WAIMAKARIRI
DISTRICT COUNCIL

Utilities and Roading Committee

Agenda

Thursday 19 December 2019

9.30am

Waimakariri District Council Chambers
215 High Street
Rangiora

Members:

Cr Wendy Doody (Chairperson)
Cr Al Blackie
Cr Robbie Brine
Cr Sandra Stewart
Cr Paul Williams
Mayor Dan Gordon (ex officio)

The Chairperson and Members
UTILITIES AND ROADING COMMITTEE

A Meeting of the **UTILITIES AND ROADING COMMITTEE** will be held in the **COUNCIL CHAMBERS, 215 HIGH STREET, RANGIORA** on **THURSDAY 19 DECEMBER 2019** to commence at **9:30a.m.**

Adrienne Smith
Governance Coordinator

Recommendations in reports are not to be construed as Council policy until adopted by the Council

BUSINESS

Page No

1 APOLOGIES

2 CONFLICTS OF INTEREST

Conflicts of interest (if any) to be reported for minuting.

3 CONFIRMATION OF MINUTES

3.1 Minutes of a meeting of the Utilities and Roading Committee held on Tuesday 19 November 2019

RECOMMENDATION *9-21*

THAT the Utilities and Roading Committee:

(a) **Confirms** the circulated minutes of a meeting of the Utilities and Roading Committee held on 19 November 2019, as a true and accurate record.

4 MATTERS ARISING

5 DEPUTATION

6 REPORTS

6.1 Adoption of Drinking-water Commitment Statement and Approval of Draft Water Safety Plan for Woodend Pegasus – Colin Roxburgh (Water Asset Manager)

RECOMMENDATION *22-155*

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191206172141.

(b) **Notes** that each public drinking-water supply that Council manages is required to have a Water Safety Plan, as a requirement of the Health (Drinking-water) Amendment Act.

(c) **Notes** that as part of the new Water Safety Plan Framework, each Water Safety Plan must contain a statement endorsed by the senior leadership of the organisation, confirming the organisation's commitment to providing safe drinking-water.

(d) **Notes** that the Waimakariri District Council is committed to providing safe drinking-water to approximately 47,000 residents on one of its 12 public water supplies currently, and that with this responsibility comes significant consequences if this obligation is not adequately fulfilled.

(e) **Recommends** that the Council adopts the commitment statement below, on behalf of the organisation.

Commitment Statement
The Waimakariri District Council is committed to managing its community drinking-water supplies to ensure that consumers consistently receive a safe and reliable supply of high-quality drinking-water, and that the relevant legislation and standards are met. This commitment will be met through the Council maintaining oversight of its water systems, and being accountable for its performance. This encompasses the day to day operation and maintenance, the identification and delivery of required upgrades, and long term strategic planning to ensure that both current and future needs are met. Specifically, Council staff and its nominated contractors will ensure that this commitment is met through the following core areas: • **High Standard of Care:** At all points along the supply chain from source water to consumer a high standard of care will be embraced to manage water quality. • **Ownership and Responsibility:** A culture of collective ownership and responsibility is required throughout relevant members of the organisation. • **Continuous Improvement:** Council staff at all levels will be encouraged to raise issues and develop improvements to systems, to continuously improve the systems used to ensure the safety of drinking-water in the district.

(f) **Notes** that commitment statement will be signed by Mayor, Utilities portfolio holder, Chief Executive and Manager Utilities and Roading.

(g) **Approves** the Woodend Pegasus Water Safety Plan for submission to the Council's Drinking-water Assessor.

(h) **Notes** that at the time this report was published, no Water Safety Plans had been approved under the new framework within New Zealand, and it is likely that changes will be required prior to final approval of the plan by the Drinking-water Assessor, and that staff will report back to the Utilities and Roading Committee if significant changes are required.

(i) **Circulates** this report to the Council and to the Community Boards for their information.

6.2 Installation of RPZ (potable water supply protection) devices at Southbrook resource recovery park and Oxford transfer station – Kitty Waghorn (Solid Waste Asset Manager)

RECOMMENDATION *156-163*

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191202168626.

(b) **Notes** that the estimated cost for the backflow protection installations at Southbrook resource recovery park is $23,581.83, which is within the $50,000 budget.

(c) **Notes** that the estimated cost for the backflow protection installations at Oxford transfer station is $27,622.14, which is within the $43,900 budget.

