison between the Regional Council and the District Council was therefore necessary, but that the Regional Council failed to initiate this.

[373] The Inquiry has recorded above a significant level of ill-feeling and tension in the relationship between the two councils, which is equally relevant in the present context. Mr Lew explained that the Regional Council as regulator had an enforcement role, which led to tension, particularly as the Regional Council believed that the District Council’s water activities from time to time gave rise to enforcement concerns. The Inquiry appreciates the desirability of maintaining a separation between regulatory and non-regulatory decision-making. However, this desire is not a matter that can be effectively legislated for in connection with the day to day activities of council staff.

[374] Counsel for the Regional Council pointed to evidence from Mr Maxwell of some information-sharing with the District Council, including its “TANK Process” and publicly available State of the Environment monitoring output. However, this addressed only general and occasional instances of information-sharing and interaction.

[375] In particular, the purpose of the TANK Process is to bring together over 30 community groups to develop a collaborative and consensus approach to managing water quality, flows and allocation in the Tutaekuri, Ahuriri, Ngaruroro and Karamu catchments (hence, “TANK”) and the Heretaunga Plains aquifer system. While the TANK Process is, in effect, a forum for information-sharing, it is future-looking. Its intended outcome is to provide an agreed high-level direction for water and land management in the TANK catchments, which will be implemented through a plan change to Regional Council’s Regional Resource Management Plan.

[376] The Inquiry does not accept that the TANK Process or the State of the Environment monitoring records were a sufficient basis for specific and effective liaison

between the Regional Council and the District Council about aquifer contamination risks and associated risks to the drinking water supply. Nor did either Council use them in this manner.

[377] Counsel assisting submitted the Regional Council was the “senior partner” in relation to any aquifer dealings with the District Council. The Regional Council presented some statistics to show that the District Council had a substantially greater total revenue and expenditure than the Regional Council. However, these bare statistics did not address the more pertinent matter, which was the number of science and technical personnel within the Regional Council compared to the District Council. This was accepted by Messrs Lew and Gordon.

[378] In the context of the particular catchment and aquifer risks in the vicinity of Brookvale Road, and given the historical issues, the Inquiry finds that regular and meaningful co-operation and collaboration was lacking. The Inquiry has noted that the Regional Council acknowledged the importance of increasing its liaison efforts.

October 2015 Brookvale Road Bore 3 Event

[379] When the Regional Council found out about the October 2015 Brookvale Road bore 3 contamination event, through the media, it exchanged some brief emails with the District Council between 6 and 13 October 2015. The Regional Council failed to follow this up with the District Council, pursue investigations against Te Mata Mushrooms, or escalate the matter within the Regional Council. Most unfortunately, the liaison between the two Councils was seriously inadequate. This was a prime example of an area where information exchange, discussions and co-ordinated action between the two key stakeholders should have taken place.

[380] The Inquiry finds that the Brookvale Road bore 3 event very probably involved aquifer contamination. The source and pathway of such contamination were unknown. The Inquiry does not accept the Regional Council’s submissions that there was no reason to suspect widespread contamination within the aquifer. There was simply no significant evidence clearly excluding widespread contamination in October 2015. Moreover, the Regional Council maintained its own test bore 10496 some 235 metres distant from Brookvale Road bore 3 and that test bore had a history of E.coli readings. The District Council, through Mr Stuijt, raised factors of clear interest and relevance to

the enforcement powers of the Regional Council, but the Inquiry finds that the Regional Council did not pursue these matters to any significant extent.

December 2015 Test Bore 10496 Event

[381] The Regional Council properly identified the need to confer with the District Council about the elevated E.coli readings in the test bore 10496 in December 2015. This occurred by email from Mr Gordon to Mr Stuijt and was followed up about two months later when Regional Council personnel attended a meeting with Tonkin & Taylor concerning both the Brookvale Road bore 3 and the test bore 10496 events. The Regional Council subsequently shared some data with Tonkin & Taylor.

[382] However, the Inquiry finds that what was needed by the end of 2015, or at least by early 2016, was a substantial and rigorous joint investigation between the Regional Council and the District Council into aquifer and catchment matters of any possible relevance to these events. The Inquiry makes the same criticism of the Regional Council as it made of the District Council for not retaining ownership of these issues.

[383] Counsel for the Regional Council went to some length to justify its treatment of ongoing E.coli readings in test bore 10496 as innocuous and explicable. The Inquiry does not accept this position. Test bore 10496, although shallower than the drinking water bores, still penetrated the aquifer and its 8.4 metre depth connected that part of the aquifer with the surface. Faecal material was found in the water drawn from the test bore twice in December 2015, once at high levels. Test bore 10496 was upgradient of Brookvale Road bore 3. Mr Gordon was concerned enough to return from leave to ensure the District Council was advised promptly of these readings.

[384] The Regional Council also submitted that, in October and December 2015, it was operating on the scientific understanding that test bore 10496 was not linked hydrologically to Brookvale Road bore 3, and that Brookvale Road bore 3 was not linked hydrologically with Brookvale Road bores 1 and/or 2. The Regional Council said it was operating on the basis that physical movement of groundwater through the aquifer was highly localised and that water drawn by each bore was from a separate capture zone.

[385] The Inquiry did not receive any evidence suggesting that Mr Gordon or Dr Swabey in fact turned their minds to the nature and degree of connection between

all of the bores in December 2015. Even if they did, the Inquiry does not accept that there was any level of clarity or certainty in late 2015 or 2016 that contamination from any one bore could not reach another bore, to allow the Regional Council to safely make assumptions to that effect. As well, the ever-present possibility of a change in the aquifer materials and pathways (whether from an earthquake or more “normal” changes) should have been considered. The possibility of a connection was at least theoretically present and the Regional Council’s lack of curiosity at the time was surprising. It is noteworthy that the Regional Council now accepts, as it submitted to the Inquiry, that Dr Gyopari’s evidence shows that test bore 10496 and Brookvale Road bore 3 are “hydrologically and theoretically connected” and that “water flows from the vicinity of 10496 to the vicinity of bore 3”.

[386] The Inquiry accepts that the Regional Council officers believed at the time that some of the readings at test bore 10496 were within norms and acceptable, particularly given the proximity of the bore to a stream. However, in combination with the October 2015 event, and in the vicinity of three drinking water bores, the Inquiry considers a proper investigation was warranted. This should have involved the putting aside of all prior assumptions about the connections and characteristics of any aspect of the aquifer and catchment area. Pointing to pre-existing assumptions, which had no strong basis in any event, was not in the Inquiry’s view an adequate answer to the failure involved.

[387] The Inquiry finds that the lack of any meaningful or effective response by the Regional Council in late 2015 in connection with the Brookvale Road bore 3 and test bore 10496 issues indicated a substantial failure to grasp the changed contamination risk to the Te Mata aquifer at that time.

[388] It is striking that the Regional Council carried out an intensive and comprehensive investigation after the August 2016 outbreak, at a time when it perceived at least a possible changed risk landscape.

NES Regulations

[389] Counsel assisting submitted that the Regional Council had failed to educate itself on, and to apply the NES Regulations effectively from their commencement date on 20 June 2008. The Inquiry acknowledged that the Regional Council was aware of the regulations from some point well before 2016, and did on occasion seek to apply

them, albeit not very rigorously. It is also acknowledged that the NES Regulations imposed specific legal duties in respect of drinking water on the Regional Council only in certain limited circumstances.

[390] The Inquiry finds that strong criticism of the Regional Council in this regard is not warranted. However the extent to which regional councils have educated themselves and implemented the NES Regulations will be an important matter for Stage 2. It is therefore helpful to comment further at this stage.

[391] The NES Regulations impact on a fundamental issue, namely whether regional councils have any responsibility for the safety of drinking water. On this point, the Inquiry observes that the Regional Council changed position substantially from its initial written materials and evidence submitted to the Inquiry, in which it asserted it had no responsibility for the quality or safety of drinking water. Later materials received from Regional Council did acknowledge the role and responsibility of a regional council for drinking water quality at the first barrier stage.

[392] Prior to June 2008 there was no express requirement for regional councils to consider the effects of activities on the quality of drinking water sources when making decisions under the RMA. The NES Regulations were intended to plug that legislative gap. They provided statutory recognition of the importance of the first barrier in the multi-barrier risk management system attaching to safe drinking water.

[393] The NES Regulations did not arrive unheralded; they were under development for some years prior to their operative date of 20 June 2008. The Ministry for the Environment commenced extensive public consultation on a range of proposed national environment standards, including what are now the NES Regulations, in August 2003. The Ministry for the Environment released a discussion document in August 2005. The Regional Council provided a written submission, largely opposing the concept of the NES Regulations, on 28 November 2005.

[394] As the commencement date for the regulations approached, the Ministry for the Environment held a series of workshops in cities and towns in New Zealand, including one in Napier on 16 May 2008. A specific workshop was held for the Regional Council in the following year on 26 June 2009. The Ministry for the Environment retained ESR to produce a substantial document, "An Introduction to Drinking Water Contaminants,

Treatment and Management for Users of the National Environmental Standard for Sources of Human Drinking Water”, dated June 2008.³¹

[395] In the following year, the Ministry for the Environment produced the Draft User’s Guide for the NES Regulations. This has not been finalised since it was first published in May 2009. The Ministry for the Environment sent a copy of this document to the Regional Council on 17 June 2009.

[396] In the Inquiry’s view, the Ministry for the Environment pursued a reasonably comprehensive educational programme in respect of the NES Regulations, bearing in mind they had been the subject of industry consultation from 2003 onwards. Despite this, Mr Lew’s evidence was that he did not take any steps to implement the NES Regulations during his time at the Regional Council. He frankly accepted that the NES Regulations were not “front of mind” when dealing with the District Council’s 2008 water permit application. It appeared to the Inquiry that this lack of recognition of the regulations continued for the remainder of Mr Lew’s time at the Council, until 2011.

[397] The Regional Council filed evidence with its submissions from Mr Barrett, a Principal Consents Planner at the Regional Council. This limited, and untested, evidence dealt only with some aspects of consents granted to Te Mata Mushrooms and it did not address broader issues involving the Regional Council’s systems, processes and practices in relation to the NES Regulations post 2011. Mr Maxwell briefly stated in his evidence that the Regional Council did apply the NES Regulations in two instances with Te Mata Mushrooms, but he too did not provide information about the Regional Council’s recent systems relating to the NES Regulations. The Inquiry’s focus in Stage 1 is on previous systems (or, as here, lack of them) and current and future Drinking Water- Sources Regulations systems will be considered in Stage 2.

[398] The Inquiry should not be taken to indicate that the Regional Council ignored the NES Regulations entirely. The Inquiry’s key concern was that the Regional Council failed to embrace the principles and philosophies behind the NES Regulations by continuing, at least during Mr Lew’s time at the Regional Council, with the view that it had no legal or other responsibility for drinking water and no perceived accountability in that area.

³¹ Chris Nokes “An Introduction to Drinking Water Contaminations, Treatment and Management for Users of the National Environmental Standard for Sources of Human Drinking Water (ESR, 2008) (**CB077**).

[399] The principal purpose of the NES Regulations was to address this “no-responsibility” mindset and to create in some circumstances direct legal responsibility by regional councils for drinking water, thereby substantially boosting the strength and effectiveness of the first barrier in the multi-barrier drinking water safety system. However, the Regional Council’s resistance to any acceptance of responsibility for drinking water (until late in the Inquiry process) has shown that this goal was not achieved in its case.

[400] The Draft User’s Guide for the NES Regulations spoke of the agencies involved in drinking water in each region meeting to agree on procedures and protocols for handling consent applications affected by the NES Regulations. It indicated that participants could include regional council staff, district council officers, water suppliers and public health unit staff. The Regional Council’s failure to embrace the NES Regulations included, in particular, a failure to liaise with the District Council and District Health Board and DWA personnel.

[401] Such collaboration was not a difficult or obscure idea. Any effective implementation of the NES Regulations necessarily carried a need to confer, at least with the water supplier. In addition, the LGA already provided that, in performing its role, a local authority should seek actively to collaborate and cooperate with other local authorities and bodies to improve the effectiveness and efficiency with which it achieves its identified priorities and desired outcomes.

[402] This Stage 1 report spells out at some length the background and intent of the NES Regulations, because the Inquiry concludes that the Regional Council’s failure to embrace and give full effect to them represented a substantial missed opportunity in the years preceding August 2016. In the Inquiry’s view, the NES Regulations created a platform for the pursuit of a symbiotic working relationship between the participants in its processes (including, in this case, the Regional Council and the District Council), one involving mutual benefits and advantages.

[403] Had the Regional Council more fully and properly embraced the NES Regulations from 2008 to this point, the Inquiry concludes that the Regional Council would have been generally more engaged in relation to all potential drinking water risks. In almost every case, these would also have involved a risk of contamination of the aquifer, thereby engaging the Regional Council’s wider and more general duties under the RMA, regardless of the specific obligations in the NES Regulations

themselves. Where public drinking water bores are involved, those general responsibilities under the RMA cannot sensibly or realistically be divorced from their context.

[404] The Inquiry is pleased to note that the Regional Council is in the process of revising and updating its consenting procedures, forms and templates for implementing the NES Regulations.

Consent Conditions

[405] The Inquiry has concluded that the Regional Council failed to meet the required standard in relation to its imposition and enforcement of condition 21 attached to the 2008 and subsequent water permits granted to the District Council. This condition concerned the safe and serviceable state of the Brookvale Road bores.

[406] When considering a water permit application, the Regional Council had substantial power to impose any condition required to meet RMA objectives. The Regional Council had a strong regulatory framework in place in relation to the bores but it did not invoke it effectively. Rather than imposing a bespoke and effective condition in respect of the District Council's drinking water bores, the Regional Council simply added a generic and very general condition, which it imposed on all bore consents. Mr Lew accepted that, in future, a more specific and effective form of condition requiring proper bore protection would be appropriate.

[407] The Inquiry also concludes that the Regional Council fell short of the required standard in terms of its compliance monitoring of the District Council's permits, both in terms of its general statutory duty under the RMA to monitor the exercise of consents in its region for compliance, and also in terms of the indications it gave in the relevant consent documents.

[408] The 2008 consent stated that:

Routine monitoring inspections will be undertaken by Council officers at a frequency of no more than once every year to check compliance with the conditions of the consent.

[409] It also advised under the heading "Non-routine Monitoring" that this would be undertaken if there was "cause to consider (e.g. following a complaint from the public or routine monitoring) that the consent holder is in breach of the conditions of the

consent". In both cases, the consent holder (the District Council) had to pay the monitoring costs.

[410] The Regional Council's evidence was that these representations in relation to monitoring applied only to the quantity of water being extracted by the District Council. The Inquiry does not accept that this limitation was apparent in the consent, nor was there any evidence that such a limitation was otherwise communicated to the District Council.

[411] The statements in the consent were followed by a series of reports from Regional Council compliance officers between 14 December 2010 and 20 September 2016. In most cases, these reports contained a date alongside the words "monitoring inspection", and in relation to condition 21, they noted that there had been compliance. In some cases, the statement was "[t]his has been assumed compliant".

[412] The Inquiry concludes that the statements in the consent, in combination with the statements in the various reports mentioned above, were misleading. The consent gave a clear impression that the Regional Council would monitor the Brookvale Road bores to ensure compliance with condition 21. The reports gave the impression that the Brookvale Road bores had been inspected and were found to be compliant. The undisputed evidence was that the Regional Council on no occasion carried out any physical inspection of the bores or otherwise monitored their status and serviceability.

[413] Inspection by the Regional Council was not the only available method of ensuring compliance. Mr Lew agreed with counsel assisting that the Regional Council could and should have imposed a consent condition requiring the District Council to report to it periodically on the state of each of the Brookvale Road bores. Had a report of this type been required, and in rigorous terms, the deficiencies recorded in relation to the Brookvale Road bores set out at length in the Regional Council's evidence to the Inquiry would presumably have been absent in August 2016.

[414] In response, counsel for the Regional Council submitted that it was entitled to rely on the absence of any reports of breach by the District Council. The Inquiry accepted that the District Council as consent holder was required to comply with the conditions. However, ultimately, adequate monitoring to ensure compliance was the Regional Council's responsibility. The Inquiry considered that the Regional Council's

submission went too far; reliance on the absence of negative reports from a consent holder could not be a proper basis for compliance monitoring.

[415] Mr Maxwell sought in his evidence to justify the Regional Council's lack of monitoring of the bore conditions by reference to a "risk-based" approach. He said that regional councils do not have the resources needed to monitor the physical condition of thousands of bores.

[416] The Inquiry accepts, with reference to recent reports and literature on this matter, that this is a common approach taken by councils nationwide. Even if a "risk-based" approach to monitoring were pursued, however, on any proper assessment of risk, the three substantial Brookvale Road water supply bores and their infrastructure represented a level of risk at the highest end of the risk scale. The three Brookvale Road bores could have been physically inspected by the Regional Council, or by a contractor on behalf of the Regional Council (all at the District Council's cost), without any undue strain on the Regional Council's resources.

[417] The Inquiry concludes that the Regional Council's imposition of condition 21 was inadequate, its duty to monitor the terms of its consent was not discharged adequately, and that the monitoring representations were misleading.

PART 11: FAULTS AND FAILURES OF THE DWAS

Background

Role of the DWAs

[418] The role of the DWAs, as outlined in the Drinking-water Guidelines, is to verify that the requirements of the Health Act as they apply to drinking water have been complied with. The broad features of that role have been discussed earlier. Specifically, the DWAs have the statutory tasks and functions set out in s 69ZL of the Health Act. In summary, the key components involve monitoring and surveillance.

[419] The monitoring function means the DWAs need to assess the extent to which, at the time of monitoring, the drinking water supply complies with the Drinking-water Standards. The surveillance function means the DWAs need to check that the management of the drinking water supply conforms to the specifications of the

Drinking-water Standards. In each of the above functions, the critical interface is between the DWAs and the District Council as the water supplier.

[420] In terms of the standards expected of the DWAs, their surveillance role has been described as: “the continuous and vigilant public health assessment and review of the safety and acceptability of drinking water supplies”.³² The protection of public health by promoting the improvement of, amongst other things, the quality of water supplies is central to this function.

[421] The DWAs are statutory officers under the Health Act, but they are also employed by the District Health Board. Throughout the course of the Inquiry the District Health Board has worked closely and collaboratively with the DWAs for the purpose of assisting the Inquiry. This has included gathering and producing relevant information and documentation, as well as the preparation of evidence. The DWAs and the District Health Board maintained the same approach in their submissions to the Inquiry.

[422] The Inquiry has appreciated the DWAs and the District Health Board adopting an open, frank, cooperative and non-defensive approach. This approach, as well as their acceptance that it was open to the Inquiry to consider indirect causes and to identify failings or poor practices unrelated to cause, has influenced the manner in which the DWAs have responded to the various matters or allegations raised by counsel assisting in relation to their conduct. The Inquiry records that the DWAs made two important observations in this respect:

- (a) The responses of the DWAs were made with the benefit of hindsight and with the knowledge and insights that all participants have gained from a rigorous public inquiry; and
- (b) The DWAs contended that there are too few DWAs, they are under-resourced and underpowered, and to achieve the ideal standards implicit in the matters raised in relation to their conduct there would need to be legislative and resourcing changes to the DWA model.

³² WHO “Guidelines for Drinking-water Quality” (3rd ed, 2004).

[423] The Inquiry acknowledges both observations. The second relating to resourcing raises issues that will be considered in more detail in Stage 2. No further comment on these matters is required at this point.

Knowledge of the DWAs

[424] The Inquiry focussed particularly on the DWAs' assessment and review of the District Council's Water Safety Plan. The Water Safety Plan covered the water supply for Hastings, Flaxmere and Havelock North, including the Brookvale Road bores. The DWAs' conduct in ensuring that the District Council complied with its obligations to have a Water Safety Plan needs to be viewed in this context, particularly in terms of the knowledge the DWAs had about the Brookvale Road bores.

[425] The DWAs were aware from the events concerning the Brookvale Road bores in 1998 that the bore heads for bores 1 and 2 were situated below ground level. The District Council's 2008 Water Safety Plan also recorded that the well head chambers at the Brookvale Road bores "have been prone to flooding". That Water Safety Plan stated that to avoid the possibility of contaminated water entering the bores, additional alarms had been fitted to the chambers to prevent pump operation when the chamber was flooded.³³ The District Council's 2015 Water Safety Plan contained similar observations, with an additional reference to the installation of submersible pumps "to ensure each well is kept dry".

[426] Another important aspect of DWA knowledge about the Hastings/Havelock North supply was the fact the supply was not treated with chlorine. The 2015 Water Safety Plan noted that "[w]ithin the Hastings District community supplies there is a strong resistance to chlorination".

Findings on Faults, Failures and Breaches of Standards

Documentation and Consideration of the 1998 Event

[427] Counsel assisting submitted that the DWAs were aware of the events surrounding the campylobacter outbreak in 1998 involving Brookvale Road bores 1 and 2. This was confirmed by the documentation provided to the Inquiry. The 1998 event was mentioned repeatedly in various DWAs' reports, often in considerable detail.

³³ This detail was not in fact correct for the Brookvale Road bores.

Counsel assisting argued that the 1998 event provided powerful lessons for the future, yet the DWAs did not use that knowledge effectively.

[428] The Inquiry accepts that the DWAs drew the 1998 event to the attention of District Council management in a number of reports. For example, the 2013 Report on Verification of a Water Supply's Water Quality Monitoring Data,³⁴ which was sent to Mr Stuijt from the District Council by letter dated 16 September 2013, stated, under the heading "Outline of Water Supplies":

Unfortunately not all secure groundwater bores possess flowing artesian properties and during (sic) 1998 during the investigation of a campylobacter outbreak which appeared to be centred upon Havelock North and Hastings East. A sample was taken from the Brookvale 2 bore and that was found to contain campylobacter spp. It was found that water draining from the adjacent stocked paddock and roadway would drain into the bore's "dry" well and we were informed by HDC staff at that time that a contractor had earlier done work on that bore and had sealed the bore head improperly using such as silicone sealant or similar. As originally built the Brookvale bore "dry well" lid did not fit properly and shingle and mud would access that chamber and at times it is understood that shingle would stall the sump pump and lead to the bore being fully inundated at times.

[429] The 2014 Report on Implementation of a Drinking Water Supply's Water Safety Plan,³⁵ which was sent to Mr Stuijt by letter dated 1 October 2014, contained another, albeit briefer, reference to the 1998 event. It is helpful to quote the reference because it arises again in the context of the history of transgressions in the Havelock North reticulation:

Havelock North experienced a transgression event in 2012, where identified sources of contamination where (sic) addressed by the installation of backflow prevention. During 1998 campylobacter species were identified in water coming from Brookvale No 2 bore. An insecure bore head was identified as contributing and improved subsequently. More recently there was an *E.coli* transgression event in Mahora on 20th June 2014; the cause of this was unable to be identified.

[430] Mr Stuijt said in evidence he was not aware of the 1998 outbreak. Plainly he had not comprehended or appreciated the references to the events of 1998 in these and other similar reports addressed to him. When asked about this at the hearing, he described learning about the 1998 events after the August 2016 outbreak as "Groundhog Day". He said in hindsight he should have asked more of the DWAs

³⁴ Hawke's Bay District Health Board "Report on Verification of a Drinking Water Supply's Water Quality Management Data" (16 September 2013) (**CB027**).

³⁵ Hawke's Bay District Health Board "Report on Verification of Water Safety Plan Implementation for Hastings and Havelock North (1 October 2014) (**CB037**).

because when he found out about it post-August 2016 he “couldn’t believe what he was reading”.

[431] Although the 1998 event was repeatedly mentioned in the DWAs’ reports, the Inquiry finds that the relevant risks and lessons to be learned from it were not brought effectively to the attention of District Council management by the DWAs.

[432] Mr Peter Wood agreed that having a good clear record of the 1998 event available for the DWAs would have been very useful. The Inquiry considers it was also necessary for the DWAs to ensure that the District Council as the water supplier had a clear accessible record of the events of 1998. One obvious place for such a record was in the Water Safety Plan.

[433] Counsel for the DWAs acknowledged that the retention and optimal use of such information within, and across, all relevant agencies was critical. He also accepted that additional, more proactive and better interactions with the District Council would have been beneficial. However, he submitted that without systemic change and better resourcing, it would be difficult to deliver the level and nature of liaison referred to by counsel assisting the Inquiry. The Inquiry agrees that this will be an important issue to address in Stage 2.

Dealings with District Council Management

[434] The Inquiry finds that the level of liaison by the DWAs with the District Council, involving an annual compliance visit, formal reports on compliance with the Drinking-water Standards, and reports on the Water Safety Plan, was insufficient. The DWAs dealing with District Council management needed to be more proactive and engaged.

[435] Mr P Wood’s evidence on this issue was instructive. It is important to record that Mr Wood did not have direct responsibility as the DWA for Havelock North or Hastings. Rather he is a senior DWA in the Central North Island Drinking Water Assessment Unit who was consulted by other DWAs from time to time. As discussed earlier, he kept a written record of a peer discussion in 2014 with another DWA about the fact the Havelock North water supply had the highest number of transgressions out of any supply in the country. He accepted that this would have justified a more intense and holistic review of the risks to the District Council’s water supply.

[436] The DWA that Mr Wood spoke to about the high level of transgressions subsequently had a meeting with Mr Kersel from the District Council. However, the main topic of the meeting was the reports provided to the District Council by MWH. Unfortunately, there was no deeper, more probing discussion about the topic of transgressions.

[437] Counsel assisting also submitted that the DWAs were insufficiently probing and inquisitive about other water supply issues at Havelock North. He submitted the DWAs too readily accepted information from District Council management. The Inquiry accepts this criticism and observes that counsel for the DWAs also accepted it was appropriate. This was consistent with the evidence of Mr Wood who agreed with the allegations put to him by counsel assisting in this respect.

[438] A good example of this failing is the risk characterisation for water contamination; this was assessed by the District Council as low. The Inquiry found that the DWAs should have challenged and tested the validity of this important risk assessment with District Council management. That did not happen. Rather, the process of ensuring that the Water Safety Plan requirements were met was approached as a compliance exercise. The DWAs simply ensured the applicable boxes were ticked, as opposed to probing and critically examining key assumptions and characterisations.

[439] The Inquiry has identified various failings of the District Council at [250]–[338] above. Had the DWAs been more persistent in their dealings with the District Council, it is possible that some of the District Council's failings might have been identified, addressed, and potentially remedied. The DWAs did not notice or press the District Council hard enough on the lack of a fundamental risk assessment system underlying the risk assessments in the Water Safety Plan; the absence of any analysis of the key aquifer catchment risks, including the connection between the bores and the Mangateretere pond; and the lack of meaningful working relationships, or dialogue, with the Regional Council.

Compliance with Water Safety Plan Obligations

[440] A related failing is that the DWAs were too slow to require the District Council to comply with, and secure improvements in relation to, its Water Safety Plan obligations. The DWAs accepted that there were instances provided by counsel assisting where

they could have pushed the District Council harder. However, they said the approach they took generally reflected the nature of their role and the limited powers they had in the statutory framework. It also reflected their consultative and cajoling approach, which was reportedly supported by the Ministry of Health.

[441] The statutory context for this failing is the requirement in s 69ZL of the Health Act for a DWA to “verify the adequacy, and, where appropriate, approve Water Safety Plans prepared by the drinking-water suppliers”. Verification of a Water Safety Plan was plainly an important part of the statutory process. The DWAs were entitled to expect cooperation from the District Council as drinking water supplier. But if such cooperation was not forthcoming the DWAs needed to take a firm stance.

[442] The DWAs did not receive such cooperation from the District Council in the course of verifying the implementation of the Water Safety Plan. Counsel assisting submitted that District Council management often dragged the chain when requests were made by the DWAs. For example, on 22 August 2014 the DWA wrote to Mr Stuijt enclosing the Provisional Report on Implementation of a Drinking Water Supply’s Water Safety Plan.³⁶ The contents of the report were revealing, particularly on the topic of Water Safety Plan implementation:

The WSP Adequacy Report (dated 28th June 2013 and released to HDC on 9th July 2013) contained three recommendations and one strong recommendation. On 11th July 2013 Mr Dylan Stuijt, HDC Water Supply Manager, advised Joanne Lynch (via email) that HDC would commence work to address these recommendations however during the implementation visit it was determined that no action had yet been taken to do this. HDC does not consider these to be a priority and intend to address them during the upcoming review of the WSP. A formal update for the WSP was to take place in June 2014 but this had not been done. However, the review had been started but HDC planned to wait for this implementation visit so they could include the findings from it.

Recommendation 1 (Strong): Undertake the overdue review of the WSP as soon as possible and when doing so, address the recommendations included in the June 2013 WSP Adequacy Report.

[443] The report also contained the two further recommendations:

Recommendation 2: Include well head and storage tank inspections in the Hanson Preventative Maintenance Schedule. Records of these checks (and any findings) should be kept.

³⁶ Hawke’s Bay District Health Board “Provisional Report on Implementation of a Drinking Water Supply’s Water Safety Plan (22 August 2014) (CB035).

Recommendation 3: During the review of the WSP, ensure that timeframes are assigned to each item in the Improvement Schedule.

[444] Beneath the third recommendation the report stated:

The WSP (page 70) states that a booster pump and reservoir at Bridge Pa will be constructed by 31st December 2013. This has not been done. HDC are waiting to see if they can obtain Ministry of Health (MoH) funding for Pakipaki before beginning this project. Implementation of this improvement has not begun and therefore the timeframe set in the WSP has not been met.

Non-conformance 1: Many timeframes in the WSP Improvement Schedule are no longer relevant. Therefore, the WSP is considered out of date and needs to be reviewed as soon as possible.

Reticulation

The WSP (page 69) states that five new secure sampling points will be installed on reservoirs and wells by December 2013. This has not been done. HDC still plan to do this but do not see it as a priority and therefore has not budgeted for it. However, sampling points are being put in for all new additions to the network. Implementation of this improvement has not begun and the timeframe set in the WSP has not been met – **see non-conformance 1 above.**

[445] Finally, on the topic of the “Water Supply Contamination Protocol” the report said:

The WSP refers to a document titled “Water Supply Contamination Protocol” (page 5). It also states that this follows MoH protocol figure 4.2 on page 44 of the DWSNZ 2005(08) – it is noted that this reference is incorrect and appears to be a combination of the 2000 and 2005(08) Standards. A copy of this protocol was requested during the visit but Mr Kersel advised that this document doesn’t exist and that it needs to be developed. During the most recent transgression event in June 2014 the actions taken were consistent with figure 4.2 on page 39 of the DWSNZ 2005(08) – clearance samples were taken for three consecutive days, the sample tap was checked but unfortunately the cause of the transgression was not determined. This aspect of the WSP is considered not to be implemented as the document does not exist.

