NAPIER
CITY COUNCIL
Te Kaunihera o Ahuriri

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SUSTAINABLE NAPIER COMMITTEE

Open Attachments Under Separate Cover

Meeting Date:	Thursday 6 May 2021
Time:	10.00am
Venue:	Council Chambers Hawke's Bay Regional Council 159 Dalton Street Napier *Livestreamed to Council's Facebook page*

TABLE OF CONTENTS

DRAFT STATEMENT OF PROPOSAL

PROPOSED SPEED LIMIT AMENDMENTS TO NAPIER CITY COUNCIL'S SPEED LIMITS BYLAW 2012

CONTENTS

1. Background

1. The Government delegated speed limit decision making to Road Controlling Authorities on 1 July 2005. This delegation is contained in the Land Transport Rule: Setting of Speed Limits 2003.

2. In 2005 Napier City Council ('the Council') adopted a speed limits bylaw. The bylaw is called: *"Napier City Council Speed Limits Bylaw 2005"*.

3. A review was undertaken in 2009 with the latest review occurred in 2012 and the Speed Limits Bylaw 2012 became operational.

4. The bylaw consists of a series of plans identifying public road speed limits within the City.

5. The *draft* Speed Limits Bylaw 2021 is being released for public consultation using the Special Consultative Procedure as outlined in section 86 of the Local Government Act 2002. This procedure requires Council to:

    a. Prepare a Statement of Proposal explaining the proposal; and
    b. Give public notice of the proposal explaining why the changes are being made, where details of the proposal can be viewed and inviting public submissions; and
    c. Ensure that those likely to be most affected by the proposal are aware of the proposal; and
    d. Consider all submissions carefully before making a decision; and
    e. Write to all owners and occupiers of property on the road giving them the opportunity to submit and be heard.

6. In accordance with section 86(2) of the Local Government Act, Council is required to include the following in a Statement of Proposal:

    a. A draft of the proposed bylaw; and
    b. The reasons for the proposal; and
    c. A report on any relevant determinations by Council under section 155 of the Act.

7. The *draft* changes for the Speed Limits Bylaw 2021 form part of this Statement of Proposal and the final proposed bylaw plans will incorporate the approved changes and be a stand-alone bylaw.

8. Reasons for the amendments

9. Under the Local Government Act 2002 Council is required to review all bylaws within five years of their adoption and every ten years thereafter.

10. Council has reviewed the Speed Limits Bylaw 2012 and consider that while some current speed limits are safe and appropriate, other speed limits are not appropriate for their current road layout or they are not in alignment with the New Zealand Transport Agency's Speed Management Guide.

11. The speed limits on some roads have been amended to align with the New Zealand Transport Agency's Speed Management Guide.

12. Calculating & Changing Speed Limits

13. Despite the fact that speed limit decision making is now delegated to Road Controlling Authorities the actual calculation of speed limits remains tightly controlled. This is to ensure consistency across the country.

14. The Land Transport Rule: Setting of Speed Limits 2017 sets out how the setting of speed limits are controlled and this is assessed against the New Zealand Transport Agency's Speed Management Guide.

15. Any decision of a Road Controlling Authority can be reviewed and changed by the New Zealand Transport Agency and the New Zealand Police.

16. The Land Transport Rule: Setting of Speed Limits 2017 requires that the following people, organisations and communities that are affected by the proposed speed limits are consulted:

    a. New Zealand Transport Agency;
    b. The chief executive of the New Zealand Automobile Association Incorporated;
    c. The chief executive of the Road Transport Forum New Zealand;
    d. Any local communities considered to be affected by the proposed speed limit;
    e. The Commissioner of the New Zealand Police;
    f. Hastings District Council;
    g. Hawkes Bay Regional Council;
    h. Any other organisation or road user group the Council considers affected;

17. Consultation and Submissions

18. Council invites the community to give feedback on the proposed Bylaw to assist in the decision making process.

19. Council will follow the detailed procedures with key dates below:

Council approves the draft bylaw for consultation	3rd June 2021
Public consultation starts	28th June 2021
Public consultation ends	23rd July 2021
Council bylaw hearing with submissions being heard	August/September 2021

20. Any person or organisation is welcome to make a submission on the *Draft* Speed Limits Bylaw 2019.

21. The Council will take into account all submissions before deciding on the final content of the bylaw.

22. Copies of the Statement of Proposal will be available at:

    a. Napier City Council office, Dunvegan House;
    b. Napier Library;
    c. Taradale Library; and
    d. The Napier City Council website

23. Formal submissions may be made:

    a. Online via Napier City Council's website www.sayitnapier.nz

    b. Post to:

        Traffic and Speed Limits Bylaw
        Infrastructure Services
        Napier City Council
        Private Bag 6010
        Napier 4142

c. Email to: speedlimits@napier.govt.nz

24. Submissions will close at 5pm on Friday 23rd July 2021.

25. Submissions should include name, address, telephone number and email address and should state if you wish to speak to Council in support of your submission. The Council will contact in writing, all submitters who wish to be heard to advise the confirmed time, date and venue of the hearing.

26. All submissions will be made available to the public after the submission period closes.

Proposed Changes to the Speed Limits Bylaw 2012

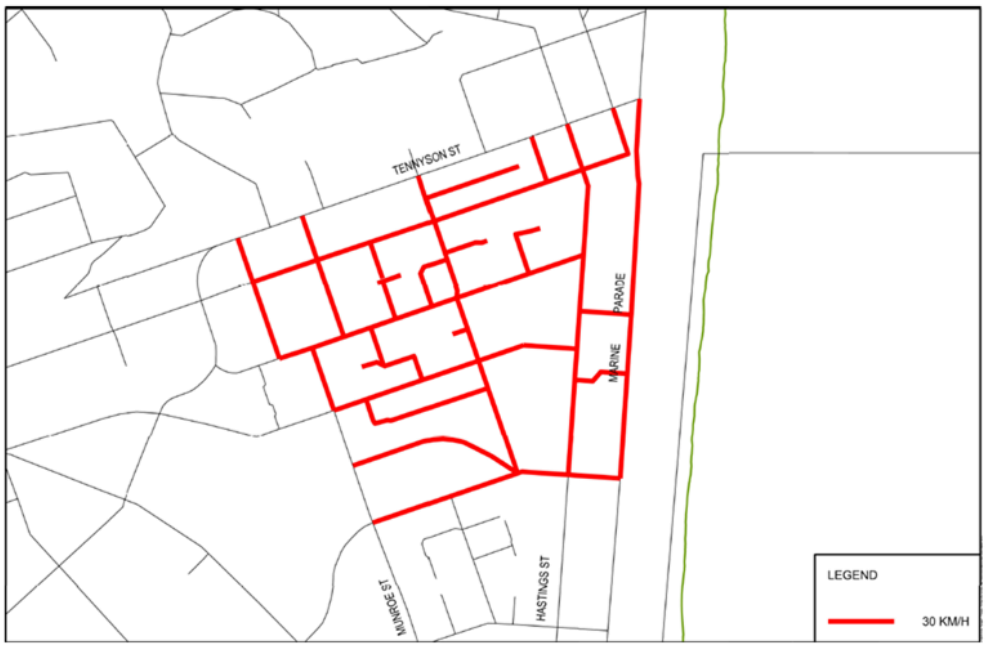
Proposal 1: Variable 40km/h school zones

Explanation
We should be ensuring we give our most vulnerable, and most unpredictable, road users the greatest chance of survival. The New Zealand Ministry of Transport's 2012 research report into speeding states *"At 30km/h pedestrians have about a 90 percent chance of surviving the impact of a motor vehicle, whereas if struck at 45km/h they have only a 50 percent chance of surviving."*

Survey Assessment
NZTA's Traffic Note 37 permits variable speed limits at schools as this significantly reduces the level of injury if a child is struck by a vehicle.
The travel time increase for an average school zone of 300m is 6 seconds.

Proposal
The speed limit be reduced from 50km/h to 40km/h during morning drop off times and afternoon pick up times which varies from school to school.
Further changes will be implemented should the speed limit rule be altered to permit the variable speed limit to be 30km/h

Proposal 2: Napier CBD



Explanation
We feel that a safe and appropriate speed for the Napier CBD is 30km/h.

This will help encourage active travel in the CBD and will allow cyclists to share the road with all other vehicles in a low speed environment.

Survey Assessment
The Speed Management Guide suggests a proposed safe and appropriate speed of 30km/h, for the CBD, based on the ONRC class and Infrastructure Risk. Having a consistent speed limit in this environment is the most appropriate method of controlling speeds.

Proposal
The speed limit be reduced from 50km/h to 30km/h in the CBD.

Proposal 3: Sandy Road, Hales Road, Sears Road, Jessep Road, King Road & Brookfields Road

Explanation

We think keeping the speed at the open road limit is too risky for all road users and lowering it to 80 km/h will provide a safe and more appropriate environment.

Assessment

Sandy Road and Brookfields Road are included in the top 10% of roads in New Zealand for deaths and serious injuries which is part of the 2018-21 GPS targets.
Roadside hazards have a moderate to high rating and the overall Infrastructure Risk Rating is Medium based on the ONRC class and Infrastructure Risk Rating. The travel time change has been calculated as 10 seconds for Sandy Road and 20 seconds for the full length of Brookfields Road.

Proposal

The speed limit be reduced from 100km/h to 80km/h.

Proposal 4: Tannery Road, Waverly Road, Burness Road & Ulyatt Road

Explanation
We want to help drivers understand what speed they should be driving at, so we want to reduce the speeds on Tannery Road and Burness Road to 80 km/h to be consistent with the proposed speed on Meeanee Road.
With the proposed retirement village on Ulyatt Road it is necessary to lower the speed limit to 50km/h.

Assessment
The proposal for these roads is due to an Infrastructure Risk Rating being medium.
The Speed Management Guide suggests a proposed safe and appropriate speed of 60km/h based on the ONRC class and Infrastructure Risk Rating for northern half of Tannery Road and 80km/h for the remainder, following further assessment of the Tannery Road speed environment we believe that a consistent speed of 80km/h is the appropriate speed.

Proposal
The speed limits on Tannery Road and Burness Road be reduced from 100km/h to 80km/h.
The speed limit on Ulyatt Road be reduced from 100km/h to 50km/h.

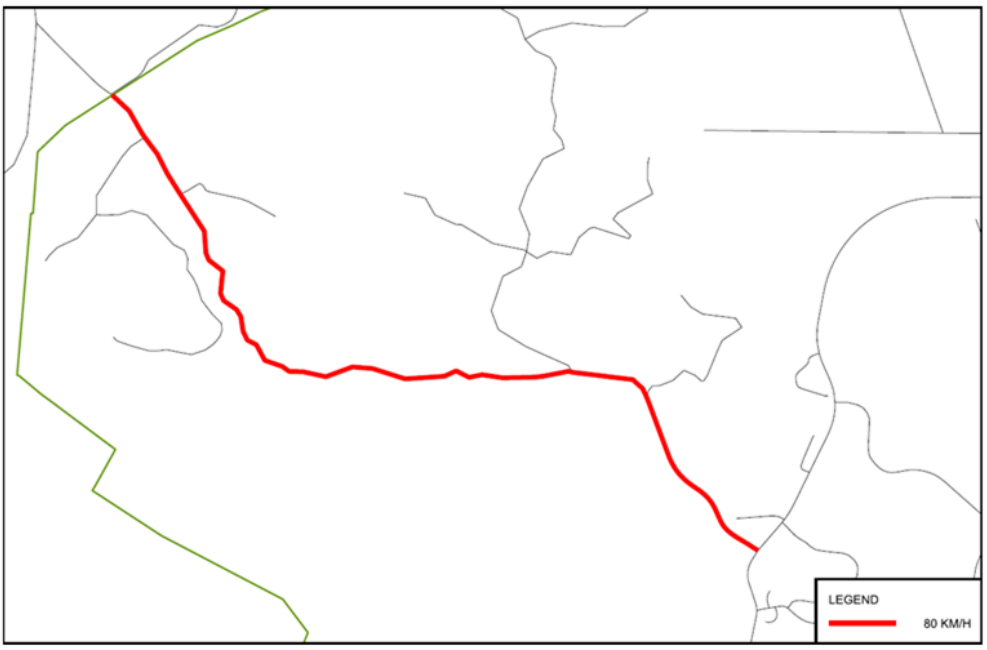
Proposal 5: Meeanee Road

Explanation
We want to help drivers understand what speed they should be driving at, so we want to increase Meeanee Road to 80 km/h to be consistent with the proposed speed limits on the adjacent roads in the area with similar speed environments.

Assessment
The proposal for these roads is due to an Infrastructure Risk Rating being low.
Further analysis of this section of Meeanee Road was published during September 2018 by NZTA in the Speed Management Guide. The results show that the safe and appropriate speed limit for this road is 60km/h. Based on local knowledge and previous investigations into how the road operates, officers are still comfortable that the speed limit is increased to 80km/h.

Proposal
The speed limit be increased from 70km/h to 80km/h.

Proposal 6: Puketitiri Road

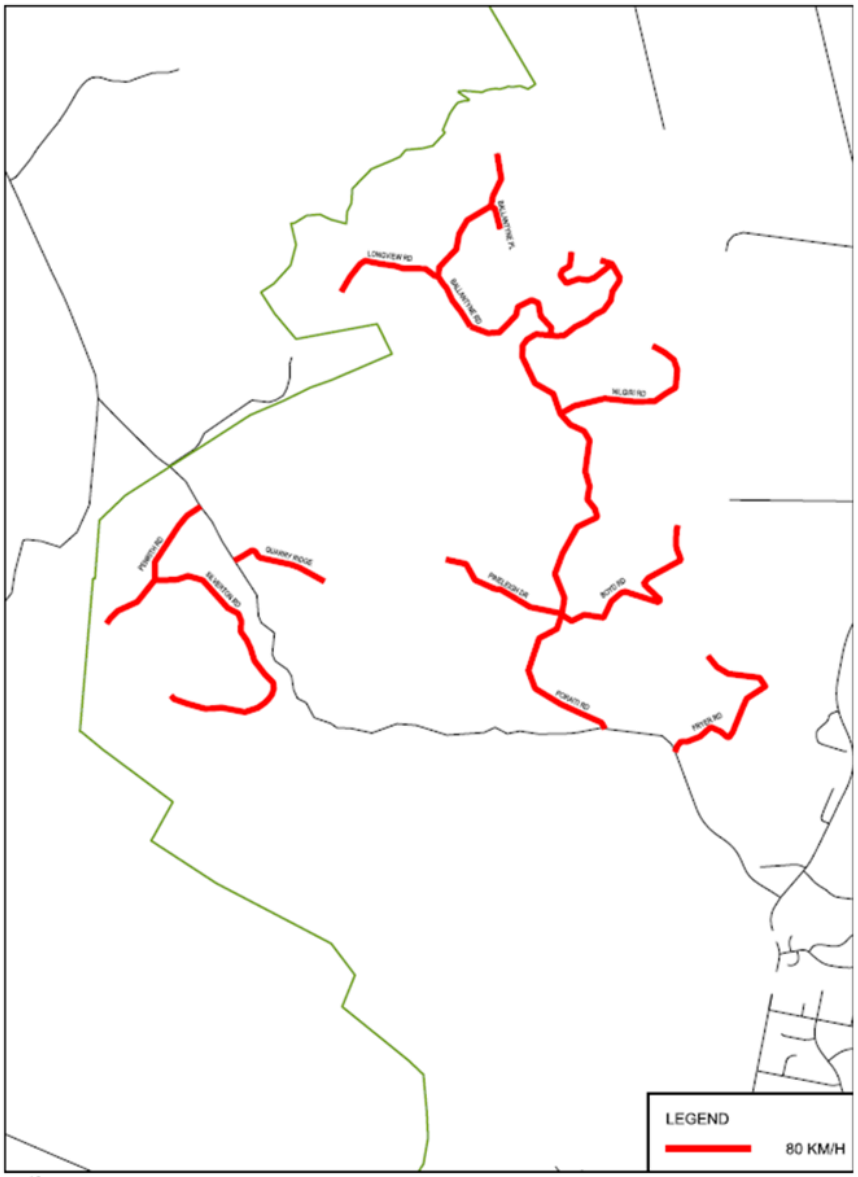


Explanation
A temporary speed limit zone of 80 km/h from the start of this road at Church Road, through to the intersection with Poraiti Road, has been in place for some time. This is working well, and we'd like to extend the 80 km/h zone through to the city boundary at Rotowhenua Road. This section of the road has some extreme horizontal and vertical alignment changes. We are in the process of preparing designs to improve the road geometry to improve safety but a lower speed limit will still be required to ensure the road operates at an acceptable level of safety. The preliminary designs have utilised an 80km/h design speed.

Assessment
The Speed Management Guide indicates that the safe and appropriate speed of 60km/h based on the ONRC class and Infrastructure Risk Rating of high with moderate to high roadside hazards. Following the assessment, we believe that 80km/h is appropriate and the proposed amendments to the road geometry will address the risk rating discrepancies. The travel time increase has been calculated as 22 seconds for the specified length of Puketitiri Road, assuming vehicles were able to travel at 100km/h for the specified length.

Proposal
The speed limit be reduced from 100km/h to 80km/h.

Proposal 7: Poraiti Road, Nilgiri Road, Boyd Road, Pineleigh Drive, Ballantyne Road, Ballantyne Place, Longview Road, Fryer Road, Penrith Road, Silverton Road & Quarry Ridge



Explanation
As with Puketitiri Road, there are some risky roadside hazards on these roads. The horizontal and vertical geometry of the roads is why we think 80 km/h is a much safer and appropriate speed here.

Assessment
The Speed Management Guide indicates a safe and appropriate speed of 60km/h based on the ONRC class and Infrastructure Risk Rating of medium to high with moderate to high roadside hazards. Following the assessment, we believe that 80km/h is appropriate and the proposed amendments to the road geometry will address the risk rating discrepancies.

Proposal
The speed limit be reduced from 100km/h to 80km/h.

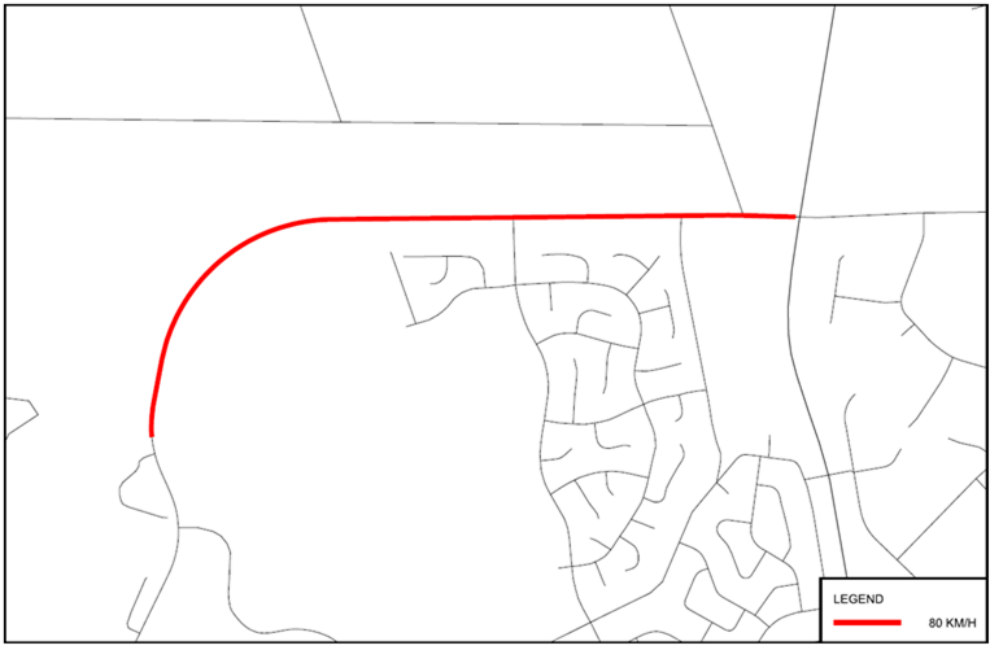
Proposal 8: Springfield Road

Explanation
We think a 60 km/h limit on this road will be much safer for all users because of the number of roadside hazards, such as trees and drainage ditches, and the geometry of the road.
A recent temporary change in speed limit to 60km/h was effective in improving driving behaviours.

Assessment
The Speed Management Guide indicates that the safe and appropriate speed is 60km/h based on the ONRC class and Infrastructure Risk Rating of medium to high with moderate to high roadside hazards. Following further assessment, we believe that 80km/h is appropriate.

Proposal
The speed limit be reduced from 100km/h to 60km/h.