(d) **Approves** staff proceeding with the installation of backflow protection at Southbrook resource recovery park and Oxford transfer station.

6.3 Stormwater Network Discharge Consents Issues and Implications – Janet Fraser (Utilities Planner)

RECOMMENDATION *164-170*

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191205171455.

(b) **Notes** the ongoing lodgement and processing of stormwater network consent applications, including applications for Kaiapoi and Oxford to be submitted by 20 December 2019, introducing new regulation of urban stormwater quality and stormwater quantity.

6.4 Subdivision Contribution Programme Update – Joanne McBride (Roading and Transport Manager) and Gerard Cleary (Manager Utilities and Roading)

RECOMMENDATION *171-177*

THAT the Utilities and Roading Committee

(a) **Receives** report No. 191205171461;

(b) **Approves** that sealing of a 98m section of Burgesses Road under the Private Funding of Seal Extensions Policy noting that this is subject to the property owner agreeing to fund 50% of the cost of the work;

(c) **Notes** the updated commitments as summarised in Table One of this report;

(d) **Notes** that there is still uncertainly around the timing of some projects and therefore if projects progress ahead of time additional funding may be required;

(e) **Circulates** this report to the Oxford-Ohoka and Rangiora-Ashley Community Boards for information.

6.5 Flaxton Road / Fernside Road Intersection – Don Young (Senior Engineering Advisor)

RECOMMENDATION *178-245*

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191204170541

(b) **Adopts** Option 6D for the Flaxton Fernside roundabout as per attachment iv.

(c) **Authorises** staff to progress the design of the intersection utilising existing budgets (Rangiora West Route Assessment)

(d) **Recommends** to the Council that it adopts, for consultation as part of the draft 20/21 Annual Plan, the requested budget to allow this work to proceed in 2020/21

(e) **Circulates** to all Community Boards for information.

6.6 Rangiora WWTP Solar Power Business Case – Gavin Hutchison (Wastewater Asset Manager)

RECOMMENDATION *246-266*

THAT the Utilities and Roading Committee

(a) **Receives** report No. 190527075051.

(b) **Notes** that a review of possible capital funding options by energy companies will be undertaken and a report presented with recommendations in April 2020.

(c) **Note** that if recommendations presented in April 2020 are adopted, recommendations will be included in the draft LTP 2021/22.

6.7 Sea foam sampling update – December 2019 – Sophie Allen (Water Environment Advisor)

RECOMMENDATION *267-295*

THAT the Utilities and Roading Committee

(a) **Receives** report No. 191206172005.

(b) **Notes** the new process for sea foam notification and sampling instigated in July 2019. This process, however, has not resulted in any further samples obtained.

(c) **Notes** the limitations of Faecal Source Tracking (FST) to show proportions of each source, such as between bovine, human and avian.

(d) **Approves** the removal of the additional expenditure of $36,000 for Faecal Source Tracking analysis from the allocated budget and work programme for sea foam sampling, due to the limitation to show relative proportions of faecal sources, and the difficulty of obtaining sea foam samples of the recommended four litres.

(e) **Notes** that the Eastern Districts Sewage Scheme ocean outfall continues to meet its consent conditions, as summarised in the 2018-19 Ocean Outfall Compliance Review, with respect to water quality at point of discharge.

(f) **Circulates** this report to the Ngāi Tūāhuriri Rūnanga executive, Kaiapoi - Tuahiwi Community Board and Woodend - Sefton Community Board.

7 MATTERS REFERRED FROM COMMUNITY BOARDS

7.1 Pines Beach Roundabout – Joanne McBride (Roading and Transport Manager) and Kieran Straw (Civil Projects Team Leader)
(refer to attached copy of report no. 190827119584, to the Kaiapoi-Tuahiwi Community Board and referred to the Utilities and Roading Committee meeting of 19 December 2019)

RECOMMENDATION *296-308*

THAT the Utilities & Roading Committee:

(a) **Adopts** “Option One” which retains the existing intersection layout, with no further action required;

OR

Adopts “Option Two” which involves including remedial work at the roundabout to improve the intersection layout in a future programme of works;

(b) **Notes** that there is no funding currently available to undertake this project, and that staff would need to include this project in the future minor safety programme which will be brought to the Board in April 2020;

(c) **Notes** that Option Two has an estimated cost of $90,000.00

7.2 Cone Street Improvement – Project Update and Requesting Support to Upgrade Cone Street Retaining Two-Way Traffic – Glenn Kempton (Project Engineer) & Joanne McBride (Roading and Transport Manager)
(refer to attached copy of report no. 191118160249, initially to the Rangiora-Ashley Community Board and referred to the Utilities and Roading Committee meeting of 19 December 2019)

RECOMMENDATION *309-341*

THAT the Utilities & Roading Committee:

(a) **Approves** the proposed scheme design which retains two-way traffic in Cone Street noted as option (a).