Non-conformance 2: The “Water supply Contamination Protocol” referred to in the WSP does not exist. A protocol/procedure that is to be followed following a transgression event needs to be developed. This must be appropriately referenced in the revised WSP.

[446] The report further stated that a contamination protocol “must be provided to this office by no later than 31/10/2014”. This was not done. A further report from the DWA dated 1 October 2014,³⁷ noted the lack of a contamination protocol again as a “non-conformance”. The District Council’s agreement to provide this plan by 31 December

³⁷ Hawke’s Bay District Health Board “Report on Verification of Water Safety Plan Implementation for Hastings and Havelock North” (1 October 2014) (CB037).

2014 was noted. This too was not done. A contamination protocol was finally provided on 19 January 2015.

[447] Counsel for the DWAs accepted the observations made about the contamination protocol. He challenged the characterisation by counsel assisting that the lack of follow up showed a “lackadaisical approach”. He referred to the evidence of Mr Wood, which explained that the District Council was required to comply with the Drinking-water Standards, but was not required to have a contamination protocol or a more detailed plan about how it would comply with the Drinking-water Standards. Counsel for the DWAs submitted that the Drinking-water Standards needed to be more focussed on proactive planning and that this was an issue to be considered in Stage 2. The Inquiry agrees.

[448] Mr Stuijt was asked at the hearing why the District Council did not deal with matters raised by the DWAs. He blamed the fact such correspondence was made by paper. He accepted that a few of the letters “had actually piled up in the in-tray and I wasn’t even aware they had come in”.

[449] This inaction, and failure to respond or deal with correspondence, amply supports the submission of counsel assisting about the slowness of the responses (or lack of them) by District Council management. The Inquiry finds such examples were not isolated. But the DWAs, faced with such dilatoriness, were too slow to require compliance and insist on the timely performance by District Council management of the District Council’s obligations in relation to the Water Safety Plan.

[450] There was one occasion in May 2013 when the DWAs escalated non-compliance by the District Council to the Medical Officer of Health.³⁸ However, the DWA explained this escalation as a means to avoid the District Council failing to meet its statutory timeframes for compliance. The Inquiry concludes that the DWAs were too lenient on the District Council, especially given that drinking water obligations were involved, as well as public safety issues. It was simply not good enough for the DWAs to continue to ask District Council management for the same thing year after year.

[451] While a “consultative and cajoling approach” may have been appropriate to a point, when faced with slow and uncooperative responses from the District Council, the

³⁸ Hawke’s Bay District Health Board “letter to Hastings District Council” (10 May 2013) (CB023).

DWAs should have adopted a different, and much firmer, approach. Their function under s 69ZL of the Health Act required this.

Raising of Bore Heads

[452] The lack of follow up by the DWAs is exemplified by the matter of raising the bore heads of Brookvale Road bores 1 and 2. Counsel assisting submitted that there was a long history between 2009 and 2014 of mechanical mentions by the DWAs of raising the bore heads.³⁹

[453] One of the DWAs responsible for raising the topic in the above reports said in evidence she wanted the bore heads raised. Yet, instead of insisting that the District Council do so, she simply deferred to District Council priorities which, as it transpired, lay elsewhere. Mr Wood was shown the history of requests to raise the bore heads. He explained there was doubt as to whether compliance was compulsory. However, he accepted that the Drinking-water Standards provide only the minima and there may be times when more is needed.

[454] Counsel for the DWAs accepted that they could have done more in relation to the bore heads. The Inquiry agrees with that concession. Counsel for the DWAs did not, however, accept the full extent of the criticisms of counsel assisting. The Inquiry does not need to resolve the question of the scope of the DWAs' inaction. It is enough to say the DWAs could plainly have done more to require the District Council to raise the bore heads of Brookvale Road bores 1 and 2.

Bore Head Security Report

[455] Another important example of inaction by the DWAs concerned the District Council's provision of a bore head security report. This requirement was one of the three barriers and criteria for drinking water to be classified as "secure" in the Drinking-water Standards. The evidence provided to the Inquiry disclosed regular requests, usually on an annual basis, from the DWAs to District Council management from 2010

³⁹ The topic was raised by the DWAs in 2009 (**CB017**), 2010 (**CB017A**), 2011 (**CB018**), 2012 (**CB025**) and 2014 (**CB028**).

onwards.⁴⁰ For example, one such statement in August 2014 to Mr Stuijt from the District Council said:⁴¹

During the implementation visit it was enquired about whether any progress had been made with the study to confirm secure status of wells. This was due to be completed by 31st December 2013. MWH have prepared a 'Bore Head Security Report' for HDC but at the time of our visit it was still in draft and was awaiting sign off by Mr Stuijt. Mr Kersel sent a copy of this report to Joanne Lynch on 8th August 2014. The report details the findings of an engineer's assessment of the twelve bores as per bore water security criterion 2 detailed in section 4.5 of the Drinking Water Standards for New Zealand 2005 (revised 2008) (dwsnz2005(08)). It details any improvements required to the bore head to provide satisfactory protection. The report is dated August 2014, therefore the timeframe specified in the WSP was not met – **see non-conformance 1 above**.

[456] The DWAs first received the August 2014 MWH Report in draft on 8 August 2014. Mr Wood confirmed the DWAs did not receive the final MWH Report until August 2016, more than five years after a bore security report was first formally requested.

[457] Mr Wood accepted that the DWAs should have been much more rigorous in ensuring that the District Council met these important requirements. Counsel for the DWAs agreed with this assessment. The Inquiry finds that this was a serious example of a failure by the DWAs to insist on timely compliance. The DWAs were plainly aware of the risks around bore head security. The various reports prepared by the DWAs were replete with such references and the Water Safety Plan explicitly referred to the risk of Brookvale Road being "prone to surface flooding". Yet not enough was done by the DWAs to require the District Council to meet the second criterion for drinking water security under the Drinking-water Standards. This lack of action is particularly significant given that the DWAs knew the Havelock North supply was not chlorinated.

Records of Inspections and Maintenance

[458] Counsel assisting further submitted the DWAs did not do enough to require the District Council to produce evidence of its system for the inspection and maintenance of the Brookvale Road bores. The DWAs accepted they could have done more in this respect. The Inquiry agrees with this concession.

⁴⁰ See the Hawke's Bay District Health Board's annual "Report on Compliance" at **CB017A, CB018, CB022, CB026, CB036** and **CB044**.

⁴¹ Hawke's Bay District Health Board "Provisional Report on Implementation of a Drinking Water Supply's Water Safety Plan" (22 August 2014) (**CB035**).

[459] The evidence provided to the Inquiry confirmed that, when the DWAs met with the District Council's water operator, Mr Kersel, in July 2013 he was asked about inspections and maintenance of bores. The DWA's note of his response was, "[n]ot documented. Quarterly. Nothing formal". This was followed by a recommendation in August 2014 to include well head inspections in the Hansen Schedule. This recommendation was repeated on 1 October 2014, but this time the recommendation was expanded to, "[r]ecords of these checks (and any findings) should be kept". The same recommendation records an agreement reached with Mr Kersel to "include the above actions in the Hansen Preventative Maintenance Schedule by 31 December 2014".

[460] Despite these recommendations and the agreement recorded, the DWAs never followed up to ensure they were done, and never effectively escalated the issue. No written inspection and maintenance programme was ever provided by the District Council to the DWAs or entered in the Hansen system. Essentially the DWAs accepted what was in reality a non-system with no records and no accountability. It seems the issue of lack of an effective system for bore inspection and maintenance was not pursued by the DWAs after October 2014. The Inquiry finds this was a regrettable failing.

Contingency Plan

[461] The next failing concerns the absence of a contingency plan in the District Council's Water Safety Plan. The 2008 Water Safety Plan provided for a contingency plan. It was described as "needed if preventative measures and improvements to the water supply fail to prevent an identified risk event occurring". The Water Safety Plans approved by the DWAs in 2012 and 2015 also mentioned the need for a contingency plan. The latter noted that "the need for development of emergency contingency plans for specific events has been identified in Table 10".

[462] Mr Wood accepted in evidence that a contingency plan needed to be comprehensive. He considered that such a plan would outline what should happen in the event of a breakthrough of pathogens into the distribution system.

[463] The topic of contingency plans was raised by the DWAs in their July 2013 visit to the District Council. Their checklist from that visit referred to a question of "what progress has been made developing specific emergency contingency plans? (due by

December 2014)". The notation recorded that the development of such a plan was "to be done".

[464] The topic "contingency plans" was also mentioned in the DWAs' report dated 22 August 2014. The report stated:

Contingency Plans

The WSP states that contingency plans specific to 'continuity of supply' and 'contamination of water source/supply' will be developed by December 2014. This timeframe has not come up yet but progress towards this improvement was enquired about during the visit. HDC has not yet developed these specific plans. HDC have reviewed the 'Water Services Policy Manual' and (sic) that they intend to develop these contingency plans now that this has been done, keeping in mind the Council's Business Continuity Plan. This aspect of the WSP has not yet been implemented but it is noted that the due date is five months away.

[465] The topic was repeated in the DWAs' 1 October 2014 report. That report similarly mentioned that the Water Safety Plan stated that contingency plans specific to "continuity of supply" and "contamination of water source/supply" would be developed by December 2014, and noted that the timeframe had yet to come up but that the District Council had not yet developed these specific plans. The issue of contingency plans was the subject of a non-conformance ruling by the DWAs and an agreement reached that "one was to be developed and referenced in the Water Safety Plan by 31 December 2014".

[466] While there was no specific statutory requirement for a contingency plan,⁴² the DWAs clearly viewed a plan for a contamination event as desirable and required under the Water Safety Plan. It was a recommended item in the Ministry of Health document: "A Framework on How to Prepare and Develop Water Safety Plans for Drinking-water Supplies". The DWAs communicated with the District Council about this over a number of years but no contingency plan was provided. The 31 December 2014 deadline came and went. Even after the DWAs verified the District Council's Water Safety Plan in January 2015, they did not check that it contained a specific emergency contingency plan or made provision to do so.

[467] Even as at the date of the Inquiry hearings, no contingency plan existed (see paragraph [544] below). However, in light of the Interim Report, a contingency plan

⁴² The need for such a plan is arguably comprehended by s 69Z(2) of the Health Act, which imposes a duty on a supplier to identify mechanisms for: (a) preventing public health risks arising in that drinking water supply; and (b) reducing and eliminating those risks if they do arise.

was finally prepared and put in place prior to the reactivation of Brookvale Road bore 3 on 7 March 2017.

[468] Counsel for the DWAs noted that the current regime did not explicitly require a water supplier to produce a contingency plan. He submitted that this topic should be addressed in Stage 2. The Inquiry agrees. However, the Inquiry has noted and agrees with counsel's acceptance that the DWAs could have required the District Council to have a contingency plan in place. A contingency plan for a contamination event properly tailored to the circumstances of Havelock North would have been beneficial. When the deadline of 31 October 2014 arrived, without a plan, the DWAs should have gone back to the District Council and insisted on the immediate preparation and provision of such a plan.

Compliance with the Secure Groundwater Criteria under the Drinking-water Standards

[469] Counsel assisting also raised the failure by the DWAs to insist that the District Council complied with the secure groundwater criteria in the Drinking-water Standards. Counsel for the DWAs submitted that the Drinking-water Standards were silent on where responsibility for assigning secure status lies. Mr Wood raised this matter in his evidence. Given the uncertainty of this question, the Inquiry considers it will need to be addressed at Stage 2.

[470] Counsel for the DWAs did, however, accept that the DWAs could have been more proactive in relation the District Council's compliance (or lack of it) with the secure criteria under the Drinking-water Standards. In this context the DWAs commented that the possibility of a hydrological connection between the Mangateretere Stream and Brookvale Road bore 1 was a concept that had only come to their attention during the course of this Inquiry.

High Transgression Rates

[471] The next alleged failing concerned the DWAs' responses to the unusually high rate of transgressions in the Havelock North water supply. The DWAs accepted that a more proactive and holistic approach to transgressions in Havelock North would have been beneficial, although they said they ensured that the District Council complied with the Drinking-water Standards in respect of all transgressions. In this context, the proposition that the Drinking-water Standards establish only minimum standards is

important. Moreover, all those with responsibilities to deliver safe clean drinking water also had statutory obligations under the Health Act.

[472] The Inquiry accepts that, in respect of the series of transgressions between 2007 and 2016, the District Council was able to demonstrate on each occasion to the DWAs that it had complied with the Drinking-water Standards requirements for responses to and investigations of each transgression. There is no present benefit in examining in detail whether the DWAs ought to have accepted the District Council's responses in each and every case.

[473] The Inquiry accepted that it would not have been reasonable for the DWAs to have detected unusual patterns or the need for a more holistic review in the early years following 2007.

[474] However, by 2013, indications of abnormality began to emerge. As touched on earlier, in January 2013, the Ministry of Health enquired with the District Health Board and the DWAs about the number of transgressions in Havelock North within the period covered by the most recent annual survey, and whether these were a one-off or ongoing issue. The resulting exchange of correspondence was followed in September 2014 by further enquiries to the DWAs, this time prompted by an Operations Researcher, Water Programme at ESR who indicated to a DWA that it seemed unusual for there to be so many transgressions in the Havelock North reticulation, especially when it had a secure groundwater status.

[475] Ms Lynch, the DWA who received and responded to that email, also discussed the matter with Mr Wood. Mr Wood's file note of the discussion recommended that she discuss the matter with the District Council. As recorded earlier, she did mention it in a meeting with Mr Kersel from the District Council.

[476] Unfortunately, the DWAs did not pursue this matter, despite the January 2013 and September 2014 inputs from external agencies voicing questions and concerns about the unusually high rate of transgressions within the Havelock North water supply. The specific references to abnormal patterns and the possibility of some broader and more systemic issue provided a compelling opportunity for the DWAs to intervene in a more active and probing way.

[477] Although the DWAs made a general submission that they lacked adequate powers, the Inquiry takes the view that s 69ZP(1)(e) of the Health Act did provide ample power to require “any inspections, surveys, inquiries, tests and measurements in relation to raw water taken by a drinking water supplier ... that are reasonably necessary ...”. In addition to their statutory powers, the DWAs were in a position to exercise substantial persuasive influence and to work with the water supplier (and, if appropriate, other agencies) in promoting the need for a thorough and probing investigation into the Havelock North transgressions.

[478] Counsel for the DWAs said that the Drinking-water Standards lacked provisions dealing with requirements for frequent and unusual pattern of transgressions and that this was a topic that needed to be addressed in Stage 2. The Inquiry agrees with this observation.

Brookvale Road Bore 3

[479] The penultimate alleged failing concerns the DWAs’ response to contamination of Brookvale Road bore 3 in October 2015. The DWAs accepted they could have responded better to this event. The Inquiry has discussed in some detail the response by the District Council. In view of the acknowledgement by the DWAs that they could have responded better, the Inquiry takes this matter no further.

Annual Report on Bore Head Security/Maintenance

[480] The final topic of asserted failing by the DWAs was a failure to require annually a report from the District Council on bore head security/maintenance.⁴³ In response the DWAs said:

- (a) More proactive and better interactions with the District Council would have been ideal. This was a resourcing issue and something that should be considered carefully in Stage 2 of the Inquiry;
- (b) They could have pushed the District Council harder. However, the approach they took generally reflected the role they had in the

⁴³ Guideline 3.2.5.5.

statutory framework. It also reflected their consultative approach supported by the Ministry of Health; and

- (c) The status of the Drinking-water Guidelines was also something that should be carefully considered in Stage 2 of the Inquiry.

[481] The Inquiry acknowledges that this topic, along with others identified above, will need to be addressed in Stage 2.

PART 12: FAULTS AND FAILURES OF MWH

Background

[482] In this part of the report the Inquiry addresses the actions of MWH and its employee, Mr Abbas Rahman.

[483] The Inquiry's consideration of the actions and involvement of MWH as a consultancy and Mr Rahman focussed on the nature of the inspections carried out by it for the District Council, the qualifications of Mr Rahman to inspect and report on bore head security for the purposes of the Drinking-water Standards, the training and supervision he was given, and the reports MWH prepared and provided to the District Council. Before addressing these issues it is necessary to provide further context by describing the key aspects of the inspections carried out and reports prepared by MWH in 2014 and 2016.

Relationship with the District Council

[484] MWH is a large international multidisciplinary consultancy firm. Its New Zealand branch has had a long-standing professional relationship with the District Council as its preferred technical adviser. MWH provided technical assistance to the District Council in the development and preparation of its various Water Safety Plans. It also provided technical services in respect of the District Council's water supply activity, infrastructure and operations. MWH could be considered as the District Council's water capability expert.

June 2014 Inspections

[485] In June 2014 the District Council retained MWH to carry out a bore head security assessment of the 12 bores operated by the District Council in the Hastings/Havelock North area. This included the Brookvale Road bores. The bores were to be inspected and reviewed for compliance with the bore head security requirements set out in the Drinking-water Standards. The relevant inspections were carried out by Mr Rahman, in the company of Mr Kersel from the District Council.

[486] Of critical importance to the Inquiry was the scope of the inspections of Brookvale Road bores 1 and 2. Mr Rahman confirmed in evidence that the bore 1 and 2 bore heads were “below ground level within sealed concrete manholes”. Mr Kersel facilitated the inspections by removing the steel manhole lid. In his evidence Mr Rahman said, “I inspected the assembly through the manhole entrance”. He accepted he did not enter the bore chambers. Rather, he sought to inspect the electrical and other cables, the holes through which they passed into the bore, and associated seals and glands by shining a torch onto these items. This enabled a visual examination from one and a half to two metres away, Mr Rahman’s head being above the manhole.

August 2014 MWH Report

[487] The purpose of the August 2014 MWH Report was to ensure the District Council’s compliance with the bore head security requirements of the Drinking-water Standards. The Report listed the relevant requirements as:

Groundwater security criterion 2

Bore head must be judged to provide satisfactory sanitary protection by person deemed appropriately qualified by the Ministry of Health

The bore head must be assessed to be secure by verification of the following:

- Bore head is sealed at the surface to prevent the ingress of surface water and contaminants;
- Bore location is distant from potential sources of contamination such as septic tanks and other waste disposal systems;
- Air and access points are screened, and facing downwards and at least 0.5 m above the 100 year flood level;
- Animals are excluded from at least 5 m and preferably 10 m of the bore head;

- Effective backflow device is installed to prevent backflow of contaminated water from the treatment plant or distribution system;
- Bore head construction complies with the environmental standard for drilling soil and rock (NZS 4411).

[488] The August 2014 MWH Report recorded key parameters and technical aspects of Brookvale Road bores 1 and 2. They were described as being of similar construction, with the only difference being the absence of an additional return (swing-check) valve on the bore head of bore 2. The critical bore assessment confirmed:

- The bore heads for Bores 1 and 2 are located below ground, within sealed manholes. Both manholes are sealed at the bottom with a concrete base. The seal around the bore casing appeared to be in good condition. The concrete base has a recess which allows any water within the manhole to be collected and pumped out.
- There are two sump pumps within each manhole. The pumps sit within the sump recess formed in the concrete manhole base. The sump collects water within the manhole prior to it being pumped out. Both pumps are activated by float-less switches. The switch for the first pump is located within the sump recess. The switch for the second pump is located just below the sump full level. When water levels rise sufficiently to activate the high level float, HDC's water operators receive an alarm signal via the pager network.
- Rust and dirt was observed on the bore head and pipework.
- Power cables and sensor cables are untidy and lie loose on the damp concrete pad at the bottom of the manhole.
- Both bores 1 and 2 are fitted with foot valves below the pumping unit.
- The discharge port for the air release valve is turned to face the ground and fitted with a fine insect mesh. A review of flood maps held on HDC's GIS system confirmed that neither of the bores is located within the 50 year flood inundation area.

[489] It is significant that, in respect of Brookvale Road bores 1 and 2, there was no mention of the ducts and cable seals around the bore heads. By contrast, in respect of Brookvale Road bore 3, the August 2014 MWH Report recorded that, "all the duct and cable seals around the bore head were observed to be in good condition with wiring and cables neatly arranged".

[490] The Report's overall conclusion on the Brookvale Road bores was that the bore heads were "considered to be largely secure as currently constructed". The Report then stated:

However, there has been some deterioration in the condition of the bore head and some remedial work is recommended to minimise the risk of contamination. Improvements have been divided into those required to confirm bore head security and those recommended to minimise future risks of contamination.

Table 2-2: Brookvale Bores – Bore head Improvements

	Required	Recommended
Bore 1		<ol style="list-style-type: none"> 1. Clean to remove dirt and rust around the bore head and pipe works, and re-paint. 2. Wires to be hung or housed higher to keep them above the bottom of manhole.
Bore 2	<ol style="list-style-type: none"> 1. Fit a non-return valve on bore head assembly. 	<ol style="list-style-type: none"> 1. Clean to remove dirt and rust around the bore head and pipe works, and re-paint. 2. Wires to be hung or housed higher to keep them above the bottom of manhole.
Bore 3	<ol style="list-style-type: none"> 1. Clean and seal cracks developing on concrete pad. 	<ol style="list-style-type: none"> 1. Clean to remove debris and leaf litter on concrete pad. 2. Clean to remove dirt and rust around the bore head and pipe works, and re-paint.

Most of the recommended works are due to deferred maintenance. It will be crucial to seal the crack on the concrete pad for Bore 3 as this will prevent the crack from deteriorating and, subsequently, compromising the integrity of the concrete pad. It will also be important to have a non-return valve fitted onto the bore head assembly of Bore 2 given the history of foot valve failures and the implication to bore security.

May 2016 Inspection

[491] The District Council did not carry out the work required by MWH on the Brookvale Road bores until January 2016.

[492] In March 2016 the District Council instructed MWH to complete the post works inspections of the bores, including of Brookvale Road bores 1 and 2. On 15 May 2016 Mr Rahman carried out an inspection of the remedial work on some of the bores. This inspection included Brookvale Road bores 2 and 3. Bore 1 did not have any required remedial works for completion of the assessment and was not inspected.

[493] Mr Rahman drafted the August 2016 MWH Report,⁴⁴ which incorporated the observations and findings made during the second inspection.

August 2016 MWH Report

[494] The August 2016 MWH Report was in broadly similar terms to the August 2014 MWH Report. However, the “Bore Head Security Improvements” section discussed at [488] was replaced by a new section, “Bore Head Security Findings”, which stated:

All critical security risks identified during the initial site visit in 2014 have been addressed. Most of the recommended works are due to deferred maintenance. To summarise the works:

- (1) Bore 2 has two non-return valves now as an existing non-return valve was found at the edge of the chamber, covered in grout, when works to install a new non-return valve was carried out. It was previously thought that this bore did not have a non-return valve on the bore head assembly. Thus, recommendations were made to install a new non-return valve.
- (2) The cracks observed on the concrete pad for Bore 3 during the initial inspection have now been sealed.
- (3) The untidy wires and cables previously observed within Bores 1 and 2 have been tidied up.
- (4) Leaf litter observed around Bore 3 during the initial inspection has been cleared. The bore surround is now neat and tidy.

Some minor works to remove the surface rust on the headworks is recommended for the future but the bore heads are now considered to be secure as currently constructed.

[495] Mr Rahman said in evidence that the statement in 3) above was “not well-expressed”. Mr Rahman accepted he only inspected Brookvale Road bores 2 and 3 on the 2016 visit and, accordingly, was not in a position to confirm whether the cables in Brookvale Road bore 1 had been tidied up. He also accepted that the August 2016 MWH Report did not clearly identify which bores had been inspected on that visit and that this would need to be corrected.

Findings on Faults, Failures and Breaches of Standards

[496] Counsel assisting submitted that MWH did not competently carry out the inspections of Brookvale Road bores 1 and 2, or competently prepare the subsequent August 2014 and August 2016 Reports. The context for these contentions is that the

⁴⁴ MWH “Hastings District council Bore Security Assessment” (August 2016) (CB010).

inspections and reporting were part of the maintenance of public health by ensuring the provision of clean safe drinking water.

Expertise and Supervision

[497] The Drinking-water Standards provide that bore water is considered secure when it can be demonstrated that contamination by pathogenic organisms is unlikely because the bore water is, relevantly, “abstracted from a bore head that provides satisfactory protection”. The Drinking-water Standards set out strict criteria for bore water security. These standards are directed at providing satisfactory protection to the public. Compliance with the Drinking-water Standards by the drinking water supplier is part of that process, as is obtaining reports from suitably qualified experts that satisfactory protection exists.

[498] The Drinking-water Standards provide that the bore head must be judged to provide satisfactory protection “by a person recognised as an expert in the field”. The fact that both Brookvale Road bores 1 and 2 had their chambers situated below ground level was significant. Mr van Bentum, previously the supervisor at MWH of Mr Rahman, gave evidence that because these bore head installations were below ground, the ingress of contaminated water had the potential to inundate the bore head. This required a more comprehensive and robust assessment to establish bore head security.

[499] Irrespective of the nature and scope of the bore head security assessment, the assessment must be carried out, for the purposes of compliance with the Drinking-water Standards, by a person recognised as an expert in the field. This immediately gave rise to the question whether Mr Rahman, who carried out the 2014 and 2016 inspections and drafted the August 2014 and August 2016 Reports, was, or could be said to be, an expert in the field.

[500] Counsel assisting put to Mr Rahman that after nine months in the job it would be overstating things to say he was a recognised expert in the field. Mr Rahman responded, “Absolutely. I am not. I would not have been an expert in the field”. He accepted that he was still learning things as he went along.

[501] The Inquiry agreed that Mr Rahman was not an expert in the field of bore head security. Before he carried out the inspections in June 2014 he had nine months

experience with MWH. He had inspected some 18 bores in this time with his supervisor, Mr van Bentum. But the Brookvale Road bore 1 and 2 inspections were done without supervision. Beforehand he had received no formal or practical training, only some relatively limited on-the-job training. Mr Rahman seemed to have limited knowledge of the Drinking-water Standards and the importance of the compliance process he was undertaking.

[502] The Inquiry considered it was wrong for MWH to have permitted Mr Rahman to undertake the tasks he did for the District Council without proper training and adequate supervision. The Inquiry considers he should have been closely supervised, particularly given that the task he was undertaking was for the purposes of compliance with the Drinking-water Standards to meet groundwater security requirements.

[503] Counsel for MWH accepted that Mr Rahman was not qualified as an expert in his own right and submitted that he had not purported to be. She submitted it was standard practice for junior engineers to undertake field work and engineering assessments after a period of “shadowing” and under the supervision of a chartered professional engineer. Mr Rahman’s role was to undertake the fieldwork and draft the reports, which were then discussed, reviewed, revised and approved by Mr Rahman’s supervisors. In the case of the August 2014 MWH Report, this included Mr van Bentum and Mr Hodson. In the case of the August 2016 MWH Report, this included Mr Hodson and an environmental consultant, Mr Gandashanga. Counsel for MWH accepted that the work of a junior must be conducted under adequate supervision with checks and review procedures in place. The Inquiry has found that the supervision of Mr Rahman was inadequate, and that the checks and review procedures were ineffectual, as the deficiencies in the subsequent reports illustrate.

Inspections

[504] The Inquiry has found that the inspections themselves were negligently carried out. Mr van Bentum in evidence properly acknowledged as much. As indicated above, the visual inspections were conducted from outside the manholes. Mr Rahman did not enter the bore chambers themselves. As instructed, he carried out the inspections using a torch to light the chambers and viewed the ducts, glands and seals in the chambers from too great a distance.

[505] The Drinking-water Standards require that the “bore head must be sealed at the surface to prevent the ingress of surface water and contaminants”. The crucial word is “sealed”. The Inquiry has found that the training and instructions given to Mr Rahman failed to identify the need for special attention to be paid to the seals and glands in respect of wires passing through the holes into the bores. Mr van Bentum recognised that glands and seals are intended to operate under pressure and form an effective seal around the cables. He also acknowledged that glands and seals deteriorate over time. Hence the need for careful checking of the glands and seals. Mr Rahman could not properly have checked the glands and seals by means of the inspection he undertook.

[506] Counsel for MWH submitted that the Drinking-water Guidelines contemplated an above ground visual assessment of the infrastructure and a “desk-top review” of the construction data, “unless there are doubts about bore integrity that require further testing”. Although counsel for MWH acknowledged that the investigations following the August 2016 outbreak raised “questions as to whether this type of inspection is sufficient for below-ground installations”, and accepted it would have been good practice to have required “the sump pumps be tested, or confirmation from the operator that the pumps had been serviced”, she nevertheless submitted that the above ground visual assessment was appropriate. She argued that even if Mr Rahman had entered the bore chambers his findings may not have differed; that counsel assisting placed undue emphasis on the importance of properly checking the glands when the pumps and alarms are the real protections; and that counsel assisting wrongly asserted the “cellar” is part of the casing of the bore.

[507] The Inquiry disagreed that a visual assessment was sufficient or that a proper check of the glands was not of central importance here. The Inquiry preferred the evidence of Mr Baylis, called on behalf of the Regional Council, which suggests that a more intensive inspection from inside the chambers was necessary. The Inquiry did not consider that the argument about the meaning of the casing of the bore adds anything, given the clear negligence of the inspection and, in any event, disagrees.

[508] Finally, in this context it is appropriate to comment on the risk-based approach raised in the evidence of Mr van Bentum. He postulated that the bore head security assessment being undertaken by MWH was “essentially a risk-based assessment and what [MWH was] undertaking was a practical visual assessment.” He added, “There

was never any intention that this was somehow a foolproof assessment of all potential risks”.

[509] The Inquiry has rejected the notion of a risk-based approach. MWH was undertaking a groundwater security assessment for compliance purposes. It was simply not enough that the person carrying out the inspection should do so from a distance and be able to conclude that there was no obvious sign of deterioration or breakdown of the glands and seals. Plainly under the Drinking-water Standards sealing is a critical part of the bore head. If seals are an integral part of the safety mechanism, as was the case with Brookvale Road bores 1 and 2, a competent inspection of them was required.

August 2014 MWH Report

[510] In the August 2014 MWH Report, the findings in relation to Brookvale Road bores 1 and 2 do not mention either the glands or seals or the cabling passing through them. This was the single most critical element in the below-ground chambers of bores 1 and 2. Yet the Report made no mention of them. In contrast, the Report’s findings in respect of Brookvale Road bore 3 did mention the “duct and cable seals around the bore head”. Mr van Bentum acknowledged in his evidence that the August 2014 MWH Report should have made reference to the duct and gland seals in bores 1 and 2.