Proposal 9: Prebensen Drive

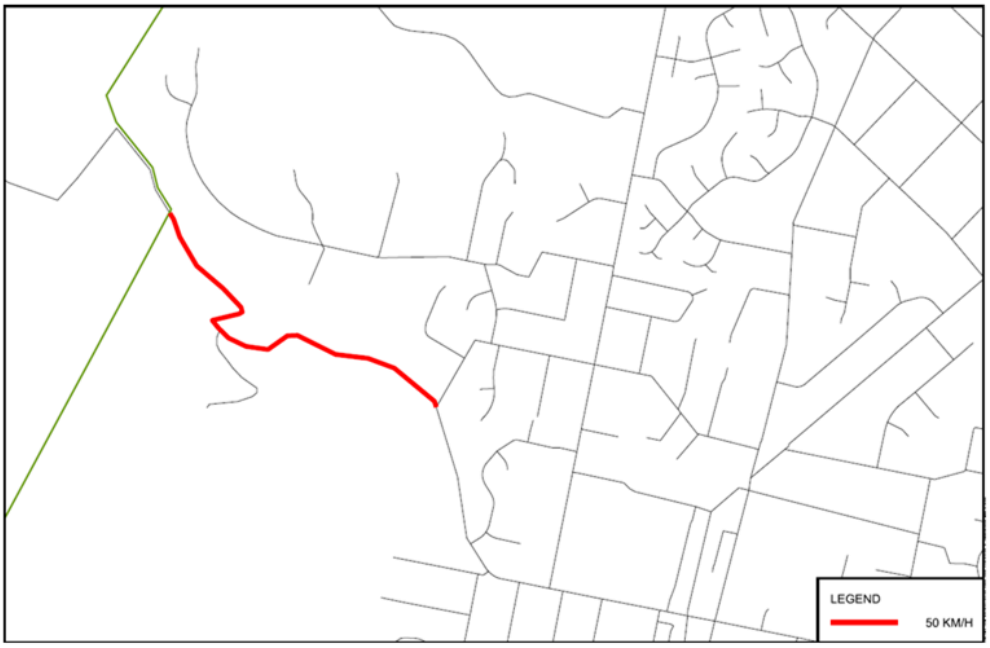


Explanation
Due to the roadside hazards and the horizontal curvature of the road, we think the safe and appropriate speed for this stretch of road is 80 km/h. The limit for the rest of Prebensen Drive to the east of SH50 will stay at 70 km/h.

Assessment
This section of Prebensen Drive is included in the top 10% of roads in New Zealand for deaths and serious injuries which is part of the 2018-21 GPS targets. The travel time change has been calculated as 3 seconds for the section of road with a lower speed limit which will be offset slightly with the increased section between Tamatea Drive and SH50.

Proposal
The 70km/h speed limit be increased to 80km/h between Tamatea Drive and Orotu Drive and reduce the 100km/h speed limit between Orotu Drive and Cato Road to 80km/h.

Proposal 10: Puketapu Road



Explanation
This is to remove an anomaly of what is marked on site and what is included in the Speed Limits Bylaw. It is proposed to amend the bylaw to align with the speed limit signage on the ground.

Assessment
This has not been assessed against the Land Transport Rule: Setting of Speed Limits 2017. Rather, given it has operated for at least 5 years and maybe longer, it is simply proposed to amend the bylaw to reflect the situation on the ground.

Proposal
The speed limit be reduced from 100km/h to 50km/h.

Proposal 11: Tamatea Drive

Explanation
There are a number of existing and proposed developments in this area, which means more residents, traffic, bikes on the road, and pedestrians to look out for. We think 50 km/h is a much safer speed for this residential area.

Assessment
This section of Tamatea Drive is included in the top 10% of roads in New Zealand for deaths and serious injuries which is part of the 2018-21 GPS targets with a speed of 60km/h. Given the proposed aquatic development and the high traffic generation this will produce the safe and appropriate speed is assessed as 50km/h.

Proposal
The speed limit be reduced from 70km/h to 50km/h.

Proposal 12: Te Awa Avenue, Eriksen Road & Kenny Road

Explanation
Due to the increasing residential developments in the area we think it is safer to lower the speed to 50km/h.

Assessment
Given the number of developments and the high traffic generation these will produce, the safe and appropriate speed is assessed as 50km/h.

Proposal
The section of Te Awa Avenue with a speed limit of 70km/h be reduced to 50km/h.
The section of Kenny Road from Te Awa Avenue to 100m after Eriksen Road be reduced from 70km/h to 50km/h.
The section of Eriksen Road from 550m before Kenny Road to the closed end be reduced from 100km/h to 50km/h.

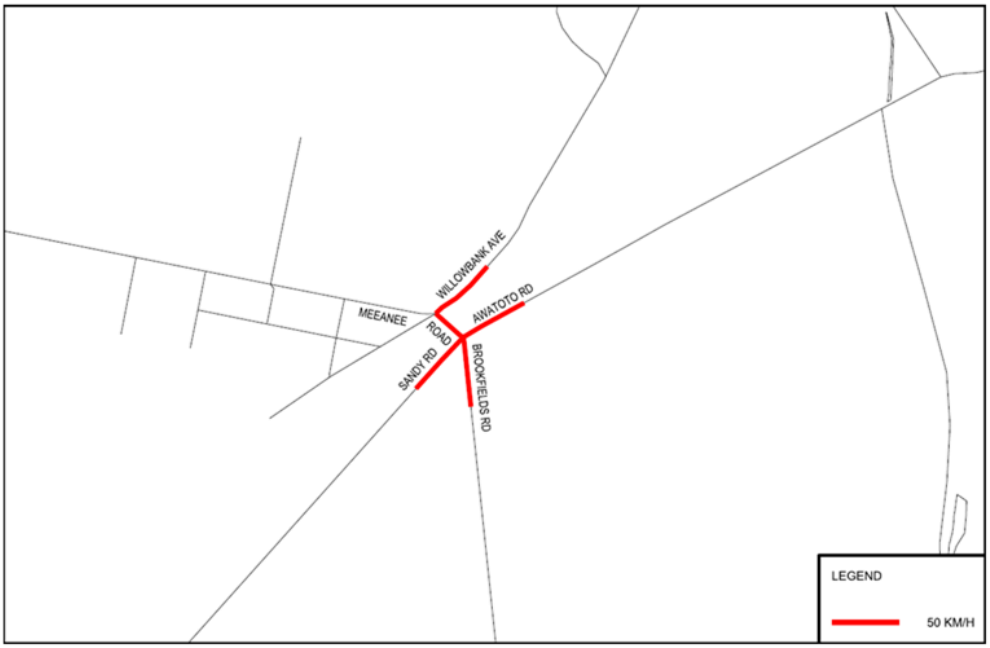
Proposal 13: Onehunga Road

Explanation
This part of the Onehunga Road is narrow with a number of residential properties, so we would like to lower the speed limit to 50km/h. Threshold treatments will be required to differentiate between the two sections of road.

Assessment
Due to the low traffic volumes the Speed Management Guide has little information on Onehunga Road but due to the residential properties at the end of the road it is assessed as an urban area and therefore should be 50km/h.

Proposal
The speed limit be reduced from 100km/h to 50km/h.

Proposal 14: Meeanee Village



Explanation
There are two high risk intersections in this area. We want to extend the current 50 km/h limit through the village to include these two intersections as well.

Assessment
As previously mentioned, Sandy Road and Brookfields Road are included in the top 10% of roads in New Zealand for deaths and serious injuries and the reduction in speed at this high risk intersection is to further lower risk of death and serious injury. There has been one serious and one fatal crash since 2013 at this intersection.

Proposal
75m of Sandy Road, Brookfields Road and Awatoto Road from the intersection of Meeanee Road be reduced from 100km/h to 50km/h.

75m of Willowbank Road from the intersection of Meeanee Road be reduced from 100km/h to 50km/h which will reflect the signage that already exists.

Proposal 15: Marine Parade

Explanation
Due to the many facilities, hotels and tourist activities on this section of Marine Parade and the high number of vulnerable users (pedestrians, particularly children and tourists, and cyclists).
The 40km/h courtesy zone signs on Marine Parade at Ellison Street and Coote Road will be removed.

Assessment
This is an inappropriate speed limit for the environment given the high number of vulnerable users including tourists, attractions and businesses in the area.
The travel time increase has been verified through field testing as 30 seconds between Vautier Street and Ocean Spa with the reduced speed limit. However, the overall travel time difference between Ellison Street and Ocean Spa is only 2 seconds with the removal of the courtesy zone.

Proposal
The speed limit be reduced from 50km/h to 30km/h.

Proposal 16: Gloucester Street

Explanation
We recognise how many people and vehicles move in and out of the bus layby, so we think 20 km/h will be a much safer speed for this environment. The speed limit on Gloucester Street will remain at 50km/h.

Assessment
Due to the number of pedestrians that cross Gloucester Street through the layby it has been assessed as needing a safe and appropriate speed limit of 20km/h.

Proposal
The speed limit be reduced for the layby from 50km/h to 20km/h.

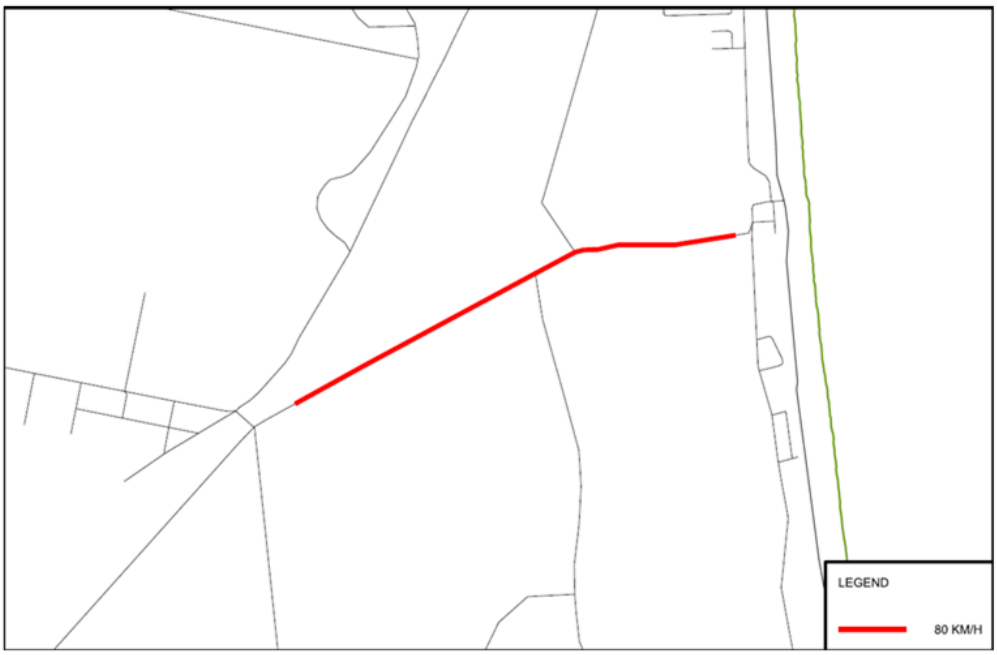
Proposal 17: Symons Lane

Explanation
This is a narrow service lane primarily for the Taradale CBD and we think it will be much safer for all users if the speed limit is set at 20km/h.

Assessment
Due to the low traffic volumes the Speed Management Guide has little information on Symons Lane but due to the adjacent facilities and parking demand, it is assessed as a low speed environment with a safe and appropriate speed of 20km/h.

Proposal
The speed limit be reduced from 50km/h to 20km/h.

Proposal 18: Awatoto Road

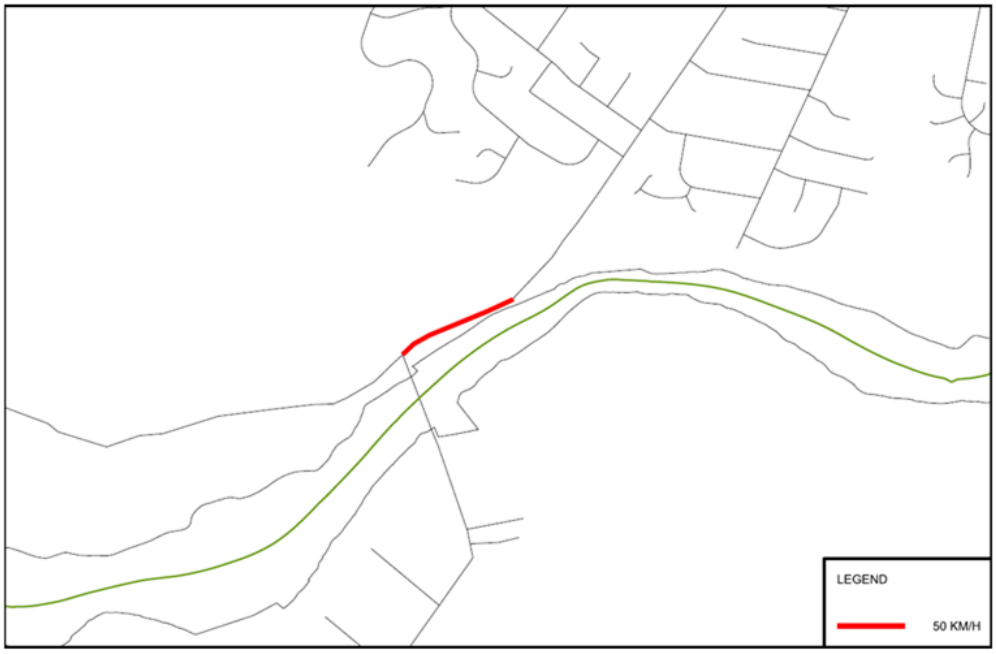


Explanation
Due to the high volume of trucks using this route it is felt that the reduction of the 100km/h speed limit on Sandy Road should be continued to the include Awatoto Road.

Assessment
The Speed Management Guide has the safe and appropriate speed as 80km/h with the Infrastructure Risk Rating of medium. The travel time change has been calculated as 23 seconds for the full length of Awatoto Road.

Proposal
The speed limit be reduced from 100km/h to 80km/h.

Proposal 19: Gloucester Street

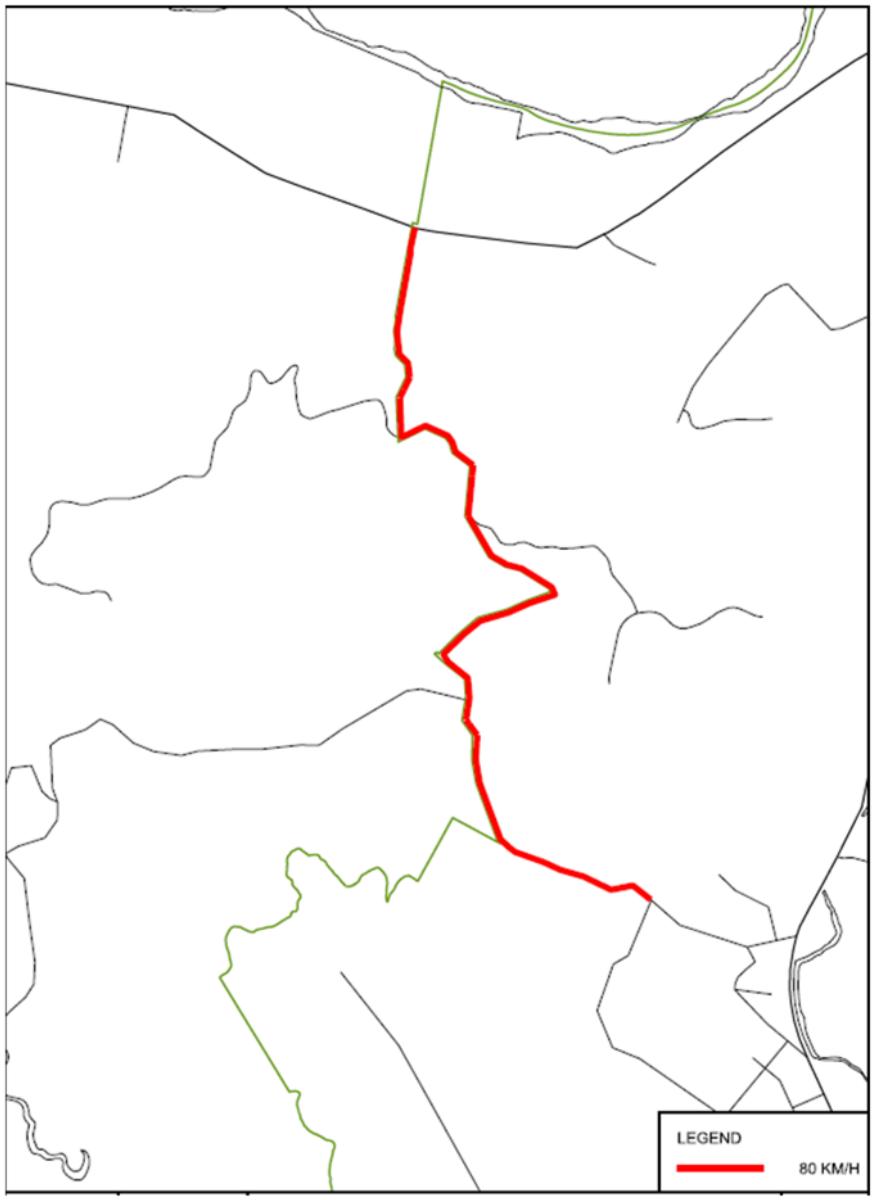


Explanation
This section of road has poor horizontal alignment and poor visibility entering a narrow bridge so the 70km/h limit is considered to be too fast for the road environment.

Assessment
This section of Gloucester Street is included in the top 10% of roads in New Zealand for deaths and serious injuries which is part of the 2018-21 GPS targets.
Roadside hazards have a moderate to severe rating and the overall Infrastructure Risk Rating is low to medium based on the ONRC class and Infrastructure Risk Rating. The travel time change has been calculated as 2 seconds for this section of road.

Proposal
The speed limit be reduced from 70km/h to 50km/h.

Proposal 20: Hill Road



Explanation
Hill Road has some sharp horizontal and steep vertical geometry along its alignment and the width is narrow with no margin for error.

Assessment
The Speed Management Guide indicates that the safe and appropriate speed is 60km/h based on the ONRC class. In addition an Infrastructure Risk Rating of high with moderate to high roadside hazards. Following the assessment, we believe that 80km/h is appropriate.

Proposal
The speed limit be reduced from 100km/h to 80km/h.


WATER
SAFETY
PLAN
Napier drinking water supply
(NAPO01)
v4.4
NAPIER
CITY COUNCIL
Te Kaunihera o Ahuriri

Contents

Figures

Tables

1. Document Version Control

Version number	Description	Approved	Next revision Date
v1.0	Prepared by BTO 17.08.10. Approved by DWA	2010	N/A
v2	Prepared by NCC staff with input from BECA	December 2016	N/A
v3	Prepared by NCC staff – updated before DWA Implementation visit on 27 Feb 2018	N/A	N/A
v3.1	Prepared by NCC staff on v3 basis and Implementation visit outcome's comments and recommendations– not yet approved by DWA	Sent out for approval on 4 April 2018	N/A
v3.2	Prepared by NCC staff on v3.1 basis, rectifying 'v3.1 Report on Adequacy' non-conformances	Approved 29 May 2018	N/A
v4.1	Prepared by NCC staff on v3.2 basis, updating WSP on regained interim bore security status and adopting majority of the 'v3.1 Report on Adequacy' recommendations (Doc. ID: 667594)	Approved 8 November 2018	N/A
v4.2	Prepared by NCC staff on approved v4.1 basis, only minor changes done. (Doc. ID: 706259)	N/A	N/A
v4.3	Prepared by NCC staff, only minor changes done. Issued 8 August 2019. (Doc. ID: 706259)	N/A	N/A
v4.4	Prepared by NCC staff, only minor changes done. Issued 18 December 2020. (Doc. ID: 1271452)	N/A	December 2021 or upon major change

WSP v4.4 will be revised again latest December 2021. A change that would require a major and significant update of the WSP and which would trigger a new DWA adequacy assessment, would also require NCC to adopt the new WSP framework (released by MoH in December 2018).

Assessment of the performance of the plan

Assessment of the performance of the plan will be undertaken annually – latest end of March. The assessment will consider any events, non-compliances, near misses and unexpected situations that have occurred, progress against the improvement schedule and any changes to any of the supply elements. A report of this assessment will be provided by the Team Leader 3 Waters to the Manager Asset Strategy.

The Team Leader 3 Waters will be responsible for ensuring that any matters requiring attention will be communicated with Manager Asset Strategy and reviewed if they need to be included into the Annual Plan, the Asset Management Plan for Water Supplies (AMP) or (if requiring significant capital funding) the Council Long Term Plan.

2. Linked Documents and Abbreviations

Linked Documents

This Water Safety Plan (WSP) is linked to several documents that are stored in the InfoSource - NCC's document management system. The references are either supporting documents or the referred-to documents are an integral part of this WSP.