(b) **Approves** the removal of eight carparks along Cone Street (between High Street and Collins Street) to allow adequate room for a footpath and two lanes of traffic;

(c) **Notes** that four of the eight carpark spaces should, according to our Code of Practice, be marked as no-stopping within the current road layout due to either the existing road width, or proximity to the intersection of High Street.

(d) **Notes** that the proposed scheme design, including the removal of eight carparks, is the preferred option of the stakeholders.

(e) **Notes** that physical works are likely to be carried out within the 2020/2021 financial year

7.3 Park and Ride Facility Locations – Don Young (Senior Engineering Advisor)
(refer to attached copy of report no. 191128167500, initially to the Rangiora-Ashley Community Board and referred to the Utilities and Roading Committee meeting of 19 December 2019)

RECOMMENDATION *342-353*

THAT the Utilities & Roading Committee:

(a) **Adopt** the following Park and Ride facilities for Rangiora

i. River Road – extension of the existing dog park carpark

ii. White St – existing Park and Ride site

iii. Southbrook Park – the exact option and detail to be worked out by staff to optimise benefits, minimise costs, and mitigate effects.

(b) **Notes** that an additional long term option for South Rangiora will be considered if/when Southbrook Park approaches capacity.

8 PORTFOLIO UPDATES

8.1 Roading – Councillor Paul Williams

8.2 Drainage and Stockwater – Councillor Sandra Stewart

8.3 Utilities (Water Supplies and Sewer) – Councillor Paul Williams

8.4 Solid Waste– Councillor Robbie Brine

8.5 Transport – Mayor Dan Gordon

9 QUESTIONS

10 URGENT GENERAL BUSINESS

11 MATTERS TO BE CONSIDERED WITH THE PUBLIC EXCLUDED

Section 48, Local Government Official Information and Meetings Act 1987

RECOMMENDATION

THAT the public be excluded from the following parts of the proceedings of this meeting.

The general subject of each matter to be considered while the public is excluded, the reason for passing this resolution in relation to each matter and the specific grounds under section 48(1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution, are as follows:

Item Nº	Minutes/Report of:	General subject of each matter to be considered	Reason for passing this resolution in relation to each matter	Ground(s) under section 48(1) for the passing of this resolution
11.1	Report of Gavin Hutchison (Wastewater Asset Manager	Rangiora Septage Facility Business Case Assessment	Good reason to withhold exists under Section 7	Section 48(1)(a)

This resolution is made in reliance on section 48(1)(a) of the Local Government Official Information and Meetings Act 1987, and the particular interest or interests protected by Section 6 or Section 7 of that Act which would be prejudiced by the holding of the whole or relevant part of the proceedings of the meeting in public are as follows:

Item Nº	Reason for protection of interests	Ref NZS 9202:2003 Appendix A
11.1	Protection of privacy of natural persons To carry out commercial activities without prejudice	A2(a) A2(b)ii

NEXT MEETING

The next meeting of the Utilities and Roading Committee is scheduled for 4:00pm, Tuesday 18 February 2020 in the Council Chambers.

WAIMAKARIRI DISTRICT COUNCIL

MINUTES OF THE MEETING OF THE UTILITIES AND ROADING COMMITTEE HELD IN THE COUNCIL CHAMBERS, 215 HIGH STREET, RANGIORA ON TUESDAY 19 NOVEMBER 2019 COMMENCING AT 4.00PM

PRESENT

Councillor W Doody (Chair), Councillors A Blackie, R Brine, S Stewart and P Williams

IN ATTENDANCE

Councillors K Barnett (until 6pm) and J Ward (until 5.15pm)
J Palmer (Chief Executive), G Cleary (Manager Utilities and Roading), C Roxburgh (Water Asset Manager), K Waghorn (Solid Waste Asset Manager), J McBride (Roading and Transport Manager), O Davies (Drainage Asset Manager), K LaValley (PDU Manager), D Lewis(Land Drainage Engineer, 3 Waters), S Allen (Water Environment Advisor), J Fraser (Utilities Planner), A Smith (Governance Coordinator)

1 APOLOGIES

Moved Councillor Brine Seconded Councillor Blackie

(a) **THAT** an apology be received and sustained from Mayor D Gordon.