[511] The August 2014 MWH Report also made no mention of the second main requirement of the Drinking-water Standards that the bore casing must not allow ingress of shallow groundwater. Mr Rahman took this to mean only the shaft or casing in the ground, but the Inquiry considers that this was an impractical or unduly limited interpretation.

[512] Other failings in relation to the preparation of the August 2014 MWH Report included Mr Rahman failing to obtain and review a copy of the District Council’s latest Water Safety Plan. The Drinking-water Standards mention the drinking water supplier’s Water Safety Plan in this respect, and the Inquiry considers it would have been an obvious reference document for MWH to read. Mr Rahman seemed to be unaware of some of the risks associated with Brookvale Road bores 1 and 2. He acknowledged in evidence the fact that the Brookvale Road bores were known to be subject to surface flooding. He checked the flood maps and mentioned this in the “Assessment” section of the August 2014 MWH Report. However, such general

knowledge is not sufficient when compared with the specific contamination risks addressed in the Water Safety Plan. The Inquiry considers that reliance on flood maps and the theoretical 50 year inundation risk was wholly inadequate in the present circumstances.

[513] The Inquiry agrees with counsel assisting that there are many other aspects of the August 2014 MWH Report that are unsatisfactory. One such matter is that the Report did not address compliance with the Bore Construction Standard NZS 4411, as required by the Drinking-water Standards. The Inquiry did not consider it necessary to catalogue other inadequacies with the Report. These essentially stemmed from the negligent inspection and limited understanding Mr Rahman had about the important compliance assessment he was being asked by MWH to undertake, despite the fact that he had not been properly trained to undertake it.

[514] Following on from the negligent inspection, Mr Rahman was not in a position to make a bore head security assessment. The wording actually used in the August 2014 MWH Report was revealing. Rather than providing a judgment that the bore water security criterion was met, or that the bore head provided “satisfactory protection”, the Report stated, “The bore heads are considered to be largely secure as currently constructed”. It then listed improvements needed for each of Brookvale Road bores 1, 2 and 3 including, in respect of bores 2 and 3, improvements “required to confirm bore head security”. The text of the Report then drew a distinction between such improvements and “those recommended to minimise future risks of contamination”.

[515] The Inquiry did not find the distinction between “improvements required” and “improvements recommended” helpful. First, Mr Rahman did not in his evidence seek to rely upon or explain the difference. Second, the August 2014 MWH Report should have focussed on whether bore head security criterion 2 was met. If it was, that needed to be stated in plain language. If it was not, the reasons for that judgment needed to be spelled out. The steps to be taken by the water supplier, as a condition of obtaining compliance, should have been clearly listed. Subtle distinctions of language did not assist that process.

[516] The Inquiry therefore considered that the August 2014 MWH Report did not meet the requirements of the Drinking-water Standards. It did not set out the type of professional judgment required to demonstrate compliance by the drinking water

supplier of bore water security criterion 2. It was utterly deficient as a compliance report.

August 2016 MWH Report

[517] The Inquiry also records that the August 2016 MWH Report suffered from similar deficiencies. The Inquiry has found it extraordinary that the Report, destined as it was to be relied upon by the DWAs as a compliance report, included a statement that should never have been made. Mr Rahman accepted in his evidence that the statement about the condition of Brookvale Road bores 1 and 2, as referred to earlier, was “not well-expressed”. The Inquiry says that if Mr Rahman has not inspected bore 1, it was seriously negligent for the Report to state a finding in relation to bore 1 that “the untidy cables and wires previously observed within bore 1 ... have been tidied up”. Plainly the supervision of Mr Rahman was absent in this respect and the review procedure did not identify this problem.

[518] The “Bore Head Security Findings” section of the August 2016 MWH Report stated that, “All critical security risks identified during the initial site visit in 2014 have been addressed”. This statement should not have been made in respect of Brookvale Road bore 1. The August 2014 MWH Report recommended things be done inside the chamber of bore 1 “to minimise the future risks of contamination”. Because there was no inspection of that bore in 2016, the August 2016 Report should have excluded bore 1 from the findings. It did not.

[519] The end of the “Bore Head Security Findings” section in the August 2016 MWH Report stated, “Some minor works to remove the surface rust on the head works is recommended for the future but the bore heads are now considered to be secure as currently constructed”. Whether this statement should have been made depended on the nature of the inspections carried out by MWH staff. In respect of Brookvale Road bore 1 the Inquiry has found the 2014 inspection was negligent. The 2016 “inspection” did not occur. The statement regarding compliance made about Brookvale Road bore 1 therefore should not have been made in the August 2016 MWH Report.

[520] So far as Brookvale Road bore 2 is concerned, to the extent that the statement in the August 2016 MWH Report relied on the 2014 inspection, it too was a product of a negligent inspection. The precise nature of the 2016 inspection of bore 2 was not elaborated upon in Mr Rahman’s evidence. He stated in evidence simply that he

inspected the bore and took a number of photographs. The Report suggested that the focus of the June 2016 inspection was to determine whether the required improvements (referred to in the August 2014 MWH Report) had been addressed. The Inquiry considers that the inspection and reporting process in 2016 was so unsatisfactory that the statement of security for Brookvale Road bore 2 ought not to have been made in the August 2016 MWH Report.

[521] There is a final concern in relation to the August 2016 MWH Report. It was issued on 10 August 2016, some 26 months after the bores were first inspected and assessed by MWH. Any of the circumstances relevant to the requirements of the Drinking-water Standards could well have changed over such a long period of time. The August 2016 MWH Report was, except for the matters briefly noted in 2016, over two years out of date when it was issued.

[522] As this topic was not directly addressed at the hearing, the Inquiry gave MWH a further opportunity to comment. The reply received from counsel for MWH was not responsive to the key point, being that the subject of the August 2016 MWH Report was the duct and cable seals inside the bore head, which by their very nature are apt to deteriorate or break down over time. With such an item, a 26 month lapse of time between inspections may be significant, especially given the requirement of the Drinking-water Standards that the bore head must be sealed.

[523] Nor was it sufficient to rely on the requirement of the Drinking-water Standards that to demonstrate continued compliance with bore water security criterion 2, the bore head protection must be reviewed every five years. The inspections and subsequent August 2014 MWH Report disclosed the need for improvements in relation to Brookvale Road bores 1 and 2. The compliance process would have to be completed by inspections after the work had been carried out to determine whether the bore heads were then compliant. The MWH inspections and August 2016 MWH Report were therefore a necessary part of that process. The five year review had nothing to do with that matter.

[524] In any event, when MWH reported on bore head compliance in the August 2016 MWH Report, the District Council and the DWAs were entitled to be told whether, at that time, the bore heads for Brookvale Road bores 1 and 2 were compliant. The fact that a report of non-compliant bore heads was issued in August 2014 was irrelevant.

The five year time frame for review of bore head security had no application in August 2016 when the previous review had resulted in non-compliance.

[525] The Inquiry has outlined its findings as to the true condition of the Brookvale Road bores at [293]. It seems from the condition of Brookvale Road bores 1 and 2 as they existed in August-September 2016 that the inspection by Mr Rahman in June 2016 must have been cursory in the extreme and not focussed on the condition of the duct glands and seals of bore 2.

[526] As a result the Inquiry considered that the August 2016 MWH Report, like the August 2014 MWH Report, did not meet the requirements of the Drinking-water Standards. This is both because of the negligent inspection made in 2014 (which was still relied on), and because the 2016 inspection was non-existent in the case of Brookvale Road bore 1. In the case of bore 2, the inspection was inept and not fit for the purposes required by the Drinking-water Standards. The August 2016 MWH Report therefore did not establish compliance with bore water security criterion 2.

SECTION THREE – OUTBREAK EVENTS AND RESPONSES

PART 13 - OUTBREAK EVENTS, CONTINGENCY PLANNING AND RESPONSES

Relevant Outbreak Facts

[527] This Part provides a summary of the relevant outbreak events with which all parties are broadly in agreement. **Appendix 8** (page 203) provides a more detailed timeline.⁴⁵

[528] In the early morning of Friday 12 August 2016 the duty manager at Hawke's Bay Hospital advised the District Health Board's Infection Prevention and Control Committee of an increase in diarrhoea and vomiting cases presenting overnight to Hawke's Bay Hospital's emergency department. This report was investigated in the usual way by a Health Protection Officer.

⁴⁵ **Appendix 8** reproduces **CB000**, which is a timeline of significant events related to the outbreak. All core participants were provided with opportunities to comment on, or correct the contents of this timeline, and consequently the Inquiry understands that **Appendix 8** represents an agreed factual record with respect to the matters it addresses.

[529] Later that morning various members of the District Health Board's Health Protection Team received the following information:

- (a) Notification of a confirmed case of campylobacteriosis from Mary Doyle Rest Home in Havelock North;
- (b) A report from Gilmours Pharmacy that 10-15 people from different locations and different age groups in Havelock North had attended for diarrhoea and vomiting medication;
- (c) Notification of five suspected campylobacteriosis cases in Havelock North; and
- (d) Notification of two positive results for E.coli from water samples taken on Thursday 11 August from the Poole Street shops, Flaxmere (Hastings supply) and 41 Hikanui Drive (Havelock North supply). The Inquiry heard no evidence to suggest these positive results were directly related to the Brookvale Road bores.

[530] The Health Protection Team leader arranged for Dr Jones, the Medical Officer of Health, and the District Council to be notified. An urgent meeting was organised. The District Council was contacted at noon and requested to attend the meeting.

[531] The meeting was convened at 2.00 pm. It was attended by various members of the District Health Board (including the Medical Officer of Health, Health Protection Officers and DWAs), the District Council (including the Water Supply Manager, a Water Supply Operator, and Environmental Health Officers), and ESR.

[532] Further information about the developing outbreak of illness had been gathered in advance of the meeting, including the following:

- (a) Some 22 of 300 (7.33 per cent) Mary Doyle Rest Home residents had diarrhoea and vomiting symptoms;
- (b) Six residents of Waiapu Rest Home also had diarrhoea and vomiting symptoms;

- (c) The Hawke's Bay Hospital Emergency Department presentations and hospital admissions were all from Havelock North;
- (d) Both District Health Board and District Council had some staff who were off sick;
- (e) There was illness at both Woodford House and Iona boarding schools; and
- (f) Havelock North schools had over 20 per cent absenteeism.

[533] During the course of the 2.00 pm meeting two staff were requested to make further calls to schools to ascertain whether the illness outbreak was confined to Havelock North, despite the positive result for E.coli from Flaxmere. Information was received that there was no significant absenteeism in Napier, Flaxmere, or Hastings.

[534] In light of the vomiting and diarrhoea cases apparently connected to the Havelock North supply, a decision was made by the District Council to chlorinate the water supply. Arrangements were promptly put in place to do so. However, the attendees at the 2.00 pm meeting did not consider whether in addition to chlorination, it would be appropriate to issue a boil water notice.

[535] The Inquiry noted that under cross-examination Mr Stuijt recalled, for the first time, a discussion about whether to issue a boil water notice at the 2.00 pm meeting. The Inquiry preferred Mr Stuijt's earlier (albeit inconsistent) evidence that a boil water notice was not discussed during this meeting. This corresponds with the minutes of the 2.00 pm meeting and the acceptance by the DWAs that a boil water notice should have been, but was not, discussed at this meeting. The Inquiry has found that the suggestion of a boil water notice was first raised by Dr Snee, the Chief Executive of the District Health Board, when he was briefed on the situation by the Medical Officer of Health following the 2.00 pm meeting.

[536] Later that afternoon the possibility of a boil water notice being issued was discussed with Mr P Wood. His view was that a boil water notice should be issued in the circumstances.

[537] At 4.45 pm a further meeting was convened involving representatives of the District Health Board, the District Council, and ESR. The Ministry of Health was also contacted by telephone during the course of the meeting about the issuing of a boil water notice. It was agreed that, in addition to the chlorination process already underway, a boil water notice should be issued. A media release then being prepared by the communications managers of the District Council and the District Health Board was amended to reflect this.

[538] During the course of the meeting after hours health providers (Te Mata Peak General Practice, Havelock North and Hastings Health Centre) were notified of the situation by telephone. It was also agreed that the District Health Board would contact aged residential care providers that evening to advise them of the boil water notice.

[539] Following the meeting the District Council's call centre was provided with an update of the situation so that staff could respond to any increased calls. A media release was jointly issued by the District Health Board and District Council at 6.40 pm. The media release was distributed to the media, posted on the District Council and District Health Board's Facebook accounts, and emailed to the Havelock North Business Association.

[540] Over the course of the next few days, the level of illness within the community continued to escalate and the District Health Board and the District Council responded by:

- (a) On Saturday morning the District Health Board issued an advisory to Havelock North aged residential care facilities, pharmacies, and GP practices, and contacted boarding schools;
- (b) During Saturday morning and early afternoon the District Council had Health Protection Officers contact food handling businesses;
- (c) On Saturday afternoon the District Health Board deployed district nurses to Havelock North aged residential care facilities to assess, triage and administer treatment;
- (d) On Sunday morning the District Health Board contacted the Ministry of Education;

- (e) On Sunday the District Council organised tankers to be at schools on Monday to ensure an adequate supply of water;
- (f) On Monday morning the District Health Board issued an advisory to schools and early childhood education centres;
- (g) On Monday morning the District Council deployed water tankers to supply Hastings water to Havelock North;
- (h) On Monday afternoon the District Council contacted the Red Cross to request assistance for community outreach; and
- (i) On Tuesday with the assistance of the Red Cross, the District Council started providing welfare assistance.

[541] The above factual outline describes in summary form the development of events between Friday 12 and Tuesday 16 August 2016. This factual background provides the context for the following discussion about the roles played by the District Council, the DWAs, the District Health Board, and others in relation to the outbreak of illness and the response of these parties at the time.

PART 14: ASSESSMENT OF RESPONSES TO OUTBREAK

The District Council's Contingency Planning and Response

[542] The District Council did not have a comprehensive contingency plan for a water contamination event in place. The effects of this permeated the District Council's response to the outbreak and the Inquiry's assessment of that response.

[543] While there was no specific statutory requirement for a contingency plan, the DWAs considered such plans to be desirable parts of a comprehensive Water Safety Plan. The Inquiry agreed with the DWAs' submission on this point.

[544] The District Council has also recognised the need to develop its contingency plans since at least 2008. Despite having had both adequate time and resources available to do so, at the time of the outbreak, and also as at the Stage 1 hearings, the District Council did not have a comprehensive or effective contingency plan for a water contamination event. This appears to have been because:

- (a) The task was delegated to operational staff (water operators) who were generally busy with day to day matters;
- (b) The importance of the task was not adequately recognised by senior management, the executive team, or elected councillors and was therefore not actively managed by them (in terms of both ensuring the task was actually completed and the subject of training and continuous improvement); and
- (c) Even after the August 2016 outbreak, adequate urgency was not given to the task.

[545] The main areas where the District Council's lack of contingency planning was apparent in the response to the outbreak are:

- (a) The responses to the DWA's notification of the possible outbreak;
- (b) The failure to consider the need for a boil water notice at the 2.00 pm meeting;
- (c) The timing, drafting, and distribution channels for the boil water notice on the Friday night;
- (d) The lack of a clear division of labour between the District Council management and the District Health Board staff;
- (e) The lack of understanding of the possible scale of the outbreak and the need to provide welfare support;
- (f) The inaccuracies and lack of process for other communications issued during the outbreak; and
- (g) The lack of detailed investigation of water quality issues and the possible pathogens.

[546] We consider below each of these areas in which the District Council's lack of contingency planning is apparent.

Responses to Notification of the Possible Outbreak

[547] At noon on Friday 12 August a DWA called the District Council's Water Supply Operator to advise them of the District Health Board's concerns. That call was described as "exceptional" by the Water Supply Operator who was not aware of another such in his nine years with the District Council. The DWA has described recommending during that call that the District Council chlorinate the water. She made a note of being advised that the District Council was awaiting enumerated results (then due the next day) before making a decision regarding chlorination. The Water Supply Operator has since clarified that he was not saying that the District Council would not chlorinate before receiving the enumerated results, rather he was simply noting the process that was then in train.

[548] Whatever the exact details of the call between the DWA and the Water Supply Operator, the District Council may well have been justified in awaiting fuller information at the 2.00 pm meeting before making a decision to chlorinate. Given the exceptional nature of the call, however, the Inquiry considers it would have been preferable if:

- (a) The contractors who were to facilitate the chlorination had been immediately advised that there may have been an urgent situation developing. As events transpired, the District Council did not have 24 hours' supply of chlorine on hand that day even though that was its usual practice. Consequently, the contractors had to purchase stock on route to the chlorination site after they were advised during the course of the 2.00 pm meeting that it was necessary to chlorinate.
- (b) The District Council staff were familiar with the necessary testing procedure and did not have to contact ESR and Hills Laboratories for advice. This would have enabled District Council staff to focus on the most important part of any immediate response - stopping further people from becoming ill.

[549] It will never be known the extent to which these small delays may have contributed to the number of people who ultimately became sick or the seriousness of a particular person's illness. However, the Inquiry was concerned that an "exceptional" call was initially received by the District Council as simply another example of the water being blamed because it is the "easy" explanation for any illness in the community. This would not have been the case if the District Council's staff had been trained to

recognise the circumstances in which community illness indicates a waterborne outbreak. Given all parties, including the District Council, now recognise that community illness may well be the first sign of a waterborne outbreak (given the inherent limitations in any water testing regime), it is important that these issues are properly worked through by a water supplier in its contingency planning and staff training.

Boil Water Notice

[550] On Friday 12 August 2016 it was apparent to the attendees of the 2.00 pm meeting that there was an unusual degree of diarrhoea and vomiting illness in the Havelock North community. In light of the information available at that time, including that water is ubiquitous, the District Health Board and the District Council were right to recognise the water supply as a risk factor and to take steps to address it.

[551] Although there were no enumerated results from the water supply available at the time, the Inquiry considers the 2.00 pm meeting should have considered whether a boil water notice was necessary. This is not to say that a boil water notice should be issued every time there is a positive E.coli result. Rather, where there is elevated community illness and a credible basis for considering that the water supply is a likely culprit, consideration must be given to all relevant pathogens.

[552] *Campylobacter* was already being treated as a prime suspect at that meeting. Given there was only one confirmed case of campylobacteriosis and five suspected cases (later revised to three), the Inquiry considers there was insufficient information available to exclude the possibility that the faecal contamination suspected of causing the illness did not also contain chlorine-resistant protozoal pathogens. The symptoms of many gastroenteritis infections are similar and faecal material is likely to contain more than one pathogen. It was therefore imperative in the Inquiry's view that water suppliers consider the risk of pathogens that are resistant to chlorine as soon as waterborne illness is an issue. This is true whether it is suspected that the source water or the reticulation has been contaminated.

[553] The Inquiry considers that the failure to consider a boil water notice at the 2.00 pm meeting was material to how that notice was ultimately issued and its effect. If the 2.00 pm meeting had considered the risk of chlorine resistant pathogens and determined, as it should have, that a boil water notice was appropriate, the boil water

notice would have been issued before the close of business on a Friday. This would have ensured a much wider and faster distribution of its important message. For example, it is likely it would have been reported in the course of the 6.00 pm news bulletins on radio and television.

[554] This certainly would have been the case if a template boil water notice, and a communications plan for that notice, had been prepared as part of the District Council's contingency planning. As it was, the District Council did not have a template boil water notice. The District Council staff member delegated the task of preparing the notice had no previous experience of issuing such a notice and (not being a member of the water supply team) was not aware of the guidance set out in the Drinking-water Guidelines. Two major flaws arose as a result:

- (a) The notice was not in fact directive. Rather it simply "urged" the boiling of water.
- (b) The notice recommended boiling water for one minute, whereas the Drinking-water Guidelines state:

WHO (2015) states that bacteria are particularly sensitive to heat, and rapid kills – less than 1 minute per log (90%) reduction – are achieved at temperatures above 65°C. Based on these results, it is considered that the process of heating water to a rolling boil, as recommended in the *WHO Guidelines for Drinking-water Quality* (WHO 2001), is sufficient to inactivate pathogenic bacteria, viruses and protozoa. After the water has reached a rolling boil, it should be removed from the heat, allowed to cool naturally, without the addition of ice, and protected from post-treatment recontamination during storage.

[555] The Inquiry understands that the WHO recommendation is particularly important to protect elderly members of the community, who were most at risk of harm during the period of a boil water notice from burn injuries.

[556] Similarly, the District Council did not have a comprehensive communication plan for issuing a boil water notice (or indeed any emergency advice about its network). The Inquiry understood that the District Council did have lists for dialysis patients and also customers who require prior notice of chlorination. This included businesses that had various sensitivities to chlorine and goldfish owners. These customers were notified about the decision to chlorinate (although not the need to boil water). But the District Council had not worked systematically through the other groups it should contact in an emergency situation so as to ensure it had both:

- (a) Up-to-date contact details for each of them; and
- (b) A clear plan as to how to best contact them depending on their particular circumstances (for example through a phone tree for the elderly) and who should make contact (such as a particular branch of the District Council or the District Health Board).

[557] If such plans had been in place, the District Council would have had a comprehensive list of parties who needed to be contacted and would have been readily able to contact vulnerable customers and advise them of the need to boil water. Forgotten customers included:

- (a) The Havelock North boarding schools. In fact, the Inquiry understands that no thought was given to the boarding schools on Friday night even though it was known by the 2.00 pm meeting that both Iona and Woodford had reported illnesses.
- (b) The Ministry of Education, who learnt of the situation through social media on Saturday afternoon and was not formally contacted (by the District Health Board) until Sunday morning.
- (c) Commercial premises dealing with food (cafes and restaurants, hotels and motels, and food and beverage manufacturers). While the District Council emailed the Havelock North Business Association on Friday night, it did not seem to have considered whether it should use its Environmental Health Team to contact such premises directly until Saturday morning. As at least 10 of 22 Havelock North cafes and restaurants remained open on the evening of 12 August 2016. After the boil water notice had been issued this should have been a priority and should have been able to be readily organised through the District Council's Environmental Health Team.
- (d) Aged residential care facilities. These were considered on Friday night but the District Council did not have a comprehensive list for them and it was agreed that the District Health Board should contact them. As detailed below in the discussion of the District Health Board actions, this did not in fact occur until Saturday morning.

[558] The Drinking-water Guidelines highlight the importance of a boil water notice and envisage specific attention being given to it in the development of a Water Safety Plan. It is clear that the District Council had overlooked this aspect of the Drinking-water Guidelines in developing its Water Safety Plan.

[559] As it had not previously developed a boil water notice or a communications plan, the District Council was left relying on a generic “scattergun” approach that was particularly reliant on late night media and social media channels. The District Council’s expectation was that the message would trickle down through sharing on social media and that those who used social media would communicate the message to those who did not.

[560] Given those who are most vulnerable in such an outbreak are least likely to use social media or to have strong support networks, it is of concern that the District Council was not better prepared with mechanisms such as phone trees through Age Concern and Neighbourhood Support. Such groups are considered to be a more reliable method of communicating important messages to vulnerable members of the community.

[561] In addition to the lack of a boil water notice, there were no other templates of information ready to go. The District Council had not considered or implemented other common practices such as reserved pages (known as black pages) on its website for emergency information or preparing proactive messaging in advance. Consequently, all communications needed to be drafted from scratch. While specific information will always need to be included as a situation develops, considerable time can be saved, and basic mistakes avoided, if such communications are prepared in advance.

[562] As it had not laid this groundwork, on the evening of Friday 12 August 2016 the District Council was caught short with a small number of staff working on the issue and their responses being determined by the resources available to them and their own (limited) experience. These issues could, and should, have been addressed through proper contingency planning.

Division of Responsibilities Between the District Council and District Health Board

[563] The Inquiry has heard that the division of responsibilities between the District Council and the District Health Board evolved over the course of the weekend of

13-14 August. This should have been discussed on Friday 12 August so that everyone was clear as to who was doing what.

[564] Ideally that discussion would have simply been guided by reference to the District Council's contingency plans that had been consulted on with the District Health Board in "peace time". At the very least, that discussion would have been well guided by a clear communications plan from the District Council. As it was, key tasks that should have been undertaken on Friday 12 August were not thought of (for example contacting the boarding schools) and instead evolved over the course of the weekend.

Scale of the Outbreak and the Need to Provide Welfare Support

[565] On the afternoon of Friday 12 August, the District Health Board was already anticipating the outbreak was likely to be significant and involve between 1,000 and 2,000 cases. While these are lower figures than in fact eventuated (some 5,500 cases) it was still expected to be a "big" outbreak.

[566] The Inquiry considers that the senior leadership within the District Council did not fully understand this, or at least did not understand the implications of this, until Sunday 14 August 2016. Consequently, welfare planning did not start until then. That planning resulted in a District Council briefing meeting being convened at 11.00 am on Monday 15 August 2016, the establishment of the District Council's Emergency Operations Centre, and significant welfare efforts from Tuesday 16 August onwards.

[567] Given the test results received on the morning of Saturday 13 August showed widespread contamination within the Havelock North water supply, it should have been clear to the District Council by that time that there was a very serious risk to the whole of the Havelock North community. If it had any uncertainty about this matter, it should have been proactively questioning the District Health Board to ensure it understood both the expected trajectory but also the "worst case" scenario.

[568] Ultimately the welfare support provided to the Havelock North community appears to have been helpful and generally well executed but it effectively started only on Tuesday 16 August 2016 when it could have been identified as necessary on Friday 12 August 2016, and certainly should have been by the morning of Saturday 13 August 2016. Given the difficulties experienced by some members of the community, those 36 to 48 hours were significant.

Communications Issues During the Outbreak

[569] During the outbreak, the District Council sought to engage frequently and transparently with the Havelock North community through public communications distributed through the media, on Facebook and other social media. Review of the District Council's communications during this time, however, illustrated that some of its efforts to provide succinct but reassuring messages sacrificed accuracy. For example:

- (a) On 16 August 2016, it advised the public that testing showed it was "highly likely" that campylobacter was the "bug in the water". As at 16 August 2016, the only testing done on water samples was for E.coli and campylobacter and the campylobacter test results had not been received from ESR. Samples for testing for cryptosporidium and giardia were not collected until 19 August 2016. The District Council may have been referring to case samples but clinical samples are not as good an indicator as water samples and particularly not some three to four days into testing given the different incubation periods of various pathogens.
- (b) Communications referred to all tests being "clear". This is misleading as:
 - (i) the test results at the bores were not clear;
 - (ii) while the test results in the reticulation were clear, they were only clear because the water was being treated with chlorine. As chlorine kills E.coli and E.coli was what was being tested for, this was entirely to be expected.
- (c) Messages repeated the advice in the boil water notice that it was necessary to boil water for one minute.

[570] Given the very limited tests that were undertaken for pathogens other than campylobacter (discussed further below), it was inappropriate to refer to the test results in such a generalised way. The Inquiry was told that the references to the testing was simply meant to show that the "water was safe to drink". But if this was the message, it should have been stated in that way without reference to the test results which required proper consideration to be meaningful. Until the District Council had properly investigated the source of the contamination and the various possible pathogens it was

also very important that the community was not given the impression that chlorination was sufficient to protect them.

[571] Further, the District Council did not have signed audit trails for release of public communication materials during the outbreak. The difficulties with communications that have now been identified, highlight the need for robust processes to be in place before an emergency event occurs.

Investigation of Water Quality Issues and the Possible Pathogens

[572] The Inquiry considers the risk of protozoa should have been investigated fully and the District Council should have contacted the Regional Council for information on the state of the aquifer.

[573] Given that the clinical findings now show that campylobacter was likely the primary pathogen in the outbreak, it is tempting to take the view that treating campylobacter as the prime suspect was the right thing to do.

[574] This is, however, inappropriate because:

- (a) As detailed in [529] and [532], there was in fact only one confirmed case of campylobacteriosis known on Friday 12 August 2016. Up until that time the illnesses at the rest homes were being treated as likely to be norovirus (which can also be waterborne). All other cases being considered were no more than diarrhoea and vomiting cases which could have been the result of any one of a number of gastroenteritis infections.
- (b) Best practice is to test at the source and at the extremes of the reticulation system to ensure clean water everywhere. Clinical data is not as good an indicator. But the water testing undertaken was largely confined to E.coli and campylobacter testing. Only four days of samples (19-22 August) were taken for testing for giardia and cryptosporidium and while five sites were sampled on the first day, only three sites were sampled on the subsequent three days. The largest sample taken was 123 litres. This testing does not compare to a minimum of 10 days with 1,000 litre samples which Dr Fricker has advised the Inquiry is good international practice.

[575] The Inquiry considers that the risk of protozoa should have been investigated fully. Importantly, the testing for protozoa was not done by the District Council and until the Inquiry commenced, the District Council held only the results of the 19 August 2016 samples and had not received the results from the 20-22 August 2016 samples. It was entirely inadequate for a water supplier to be aware of only one set of protozoa results. The District Council should have been actively monitoring the relevant tests, even though the boil water notice was in place. It also should have been aware of all tests being commissioned on its water supply by other parties and ensuring it received a copy of the results.

[576] The Inquiry considers that the District Council's immediate inquiries for its investigation of water quality issues and the possible pathogens should have included contacting the Regional Council for information as to the state of the aquifer. While contact was ultimately made on Sunday 14 August (and that may in fact have been appropriate given other priorities and demands on staff time), it appears to have been motivated by a concern about private bores rather than as part of a systematic approach to investigating the cause of the contamination. With proper contingency planning, the risks to private bores would have already been considered and the subject of discussions with the Regional Council. Consequently, in the event of an outbreak communications with the Regional Council would have been properly focussed.

The District Council Summary

[577] The Inquiry finds in summary that the District Council's lack of contingency planning was evident in all aspects of its response to the outbreak. The District Council appears to have had a misguided belief in the value of "common sense", "just doing the job", and the support it could expect to receive from other organisations. As both the timing issues (when issuing the boil water notice and organising welfare support) and the obvious oversights (contacting the boarding schools and food outlets on Friday night) showed, lack of planning increased the likelihood of error even though there would always be a need to adapt plans for the particular circumstances. As the water supplier, it was and is the District Council's non-delegable responsibility to ensure those plans are in place.

DWAs: Contingency Planning and Response

[578] The Inquiry considers that there were three matters of note in respect of the DWAs' role in the contingency planning and response to the outbreak:

- (a) The DWAs did not review the documents referred to by the District Council in its Water Safety Plan to confirm that the District Council in fact had an effective contingency plan for a water contamination event, nor did they adequately follow up the requirement in the Water Safety Plan that "specific emergency contingency plans" be developed, as discussed at [461]–[465];
- (b) There was no DWA present at the 4.45 pm meeting; and
- (c) There was a focus on campylobacter from the outset rather than a fulsome consideration and investigation of other pathogens.