Document name	Infosource D# or F#
Alternative Water Supply Plan	D#1272788
Annual Plan (referring to water section only)	F#591544
Asset Management Plan for Water Supplies (AMP)	F# 975081
Att6 to WTHB-NCC Contract	F#970070
Bore Isolation Plan	D#945489
Code of Practice (D-M)	D#1273111
Communications and Engagements Strategy	D#1272106
Drinking-water Standards for New Zealand 2005 (Revised 2018) (DWSNZ)	D#951236
Emergency Management Plan (EMP) (referring to water section only)	F#1021160
Internal Audit Programme for Napier Water Supply (NAP001)	D#1266865
Long Term Plan (LTP)	F# 591548
Napier (NAP001) - Monitoring Programme	D#785147
Napier Drinking-water Sampling Locations	D#785147
Operation and Maintenance Manual	D#956473
SOP 120-01 Critical Control Points	D#732344
SOP 120-02 Total Coliforms in Bore Water	D#732345
SOP 120-03 Chlorine Dosing	D#732346
SOP 120-04 Water Dechlorination	D#732358
SOP 120-05 Bore Pump Storage and Disinfection	D#732631
SOP 120-06 Water Testing	D#735449
SOP 120-07 Covid-19 – Dechlorinated Water Station	D#932917
SOP 120-07 Dechlorinated Water Station	D#865272
SOP 120-08 Bore Pump Lockout Reset	D#956517
Water Conservation Strategy	D#440616
Water Contamination Communications Plan	D#977463
Water Restrictions Communications Plan	D#1273338
Water Restrictions Plan	D#1273140
Water Supply Network Master Plan	D#912145

Abbreviations Used

3WL – 3 Waters Lead

3WOE – 3 Waters Operations Engineer

3WPM – 3 Waters Programme Manager

AMP – Asset Management Plan for Water Supplies

CAPA – Corrective and Preventative Action

CC – Combined Chlorine

CCP – Critical Control Point

CEO – Chief Executive Officer

D# - Document Id number in Infosource

DCS – Director City Services

DI – Director Infrastructure

DWA – Drinking Water Assessor

DWO – Drinking-water online portal

DWSNZ (Drinking-water Standards for New Zealand)

E. coli – *Escherichia coli*

F# - Folder Id number in Infosource

FAC – Free Available Chlorine

Fe – Iron

GV – Guideline Value (DWSNZ)

HB DHB – Hawke's Bay District Health Board

HBRC – Hawkes Bay Regional Council

HPC – Heterotrophic Plate Count

ID – Infrastructure Data

IP – Improvement Plan

LTP – Long Term Plan

MAS – Manager Asset Strategy

MAV – Maximum Acceptable Value (DWSNZ)

Mn – Manganese

MoH – Ministry of Health

MoH – Ministry of Health

NCC – Napier City Council

NCC – Napier City Council

NCSE – Network Control Systems Engineer

NTU – Nephelometric Turbidity Unit

OM3W – Operations Manager 3 Waters

OMCS – Operations Manager City Services

PPM – Parts per Million

RA – Risk Assessment

SLT – Senior Leadership Team

SOE – State of the Environment

SOP – Standard Operating Procedure

SPZ – Source Protection Zone

TC – Total Coliforms

TL3W – Team Leader 3 Waters

TLAI – Team Leader Asset Intelligence

TLWS – Team Leader Water Supply

WQL – Water Quality Lead

WSP – Water Safety Plan

WTHB – Water Testing Hawkes Bay

3. Introduction

This WSP has been prepared for the Napier drinking-water supply to identify potential events that present public health risks to the customers of the drinking water supply. Napier City Council is committed to the WSP and to the future improvements to the supply that have been identified in this WSP.

The Napier drinking water supply is a large urban supply providing water to only one community - Napier. The total population that is supplied counts approximately 59,055 people (that is approximately 93% of total 63,500 people, both figures NCC estimate). The water is sourced from a local aquifer, and is being chlorinated with sodium hypochlorite at each bore (chlorination in place after 2017 *E. coli* transgressions) and provided to the community. Chlorination setup also in place at Tannery booster pump station, dosing into the supply main to Bay View. No other treatment in place at this stage (e.g. UV, filtration, etc.).

After loosing secure bore status at all NCC bores on 21 July 2017, NCC has undertaken required upgrades on its bores and moved from interim secure status (granted in second half of 2018) to full secure bore status on all bores from April 2019 onwards. Secure Bore Status (D#1268090) has been granted for a period of 2 years and NCC is to provide age-testing results and bore head protection review latest April 2021 for consideration of ongoing compliance after that date.

NCC long-term plans are to achieve protozoal compliance at each bore utilising appropriate treatment to meet DWSNZ, as NCC does not intend to rely on bore security status going forward. With current configuration, it is difficult to install additional treatment. However NCC's Long Term Plan 2018-2028, includes commissioning two bore fields with treatment plants at each one (most likely UV treatment and chlorination) before June 2023.

The scheme is administered at the main council offices on PO 6010, Napier, 4142 and operated and managed by the Council's Asset Strategy Management and the Depot. The management, maintenance and operation of the Napier Water Supply are the responsibility of below Council staff:

- Chief Executive Officer (interim), CEO – Keith Marshall
- Director Infrastructure, DI (Jon Kingsford)
- Director City Services, DCS (Lance Titter)
- Operations Manager City Services, OMCS (Howard Tisdall)
- Manager Asset Strategy, MAS (Catherine Bayly)
- Team Leader 3 Waters, TL3W (Santha Agas)
- Team Leader Water Supply, TLWS (Dean Hammond)
- 3 Waters Lead, 3WL (Lance Groves)
- Water Quality Lead, WQL (Anze Lencek)
- Network Control Systems Engineer, NCSE (John Kelsey)
- 3 Waters Operations Engineer, 3WOE (Daniel Monrad)
- Team Leader Asset Intelligence, TLAI (Shannon Kelly)
- 3 Waters Programme Manager, 3WPM (Russell Bond)

4. Supply Details

The Napier drinking-water supply (NAP001) comprises only one zone – Napier (NAP001NA), supplied with groundwater from a number of bores and pump stations. NCC owns and manages the supply. The Ministry of Health registration details are set out in the table below with some further relevant detail about each source. Note 'DWO' stands for 'Drinking-Water Online' (https://drinkingwateronline.nz).

Table 1. Summary of the Napier City water supply details

Supply Details		
Supply Name	Napier	
DWO Community Code	NAP001	
Supply Owner	Napier City Council	
Manager Asset Strategy	Catherine Bayly	
Director Services Manager	Lance Titter	
Team Leader 3 Waters	Santha Agas	
Team Leader Water Supply	Dean Hammond	
Population Served by Supply	59,055 (DWO register, December 2020)	
Consent Details		
Resource consent Number	WP 060658TA	
Consented quantity	Consent covers take from all of the bores supplying Napier community. It allows 784 L/s, 67,738 m^3/day, 387,744 m^3/7 days and 55,392 m^3 per day over a 7 day period.	
Source and Plant Details		
Source Name	A1 Bore	
Source DWO Code	G02037	
Type of Source	Bore	
Grid Reference of Source (NZMG)	Easting : 2845712	Northing : 677740
Plant Name	A1 Treatment Plant	
Plant DWO Code	TP03097	
Location	(A1) Road reserve cnr Awatoto & McLeod Roads	
Treatment Processes	Chlorination in place. Secure bore status reinstated in April 2019.	
Source and Plant Details		
Source Name	T2 Bore	
Source DWO Code	G00062	
Type of Source	Bore	
Grid Reference of Source (NZMG)	Easting : 2841040	Northing : 6178391
Plant Name	T2 Treatment Plant	
Plant DWO Code	TP00105	
Location	(T2) Bledisloe Park	
Treatment Processes	Chlorination in place. Secure bore status reinstated in April 2019.	
Source and Plant Details		
Source Name	T1 Bore	
Source DWO Code	G00061	
Type of Source	Bore	
Grid Reference of Source (NZMG)	Easting : 2841921	Northing : 6178720
Plant Name	T1 Treatment Plant	
Plant DWO Code	TP00106	
Location	(T1) Road reserve Burness Road	
Treatment Processes	N/A. T1 is not in use and not intended to be put back online again. (Secure ground water status removed on 21 July 2017 by DWA).	

	Bore hydraulically and electrically disconnected from the water supply system.	
Source and Plant Details		
Source Name	C1 Bore	
Source DWO Code	G00067	
Type of Source	Bore	
Grid Reference of Source (NZMG)	Easting : 2844053	Northing : 6180574
Plant Name	C1 Treatment Plant	
Plant DWO Code	TP00111	
Location	(C1) Coverdale St	
Treatment Processes	Chlorination in place. Secure bore status reinstated in April 2019.	
Source and Plant Details		
Source Name	T5 Bore	
Source DWO Code	G00064	
Type of Source	Bore	
Grid Reference of Source (NZMG)	Easting : 2841570	Northing : 6177913
Plant Name	T5 Treatment Plant	
Plant DWO Code	TP00103	
Location	(T5) Road reserve Guppy Road	
Treatment Processes	Chlorination in place. Secure bore status reinstated in April 2019.	
Source and Plant Details		
Source Name	T3 Bore	
Source DWO Code	G00065	
Type of Source	Bore	
Grid Reference of Source (NZTM)	Easting : 2840344	Northing : 6177098
Plant Name	T3 Treatment Plant	
Plant DWO Code	TP00102	
Location	(T3) Riverside Park	
Treatment Processes	Chlorination in place. Secure bore status reinstated in April 2019.	
Source and Plant Details		
Source Name	T4 Bore	
Source DWO Code	G00063	
Type of Source	Bore	
Grid Reference of Source (NZMG)	Easting : 2842048	Northing : 6179482
Plant Name	T4 Treatment Plant	
Plant DWO Code	TP00104	
Location	(T4) Gloucester Street	
Treatment Processes	N/A. T1 is not in use and not intended to be put back online again. (Secure ground water status removed on 21 July 2017 by DWA). Bore hydraulically and electrically disconnected from the water supply system.	
Source and Plant Details		
Source Name	T6 Bore	

Source DWO Code	G01151	
Type of Source	Bore	
Grid Reference of Source (NZMG)	Easting : 2841390	Northing : 6177111
Plant Name	T6 Treatment Plant	
Plant DWO Code	TP01961	
Location	(T6) Road reserve Guppy Road	
Treatment Processes	Chlorination in place Secure bore status reinstated in April 2019.	
Source and Plant Details		
Source Name	T7 Bore	
Source DWO Code	G01395	
Type of Source	Bore	
Grid Reference of Source (NZMG)	Easting : 2841297	Northing : 6178066
Plant Name	T7 Treatment Plant	
Plant DWO Code	TP02308	
Location	(T7) King Street	
Treatment Processes	Chlorination in place. Secure bore status reinstated in April 2019.	

5. Description of the Napier City Drinking-water Supply

The first community water supply for Napier City was commissioned in late 1877 and utilised water from a bore located in what is now the central business district. The 1931 earthquake considerably changed the geography of the Napier, elevating areas that had been underwater and providing considerable further areas for development. The water supply has continued to rely on groundwater bores and in 1968 when the Taradale Borough was amalgamated with Napier City the public drinking-water supply was extended to that area. Aesthetically high quality groundwater in the Taradale area was utilised with the first bore drilled in the mid-1970s and six more since. Bores closer to Napier City with lower aesthetic quality were progressively decommissioned as more supply capacity from Taradale was constructed. Trunk mains, booster pump stations and reservoirs have subsequently been constructed to provide consistent pressures and security of supply as development has continued.

The Bay View area was amalgamated with Napier in 1989. Bay View had been reticulated during the early 1960's, with the supply from a bore on the northern bank of the Esk River. This water was of poor aesthetic quality, in 1988 the Tannery Road bore, pump station was established, and a 14 km pipeline was installed to supply the area. In 1998 the Bay View area was connected to the Napier City supply.

Today Napier City's water supply system consists of only one distinct supply area or community - the Napier Community (NAP001). The Napier community consists of a single distribution zone – Napier (NAP001NA), supplying water to urban and rural areas. Approximately 93% of Napier's population is serviced by reticulation system and around 10 million m^3 of water is produced annually.

Groundwater is abstracted from the Heretaunga Plains aquifer. The Heretaunga Plains is underlain by Quaternary fluvial, estuarine-lagoonal, and marine deposits in-filling a subsiding syncline. Borehole data indicate the deposition during the low sea level stands of the Last Glaciation was dominated by alluvial gravels accumulated from the bed load of the braided river systems of the Ngaruroro, Tutaekuri and Tukituki rivers. There materials make up the primary aquifer of the Heretaunga Plains. Overlying fine-grained materials deposited subsequently across much of the eastern Heretaunga Plains comprise an aquitard that confines the aquifer. Within the depositional sequence, river-channel gravels form an interconnected unconfined-confined aquifer system containing groundwater recharged from land surface recharge and the Ngaruroro River bed at the inland margin of the plain, 20 km from the coast. At the coast, gravel aquifers extend to a depth of 250m. The multiple gravel layers are in general highly transmissive.

Groundwater age tracers indicate that most of the wells within the Holocene unconfined gravel fans of the Ngaruroro River and Tukituki River contain relatively young water with mean residence time (MRT) 0-10 years, and from the area of the main water loss from the Ngaruroro River towards the coast, the groundwater within the confined aquifer becomes progressively older. The drinking water wells southwest of Napier contain water with MRT between 20-40 years. Further down the coast, the groundwater becomes significantly older with MRT 40-80 years, and close to the coast the water is even older, indicating sluggish flow at this part of the aquifer. Greater groundwater flow velocities in the confined aquifer toward the coast is indicated further south in the centre of the Plains. A tongue of very young groundwater with MRT <5 years extends nearly half way towards the coast, and the groundwater near the coast is still relatively young with MRT 27-34 years. At the southern margin of the confined aquifer, older water of MRT >70 years prevails, again indicating more sluggish flow of margin of the aquifer. Only around the Holocene gravel fan of the Tukituki River very young groundwaters of MRT <10 years occur. Mudstone and limestone outcrops (e.g. the hills to the west of Taradale) ensure there is negligible groundwater contribution to the Heretaunga Plains aquifer from these outcrops. More details on Heretaunga Plains can be found in GNS Science Consultancy Report 2017/33: Heretaunga Plains Aquifer: Groundwater Dynamics, Source and Hydro chemical Processes as Inferred from Age, Chemistry, and Stable Isotope Tracer Data; April 2018 D#940982.

Once the water abstracted from the Heretaunga Plains aquifer it is supplied to pressure zones via bore pumps, reservoirs and pump stations.

The system comprises:

- 9 registered groundwater bores (of which seven: A1, C1, T2, T3, T5, T6, T7) in production mode; T1 and T4 not intended to be put online again in the future
- 8 booster pump stations
- 11 reservoirs (Enfield, Taradale 1, Taradale 2, Thompson 1, Thompson 2, Thompson 3, Otatara, Halliwell, Tironui, Franklin Small, Franklin Large)
- 488 km pipe mains

The bores have been drilled to depths of between 40 and 90 metres and are screened for the bottom three to nine metres. They flow under artesian pressure, but bore pumps are used to provide the pressures required in the reticulation system. Flow meters installed on the bore head's pipework are validated every year (based on the water take consent condition).

Reservoir	Gross Volume [m3]	TWL / BWL [mRL]	Location	Notes
Enfield	11,021	61.45 / 54.40	10 Oliver Road, Hospital Hill	2 compartments but considered as one. Common inlet/outlet. Can be separately isolated.
Taradale 1	9,219	61.47 / 54.17	38 Tironui Drive, Taradale	/
Taradale 2	9,219	61.47 / 54.17	38 Tironui Drive, Taradale	Introduced to supply in November 2019.
Thompson 1	7,075	108.98 / 100.74	100 Thompson Road, Bluff Hill	Thompson 1 & 2 are round, Thompson 1 is the one closest to Thompson Road. Common inlet/outlet. Can be separately isolated.
Thompson 2				
Thompson 3				
Otatara	183	86 / 84	120 Churchill Drive, Taradale	/
Halliwell	154	88 / 85	50 Cumberland Rise, Taradale	/
Tironui	987	131.29 / 127.42	86A Tironui Drive, Taradale	Also previously known as "Western Hills'
Franklin Small	1,118	77.67 / 73.80	681 Main North Road, Bay View	Common inlet/outlet. Can be separately isolated.
Franklin Large				

Two reservoirs, Enfield (11,021 m^3) on Hospital Hill and Taradale 1 & 2 (combined around 18,000 m^3), located at an elevated site behind Taradale, are filled from the reticulation system and provide storage to balance demand. Both reservoirs have the same top water level so operate in unison. The reservoir levels control the bore pump stop/start. The Enfield and smaller Thompson reservoirs 1-3 (on Bluff Hill) supply the bulk of the water to residents in this geographical part of Napier and the Taradale 1 and 2 reservoirs supplies water mostly to the Taradale residents.

A number of smaller reservoirs or pump stations supply customers in elevated locations. Seven booster pump stations are used to transfer water to more elevated pressure zones. Church Road Booster is used to increase the supply capacity of the Taradale source pumps within the Enfield reservoir system by fully utilising the pressure capacity of the 450mm Tamatea trunk main.

Water is taken from a trunk main in the Napier system and pumped to the Bay View, using Tannery booster (close to corner of Prebensen Drive and Shed Road) as a primary and Westshore booster as a secondary booster station. Bay View has in the past been supplied by the dedicated Tannery Bore as well, but supply from this bore has been discontinued in 2016.

Eleven storage tanks on seven sites provide the storage required to balance peak demand and meet firefighting and other emergency requirements throughout the zones. At strategic points in the system, pressure control valves are used to maintain reticulation pressure within desirable operational limits by utilising the higher pressure available in adjacent pressure zones or from pumping trunk mains.

Approximately 488km of water mains ranging in diameter from 50mm to 550mm distribute water to customers.

Groundwater age dating for all of the bores has shown the water to have been underground for longer than 12 months and compliance with DWSNZ Bore water security criterion 1 has been demonstrated. Modelled mean residence times (MRT) of groundwater for all 7 wells ranges from 18.1 years to 94 years and Minimum Residence Time ranges from 2.0 to 11.6 years. GNS Science issued latest Groundwater residence time assessment for NCC wells in December 2019 for samples taken in April 2019 D#940948. Last sampling event for residence time testing has been done in September 2020, awaiting results.

T3, T5, T7 and C1 bores are installed below ground level in sealed chambers. All mentioned bores' dry chambers, lids with seals, sump pumps, water detection systems with alarms and drainage pipes have been completely refurbished in 2017. The bore chambers include sump pumps and alarms connected to SCADA to alert the operators should flooding of the chambers occur. In case water level inside the dry chamber would reach highest sensor, the bore automatically shuts down and cannot be put back online without operators visiting the site and conducting inspection and rectifying issues.

A1, T2 and T6 bores have been raised in 2017, with bore heads at least 0.5 meter above 100-years flood levels.

The bores are continuously monitored for pump performance, pressure and flow. Data is telemetered to the Council office and alarmed to the operators.

In the past, supply with secure groundwater meant that treatment of the source water has not been required, significantly influencing the way the water supply system has developed. As urban development spread south, so too did the reticulation network. Additional bores and pump stations were easily installed where development occurred. Most of the pump stations pumped directly into the reticulation system since the water was not required to be conveyed any great distance from source to the customer. The required trunk main infrastructure was minimal and generally located to service areas remote from the aquifer. In the Napier City area, this approach meant that, all the bores and pump stations were located in an area of the aquifer which had poor aesthetic quality. Since the amalgamation with Taradale Borough, the original development strategy was discarded in favour of developing a pumping and distribution trunk main infrastructure that takes advantage of the better quality water in the Taradale area.

Prioritising use of good quality water from the Taradale area has resulted in high but fluctuating pressures in much of the network, particularly Taradale and contributed to an increased risk of pipe failure and customer complaints. Since 1995 a number of pumping trunk mains have been installed to separate the bulk supply and distribution functions of the network.

Soil properties in the area where pipes have been installed varies depending on whether or not it was submerged prior to the earthquake. This variation influences the performance of metallic pipes and fittings with

some areas less prone to corrosion than others. This is an issue which Napier City Council manages through an asset management system which utilises Accela asset management software.

A new hydraulic model of the reticulation network was developed in 2017, calibrated in 2019 and used when developing the Water Supply Network Master Plan. The model is used to identify capacity issues, pipe renewal options, effects of development, levels of service, the impact of shutdowns and tracing water source and age in the network. The supply as it is now configured supplies a consistently high aesthetic quality water throughout the city at constant pressure.

Regular flushing of the wider network is not required as demand means that 'fresh' water is maintained within the system. Flushing of cul-de-sacs in the areas that have been recognised as most problematic, has been reintroduced as an ongoing activity starting October 2018, in other parts of reticulation flushing is undertaken if a need is demonstrated (clarity customer complaints). Mains cleaning is undertaken with 'pigging' and flushing. Aiming to clean (pig) at least 50 km of mains annually during winter period when water demand is low. An extensive pigging programme has been undertaken in winters 2018-2020, focusing on areas with highest customer complaints percentage and low FAC reticulation results.

Backflow within the reticulation system is managed through a comprehensive programme. All premises in industrial zoned land (existing and new) are required to have at least a testable double check valve if the hazard is assessed as medium or lower. RPZ's are required at any site that is assessed as having a high hazard. All backflow devices are installed at the boundary regardless of any devices that are installed within buildings on the site. Any other sites that present a backflow risk are picked up when a land use or building use change is made. Any other sites that Council considers to be a risk is required to have a testable backflow device installed. The type of backflow devices required is determined by the activity on the site and the risks that relate to that activity. All backflow devices are tested annually by Council. Requirements for backflow prevention are set in the Code of Practice (D-M).