CARRIED

2 CONFLICTS OF INTEREST

There were no conflicts of interest noted.

3 RECEIPT OF MINUTES

3.1 Minutes of a meeting of the Utilities and Roading Committee held on Tuesday 24 September 2019

Moved Councillor Williams seconded Councillor Blackie

THAT the Utilities and Roading Committee:

(a) **Receives** for information, the minutes of a meeting of the Utilities and Roading Committee held on 24 September 2019.

CARRIED

4 MATTERS ARISING

Councillor Stewart asked for an update on evidence of any further avian botulism.
G Cleary advised that there would be information on this matter included in the U&R weekly update.

5 DEPUTATION

There were no deputations.

unconfirmed minutes

6 REPORTS

6.1 Drinking-water Quality and Compliance Annual Report 2018-19 – Colin Roxburgh (Water Asset Manager)

C Roxburgh presented this report providing an update on the compliance of the Council's public drinking-water supplies for the 2018/19 period, and of water quality trends of this period.

A significant amount of data was provided in the report, in summary C Roxburgh advised that the rate of total coliforms being detected in the 2018/19 period was 1.3%, which is lower than the long term average rate of 5.1%. There was also a reduced number of complaints, which are measured per 1000 connections, with the last year being 6.4 and the previous year being 8.4. The target that is reported on is 5, though not meeting this target, figures are heading in the right direction. Scheme that dominated the complaints was Woodend (manganese issues in the water) though there has been improvements since joining with the Pegasus water supply.

Improvements that are being worked on for the coming year are improvements in achieving protozoa compliance on more schemes, Garrymere Water Supply, should be achieved during this year and the Poyntz Road project construction should be much closer which will be the last capital work for the Council to achieve compliance.

There are now more checks and balances to make sure the exact number of water samples are taken each day as required. This strict requirement of taking water samples is a reflection that there is a lot less leniency than there has been in the past.

An update was provided on the Cust water supply, noting that the temporary measure of using chlorination treatment is now no longer required, following it being turned off on the weekend. Samples were taken for three consecutive days indicating no coliforms being present and the supply is now back to normal operation with the normal sampling schedule.

It is a challenge for staff to keep up with the rate of change and expectations required for water but Council is trending in the right direction with drinking water quality.

Moved Councillor Williams seconded Councillor Brine

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 181002113999.

(b) **Notes** that as a drinking-water supplier, Council has met its monitoring and management obligations under the Health Act for all of its public supplies during the 2018/19 compliance period.

(c) **Notes** that at the treatment plants, all 13 of the Council's drinking-water supplies met the bacterial requirements of the Drinking-water Standards for New Zealand (DWSNZ).

(d) **Notes** that 11 of Council's 13 drinking-water supplies met the bacterial requirements of the DWSNZ for their distribution zones.

unconfirmed minutes

(e) **Notes** that 8 out of Council's 13 drinking-water supplies met the protozoal requirements of the DWSNZ for the full compliance period, two met the requirements part way through the compliance period (Mandeville-Fernside and Oxford Rural No.1), one requires some further reporting (Waikuku Beach), and two require full capital upgrades (Poyntzs Road and Garrymere).

(f) **Notes** that all 13 of Council's drinking-water supplies met the chemical requirements of the DWSNZ for the 2018/19 compliance period.

(g) **Notes** that no E. coli was detected on any of Council's 13 drinking-water supplies during the 2018/19 compliance period.

(h) **Notes** that the rate of total coliforms being detected in the 2018/19 period was 1.3% which is lower than the long term average rate of 5.1%.

(i) **Notes** that five Water Safety Plans were submitted and approved during the 2018/19 period, and that implementation visits were completed on eight water supplies to confirm that the Water Safety Plans are being implemented correctly.

(j) **Circulates** this report to Council and all Community Boards for their information.