The Water Safety Plan

[579] The requirement that a water supplier have an effective contingency plan in place was reflected in the Water Safety Plan Adequacy Checklist used by DWAs which states:

Are contingency plans included for major adverse events? Do they detail actions to be taken in situations where corrective actions have failed to stop a hazard entering the distribution system? **(R)** In situations where there is no adequate control measure currently in place for events that are likely to occur and have significant consequence, having a documented contingency plan is a mandatory requirement (e.g. pathogen contamination and no current treatment) **(M) 69ZD(2).**

[580] The DWAs accepted as satisfactory, cross-referencing to other documents a water supplier may already have in place. The District Council's Water Safety Plan, approved on 21 January 2015, included such cross-referencing. This plan stated:

Council's Water Services Policies & Procedures Manual includes procedures and contingency plans to cover a loss of supply or contamination event; however the manual is out of date and is presently being reviewed and re-written. It is intended that contingency plans contained in this will be developed in consultation with the District Health Board to ensure Ministry of Health objectives are incorporated.

In civil or large scale emergencies, HDC will operate under the Emergency management team's structure and procedures.

Council's Business Continuity Management system contains a Business continuity plan for the operation of the Water supply. This plan is currently under development.

The need for development of emergency contingency plans for specific events has been identified in Table 10.

[581] The District Council's earlier Water Safety Plan provided that "specific emergency contingency plans" were to be developed by 31 December 2014.

[582] The DWAs did not review any of the documents referred to in the District Council's Water Safety Plan as part of the verification process. If the DWAs had reviewed the documents referred to, the Inquiry expects it would have been obvious to them that the District Council did not in fact have a comprehensive or effective contingency plan for a water contamination event.

[583] The Inquiry observes that the DWAs now accept that it would have been optimal if they had reviewed the documents referred to. Whether cross-referencing, with or without review of the cross-referenced documents, is adequate is a matter that will be further explored in Stage 2 of the Inquiry.

[584] The District Council's Water Safety Plan required the District Council to develop "specific emergency contingency plans" by 31 December 2015. After verifying the District Council's Water Safety Plan in January 2015, the DWAs did not check that this had been done. While it was ultimately the District Council's responsibility to ensure it complied with its Water Safety Plan, the DWAs should have ensured that such an important step was followed up. The importance of developing contingency plans is not simply a matter of hindsight – the development of contingency plans was recorded as a mitigation measure for 35 of the 53 risks identified in the 2015 Water Safety Plan.

[585] As at August 2016, the District Council did not have a single, and readily-available source of emergency procedures. The 2015 Water Safety Plan listed no fewer than twelve documents⁴⁶ as "related Council policy documents and resources". In evidence to the Inquiry, the District Council referred to five Council documents relevant to emergency response procedures⁴⁷. The District Council accepted that it would be preferable to have all drinking-water emergency procedures in one document, and that it be readily available and updated periodically. As part of its response to the

⁴⁶ **CB004** at 1.3.

⁴⁷ Chapman brief of evidence at 7.1 to 7.4.

Issue 8 process, the District Council has now produced a Contingency Plan containing emergency procedures in relation to a drinking water contamination event.

Presence at 4.45 pm Meeting

[586] There was no DWA present at the 4.45 pm meeting on 12 August 2016 where the boil water notice was discussed. If a DWA had been present, it might be expected that the Drinking-water Guidelines would have been referred to. This may have prevented the erroneous advice as to how water should be boiled from being included in the boil water notice.

[587] The DWAs have expressed the view that this was not a failing, but rather a reflection of practical reality and that technical expertise was readily available.

[588] The Inquiry accepts that it will not always be possible to have a DWA available but notes that this highlights the importance of good contingency planning. That is, matters of particular significance (such as the text of the boil water notice) should not be prepared under urgency when limited personnel availability may mean that important information is not available.

Focus on Campylobacter

[589] For the reasons set out above, the Inquiry's view is that there was insufficient Information available on the afternoon of 12 August 2016 to have any certainty as to the likely pathogen.

[590] In their submissions, the DWAs:

- (a) Accepted that the protozoa risk and a boil water notice should have been discussed at the 2.00 pm meeting on 12 August 2016; but
- (b) Did not accept that they were inappropriately focussed on E.coli and campylobacter.

[591] The Inquiry does not consider these positions to be consistent. If the full ramifications of a positive E.coli reading had been considered then the protozoa risk would have been identified and addressed. On 12 August 2016, and for some time following, "a sound and reasoned assessment of likely cause" could not have

concluded that campylobacter was the likely or only cause. That is because while case samples were beginning to be received, very limited water testing had been done. As discussed above, water samples were not collected for protozoa testing until 19 August 2016 and case samples are not as reliable as testing of the water source particularly in the early stages of an outbreak where it will be difficult to know whether more than one pathogen is in issue due to different incubation periods. The Inquiry notes the DWAs' acknowledgement that the testing for protozoa could have been improved.

[592] The Inquiry also accepts that by the time the DWAs were considering the Reinstatement Plan their focus was on ensuring the safety of the transfer to the Hastings supply. The DWAs appropriately addressed the protozoa risk arising at the time by requiring flushing of the Havelock North network with Hastings water.

District Health Board: Contingency Planning and Response

[593] The Inquiry considers that there are two matters of note relating to the District Health Board's role in the contingency planning and response to the outbreak:

- (a) As the District Health Board had not previously been consulted by the District Council about how they would work together in the event of a waterborne outbreak, the division of responsibilities evolved over the course of 12-14 August 2016 and not all tasks were identified or completed as quickly as they should have been; and
- (b) As community illness may well be the first sign of a waterborne outbreak, the District Health Board had an important role in recognising and educating other stakeholders as to the likelihood and likely severity of a waterborne outbreak.

Lack of Contingency Planning for a Waterborne Outbreak

[594] The Inquiry understands that the District Health Board considers it would be optimal to have a contingency plan tailored to a drinking water contamination event. The Inquiry does not consider it a fault that the District Health Board did not have one in place at the time of the August outbreak, but considers it important that District Health Boards are consulted by water suppliers and have input into their Water Safety Plans, including the contingency plans. This is necessary because waterborne outbreaks are likely to have high attack rates as a pathogen can be spread widely in a

short space of time. The Inquiry intends to consider in Stage 2 how appropriate consultation on contingency planning between all relevant parties is best achieved, including how the District Health Board can support DWAs to effectively escalate non-conformances by water suppliers.

[595] The Inquiry observed that if there had been proper contingency planning by the District Council, and the District Health Board had input into that planning prior to the August outbreak, it is likely that:

- (a) Specific tasks that the District Health Board accepted did not take place as quickly as they should have (contacting aged residential care facilities and schools for instance) would have been completed on the Friday night; and
- (b) There would have been a clear division of responsibilities from the beginning rather than it evolving over the course of the weekend.

[596] As the District Health Board chose to take responsibility as the “lead agency” on Friday 12 August 2016, it must take responsibility for the fact that as matters unfolded it did not ensure that there was:

- (a) A clear division of responsibilities from the outset; and
- (b) Detailed action points agreed with appropriate timelines.

Likelihood and Likely Severity of a Waterborne Outbreak

[597] As set out in paragraphs [528] to [533] above, over the course of Friday 12 August District Health Board staff pieced together various separate pieces of information, and then cross-referenced that information to form the view that the likely cause of the community illness observed was a waterborne pathogen.

[598] Without detracting from the excellent work in this regard, the Inquiry observes that:

- (a) Prior to the involvement of Dr Snee after the 2.00 pm meeting, there was a focus on campylobacter rather than a fulsome consideration and investigation of other pathogens. For the reasons set out in paragraph [552] above, the Inquiry’s view is that there was insufficient information

available on the afternoon of 12 August 2016 to have any certainty as to the likely pathogen and it rejects the submission that the focus on campylobacter “reflected a sound and reasoned assessment of likely cause”.

- (b) As set out in paragraph [567] above, the Inquiry considers that the worst case infection rate could have been identified on Saturday 13 August when the positive test results showed widespread E.coli contamination within the Havelock North water supply.
- (c) The possibility of a high attack rate should have been known to or readily accessible by the District Health Board team. While the Inquiry acknowledges that not all outbreaks are investigated and reported in detail, there are examples of high attack rates in New Zealand. Such information could have been used to deduce the possible worst case scenario and to assist other parties fulfil their roles.

[599] The Inquiry considers this important because the District Health Board has a crucial role in assisting parties, such as the District Council and the Ministry of Education, to understand the possible severity of an outbreak and thereby to respond appropriately. This is not to detract from the responsibilities other parties have (particularly a water supplier) to make proper inquiries and to understand the risks for themselves, but simply acknowledges that in practice the views of senior members of the medical community will be given significant weight and the District Health Board should be ready and able to provide this assistance given its broad knowledge of its community.

[600] A good example of this is was in respect of the closure of schools and early childhood education centres. While the District Health Board now notes that secondary transmission is relatively infrequent with campylobacter, over the weekend of 13-14 August 2016:

- (a) It could not have known that the pathogen was campylobacter; but
- (b) It did know that the schools already had significant rates of sickness (over 20 per cent) and that a practical risk of secondary infection arises from limited numbers of hand basins being available at schools.

[601] The District Health Board was arguably in the best position to identify such matters and to provide information about the risks arising. This is not to say that it should have sought to usurp the decision-making functions properly vested in others, but rather to note that it should be actively seeking to engage with such parties to ensure they have all relevant information when making decisions. The Inquiry intends in Stage 2 to consider how other parties (e.g. schools) can best ensure that the District Health Board has the best and most timely information (e.g. daily absenteeism rates) available to assist it to do so.

11 August 2016 Tanker Result

[602] A discrete issue that arose in considering the response to the outbreak was the proposition that the contamination could have been identified a day earlier (i.e. on Thursday 11 August) if a positive result for E.coli from a routine test on a water tanker had been dealt with differently. The Inquiry considers that the positive test result from the tanker was appropriately investigated and dealt with at the time. In the course of Stage 2 the Inquiry will address the suggestions made by the District Council, the DWAs, and the District Health Board (and any other parties) as to how processes for dealing with such matters can be improved even further.

Central Government: Contingency Planning and Response

[603] The response to the outbreak was managed at a local level, with oversight and support from the Ministry of Health and various other government agencies. No party provided any evidence or submissions asserting that there was any deficiency by any central government agency in this regard. The Inquiry has, however, considered whether a drinking-water emergency should have been declared under s 69ZZA of the Health Act. While the Inquiry has identified above aspects of HDC's and the DHB's contingency planning and response that were deficient, it does not consider that the overall circumstances of the outbreak meant that a drinking-water emergency should have been declared.

PART 15: CONCLUDING OBSERVATIONS

Pathway to Stage 2

[604] Apart from referring to the recommendations made following the interim measures hearing in December 2016, this Stage 1 report does not contain any

recommendations. The focus in Stage 1 has been on ascertaining all relevant facts (including those needed to address Stage 2 issues) and the assessment of the conduct of core participants in the water supply. Stage 2 of the Inquiry will focus on lessons which can be learned and on potential improvements for the future in terms of legislation, operating practices and procedures to promote the safety of drinking water and prevent the recurrence of similar incidents.

[605] Stage 2 will also draw substantially on the experiences emerging from the Inquiry's consideration of the interim safety of the drinking water and, in particular, the work of the Joint Working Group. This part of the Inquiry has already produced very substantial benefits and insights. These will be considered further in Stage 2 which will address lessons for the future, possible changes to the statutory regime and implications for other parts of New Zealand.

[606] The interim safety of Havelock North drinking water is a matter that the Inquiry will continue to monitor and, as required, investigate. It anticipates further liaison with the Joint Working Group on these issues. Despite the substantial improvements that have been achieved in the process of reactivating Brookvale Road bore 3, the Inquiry apprehends that there is still room for further improvements with the District Council supply of drinking water.

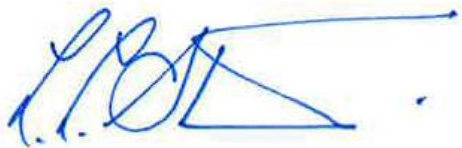
[607] In this context it is pleasing to learn that the District Council has instructed an international expert drinking water supply scientist, Dr Daniel Deere. The Inquiry will continue to focus on the supply to Havelock North but, for the foreseeable future, this is expected to be substantially from Hastings bores. On this basis the Inquiry contemplates further consideration of all of the aquifer sourced District Council water supplies.

Acknowledgements

[608] The Inquiry has been fortunate to have received outstanding advice and legal guidance from counsel assisting, Mr Nathan Gedy QC and Ms Fionnghuala Cuncannon. Further valuable research, background advice and proof reading has also been provided by Meredith Connell staff members Ms Annabel Linterman and Ms Carissa Cross. Scientific advice, particularly in the microbiology of water supplies, has been provided by Professor Colin Fricker, an adjunct professor at Queen's

University. His input has been invaluable. The Inquiry expresses its deep gratitude to Dr Fricker and all counsel assisting for their work to date.

[609] The Inquiry also acknowledges the administrative support provided by Head of Secretariat, Mr Blair Cairncross. His diligence and patience have been first class. The receipt, organisation and posting on the Inquiry website of many hundreds of documents was ably carried out by Ms Holly Mathiesen. The Stage 1 report was expertly typed by the Inquiry Secretary Ms Denise Mitchell. Mr Peter Riordan has provided editorial assistance. The Inquiry has greatly appreciated the input and guidance of the following officials from the Department of Internal Affairs: Mr Stephen Reilly, Ms Anna McKenzie and Ms Julie Wall. Finally, the Honourable Justice Joe Williams has, with grace, guided the Inquiry in matters of tikanga.



Hon Lynton Stevens QC



Dr Karen Poutasi CNZM



Anthony Wilson ED*

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FIGURE 1

Map of Brookvale Road Area



FIGURE 2

Photograph of Cable Ports



APPENDIX 1

Terms of Reference for the Government Inquiry into Havelock North Drinking-Water

Background

On or about 12 August 2016 Hastings District Council and the Hawke's Bay District Health Board became aware of a widespread situation of gastroenteritis in Havelock North. Due to the nature of the outbreak and the receipt of an initial "positive presence" test for E.coli in the water supply, suspicion fell on the Havelock North water supply. Subsequent analysis confirmed the presence of E.coli in the water supply, and sample testing through the health system led Council and District Health Board staff to suspect that Campylobacter was the primary infectious agent.

As of 21 August 2016, there have been 168 confirmed cases and 355 suspected cases of campylobacteriosis, with current estimates suggesting that approximately 4,500 people have been affected. The length of the incubation period (up to ten days) and secondary spread mean that further cases are still being reported despite chlorination of the tap and tanker-provided water, and the ongoing advice to boil tap water. Gastrointestinal illness caused by microorganisms with longer incubation periods (e.g. cryptosporidiosis, giardiasis) may also start to be reported. In addition, about 1% of people with campylobacteriosis (approximately 40 people) may develop reactive arthritis and 0.1% may develop Guillain-Barré Syndrome (approximately 3-6 people). The testing of the Havelock North bores continues to show faecal contamination and the District Council is considering the options for restoring a safe supply of drinking-water to Havelock North.

Drinking-water supplies across New Zealand rely on different methods of take and treatment, depending on the nature and security of the water source. Drinking-water supplies are regulated under the Health Act 1956 and the source of drinking-water is regulated under the Resource Management Act and National Environmental Standards for sources of drinking-water. The National Environmental Standards are given effect to by the Hawke's Bay Regional Council. New Zealanders expect that water reticulated to their homes and businesses for drinking purposes will be safe to consume and use. The Havelock North water contamination incident risks damaging public confidence in local drinking-water supplies.

This Inquiry is about determining the cause of the current contamination in Havelock North, whether relevant parties complied with their obligations, how local and central government agencies responded to the public health situation that occurred as a result of the contamination, and how to prevent future such occurrences.

The Inquiry will also consider the potential for similar situations to occur in other New Zealand water supplies and the lessons for local and central government agencies with relevant responsibilities, including whether the regulatory regime is operating effectively.

Appointment and order of reference

This Inquiry will inquire into and report (making recommendations that the Inquiry considers fit) upon the following:

Inquire into how the Havelock North water supply system became contaminated, how this was subsequently addressed, how local and central government agencies responded to the public health outbreak that occurred as a result of the contamination and how to reduce the risk of outbreaks of this nature recurring.

In relation to this incident of contamination of water at Havelock North in August 2016, to inquire into:

1. The causes of this incident including, but not limited to, engineering, catchment and infrastructure management, containment and process management, aquifer management, district and regional consenting processes, and monitoring and enforcement activities;
2. The timing and adequacy of steps taken by the Hastings District Council, the Hawke's Bay District Health Board and any other party, with regard to testing and diagnostics, reporting, public communication and ensuring a safe water supply in the short and long term;
3. The practices used at each stage, from identifying that a contaminant was present, through to (and inclusive of) the response and recovery stages of the public health incident, including, but not limited to, timeliness, adequacy, effectiveness, coordination & information sharing, readiness of systems, and triggers for action;
4. The response by central government agencies and the adequacy of support provided by them at the local level;
5. The actions that should be taken in response to any identified and confirmed contamination source, and actions to ensure a safe water supply can be provided to Havelock North;
6. Practices and strategies to ensure the prevention of future such occurrences;

7. The implementation of contingency plans for responding to water contamination and public health outbreak incidents by the relevant agencies;
8. Any lessons and improvements that can be made more broadly in the management of the water supply network in Havelock North and/or more broadly across New Zealand;
9. The regulatory regimes under which various agencies operate and any lessons and improvements that can be made to local and central government systems or practices to expedite and deal effectively with the identification of public health outbreaks; and

Any improvements that can be made in any future response to emergency events of this nature.

Matters upon or for which recommendations are required

The Inquiry will report on and make any recommendations it considers fit on:

1. The cause(s) of the Havelock North outbreak and whether any person or organisation was at fault or failed to meet required standards;
2. The adequacy and appropriateness of responses by all relevant parties to the outbreak;
3. The adequacy of the management of drinking-water supplies for Havelock North, the implementation of drinking-water standards, contingency planning, preparedness and the responses of local and central government agencies;
4. Any legal or regulatory changes or additions necessary and desirable to prevent or minimise similar incidents;
5. Any changes or additions to operational practices for monitoring, testing, reporting on and management of drinking-water supplies, implementation of drinking-water standards, contingency planning and responses by local and central government, to address the lessons from this incident; and
6. Any other matter which the Inquiry believes may promote the safety of drinking-water and/or prevent the recurrence of similar incidents.

Exclusions from inquiry and scope of recommendations

The Inquiry is not to inquire into, determine, or report in an interim or final way, or otherwise prejudice any of the following matters:

1. Subject to section 11(2) Inquiries Act 2013, questions of civil, criminal, or disciplinary liability;
2. The structural arrangements for local government; and
3. Issues relating to water, aquifer and catchment management which are unrelated to the contamination of specific sources of drinking-water supplied to Havelock North.

Other investigations may be considered by the Inquiry

The Inquiry may take account of the outcome of any other investigations into these matters undertaken by local or central government agencies, but is not bound in any way by the conclusions or recommendations of any such investigation.

Definitions

Operational 'Practice/s' or 'arrangements' include, without limitation, each of the following:

- Decision-making;
- Capability and capacity;
- Procedures;
- Processes;
- Services; and
- Systems.

Reporting sequence

The Inquiry is to report findings and opinions, together with recommendations, required and otherwise, that it considers fit to make in respect of them, to the Attorney-General in writing no later than the date to be specified in the Gazette notice establishing the Inquiry.

Amendment to the Terms of Reference

Subsequently on 28 March 2017 the Terms of Reference were amended as follows:

The Inquiry is to report its findings and opinions in writing to the appointing Minister in two stages:

- Stage 1 will address matters directly related to the contamination event, focus on findings of fact and fault, and will report by 12 May 2017; and
- Stage 2 will address systemic issues, lessons to be learned and provide recommendations, and will report by 8 December 2017.

APPENDIX 2



Government Inquiry into Havelock North Drinking Water

UNDER

THE INQUIRIES ACT 2013

IN THE MATTER OF

**GOVERNMENT INQUIRY INTO HAVELOCK NORTH
DRINKING WATER**

**INTERIM REPORT AND RECOMMENDATIONS OF THE PANEL IN RELATION TO
THE SAFETY OF HAVELOCK NORTH DRINKING WATER FOR THE NEXT
12 MONTHS**

15 December 2016

Plaza Level, AIG Building, 41 Shortland Street, Auckland
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Email: HavelockNorth.Water@dia.govt.nz
Phone: 09 363 9537

**Interim Report and Recommendations of the Panel in relation to the safety of
Havelock North drinking water for the next 12 months**

RECOMMENDATIONS

- A Having received evidence and submissions from the parties directly affected, the Panel recommends that:**
- (a) The joint working group (Water Safety JWG), which has been set up with representatives from HDC, HBRC, DHB and the Drinking-Water Assessors (DWA), continue its work with each of its members committing to co-operate with each other and work positively in the interests of drinking-water safety.**
 - (b) The Water Safety JWG meet regularly, and as frequently as required, to maintain effective oversight of all issues relating to the safety of the Havelock North drinking-water supply for at least the 12 months from 12 December 2016.**
 - (c) The Water Safety JWG members notify each other, and keep each other informed, of any information that could affect drinking-water-safety risks.**
 - (d) The Water Safety JWG investigate aquifer matters of potential relevance to drinking-water safety over the next 12 months.**
 - (e) The Water Safety JWG investigate whether the Havelock North reticulation and distribution systems are fragile or vulnerable and whether they need maintenance, repair work, or improvements, in order to deliver safe drinking water to consumers.**
 - (f) Following inspection and any necessary maintenance and/or repair work on the Brookvale bore 3 equipment, the Water Safety JWG should approve the condition of Brookvale bore 3 prior to its use as a drinking-water supply.**
 - (g) The Water Safety JWG should, prior to its use as a drinking-water supply, approve a maintenance and inspection schedule for**

Brookvale bore 3 for at least the 12 months from 12 December 2016.

- (h) For at least the 12 months commencing 12 December 2016, log 5 level of treatment be applied to Brookvale bore 3 drinking water (being cartridge filtration, UV and chlorination), with the Water Safety JWG to:**
 - (i) approve the selection and commissioning of the equipment; and**
 - (ii) oversee the training and operational procedures for the treatment equipment and processes.**
- (i) For at least the 12 months commencing 12 December 2016, the Hastings water will be treated with chlorination, and that the Water Safety JWG should keep under review the nature and extent of treatment required to ensure the safety of the Hastings water being supplied to Havelock North.**
- (j) For at least the 12 months commencing as soon as practicable (but before Brookvale bore 3 is reactivated), monitoring and testing of the Havelock North and Hastings drinking-water supplies take place in accordance with the recommendations of Dr Fricker dated 6 December 2016 and, in particular, that the following minimum monitoring shall be carried out:**
 - (i) 2-litre raw water samples be taken daily from each bore contributing to the supply of Havelock North drinking water;**
 - (ii) total coliform and E.coli testing, using either Colilert 18 or such other effective and speedy test that the DWA approves;**
 - (iii) enumerated tests for all reticulation samples and presence/absence testing for the 2 litre samples from the bores;**
 - (iv) testing from the reticulation sites be continued in accordance with the DWSNZ and the requirements of the DWA;**

- (v) daily testing of FAC levels take place at the ends, and in the dead ends that are most at risk, of the reticulation with a pH level of less than 8 and with a required FAC level of at least 0.2mg/L, or an adjusted level if the pH level is greater than 8;
 - (vi) testing for disinfectant by-products take place as directed by the DWA; and
 - (vii) the test set out in (i) be carried out three times a day during and immediately after an abnormal wet weather event (this event, and the details of such increased testing, to be defined and prescribed by the Water Safety JWG).
- (k) For at least the four months commencing 12 December 2016, testing and monitoring for protozoa shall be carried out at each bore weekly using 1,000 litre samples, with the regime thereafter to be subject to review by the Water Safety JWG for frequency but still using 1,000 litre samples.
- (l) For the purpose of recommendation (k) above, the Eastbourne bores 2 - 5 should be treated as one bore.
- (m) The Water Safety JWG satisfy itself that persons carrying out sampling and testing are properly trained and competent, that the testing methods being used are as sensitive and effective as practicable, and that the test processes are being carried out in a way that is optimal in terms of timing, efficiency, and result-reporting.
- (n) An Emergency Response Plan be drafted by HDC and approved by the Water Safety JWG and the DWA before Brookvale bore 3 supplies drinking water to the reticulation.
- (o) If the Water Safety JWG is unable to reach unanimous agreement in relation to any matter pertaining to the safety of drinking water, advice to the Inquiry of that should be given promptly by the Water Safety JWG Chair to counsel assisting the Inquiry.

- (p) **Brookvale bores 1 and 2 should not be reactivated for drinking-water supply without at least six weeks prior notice to the Inquiry and the Water Safety JWG.**
- B Any issues concerning the implementation of the above recommendations are to be referred in the first instance for discussion and resolution by the Water Safety JWG.**
- C The above recommendations should be issued forthwith to the parties who have provided an address for service to the Inquiry and published on the Inquiry's website.**
-

REASONS AND PRELIMINARY FINDINGS OF THE PANEL

Introduction

[1] On 21 November 2016 one of the core participants in the Inquiry, HDC, made an application for postponement of the Inquiry until after the conclusion of prosecution action commenced by HBRC against it.⁴⁸ The Panel convened urgently to consider the application. In a decision dated 22 November 2016 the Panel granted the application on the terms outlined.

[2] As to the proposed hearings of evidence for the Inquiry the Panel said this in its decision:

[36] We believe the public interest and the importance of the drinking water issues require us to commence and continue the Inquiry from 30 January 2017. While we are currently investigating arrangements, our current expectation is that the Inquiry will continue sitting in public hearings throughout February 2017 until the evidence is finished.

[3] On the topic of safety of the Havelock North drinking water generally, the Panel added:

[37] If any party has concerns about the safety of the Havelock North drinking water supply over the coming months, we invite a submission to be made at any time on that matter. We may opt to convene a hearing at any time (including before 30 January 2017) on that specific issue, should we believe this is desirable. While the parties have been asked to cover issue 8 in their evidence, under the changed circumstances we [may] wish to address this further, and

⁴⁸ As advised by counsel for HBRC and HDC on 13 December 2016, the prosecution has now been withdrawn.

more quickly, and Minute No. 4 (to be issued shortly) will address the question of the water supply over the coming summer.

Background

[4] One of the matters in respect of which the Inquiry is required by the Terms of Reference to report on, and provide recommendations about, is the following:

- (f) Any other matter which the Inquiry believes may promote the safety of drinking water and/or prevent the recurrence of similar incidents.

[5] At the Initial Hearing held on 27 October 2016 the Panel discussed with interested parties whether they considered the Inquiry would proceed most efficiently if it were dealt with in two stages. The proposal was that Stage One would address matters directly relevant to the campylobacteriosis outbreak in Havelock North in August 2016 and Stage Two would address systemic issues and lessons to be learned. All parties who appeared at the initial hearing supported the proposal to proceed in two stages.

[6] The Panel endorsed the above approach. In Minute No. 2 the Panel directed that Stage One would focus on the eight issues identified as List of Issues: Stage One. Issue 8 in that list states:

What action or further action should be taken to ensure a safe supply of drinking water to Havelock North.

[7] Until recently the Inquiry has been proceeding on the basis that all three bores in Brookvale Road are not connected to the Havelock North drinking water reticulation system, and that the Hastings water supply is being used. However, HDC recently advised the Inquiry that the Hastings water supply will be insufficient to meet the needs of the Havelock North residents during periods of high demand over the summer. HDC now considers it has no option but to reactivate Brookvale bore 3 to supplement the Hastings water supply during periods of high demand. A proposal to this effect was considered at its meeting on 22 November 2016.

[8] The Panel determined that the proposed reactivation of Brookvale bore 3 required an assessment of interim measures needed to ensure the safe supply of water to the residents and businesses in Havelock North.⁴⁹ Accordingly the Inquiry directed that it would consider issue 8 at a public hearing to be held on 12 and 13 December 2016. The focus of this hearing would be on the actions or further actions required to

⁴⁹ Minute No. 4 dated 24 November 2016.

ensure a safe supply of drinking water to Havelock North over the next 12 months. Its consideration of these issues was to be without prejudice to, and will have no effect on, the Inquiry's subsequent consideration of issues 1 to 7 or the position of any party in relation to such issues.

The hearing

Proposal to reactive Brookvale bore 3

[9] In a memorandum dealing with issue 8 HDC advised its intention to recommence extraction from Brookvale bore 3 to augment the Hastings supply during periods of peak demand. HDC considered this combination should be sufficient to meet the shortfall which would otherwise occur. Brookvale bore 3 would not be used at times when the Hastings supply is able to meet demand.

[10] The Inquiry has been told that HDC has no intention to bring Brookvale bores 1 and 2 into service in the immediate future. Further, the longer term use of the Brookvale Road bores will be assessed as part of a wider network options analysis.

[11] HDC is concerned to ensure the safety of the water supply from Brookvale bore 3. Accordingly it has resolved to implement a comprehensive treatment regime. Water pumped from Brookvale bore 3 will be treated by filtration, UV treatment, and chlorination. Brookvale bore 3 will not be reactivated until the infrastructure for that treatment regime has been constructed, commissioned, tested, and approved by the DWA. The Hastings water supply will continue to be chlorinated. This will continue at least for the next 12 months.

[12] In addition to the above treatment measures, daily bacteriological testing will occur at the source (Brookvale bore 3) prior to treatments occurring and tests for protozoa will occur weekly for the first four months. The online monitoring, eg UV intensity, pressure monitoring on filters, alarms and the like will be integrated into the SCADA telemetry and monitoring system.

The issues

[13] On 28 November 2016 Mr Gedy QC circulated a list of topics for issue 8 to counsel for HDC, HBRC, Ministry of Health, HBDHB, and the Drinking Water Assessors. The parties have filed memoranda, evidence, and submissions which were considered at the hearing. The Inquiry also heard evidence on from:

- (a) Craig Thew, Manager Asset Management, HDC;
- (b) Iain Maxwell, Group Manager Resource Management, HBRC;
- (c) Andrew Newman, Chief Executive, HBRC; and
- (d) Stephen Swabey, Manager of Environmental Science, HBRC.

The Water Safety JWG

[14] During the course of preparation for the issue 8 hearing, Dr Kevin Snee, the Chief Executive Officer of HBDHB, proposed a tripartite working group, the Water Safety JWG.⁵⁰ The gist of the proposal was that the Water Safety JWG would have two representatives from HDC and HBRC. There would also be a representative from HBDHB and Mr Peter Wood from the Central North Island Drinking Water Assessment Unit would also attend.