Any new residential properties have manifolds with check valves (non-testable) installed and Council has a programme underway to replace all existing beyond-repair manifold service connections with check valve manifolds.

The reticulation network consists of 488 kms of mains with a range of pipe types and sizes, including asbestos cement (37.3%), PVC (33.7%), CI (12.6%), PE (6.3%), ST (4.9%) and other minor lengths of ductile iron, ABS and unknown pipe materials. Service history provided no indication of any major service delivery issues with the water network.

In the event of an extended power outage, the reservoirs can provide up to 30 hours of average demand. At the moment Napier is not meeting 24h storage requirement for peak summer demand. Elevated areas that are pumped are supplied with water in the event of a power outage, but with considerably reduced pressure.

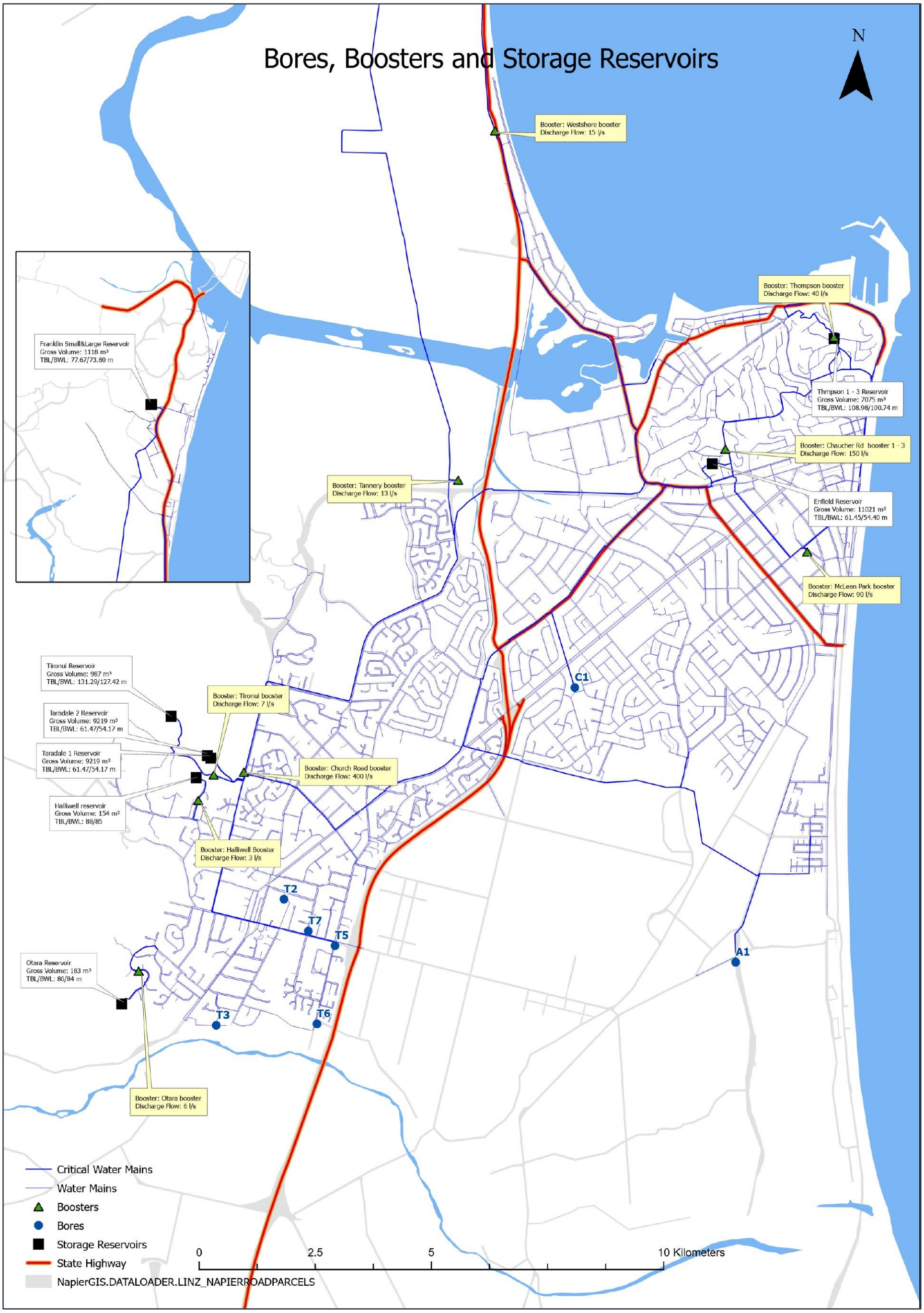
The system is fully automated and effectively operates itself. There are however inherent complexities that arise from the number of bores suppling the network, the way the bores are spread across the network and the size and extent of the system.

Council manages the operation and maintenance of all aspects of the supply. Council also operates and manages the City wastewater system but keeps all aspects of the systems separate, including staff and equipment. Council engages consultants or contractors to undertake specific tasks as required.

Council undertakes a year round water conservation programme aimed at minimising demand. This is intended to ensure that only infrastructure that is required is installed and to promote a responsible and informed approach to water use amongst customers. After the secure bore status has been regained for the 7 of the bores, the supply complies with the DWSNZ Section 5 - Protozoal Compliance Criteria from 1 July 2018 again.

NCC has put two four-taps Dechlorinated Water Station at York Avenue (SW part of Anderson Park) and at Marine Parade (north of NZ National Aquarium) in July 2019 and July 2020, respectively, in order to provide the public access to dechlorinated water. The water is taken from the reticulation. Treatment consists of 20

and 1 µm cartridge filtration, a carbon filter to remove the chlorine and a stay-on UV reactor (min 40 mJ/cm2; with UV sensor) installed just before the taps. UV malfunction triggers automatic site shutdown (via solenoid valve) and SCADA alarm. There are two separate trains, each feeding two tower taps. Water is tested monthly against TC and *E. coli*, sampled from dedicated sampling tap. Cartridge filters chosen due to eliminate potential discoloured water issues and for effective UV treatment downstream. UV treatment decided upon potential for increased HPC count coming from carbon filter. Risk Assessment workshop on appropriate treatment held on 15 May 2019 (D#737330).


Bores, Boosters and Storage Reservoirs
N
Booster: Westshore booster
Discharge Flow: 15 l/s
Booster: Thompson booster
Discharge Flow: 40 l/s
Franklin Small&Large Reservoir
Gross Volume: 1118 m³
TBL/BWL: 77.67/73.80 m
Thmpson 1 - 3 Reservoir
Gross Volume: 7075 m³
TBL/BWL: 108.98/100.74 m
Booster: Chaucher Rd booster 1 - 3
Discharge Flow: 150 l/s
Booster: Tannery booster
Discharge Flow: 13 l/s
Enfield Reservoir
Gross Volume: 11021 m³
TBL/BWL: 61.45/54.40 m
Booster: McLean Park booster
Discharge Flow: 90 l/s
Tironui Reservoir
Gross Volume: 987 m³
TBL/BWL: 131.29/127.42 m
Booster: Tironui booster
Discharge Flow: 7 l/s
Taradale 2 Reservoir
Gross Volume: 9219 m³
TBL/BWL: 61.47/54.17 m
Taradale 1 Reservoir
Gross Volume: 9219 m³
TBL/BWL: 61.47/54.17 m
Booster: Church Road booster
Discharge Flow: 400 l/s
Halliwell reservoir
Gross Volume: 154 m³
TBL/BWL: 88/85
Booster: Halliwell Booster
Discharge Flow: 3 l/s
C1
T2
T7
T5
A1
T3
T6
Otara Reservoir
Gross Volume: 183 m³
TBL/BWL: 86/84 m
Booster: Otara booster
Discharge Flow: 6 l/s
Critical Water Mains
Water Mains
Boosters
Bores
Storage Reservoirs
State Highway
NapierGIS.DATALOADER.LINZ_NAPIERROADPARCELS
0
2.5
5
10 Kilometers

6. Photographs of Napier City Water Supply

The following photos were taken on a site visits to the Napier City supply on different dates between 2017 and 2020.

Figure 2 - Coverdale (C1) bore head in refurbished dry chamber (as on 16 Jan 2018)

Figure 3 - Typical bore electrical control cabinet (November 2017)

Figure 4 – T7 Bore - typical underground bore (November 2017)

Figure 5 - T6 Bore - typical raised bore setup (March 2018)

Figure 6 - Taradale reservoir 1 with typical sampling tap setup (December 2017)

Figure 7 - Hatch on Tironui reservoir which is covered with roof membrane (June 2020)

Figure 8 – Dechlorinated Water Station at York Avenue (July 2019)

Figure 9 - Tironui reservoir (December 2017)

Figure 10 - Inside McLean Park booster station (December 2017)

Figure 11 - 9 Tait Drive - typical NCC reticulation sampling tap (January 2018)

Figure 12 – Typical chlorination setup, T7 bore (June 2020)

Figure 13 - A) Typical chlorine dosage entry point and B) Raw water sampling point

7. Schematic of the Supply

The following schematic provides a representation of the type of supply provided at Napier City. It is not accurate in terms of the number or location of the bores or reservoirs etc. but is intended to highlight the critical points and barriers relevant to this type of supply.

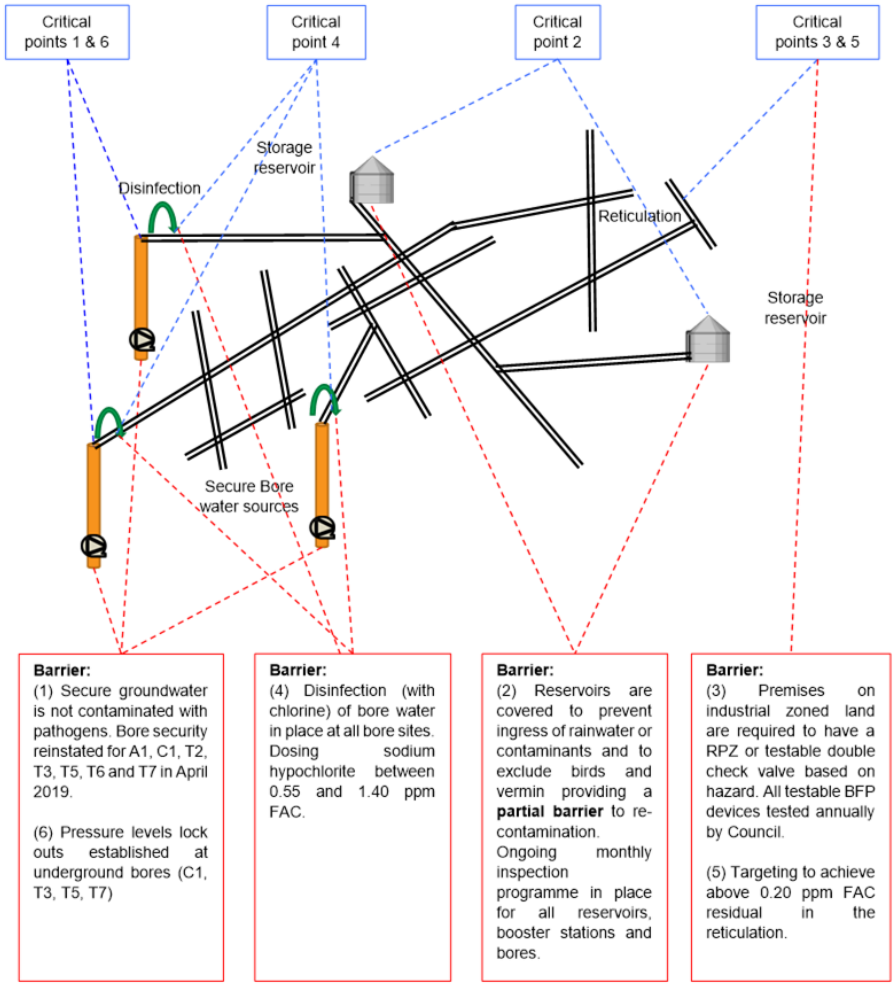


Figure 14 – Supply Schematic

8. Barriers to Contamination

Table 2. Critical points

Critical points where hazards can be eliminated, minimised or isolated include:

	Critical Point	Description
1. & 6.	Groundwater bores	*Bore or bore pump failure may result in a loss of source water to a part of the supply. Infiltration of surface water into the bores can compromise water quality – pressure level lock outs in place*
2.	Treated water storage	*Possible point for microbiological contamination*
3.	Distribution system (reticulation) and connections	*Possible access point for contamination due to backflow. Released biofilm inside mains causing clarity issues and causing a risk of elevated chemical determinands (e.g. Mn and Fe)*
4.	Groundwater	*Chlorine disinfection of all drawn groundwater at all bores despite bore security status reinstated*
5.	Distribution system (reticulation)	*Chlorination in place at all bores at all times and at Tannery booster station (utilised whenever needed)*

Existing barriers to contamination include:

1. Groundwater Bores

On 23 January 2020 DWA reinstated Secure Bore Water Status for A1, C1, T2, T3, T5, T6 and T7 bore for the period of two years from April 2019 onwards. For consideration of ongoing compliance in April 2021, residence time samples have already been taken end of September 2020, however a review of the bore head protection needs to accompany the ongoing compliance request.

Bore water security criterion 3 is currently demonstrated by *E. coli* monitoring of the bores in accordance to Table 4.4 in DWSNZ.

2. Prevention of contamination of treated water in storage

The reservoirs are fenced off (except Halliwell) to prevent public access, covered to prevent ingress of rainwater or contaminants, and to exclude birds and vermin (air vents and overflow pipes have insect screens or floodgates installed). This contributes to the provision of a **partial barrier against re-contamination** of water following abstraction. Halliwell reservoir is located next to the road, not possible to fence off.

3. Distribution system connections

High risk and medium risk premises on industrial zoned land are required to have a RPZ or testable double check valve based on hazard. All back flow preventing (BFP) devices are tested annually by the Council and work orders managed in Accela.

4. Groundwater disinfection

Although NCC holds Secure Bore Water status for 7 bores, it is not relying on it in regards to microbiological risks. Disinfection of all drawn groundwater is in place to manage the risk of potential microbiological pathogens (excluding protozoa) present in the source water / aquifer. Sodium hypochlorite is being dosed in 0.55-0.85 ppm FAC range at 5 bores and appropriately higher at C1 and A1 bore to address chlorination breakpoint.

Contact time before treated water reaches first customer not achieving 30 minutes in all cases, however at least 12 minutes achieved in worst case (depending on that bore and other bores' online/offline status).

More details on chlorination available in Section 11.

5. Distribution system (reticulation)

Maintaining disinfection residual (FAC) throughout the reticulation in order to manage the risks of microbial contamination (excluding protozoa) due to backflow or intrusion events is paramount. Targeting min 0.20 ppm FAC in every sampling area of the distribution. Water that is pushed to Bay View utilizing Tannery booster can be additionally chlorinated at the booster station with sodium hypochlorite if needed (e.g. during hot periods that could increase chlorine decay rate).

FAC and combined chlorine are monitored at around 30 sampling locations throughout reticulation at least every second day.

In order to minimise biofilm presence and inorganic sediments within reticulation, annual Mains Cleaning (aka pigging) Programme and ongoing Cul-de-sac Flushing Programme are in place. NCC is aiming to clean at least 50km of 100mm and 150mm mains each year, out of (estimated) 130km of mains that are feasible to clean. Dedicated capital project that is currently in progress will address also some bigger diameter (>200mm) pipes (e.g. 450mm bulk main form A1 bore to Eriksen Rd).

6. Underground bores pressure level lock outs

Section 3.2.4 of GHD 'Bore security investigation, 51/37522' report D#940977 for NCC dated June 2018, is setting a requirement to NCC to continuously monitor aquifer pressure and have pressure level lock outs in place (on underground bores) in order to establish protection against a major disruption to the aquitard (significant seismic ground movement).

9. Source Protection Zones (SPZs)

NCC is using only secure groundwater sources for abstraction of raw water for its water supply. Source Protection Zones have been established, for the existing and future bores, using analytical method. There has been work completed towards source protection, which in favour to us, is proven to be a confined aquifer.

Aquifer confinement

During the process of collecting evidence to regain interim bore security status in early 2018, GHD has undertaken 'Taradale Supply Aquifer – Hydrogeological Assessment' (Appendix B to D#940977), which states that "…the Taradale Supply Aquifer type is considered to be confined with heterogeneity, reflected in the drawdown response...". The Hydrogeological Assessment Report provides information in section 4.4.1 on the recharge zone for the Taradale Aquifer which has been assessed to come from the Ngaruroro River, near Roys Hill. This correlates well with a number of other studies which are referenced in the report, in particular the length of the flow path, the strong upward vertical gradients and the low storativity, add weight to the long residence time of the water below ground. The nearby Tutaekuri River is reported by GNS (GNS Science Consultancy report 2017/33 D#940982) to have no or limited connection to the main Heretaunga Plains aquifer or the Taradale aquifer.

Actions taken so far to risks related to aquifer confinement

- NCC is an active member of Joint Working Group (JWG) and TANK, where the risks associated with the catchment of Heretaunga plains aquifer, are being discussed and addressed.

- As mentioned above, in the process of collecting evidence to regain bore security status in early 2018, drawn down test did not reveal any abnormalities to confinement, which includes any potential unfit private bore(s) around NCC bores.

- JWG has made a submission to TANK plan change process to take measures to protect and control activities within SPZs.

- HBRC is sharing A-applications received on a weekly basis with NCC, therefore any new close-by abstraction activity, new private bores or any discharges of contaminants onto land or water is noticed, reviewed and submissions made.

- NCC already reviewed the risks the waste water network's assets are posing to the bores nearby. T5 and T7 bore has been identified as high risk and relining of the waste water mains in the vicinity of these bores where NCC regained bore security status is complete.

- Redclyffe transfer station shallow groundwater, onsite groundwater well and nearby private groundwater wells monitoring (November 2018 – November 2019) did not reveal any leachate to penetrate to the aquifer(s) on site or in the vicinity.

Ongoing monitoring of raw water

NCC is currently monitoring source water at all online bores every second day for temperature, pH, conductivity, TDS and turbidity. Data is monitored and trended, any abnormalities shared and discussed with DWA and any advice taken into consideration. Infrastructure Data service provision (ID) by Lutra will be implemented in early 2021 and will provide a comprehensive and robust monitoring tool going forward.

SPZs, Catchment Risk Tool and Bore Field Optimisation

NCC has engaged a consultant company to undertake works to allow NCC to efficiently assess, manage and mitigate catchment risks for our drinking-water supply, including:

- Development of Source Protection Zones (SPZs) for the existing bores complete (D#940928)
- Identification of existing risks within SPZs of the existing bores complete (D#966713) and additional monitoring put in place as appropriate
- Engaging a consulting company to develop a GIS risk matrix/screening tool to characterise catchment risk, including Catchment Sanitary Inspections (CSI) for the two new bore fields (IP Action #59)
- Future bore fields optimisation

10. Standard Operating Procedures (SOPs), Manuals and Quality Assurance

Standard Operating Procedures (SOPs) have been introduced in 2018 to help water operators carry out complex routine operations and to produce evidence of works complete. They are an integral part of this WSP and adhered to at all times. Training for water operators on each SOP is scheduled on a 2-yearly basis. SOPs / Manual(s) are stored in InfoSource, which is available to all employees. Documents in place to date:

- SOP 120-01 Critical Control Points
- SOP 120-02 Total Coliforms in Bore Water
- SOP 120-03 Chlorine Dosing
- SOP 120-04 Water Dechlorination
- SOP 120-05 Bore Pump Storage and Disinfection
- SOP 120-06 Water Testing
- SOP 120-07 Dechlorinated Water Station
- SOP 120-07 Covid-19 – Dechlorinated Water Station (enforced under Covid-19 Level 2 only)
- SOP 120-08 Bore Pump Lockout Reset

- Operations and Maintenance Manual

An Internal Audit Programme for Napier Water Supply (NAP001) has been established in November 2020, mainly to address:

- Principle 6 of fundamental principles of drinking-water safety in NZ: '*Apply a preventative risk management approach. Adequate monitoring of performance of each barrier is essential*, etc.'
- Drinking-water Safety Plan Framework (2018) – Component 10: Oversight, review and continual improvement
- Quality assurance goals - adherence to and improvement of our established processes and procedures

Currently following stakeholders are included in the programme: operations service provider (NCC Depot), sampling and laboratory services provider (WTHB) and electrical maintenance service provider (ProElectrical).

11. Chlorination

Chlorination timeline

Chlorination was put in place as a response to Park Island *E. coli* transgression. It has been introduced on 24 and 25 May 2017 at C1, T1, T2, T5, T6 and T7 (T4 was taken out of service at that time).

Isolated Otatara/Puketapu geographical area, supplied by T3 bore, was the only area not chlorinated until Otatara Reservoir *E. coli* transgression occurred on 30 November 2017, upon which chlorination was introduced there as well. A1 bore has been put online for the first time on 7 December 2017 with chlorination system in place and running. Since December 2017 automated chlorination dosing setup is installed and running at all bores that are online. Chlorine dosing is also installed at Tannery booster (pushing water from Napier to Bay View), but only runs if there is a need to manually increase FAC, based on the FAC residual results.