CARRIED

6.2 Cust Headwork's Renewal Project – Colin Roxburgh (Water Asset Manager)

C Roxburgh presented this report, seeking endorsement of proposed strategy for the Cust headworks renewal, storage upgrade and UV treatment implementation projects and redistribution of the budget for these. All three projects are budgeted to be completed within the 2020/21 financial year. These projects are all interlinked.

An overview of the renewal required for the Cust headworks was provided, and the current storage facility which is not sufficient. There is also an issue with the state of the headworks facility and the concrete tanks. The site is quite constrained with the neighbouring properties, Cust Fire Station and Plunket and there is no room to expand it exactly where it is located. The issue is that the UV upgrade is still subject to confirmation. It is planned to still construct the new headworks and storage facility at the back of the site and make the headworks large enough to accommodate the UV equipment and also accommodate emergency chlorination equipment so the design is flexible for any future eventualities. This addresses existing deficiencies in the facility, without committing to UV treatment. This would mean spending approximately $700,000 in the next year instead of $1m that was budgeted in total and then the UV part of the project when those standards are introduced, or any alternative requirements. Key next steps are to have discussions one on one with the direct neighbouring properties, including Cust Fire Brigade, Cust School and Cust Garage, and also with the Cust Community Network and Rangiora-Ashley Community Board. Letters will also go out to residents and information will be made available on the Council website.

Following a question from Cr Stewart, it was advised that the water supply comes from two wells, identified as Springbank 1 and Springbank 2 wells. In response to a question on whether Cust water scheme could join the West Eyreton Summerhill scheme. C Roxburgh advised that this isn't an option as there is a difference in water pressure that would require an additional pump station and other upgrades.

unconfirmed minutes

Question from Cr Barnett on what is proposed for the site to be abandoned where the existing headworks is located. C Roxburgh said there will be discussions with the Cust Community Network and the Community Board on the future use of this. There will also be feedback sought from neighbours on this. There will also be conversation with the school on fencing bordering the school grounds.

Question from Cr Williams on the current condition of the tanks. There are four tanks which will continue to be used until the new headworks is developed. C Roxburgh noted that two of these tanks have had some cracks and leaks detected, but these have been mended. These tanks will not be used at the new site, where plastic tanks will be used.

Moved Councillor Williams seconded Councillor Brine

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191031151907.

(b) **Notes** that there is an immediate need to renew the Cust water headworks and increase the storage provision at the site, but that the UV treatment project is proposed to be deferred until there is greater certainty about future requirements.

(c) **Recommends** that the Council, for consideration as part of the Draft 2020/21 Annual Plan, retain the Cust Headworks Renewal ($400,000) and Cust Storage Upgrade ($80,000) budgets currently set for the 2020/21 financial years, but defer the majority ($330,000) of the UV upgrade budget until the 2021/22 financial year, leaving $220,000 in 2020/21.

(d) **Endorses** the engagement strategy outlined in Section 5 of this report as the means of informing and gaining feedback from the relevant stakeholders to this project.

(e) **Circulates** this report to the Rangiora-Ashley Community Board for their information.

CARRIED

6.3 Ohoka, Central and Coastal Drainage Maintenance Budgets – Owen Davies (Drainage Asset Manager)

O Davies presented this report advising of the increased maintenance expenditure within the Ohoka Rural, Central Rural and Coastal Rural Drainage Rating areas. Replacement copies of page 61 from the agenda were tabled and circulated, as the agenda version did not print a table complete.

The drain maintenance expenditure has been increasing over the last two years within the Ohoka, Central and Coastal Rural Drainage rating areas, over and above what would have normally been expected. The reason for this increase is down to a number of factors, as noted in the report:

- Reduction of spraying drains and increase in mechanical cleaning
- Removal of all roadside drain cleanings
- Higher levels of service due to increased rural residential development (with increased lifestyle blocks property owners are keeping their road frontages mowed and tidier than if it was a working farm property.
- Warmer winter conditions, causing rapid weed growth in drains.

Staff will undertake some further investigation and the increased budget figures will be included in report to councils draft budget meeting in January.

unconfirmed minutes

Cr Barnett asked about the savings regarding use of spraying drains versus cleaning drains. O Davies advised that staff have tried to limit the use of spraying glyphosate in wet drains and use it mostly in dry drains. G Cleary added that staff are very aware of the costs involved and are using the most practical methods in each situation.