[15] The first meeting of the Water Safety JWG was convened on 7 December 2016. Dr Snee chaired that meeting and then wrote to the Inquiry on 9 December 2016 to:

- (a) provide the minutes of that meeting including the Water Safety JWG's responses to the list of topics for issue 8;
- (b) advise that an independent chair had been appointed (Chris Tremain) and the next meeting scheduled for 21 December 2016;
- (c) update the Inquiry on the progress already made since the meeting with respect to the DWA's involvement and the inspection of Brookvale bore 3.

[16] With respect to the topics for issue 8, the Water Safety JWG relevantly advised that the following matters were agreed by all of its members:

- (a) Brookvale bore 3 can no longer be regarded as secure;
- (b) HDC is to maintain chlorination of the Hastings supply until it has completed its investigation of the security of all Hastings bores and the options for long term measures to ensure the safety of the water;

⁵⁰ As discussed in his letter dated 30 November 2016, CB90.

- (c) in addition to chlorination, water sourced from Brookvale bore 3 is to be treated with both cartridge filtration and UV for the next 12 months;
- (d) options for restoring fluoridation are to be investigated;
- (e) an emergency response plan is to be developed; and
- (f) the Water Safety JWG members are to notify each other of any information that may affect the safety of drinking water.

Recommendations

[17] The task of the Inquiry is to make findings and recommendations.⁵¹ We take this power to include findings and recommendations on matters arising in the course of the Inquiry that require urgent or interim attention.⁵² Our preliminary findings in relation to the interim safety of Havelock North drinking water are in this interim report and any further findings will appear in our report into Stage One Issues.

[18] The Inquiry accepts that all parties have existing responsibilities and obligations under the current legal framework.⁵³ It records, for the avoidance of doubt, that nothing in the recommendations derogates from those existing responsibilities and obligations. As set out in [8] above, the recommendations are without prejudice to, and will have no effect on, the Inquiry's consideration of issues 1 to 7 or the position of any party in relation to those issues. Nonetheless the Panel considers that the recommendations will usefully augment the current regulatory framework in order to ensure drinking-water safety at this time.

[19] The recommendations herein were supported by the Water Safety JWG and by the core participants who attended the hearing on 12 and 13 December 2016.

[20] Consequently, in light of the information currently available about the campylobacteriosis outbreak, and the state of both the aquifer and bores supplying Havelock North, we recommend that:

- (a) The Water Safety JWG, which has been set up with representatives from HDC, HBRC, DHB and the DWA, continue its work with each of its

⁵¹ Inquiries Act 2013, s 12.

⁵² Inquiries Act 2013, ss 12 and 14.

⁵³ For example, the Health Act 1956, the Resource Management (National Environmental Standard for Sources of Human Drinking Water) Regulations 2007, and the Drinking-water Standards for New Zealand 2005 (Revised 2008).

members committing to co-operate with each other and work positively in the interests of drinking-water safety.

- (b) The Water Safety JWG meet regularly, and as frequently as required, to maintain effective oversight of all issues relating to the safety of the Havelock North drinking-water supply for at least the 12 months from 12 December 2016.
- (c) The Water Safety JWG members notify each other, and keep each other informed, of any information that could affect drinking-water-safety risks.
- (d) The Water Safety JWG investigate aquifer matters of potential relevance to drinking-water safety over the next 12 months.
- (e) The Water Safety JWG investigate whether the Havelock North reticulation and distribution systems are fragile or vulnerable and whether they need maintenance, repair work, or improvements, in order to deliver safe drinking water to consumers.
- (f) Following inspection and any necessary maintenance and/or repair work on the Brookvale bore 3 equipment, the Water Safety JWG should approve the condition of Brookvale bore 3 prior to its use as a drinking-water supply.
- (g) The Water Safety JWG should, prior to its use as a drinking-water supply, approve a maintenance and inspection schedule for Brookvale bore 3 for at least the 12 months from 12 December 2016.
- (h) For at least the 12 months commencing 12 December 2016, log 5 level of treatment be applied to Brookvale bore 3 drinking water (being cartridge filtration, UV and chlorination), with the Water Safety JWG to:
 - (i) approve the selection and commissioning of the equipment; and
 - (ii) oversee the training and operational procedures for the treatment equipment and processes.
- (i) For at least the 12 months commencing 12 December 2016, the Hastings water will be treated with chlorination, and that the Water Safety JWG should keep under review the nature and extent of

treatment required to ensure the safety of the Hastings water being supplied to Havelock North.

- (j) For at least the 12 months commencing as soon as practicable (but before Brookvale bore 3 is reactivated), monitoring and testing of the Havelock North and Hastings drinking-water supplies take place in accordance with the recommendations of Dr Fricker dated 6 December 2016 and, in particular, that the following minimum monitoring shall be carried out:
 - (i) 2-litre raw water samples be taken daily from each bore contributing to the supply of Havelock North drinking water;
 - (ii) total coliform and E.coli testing, using either Colilert 18 or such other effective and speedy test that the DWA approves;
 - (iii) enumerated tests for all reticulation samples and presence/absence testing for the 2 litre samples from the bores;
 - (iv) testing from the reticulation sites be continued in accordance with the DWSNZ and the requirements of the DWA;
 - (v) daily testing of FAC levels take place at the ends, and in the dead ends that are most at risk, of the reticulation with a pH level of less than 8 and with a required FAC level of at least 0.2mg/L, or an adjusted level if the pH level is greater than 8;
 - (vi) testing for disinfectant by-products take place as directed by the DWA; and
 - (vii) the test set out in (i) be carried out three times a day during and immediately after an abnormal wet weather event (this event, and the details of such increased testing, to be defined and prescribed by the Water Safety JWG).
- (k) For at least the four months commencing 12 December 2016, testing and monitoring for protozoa shall be carried out at each bore weekly using 1,000 litre samples, with the regime thereafter to be subject to review by the Water Safety JWG for frequency but still using 1,000 litre samples.

- (l) For the purpose of recommendation (k) above, the Eastbourne bores 2 - 5 should be treated as one bore.
- (m) The Water Safety JWG satisfy itself that persons carrying out sampling and testing are properly trained and competent, that the testing methods being used are as sensitive and effective as practicable, and that the test processes are being carried out in a way that is optimal in terms of timing, efficiency, and result-reporting.
- (n) An Emergency Response Plan be drafted by HDC and approved by the Water Safety JWG and the DWA before Brookvale bore 3 supplies drinking water to the reticulation.
- (o) If the Water Safety JWG is unable to reach unanimous agreement in relation to any matter pertaining to the safety of drinking water, advice to the Inquiry of that should be given promptly by the Water Safety JWG Chair to counsel assisting the Inquiry.
- (p) Brookvale bores 1 and 2 should not be reactivated for drinking-water supply without at least six weeks prior notice to the Inquiry and the Water Safety JWG.

[21] These recommendations were provided in draft to counsel for HDC, HBRC, HBDHB, and the Crown parties (Ministry of Health, Ministry for the Environment, and Department of Internal Affairs) on the evening of 12 December 2016. On 13 December 2016 submissions were heard and all parties confirmed their agreement to the recommendations. The Inquiry appreciates the assistance of all parties in this regard, and particularly the work of the Water Safety JWG.

.....
Hon Lynton Stevens QC

.....
Dr Karen Poutasi CNZM

.....
Anthony Wilson ED*

APPENDIX 3

Report of the Science Caucus - 2 February 2017

The Science Caucus met on the evening 1 February 2017 and morning 2 February 2017 to consider the following questions posed by the Inquiry:

Which of three pathways was most probable? Which level of probability do the experts assign to each of the following pathways, or any combination:

<p>1. Paddocks to drains to dry wells to bore 1</p> <p><i>Less probable 20%</i></p> <p><i>There remain issues that are difficult to explain whether or not the glad overtopping occurred.</i></p>	<p>1a. Relevant to the borehead entry theory, what probability do you attach to the alarm in bore 1 being ineffective/inoperative on 5-6 August.</p> <p><i>Mr Ehlers and Mr Tomkins consider that it was effective and operable on 5-6 August 2016.</i></p>
<p>2. Paddocks to drains to external casing (via casing or screen)</p> <p><i>Caucus considers this very unlikely to have happened (probability of 2%)</i></p>	
<p>3. Pond to bore 1 (via casing or screen)</p> <p><i>Most probable 78%</i></p>	<p>3a. What probability does each expert attach to a defect in casing which would allow ingress of contaminated water</p> <p><i>Mr Cussins considers that he is unable to determine a probability for this occurring, based on the available information.</i></p> <p><i>The remaining members of the Caucus consider that, based on available information, the potential exists for a defect in the casing to allow ingress of contaminated water.</i></p>

	<p><i>All members of the Caucus agree that packer or casing pressure testing, and/or further camera investigation will determine whether these opinions could be revised.</i></p> <p>3b. If there was a hole, what significance does this have to the Inquiry's findings, and what difference would this make (applies to 2 and 3 above) to what pathway?</p> <p><i>Can be significant if it provides a shorter flowpath, and provides an explanation for the difference in microbial data between pre-August and post-August 2016?</i></p> <p><i>This has great significance for the issue of bore design and asset management in municipal water supplies.</i></p>
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4. What significance, if any, does the 86ML pumped between 12-28 August mean with respect to E.coli.

The Caucus considers that E.coli present in the period 12-28 August during pumping of the 86ML of water is largely consistent with an ongoing source from the Mangateretere Stream

[Signed by]

"Brydon Hughes"

"Mark Gyopari"

"Tony Cussins" Stephen Swabey"

APPENDIX 4

Government Inquiry into Havelock North Drinking Water: Overview of the regulatory framework for supplying drinking water

1 Introduction

- 1.1 The regulatory framework for drinking water is established under the Resource Management Act 1991 (**RMA**), the Local Government Act 2002 (**LGA**), and the Health Act 1956 (**Health Act**).
- 1.2 Each Act deals with different, but often overlapping, aspects of New Zealand's multiple barrier approach to the process of supplying potable drinking-water to New Zealanders.
- 1.3 The RMA is targeted at protecting the sources of drinking water and assigns primary responsibility for protecting these sources to regional councils through their prescribed functions under the Act and through a national environmental standard for protecting sources of human drinking water.
- 1.4 The LGA provides local authorities with mechanisms and responsibilities for protecting the needs of their communities in relation to the sourcing, treatment, and supply of drinking-water.
- 1.5 The Health Act protects consumers by specifying quality standards for drinking water and imposing duties on drinking-water suppliers. Under the Health Act drinking-water assessors (**DWAs**) have primary responsibility for monitoring drinking-water suppliers' compliance with their obligations to supply safe drinking-water, but designated officers are responsible for any necessary enforcement action.
- 1.6 The review below is not exhaustive and has been focussed on the core aspects of responsibility for drinking water.

2 RMA

- 2.1 The purpose of the RMA is to promote the sustainable management of natural and physical resources,⁵⁴ including water. It does this through the use of national environmental standards, national policy statements, regional policy statements and regional plans, district plans, and monitoring and enforcement mechanisms.
- 2.2 The Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007 (**NES Regulations**) contain minimum requirements for protecting sources of human drinking water and impose

⁵⁴ Resource Management Act 1991, s 5(1).

responsibilities primarily on regional councils.⁵⁵ The NES came into force on 20 June 2008.⁵⁶

- 2.3 The National Policy Statement for Freshwater Management (**NPSFM**) is a national policy statement made under the RMA that states objectives and policies for the integrated and sustainable management of freshwater. The NPSFM was first gazetted in 2011 and was revised in July 2014.

Responsibilities of regional councils under the RMA

- 2.4 Under the RMA, regional councils have primary responsibility for maintaining and enhancing the quality and quantity of water in their regions.⁵⁷ Their functions include controlling:⁵⁸
- (a) the use of land for the purpose of maintaining and enhancing the quality and quantity of water in water bodies;
 - (b) the taking, use, damming, diversion, quantity, level, and flow of water in any water body;
 - (c) the discharge of contaminants into or onto land, air, or water and discharges of water into water;
 - (d) the introduction or planting of any plant in, on or under a bed of a water body to maintain and enhance the quality and quantity of water in that water body; and
 - (e) the allocation of natural resources, including water.
- 2.5 Regional councils exercise these functions by: preparing, implementing and administering regional policy statements⁵⁹ and regional plans;⁶⁰ assessing applications for and issuing resource consents to enable activities that would otherwise contravene the RMA and regional plans,⁶¹ usually subject to appropriate conditions,⁶² and through ongoing monitoring and enforcement action.
- 2.6 Drinking-water suppliers must obtain a resource consent from the regional council to take water.
- 2.7 Regional councils⁶³ are required to assess and determine applications for resource consent, including applications to take water, having regard to any:⁶⁴

⁵⁵ Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007, reg 13. The regional council may set more stringent requirements.

⁵⁶ Regulation 2. The NES were gazetted on 20 December 2007.

⁵⁷ Resource Management Act 1991, s 30.

⁵⁸ Resource Management Act 1991, s 30(e),(f),(fa),(g).

⁵⁹ Resource Management Act 1991, ss 59-62.

⁶⁰ Resource Management Act 1991, ss 59-62.

⁶¹ Resource Management Act 1991, ss 59-62, 87A.

⁶² Resource Management Act 1991, s 108.

⁶³ A "consent authority" has responsibility for issuing resource consents and is defined as meaning "a regional council ... whose permission is required to carry out an activity for which a resource consent is required under this Act": Resource Management Act 1991, s 2.

⁶⁴ Resource Management Act 1991, s 104.

- (a) actual and potential effects on the environment of the proposed activity;
- (b) relevant provisions of any applicable planning documents, including national environmental standards, national policy statements, regional policy statements, and regional and district plans; and
- (c) other matters they consider relevant and reasonably necessary to determine the application.

2.8 A regional council's assessment of an application for resource consent is subject to Part 2 of the RMA: the Act's sustainable management purpose. This overarching obligation means that regional councils have to decide resource consent applications in light of the sustainable management purpose. In effect, this involves a balancing of the, sometimes competing, components of sustainable management, which includes protecting natural resources, providing for people and communities' health and safety, and enabling development to provide for economic well-being.

Responsibilities of regional councils under the NES Regulations

2.9 The NES Regulations set requirements for protecting sources of drinking water from becoming contaminated. Specifically regional councils are required to:

- (a) Under regulations 7 and 8, decline discharge or water permits for an activity that will occur upstream of an abstraction point for drinking water if the activity is likely to introduce or increase determinands in the drinking water to a level unsafe for human consumption following existing treatment;⁶⁵
- (b) Under regulation 10, be satisfied that permitted activities in regional plans will not result in the introduction or increase of determinands into drinking water supplies such that they become unsafe for human consumption following existing treatment;⁶⁶ and
- (c) Under regulation 12, consider whether an activity for which resource consent is sought may itself lead to, or as a consequence of an external event may result in, a significant adverse effect on a drinking water abstraction point and, if so, place a condition on the consent requiring notification by the consent holder to the relevant drinking water supplier and the consent authority of any such unintended event.⁶⁷

2.10 Further reference to the NES Regulations is contained in the report.

⁶⁵ Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007, reg 7 and 8.

⁶⁶ Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007, reg 10.

⁶⁷ Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007, reg 12.

Responsibilities of district councils⁶⁸

- 2.11 Section 31 of the RMA specifies the functions of district councils under the RMA. District councils have narrower functions than regional councils and, under the RMA, have no express responsibility for maintaining or enhancing, or controlling potential adverse effects on, the quality of water in their district.
- 2.12 District councils have responsibility for creating district plans which state the objectives for the district, the policies to implement those objectives and the rules, if any, that are required to implement the policies.⁶⁹ A district plan must give effect to any national and regional policy statements and may not be inconsistent with a regional plan, including any specification in a regional plan as to:⁷⁰
- (a) the use of land for the purpose of maintaining and enhancing the quality and quantity of water in water bodies;
 - (b) the taking, use, damming, diversion, quantity, level, and flow of water in any water body;
 - (c) the discharge of contaminants into or onto land, air, or water and discharges of water into water;
 - (d) the introduction or planting of any plant in, on or under a bed of a water body to maintain and enhance the quality and quantity of water in that water body.

Responsibilities of district councils as consent holders

- 2.13 A district council that supplies drinking-water must obtain and retain the necessary resource consents from its relevant regional council. The RMA places no explicit obligations on the holder of a resource consent. However, a consent holder who fails to: comply with the conditions of its consent; exercises its consent in a manner that causes or is likely to cause adverse effects to the environment; acts in a way that causes or is likely to cause loss of life, injury or serious damage to property; or otherwise breaches the RMA may be subject to review, enforcement action or penalties by a regional council.⁷¹

Monitoring and enforcement

- 2.14 Regional councils and district councils have day to day responsibility for enforcing compliance with the RMA. The Minister for the Environment has an oversight responsibility and may intervene where a regional or district council is failing in its responsibilities.⁷²

⁶⁸ The Resource Management Act 1991 refers to territorial authority which means a city council or a district council named in Part 2 of the Local Government Act. This includes Hastings District Council: Resource Management Act 1991, s 2; Local Government Act 2002, s 5 and sch 2.

⁶⁹ Resource Management Act 1991, ss 75, 76.

⁷⁰ Resource Management Act 1991, s 75(4).

⁷¹ Resource Management Act 1991, ss 84, 128-132 and Part 12.

⁷² Resource Management Act 1991, ss 24, 24A, 25, 25A.

- 2.15 Both regional and district councils are required to monitor and take appropriate action in relation to: the exercise of resource consents and the state of the environment in their districts; the efficiency and effectiveness of their policies and rules; the exercise of their functions and powers; and observance of the relevant policy statements or plans.⁷³ They are also required to gather information, and undertake or commission research, as is necessary to effectively carry out their functions under the RMA and regulations.⁷⁴
- 2.16 In the event that monitoring reveals action is necessary,⁷⁵ regional councils have a range of powers available including as relevant:⁷⁶
- (a) conducting a review of, and changing, consent conditions;⁷⁷
 - (b) using emergency powers to prevent or remediate any actual or likely adverse effect on the environment or sudden event causing or likely to cause loss of life, injury or serious damage to property;⁷⁸
 - (c) issuing an infringement notice for minor contraventions of the RMA, for instance the s 14 restrictions relating to the taking and use of water carry fines of up to \$1,000;⁷⁹
 - (d) issuing an abatement notice,⁸⁰ or obtaining an enforcement order or interim enforcement order from the Environment Court requiring a person to do or cease doing anything to ensure compliance with the RMA, including any regulations, and resource consents;⁸¹ and
 - (e) bringing prosecution proceedings in the District Court for contravention, or permitting the contravention, of sections 9, 11, 12, 13, 14, and 15 (which impose duties and restrictions in relation to land, subdivision, the coastal marine area, the beds of certain rivers and lakes, water, and discharges of contaminants).⁸²
- 2.17 District councils may, like regional councils, enforce their functions through abatement notices,⁸³ enforcement orders or interim enforcement orders,⁸⁴ the exercise of emergency powers,⁸⁵ and infringement notices or prosecutions.⁸⁶

⁷³ Resource Management Act 1991, s 35.

⁷⁴ Resource Management Act 1991, s 35(1).

⁷⁵ Resource Management Act 1991, s 35.

⁷⁶ A regional council also has the power to issue a water shortage direction: Resource Management Act 1991, s 329.

⁷⁷ Resource Management Act 1991, ss 128-132.

⁷⁸ Resource Management Act 1991, ss 330-331.

⁷⁹ Resource Management Act 1991, ss 343A-343D. Resource Management (Infringement Offences) Regulations 1999.

⁸⁰ Resource Management Act 1991, ss 322-325B.

⁸¹ Resource Management Act 1991, ss 314-321.

⁸² Resource Management Act 1991, ss 338-342.

⁸³ Resource Management Act 1991, ss 322-325B.

⁸⁴ Resource Management Act 1991, ss 338-342.

⁸⁴ Resource Management Act 1991, ss 314-321.

⁸⁵ Resource Management Act 1991, ss 330-331.

⁸⁶ Resource Management Act 1991, ss 343A-343D, ss 338-342; Resource Management (Infringement Offences) Regulations 1999.

3 LGA

- 3.1 Local authorities, that is regional councils and territorial authorities (city councils and district councils),⁸⁷ have both duties and powers under the LGA.⁸⁸ The LGA requires local authorities to: have regard to, amongst other matters, the contribution that core services, including the provision of water, makes to its community;⁸⁹ and assess and plan for the future needs of its community, taking a sustainable development approach.⁹⁰
- 3.2 Local authorities may utilise bylaws to give effect to these responsibilities. Hastings District Council has implemented the Hastings District Council Water Services Bylaw 2014, being Part 21 of the Hastings District Council Bylaws which provides protection for its network corridor, and restricts unauthorised connections to and takings from its water supply network.
- 3.3 The LGA also creates an accountability regime which makes local authorities accountable to the communities they serve through mechanisms for consultation, audited long-term and annual plans, and reporting on performance to the community.⁹¹ From 2015-2016, this annual reporting includes, in accordance with the Non-Financial Performance Rules:⁹²
 - (a) an assessment of the extent to which a local authority's drinking water supply complies with Part 4 (bacteria compliance criteria) and Part 5 (protozoal compliance criteria) of the Drinking Water Standards for New Zealand 2005 (rev 2008) (the **DWSNZ**); and
 - (b) reporting on the number of complaints received about drinking water issues including taste, odour, clarity and the authority's response to any complaints.
- 3.4 Consistent with the accountability scheme in the LGA, the Non-Financial Performance Rules do not include any specified performance targets. It is for each local authority, in consultation with its ratepayers, to determine the level of service it intends to provide.
- 3.5 In addition to the above responsibilities, a district council or regional council that provides drinking water must continue to provide and maintain its capacity to provide drinking water.⁹³ A district council, but not a regional council must also, from time to time, assess the provision of water services⁹⁴ in its district for the purpose of assessing, from a public health perspective, the adequacy of water services including the extent to which the services meet the applicable regulatory standards.⁹⁵ There is a continuing obligation to complete such

⁸⁷ Local Government Act 2002, s 5.

⁸⁸ Local Government Act 2002, s 11.

⁸⁹ Local Government Act 2002, s 11A and s 197(2).

⁹⁰ Local Government Act 2002, s 14.

⁹¹ Local Government Act 2002, ss 67-81, 82-87, 93-99.

⁹² Local Government Act 2002, s 261B.

⁹³ Local Government Act 2002, s 130.

⁹⁴ Water services is defined in s 124 of the Local Government Act 2002 as "means water supply and wastewater services". Water supply is defined as "means the provision of drinking water to communities by network reticulation to the point of supply of each dwellinghouse and commercial premise to which drinking water is supplied".

⁹⁵ Local Government Act 2002, ss 125-126.

assessments but no ongoing time period or frequency of assessment is specified.

4 Health Act

- 4.1 Part 2A of the Health Act,⁹⁶ and the drinking-water standards promulgated thereunder provide the primary mechanisms for protecting the health and safety of people and communities by promoting adequate supplies of safe and wholesome drinking water from all drinking-water supplies.⁹⁷ The Health Act protects drinking water at all stages of the drinking water supply process from the raw source through to supply to consumers.⁹⁸ Throughout this process there are four key players with responsibility for ensuring the drinking-water that reaches the end consumer is safe: the Ministry of Health (**Ministry**); the drinking-water supplier (primarily local authorities⁹⁹); the DWA; and designated officers.

The responsibilities of the Ministry

- 4.2 The Ministry is responsible for improving, promoting, and protecting public health.¹⁰⁰ As safe drinking-water supply is a fundamental pre-requisite of public health, the overview of drinking-water supplies is accordingly a significant aspect of the Ministry's broader responsibility for public health.
- 4.3 The Ministry and Hawke's Bay District Health Board (**DHB**) have entered into a contract under which the DHB provides public health services and, in practice performs some of the Ministry's duties under the Health Act. This contractual arrangement does not alter the legislative framework and DHB has no express obligations under the Health Act. The Public Health and Disability Act 2000 lists the objectives and functions of DHBs as including, inter alia:
- (a) to improve, promote, and protect the health of people and communities;
 - (b) to actively investigate, facilitate, sponsor, and develop co-operative and collaborative arrangements with persons in the health and disability sector;
 - (c) to regularly investigate, assess, and monitor ... any factors that the DHB believes may adversely affect the health status of that population; and
 - (d) to promote the reduction of adverse social and environmental effects on the health of people and communities.¹⁰¹
- 4.4 The Ministry has specific responsibility for: issuing drinking-water standards; appointing, and overseeing the continued appointment of, suitably qualified DWAs and other statutory officers (medical officers of health and health

⁹⁶ Part 2A commenced on 1 July 2008 following passage of the Health (Drinking Water) Amendment Act 2007.

⁹⁷ Health Act 1956, s 69A. The safety of drinking-water provided by way of bottled water is primarily controlled through the Food Act 2014 and associated regulations. This Inquiry is not concerned with bottled water.

⁹⁸ Health Act 1956, s 69U, s 69W.

⁹⁹ New Zealand also has hundreds of private and institutional suppliers of drinking-water.

¹⁰⁰ Health Act 1956, s 3A.

¹⁰¹ New Zealand Public Health and Disability Act 2000, excerpts from sections 22 and 23.

protection officers); maintaining registers of specified drinking-water suppliers, laboratories, and drinking-water agencies;¹⁰² publishing annual reports on compliance with the drinking water standards and Part 2; and declaring drinking water emergencies.

Drinking-water standards

- 4.5 The Health Act provides for the Minister of Health to issue or adopt drinking-water standards.¹⁰³ On 30 October 2008, the Minister of Health gazetted the DWSNZ. These standards remain in force and have not been amended. The 2008 DWSNZ updated voluntary 2005 standards and are based on World Health Organisation (**WHO**) data on the maximum acceptable levels of contaminants in water.¹⁰⁴ The DWSNZ specify:
- (a) the maximum acceptable concentrations of contaminants including E.coli in drinking water;¹⁰⁵
 - (b) criteria for ensuring that monitoring of drinking-water quality is carried out to a consistent standard;¹⁰⁶ and
 - (c) the remedial actions to be taken in the event of the standards being breached.¹⁰⁷
- 4.6 The Ministry has published a companion document to the DWSNZ, the *Guidelines for Drinking-water Quality Management in New Zealand* which provides further guidance to drinking-water suppliers on how to manage their supplies in order to comply with the DWSNZ. These guidelines, unlike the DWSNZ have no legal status. Rather, they are a tool by which the Ministry seeks to give effect to its obligations under the Health Act.
- 4.7 The Minister of Health may amend the DWSNZ but must (unless the amendment is minor, needs to be adopted urgently, or is necessary to deal with transitional issues) consult adequately over a period of at least three years before amending.¹⁰⁸ Additionally, any amendment to the standards that is not urgent, minor or dealing with transitional issues does not come into force until at least two years after it is gazetted.¹⁰⁹

¹⁰² No agencies have been appointed as drinking-water assessors. While not statutorily required, the Ministry of Health maintains a register of individual drinking-water assessors.

¹⁰³ Health Act 1956, ss 69O-69R.

¹⁰⁴ Drinking-water Standards for New Zealand 2005 (revised 2008) at [1.2.3]. The protozoa section of the DWSNZ is based on the United States Environmental Protection Agency's Long Term 2 Enhanced Water Treatment Rule.

¹⁰⁵ For instance see Drinking-water Standards for New Zealand 2005 (revised 2008), section 2, 4, 6, 7, 8, 9, 10, 11, 12, 13.

¹⁰⁶ For instance see Drinking-water Standards for New Zealand 2005 (revised 2008), section 3, 12, Appendix 1, 2.

¹⁰⁷ For instance see Drinking-water Standards for New Zealand 2005 (revised 2008), section 3.2.

¹⁰⁸ Health Act 1956, s 69P.

¹⁰⁹ Health Act s 69R.

DWAs and other statutory officers

- 4.8 The Director-General of Health is required to designate suitably qualified medical practitioners as medical officers of health, and may also designate persons as health protection officers, on such terms and conditions as the Director-General considers appropriate.¹¹⁰ Medical officers of health or health protection officers have specific responsibilities as “designated officers” to ensure compliance with the Act by drinking-water suppliers.¹¹¹ The Director-General may also, on any conditions considered appropriate, appoint as DWAs, any persons including health protection officers who are: appropriately qualified; accredited to international standards; and have in place appropriate conflict management processes.¹¹²
- 4.9 DWAs are accountable to the Director-General for the discharge of their statutory functions,¹¹³ and the Director-General retains oversight of whether the DWA is properly discharging their functions.¹¹⁴ A drinking-water supplier may also request a review by the Director-General of significant decisions made by a DWA.¹¹⁵

Maintaining registers

- 4.10 The Director-General is required to maintain a register of:
- (a) specified drinking-water suppliers;¹¹⁶
 - (b) laboratories recognised by the Director-General as being properly accredited to conduct tests and analyses of water for the purposes of the DWSNZ and the Health Act;¹¹⁷ and
 - (c) agencies, but not individuals, who have been appointed as DWAs.¹¹⁸

Annual report

- 4.11 The Director-General must prepare and publish a report on the quality of drinking-water supplied by each drinking-water supplier and the compliance or non-compliance by those drinking-water suppliers with Part 2A and the DWSNZ.¹¹⁹

¹¹⁰ Health Act 1956, s 69G.

¹¹¹ Health Act 1956, s 69ZN, s 69G.

¹¹² Health Act 1956, ss 69ZK, 69ZN, 69G, 69ZW. The Director-General has authorised DWAs to exercise the powers conferred in s 69ZP(1)(a)-(i) and the powers conferred in s 69ZQ(1) to take assistants and equipment when exercising powers of entry. See <http://www.health.govt.nz/our-work/environmental-health/drinking-water/drinking-water-legislation#register>.

¹¹³ Health Act 1956, s 69ZM.

¹¹⁴ Health Act 1956, s 69ZM.

¹¹⁵ Health Act 1956, s 69ZW.

¹¹⁶ Health Act 1956, s 69J.

¹¹⁷ Health Act 1956, s 69ZY. See further Section 5 below.

¹¹⁸ Health Act 1956, s 69ZX.

¹¹⁹ Health Act 1956, s 69ZZZB. The Director-General does not have to report on neighbourhood drinking-water suppliers.

Emergency and other powers

- 4.12 If the Minister of Health believes on reasonable grounds that there is a serious risk of harm to the health or safety of any people arising from the drinking water supplied to those people (or from a lack of drinking water), the Minister of Health may declare a drinking-water emergency for a maximum of 28 days unless regulations are passed.¹²⁰ The power to declare an emergency is non-delegable.¹²¹ In the event a drinking-water emergency is declared, designated officers may exercise specified emergency powers.¹²²
- 4.13 The Minister of Health may, for the purpose of protecting the public, publish statements relating to any drinking-water emergency.¹²³

Responsibilities of the drinking-water supplier

- 4.14 In New Zealand, the primary suppliers of drinking-water are local authorities (district and city councils). Accordingly, the drinking-water supplier will usually have obligations under the Health Act both as a local authority and as a drinking-water supplier.