Chlorination setup consists of a bunded 100, 200 or 300 litres Sodium hypochlorite solution (13-15% W/V; container, Grundfos Smart Digital S DDA dosage pump (dosing flow up to 120L/h, pressure up to 16 bar) and reinforced plastic connection hose. The dosage entry point is typically set up on a bore head pipe just after the bore's actuated/manual valve. The Grundfos dosage pump is electrically connected to each bores' pump in such a way, that it only operates when the bore pump is on. The dosage rate (flow) can be manually adjusted at each site. Usual chlorine dosage is in 0.55-0.85 ppm FAC range at 5 bores and appropriately higher at C1 and A1 bore to address chlorination breakpoint. Chlorine dosing is being adjusted accordingly based on current reticulation FAC results. Sodium hypochlorite is manually topped up two to three times per week at each chlorination site and dosing system performance is checked on each occasion. Any fault on chlorine dosing system automatically shuts down the bore pump and raise the alarm in SCADA. In order to put the affected bore back online, site inspection needs to occur and faults need to be rectified; the bore cannot be put back online through SCADA without that step.

Chlorine dosing pumps are calibrated min every 7,500 hours as part of the scheduled service – done by external service provider.

WTHB is testing for residual FAC and CC in the reticulation on 29 locations sampling zones every second day, and at each reservoir on a weekly basis. In 2020 calendar year to date (excluding December) 90.3% of reticulation results and 98.5% of reservoir results have returned above 0.20 ppm FAC result.

Future treatment options

NCC has acknowledged Havelock North Stage 2 Inquiry Report and recommendation letters published on 20 December 2017 by Director-General of Health and on 2 February 2018 by Kevin Snee (Hawke's Bay DHB Chief Executive Officer), all advising to implement appropriate and effective treatment. On that basis and on

the risks identified within the reticulation, NCC is currently mitigating these risks with chlorination in place. Council intension is to explore other options that would mitigate those risks. Council has already addressed some of the risks within the reticulation, however quite a few corrective measures need substantial capital funding and the projects have been submitted to the new 2021-2031 LTP document, to be adopted by the Council.

Chlorine Free Review

In September 2020 Council appointed a consulting company Pattle Delamore Partners, to undertake a Chlorine Free Review – a study into feasibility and a roadmap against different future scenarios for Napier water supply, with some to include and some to exclude the use of disinfection residual in the reticulation.

The final report, which has been peer-reviewed by GHD, is to be presented to Council early 2021.

12. Critical Control Points (CCPs)

On 18 August 2017 Ministry of Health sent out a public letter on Inclusion of Critical Control Points and Process Control Summaries. Later on, one of the Havelock North Inquiry Stage 2 report's recommendations (Part 23, page 224-225, recommendation no. 14, line (i)) advises all water suppliers to incorporate critical control points and process control summaries in its WSP by 23 February 2018. NCC acknowledges the significance of CCPs.

Critical Control Points (CCPs) are an activity, step or procedure where controls can be applied and a drinking-water safety hazard can be prevented, eliminated or reduced to acceptable levels (below critical levels).

The decision tree below is used to determine CCPs:

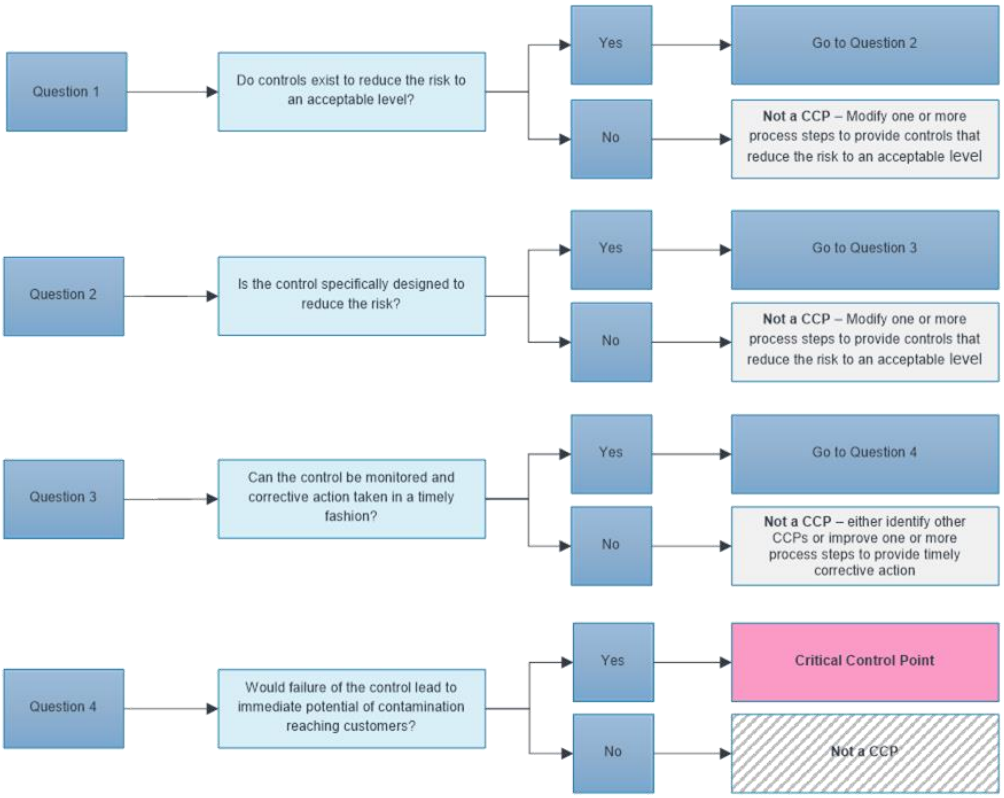


Figure 13 – CCPs Decision Tree

Turbidity Critical Control Point

Turbidity CCP has been established on 1 March 2018 to detect any changes in water source and to ensure high efficiency of chemical disinfection. Elevated turbidity levels might be coming from the aquifer or might be caused by the biofilm covering the bore pump, column or the well itself. All NCC bores tend to return elevated turbidity levels after the bores are left offline for a longer period of time (day or more). Flushing the bore as a corrective action after high turbidity results has so far always returned turbidity results within target range, which indicates the elevated turbidity does not have its origin in the aquifer.

Currently Water Testing Hawkes Bay (WTHB) performs turbidity measurements every second day at each bore. Any turbidity results outside the target range are immediately communicated with 3 Waters team member and appropriate actions will be undertaken.

Standard Operating Procedure SOP 120-01 Critical Control Points is in place to support activities, response actions and records around this CCP and which also contains the process performance criteria as presented in the table below.

Process performance criteria at the operational monitoring point		Correction if the performance criteria are not met:
NTU Target Range	0.00 - 1.00	N/A (as results within target range)
NTU Action Limits	1.01 - 2.00	- If a consecutive turbidity result comes back within action limits manually perform shutdown procedure of the affected treatment plant: shut down bore pump (therefore chlorine dosing pump shuts down automatically, close actuated valve (if any installed) - Operator: flush the affected bore. NTU must be in target range in order to put bore back online
NTU Critical Limits	NTU ≥ 2.01	- Immediately manually shut down the affected treatment plant if NTU above 2.00: shut down bore pump (therefore chlorine dosing pump shuts down automatically, close actuated valve (if any installed) - Operator: flush the affected bore. NTU must be in target range in order to put bore back online

Implementing actions #62 and #64 of the Improvement Plan will provide automated online water quality monitoring of the source water (temperature, pH, conductivity, turbidity) and FAC levels leaving the treatment plants. Any pre-set out-of-range CCP threshold values will trigger automatic bore pump shutdown.

13. Improvement Plan

The proposed improvements (included in the Improvement Plan) will provide public health benefits, by reducing the risks of adverse health outcomes associated with poor drinking water quality in the Napier drinking water supply. Possible improvements to the water supply have been identified in the 'Proposed Corrective Action(s)' column of the risk tables. All essential '*Very High*' and '*High* risks' (based on existing measures) corrective actions (= projects) have been included into the Table 3 - Improvement Plan as priority. Also majority of '*Medium risks*' corrective actions have been included, however remaining and new (if any) will be added on next WSP reviews, depending on prioritisation and work load. It should be noted that costs are estimates only. All improvements (projects) due-dates have been set depending on Council priorities (existing risk assessment outcomes), affordability, contractors' availability and Council statutory budget approval processes.

Table 3. Improvement Plan (IP)

Action no.	Risk level following improvements	Water Supply area	Reference to risk table	Proposed works	Person responsible	Expected cost	Intended completion date
24	Medium	Reticulation	NTD2.8	Develop dedicated location for taking water from hydrants (Thames St Water Take Site)	3WL	$320,000	June 2021
31	Low	Abstraction wells	NS1.1	Commission two bore fields with treatment plants at each one (Taradale, Awatoto) with chlorination and appropriate protozoa treatment.	TL3W	$6,300,000	June 2023
32	Low	Abstraction wells	NS1.2	Decommission T4 and T1 bore	3WL	$25,000	June 2023
39	N/A	Reticulation	N/A	Update Napier City Water Supply Bylaw 2012 to integrate Health Act 69ZZR(4) and 69ZZV sections' requirements on offences for persons taking water from a hydrant.	TL3W	Staff time	June 2021
42	N/A	Abstraction wells	NS2.9	Apply for a resource consent to fit future bore field configuration.	TL3W	Staff time	May 2023
54	N/A	Other	NO1.7	Complete all works needed to commission existing A2 bore and put appropriate protozoa treatment in place.	3WL	$2,000,000	June 2023
56	Medium	Reticulation	NTD2.11	Locate and inspect all reticulation air valves, evaluate risks associated with the location and condition of the valves.	3WL	Staff time	June 2022
57	Medium	Booster Pump Stations	NBP1.2	Finalise draft methodology for deploying generators to BPS and test in field.	3WL	Staff time	April 2021
58	Low	Reservoirs	NTD1.9	Reservoir Inlets and Outlets Improvements – assure adequate water mixing during filling up, to prevent short circuiting and/or stratification, which could cause FAC drop, elevated HPCs and other water quality issues. Excluding Halliwell, Thompsons and Enfield.	3WL	$250,000	December 2023
59	Medium	Catchment	NS1.4	Engage a consulting company to develop a GIS risk matrix / screening tool to characterise catchment risk, including Catchment Sanitary Inspections (CSI) within SPZs around locations identified as most suitable for the two new bore fields.	TL3W	$30,000	June 2023
60	Low	Reservoirs	NTD1.1	Upgrade or replace Enfield reservoir due to potential leak issues.	L3W	$10,300,000	June 2024
61	N/A	Abstraction wells	NS1.1	In order to request ongoing Secure Bore Water status from April 2021 onwards, DWA's condition is to provide a review of the bore head protection report (in line with criterion 2 of section 4.4.6 of DWSNZ). Outsource this review to consultancy with expert(s) in the field competent to review and sign it off.	3WL	$10,000	April 2021
62	Low	Abstraction wells	NWT1.2	Commission online turbidity, temperature, pH and conductivity monitoring at all bores in use to monitor CCP parameters in real-time (through SCADA) when the bores are online. Automatic shutdown for values over set thresholds.	3WL	$350,000	December 2021
63	High	Reticulation	NTD2.12	Create District Metered Area (DMA) to encompass Tamatea and Poraiti (Parklands development) in order to improve stability of flow direction and consequently reduce the number of discoloured water occurrences.	3WL	$350,000	June 2021

Action no.	Risk level following improvements	Water Supply area	Reference to risk table	Proposed works	Person responsible	Expected cost	Intended completion date
64	Low	Treatment Plant	NWT1.1, NWT1.2, NWT1.4, NWT1.5, NWT1.6	Install online FAC monitoring of water leaving the treatment plant at all bore sites (7). To include automatic shutdown of the treatment plant if threshold values not met.	3WL	$150,000	December 2021
65	Medium	Reticulation	NTD2.4	Inspect all industrial sites against backflow requirements based on risks their activities pose and install or upgrade BFP devices if needed.	3WL	$30,000	December 2022
66	Low	Abstraction wells	NS1.1	Develop procedures to flush the bores on artesian pressure, should the contamination coming from the aquifer be detected and include in Operations and Maintenance Manual. Install 2" connection points on bore heads where missing.	OM3W	$30,000	December 2021
67	N/A	Reticulation, Reservoirs	NS1.1	Develop procedures to flush the entire distribution network in case of a widespread chemical contamination event should contaminated water enter the reticulation. Include reference in the EMP. Update Contingency Plans.	3WL	Staff time	December 2021

Justification for changes made to the IP in this version of the WSP:

- **#24**: Previous due date Dec20 postponed to Jun21. Contract has been awarded in November 2020. Reason for not meeting due date is a combination of changed environment due to Covid, changes in the Projects Team, lead time for key materials ordered and substantial additional road works identified after being raised as a critical issue by adjacent land-owner.
- **#56**: Previous due date Jun21 postponed to Dec21. Initial investigations undertaken revealed majority of the sites are in live lanes, underground and some sealed over. Need more time to complete.
- **#57**: Previous due date Jan21 postponed to Apr21. During inspections major electrical compliance issues found, some sites needs rewiring which need to be completed first.
- **#58**: Previous due date Nov20 postponed to Dec23. Reprioritising and postponing due to low risk. Based on 3 years of HPC monitoring and favourable customer complaints trends.
- **#59**: Previous due date Jul21 postponed to Jun23. Subject to establishing and defining final locations of the two new bore fields (IP Action #31).

14. Water Quality Monitoring

DWSNZ compliance is demonstrated against section 4.3.1, compliance criterion 1 for water leaving the treatment plants and section 4.4.1, compliance criteria 6A for water in the distribution zone. Both of these compliance criteria rely on the analysis of *E. coli* in the water samples. Each bore (raw water) is sampled (DWSNZ treatment plants) for *E.coli* and TC accordingly to DWSNZ Table 4.4 and around 30 samples are collected each month from the distribution zone. Sampling and analyses is undertaken by the Water Testing Hawkes Bay Ltd (WTHB, Hastings), an IANZ Accredited Laboratory. This laboratory is also Ministry of Health recognised for the analyses it undertakes. NCC staff only does reactive FAC and turbidity testing for our internal information. Verifications of the in-house eXact 20 chlorine meters are undertaken via contractor on a 6-monthly basis.

Summary of Water Sampling for DWSNZ compliance

***E.coli* MONITORING FREQUENCY OF NAPIER CITY COUNCIL RETICULATION PER QUARTER**				
Zone	Minimum number of samples required by Drinking Water Standards	Number of samples scheduled	Maximum interval between samples (days)	Minimum number of days of the week used
Napier	46	90	3	7

***E.coli* MONITORING FREQUENCY OF NAPIER CITY COUNCIL BORES PER QUARTER**				
Bore	Minimum number of samples required by Drinking Water Standards	Number of samples scheduled	Maximum interval between samples (days)	Minimum number of days of the week used
Secure Bore Water supplies	1 / quarter	2 / month	135	N/A

Note - In regards to the DWSNZ Section 4.2.8, the bores do not need to be sampled for compliance requirements while they are offline. In order for the bore to be considered offline, meaning NCC can claim 'offline status', following must occur:

- The bore has been forced off in SCADA
- There is no flow recorded (from flowmeter) for that bore after it was forced off in SCADA

In order to put the bore back online, NCC will test the source water prior putting online and once again within an hour after putting it online. This offline status definition have been presented and acknowledged by DWA in a meeting on 12 July 2019.

Current NCC' water quality testing programme is defined in the document Napier (NAP001) – Monitoring Programme. Any changes to the programme are recorded and date stamped.

Upon each change the programme is communicated with the WTHB to accordingly update the sampling schedules in their software called eQual. Implementation of the sampling schedules is monitored by Water Quality Lead on a daily basis, any issues or concerns raised immediately with the lab. Regular monthly meetings with the lab also cover any sampling and testing transgressions and corrective

actions are put in place if needed. NCC-WTHB Meeting Minutes (F#969878) are produced as evidence. Lab produces CAPA reports for any non-conformances identified in their service provision (F#970070).

Napier Drinking-water Sampling Locations document contains details on sampling taps within sampling areas, at reservoirs, dechlorinated water stations and other sampling sites. The document is shared with WTHB upon every update and is available to all WTHB lab personnel and samplers at all times to refer to.

At the moment spreadsheets are used to capture testing results and other relevant supporting data (e.g. online / offline status of water assets) (F#970099). Procurement process to secure a professionally developed and specialized IT solution is in place – in early 2021 NCC will implement and start using Lutra's IT service called Infrastructure Data (ID) to acquire, monitor and trend all drinking-water related quality results and also provide access to DWAs to enhance visibility on the performance of the supply.

All water testing reports issued by WTHB are uploaded to Infosource on a regular basis (F#970099).

Starting in May 2020, quarterly 'Napier Water Supply Status Update' Memos (#F990118) are produced and shared with CEO, Mayor and Councillors, to provide more visibility into current water compliance, progress against the Improvement Plan and other significant events that have occurred. 2021 onwards, this Memos will be converted to reports and submitted and presented at Napier Sustainable Committee meetings.

A summary on how the sampling programme evolved since late 2017 is captured below.

1) Started 1 November 2017, NCC is trending data captured by Water Testing HB at the bores sites, reticulation and reservoirs. Data trended and analysed:

- temperature at the bores and reservoirs
- pH at the bores and reservoirs
- conductivity at the bores and reservoirs
- TDS at the bores and reservoirs
- turbidity at the bores and reservoirs
- *E. coli* and total coliforms at the bores
- *E. coli*, total coliforms and HPC (at 22 °C and 35 °C) in reservoirs
- FAC and combined chlorine in reticulation and reservoirs

2) Started July 2017, extended reticulation water chemistry analysis programme in place to capture customer complaints water samples and ordinary samples taken from reticulation. Most of those water samples have been analysed against:

- pH
- conductivity
- turbidity
- total dissolved solids
- arsenic
- boron
- copper
- iron
- manganese
- zinc
- calcium
- magnesium
- potassium
- sodium
- total organic carbon

WTHB samples and analyses two reticulation water samples against above substances/parameters per month: one sample is taken from random reticulation zone and one from a random reservoir. NCC Depot team samples one water sample per month when flushing the main upon customer complaints on water clarity issues. This will be an ongoing programme going forward.

3) In January 2018, Shared Services Laboratory (Hamilton) conducted a 14-days experiment on chlorine decay using raw water samples from all NCC bores, to get better understanding on chlorination process dynamics and to help us adjust chlorine dosage levels accordingly.

4) In January 2018, all NCC bores' raw water samples have been extensively chemically analysed, as a response to a previously high concentration of arsenic detection in one of the customer complaints water sample. The analysis was undertaken to demonstrate the arsenic source in that case was not bore water and has most likely originated in biofilms within reticulation. Previous bores water analysis was done in December 2016.

5) In November 2018 chlorination by-products monitoring programme commenced. Twice a year 2 random samples are taken from reticulation (from reservoir and reticulation each) and tested against bromate, chlorate, TOC, halogenated acetic acids by GCMS and halogenated volatile disinfection by-products by GCMS. Chemical suite expanded in October 2020 to include Acetylated Phenols suite going forward.

6) In accordance to sub notes under DWSNZ Table 4.3a (Minimum sampling frequency for *E. coli* in the distribution zone), additional monitoring is undertaken for all reservoirs before reintroducing them back to reticulation (e.g. commissioning of new reservoirs, reintroducing previously isolated reservoirs for cleaning, maintenance or other reasons). Clear micro results are to be shared with DWA before connecting them to reticulation. No additional monitoring after planned or unplanned regular reticulation maintenance works planned, as all supply chlorinated and additional super-chlorination undertaken on new mains, tees, valves, etc., as part of the maintenance procedures.

   Additional reticulation sampling and testing against Fe and Mn started 3 January 2019 as a response to media reports on elevated Mn levels in Napier reticulation. Two samples are taken and tested on a weekly basis. This sampling provides evidence to regulator that Napier water supply does not contain elevated Mn and / or Fe levels (above MAV or GV values) whenever the water tested is clear.

7) Based on Catchment Risk Assessment report (D#966713), produced by Tonkin & Taylor in December 2019, additional monitoring was put in place end January 2020 to address detection of potential contamination risks outlined in the report.

15. Benefits of Proposed Improvements

The proposed improvements will provide public health benefits by reducing the risk of adverse health outcomes associated with poor drinking water quality. Provision of more storage will reduce the risk of supply interruption as well as reduce risks arising from leaky Enfield reservoir. Backflow risks in the reticulation will be further mitigated by a dedicated water take station. Creation of Tamatea DMA will improve water quality in this most affected area by discoloured water incidents.

16. Methodology

This WSP has been prepared consistent with the approaches recommended by the Ministry of Health. Supporting documents include the WSP Guides and *A Framework on How to Prepare and Develop Water Safety Plans for Drinking-water Supplies*, Ministry of Health (2005). A qualitative risk assessment approach has been taken following the guidance notes in Appendix 2 of the "Framework" allowing the prioritisation of improvement needs and development of the Improvement Schedule.