Cr Stewart spoke noting that she is representative of the Council on these Rural Drainage Advisory Groups and commented that the members of these Groups want the drain cleaning funded across a general rate rather than the targeted rate that it is currently. Questioned what proportion of the cost is for the removal of drain cleaning as distinct from the mechanical versus the spray. This is an issue which comes up with the Rural Drainage Advisory groups regularly. O Davies noted the cost involves coming back and re-establishing on site which effectively doubles the cost of the operation. Cr Stewart comment that the Rural Advisory Group members see this as an issue of lifestyle blocks versus the genuine rural land owners, who doesn't mind the drain cleanings being left there. In response to the questions from both Crs Barnett and Stewart, Cr G Cleary noted there are three matters here – level of service, secondly whether Council is removing the cleanings and thirdly the equity, as to whether this is purely borne by the ratepayers on the drainage scheme. G Cleary advised that more detailed information will be provided to Council either during consideration of the draft Annual Plan budget or some of the issues will require further investigation work and could be considered as part of the LTP. O Davies added that the question of the district wide drainage rate will also be coming up for consideration in future.

Cr A Blackie asked is the amount of silt in the wet drains increasing with the mechanical cleaning being undertaken, with the damage to the sides of the drains and this feeding into the Cam and Silverstream and eventually the Kaiapoi River. O Davies believes that mechanical cleaning removes a lot of silt from the drains, and noted that the level of silt is a result of bank failures. Planting of banks will reduce the amount of maintenance work that is required.

Cr Williams asked if the Council had looked into any alternative spray than glyphosate. O Davies noted that over years there has been many of the eco-friendly sprays suggested to the Council to use, but the problem is that the Council is only licensed to use glyphosate over water. A lot of these alternative sprays, which may or may not work, are not licensed by ECan to be used over water and some are not friendly to the fish life. G Cleary added that any investigations that staff have undertaken in the past have not determined any better spray to be used and there has been research done on this, with the help of Canterbury University.

Regarding the bank failures, this is not as a result of spraying by Council contractors (they only spray in the centre of drains). There are a lot of issues with private landowners spraying right up the banks. O Davies advised that staff have spoken with these people who are adjacent landowners, and mostly the don't realise the damage they are doing. They are advised to use a weed eater as an alternative method.

Moved Councillor Doody seconded Councillor Brine

THAT the Utilities and Roading Committee:

unconfirmed minutes

(a) **Receives** report No. 191104153585.

(b) **Notes** that there has been a significant increase in the annual drain maintenance expenditure in the Ohoka Rural, Central Rural and Coastal Rural drainage schemes, over the previous two financial years.

(c) **Notes** drainage staff will continue to monitor drainage maintenance expenditure over the current financial year and will implement cost saving measures where possible.

(d) **Notes** that even with some cost savings being realised, it is still expected that an increase in the Ohoka Rural, Central Rural and Coastal Rural drainage schemes' drain maintenance budgets in the 2020/21 will be required.

(e) **Circulates** this report to the Council, Oxford-Ohoka, Kaiapoi-Tuahiwi, Rangiora-Ashley and Woodend-Sefton Community Boards for their information.

CARRIED

6.4 Re-establishment of the Solid and Hazardous Waste Working Party Post the 2019 Elections – Kitty Waghorn (Solid Waste Asset Manager)

K Waghorn spoke to this report requesting the re-establishment of the Solid and Hazardous Waste Working Party following the recent 2019 elections. The previous Working Party was made up of seven Councillors. The guidance of the working party will be sought for the overview of the new services, planned facility upgrades, input into Annual Plan and LTP Budgets, and input into the future review of the Waste Minimisation and Minimisation Plan.

Following discussion on which members would be interested in being on the Working Party, it was agreed that the membership should number six Councillors (plus Mayor Gordon ex officio), and the Terms of Reference will be updated accordingly.

Moved Councillor Brine seconded Councillor Williams

THAT the Utilities and Roading Committee

(a) **Receives** report No. 191105154393.

(b) **Establishes** a Solid and Hazardous Waste Working Party.

(c) **Approves** the Terms of Reference for the Solid and Hazardous Waste Working Party as contained in document 191105154039, subject to change in the membership numbers.

(d) **Appoints** Councillors Brine, Doody, Stewart, Williams, Blackie and Barnett as members of the Solid and Hazardous Waste Working Party

(e) **Notes** that Mayor Gordon is an ex-officio member of the Solid and Hazardous Waste Working Party.