Responsibilities under the Health Act as a local authority

- 4.15 A local authority has obligations under the Health Act to improve, promote and protect public health within its district and for those purposes is empowered and directed to:¹²⁴
- (a) appoint environment health officers;
 - (b) inspect its district to ascertain whether there are any nuisances including where any source of water supply which is used or likely to be used for domestic purposes is so placed or constructed, or is in such a condition as to render the water offensive, liable to contamination, or likely to be injurious to health and take steps to secure the abatement or removal of any such nuisance;¹²⁵
 - (c) enforce regulations and create bylaws including for the protection from pollution of any water supply;¹²⁶ and
 - (d) furnish to the medical officer of health reports as to diseases, drinking water, and sanitary conditions within its district as the Director-General or medical officer of health requires.
- 4.16 These obligations on a local authority apply irrespective of whether the local authority has additional obligations as a drinking-water supplier. The

¹²⁰ Health Act 1956, s 69ZZA, s 69ZZB.

¹²¹ Health Act 1956, s 69ZZA(5).

¹²² Health Act 1956, s 69ZZD.

¹²³ Health Act 1956, s 69ZZZC.

¹²⁴ Health Act 1956, s 23.

¹²⁵ Health Act 1956, s 29.

¹²⁶ Health Act 1956, s 64(1)(v).

obligations do not apply to regional councils who have limited Health Act responsibilities.¹²⁷

Responsibilities of a drinking-water supplier

4.17 The key duties imposed on a drinking-water supplier by the Health Act are to:

- (a) take all practicable steps to ensure an adequate supply of drinking water,¹²⁸ notify any risk to that supply,¹²⁹ ensure that drinking water complies with the DWSNZ,¹³⁰ and if the supplier becomes aware that water is not meeting the DWSNZ, to carry out the remedial action set out in the DWSNZ, or all other practicable steps if no remedial action is specified;¹³¹
- (b) take reasonable steps to protect its source of raw water from contamination, to protect all aspects of the drinking-water supply system from pollution¹³² and to ensure the drinking water supplied is wholesome;¹³³
- (c) monitor the drinking water supplied to determine its compliance with the DWSNZ and detect and assess public health risks;¹³⁴
- (d) prepare and implement a water safety plan;¹³⁵
- (e) keep records that contain sufficient information to enable a DWA to assess compliance with Part 2A, the DWSNZ and the water safety plan;¹³⁶
- (f) investigate any complaint received about the quality of drinking water and take action to remediate the problem, if the complaint is upheld;¹³⁷ and
- (g) provide reasonable assistance to DWAs, designated officers, and medical officers of health.¹³⁸

¹²⁷ Health Act 1956, ss 69T, 69ZZP.

¹²⁸ Health Act 1956, s 69S.

¹²⁹ Health Act 1956, s 69T.

¹³⁰ Health Act 1956, s 69V.

¹³¹ Health Act 1956, s 69ZF.

¹³² Health Act 1956, s 69U(2).

¹³³ Health Act 1956, s 69W. Wholesome drinking water is water that is: (1) potable (meaning the water does not contain or exhibit any determinands to any extent that exceeds the maximum acceptable values (other than aesthetic guideline values) specified in the drinking-water standards) and; (2) does not contain or exhibit any determinand in an amount that exceeds the guideline values for aesthetic determinands in the drinking-water standards as being the maximum extent to which drinking water may contain or exhibit the determinand without being likely to have an adverse aesthetic effect on the drinking water: s 69G.

¹³⁴ Health Act 1956, s 69Y.

¹³⁵ Health Act 1956, ss 69Z-69ZC.

¹³⁶ Health Act 1956, s 69ZD.

¹³⁷ Health Act 1956, s 69ZE.

¹³⁸ Health Act 1956, s 69ZG.

- 4.18 The Act does not impose an absolute duty to comply with the DWSNZ, or to require that safe drinking-water be provided. Rather, the Act requires suppliers of drinking water to take “all practicable steps” to comply with the DWSNZ,¹³⁹ and to take “reasonable steps” to ensure the drinking water supplied is wholesome.¹⁴⁰ “Reasonable steps” is not defined. “All practicable steps” is defined as all steps it is reasonably practicable to take in the circumstances having regard to: their availability and affordability; the nature and severity of likely harm; and the state of knowledge about harm of that nature.¹⁴¹

Water safety plan

- 4.19 A supplier takes all practicable steps to comply with the DWSNZ if the “supplier implements those provisions of the supplier’s approved water safety plan relating to the drinking-water standards”.¹⁴² In this way the water safety plan becomes the effective regime which applies to, and defines the responsibilities of, the drinking-water supplier.
- 4.20 A supplier must prepare and implement a water safety plan that identifies the public health risk of its drinking-water supply, identifies critical points in the supply and identifies and implements mechanisms for guarding against these risks.¹⁴³
- 4.21 A water safety plan must be submitted to a DWA for approval, and, following approval, a water supplier must start to implement the water safety plan within one month.¹⁴⁴
- 4.22 A water safety plan can remain in force for a period of up to five years, as stated in the plan.¹⁴⁵ A plan must be reviewed and submitted to a DWA for re-approval no later than two months before the plan is due to expire.¹⁴⁶

Breach of the responsibilities of a drinking-water supplier

- 4.23 As detailed above, a drinking-water supplier has ongoing obligations to monitor compliance, investigate complaints, and rectify any non-compliance with the DWSNZ.¹⁴⁷ Where there is nevertheless a risk of serious harm or breach of the supplier’s duties (including its duties as a local authority) this may lead to: the declaration of a drinking-water emergency by the Minister of Health;¹⁴⁸ the exercise of the functions of the local authority by the Director-General or an order for mandamus;¹⁴⁹ a compliance order from a medical officer of health;¹⁵⁰ a

¹³⁹ Health Act 1956, s 69V.

¹⁴⁰ Health Act 1956, s 69W.

¹⁴¹ Health Act 1956, s 69H.

¹⁴² Health Act 1956, s 69V.

¹⁴³ Health Act 1956, ss 69Z-69ZC.

¹⁴⁴ Health Act 1956, s 69Z.

¹⁴⁵ Health Act 1956, s 69ZB.

¹⁴⁶ Health Act 1956, s 69ZC.

¹⁴⁷ Health Act 1956, s 69F, Drinking-water Standards for New Zealand 2005 (revised 2008), s 3.1.2.

¹⁴⁸ Health Act 1956, s 69ZZA.

¹⁴⁹ Health Act 1956, ss 123, 123A.

¹⁵⁰ Health Act 1956, s 69ZZH(1)(a).

direction from a designated officer requiring specific action;¹⁵¹ and criminal prosecution by a designated officer.¹⁵²

- 4.24 There are criminal penalties provided for breach of many of the duties on drinking-water suppliers under the Health Act including the duties to protect sources of drinking water, take all practicable steps to comply with drinking-water standards, monitor drinking water, prepare and implement a water safety plan, and take remedial action if drinking-water standards are breached.¹⁵³ Additionally, it is an offence to contaminate raw water or to pollute a water supply.¹⁵⁴

Responsibilities of DWAs

- 4.25 The functions of DWAs are to:

- (a) determine whether drinking-water suppliers are complying with the requirements in Part 2A Health Act and the DWSNZ and implementing their water safety plans;¹⁵⁵
- (b) as set out above, verify and, if appropriate, approve a drinking-water supplier's water safety plan;¹⁵⁶
- (c) check whether drinking-water suppliers are recording and responding appropriately to complaints;¹⁵⁷ and
- (d) assess and authorise persons to undertake testing of water (if that testing is not undertaken by a recognised laboratory).¹⁵⁸

- 4.26 For the purposes of performing their functions DWAs have a range of powers including to: enter land owned, occupied, or used by the drinking-water supplier; require information from the drinking-water supplier or any other person; and conduct inspections and tests, including taking samples.¹⁵⁹ DWAs do not have enforcement powers but must notify any non-compliance to a designated officer and the drinking-water supplier and provide the necessary information to the Director-General.¹⁶⁰

¹⁵¹ Health Act 1956, s 69ZO.

¹⁵² Health Act 1956, s 69ZZR.

¹⁵³ Health Act 1956, s 69ZZR. Not all of the duties on water suppliers set out in the Health Act have corresponding offence provisions. For example, the failure to comply with s 69S, the duty to take all practicable steps to ensure that an adequate supply of drinking water is provided to each point of supply to which that supplier supplies drinking water, is not an offence.

¹⁵⁴ Health Act 1956, s 69ZZO.

¹⁵⁵ Health Act 1956, s 69ZL(1)(a).

¹⁵⁶ Health Act 1956, ss 69Z, 69ZL.

¹⁵⁷ Health Act 1956, s 69ZL(1)(H).

¹⁵⁸ Health Act 1956, s 69ZL(1)(e)-(f).

¹⁵⁹ Health Act 1956, s 69ZP.

¹⁶⁰ Health Act 1956, s 69ZL(1)(b)-(d).

Designated officers

- 4.27 Designated officers are medical officers of health or health protection officers.¹⁶¹ Designated officers have broad responsibility for enforcing compliance by suppliers with Part 2A.¹⁶² Their functions include:
- (a) ensuring any requirement imposed or direction given by a DWA,¹⁶³ or a compliance order issued by a medical officer of health, is complied with;¹⁶⁴
 - (b) investigating the commission of offences in respect of drinking-water and bringing proceedings in respect of those offences;¹⁶⁵ and
 - (c) where a designated officer believes on reasonable grounds that there is a serious risk to public health arising from drinking water, directing a drinking-water supplier to take immediate action, including to stop the supply of water.¹⁶⁶ Designated officers are under a duty to take all practicable steps to consult with suppliers before exercising this power.¹⁶⁷ The exercise of such a power is deemed not to contravene certain sections of the RMA if, before the exercise of the power, the designated officer consults with the relevant consent authority and takes account of any views expressed by the authority about the way in which the power is to be exercised, and obtains the consent of the Director-General.¹⁶⁸
- 4.28 The drinking-water supplier must comply with any requirement of a designated officer.¹⁶⁹
- 4.29 For the purposes of performing their functions designated officers have a range of powers including to: enter land owned, occupied, or used by the drinking-water supplier; require information from the drinking-water supplier or any other person; and conduct inspections and tests, including taking samples.¹⁷⁰

Responsibilities of medical officers of health

- 4.30 A medical officer of health may serve a compliance order on a drinking-water supplier:
- (a) requiring the supplier to stop doing, or prohibiting the supplier from doing, anything the medical officer believes on reasonable grounds contravenes or is likely to contravene Part 2A of the Health Act or will or may create a risk to public health arising from the drinking-water supply; or¹⁷¹

¹⁶¹ Health Act 1956, s 69ZN, s 69G.

¹⁶² Health Act 1956, s 69ZN and s 69ZO.

¹⁶³ Health Act 1956, s 69ZN(a)(i).

¹⁶⁴ Health Act 1956, s 69ZN(a)(ii).

¹⁶⁵ Health Act 1956, s 69ZN(c).

¹⁶⁶ Health Act 1956, s 69ZO(5).

¹⁶⁷ Health Act 1956, s 69ZO(4).

¹⁶⁸ Health Act 1956, s 69ZO(3).

¹⁶⁹ Health Act 1956, s 69ZO(5).

¹⁷⁰ Health Act 1956, s 69ZP.

¹⁷¹ Health Act 1956, s 69ZZH(1)(a).

- (b) requiring the supplier to do something the medical officer believes, on reasonable grounds, is necessary to ensure compliance by, or on behalf of, that person with Part 2A, or prevent, remedy, or mitigate any risk to public health arising from that person's drinking-water supply.¹⁷²
- 4.31 A drinking-water supplier must comply with the order, subject to a right of appeal,¹⁷³ and, unless the order directs otherwise, pay all the costs and expenses of complying with it.¹⁷⁴
- 4.32 In addition, medical officers of health have functions and duties in respect of infectious and notifiable diseases which include campylobacteriosis under Part 3 of the Health Act.¹⁷⁵ A medical officer of health can take steps to prevent the outbreak or spread of an infectious disease in a state of emergency, when an epidemic notice is in place, and when authorised by the Minister of Health.¹⁷⁶

5 Laboratories and Testing

- 5.1 Laboratories and testing fall within the Health Act regime. The Director-General may recognise appropriately accredited laboratories to conduct tests and analyses of raw water and drinking-water for the purposes of Part 2A of the Health Act and the DWSNZ.¹⁷⁷ All such tests and analyses must be performed at a recognised laboratory unless it is not reasonably practicable to do so or the Director-General has approved an alternative procedure.¹⁷⁸
- 5.2 Laboratories may be recognised on any terms and conditions the Director-General considers appropriate. The Director-General must maintain a register of recognised laboratories containing certain details relating to each laboratory, including any such terms and conditions.¹⁷⁹ The register must also specify the testing methods and determinands in respect of which a laboratory has expertise and appropriate testing equipment.¹⁸⁰ Laboratories are accordingly not registered in a general sense, their registration relates to particular determinands and testing methods.
- 5.3 Most laboratories are accredited by International Accreditation New Zealand (IANZ). IANZ has specified criteria against which it assesses laboratories for accreditation, which focus on matter such as testing methods, management systems, documentation, proficiency of staff and complaints procedures.
- 5.4 The DWSNZ may specify performance standards that drinking-water suppliers, drinking-water assessors, and recognised laboratories are required to meet when sampling and testing raw water or drinking water. They may also specify criteria and procedures for demonstrating compliance with their standards,

¹⁷² Health Act 1956, s 69ZZH(1)(b).

¹⁷³ Health Act 1956, s 69ZZK.

¹⁷⁴ Health Act 1956, s 69ZZI.

¹⁷⁵ Health Act 1956, pt 3, sch 1, p 1, s A.

¹⁷⁶ Health Act 1956, ss 70-71.

¹⁷⁷ Health Act 1956, ss 69ZY(1) and 69ZY(2).

¹⁷⁸ Health Act 1956, s 69ZZ(1).

¹⁷⁹ The register can be viewed on the Institute of Environmental Science and Research Limited website: <http://www.esr.cri.nz/water-science/our-services/drinking-water/register-of-suppliers>.

¹⁸⁰ Health Act 1956, ss 69ZY(3)-(5).

including the methods or tests by which the levels of determinands present in raw water or drinking water must be calculated or ascertained.¹⁸¹

- 5.5 Specifically, the DWSNZ prescribe how certain sampling and testing must be undertaken. For example, samples for E.coli testing must be collected aseptically, using sodium thiosulphate for dechlorination if necessary, transferred and stored in appropriate conditions, and tested within a certain timeframe.¹⁸²
- 5.6 Where any test or analysis indicates non-compliance with a maximum acceptable value in the DWSNZ, the operator of the laboratory or the person who performs the test or analysis is required to forward the results to the Director-General as soon as practicable after the test or analysis is conducted.¹⁸³ In practice, such results are forwarded instead to a DWA.
- 5.7 To remain registered, laboratories are required to maintain their accreditation and to meet any terms and conditions the Director-General considers appropriate.¹⁸⁴ IANZ manages the ongoing accreditation of most laboratories. This involves annual surveillance checks of the proficiency and management systems of accredited laboratories; three-yearly full technical reassessments; and special assessments where evidence suggests this is necessary. Laboratories are required to inform IANZ of any changes to their operations or senior personnel. IANZ has suspension or withdrawal processes in the event of non-compliance with its accreditation criteria. However, there is no provision for offences or penalties in relation to recognised laboratories under the Health Act regime.
- 5.8 Neither DWAs nor designated officers have any statutory functions or powers in relation to recognised laboratories. DWAs are required to assess the competency and authorise persons to analyse samples of raw water or drinking water and to calibrate equipment used to monitor raw water, but not in relation to recognised laboratories. Similarly, DWAs and designated officers may take any necessary steps to verify the competence or persons to perform tests and analyses of raw water or drinking water, but not where such tests and analyses are performed by a recognised laboratory.¹⁸⁵
- 5.9 Water sampling is either carried out by laboratory staff or personnel outside of laboratories, such as council officers. As indicated above, performance standards and criteria and procedures for demonstrating compliance are enabled by the Health Act and contained in the DWSNZ and, relevantly, DWAs and designated officers have statutory functions and powers in relation to tasks required to ensure compliance with the Health Act regime that are undertaken outside of laboratories.

¹⁸¹ Health Act 1956, ss 69O(2)(e) and 69O(2)(c).

¹⁸² DWSNZ, p 28.

¹⁸³ Health Act 1956, s 69ZZ(2).

¹⁸⁴ Health Act 1956, s 69ZZ(3) and (4). Where laboratories are accredited under subpart 3 of Part 1 of the Standards and Accreditation Act 2015, under s 40 of that Act it is an offence to make false statements or representations about being accredited. (\$5,000)

¹⁸⁵ Health Act 1956, ss 69ZL(1)(e), 69ZL(1)(f), 69ZL(2) and 69ZP(1)(h).

APPENDIX 5

SUMMARY OF AQUIFER FEATURES

Heretaunga Plains Aquifer

The Heretaunga Plains, an area of about 320 km², consist of about 5 to 7 primary aquifers that supply water to Hastings, Napier, Havelock North, Flaxmere, coastal and inland communities. Groundwater is used for about 85% of the requirements for public supply, agricultural, industrial and domestic use.¹⁸⁶

The plains cover a deep basin formed by fault lines filled during the last 250,000 years with alluvial sediments deposited by the Tutaekuri, Ngaruroro and Tukituki Rivers and coastal lagoon, estuarine and embayment deposits. The sediments typically comprise poorly sorted gravels up to 900m deep, consisting of heterogeneous layers of coarse permeable gravel beds alternating with fine alluvial beds. The permeable gravel beds form aquifers which in plan reflect their formation as meandering river channels. Fine grained estuarine and alluvial deposits nearer the coastline have formed near surface aquitards confining groundwater as it moves to the east.¹⁸⁷

Te Mata Aquifer and Surface Water Catchment

The Brookvale Road bores are situated in the Te Mata aquifer on the eastern edge of the Plains, located within fan gravels of the Tukituki River which extend north to Whakatu and cover about 20 km² with an average depth of 20 m.

HDC has other drinking water supply bores at Napier Road, Eastbourne Street (5), Frimley, Wilson Road and Portsmouth Road.

In the immediate vicinity of the Brookvale Road bores, the geological profile generally comprises a clay and silt aquitard from 2 to 3 m thickness extending down from the surface. The aquitard overlies a gravel aquifer comprised of interbedded layers of gravel and sandy gravel extending to approximately 20 - 25 m below ground. Tightly packed or clay bound gravels underlie the gravel layers which are likely to retard vertical groundwater flow. Where the bores have been drilled, the aquifer has been described as 'semi-confined' exhibiting evidence of interaction with the surface environment.

¹⁸⁶ HBRC Technical report EMI 0406 MWH 012.

¹⁸⁷ BOE HBRC 4 (Hughes) para 21.

The aquifer receives recharge from both the Heretaunga Plains main aquifer and from the adjacent Te Mata limestone aquifer. Piezometric mapping indicates groundwater flow to be from the southwest towards the northeast.

The Te Mata aquifer and similar aquifers in New Zealand, by virtue of their high transmissivities and alluvial depositional environment, are considered to be heterogeneous with localised highly permeable channels. These channels potentially provide high velocity transport routes for contaminants.¹⁸⁸

It is axiomatic that water will flow within these channels and its direction of flow, both horizontally and vertically, will depend on pressure gradients. Should these gradients change, such as the zone of influence from pumping, so will the direction of flow.

There is also experience in other parts of NZ that the flow characteristics of aquifers can be affected by earthquakes.

Surface Water Catchment

Key surface water features within the Brookvale Road area are:

- Shallow swale drains run along the northern and southern sides of Brookvale Road
- The Mangateretere Stream crosses beneath Brookvale Road about 90 m northeast of BV1, The road culvert invert is higher than the streambed, creating an ephemeral pond on the south-eastern side. This stream was deepened and extended in the late 19th century to improve drainage.
- A stream runs along the northern boundary of 174 Brookvale Road (Te Mata Mushrooms), with an ox-bow section which was filled in and the main stream channel realigned in early 2016. The stream flows through a box culvert beneath Brookvale Road west of BV3.

Surface-Groundwater Interaction

Aquifer fed springs occur in the Mangateretere Stream in the immediate vicinity of Brookvale Road. The aquifer is shallow with discrete locations where the stream cuts through the confining layer between the aquifer and the stream bed allowing these artesian springs to develop.

¹⁸⁸ Evidence Dr Gyopari 23.1.17.

APPENDIX 6

Summary of Brookvale Road Bores

The Brookvale Road bore field was initially developed by the Havelock North Borough and Hawke's Bay County Councils to replace the St Andrews Road bore source which had water quality problems associated with iron, manganese and odours.

They were constructed within the road reserve in the county, (rather than within an off-road lot) presumably to expedite construction and minimise costs. The reason for their exact location, in particular relative to the Mangateretere Stream, is unknown.

Bore number one (BV1) was drilled in 1982 and number 2 (BV2) in 1986. Both were drilled by Hill Welldrillers 1980 Ltd.

The casings were driven 'tight' into the formation and cleaned by either a sand pump or cable tooling. Once at depth, the well screen was installed and the casing jacked back to expose the screen to the water bearing gravels, before the wells were developed using a surging method.

There is only a single casing in each well and this is not externally grouted, grouting being considered unnecessary with the construction method used.

This construction method was common practice at the time and remains so in the greater Hawke's Bay area today.

Bore number 3 (BV3) was constructed for the Hastings District Council¹⁸⁹ in 1998 by Honnor Drilling Ltd. The method of construction is unknown.

The bores are non-artesian with water drawn by means of submersible pumps. Each bore has two non-return valves, a foot valve at the base of the pump and a check valve within the headworks.¹⁹⁰

The key parameters of all three bores are shown on Table 1. A long section showing the bores, ground conditions and water levels is shown in Figure 1.

BV1 and BV2 were constructed with the well headworks entirely below ground level to facilitate a simple single bend connection to the rising main (also a common practice at the time) with the headworks accessed via a subterranean chamber.

¹⁸⁹ Hastings District Council was formed by local government reorganistaion on 1 November 1989 amalgamating the Hastings City Council, Havelock North Borough Council and Hawke's Bay County Councils. All assets and liabilites from the antecedent authorities passed to the new entity.

¹⁹⁰ In 2015 a non-return valve was installed within the chamber on BV2, however during installation an undocumented non-return valve was discovered buried outside the chamber.

BV3 was constructed with the entire headworks above ground. Both BV1 and BV2 share a common rising main to the water treatment facility. BV3 has a separate main.

Bore	BV1	BV2	BV3
Construction date	Dec-82	Aug-86	Jun-98
Constructed by	Hill Welldrillers 1980 Ltd	Hill Welldrillers 1980 Ltd	Honnor Drilling Ltd
Bore diameter (mm)	400/320 ¹⁹¹	400	400
Drilled depth (m below ground level)	24	24	35
Current depth (m below ground level)	24	24	28.5
Screened intervals (m below ground level)	11.4 – 17.4	13.0 – 19.0	15.5 – 20.0
	19.0 – 22.0	21.0 – 24.0	22.0 – 26.5

Table 1: Bore Details

The sampling points on both BV1 and BV2 are downstream of the non-return valves at each wellhead, meaning that samples are effectively drawn from a common manifold and it is not possible to categorically ensure that a particular sample is unique to a particular bore.

In August 1998, in response to a previous contamination incident, the headworks chambers on both BV1 and BV2 were raised above ground level to improve their security. Budget provision was made to raise the headworks above ground but this did not proceed, possibly because of the uncertainty of consent renewal in 2008 and the relatively short term of the current consent (expiring in 2018).

The headworks chambers for both consist of a lower concrete 2m diameter manhole ring with the floor concreted in surrounding the casing, a manhole riser extending the chamber above ground level and a precast circular concrete lid with a lockable hatch.

There are penetrations in the lower manhole ring for the rising main, the sump pump rising main passes through the joint between the base and riser, and there are cable ducts penetrating the walls.

The water tightness of the floor to casing, floor to lower ring, lower ring to riser, and riser to lid joints and the numerous penetrations is unknown, but there are known leakage paths around the rising main/wall penetration on BV1 and down the cable duct on BV2.

¹⁹¹ The upper sections of the casing are 400mm diameter reducing to 320 mm at the level of the screens.

The areas around the chambers do not have a constructed concrete apron but are sealed as extensions of the adjacent road surfacing. The condition of this seal is variable. BV3 has a concrete pad surrounding the casing, draining towards the adjacent roadside drain.

Each headworks chamber has two sump pumps, a lower one mounted in a 300 mm diameter recessed sump constructed in the floor of the chamber and a higher one within the main chamber. Both pumps use a common rising main which discharges to the roadside drains.

Both sump pumps are controlled by fixed probes and a local controller. The start levels for the two pumps are different but the stop levels the same. There is also a high level alarm using a mercury tilt switch. The lower pumps are not telemetered, but both the upper pumps and the high level alarms are connected to the SCADA network.

Each bore has an independent power supply with pole mounted transformers and there is no standby generation. The SCADA network has a battery back-up capable of monitoring the high level alarm and communications status. (A schematic showing the current configuration of BV1 and BV2 is attached below.)



APPENDIX 7

Table of Waterborne Outbreaks in New Zealand

Waterborne Outbreaks in New Zealand 1984 - 2015¹⁹²

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Queenstown, 1984	Gastroenteritis	(3,500)	B, D	Thorstensen, 1985	Reticulated drinking-water supply of chlorinated lake water implicated. The cause of the outbreak thought to be a sewer overflow which discharged sewage into a creek which entered Lake Whakatipu within 200m of the intake to the public water supply, which was not adequately treated. The outbreak abated when the sewage overflow was noticed and remedied. Faecal coliforms were detected in all water samples taken at the time and, given this scenario, it is likely that a range of waterborne pathogens were involved.
Ashburton, 1986	Campylobacter	19	B, D	Brieseman, 1987	The Ashburton water supply was fed from several bores and a recently installed infiltration gallery on the Ashburton River. Although the water was drawn from the infiltration gallery and was served by a chlorination plant, it was normal practice in the borough to only chlorinate the water "as required", ie when the river level was high after heavy rain. The bores drew water from 3-60m depths and were not chlorinated. Heavy rain fell on the night of 12 March, yet chlorination did not occur until 9am the following morning, at which time the inlet water contained a high concentration of coliforms. It is likely that the delay in the commencement of chlorination may have contributed to the outbreak. No samples were taken of the chlorinated water, nor were water samples tested for the presence of campylobacter. However, the reticulated water was observed to be quite turbid and therefore a reduction in the effect of chlorination was likely and given the large numbers of livestock present in the catchment area, the likelihood of campylobacter being present in the water was high.

¹⁹² This table is based on "Table 1 Waterborne Outbreaks in New Zealand 1984-2006" and Appendix 1 of the Ministry of Health's report, Andrew Ball "Estimation of the burden of Waterborne Disease in New Zealand" (November 2006) together with "Table 1.3 Documented waterborne outbreaks in New Zealand, with probable links to drinking water, 2005-2013" contained in the Ministry of Health's Drinking-water Guidelines. With the assistance of ESR the table has been expanded in the course of the Inquiry's investigation.

¹⁹³ Confirmed cases are listed; probable cases are noted in round brackets; and where the number of people likely exposed is known, this is included in square brackets.

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Canterbury, camp, 1990	Campylobacter	42	B, C	Stehr-Green <i>et al.</i> , 1991	The case-control study implicated contaminated drinking water as the source of infection, a conclusion that was backed up by microbiological evidence of faecal contamination that could be explained by contamination of two of the springs by surface runoff and lack of water treatment.
Havelock North, 1991	Campylobacter	12	B	M Hart, Health Care Hawkes Bay, <i>pers. comm.</i>	Investigation revealed no common source but drinking water was suspected, although faecal coliforms were not detected in routine surveillance samples. Subsequently, a potential for back siphoning was discovered where water may have entered the reticulation system via a roadside drain contaminated with a high level of faecal coliforms.
Northland, 1992	HAV	30	B	Calder & Collison, (1992)	Non-reticulated drinking-water supply possibly linked to outbreak, but equally as likely was person-to-person spread or consumption of fish. The drinking water at a tangi was supplied from rainwater tanks and untreated water and water from a slow-flowing creek which may have been contaminated by cattle or seepage from septic tanks.
Lonsdale Park, Northland, 1992	Campylobacter	14	B	Jarman & Hennevald (1993)	The water supplies were all highly contaminated. Faecal coliform counts in the untreated roof water camp drinking-water supply and the farm supply used at the overnight camp were 225 and 900/100 mL respectively. Campylobacter was not detected in any of the water or milk samples. The investigation was inconclusive but implicated raw milk and drinking water as vehicles of infection.
Waimate, 1992	Campylobacter	?	B	R Parr, Crown Public Health, Timaru, <i>pers. comm.</i>	While pets and food were not ruled out as sources of infection, the water supply was suspected as the chlorinator was inoperative between at least from 24-27 February. Subsequent analysis of the source water before chlorination resulted in faecal coliform concentrations of 92 and >240 /100mL. However, the water was not tested for campylobacter.

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Dunedin	Giardia	50*	B, C	Fraser <i>et al.</i> , 1991	Fraser & Cooke (1991) conducted a cohort study to determine the incidence of laboratory-confirmed giardiasis in Dunedin. The incidence of giardiasis was higher (RR = 3.3; CI _{95%} = 1.1 – 10.1) in the area of Dunedin where the drinking water contained no effective protozoal treatment (i.e. 23 µm filtration and chlorination only) compared with the remainder of the city, whose water was fully treated (i.e. coagulation, flocculation, dual media filtration and chlorination).
Hawkes Bay, youth camp, 1992	Campylobacter	97	B, C?	CDNZ 92(1):11-12	No risk factors were identified except that the people who developed symptoms consumed more water each day than those not affected (p=0.01). The source of drinking water at the camp was untreated bore water and was found to contain between 2 and 11 faecal coliforms /100mL, although campylobacter was not detected in the two bore water samples tested subsequently.
Auckland, 1993	Giardia	34	B	Thornton <i>et al.</i> , 1993	Contaminated water from an illegal connection between an outflow drain and a kitchen tap was implicated although the source of infection was not conclusive as the outbreak investigation could not definitely exclude the possibility of a food handler as the source.
Raurimu, 1994	Campylobacter	16	B	D Vince, Ruapehu District Council, <i>pers. comm.</i>	Outbreak linked to a private non-chlorinated water supply at Raurimu.
Fairlie, 1994	Campylobacter	6	B	R Parr, Crown Public Health, Timaru, <i>pers. comm.</i>	Drinking water was suspected because there was heavy rain on 19 March and the water, which is obtained from a spring adjacent to the Opihi River, develops increased turbidity during and after heavy rain that can reduce the efficacy of chlorination.
Hutt Valley, holiday camp, 1995	Gastroenteritis	(100)	B, D	A Bichan, Hutt Valley Health, <i>pers. comm.</i>	The causal agent was not identified but 30 faecal coliforms/100mL were detected in the drinking water.
Tauranga district, 1995	Cryptosporidium	?	B	TM Fowles, East Bay Health, <i>pers. comm.</i>	Contamination of storage tank. Drinking water was supplied from a bore and was untreated except for an aged filter that was totally clogged at the time of sampling. Faecal coliforms were not detected in the bore water but counts up to 54/100 mL were observed in the storage tank. The storage tank was open and was frequented by birds.