Risk tables have been prepared which identify the '*Event*', '*Cause*', '*Existing Preventive Measures*', '*Monitoring – What to check (and signs that action is needed)*', '*Risk Assessment based on existing measures*', '*Proposed Corrective Action(s)*' and '*Residual Risk Assessment*'. The residual risk is the remaining level of risk, taking account of the measures that are already in place and all proposed corrective actions in place as well, to prevent the event related to that cause.

Indicative cost estimates and implementation timeframes have been prepared for the required improvement measures and included in the Improvement Plan where necessary. These will be carried forward to the next Asset Management Plan (AMP) and Council Long Term Plan for approval and inclusion in annual budgets following the statutory public consultation process. Implementation of the Improvement Plan is ultimately subject to Council funding approval.

New WSP Framework (published by MoH in December 2018) will be adopted upon any major change that would trigger a new DWA adequacy review of the WSP, upon changes in legislation or new regulatory framework that would require NCC to do so.

The Team Leader 3 Waters is responsible for implementation of the Improvement Plan within the timeframes indicated, subject to community and council approvals, funding constraints and availability of resources. The Team Leader 3 Waters is responsible for on-going review and updating of the WSP.

Contingency Plans have been prepared to provide guidance in the event that control measures fail to prevent the occurrence of a risk event that may present an acute risk to public health. The Water Supply Overseer is responsible for implementation of the Contingency Plans when monitoring has identified the occurrence of a risk event.

Separate risk tables have been prepared for:

- **Napier recharge zone & wells:**
  - ► NS1 Groundwater source
  - ► NS2 Groundwater abstraction wells
- **Napier booster pumps:**
  - ► NPB1 Booster pumps

- **Napier transmission & distribution**
  - ► NTD1 Storage reservoirs
  - ► NTD2 Treated water transmission
- **Water Treatment**
  - ► NWT Water Treatment
- **Other**
  - ► NWT Other

17. Risk Ranking Procedure

Potential public health risks have been evaluated using the Likelihood and Consequence scales tabulated below to determine a risk level – low, medium, high, very high. The assessed risk level allows prioritisation of the associated improvement measures.

Table 4. Likelihood Scale

Likelihood ranking	Description
Almost Certain	Is expected to occur in most circumstances
Likely	Will probably occur (once in 1 or 2 years)
Possible	Might occur at some time (once in say 5 years)
Unlikely	Might occur once in 10 to 20 years
Rare	Could occur (once in 50 to 100 years)

Table 5. Consequence Scale

Consequence Scale	Description
Insignificant	- Insignificant impact - Little disruption to normal operation - Small increase in operation costs
Minor	- Short disruption of service (< 1 hour) to part of a zone - Aesthetic water quality event for some customers - No reported illness - Some manageable operation disruption - Some increase in operating costs.
Moderate	- Disruption of service (<4 hours) to more than 1,000 properties - Water quality event that requires flushing to clear - Boil water notice for up to 3 days - No reported illness - Significant modification to normal operation but manageable - Operation costs increased - Increased monitoring
Major	- Disruption of service (>4 hours) to two or more hydraulic zones (taken to be the 7 hydraulic zones in the Napier system) - Prolonged boil water notice - Probable illnesses - Adverse publicity and loss of trust of customers - Systems significantly compromised and abnormal operation if at all - High level of monitoring required
Catastrophic	- Disruption of complete supply for one or more days - Several instances of illness in the community or instance of death - Prolonged boil water notice - Significant negative national press and long term loss of trust of customers - Complete failure of systems

Table 6. Risk Level Allocation Table

	Consequence				
Likelihood	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Medium	High	Very high	Very high	Very high
Likely	Medium	High	High	Very high	Very high
Possible	Low	Medium	High	Very high	Very high
Unlikely	Low	Low	Medium	High	Very high
Rare	Low	Low	Medium	Medium	High

18. Drinking Water Standards

Compliance with DWSNZ in previous compliance years

Napier water supply (NAP001) has been fully compliant with the DWSNZ and Health Act 1956 in 2018/2019 and 2019/2020 compliance years.

Compliance with DWSNZ for 2020/2021 compliance year

It is our understanding that Napier water supply has to date been compliant with DWSNZ and the Health Act for 2020/2021 period. Table 7 below shows a summary of compliance requirements with the DWSNZ NCC is adhering to for this period.

Table 7. Summary of Compliance with DWSNZ for 2020/2021 compliance year

Compliance area	Comments
Bacterial compliance criteria used for water leaving the treatment plant	Secure Bore Status in place for A1, C1, T2, T3, T5, T6 and T7 bore since April 2019. *E. coli* testing is adhering to Table 4.4 in DWSNZ.
Protozoa log removal requirement required for the supply	Secure Bore Status in place for A1, C1, T2, T3, T5, T6 and T7 bore since April 2019.
Protozoa treatment process	Secure Bore Status in place for A1, C1, T2, T3, T5, T6 and T7 bore since April 2019.
Compliance criterion 6A is used for water in the distribution zone.	Adhering to Table 4.3b sampling requirements in Section 4.3.4.1 of the DWSNZ
Radiological compliance	Testing required every 10 years. Last tested in May-June 2018.

19. Consultation

WSP – v3.1, February - March 2018

On 12, 16 and 19 February 2018 workshops were held at Civic Building to prepare and review updates to v3 WSP. The attendees of the workshop were: Team Leader 3 Waters (Santha Agas), 3 Waters Lead (Lance Groves), 3 Waters Lead (Gary Schofield), Water Quality Lead (Anze Lencek), Water Supply Team (Peter Martin), Team Leader Water Operations (Dean Hammond).

v3 of the WSP was the starting point for v3.1, with integrated comments and recommendations from WSP Implementation Visit, held between 27 February and 2 March 2018. On 16 March 2018 a review of v3.1 was held at Civic Building. The attendees were: Manager Asset Strategy (Chris Dolley), Team Leader 3 Waters (Santha Agas), 3 Waters Lead (Lance Groves), 3 Waters Lead (Gary Schofield), Water Quality Lead (Anze Lencek), Water Supply Team (Peter Martin), Team Leader Water Operations (Dean Hammond).

After receiving 'Report on implementation of a Drinking Water Supply's Water Safety Plan' from CNIDWAU (dated 20 March 2018), on 3 April 2018 a final review of v3.1 was held at Civic Building. The attendees were: Team Leader 3 Waters (Santha Agas), 3 Waters Lead (Lance Groves), Water Quality Lead (Anze Lencek). WSP v3.1 has been sent to DWA for approval on 4 April 2018. Report on adequacy of a Drinking-water water supply's WSP has been issued by DWA on 30 April 2018, with 3 non-conformances identified.

WSP – v3.2, May 2018

WSP v3.1 has been updated around non-conformances as identified by DWA, and resend for approval as v3.2 in May 2018. DWA approved WSP v3.2 on 29 May 2018.

WSP – v4, October 2018

On 10 August 2018 DWA reinstated interim bore security status for C1, T2, T3, T6 and T7 bore from 1 July 2018. Updating WSP on interim bore security status, adopting majority of Report on adequacy's (dated 30 April 2018) recommendations and other minor updates have been included in v4. Workshop and complete review of v4 was held at Cape View on 11 September 2018. The attendees were: Team Leader 3 Waters (Santha Agas), 3 Waters Lead (Lance Groves), Water Quality Lead (Anze Lencek), Water Supply Team (Peter Martin), Team Leader Water Operations (Dean Hammond), Operations Manager 3 Waters (Howard Tisdall). Final review held on 5 October, attendees were: Team Leader 3 Waters (Santha Agas), 3 Waters Lead (Lance Groves), Water Quality Lead (Anze Lencek).

WSP – v4.1, November 2018

WSP v4 has been submitted for adequacy approval with DWA on 5 October 2018. During the assessment, NCC made changes to DWO (sources & plants names change, population figure update, amalgamating three distribution zones into one and deregistering Tannery bore). WSP has been updated to incorporate these changes in v4.1, which was sent to DWA on 7 November 2018 for use in adequacy approval process.

WSP – v4.2, February 2019

Based on approved v4.1, WSP has been updated to v4.2 to incorporate changes to water supply after November 2018. These include major and significant changes such as regaining interim bore security for A1 and T5 bore – however, v4.2 does not need to go through adequacy approval process as those (coming up) changes have already been included in v4.1 Improvement Plan and agreed beforehand with DWA.

WSP – v4.3, August 2019

Based on approved v4.1, WSP has been updated to v4.3 to incorporate changes to water supply after February 2019, however only minor changes made (updating or adding details on Dechlorinated Water Station at York Ave, closing out complete actions from the IP, IP actions due dates revised and updated, commissioning of Taradale 2 reservoir, etc.).

WSP – v4.4, December 2020

Due to Covid-19 measures in 2020, various projects and workshops had to be postponed, which is why WSP annual review has not been undertaken in August but rather in November-December 2020. Only changes that do not trigger the need for adequacy approval have been made in this version. Some Implementation Plan's actions have been re-scoped and due-dates amended, some closed out as complete and some added; risk tables have been updated accordingly. Infosource references to WSP linked documents have been added. Several new linked documents introduced: Napier (NAP001) – Monitoring Programme, Internal Auditing Programme, SOP-120-07 Covid-19 Dechlorinated Water Station and Alternative Water Supply Plan, SOP 120-08 Bore Pump Lockout Reset.

20. Contingency Plans

Napier Water Supply Contingency Plan			
Type of Event	**Contingency Plan/Plans**	**Required Contingency Action**	**Person Responsible**
Severe turbidity of source water. Indicators / Triggers: Highly turbid water detected in source water (SOP 120-01 CCP) or reticulation (Att6 to WTHB-NCC Contract thresholds) and/or complaints from customers.	Refer to: Bore Isolation Plan D#945489 Water Contamination Communications Plan D#977463 Water Restrictions Plan D#1273140 Water Restrictions Communications Plan D#1273338 Alternative Water Supply Plan D#1272788	Identify which bore(s) turbid water is coming from and cease abstraction from that bore(s). Refer to Bore Isolation Plan. If a number of bores are implicated and unable to abstract sufficient quantities of water, supply from storage reservoirs while problem is resolved. Pump any turbid bores to waste until they run clear (through 2" connection on bore head works or through other arrangement; discharge to open drains or kerb) Monitor storage levels. Monitor source water turbidity. If storage is low and water with low turbidity cannot be supplied, advise DWA. Depending on severity of the event (demand vs production) select appropriate water restriction level from Water Restrictions Plan and refer to Water Restrictions Communications Plan Keep customers informed and advise once regular supply is restored (refer to Communications plan) If it is recognised that water supply will no longer meet demand the Alternative Water Supply Plan should be implemented.	3WL
Severe microbiological contamination of source water Indicators / Triggers: A contamination event near to the bore heads may be observed by or reported to NCC staff. May also be indicated by reported illness among customers or positive *E. coli* monitoring results. This will become evident from the routine water testing.	Refer to: Bore Isolation Plan D#945489 Water Contamination Communications Plan D#977463 Alternative Water Supply Plan D#1272788 Water Restrictions Plan D#1273140 Water Restrictions Communications Plan D#1273338	Advise Drinking Water Assessor (DWA) Assess situation and take following actions. Implement Water Contamination Communications Plan. Identify which bore(s) is contaminated, Cease abstraction and isolate from the bore(s) returning positive microbiological test results. Refer to Bore Isolation Plan. If a number of bores are affected and unable to abstract sufficient quantities of water, in addition to the transgression response procedures in the Drinking Water Standards, supply from storage reservoirs until contingency measures are in place as described below. Advise DWA and consider issuing a Boil Water notice if the affected bore has supplied into the	MAS

Napier Water Supply Contingency Plan			
Type of Event	**Contingency Plan/Plans**	**Required Contingency Action**	**Person Responsible**
		reticulation (subject to FAC levels in reticulation and other monitoring results). Depending on severity of the event (demand vs production) select appropriate water restriction level from Water Restrictions Plan. If this contamination event is persistent throughout the network a complete boil water notice should be issued. (this option is acceptable if no chemical contamination is also occurring). It is also an option to consider implementing the provisions of the Alternative Water Supply Plan. These contingency measures shall be in place until the issue is resolved.	
E. coli transgression in water, in distribution zone Indicators: *E. coli* transgression reported following routine monitoring. Illness among customers (communicated by DHB)	Refer to: Water Contamination Communications plan D#977463 Water Restrictions Plan D#1273140 Alternative Water Supply Plan D#1272788	Advise Drinking Water Assessor (DWA) Assess situation and take following actions. Follow the transgression response procedures in the Drinking Water Standards. If the *E.coli* transgression has the potential to effect more than 500 properties, take following actions immediately until the issue is resolved. Implement Water Contamination Communications Plan. Check and increase FAC testing frequency in reticulation. Consider increasing chlorine dosing at the bores. A complete boil water notice will be the next option if the FAC results are not above 0.20 ppm. Depending on severity of the event (demand vs production) select appropriate water restriction level from Water Restrictions Plan It is also an option to consider implementing the provisions of the Alternative Water Supply Plan. These contingency measures shall be in place until the issue is resolved.	MAS
Chemical contamination of source water Indicators: A contamination event	Refer to: Bore Isolation Plan D#945489	Advise Drinking Water Assessor (DWA) Assess situation and take following actions. Identify which bore(s) contaminated water is coming from and cease abstraction from that bore(s). Refer to Bore Isolation Plan.	MAS

Napier Water Supply Contingency Plan			
Type of Event	**Contingency Plan/Plans**	**Required Contingency Action**	**Person Responsible**
near to the bore heads may be observed by or reported to NCC staff. May also be indicated by reported water quality concerns from customers (taste, odour, colour) or illness among customers.	Water Contamination Communications Plan D#977463 Water Restrictions Plan D#1273140 Alternative Water Supply Plan D#1272788	If a number of bores are implicated and unable to abstract sufficient quantities of water, supply from storage reservoirs while problem is resolved. Monitor storage levels. Implement Water Contamination Communications plan. Depending on severity of the event (demand vs production) select appropriate water restriction level from Water Restrictions Plan. If contamination is found throughout the network, implement provision of Alternative Water Supply Plan. These contingency measures shall be in place until the issue is resolved.	
Insufficient water available for abstraction or loss of ability to take water from the Napier bores. Indicators: Observed or reported low abstraction levels, low reservoir levels	Refer to: Water Restrictions Plan D#1273140 Water Restrictions Communications Plan D#1273338 Alternative Water Supply Plan D#1272788	Depending on severity of the event (demand vs production) select appropriate water restriction level from Emergency Water Restrictions Plan. Implement Water Restrictions Communications Plan. Advise Drinking Water Assessor (DWA) Assess situation and take following actions. If insufficient water supply is likely to continue for a prolonged period implement provision of Alternative Water Supply Plan These contingency measures shall be in place until the issue is resolved.	MAS
Earthquake, flood or other natural disaster	Refer to: Emergency Management Plan A-E D#1273017	Implement Emergency Management Plan	3WL

21. Risk Tables

Napier Recharge Zone and Wells

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NS1	**Groundwater Source**										
NS1.1	Microbiological or chemical contamination	Surface runoff from catchment.	Operating only bores with secure status. Chlorination set up (with alarms and automatic shutdown of the plant) at each bore and at Tannery booster, dosing at 0.55-0.85 ppm. 3 monthly meetings with relevant HBRC staff. Regional Council regulation of catchment. Meetings with HDC staff. NCC an active member of JWG and TANK. HBRC sharing Resource Consent Applications within Napier's SPZ2; NCC reviewing and providing input back to HBRC. Contingency Plans (Section 20). Enhanced water monitoring based on RA of existing risks within SPZs of the existing bores.	Positive *E. coli* results at the bores and reticulation. Turbidity, pH and conductivity in raw water monitored (+ customer complaints). Illness in community (communicated by DHB). Monitoring FAC levels monitoring in reservoirs and reticulation ongoing.	Rare	Major	Medium	Commission two bore fields with treatment plants at each one (Taradale & Awatoto) with chlorination and appropriate protozoa treatment. (IP Action #31) In order to request ongoing Secure Bore Water Status from April 2021 onwards, DWA's condition is to provide a review of the bore head protection report (in line with criterion 2 of section 4.4.6 of DWSNZ). Outsource this review to consultancy with expert(s) in the field competent to review and sign it off. (IP Action #61) Develop procedures to flush the bores on artesian pressure, should the contamination coming from the aquifer be detected and include in Operations and Maintenance Manual. Install 2" connection points on bore heads where missing. (IP Action #66) Develop procedures to flush the entire distribution network in case of a widespread chemical contamination event should contaminated water enter the reticulation. Include reference in the EMP. Update Contingency Plans. (IP Action #67)	Rare	Minor	Low

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NS1.2	Microbiological or chemical contamination	Discharges from community wastewater systems, dairy effluent ponds, septic tank systems or urban storm water entering through NCC bores	As for NS1.1 Artesian pressure in lower part of plains, long travel time in aquifer from upper plains.	Positive *E. coli* results at the bores. Turbidity, pH and conductivity in raw water monitored. Customer complaints on water quality. Monitoring against possible contaminants as identified in Napier Catchment Risk Assessment Report within current SPZ2. Illness in community communicated by DHB.	Rare	Major	Medium	As for NS1.1 Do not operate T4 bore unless emergency. Decommission T4 bore as next to the wastewater station. (IP Action #32) Engage a consulting company to develop a GIS risk matrix / screening tool to characterise catchment risk, including Catchment Sanitary Inspections (CSI) within SPZs around locations identified as most suitable for the two new bore fields. (IP Action #59)	Rare	Minor	Low
NS1.3	Chemical contamination	Surface runoff containing chemical contaminants from agricultural or industrial activities. (e.g. pesticides, fertilisers etc.) entering through NCC bores	No P2s registered against the supply. Extended chemical suite undertaken annually – all 7 secure bores on the schedule. Security bore status reinstated from April 2019 onwards (for A1, C1, T2, T3, T5, T6, T7). Operating only bores with secure status. Artesian pressure in lower part of plains, long travel time in aquifer from upper plains.	P2s monitoring in raw water. At present no P2s registered against the supply. Customer complaints on water quality or information provided by public about activities in SPZs. Ongoing routine monitoring of raw water.	Rare	Moderate	Medium	As for NS1.2	Rare	Moderate	Medium

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NS1.4	Microbiological or chemical contamination	Contaminants enter aquifer through abandoned / private / illegal wells.	Regional Council regulating wells activities within catchment through resource consent process. SOE monitoring bores spread across plains. Artesian pressure in lower part of plains, long travel time in aquifer from upper plains. HBRC sharing Resource Consent Applications within Napier's SPZ2; NCC reviewing and providing input back to HBRC. Chlorination.	Positive *E. coli* results at the bores. Turbidity, pH and conductivity in raw water monitored. Customer complaints on water quality Ongoing routine monitoring of raw water. Monitoring against possible contaminants as identified in Napier Catchment Risk Assessment Report within current SPZ2	Rare	Major	Medium	As for NS1.1 Engage a consulting company to develop a GIS risk matrix / screening tool to characterise catchment risk, including Catchment Sanitary Inspections (CSI) within SPZs around locations identified as most suitable for the two new bore fields. (IP Action #59)	Rare	Moderate	Medium
NS1.5	Chemical contamination	Naturally occurring chemical contaminants that exceed MAV.	Chemical analysis indicates that the water does not contain contaminants which exceed 50% of the DWSNZ MAVs (i.e. no P2s). pH, conductivity, TDS and turbidity monitoring and trending in place. At least three reticulation samples chemically analysed each month and further eight against Mn and Fe. Contingency Plans (Section 20).	Customer complaints on water quality. Results of raw water chemical testing. Ongoing routine monitoring of raw water. Major seismic activity.	Rare	Moderate	Medium	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NS1.6	Chemical contamination	Chemical spill contaminates ground water in catchment.	Transit time of groundwater to bores means considerable delay between water being contaminated by a spill and being abstracted at the bores. 7 production bores provide various abstraction options. pH, conductivity, TDS and turbidity monitoring and trending in place. At least three reticulation samples chemically analysed each month. Established emergency spill communications procedures between HBRC and NCC.	Chemical spill within catchment is reported. Customer complaints on water quality. Ongoing routine monitoring of raw water predicts (un)expected contaminant might be present.	Unlikely	Moderate	Medium	None	N/A	N/A	N/A
NS1.7	Leachate contamination	Leachate from Redclyffe Landfill contaminates aquifer.	Aquifer protected by confining layer. Mudstone and limestone outcrops (e.g. the hills to the west of Taradale) and GNS findings ensure there is no groundwater contribution to the Heretaunga Plains aquifer from these outcrops. Monitoring of groundwater at landfill and close-by private wells confirmed no leachate contamination occurring.	Customer complaints on water quality. Ongoing routine monitoring of raw water predicts (un)expected contaminant might be present.	Rare	Major	Medium	None	N/A	N/A	N/A
NS1.8	Loss of supply	Drought lowers water table reducing or preventing abstraction.	Water conservation measures (water restrictions) can be implemented during drought conditions. Aquifer has not been demonstrated to be affected by drought conditions. HBRC management of water take quantities. Emergency Management Plan can be activated. Contingency Plans.	Prolonged drought conditions. Bore pressure lock-out alarms that might indicate decreased water table level.	Unlikely	Minor	Low	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NS1.9	Saline contamination	Saline intrusion into ground water source.	Conductivity measured at all bores and trended. Aquifer pressures are understood. Abstraction is managed to prevent excessive drawdown. Likely to have many years warning of intrusion, giving time to put response in place. HBRC manages combined takes from aquifer.	Conductivity monitoring. Customer complaints on water quality.	Rare	Minor	Low	None	N/A	N/A	N/A
NS2	**Groundwater Abstraction Wells**										
NS2.1	Loss of supply	Intentional vandalism to bore heads and/or bore electrical components.	Seven production bores provide abstraction options. Four bores are installed below ground in difficult to access chambers. Bore electrical components are installed in locked steel cabinets. 3 raised bores have security fencing around. Thorough monthly inspections in place. All bores visited every 2-3 days and checked when topping up hypochlorite. Between 6 and more than 30 hours treated water storage is available (in average summer demand period).	Obvious signs of damage to bore heads. Alarms from bores indicate inadequate pump performance, pressure or flow.	Unlikely	Minor	Low	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NS2.2	Loss of supply	Damage to bore heads or electrical components from flooding.	Seven production bores provide abstraction options. Four bores are installed below ground in difficult to access refurbished and water-tight chambers. Bore chambers include sump pumps and flooding alarms. Between 6 and more than 30 hours treated water storage is available (in average summer demand period). Electrical cabinets are installed in well drained areas.	Obvious signs of flooding, or heavy/prolonged rainfall.	Unlikely	Minor	Low	None	N/A	N/A	N/A
NS2.3	Loss of supply	Bore pump failure	Seven production bores provide abstraction options. Between 6 and more than 30 hours treated water storage is available (in average summer demand period). Monthly motor electrical monitoring and maintenance of pumps undertaken. Bore pumps can be replaced in 1-2 days. Spare bore pumps held in store.	Reduced/no flow from bores. Alarms from bores indicate inadequate pump performance, pressure or flow.	Possible	Insignificant	Low	None	N/A	N/A	N/A
NS2.4	Loss of supply	Pump failure due to power outage >6hrs.	Reservoirs can provide between 6 and over 30 hours supply (in average summer demand period) Have 12 emergency generators (22 - 450kVA) Draft methodology for deploying generators to BPSs documented.	No pump activity alarm to operator. Reduction in storage reservoir water levels.	Unlikely	Moderate	Medium	Finalise draft methodology for deploying generators to BPSs and test in field. (IP Action #57)	Rare	Moderate	Medium