(f) **Circulates** report No. 191105154393 to the Community Boards.

CARRIED

Cr Brine supports the increase in the number of members for the Working Party, noting that any recommendations of the working party either come to this Committee or the Council.

unconfirmed minutes

6.5 Update on Solid Waste Services and Waste Quantities to 31 October 2019 – Kitty Waghorn (Solid Waste Asset Manager)

K Waghorn presented this report and noted that the overall uptake of the bins has exceeded expectations. The overall tonnage of green waste has increased in October. The increase is attributes to the amount of spring growth but is also attributed to the bin swap scheme which saw a lot of residents swap their small green waste bins for larger option. This has increased the overall tonnages.
K Waghorn believes green waste tonnages will reduce again during the summer months. Staff are tracking this and will be adjusting the rates accordingly for next year if the figures are higher than anticipated. This will be part of the draft budget to the Council in January 2020.

The main issue that will impact on this year's overall costs is the continuing changes in the international recycling market which has resulted in an increase this year from $95 to $124 a tonne for recycling processing. There has been an indication that this will go up to $140 a tonne on the 1st July 2020 (this is only an indication, it may go up more). The main reason for this is the falling income from paper and cardboard which has usually carried everything through.
K Waghorn advised that Eco Central are looking at different ways to see if processing can be brought into New Zealand to try to minimise the amount of processing costs. This would be at least three to four years away if anything does get established. There has been almost 21 tonnes of material diverted from the pit at Southbrook Resource Recovery Park, with the sorting activities. Overall landfill tonnages are about 7.4% less than the same time last year and greenwaste at Southbrook has dropped approx. 28%.

Following a question from Cr Doody on disposing of grass clipping after spraying, K Waghorn said it is recommended that the first three cuts don't get put into the greenwaste bins. It was agreed that this information be included on the website.

Cr Williams asked what the cost of the Cust Recycling drop off centre is, and is this is paid for by ratepayers. This is mostly funded out of the Waste Minimisation Account, using Waste Levy funding this year as a trial. If it continues it will come under the general rate, which currently funds a lot of the recycling at Southbrook and Oxford transfer stations. K Waghorn advised the exact figures on this would be provided at the next report.

Cr Williams had some questions on the costs of recycling and the cost of transporting of this. It was agreed that these would be a topic for discussion at a meeting of the Solid and Hazard Waste Working Party.

Moved Councillor Brine seconded Councillor Blackie

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191107155980.

(b) **Notes** that staff will continue to monitor the weight of waste collected at kerbside over the spring and summer periods, and will regularly report back to the Utilities & Roading Committee on these figures.

(c) **Circulates** report No 191107155980 to the Council.

(d) **Circulates** report No 191107155980 to Community Boards.

CARRIED

Cr Brine noted the matter of the cost of recycling is a matter for discussion for the Solid and Hazardous Working Party. This is an important discussion to be had.

unconfirmed minutes

Cr Barnett said she believes the community has been moving away from the use of the landfill and towards using recycling. There is a push now for "re-use" but there needs to be a balance for the community to accept any changes. For any proposals that the Council consider in the future, communication with the community will be critical.

6.6 Water Race Management Contract – Renegotiation of Base Payment – Kalley Simpson (3 Waters Manager)

O Davies presented this report on behalf of K Simpson. The report seeks approval of the committee for an increase in the base payment from $206,437 to $244,673 for maintenance of the stock water race system under the Water Race Management Contract 98/62. This is an increase of approximately 18% for the contract which is presently held by Waimakariri Irrigation Ltd. The base payment hasn't been reviewed since 2011. It was also noted that staff believe this increase is justified and have been working with WIL to come to an agreement as to what the increase should be.

Cr Stewart asked why there isn't a regular review of this contract. O Davies noted that under the contract it is supposed to be reviewed every three years, but WIL have not requested a review. A Table in the reports shows that the WIL staff are now dealing with a lot more property owners than previously. This entails a lot more staff time involved and they are now looking at the Council to pay more of the share.

Water is not metered and can be taken from the race for stock and also there is limited use of water for irrigation, which can be drawn off at a certain time of day.

Cr Williams asked if there has been impact on some of the stock water races being closed. O Davies advised that the overall length of closures is fairly limited – the biggest one is the race through the Ngai Tahu property in Eyrewell. Other recent closures have had very little impact on the viability of the system.