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Ashburton, 1996	Campylobacter	19 (33)	B, D	Holmes, 1996; Lees, 1996; R Parr, Crown Public Health, Timaru, <i>pers. comm.</i>	The only common feature was consumption of drinking water from the Ashburton town supply. On 6-8 February, during three days of heavy rain, there was chlorinator failure at the infiltration gallery that resulted in the reticulated water supply not being chlorinated for at least 24 hours during a time when the river water was turbid and probably contained a high concentration of faecal material from the surrounding agricultural areas. The onset period of most patients was consistent with an initial infection during this period. Campylobacter and high faecal coliform counts were detected in water sampled from the gallery intake on 4 March, following another period of heavy rain on the previous two days, which further substantiated the hypothesis of a waterborne source of this outbreak.
Mt Hutt, 1996	Norovirus	59	B, D	Brieseman <i>et al.</i> , 2000	Drinking-water considered source. All water samples tested were free of faecal coliforms but F-RNA bacteriophage (a viral indicator of faecal contamination) was isolated from one of the water filters and enterovirus was detected in another, indicating faecal contamination. The water supply was taken from a river downstream of the sewage discharge and stored for several weeks in a frozen lake before being used to supplement the reticulation system. It was postulated that the faecal indicator bacteria in the source water were removed by the protracted storage and UV treatment, whereas the long-lived pathogens such as viruses survived.
Auckland, 1996	Salmonella typhimurium 1	2	A, D	Simmons & Smith, 1997	Private household drinking-water supply of untreated roof water contained faecal coliforms.
Mt Arthur, 1996	Suspected viral gastroenteritis	6 (69?)	B, C	M Molloy, Nelson-Marlborough Health, <i>pers. comm.</i>	Consumption of untreated rainwater at the Mt. Arthur hut in September 1996. No microbiological analysis was performed on water or clinical specimens.
Denniston, 1996	Giardia	4	B, D	C Bergin, Crown Public Health, <i>pers. comm.</i>	The common link was that all consumed water from the Denniston water supply, which is unregistered, untreated, and unprotected. While the water not tested for giardia, the water had a turbidity of 8 NTU.

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Wainui, 1997	Campylobacter	6 (67)	A, C	Bohmer, 1997	Consumption of camp drinking water was identified as the likely vehicle of infection (relative risk 1.51, CI95% 1.07-2.12). The drinking-water supply was drawn from a bore without treatment and contained 95 faecal coliforms / 100 mL but was not tested for pathogens. However, campylobacter was isolated from the stream nearby and back-flow of stream water into the camp drinking-water supply was observed during periods of high demand.
Waikato district, 1997	Cryptosporidium, giardia	8 (80) [3000]	B, D	D Sinclair, MOH, Health Waikato, pers. comm. EpiSurv	Incident considered to be caused by drinking-water supply as most cases followed two turbidity spikes in the drinking-water supply and reports of taste problems and discoloration of the water supply. However, analysis of the chlorinated supply revealed no faecal coliforms and no cryptosporidium oocysts.
School camp near Christchurch, 1997	Campylobacter	61		http://moh.govt.nz/moh.nsf/Files/pvol4no8/\$file/pvol4no8.pdf	The risk ratio in this investigation, although weak, suggests the camp water supply as the likely source of the outbreak. This indication is supported by the results of the water testing and by the fact that there were no further cases after the drinking water was boiled. Laboratory testing revealed 95 faecal coliforms/100 ml in the camp water, and campylobacter in the stream water. Further investigation into the water supply revealed several deficiencies, including back-flow of stream water into the camp supply during times of high demand.
Te Aute College, Hawke's Bay, 2001	Campylobacter	137	A, D	Inkson, 2002.	Campylobacter were isolated in both pre- and post-treated drinking water and from the faeces of cattle which had access to the source water. The UV treatment system malfunctioned at about the time of the outbreak.
Hawke's Bay, 2001	Giardia	3 (7)		EpiSurv	Possible source Waikoa drinking-water supply (100 E.coli per 100ml), although those who were ill also swam in Lake Tutira which has a lot of water fowl, and in a home swimming pool.
Canterbury, 2001	Campylobacter	28 [1700]		EpiSurv	Burnham military camp water supply transgressed Drinking-water Standards. One person was hospitalised.
Canterbury, 2002	Norovirus	2 (15)		EpiSurv	Hotel tank water supply contaminated. Water supply had E coli at levels of 26-28 per 100ml.

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Masterton, 2003	Cryptosporidium	5		http://www.stuff.co.nz/dominion-post/news/local-papers/wairarapa-news/83473033/havelock-water-shock-reminder-of-2003-wairarapa-contamination	Cryptosporidium detected in water supply and boil water notice issued.
Banks Peninsula, 2004	Shigella	5 (18)	B, D	Morrison & Smith, 2005	A break in the septic tank effluent pipe was discharging effluent directly above the intake of the spring-fed drinking-water supply. The drinking water was tested and found to contain E.coli but was not tested for the presence of Shigella. Initial cases most likely water-borne but person-to-person spread became more likely as the outbreak progressed.
Camp near Nelson, 2004	Campylobacter	3 (13)	B	Todd, 2005	A campylobacteriosis outbreak at a self-catered camp near Nelson occurred during late December of 2004 and was reported by Todd (2005). Drinking-water for the camp was obtained from a spring and was untreated other than being passed through a coarse filter before entry to three storage tanks. Spring, tap and tank water samples were tested for E.coli resulting in counts of <1, 2 and 11/100 mL respectively. The former two were also tested for the presence of campylobacter but with negative results. It is difficult to assess whether the likelihood of this being a waterborne outbreak because of the poor response rate and the commensurate inability to assess the roles of the possible risk factors.
Bridge Valley, camp, 2005	Campylobacter	3 (10)		EpiSurv, Drinking-water Guidelines	Drinking-water supply implicated.

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Hawke's Bay school camp, 2005	Campylobacter	6 (34)		NZPHSR https://surv.esr.cri.nz/PDF/surveillance/NZPHSR/2006/NZPHSR2006March.pdf EpiSurv	Although recreational water samples taken nine days after the rainfall event complied with the Microbiological Water Quality Drinking-water Guidelines for Marine and Freshwater Recreational Areas, it is likely that the recreational water was heavily contaminated at the time of the camp. The questionnaire survey showed high risk ratios for exposure to recreational water. Logistic regression analysis of survey data showed strong statistical evidence for river exposure as the source. This is the most likely source of infection for most camp attendees. The drinking water on the property came from two separate springs. There was no treatment system in place at either supply and both springs were unprotected from access by animals and surface runoff. E.coli was found in both drinking water sources (57 and 8.6 MPN/100ml E.coli). No campylobacter were isolated from either source.
Med student camp, Canterbury, 2005	Norovirus	13 (8)		EpiSurv, Drinking-water Guidelines	Campylobacter found in tap water in kitchen.
Cardrona ski field, 2006	Norovirus	(218)	A, D	D Bell, MOH, Public Health South, <i>pers. comm.</i>	Drinking-water supply was contaminated by septic tank and effluent run off. The usual drinking-water supply was being supplemented with water from a stream with the intake being downstream of the septic tanks and the effluent holding pond. An effluent overflow was reported to have occurred 1-2 days before first reported illness. Drinking-water supply was not registered, treatment did not comply with the requirements of the Drinking-water Standards, some water supplied bypassed the treatment process. Water testing revealed excessive E.coli (range 7.4 – 220/100mL) in the drinking-water supply.
2006, School camp, Te Kuiti	Campylobacter	2 (18)		EpiSurv, Drinking-water Guidelines	

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
School camp, Wellington, 2007	Gastroenteritis	152 [250]		NZPHSR https://surv.esr.cri.nz/PDF_surveillance/NZPHSR/2007/NZPHSR200712Dec.pdf	Source of outbreak not known. Analysis of drinking water found no free available chlorine and samples from three areas of the camp demonstrated high E.coli levels in breach of the Drinking-Water Standards. Norovirus was not demonstrated in the drinking water. It is possible that viral contamination of the drinking water was beneath the detection threshold of microbiological testing or was no longer present when the samples were collected. Management of the swimming pool was also inadequate and not consistent with the NZS 5826/2000.
Springston, 2008	Campylobacter	5 (44)		EpiSurv http://www.stuff.co.nz/national/health/381041/Springston-not-so-crook-with-new-water-bore	Previous transgressions of Drinking-Water Standards in February and March 2008. It is suspected the existing well had a break in the well casing enabling contamination to occur. New well commissioned on 11 March 2008, no new cases since that date.
South Canterbury, youth camp, 2008	Campylobacter	2 (13)		Episurv	Water sourced from stream.
Turoa ski field, 2009	Gastroenteritis	93	B, D	Lucy Thompson "A comparison of the microbiological quality of drinking water of urban and semi-urban dwellings in the Richmond district of New Zealand" (2013) O'Connor, Wood & Butters 2010	Ski field drinking-water supply. Untreated, roof-collected rainwater used as drinking-water supply.

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Golden Bay Holiday Park, 2010	Norovirus	(120)		Drinking-water Guidelines, Otago Daily Times https://www.odt.co.nz/news/national/golden-bay-campsite-ordered-boil-water-after-contamination	High levels of E.coli contamination found at the mouth of the Tukurua Stream, which runs through the campground and in the camp's drinking water.
Waiouru Commanders' Course, 2010	Campylobacter	1 (15)		EpiSurv	Drinking untreated water.
November 2011, Runanga	Campylobacter	4		NZPHSR (Mar 2012)	Runanga's drinking-water supply is sourced from two unsecure bores that are surrounded by farming properties, and the supply is untreated. Plans for the treatment plant to be improved to incorporate treatment with ultraviolet irradiation have been proposed because the community has been resistant to chlorination as a standard treatment practice. Severe weather event with torrential rain and surface flooding. Sample taken from the Runanga supply after the storm was positive both for E.coli and total coliforms. The drinking-water supply was not tested for campylobacter as chlorination was already in place by the time the cases were reported. The microbial contamination of the water supply and timing of disease onset suggested that the local drinking-water supply was the most likely cause of the outbreak.

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Cardrona, Hotel, 2012	Norovirus	52		ESR Annual Outbreak Summary 2012 NZMJ 12 Dec 2013, vol 126 (1387) "Norovirus contamination of a drinking-water supply at a hotel resort"	Norovirus outbreak associated with consumption of contaminated drinking water at a hotel. Problems with hotel water system management and wastewater, and specifically with the groundwater intake separation distance contributed to the outbreak. Observed that "the current legislation does not adequately address drinking water and wastewater risk management for small resident populations that have large seasonal influxes due to tourism." The initial registration was for single title self-supply but subsequent development and issuing of unit titles should have obligated the registration of the resort water supply as a small community drinking-water supply with attendant monitoring recommendations. This was recommended in 2008 but never actioned.
Campground, March 2012, Hawke's Bay	Cambylobacter	28		NZPHSR Sept 2012	Camp's drinking water was the source. The camp's drinking water contained coliforms and campylobacter. When the outbreak happened, the camp's treatment plant was ineffective at treating the river water to the requirements of the Drinking-water Standards. This was due to the system not being designed to cope with the river in flood, inadequate filtration, and the non-operational UV system. ESR noted that the contamination of river water (and therefore drinking water) by animal effluent during heavy rainfall was highlighted in a recent Ministry of Agriculture and Forestry Technical Paper and that these outbreaks highlight the potential for local authority enhancement of camp drinking water safety through camping ground registration processes.

Incident	Causal agent	Cases ¹⁹³	Strength of association	Reference	Notes
Darfield, 2012	Campylobacter Gastroenteritis	29 (109) 9	?	<p>Canterbury DHB <i>Community & Public Health Report to the Darfield Community: An Outbreak of Waterborne Gastroenteritis in Darfield, Canterbury, July- August 2012</i> (18 February 2013)</p> <p>NZPHSR Dec 2012</p> <p>NZMJ "Estimated community costs of an outbreak of campylobacteriosis resulting from contamination of a public water supply in Darfield, New Zealand" (28 March 2014) vol 127(1391)</p>	<p>Drinking water supply contaminated either by runoff of effluent from paddock entering river and then into the supply, or entered the gallery directly through seepage through the ground in a paddock where sheep graze.</p> <p>DHB report concluded:</p> <ul style="list-style-type: none"> • The failure to implement a strategy to manage turbidity, lack of chlorine treatment, and the lack of protozoal barriers led to water containing disease-causing organisms to be distributed through the town's water supply and the subsequent outbreak of gastroenteritis. • DHB will continue to encourage and support Selwyn District Council to adopt a multi-barrier approach to their drinking water supplies involving protection, monitoring, and maintenance of the source, treatment and distribution, consistent with New Zealand drinking water legislation. <p>Water supply transgression reported Friday 11 August. High levels of coliforms, reported failure of chlorination. Boil water notice issued to Darfield residents late on Friday.</p>
2013, Nelson Lakes Scouts camp	Gastroenteritis	(13)		EpiSurv	

APPENDIX 8

Government Inquiry into Havelock North Drinking Water: Timeline of Outbreak and Responses

Date	Activities and Occurrence
May 2016	GNS collects samples from HDC drinking-water bores for dating.
Sunday, 10 July 2016	<p>Brookvale Bores 1 and 2 turned off for repair work.</p> <p>Pumps turned off. The connection between the Hastings supply and Havelock North reticulation at Hikanui opened.</p> <p>A failure in a pipe (300dia PVC) close to the 375dia Asbestos Cement (AC) delivery main. The failure and required repair works deemed a risk to the AC main due to close proximity between the pipes.</p> <p>Low winter demand meant Havelock North able to be provided solely from the Hastings supply.</p>
Wednesday, 3 August 2016	<p>HDC contractor City Care completes repair work on Havelock North pipeline and installation of new scour.</p> <p>Brookvale Bores 1 and 2 turned back on.</p>
5 - 6 August 2016	Heavy rainfall of 113 – 145 mm (as the likely bounds) with a mid-range estimate used for modelling of 125 mm (over the 2 days) in Havelock North.
Tuesday, 9 August 2016	HDC undertakes routine sampling of water supply reticulation in Havelock North at one site (Havelock North High School). No E.coli detected in result received the following day (ie on Wednesday 10 August).
Wednesday, 10 August 2016	Water carrier (Bourke Contractors) fills water tanker from Havelock North supply at Napier Road filling point in morning. Water sample taken from water tanker for testing.
Thursday, 11 August 2016 (morning)	<p>Mary Doyle and Waiapu Aged Residential Care (ARC) facilities, Havelock North both report separate gastroenteritis outbreaks.</p> <p>1000 hours – Population Health Service informed laboratory has reported that the water tanker sample taken on Wednesday 10 August contained E.coli.</p> <p>Havelock North supply tested by HDC in the course of routine tests. Locations included Brookvale Bore 1 and 41 Hikanui Drive.</p> <p>Hastings supply tested by HDC in the course of routine tests. Locations included the Poole Street shops in Flaxmere, Wilson Road Bore, Frimley Bore and Eastbourne Bore 3.</p>

Date	Activities and Occurrence
Friday, 12 August 2016	
	Havelock North supply tested by HDC at eight sites. Hastings supply tested at four sites.
5.50am	The first alert from the overnight duty manager at Hawke's Bay Hospital advising the DHB's Infection Prevention and Control Committee (via email) of an increase in diarrhoea and vomiting cases presenting overnight to Hawkes Bay Hospital's Emergency Department. Some cases were admitted to the acute assessment unit for observation and treatment.
8.00 – 9.30am	<p>Medical Officer of Health (Communicable Disease) (Dr Rachel Eyre) forwards the night duty manager's email onto the Health Protection team suggesting follow up.</p> <p>Health Protection Team Leader (Maree Rohleder) assigns an HPO (Theresa Te Whaiti) to review the reported cases of diarrhoea and vomiting. Infection prevention and control nurse (Margaret Drury) advises there is no cause for action at that time.</p>
Between 9.35 – 11.35am	<p>Mary Doyle ARC facility in Havelock North advises one resident has confirmed campylobacteriosis. DHB is advised that Gilmours Pharmacy has had a number of people requesting medication for diarrhoea and vomiting.</p> <p>An HPO contacts Gilmours Pharmacy. The pharmacy confirms that 10 – 15 people from different locations and different age groups in Havelock North have attended for diarrhoea and vomiting medication.</p> <p>Health Protection Team Leader (Maree Rohleder) contacts communicable disease support officer (Cherylene Roberts) who confirms five campylobacteriosis notifications in Havelock North. This figure is later revised to three notifications. Cherylene advises Maree she was about to contact an HPO as this was unusual.</p>
9.37am	<p>HDC notifies (by email) the Napier branch of the Central North Island DWA Unit of a positive result from samples taken on Thursday 11 August from the Poole Street shops, Flaxmere (Hastings supply) and 41 Hikanui Drive (Havelock North supply).</p> <p>Wilson Road Bore (Hastings supply) and Brookvale Bore 1 (Havelock North supply) had also been sampled on Thursday 11 August and no E.coli detected.</p>
9.44am	<p>HPO and DWA (Joanne Lynch) notifies the Medical Officer of Health (Environmental) (Dr Nick Jones) and other public health staff of the notification of a positive water sample from Poole Street shops, Flaxmere (Hastings supply) and 41 Hikanui Drive, Havelock North (Havelock North supply).</p> <p>HDC arranges for 38 additional samples to be taken from bore and reticulation systems and sent to testing laboratory.</p>

Date	Activities and Occurrence
11.45am	<p>Health Protection Team Leader (Maree Rohleder) advises Dr Jones of the developing situation via message on cell phone and followed up directly via his PA who called him out of a meeting.</p> <p>Outcome of discussion:</p> <ul style="list-style-type: none"> • Agreed to discuss chlorination of the supply with HDC and sampling for campylobacter prior to chlorination. • DWA (Joanne Lynch) was to contact the HDC and Health Protection Team Leader (Maree Rohleder) was to advise Ministry of Health (MoH). • Agreed to organise an outbreak meeting for early afternoon (initially 2.30pm but time then moved to 2.00pm).
12 noon	<p>DWA (Joanne Lynch) advised HDC (Matthew Kersel) of situation and recommends chlorination of supply and sampling of water for campylobacter prior to chlorination.</p> <p>DWA notes in diary that:</p> <p><i>“Phoned Matt Kersel – HDC. Advised of situation. Need to take sample for Campy and look at chlorination of the supply. He advised that they were waiting on enumeration results due tomorrow before making a decision re chlorination. Advised need to look at bringing this forward due to concerns being raised re illness in community and campy notifications received. Advised an outbreak meeting at Napier Health Centre at 2:30pm [later rescheduled to 2pm]. He will have some conversations internally within HDC.”</i></p> <p>Health Protection Team Leader (Maree Rohleder) advises MoH (Scott Rostron) of the emerging situation in Havelock North. DWA (Joanne Lynch) forwards summary of HDC water sampling results to MOH (Scott Rostron).</p> <p>HDC (Matthew Kersel) advises Water Supply Manager (Dylan Stuijt) of conversation and they discuss the possibility of campylobacter. HDC contacts ESR and Hills to inquire about details for campylobacter sampling.</p>
12.27pm	<p>HPO/DWA (Joanne Lynch) advises HDC (Matthew Kersel) of revised outbreak meeting time, rescheduled for 1400hrs.</p>
12.42pm	<p>MoH (Scott Rostron) emails Health Protection Team Leader (Maree Rohleder) confirming their earlier discussion and summarising the situation (above normal increase in campylobacteriosis notifications, increased demand for diarrhoeal medications, HDC reports of positive E. coli tests in two zones).</p>

Date	Activities and Occurrence
12.30 – 13.15pm	Medical Officer of Health (Dr Jones) contacts Havelock North Primary School and found an increase of student absenteeism. The Manager public health nurses (Liz Read) contacts Havelock North schools and the Health Protection Team Leader (Maree Rohleder) contacts two control schools from outside that area to ascertain their level of absenteeism. Havelock North schools reported absences between approximately 15% and 20% and control schools reported normal absences of between 5% and 10%.
12.53pm	Health Protection Team Leader (Maree Rohleder) emails HDC (Matthew Kersel, Tony Stothart, Brett Chapman, Dylan Stuijt), Medical Officers of Health (Dr Eyre, Dr Jones), DHB communications manager (Anna Kirk), communicable disease support officer (Cherylene Roberts), Emergency Response Advisor (Sandra Bee), DWAs (Joanne Waldon, Joanne Lynch), HPOs (Cameron Ormsby, Theresa Te Whaiti, Noel Watson), Manager, Population Programmes (Jenny Cawston), infection prevention and control nurse (Margaret Drury), DW technician (Malcolm McGregor) advising of the emerging situation and inviting them to participate in the outbreak meeting, planned for 1400hrs.
2.00pm	HDC (Kersel and Stuijt) travel to Napier for 2pm meeting. ESR responds with details for campylobacter sampling protocols. Population Health Service co-ordinates outbreak meeting. Additional schools outside of Havelock North contacted and normal absenteeism rates reported (only Havelock North schools affected). (Meeting attended by Joanne Waldon, Maree Rohleder, Joanne Lynch, Dr Nick Jones, Cherylene Roberts, Tony Stothart, Philip Hunter, Theresa Te Whaiti, Ray Wilbrow, Matthew Kersel, Dylan Stuijt, Cameron Ormsby, Chris Nokes, Maurice Wilson, Margaret Drury, Anna Kirk, Andrew Burns, Raquel McDonald, and Melinda Sando.)
2.30 – 3.00pm	HDC organises for chlorination of Havelock North water supply following discussions and advice from DWA (Joanne Lynch) and Medical Officer of Health (Dr Jones). HDC arranges for Water Testing HB to undertake sampling for campylobacter prior to chlorination.
3.30 – 4.00pm	Medical Officer of Health (Dr Jones) updates DHB chief executive (Kevin Snee) of the actions from the outbreak meeting. They discuss boil water notice in addition to chlorination of the water supply.
4.30pm	Medical Officer of Health (Dr Jones) and DWA (Joanne Lynch) discuss the situation with CNIDWA Unit's Technical Manager Operations (Peter Wood) and they agree on recommending that HDC issue a boil water notice as well as chlorinate the Havelock North drinking water supply. Medical Officer of Health (Dr Jones) contacts MoH to discuss the proposal to recommend HDC issue a boil water notice.

Date	Activities and Occurrence
4.38pm	Ministry of Primary Industries (Melinda Sando) advises Medical Officer of Health (Dr Jones) and Health Protection team leader (Maree Rohleder) that National Surveillance testing programmes for campylobacter indicate compliance with performance targets and there are no reasons for concerns that reports of illness in the Havelock North Area could be linked to food contamination.
Late afternoon	HPOs interview the five notified campylobacteriosis cases. Only three found to be from the Havelock North area. HPO also in contact with Southern Community Laboratory around faecal testing of specimens submitted.
4.45 – 6.00pm	DHB chief executive (Kevin Snee) calls a briefing meeting of DHB personnel (Ken Foote, Sandra Bee, Margaret Drury, Nicholas Jones, Anna Kirk, Wietske Cloo, Andrew Burns, Ray Wilbrow) and HDC personnel (Jane McKay, Craig Thew) with ESR (Chris Nokes) attending by teleconference to assess the situation and to decide how to manage the emerging situation in Havelock North using the incident management process. Agreed DHB to be lead response. The incident management objective was to: <ul style="list-style-type: none"> • determine the cause and control the outbreak of gastroenteritis in Havelock North, and • prepare the health services escalation if required Planned action: <ul style="list-style-type: none"> • Public health service to manage the outbreak with support from the incident management team • Reconvene at 10.00am on Saturday, 13 August 2016. HDC advises DHB at 4.45pm meeting that they will be unable to distribute the boil water notice to Havelock North households by letter drop until the next morning (Saturday).
5.15pm	Scott Rostron (MoH) calls Medical Officer of Health (Dr Jones) during the meeting to discuss the recommendation to issue the boil water notice. Scott Rostron joins the briefing meeting by telephone. The meeting agrees a boil water notice should be issued and remain in place until the Population Health Service has greater confidence that there is no link between the positive drinking water sample and gastroenteritis cases related to campylobacter.
5.17pm	Calls received by the on-call HPO from members of the public hearing rumours about norovirus or campylobacter in the Havelock North water supply.
5.21pm	Advisory notice for Primary Care prepared by Population Health Service. The notice was released the following morning.
5.45pm	HDC (Jane Mackay) and HBDHB (Anna Kirk) communications staff meet to draft media release.

Date	Activities and Occurrence
5.00 – 9pm	HDC reports water chlorination starts at 1700 hrs and ends 2100hrs. HDC chlorinates reservoirs and flushes Havelock North reticulation system with chlorinated water.
6.00pm	After hours providers Te Mata Peak general practice, Havelock North and Hastings Health Centre are notified by the DHB's Emergency Response Advisor (Sandra Bee) and informed a Primary Care advisory will be forthcoming.
6.40pm	<p>A joint DHB and HDC media release is released to the media, including radio, posted on DHB and HDC websites, and uploaded to DHB and HDC Facebook sites. Includes boil water notice.</p> <p>HDC call centre briefed and asked to report the following day. The DHB's executive management team and Board are notified of the outbreak.</p>
6.48pm	MoH (Scott Rostron) emails Medical Officer of Health (Dr Nick Jones), copied to Health Protection Team Leader (Maree Rohleder), confirming the MoH's understanding that the DHB is dealing with a localised disease event and has concerns over the water quality, that HDC will chlorinate the water supply to protect consumers as a precautionary measure, and that the DHB considers a boil water advisory notice would be prudent. Medical Officer of Health (Dr Jones) confirms at 9.48pm that MoH's summary aligns with the DHB's understanding and that the DHB will update MoH after the 10 am meeting Saturday.
Friday evening	<p>Discussion on definition of 'boil water' within DHB to ensure clarity of messaging for public. Medical Officer of Health (Dr Jones) advises HDC needs to respond.</p> <p>First outbreak news aired on late TV news.</p> <p>DHB and HDC Facebook posts monitored until midnight, by 11.30pm over 120,000 views across both sites.</p> <p>Havelock North network fully flushed with chlorinated water and tested for chlorine levels by midnight.</p>

Date	Activities and Occurrence
Saturday, 13 August 2016	
	<p>Most Probable Number (MPN) test (second test) from Thursday 11 August sample from 41 Hikanui Drive (Havelock North supply) confirms E.coli in water supply. Result is 16 MPN/100ml.</p> <p>Result of MPN test (second test) from Thursday 11 August sample from Poole Street shops, Flaxmere (Hastings supply is) is clear (ie <1.1 MPN/100ml).</p> <p>None of the four sites sampled from the Hasting supply on Friday 12 August return a positive result (Poole Street shops, Wilson Road Bore, Primary School Henderson Road, and 47 Dover Road).</p> <p>All of the eight sites sampled from the Havelock North supply on Friday 12 August, prior to chlorination commencing, return a positive result:</p> <ul style="list-style-type: none"> • Sample taken on Friday 12 August from Havelock North Library shows E.coli of 14 MPN/100mls. • Sample taken on Friday 12 August from 92 Endsleigh Drive shows E.coli of 23 MPN/100 ml. • Sample taken on Friday 12 August from 22 Russel Robertson Drive shows E.coli of 9.2 MPN/100ml. • Samples taken on Friday 12 August from 31 Endsleigh Road show E.coli of 16 MPN/100ml and 12 MPN/100ml. • Sample taken on Friday 12 August from 41 Hikanui Drive White Post shows E.coli of 23 MPN/100ml. • Sample taken on Friday 12 August from Brookvale Bore 1 shows E.coli of 16 MPN/100ml. = • Sample taken on Friday 12 August from Brookvale Bore 2 shows E.coli of 23 MPN/100ml. • Sample taken on Friday 12 August from High Tee Pee shows E.coli of >23 MPN/100ml. <p>Havelock North water tested daily from this point on.</p>
7.30 am	Emergency Response Advisor (Sandra Bee) and infection prevention and control nurse (Margaret Drury) meet at Napier Health Centre to prepare advisory for Havelock North ARC facilities, pharmacies, GP practices and distribute these via email.
8.00 – 9.30 am	<p>Population Health team convenes to assess surveillance intelligence and discuss outbreak situation. HDC staff participated in this meeting held at the Napier Health Centre.</p> <p>HDC Environmental Health Team despatches to all food handling businesses/premises on Havelock North supply. Confirms completed by 2.09pm.</p>

Date	Activities and Occurrence
9.00 – 9.30am	<p>Medical Officer of Health (Dr Jones) discusses the situation with on-call doctor at Te Mata and Healthline director. Te Mata GP reports one death at Mary Doyle ARC facility possibly linked to outbreak.</p>
10.00 – 11.00am	<p>Outbreak meeting held at the Napier Health Centre, also attended by HDC.</p> <p>At this meeting:</p> <ul style="list-style-type: none"> • HDC confirms water contamination with E.coli. The pathogen is unknown but source water is more likely than a reticulation problem. • Eight emergency department visits overnight and 12 gastro related calls to Te Mata practice since last night are reported. <p>Key Actions arising:</p> <ul style="list-style-type: none"> • HDC's Environmental Health Officers to visit Havelock North food outlets, cafes and motels to ensure they are aware of the boil water notice and to exclude ill staff from the workplace. • Preparation of FAQs and joint media statements by DHB and HDC. First press conference arranged for 4.30pm. • Medical Officer of Health (Dr Jones) to follow-up with Mary Doyle ARC facility. • Boarding schools to be contacted by DHB's Emergency Response Advisor (Sandra Bee). • DHB to activate full emergency operations centre (EOC). • Media and social media update sent out.
10.00am – 12noon	<p>DHB chief executive briefed and decides to escalate to a full Emergency Operations Centre (EOC) and co-ordinate incident management system (CIMS) response.</p> <p>Ongoing public health surveillance of Havelock North community including contact with boarding schools.</p> <p>Ongoing chlorination of Havelock North water supply to continue until further notice and boil water notice in place.</p> <p>HDC staff and contractors visit private tanks fed by Havelock North supply to refill or dose with chlorine.</p> <p>HDC flush external school taps where visible and advises MoE to inform schools to flush before Monday.</p>

Date	Activities and Occurrence
1.00pm	<p>DHB EOC established at Hawke's Bay Hospital site and the second Incident Action Plan (IAP) is developed and implemented. Subsequent IAPs are developed and implemented to meet changing circumstances and issues encountered during the 10-day emergency response period. Variations to the IAP included:</p> <ul style="list-style-type: none"> • Collaboration with HDC • Planning for resilience • Managing the impacts/consequences • Supporting community welfare response.
2.00pm	<p>District nurses deployed to Havelock North ARC facilities to assess, triage and administer treatment.</p> <p>Communications and health information for pharmacies, general practices, ARC facilities, and public developed and distributed.</p>
3.21pm	DHB emails sitrep report to MoH (Sally Gilbert).
4.30pm	<p>Press conference.</p> <p>DHB and HDC agree a joint communication strategy to ensure consistent messaging, and develop frequently asked questions (FAQs).</p> <p>Event activated in Health Emergency Management Information System to log public health service activities.</p> <p>Formal engagement with Healthline commenced and ongoing liaison.</p>
6.00pm	<p>First daily situation report produced and continued on daily basis throughout the outbreak response phase.</p> <p>Joint DHB and HDC communications released.</p>
8.30pm	The Emergency Response Advisor (Sandra Bee) informs MoH (Charles Blanch, Director Emergency Management) of the gastroenteritis situation in Havelock North.
Sunday, 14 August 2016	
	<p>Of the 13 sites sampled from the Havelock North supply on Saturday 13 August 2016 only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Saturday 13 August from Brookvale Bore 1 shows E.coli of 6.9 MPN/100ml. • Sample taken on Saturday 13 August from Brookvale Bore 2 shows E.coli of 9.2 MPN/100ml.