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NS2.5	Loss of supply	Failure of bore structures.	Seven production bores provide abstraction options. Between 6 and more than 30 hours treated water storage is available (in average summer demand period). Turbidity monitoring (every 2nd day) and trending in place.	Reduced/no flow from bores. High turbidity of water. Alarms from bores indicate inadequate pump performance, pressure or flow. Turbidity identified in source water.	Rare	Minor	Low	None	N/A	N/A	N/A
NS2.6	Loss of supply	Damage to bore from natural event like an earthquake.	Seven production bores provide abstraction options. Between 6 and more than 30 hours treated water storage is available (in average summer demand period). Turbidity and conductivity monitoring and trending in place. Bore Isolation Plan. SOP 120-08 Bore Pump Lockout Reset	Reduced / no flow from bores. High turbidity in water in reticulation network.	Rare	Minor	Low	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NS2.7	Contamination of supply	Bore maintenance procedures result in contamination of supply.	Staff hold NZQA reticulation qualifications and understand need for good sanitation when working on assets located prior chlorination point (e.g. bore pump & column, bore head, etc.) Water and wastewater maintenance and operations are separated within Council. 2-yearly SOPs refresher training programme for staff. SOP for disinfection of the bore pumps and columns prior to installation Operations and Maintenance Manual. Chlorination.	Positive *E.coli* results at bores or in network. Visual evidence of unsanitary maintenance practices.	Unlikely	Moderate	Medium	None.	N/A	N/A	N/A
NS2.8	Microbiological contamination	Contamination of non-secure chamber bore or pipeline from waste / storm water network overflow	Artesian pressure. 3 bores raised above ground and refurbished. Other underground chambers refurbished and water-tight. Sumps pumps and alarms in place. Secure Bore Status. Chlorination.	Positive *E.coli* results at bore or in network. Illness in the community communicated by DHB.	Rare	Major	Medium	None.	N/A	N/A	N/A
NS2.9	Loss of right to take water	Consent to take water is not renewed or is declined (one consent covers all bores).	Current consent expires end May 2027. Catchment investigation and 3 monthly meetings with HBRC staff ongoing.	Expiry date of existing resource consents.	Unlikely	Catastrophic	Very high	Apply for the renewal of existing consent well in advance of expiry date. (IP Action #42)	Rare	Major	Medium

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NS2.10	Insufficient water for supply	Yield from current bores unable to meet demand.	Current consent conditions restrict quantity that can be extracted. Water production monitored in SCADA and trended. Water Conservation Strategy (including Water Restrictions Plan) can be implemented during times of high demand.	Low or reducing storage levels at times of high demand. Monitoring wells indicate excessive drawdown during time of high demand.	Rare	Minor	Low	None	N/A	N/A	N/A

Napier Booster Pumps

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures / Monitoring**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NBP1	**Booster Pumps**										
NBP1.1	Microbiological contamination	Contamination by sewage and/or floodwaters via air valves (located on suction side).	Church Rd and McLean Park BPSs have sump pumps. All others on hills except West Shore BPS which is unlikely to be flooded and therefore less vulnerable. Chlorination in place, FAC target above 0.20 ppm in reticulation. Booster pump stations upgraded, flood alarms and drainage solutions in place.	BPS overflow alarms. Positive *E. coli* result. Customer complaints. FAC (ppm) levels.	Rare	Minor	Low	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures / Monitoring**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NBP1.2	Loss of supply	Pump failure due to power outage >6hrs.	Reservoirs can provide between 6 and over 24 hours supply (in summer). Have 12 emergency generators (22 - 450kVA). Draft methodology for deploying generators to BPSs documented.	No pump activity. Alarm to operator. Reduction in storage reservoir water levels.	Unlikely	Moderate	Medium	Finalise draft methodology for deploying generators to BPS and test in field (IP Action #57)	Rare	Moderate	Medium
NBP1.3	Loss of supply to reticulation	Pump mechanical or motor failure.	Seven booster pumps and seven production bore pumps provide supply pressure ensuring minimal impact from one pump failure. All BPSs have standby pump. Reservoirs can provide between 6 and more than 24 hours supply (in summer). Monthly electrical monitoring/maintenance of pump motors undertaken (but not pumps themselves). No spare pumps held in store, but can be ordered/delivered/replaced in 10 days. BPS's pump maintenance programme review complete.	No pump activity. Alarm to operator. Low reservoir levels or loss of pressure in reticulation. Customer complaints.	Unlikely	Minor	Low	None	N/A	N/A	N/A

Napier Transmission & Distribution

Event Reference	Event	Cause	Existing Preventive Measures	Monitoring - What to check (and signs that action is needed)	Risk Assessment based on existing measures: Likelihood	Consequence	Residual Risk	Proposed Corrective Action(s)	Residual Risk Assessment: Likelihood	Consequence	Residual Risk
NTD1	**Storage Reservoirs**										
NTD1.1	Microbiological contamination	Leakage through reservoir roof or other parts of structure (need to consider retained soil at one end of Enfield reservoir with houses above).	Reservoirs are covered and all entry hatches are sealed, but acknowledged that roofs and walls (and buried wall at Enfield) could leak through cracks etc. Monthly regular inspection of reservoirs is carried out (using WorkCrew). Chlorination in place, FAC target above 0.20 ppm in reservoirs and reticulation. Membrane covers installed on vulnerable reservoirs.	Positive *E. coli* in reservoir or reticulation sample. FAC and TC (ppm) levels.	Unlikely	Minor	Low	Upgrade or replace Enfield reservoir due to potential leak issues. (IP Action #60)	Rare	Minor	Low
NTD1.2	Microbiological contamination	Access by birds or vermin through vents/gaps in roof or other parts of structure.	Reservoirs are covered and all entry hatches are secure against ingress. Regular inspection of reservoirs is carried out (using WorkCrew). Chlorination in place, FAC target above 0.20 ppm in reservoirs and reticulation.	Positive *E. coli* in reservoir or reticulation sample FAC and TC (ppm) levels.	Unlikely	Minor	Low	None	N/A	N/A	N/A
NTD1.3	Microbiological contamination	Vandalism to reservoir causes contamination either directly or indirectly (i.e. not graffiti).	Reservoirs are concrete structures that are very difficult to climb or damage. Roof of Enfield Reservoir is at ground level but is fenced. Ladder accesses have locked barriers. All access hatches are locked, secured and alarmed through SCADA. All reservoirs (except Halliwell) are fenced off to prevent public access. Chlorination in place, FAC target above 0.20 ppm in reservoirs.	Positive *E. coli* in reservoir or reticulation sample. FAC and TC (ppm) levels. SCADA hatch alarms.	Rare	Moderate	Medium	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NTD1.4	Microbiological contamination	Sediment accumulation within reservoir.	Use of bore water ensures water entering reservoir has very low sediment load, and secure source means no pathogens present. Reservoirs can be taken out of service and cleaned if required. Reservoirs cleaned out every 5 years (target). Chlorination in place, FAC target above 0.20 ppm in reservoirs.	Positive *E. coli* in reservoir or reticulation sample. FAC and TC (ppm) levels.	Rare	Minor	Low	None	N/A	N/A	N/A
NTD1.5	Microbiological contamination	Contamination through insanitary maintenance or dip sampling procedure.	Access to reservoirs is restricted to NZQA-qualified staff. Chlorination in place, FAC target above 0.20 ppm in reservoirs. Operations and Maintenance Manual.	Positive *E. coli* in reservoir or reticulation sample. FAC and TC (ppm) levels.	Rare	Minor	Low	None	N/A	N/A	N/A
NTD1.6	Loss of supply	Insufficient storage to meet demand.	Increasing demand is understood. Demand management actions can be implemented. Water conservation initiatives (e.g. Leaky Tap programme, water conservation media campaign). New Taradale 2 reservoir introduced to supply in July 2019.	Monitor reservoirs levels through SCADA. Loss of water or pressure in reticulation. Frequent low reservoir levels	Unlikely	Moderate	Medium	None	N/A	N/A	N/A
NTD1.7	Loss of supply	Failure of reservoir	Water (on restricted demand basis) could be supplied directly to most of reticulation system. Condition assessments are undertaken at a regular frequency. Initial seismic assessment complete with good outcome.	Complaints from customers about loss of supply or pressure. Obvious signs of leakage or failure at reservoir site.	Rare	Moderate	Medium	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NTD1.8	Low chlorine levels (<0.20 ppm)	Organic matter present in reservoirs	Monthly inspections of all reservoirs. Routine monitoring at reservoirs (FAC, CC, conductivity, *E. coli*, TC, HPC, etc.) Upgrades including restricted access, alarmed roof hatches and membrane covers* (*at some reservoirs). All overflow pipes and arrangements secured to prevent animal access.	FAC and TC. Customer complaints on odour and taste.	Rare	Moderate	Medium	None	N/A	N/A	N/A
NTD1.9	Low chlorine levels (<0.20 ppm) and/or increased HPCs and/or taste/odour issues	Slow reservoir turnover and/or stratification occurring	Halliwell reservoir already has separated inlet and outlet pipes to reduce this risk.	FAC and TC. HPCs (22 °C and 35 °C). Customer complaints on odour and taste.	Possible	Minor	Medium	Reservoir Inlets and Outlets Improvements – assure adequate water mixing during filling up, to prevent short circuiting and/or stratification, which could cause FAC drop, elevated HPCs and other water quality issues. Excluding Halliwell, Thompsons and Enfield. (IP Action #58)	Rare	Minor	Low
NTD2	**Treated Water Transmission**										
NTD2.1	Loss of supply	Pipe failure	Pipe failures are repaired as a priority. Good asset knowledge is held on pipe ages, material and condition. At risk pipe types have been replace as part of the on-going renewals programme	Complaints from customers about loss of supply. Change in flow or pressure in reticulation.	Possible	Insignificant	Low	None	N/A	N/A	N/A
NTD2.2	Loss of supply	Excessive demand in network or inadequate system capacity	Network capacity and pressures have been demonstrated to be adequate. A new network model built to analyse and identify upgrade requirements and those included in the LTP.	Complaints from customers about low pressure or loss of supply. Change in flow or pressure in reticulation.	Rare	Minor	Low	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NTD2.3	Microbiological contamination	Inadequate controls on maintenance and construction work.	Written procedures have been prepared for disinfection and testing on pipe installations or repairs. Work is undertaken by NZQA water reticulation trained and experienced staff. Ongoing staff training on SOPs in place Chlorination in place, FAC target above 0.20 ppm in reticulation. Annual pigging programme in place. Ongoing Flushing Programme of problematic cul-de-sacs in place. Operations and Maintenance Manual.	Complaints from customers about taste or odour. *E. coli* identified in reticulation system. Reticulation FAC and TC (ppm) levels.	Rare	Minor	Low	None	N/A	N/A	N/A
NTD2.4	Chemical or microbiological contamination	Backflow from customer connections	Premises on industrial zoned land are required to have a RPZ or testable double check valve based on hazard. BFPs installed on SPSs. Land-use or building use change initiates backflow assessment. Check valve manifolds (non-testable) being progressively installed at residential premises. Backflow devices are tested annually by Council. Chlorination in place, FAC target above 0.20 ppm in reticulation. Annual testing of backflow preventers are ongoing. Records kept in Accela.	Contaminants identified in the reticulation system. Taste or odour complaints from customers. FAC and TC (ppm) levels.	Rare	Major	Medium	Inspect all industrial sites against backflow requirements based on risks their activities pose and install or upgrade BFP devices if needed. (IP Action #65)	Rare	Major	Medium

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NTD2.5	Loss of water	Unidentified leakage, illegal connections or unaccounted for water.	Known breaks and leaks repaired as a priority. Network demand is known and loss monitored. Seven production bores provide abstraction options.	Targets of future consumption are in LTP, refer to water conservation strategy in LTP. Per head consumption is monitored and trended; exceeds expectations.	Unlikely	Minor	Low	None	N/A	N/A	N/A
NTD2.6	Supply of turbid water	Silt or biofilm build up within reticulation pipes.	Groundwater has low sediment concentration. Flushing undertaken as required. Programme of cleaning (pigging) target of 50km of mains annually. Ongoing Flushing Programme of problematic cul-de-sacs in place	Reduced flows in reticulation. Complaints from customer about quality of water.	Possible	Minor	Medium	Aiming to clean as many kilometres of pipes as feasible (min 50km / year) during low demand period going forward until the discoloured water events decrease substantially.	Possible	Minor	Medium
NTD2.7	Inadequate supply of water	Poor quality workmanship or inappropriate materials used for reticulation pipes and fittings, or contractor damage to pipes.	All work and materials used in reticulation to meet standard NCC specifications. Best practice approach taken to reticulation work. Work is undertaken by NZQA-qualified and experienced staff.	Contaminants identified in the reticulation system. Water quality complaints from customers.	Rare	Moderate	Medium	None	N/A	N/A	N/A
NTD2.8	Microbiological or chemical contamination	Water takes from fire hydrants and water tanker carriers.	Permission is required from the Council to take water from hydrants - a policy and process to take water from hydrants developed – at the moment with SLT for review prior going to Council for formal adoption. Chlorination in place, FAC target above 0.20 ppm in reticulation. Fire Hydrant Use Policy in place.	Contaminants identified in the reticulation system. Water quality complaints from customers. FAC and TC (ppm) levels.	Possible	Moderate	High	Develop dedicated locations for taking water from hydrants (Thames St Water Take Site). (IP Action #24)	Rare	Moderate	Medium

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action(s)**	**Likelihood**	**Consequence**	**Residual Risk**
NTD2.9	Low chlorine levels (<0.20 ppm) in reticulation	Excessive amounts of biofilm in mains reacting with FAC	Annual pigging programme of the mains in place. Turbidity CCP Ongoing Flushing Programme of problematic cul-de-sacs in place	Water quality complaints from customers. FAC levels and TC (routine monitoring) in reticulation and reservoirs	Possible	Minor	Medium	None	N/A	N/A	N/A
NTD2.10	Loss of supply in Bay View	Supply main failure	There are 2 pumping mains. Preferable main is the one from Tannery booster station, as a back-up Westshore booster pump station is utilized. Alternative Water Supply Plan.	Complaints from customers about low pressure or loss of supply. Change in flow or pressure in reticulation	Rare	Moderate	Medium	None	N/A	N/A	N/A
NTD2.11	Chemical or microbiological contamination	Backflow through reticulation air valves in case of air valves submerged and loss of pressure in the system	Pressure in the reticulation is maintained.	Loss of supply / network pressure (customer complaints). Floods.	Rare	Moderate	Medium	Locate and inspect all reticulation air valves, evaluate risks associated with the location and condition of the valves (IP Action #56)	Rare	Moderate	Medium
NTD2.12	Discoloured water incidents in Tamatea and Poraiti	Reversed flow directions	Water Supply Bylaw 2012. Fire Hydrant Use Policy. Annual pigging programme of the mains in place. Ongoing Flushing Programme of problematic cul-de-sacs in place. Informing customers not to consume discoloured water activities ongoing.	Water quality complaints from customers.	Almost certain	Minor	High	Create District Metered Area (DMA) to encompass Tamatea and Poraiti (Parklands development) in order to improve stability of flow direction and consequently reduce the number of discoloured water occurrences. (IP Action #63)	Almost certain	Minor	High

Water Treatment

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action (s)**	**Likelihood**	**Consequence**	**Residual Risk**
NWT1	**Water Treatment**										
NWT1.1	Low chlorine levels (<0.2ppm) in water leaving treatment plant	Electronic or mechanical malfunction of chlorine dosing system at each bore	Weekly and monthly inspections of all sites with chlorination setup. Annual calibration of dosing systems. Topping up each site's chlorine reservoir and visual checks approximately 3x / week. Chlorine dosing SCADA alarms and automatic bore shutdown measures in place.	Calibration due dates. Chlorine leaks, fittings & hoses condition. FAC (ppm) levels in reticulation and reservoirs.	Unlikely	Moderate	Medium	Install online FAC monitoring of water leaving the treatment plant at all bore sites (7). To include automatic shutdown of the treatment plant if threshold values not met. (IP Action #64)	Rare	Minor	Low
NWT1.2	Low chlorine levels (<0.2ppm) in water leaving treatment plant	High turbidity of source water causing FAC levels to drop	Turbidity testing of raw water in place. SOP 120-01 Critical Control Points Bore Security Status. Chlorine dosing SCADA alarms and automatic bore shutdown measures in place.	Turbidity (NTU) at the source. Routine FAC monitoring in reticulation	Rare	Moderate	Medium	Online source water turbidity monitoring to be commissioned at all bores. (IP Action #62) Install online FAC monitoring of water leaving the treatment plant at all bore sites (7). To include automatic shutdown of the treatment plant if threshold values not met. (IP Action #64)	Rare	Insignificant	Low
NWT1.3	No chlorine in water leaving treatment plant	Supplier: Sodium hypochlorite out of stock	At least 5 days stock at Depot at all times. Increased storage volumes of 4x IBC in 2020. New supplier (IXOM) supplies NZ made product and has 2 production sites for resilience. Other suppliers available to supply if needed (e.g. Clark Products). Contract with hypochlorite supplier in place.	Sodium hypochlorite stock at Depot Incoming hypochlorite testing for chlorine levels.	Rare	Moderate	Medium	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action (s)**	**Likelihood**	**Consequence**	**Residual Risk**
NWT1.4	High chlorine levels (>5 ppm) in water leaving the treatment plant	Electronic or mechanical malfunction of chlorine dosing system at each bore	Monthly inspections of all sites with chlorination setup. Annual calibration of dosing systems. During topping up each site's chlorine reservoir visual checks approximately 3x / week conducted. Chlorine dosing SCADA alarms and automatic bore shutdown measures in place.	Calibrations due dates. Chlorine leaks, fittings & hoses condition. FAC (ppm) levels in reticulation and reservoirs.	Rare	Major	Medium	Install online FAC monitoring of water leaving the treatment plant at all bore sites (7). To include automatic shutdown of the treatment plant if threshold values not met. (IP Action #64)	Rare	Minor	Low
NWT1.5	Inappropriate chlorine dosage levels set	Human error when adjusting chlorine dosing levels or lack of training	Monthly inspections of all sites with chlorination setup. During topping up each site's chlorine reservoir visual checks approximately 3x / week conducted. SOP on adjusting chlorine dosing (SOP 120-03 – Chlorine Dosing) SOP training programme in place	Dosing pump dosing flow set value FAC (ppm) levels in reticulation and reservoirs.	Unlikely	Minor	Low	Install online FAC monitoring of water leaving the treatment plant at all bore sites (7). To include automatic shutdown of the treatment plant if threshold values not met. (IP Action #64)	Rare	Minor	Low
NWT 1.6	Inappropriate chlorine dosage levels or no chlorine in water leaving the treatment plant	Dosing system malfunction	Grundfos Smart Digital S-DDA dosage pump alarms in case of any fault (overpressure, low backpressure, air bubble, cavitation, valve leaks, etc.) During topping up each site's chlorine dosing pump visual check 3x / week conducted. Risk is localised by numbers of individual treatment plants. Spare dosage pumps in stock at Depot. Chlorine dosing SCADA alarms and automatic bore shutdown measures in place.	Dosing pump's screen for alarms and warning FAC (ppm) levels in reticulation and reservoirs	Unlikely	Minor	Low	Install online FAC monitoring of water leaving the treatment plant at all bore sites (7). To include automatic shutdown of the treatment plant if threshold values not met. (IP Action #64)	Rare	Minor	Low