Date	Activities and Occurrence
10am	<p>Chlorination reported throughout Havelock North water supply since midnight Friday.</p> <p>EOC briefing revealed high number of gastroenteritis presentations to Hasting Healthcare Centre, Te Mata Peak general practice and two Havelock North residents with gastroenteritis linked symptoms admitted to Hawke's Bay hospital overnight.</p> <p>Results for the 13 August water testing sample showed E.coli present in Brookvale Bore 1 and Bore 2 tap (Bore 2 not operating). No E.coli detected from 11 samples taken across reticulation network.</p>
11am	<p>Formal contact made with Ministry of Education (MoED) and meeting convened to discuss the situation. Population Health Service prepares a joint schools and early childhood education centre communication in agreement with the MoED.</p> <p>HDC co-ordinates water tankers to be placed at schools in Havelock North.</p>
4.00pm	<p>EOC briefing advised:</p> <ul style="list-style-type: none"> • ED presentations now at 40; • 183 cases reported by GPs; • Two patients in ICU.
4.38pm	<p>MoH (Sally Gilbert) acknowledges receipt of EOC's sitrep, requests additional information, and offers additional support to the DHB (deployment of public health staff, scientific and engineering experts etc, as required).</p>
7pm	<p>HDC (Brett Chapman) contacts all Havelock North School principals and MoED to advise of provision of water tankers.</p>
Ongoing throughout the day	<p>Boil water notice remains in place.</p> <p>Joint media releases issued on all platforms giving advice on boiling water and campylobacter pamphlet links made available.</p> <p>District nurses continued to assess, triage and treat elderly residents in Havelock North.</p> <p>Surveillance team data entered into Epidemiological Surveillance database and the first outbreak case definition was agreed and a case finding plan was implemented.</p> <p>Communication planning for post-campylobacteriosis complications (Guillian Barre Syndrome and reactive arthritis).</p> <p>Responding to numerous media requests for information.</p>

Date	Activities and Occurrence
Monday, 15 August 2016	
	<p>Of the 10 sites sampled from the Havelock North supply on Sunday 14 August 2016 only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Sunday 14 August from Brookvale Bore 1 shows E.coli of 3.6 MPN/100ml. • Sample taken on Sunday 14 August from Brookvale Bore 2 shows E.coli of 5.1 MPN/100ml. <p>DHB facilitates daily press conferences in partnership with HDC.</p> <p>HDC deploys water tankers to supply Hastings water to Havelock North (continues to 5 September).</p> <p>Medical Officer of Health (Dr Jones) provides update information to general practices and pharmacies.</p> <p>All Havelock North schools decide to close from Tuesday 16 August until Thursday 18 August. Subsequently, two boarding schools and Havelock North High School re-opened on Thursday 18 August and all other Havelock North schools re-opened on Monday 22 August.</p> <p>Joint media updates released.</p> <p>HDC issues map of area served by Havelock North water.</p> <p>Investigation into history of Havelock North water supply commenced.</p> <p>HBRC commences initial investigation into whether any contamination of the groundwater and surface water.</p> <p>Red Cross contacted during the afternoon and requested to provide support for community outreach.</p>

Date	Activities and Occurrence
Tuesday, 16 August 2016	
	<p>Of the 14 sites sampled from the Havelock North supply on Monday 15 August 2016 only Brookvale Bore 1 returns a positive result E.coli of 6.9 MPN/100ml. Brookvale Bore 2, the only other non-chlorinated sample, is negative for E.coli.</p> <p>Welfare line operating 24 hours established by HDC in conjunction with Red Cross and Hastings CDEM for those requiring urgent support.</p> <p>First wave of 250 household telephone survey conducted.</p> <p>DHB pharmacy issues memorandum to Havelock North pharmacies providing welfare assistance related to cost of gastroenteritis items.</p> <p>DHB and general practices contact known high risk/vulnerable patients in Havelock North to ascertain their wellbeing.</p> <p>Staff from other DHBs deployed to assist Population Health Service and District Nursing teams.</p> <p>Investigation into cases of giardia and cryptosporidium since 8 August completed: <i>"no evidence to suggest contamination of the Havelock North water supply with these parasites"</i>.</p> <p>DHB releases a public statement <i>"campylobacter is the likely cause of infection"</i>.</p> <p>Media conference convened to address questions of timeliness of response and reinforce prevention messages.</p> <p>Reports of misinformation circulating in the community. DHB and HDC release a combined communication to ensure consistent and clear messaging.</p> <p>Red Cross and Civil Defence volunteers commence door knocking in Havelock North to ascertain numbers and welfare of unwell people in the community.</p> <p>Interagency outbreak source investigation meeting with DHB, HBRC, MoH, DWA, and HDC convened by Medical Officer of Health (Dr Jones). Agencies agree to collaborate to investigate source of contamination.</p> <p>Collaborative work between DHB and HDC in relation to lifting the boil water notice commences, leading to the development of a drinking water reinstatement plan agreed between the DHB, HDC, and MoH.</p>

Date	Activities and Occurrence
Wednesday, 17 August 2016	
	<p>Of the 14 sites sampled from the Havelock North supply on Tuesday 16 August 2016 only Brookvale Bore 1 returns a positive result E.coli of 3.6 MPN/100ml. Brookvale Bore 2, the only other non-chlorinated sample, is negative for E.coli.</p> <p>Monitoring for secondary cases of campylobacteriosis.</p> <p>Red Cross sets up tent at the Havelock North function centre (remains until 7 September).</p> <p>HDC starts providing water to businesses, ARC facilities, and pre-schools. This continues until boil notice rescinded.</p> <p>Initial ESR reports received with confirmed presence results for campylobacter in the water samples.</p> <p>Teleconference between representatives from the investigative agencies (DHB, HDC and HBRC) to discuss response programmes and share information relevant to the outbreak and the Inquiry to reduce duplication and improve efficiency.</p>
Thursday, 18 August 2016	
	<p>Of the 14 sites sampled from the Havelock North supply on Wednesday 17 August only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Wednesday 17 August from Brookvale Bore 1 shows E.coli of 5.1 MPN/100ml. • Sample taken on Wednesday 17 August from Brookvale Bore 2 shows E.coli of 2.2 MPN/100ml. <p>ESR reports on results for samples taken on 12 August it had analysed:</p> <ul style="list-style-type: none"> • Sample taken on Friday 12 August from Havelock North Library shows E.coli of 14 MPN/100mls; total coliforms of 46/100mls; campylobacter jejuni isolated; and campylobacter coli not isolated. • Sample taken on Friday 12 August from 92 Endsleigh Drive shows E.coli of 23 MPN/100ml; total coliforms of 51/100mls; campylobacter jejuni isolated; and campylobacter coli not isolated. • Sample taken on Friday 12 August from 31 Endsleigh Road shows E.coli of 12 MPN/100ml; total coliforms of 48 MPN/100ml; campylobacter jejuni isolated and campylobacter coli not isolated. • Sample taken on Friday 12 August from 41 Hikanui Drive White Post shows E.coli of 23 MPN/100ml, campylobacter jejuni isolated, campylobacter coli not isolated.

Date	Activities and Occurrence
	<ul style="list-style-type: none"> • Sample taken on Friday 12 August from Brookvale Bore 1 shows E.coli of 9.7 MPN/100ml; total coliforms of 37/100mls; and campylobacter coli or campylobacter jejuni not isolated. • Sample taken on Friday 12 August from Brookvale Bore 2 shows E.coli of 13 MPN/100ml; total coliforms of 30/100mls; and campylobacter jejuni had been isolated. <p>Second wave household surveillance survey conducted.</p> <p>A tanker in Havelock North tested on 17 August returned positive for E.coli presence. (Retention sample enumerated on 19 August and returned E.coli not detected above limit of detection.)</p> <p>It is one of nine tankers filled from Hastings and deployed and other eight are tested clear. As a precaution HDC decides to chlorinate Hastings and Flaxmere water and therefore all tanker water will be chlorinated. No boil water notice for Hastings.</p> <p>A mailbox information drop was completed in the western side of Havelock North.</p> <p>Letter and resource information prepared for public swimming pools and distributed by HDC.</p> <p>Joint DHB and HDC press conference to focus on key messaging to address misinformation circulating in the community.</p> <p>Teleconference between representatives from the investigative agencies (DHB, HDC and HBRC) to discuss response programmes and share information relevant to the outbreak and the Inquiry to reduce duplication and improve efficiency.</p>

Date	Activities and Occurrence
Friday, 19 August 2016	
	<p>Of the 14 sites sampled from the Havelock North supply on Thursday 18 August 2016 only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Thursday 18 August from Brookvale Bore 1 shows E.coli of 3.6 MPN/100ml. • Sample taken on Thursday 18 August from Brookvale Bore 2 shows E.coli of 2.2 MPN/100ml. <p>Number of campylobacteriosis cases declining.</p> <p>Contingency planning to transfer lead EOC agency to HDC.</p> <p>DHB implements a number of strategic communications, including:</p> <ul style="list-style-type: none"> • an informative video-clip on gastroenteritis uploaded to the website, • radio advertisements used to correct public misunderstandings and communicate key messages, • updates FAQs fact sheet. <p>As follow-up from the teleconference on Tuesday 16 August, MoH asked DHB when it would receive the DHB PHU investigation plan.</p> <p>Test on tanker that returned positive Wednesday 17 August is clear when test enumerated.</p> <p>HDC advises residents that tankers will be withdrawn at 1630hrs and refilled during weekend. Tankers will be cleaned and sterilised, refilled with chlorinated water and tested.</p> <p>Havelock North residents informed that Red Cross/CDEM information hub will be open in the village over the weekend 1000-1500hrs.</p> <p>HDC commences field investigations to identify possible sources of contamination.</p> <p>Mayor responds to continuing misinformation that Council was aware of contamination on Wednesday 10 August.</p> <p>HDC receive the interim report on genotype analysis of campylobacter isolates from ESR of samples taken on Saturday 13 August.</p> <p>Drinking water investigation meeting at DHB, discussed knowledge to date and work and responsibilities moving forward.</p> <p>Teleconference between representatives from the investigative agencies (DHB, HDC and HBRC) to discuss response programmes and share information relevant to the outbreak and the Inquiry to reduce duplication and improve efficiency.</p>

Date	Activities and Occurrence
Saturday, 20 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply on Friday 19 August only Brookvale Bore 1 returned a positive result with: E.coli of 2.2 MPN/100ml and 6MPN/100ml; and campylobacter coli had been isolated. Brookvale Bore 2, the only other non-chlorinated sample, is negative for E.coli.</p> <p>Of the 19 sites sampled from the Hastings supply on Friday 19 August 2016 four samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Friday 19 August from Frimley Road Bore shows E.coli of 2.2 MPN/100ml. • Sample taken on Friday 19 August from Wilson Road Bore shows E.coli of 1.1 MPN/100ml. • Sample taken on Friday 19 August from 411 Orchard Road shows E.coli of 5.1 MPN/100ml. • Sample taken on Friday 19 August from Tarbet Street Pump Station shows E.coli of 1.1 MPN/100ml. <p>As chlorination was introduced on Thursday 18 August no further action deemed to be required except follow up on test locations to determine if suitable sampling locations (Orchard Rd and Tarbet Street Pump Station). The Orchard Rd sample was later confirmed as being taken from a property that was not connected to the reticulated supply.</p> <p>Chlorination of Hastings water will remain for three months as per DWSNZ, and the two bores status now noted as provisionally secure, require daily testing for three months and clear tests for 12 months required for secure status to be regained.</p> <p>HDC reports that chlorination of Havelock North water supplies is effective.</p> <p>Demand on primary care health services stabilising as the number of new gastroenteritis cases continue to decline.</p> <p>HDC operates full welfare and customer service response throughout weekend.</p> <p>Boil water notice remains in place.</p>

Date	Activities and Occurrence
Sunday, 21 August 2016	
	<p>Of the 14 sites sampled from the Havelock North supply on Saturday 20 August only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Saturday 20 August from Brookvale Bore 1 shows E.coli of 6.9 MPN/100ml. • Sample taken on Saturday 20 August from Brookvale Bore 2 shows E.coli of 5.1 MPN/100ml. <p>Of the 22 sites sampled from the Hastings supply on Saturday 20 August 2016 none of the samples return a positive result for E.coli.</p> <p>HDC announces tankers will return to Havelock North on Monday 22 August. All have been re-sterilised, filled and tested clear.</p> <p>HDC reviewing testing locations and programme, organising additional resourcing.</p> <p>Tanker signage with clear test results finalised, confirmation of clear tests provided to MoED.</p>
Monday, 22 August 2016	
	<p>Of the 14 sites sampled from the Havelock North supply on Sunday 21 August only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Sunday 21 August from Brookvale Bore 1 shows E.coli of 5.1 MPN/100ml. • Sample taken on Sunday 21 August from Brookvale Bore 2 shows E.coli of 3.6 MPN/100ml. <p>Of the 17 sites sampled from the Hastings supply on Sunday 21 August none of the samples return a positive result for E.coli.</p> <p>Public health surveillance team and ESR discuss tail-end surveillance planning and agree to change surveillance case definition to include all enteric pathogens.</p> <p>HDC established full CIMS recovery structure and commence taking the lead on the remaining response issues. DHB providing liaison support to HDC.</p> <p>DHB transitions to recovery phase.</p> <p>Red Cross outreach programme completed. Havelock North schools plan to reopen and public health service monitors absenteeism rates.</p> <p>All schools and early childhood centres are open.</p> <p>Meeting between DHB, HDC, HBRC and others to coordinate investigation response.</p>

Date	Activities and Occurrence
Tuesday, 23 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply on Monday 22 August one of the unchlorinated samples and one of the chlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Monday 22 August from Brookvale Bore 2 shows E.coli of 2.2 MPN/100ml. • Sample taken on Monday 22 August from Tee Pee Low shows E.coli of 1.1 MPN/100ml. <p>Of the 17 sites sampled from the Hastings supply on Monday 22 August none of the samples return a positive result for E.coli.</p> <p>Third wave household surveillance survey conducted.</p> <p>DHB returns to business as usual, maintaining a virtual EOC. Population Health Service maintains full response activation mode.</p> <p>Haumoana School reports positive test for E.coli in its private bore. School closed. HDC commences chlorination of the Haumoana, Te Awanga supply and arrange to chlorinate Clive public supply as a safeguard.</p> <p>HDC makes decision to supply Havelock North with Hastings water for the foreseeable future.</p> <p>The two networks are to be connected and Havelock North system to be flushed with Hastings water.</p>

Date	Activities and Occurrence
Wednesday, 24 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply on Tuesday 23 August only the unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Samples taken on Tuesday 23 August from Brookvale Bore 1 shows E.coli of 2.2 MPN/100ml and 4.1 MPN/100ml; total coliforms of 8.5/100ml; and no campylobacter detected. • Sample taken on Tuesday 23 August from Brookvale Bore 2 shows E.coli of 3.6 MPN/100ml and 2 MPN/100ml; total coliforms of 4.1/100ml; and no campylobacter detected. <p>Of the 20 sites sampled from the Hastings supply on Tuesday 23 August none of the samples return a positive result for E.coli.</p> <p>Brookvale Bores 1 and 2 turned off. Havelock North supplied from Hastings bores. Switchover completed prior to forecast rain. Progressing design of the flushing programme for approval as the next stage of the process to remove the boil water notice.</p> <p>Havelock North reservoirs emptied.</p> <p>Haumoana School is open (tests came back clear), Clive School closed until test results provided to Board.</p> <p>Public meeting announced by HDC for Tuesday 30 and Wednesday 31 August. Meeting to be live streamed and recorded. HDC coordinate DHB and HBRC for panel.</p> <p>Flyers begin to be delivered to all Havelock North residents inviting to public meetings and updating on water.</p>

Date	Activities and Occurrence
Thursday, 25 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply on Wednesday 24 August only Brookvale Bore 1 returns a positive result with: E.coli of 1.1 MPN/100ml and 2 MPN/100ml; total coliforms of 3/100ml; and campylobacter isolated. Brookvale Bore 2, the only other non-chlorinated sample, is negative for E.coli.</p> <p>Of the 20 sites sampled from the Hastings supply on Wednesday 24 August none of the samples return a positive result for E.coli.</p> <p>Laboratory surveillance meeting held to revise specimen testing protocol and LabTest Auckland to commence being the single point laboratory for gastroenteritis specimen testing.</p> <p>HBRC commences investigation into HDC's compliance with consent conditions for water take permits for Brookvale Bores 1 and 2, and notifies HDC of investigation. Warranted HBRC officers arrive to collect information.</p> <p>DWAs meet with HDC staff on the process to remove the boil water advisory notice. Approach is continuing with DWAs and HDC working on the plan together.</p> <p>Flushing commences to draw Hastings water through to Havelock North network.</p>
Friday, 26 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply on Thursday 25 August only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Thursday 25 August from Brookvale Bore 1 shows E.coli of 1.1 MPN/100ml. • Sample taken on Thursday 25 August from Brookvale Bore 2 shows E.coli of 3.6 MPN/100ml. <p>Of the 19 sites sampled from the Hastings supply on Thursday 25 August none of the samples return a positive result for E.coli.</p> <p>Brookvale Road bores are closed. Havelock North water is supplied from Hastings bores. Contractors are flushing Havelock North network to ensure Hastings sourced water replaces water from Brookvale.</p> <p>Boil water notice remains in place.</p>

Date	Activities and Occurrence
Saturday, 27 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply on Friday 26 August only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Friday 26 August from Brookvale Bore 1 shows E.coli of 1.1 MPN/100ml. • Sample taken on Friday 26 August from Brookvale Bore 2 shows E.coli of 2.2 MPN/100ml. <p>Of the 20 sites sampled from the Hastings supply on Friday 26 August none of the samples return a positive result for E.coli.</p>
Sunday, 28 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply Saturday 27 August only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Saturday 27 August from Brookvale Bore 1 shows E.coli of 3.6 MPN/100ml. • Sample taken on Saturday 27 August from Brookvale Bore 2 shows E.coli of 1.1 MPN/100ml. <p>Of the 17 sites sampled from the Hastings supply on Saturday 27 August none of the samples return a positive result for E.coli.</p>
Monday, 29 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply Sunday 28 August only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Sunday 28 August from Brookvale Bore 1 shows E.coli of 2.2 MPN/100ml. • Sample taken on Sunday 28 August from Brookvale Bore 2 shows E.coli of 1.1 MPN/100ml. <p>Of the 20 sites sampled from the Hastings supply on Sunday 28 August none of the samples return a positive result for E.coli.</p>

Date	Activities and Occurrence
Tuesday, 30 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply Monday 29 August only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Monday 29 August from Brookvale Bore 1 shows E.coli of 5.1 MPN/100ml. • Sample taken on Monday 29 August from Brookvale Bore 2 shows E.coli of 1.1 MPN/100ml. <p>Of the 20 sites sampled from the Hastings supply on Monday 29 August none of the samples return a positive result for E.coli.</p> <p>First joint DHB, HDC and HBRC public meeting convened in Havelock North. Live streamed and recorded; available for public.</p>
Wednesday, 31 August 2016	
	<p>Of the 15 sites sampled from the Havelock North supply Tuesday 30 August only the two unchlorinated samples return a positive result for E.coli:</p> <ul style="list-style-type: none"> • Sample taken on Tuesday 30 August from Brookvale Bore 1 shows E.coli of 3.6 MPN/100ml. • Sample taken on Tuesday 30 August from Brookvale Bore 2 shows E.coli of 2.2 MPN/100ml. <p>(Note that the Brookvale Bores were not tested again for E.coli. until Thursday 12 October.)</p> <p>Of the 19 sites sampled from the Hastings supply on Tuesday 30 August none of the samples return a positive result for E.coli.</p> <p>Tests conducted Wednesday 31 August return a low level positive at two dead ends (37 Busby Hill, FAC 0.5; 10 Ritchie Pace, FAC 0.41). Phone meeting with HDC, DHB, MoH to discuss ways forward. Outcome confirmed after three clear test days.</p> <p>HDC Havelock North drinking water supply reinstatement plan finalised and submitted to public health service.</p> <p>Second joint DHB, HDC and HBRC public meeting convened in Havelock North. Live streamed and recorded; available for public.</p> <p>HDC announce boil water notice cannot be lifted until three consecutive daily tests show clear.</p> <p>Boil water notice remains in place.</p>
Thursday, 1 September 2016	
	<p>Video of public meeting published online.</p> <p>HDC communications plan developed in partnership with DHB in preparation for lifting boil water notice.</p>

Date	Activities and Occurrence
Saturday, 3 September 2016	
	Boil water notice lifted and communication released for the lifting of the notice. Hastings water is to be chlorinated for at least three months and will be tested daily.
Monday, 5 September 2016	
	ESR and DHB meeting of epidemiological experts to gather knowledge about the outbreak.
Tuesday, 6 September 2016	
	Meeting with investigative agencies (HDC, DHB, MOH and HBRC) and epidemiological and microbiological experts (ESR, Massey University, and University of Otago) to agree on methods to link environmental, water, and human case information. DHB announces that the gastroenteritis outbreak caused by campylobacter infection has ended.
Wednesday, 7 September 2016	
	Meeting between HBRC, DHB, and HDC regarding field testing.
Friday, 9 September 2016	
	Teleconference between representatives from the investigative agencies (HDC, DHB, MOH, and HBRC) and experts (ESR, Massey University, and University of Otago) to coordinate contamination source investigation.
Tuesday, 13 September 2016	
	Water supplies compliance meeting between HDC (with Opus) and DWA to discuss reinstatement plan.
Wednesday, 14 September 2016	
	Teleconference between representatives from the investigative agencies (HDC, DHB, MOH, and HBRC) and experts (ESR, Massey University, and University of Otago) to coordinate contamination source investigation.
Monday, 19 September 2016	
	Teleconference between representatives from the investigative agencies (HDC, DHB, MOH, and HBRC) and experts (ESR, Massey University, and University of Otago) to coordinate contamination source investigation.

Date	Activities and Occurrence
Thursday, 22 September 2016	
	Of the 19 sites sampled from the Hastings supply on Wednesday 21 September 2016 only Wilson Road returns a positive result E.coli of 1 MPN/100ml.
Friday, 23 September 2016	
	Teleconference between representatives from the investigative agencies (HDC, DHB, MOH, and HBRC) and experts (ESR, Massey University, and University of Otago) to coordinate contamination source investigation.
Tuesday, 27 September 2016	
	Fourth and final household survey conducted.
Sunday, 2 October 2016	
	Of the 20 sites sampled from the Hastings supply on Saturday 1 October 2016 only Eastbourne Street Bore 1 returns a positive result for E.coli of 1 MPN/100ml.
Tuesday, 4 October 2016	
	Teleconference between representatives from the investigative agencies (HDC, DHB, MOH, and HBRC) and experts (ESR, Massey University, and University of Otago) to coordinate contamination source investigation.
Monday, 10 October 2016	
	Teleconference between representatives from the investigative agencies (HDC, DHB, MOH, and HBRC) and experts (ESR, Massey University, and University of Otago) to coordinate contamination source investigation.
Saturday, 15 October 2016	
	Sample taken from Brookvale Bore 1 on Friday 14 October returns a positive result for E.coli of 1.1 MPN/100ml.
Sunday, 16 October 2016	
	Sample taken from Brookvale Bore 1 on Saturday 15 October returns a positive result for E.coli of 1.1 MPN/100ml and campylobacter detected.
Thursday, 19 October 2016	
	Sample taken from Brookvale Bore 1 on Wednesday 18 October returns a positive result for E.coli of 1.1 MPN/100ml.

Date	Activities and Occurrence
Saturday, 21 October 2016	
	Sample taken from Brookvale Bore 1 on Friday 20 October returns a positive result for E.coli of 1.1 MPN/100ml.
Thursday, 3 November 2016	
	Sample taken from Brookvale Bore 1 on Wednesday 2 November returns a positive result for E.coli of 1.1 MPN/100ml.
Friday, 4 November 2016	
	Sample taken from Brookvale Bore 1 on Thursday 3 November returns a positive result for E.coli of 1.1 MPN/100ml.
Saturday, 13 November 2016	
	Sample taken from Brookvale Bore 1 on Friday 12 November returns a positive result for E.coli of 1.1 MPN/100ml and total coliforms of 1.1/100ml.
Monday, 16 January 2017	
	Sample taken from Brookvale Bore 1 on Sunday 15 January returns a positive result for E.coli of 3 MPN/100ml and total coliforms of 17/100ml.
Tuesday, 17 January 2017	
	Sample taken from Brookvale Bore 1 on Monday 16 January returns a positive result for E.coli of 2 MPN/100ml and total coliforms of 16/100ml.

APPENDIX 9

Hastings District Council Water Supplies

HDC owns and operate 12 separate water supplies, 7 of which draw water from the Heretaunga Plains aquifer complex. The other five rely on shallow bores near rivers, springs and surface water sources.

(Napier City Council also draws its water from the Heretaunga Plains aquifer)

The aquifer based schemes are shown in Table 1

Table 1: Water Supplies drawing from the Heretaunga Plains Aquifer

Supply	Aquifer Source	Number of Connections	Quality	DWSNZ status+
Clive	Heretaunga Plains	381	High	Compliant with DWSNZ
Hastings/Havelock North	Heretaunga Plains and Te Mata	20,193	High with elevated hardness in Havelock North	Compliant
Haumoana & Te Awanga	Tukituki and Haumoana	800	High iron and manganese, slight sulphur dioxide odour	Compliant
Omahu**	Moteo Valley and unconfined Heretaunga Plains	37	Not secure	Non-compliant for Protozoa
Waipatu	Heretaunga Plains	14	High	Not reported
Paki Paki**	West Heretaunga Plains	34	High iron and manganese, slight sulphur dioxide odour	Compliant
Whakatu	Heretaunga Plains	145	High	Compliant

**Works over the 2016/17 financial year has added Paki Paki to the main urban supply, and protozoa treatment has been added to the Omahu supply.

HDC has a total of 32 bores, 12 of which supply water to Hastings, Havelock North and Flaxmere, the primary source being the 5 bores located in Eastbourne Street.

Table 2 shows the current (post October 2016) status of these 12 bores. This is based on the HDC Agenda Paper item 22/11/16 (CB89) and other information provided to the Inquiry.

Table 2: Bore status currently in accordance with DWSNZ Criteria for Secure Source

Source	Current Use	Current Status	Comment
Brookvale 1 & 2	Off	Non-secure	Bore 1 to be decommissioned. Future use of bore 2 yet to be determined
Brookvale 3	Returned to use from 7 March 17	Non secure	New 5 log treatment installed before recommissioning. Long term use dependent on resource consenting processes.
Frimley (x2)	Primary supply. 2nd bore activated on 17 December 2016	Frimley 1 Provisionally secure	Transgression on 19 August 16 at Frimley 1. Tests since clear. Pre incident long term planning was for future bores to service growth driven demand. Recent age testing highlighted potential issue with young water. Seasonal testing underway.
Wilson	Primary supply	Non secure	Transgressions on 19 August and 21 September 16. Tests since clear. Most recent water ageing analysis indicates the young water portion is now higher than threshold, follow-up tests are being performed. Planning for treatment of the raw water is now underway as is additional online monitoring
Willowpark Rd	Primary supply	Provisionally secure	HDC has commenced work to lift the borehead above ground and upgrade the sampling point.
Eastbourne (x4)	Primary supply	Secure	
Portsmouth	Supplementary supply	Secure	Most recent water ageing analysis meets compliance with DWSNZ but a small increase in young water percentage would risk non-compliance.
Napier Road	Off. only Emergency	Secure	Not in use, Chemical properties would result in taste and odour issues with the chlorinated supply.

APPENDIX 10**List of Submitters**

1. Peter Lorentz
2. Fred Robinson and Doug Stewart
3. David Renouf
4. Robert Molony
5. Keith Gosney
6. Jessica Souter Barron
7. Water New Zealand
8. ATS International
9. Gary Roselli
10. Chris Perley & Sarah Cates
11. Iain Rabbitts
12. Transparent Hawke's Bay Inc
13. Sara Gerard
14. Plumbers, Gasfitters and Drainlayers Board
15. Matthew Nolan
16. Grahame Sisson
17. David Wilkins
18. Nigel Harwood
19. Green Party of Aotearoa/New Zealand
20. A K (Keith) Thomson
21. Angela Hair
22. Ray Turnbull
23. Brad Govan
24. Guardians of the Aquifer
25. Hawke's Bay Regional Council
26. Hastings District Council
27. Hawke's Bay District Health Board
28. MWH New Zealand Ltd

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