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action (s)**	**Likelihood**	**Consequence**	**Residual Risk**
NWT 1.7	Dechlorination Water Stations - UV treatment failure might cause micro contamination	UV lamp goes out **or** UV transmittance too low **or** power outage	Automatic shutdown when UV lamp fails or power outage (UV sensor measures transmittance; solenoid valve kicks in when power outage) Both occurrences trigger automatic shutdown – alarms through SCADA	UV lamp replacement due date (manufacturer's instructions) Automated integrated UV transmittance monitoring	Rare	Low	Low	None	N/A	N/A	N/A

Other

Event Reference	Event	Cause	Existing Preventive Measures	Monitoring - What to check (and signs that action is needed)	Risk Assessment based on existing measures			Proposed Corrective Action (s)	Residual Risk Assessment		
					Likelihood	Consequence	Residual Risk		Likelihood	Consequence	Residual Risk
NO1	**Other**										
NO1.1	Sampling or monitoring parameters failure	Inadequate sampling programme or sample collection or testing error (inadequate training)	Sampling programme prepared and checked against standards by WTHB. More than the required number of samples is collected. WTHB is IANZ accredited lab for micro testing. All other labs outsourced (i.e. Hills Laboratories, Eurofins ELS) hold IANZ accreditations. WTHB Quality Management System peer reviewed. WTHB's samplers training records are an attachment to NCC-WTHB contract. WTHB has HBDHB sampling / monitoring authorisation. NCC-WTHB contract in place, reviewed August 2020.	DWSNZ compliance failure due to days of weeks, days between samples, insufficient samples, information gaps etc.	Rare	Major	Medium	None	N/A	N/A	N/A
NO1.2	Failure of equipment due to inadequate maintenance	Supply equipment fails due to inadequate asset information or inadequate maintenance planning	Accela software is used as an asset management system. Refresher SOPs training for staff ongoing activity.	Unexpected equipment or plant failures.	Rare	Minor	Low	None	N/A	N/A	N/A
NO1.3	Failure due to inadequate procedures	Inadequate, out of date or incorrect operational procedures.	Operational procedures are updated as necessary.	Operational manuals are not used.	Rare	Moderate	Medium	None	N/A	N/A	N/A

					Risk Assessment based on existing measures				Residual Risk Assessment		
Event Reference	**Event**	**Cause**	**Existing Preventive Measures**	**Monitoring - What to check (and signs that action is needed)**	**Likelihood**	**Consequence**	**Residual Risk**	**Proposed Corrective Action (s)**	**Likelihood**	**Consequence**	**Residual Risk**
NO1.4	Operator error or management	Poor operational practices, plant failures and supply are affected.	Water supply staff are suitably qualified to operate the system.	Operational failures.	Rare	Moderate	Medium	None	N/A	N/A	N/A
NO1.5	Failure to meet DWSNZ	Poor processes and procedures or loosing bore security	Processes and procedures are updated 3 yearly or as necessary – ongoing activity. Approved LTP programme for 2 treatment plants to comply with protozoa requirements. Operations and Maintenance Manual.	System failures.	Rare	Minor	Low	Commission two bore fields with treatment plants at each one (Taradale, Awatoto) with permanent chlorination and (most likely) UV treatment (IP Action #31).	Rare	Minor	Low
NO1.6	Inadequate sampling or monitoring parameters at Reservoirs	Current assets' configuration	Only Taradale 1 and Taradale 2 reservoirs have separate inlet and outlet pipework (others have common pipe). Enfield sampling taps upgraded 2020 to draw from individual two compartments.	N/A	Rare	Minor	Low	None	N/A	N/A	N/A
NO1.7	Failure to meet Protozoa compliance with DWSNZ (Section 5)	NCC puts a non-secure bore online (e.g. during an emergency event)	NCC not using bores without bore security status.	No protozoa monitoring in place	Rare	Catastrophic	High	Two bore field with treatment plants at each one (Taradale, Awatoto) with permanent chlorination and UV treatment (IP Action #31)	N/A	N/A	N/A

CNIDWAU
Central North Island Drinking Water Assessment Unit

Report on Compliance with the Drinking-water Standards for New Zealand 2005 (Revised 2018) and duties under Health Act 1956

For Period: 1st July 2019 to 30th June 2020

Drinking Water Supply:
Napier (NAP001)

Water Supplier:
Napier City Council

Central North Island Drinking Water Assessment Unit
Napier Branch
PO Box 447
NAPIER 4140

Report Identifier
NapierCityCouncil_DWSNZ2005/18Compliance _05102020_v1

Index

Index of Tables:

Terminology

CNIDWAU	Central North Island Drinking Water Assessment Unit
DWA	Drinking Water Assessor
DWSNZ	Drinking Water Standards for New Zealand 2005 (Revised 2018)
DWO	Drinking Water Online
E. coli	*Escherichia coli*
FAC	Free Available Chlorine
MAV	Maximum Acceptable value
MoH	Ministry of Health
NCC	Napier City Council
The Act	Health Act 1956
WSP	Water Safety Plan

Codes

Bores / Treatment Plants:
A1 Awatoto (G02037) (TP03097), C1 Coverdale Park (G00067) (TP00111), T2 Bledisloe Park (G00062) (TP00105), T3 Riverside Park (G00065) (TP00102), T5 Guppy Road (G0064) (TP00103), T6 Guppy Road Reserve (G01151) (TP01961), T7 King Street (G01395) (TP02308)

Distribution Zones:
Napier City (NAP001NA)

Purpose

The purpose of this report is to provide NCC with the results from the assessments carried out on their supplies under the following compliance standard and statute:

- The DWSNZ
- Part 2A of the Act.

The assessments are based on the information provided by NCC during the 2019/2020 Annual Survey.

Executive Summary

DWAs are required under section 69ZL of the Act to assess whether a drinking water supplier complies with the DWSNZ and specific sections of the Act. An assessment for the compliance period 1st July 2019 to 30th June 2020 has been undertaken by a DWA from CNIDWAU (Napier Branch).

This report aligns with the information entered in the MoH 'Annual Survey of Drinking water Quality 2019-2020' which will populate the Minister of Health's 'Annual Report on Drinking Water 2019-2020'. The Minister's report will be publicly released during the 2020/2021 year.

The Napier Branch of the CNIDWAU gives deserved recognition to the hard work of the NCC water team, operators and contractors throughout the 2019/2020 year in working towards the delivery of a compliant supply of drinking water to the Napier community.

NCC achieved full compliance with DWSNZ and the Act for the 2019-2020 compliance year.

A copy of the DWO report is attached as Appendix 1.

Summary of Treatment Plant/Bore Compliance

Plant Name and DWO code	Bacterial Compliance	Protozoa Compliance	Cyanotoxin Compliance	Chemical Compliance	Radiological Compliance	Overall Compliance
A1 (TP03097)	✓	✓	✓	✓	✓	✓
C1 (TP00111)	✓	✓	✓	✓	✓	✓
T2 (TP00105)	✓	✓	✓	✓	✓	✓
T3 (TP00102)	✓	✓	✓	✓	✓	✓
T5 (TP00103)	✓	✓	✓	✓	✓	✓
T6 (TP01961)	✓	✓	✓	✓	✓	✓
T7 (TP02308)	✓	✓	✓	✓	✓	✓

Table 1a

Summary of Distribution Zone Compliance

Distribution zone name and DWO code	Bacterial Compliance	Cyanotoxin Compliance	Chemical Compliance	Overall Compliance
Napier (NAP001NA)	✓	✓	✓	✓

Table 1b

Compliance with Duties in the Act

Section of the Act	Compliance
69S: Duty of suppliers in relation to the provision of drinking water	✓
69U: Duty to take reasonable steps to contribute to protection of source of drinking water	✓
69Y: Duty to monitor drinking water	✓
69Z: Duty to prepare and implement a Water Safety Plan (WSP)	✓
69ZD: Duty to keep records and make them available	✓
69ZE: Duty to investigate complaints	✓
69ZF: Duty to take remedial actions if drinking-water standards are breached	✓

Table 1c

Summary of Ongoing Compliance Requirements

Napier Treatment Plants/Bores

Full secure status was granted on 1st April 2019 for seven of the NCC bores (T2, T3, T5, T6, T7, A1 and C1)

The testing criteria for interim secure bores comes from table 4.4 in DWSNZ:

- For populations of more than 10,000 sampling is daily (NCC has moved to quarterly testing for the secure bores, as per footnote below).

Note: footnote 1 of Table 4.4 of DWSNZ discusses changing of monitoring after 3 months. Any changes to monitoring programme should be confirmed with the DWA.

- Sampling may be reduced to one sample per month provided no *E. coli* detected in the first three months of testing.

For ongoing bore water security and compliance Section 4.4.6 of DWSNZ criteria must be met:
• Section 4.4.2 Bore water must not be directly affected by surface of climatic influences
• Section 4.4.3 Bore head must provide satisfactory protection
• Section 4.4.4 E. coli must be absent from bore water.

If *E. coli* is detected in a sample from an interim secure bore, the interim sampling regime must recommence (as per Table 4.4 DWSNZ). If a second positive result for *E. coli* is made during the interim period, the water must return immediately to a non-secure status.

Radiological testing must be completed every 10 years. A test for Radiological determinands for Napier bores: Awatoto (A1), Peddie Street (T2), Riverside Park (T3), Guppy Road (T5), King Street (T7), was completed in May 2018 and will not be due again until 2028. A test for Radiological determinands for Napier bores: Coverdale Park Bore (C1) and Guppy Road reserve Bore (T6) were completed in June 2018 and will not be due again until 2028.

NCC is continuing to chlorinate the water supply under their emergency chlorination setup. Although NCC are not using chlorination for compliance purposes they are commended for their proactive multi-barrier approach to treatment/residual disinfection and the continued capture of trending data.

There have been no transgressions in the distribution system since the introduction of chlorine – suggesting that the risks attached to the distribution system that allow the ingress of potentially pathogenic bacteria are being adequately managed.

Napier Distribution Zone (NAP001NA)

The Napier distribution zone bacterial compliance uses criterion 6A which is based on *E.coli* monitoring. Ongoing monitoring should comply with Tables 4.3a and 4.3b in DWSNZ:

- Napier – 46 samples per quarter, maximum of 3 days between samples and 7 days of the week used.

Napier WSP

The Napier WSP was approved in May 2018. An Implementation Audit of the Napier WSP was undertaken in September 2020, the WSP was deemed to be implemented.

An Operator Authorisation assessment was carried out with the NCC in 2018 for FAC analysis. Authorisation was granted and is valid until the 18th April 2021, unless there are significant changes to equipment, personnel or analyses undertaken by NCC.

It is taken that the above criteria has been elected by the supplier. Any changes to the elected compliance criteria must be agreed with the DWA.

DWSNZ elected compliance criteria

The above compliance criteria has been elected by the supplier. Any changes to the elected compliance criteria must be agreed with the DWA as per section 3.1.1 of the DWSNZ.

Treatment Plant Compliance

The following compliance information is derived from NCC and DWO. Other compliance information is derived from CNIDWAU records.

Treatment Plant: Bacterial Compliance (Section 4, DWSNZ)

Treatment Plant Criterion 1 Results

Bore / Plant name	Number of *E. coli* (total coliform) samples required	Number of samples collected	Number of *E coli* transgressions	Compliance
A1 Awatoto	12	34	0	✓
C1 Coverdale Park	12	28	0	✓
T2 Bledisloe Park	12	23	0	✓
T3 Riverside Park	12	25	0	✓
T5 Guppy Road	12	34	0	✓
T6 Guppy Road Reserve	12	34	0	✓
T7 King Street	12	34	0	✓

Table 2

Summary of compliance with sampling / analytical / remedial / operational requirements

Compliance was achieved for the following criteria of the DWSNZ:

- Section 4.2.6 Compliance sampling.

Staff taking samples have been trained in aseptic techniques.
All samples were tested in a MoH recognised laboratory: Water Testing Hawke's Bay.

- Section 4.2.7 Sampling sites for bacteria compliance of water leaving the treatment plant.

Sampling points have been agreed upon between the DWA and NCC.

- Section 4.2.8 Sampling frequencies for compliance of water leaving the treatment plant.

Maximum days between samples: Maximum of 1 day between samples.
Minimum days of the week used for sampling: Minimum of 7 days of the week used.

- Section 4.2.9 Response to transgression in drinking-water leaving the treatment plant.

No transgressions recorded for the Napier treatment plants during the 2019 – 2020 compliance year.

- Section 4.2.6.2 in DWSNZ 2019 indicates: for compliance testing, a method that enumerates Total Coliforms and *E. coli* must be used.

NCC was able to demonstrate a Most Probable Number (MPN) method was used to enumerate for both Total Coliforms and *E. coli* along with test results.

Treatment Plant: Protozoa Compliance (Section 5, DWSNZ)

Protozoa Log Credit Requirement

Bore / Plant name	Protozoa Log Credit requirement	Log credit determination
A1 Awatoto	0	Secure Bore
C1 Coverdale Park	0	Secure Bore
T2 Bledisloe Park	0	Secure Bore
T3 Riverside Park	0	Secure Bore
T5 Guppy Road	0	Secure Bore
T6 Guppy Road Reserve	0	Secure Bore
T7 King Street	0	Secure Bore

Table 3

Summary of Log Credit Assessment

Secure status was granted for 7 NCC bores during 2019. Secure bore status does not require any log credit assignation, therefore full compliance has been achieved.

Treatment Plant: Cyanotoxin Compliance (Section 7, DWSNZ)

This section is not applicable to groundwater supplies and those supplies not considered at risk (i.e. no management protocol required). Full compliance achieved.

Treatment Plant: Chemical Compliance (Section 8, DWSNZ)

Plumbosolvent

A Plumbosolvent water warning/public notice was provided to all consumers at the specified frequency during the compliance period – online and through mail – as evidence provided to DWA. Full compliance achieved.

Priority 2 Determinands: Monitoring Results

No P2 determinands are assigned to the Treatment Plants. No testing is required. Full compliance achieved.

Treatment Plant: Radiological Compliance (Section 9, DWSNZ)

Radiological Compliance

Bore / Plant name	Date of last sample	Exceedences of MAVs	Compliance
A1 Awatoto	May 2018	0	✓
C1 Coverdale Park	June 2018	0	✓
T2 Bledisloe Park	May 2018	0	✓
T3 Riverside Park	May 2018	0	✓
T5 Guppy Road	May 2018	0	✓
T6 Guppy Road Reserve	June 2018	0	✓
T7 King Street	May 2018	0	✓

Table 4

Distribution Zone Compliance

The following compliance information is derived from NCC and DWO. Other compliance information is derived from CNIDWAU records.

Distribution Zone: Bacterial Compliance (Section 4.3, DWSNZ)

Distribution Zone Criteria 6A Results

Distribution zone name	Number of *E. coli* (total coliform) samples required	Number of samples collected	Number of *E. coli* transgressions	Compliance
Napier	184	434	0	✓

Table 5

Summary of compliance with general sampling / analytical / remedial action requirements

Compliance was achieved for the following criteria of the DWSNZ:

- Section 4.3.3 Sampling sites for compliance in the distribution zone

Sampling points have been agreed upon between the DWA and NCC.

- Section 4.3.4 Sampling frequencies in a distribution zone:

Correct number of samples for the zone
Maximum days between samples was compliant
Minimum days of the week used for sampling was compliant

- Section 4.3.5 (4.2.6) Compliance sampling

Staff taking samples have been trained in aseptic techniques.
All samples were tested in a MoH recognised laboratory: Water Testing Hawke's Bay.

- Section 4.3.6 Remedial actions involving criteria 6A

No transgressions recorded for the Napier supply during the 2019 – 2020 compliance year.

Distribution Zone: Cyanotoxin Compliance (Section 7, DWSNZ)

No cyanotoxins are assigned to Napier distribution zone. No testing is required. Full compliance achieved.

Distribution Zone: Chemical Compliance (Section 8, DWSNZ)

No P2 determinands are assigned to Napier distribution zone. No testing is required. Full compliance achieved.

A Plumbosolvent water warning/public notice was provided to all consumers at the specified frequency (using the internet NCC Website and a pamphlet in the rates bill) during the compliance period as reported by NCC.

Summary of Audit Activities to Verify DWSNZ Monitoring Data

An audit of NCC data and test results for the compliance year was undertaken by the DWA.

Data entered into DWO was reviewed and deemed accurate by NCC.

Duties under the Act

The duties of the water supplier under the Act have all been met.

Section 69S – Duty of suppliers in relation to the provision of drinking water	**Met**

NCC provided evidence (09/07/2020) that none of their supply was interrupted or restricted for >8 hours for planned or emergency works.

Section 69U – Duty to take reasonable steps to contribute to protection of source of drinking water	**Met**

NCC demonstrated during the September Implementation Audit 2020
(Report: NCC_WSPImplementationReport_RB_30092020_v1) that this duty was being met.

Section 69Y – Duty to monitor drinking water	**Met**

This decision is based on the weekly reporting from NCC to the DWA of bacterial and other monitored parameters which are specified in the Monitoring Plan.

Section 69Z – Duty to prepare and implement water safety plan	**Met**

NCC has an approved WSP. The WSP was determined to be implemented during the September 2020 DWA Implementation Audit.

Section 69ZD – Duty to keep records and make them available	**Met**

The decision to acknowledge that this duty has been met is based on the ability of NCC to retrieve records and the records supplied to the DWA on a regular basis for bore water and reticulation monitoring.

Section 69ZE – Duty to investigate complaints	**Met**

NCC has a system to record complaints. The process was reviewed during the September 2020 Implementation Audit.

Section 69ZF – Duty to take remedial actions if drinking-water standards are breached	**Met**

Administration

This decision is based on no remedial actions required.

Information in this report may be provided to the MoH at their request. With the exception of the MoH, this report shall not be reproduced without the approval of the Public Health Unit/CNIDWAU and NCC.

Completed 5th October 2020

Reynold Ball
Drinking Water Assessor
Central North Island Drinking Water Assessment Unit – Napier Branch

Assessment Report Information	
Report identifier	NapierCityCouncil_DWSNZ2005/18Compliance _ 05102020_v1
Drinking Water Assessment Unit (Inspection Body)	Central North Island Drinking Water Assessment Unit Napier Branch P O Box 447 Napier 4140 Phone: 06 834 1815
Drinking Water Assessor	Reynold Ball
Assessment Date	July – September 2020
Description of assessment work	Assessment of Compliance with Drinking Water Standards for New Zealand 2005 (Revised 2018) for: **Napier Supply** (NAP001), **Treatment Plant / Bores** A1 Awatoto (G02037) (TP03097), C1 Coverdale Park (G00067) (TP00111), T2 Bledisloe Park (G00062) (TP00105), T3 Riverside Park (G00065) (TP00102), T5 Guppy Road (G0064) (TP00103), T6 Guppy Road Reserve (G01151) (TP01961), T7 King Street (G01395) (TP02308) **Distribution Zone:** Napier City (NAP001NA)
Equipment Used	Drinking Water Online (DWO) (v1.0.20269.2)
Water Supply Owner / Person Responsible	Napier City Council Santha Agas (Team Leader 3 Waters)
Assessment method	Standard assessment as per DWA Function 1 Drinking Water Standards for New Zealand 2005 (Revised 2018)
Documents and Information	Heath Act 1956 Drinking Water Standards for New Zealand 2005 (Revised 2018) Compliance Data on Drinking Water Online CNIDWAU supply files Excel Spreadsheet provided by NCC
Site of Assessment	Central North Island Drinking Water Assessment Unit Napier Branch
Omissions from proposed assessment	Nil
Sub-contracted work	Nil
Document checked by:	Jo Waldon Drinking Water Assessor Date 6th October 2020
Release of report authorised by:	Reynold Ball  Drinking Water Assessor 7th October 2020

The results in this report relate only to the compliance of the above listed treatment plants and distribution zones.

If you do not agree with the findings of this report a written appeal must be lodged with the Technical Manager, ***Central North Island Drinking Water Assessment Unit, C/- Toi Te Ora Public Health, PO Box 2120, Tauranga 3140*** within 2 months of receipt of this report. The Deputy Technical Manager will arrange for a review to be undertaken using the MoH appeals procedure.

Appendix 1: DWO Compliance Report