Information was provided on rating for stock water – there is a fixed charge of $110 per property, and there is 1400 properties connected. There is approximately 40,000 hectares subject to a water race charge. For each hectare there is a charge of $6.90 per hectare. Cr Williams noted that for every property that has a water race going through that is now closed, there is the loss of the water race connection charge. It was pointed out that alternative, when there is a rural subdivision undertaken, any 4 ha blocks that have stock water races going through are charged a connection fee.

Cr Doody noted that the Stockwater races have a historical significance.
O Davies added that if a race is over 100 years old, the Council is required to consult with the Historic Places Trusts if there is to be a closure.

Following a question from Cr Blackie on WIL Director fees, Mr Palmer advised that these would have been set at the recent AGM and would require the agreement of the shareholders.

unconfirmed minutes

Moved Councillor Doody seconded Councillor Brine

THAT the Utilities and Roading Committee

(a) **Receives** report No. 191107155981.

(b) **Approves** the increase of $38,236 as detailed in the WIL letter dated 18 October 2019.

(c) **Notes** that there is adequate budget available for this increase as the budgets were revised as part of the Drainage & Stockwater – Staff Submission to the Draft 2019-20 Annual Plan, May 2019 (TRIM 190418057971) in anticipation of the increase.

(d) **Circulates** this report to the Council and community board for their information.

CARRIED

6.7 Urban Stormwater quality baseline results and issues identified – Sophie Allen (Water Environment Advisor)

S Allen and J Fraser (Utilities Planner) were present for consideration of this report. It was noted that this report will also go to the Land and Water Committee and the Waimakariri Water Zone Committee. S Allen acknowledged the work of the PDU department in the information provided in this report. The Council undertook baseline water quality sampling in 2014 in Rangiora and in Woodend, Kaiapoi Oxford in 2016. Reports of the results of this sampling were appended to the report. This sampling was undertaken to inform network stormwater discharge consent applications which is a requirement from ECan. The Council was advised to provide information on what contaminants come from either the urban or rural areas. This reporting of the baseline stormwater quality monitoring is the first stage of the discharge consent process. A condition of the stormwater discharge consent is Stage 2, being a five year stormwater quality monitoring programme from 2020 – 2025. Stage 3 is stormwater improvements based on results of the monitoring programme 2025 – 2035.

J Fraser spoke on the sources of copper and zink in the water tested, with the sources of these coming from residential properties (external spouting and downpipes), and from brakepads and tyres of vehicles when breaking. It was noted that there is a clear link between high rainfall and increase in the levels of copper. For Zinc levels it is dependent on what catchment the reading was taken in. There will be further monitoring of this, which has $65,000 in the budget to allow for this. G Cleary added that there is provision in long term budgets for stormwater improvements, but what is required for these improvements is not known at this stage. S Allen noted that if there is any high risk sites identified before 2025, these can be followed up by ECan in their systems.

J Palmer noted the implications of this matter, and the challenges ahead the future.

Moved Councillor Brine seconded Councillor Williams

THAT the Utilities and Roading Committee recommends:

unconfirmed minutes

(a) **Receives** report No. 190618085491.

(b) **Notes** the issues raised in stormwater quality baseline monitoring reports, summarised in this report, for;

i. Rangiora (TRIM 140728079529);

ii. Woodend (TRIM 180822095021);

iii. Kaiapoi (TRIM 190709096637); and

iv. Oxford (report to be completed).

(c) **Notes** that WDC staff are investigating some issues raised by the stormwater quality baseline monitoring results, in conjunction with Environment Canterbury staff where appropriate.

(d) **Notes** that a report on the progress on the stormwater network discharge consent applications, associated monitoring programmes, and proposal for data management will be presented to the Utilities and Roading Committee in early 2020.

(e) **Notes** that budget allocation for urban stormwater quality improvements is included in the current budgets from 2025/26 onwards.

(f) **Circulates** this report to the Waimakariri Water Zone Committee, Land and Water Committee, and Community Boards.

CARRIED

6.8 Cam River floodgate automation for saline intrusion prevention – Sophie Allen (Water Environment Advisor)

S Allen presented this report which details a proposal from the Kaiapoi River Rehabilitation Working Part to investigate the feasibility for automation of the Cam River Floodgate to become a tidegate, for prevention of saline incursions upstream. The request is for a budget in the next annual plan for this. Noted that Henry Hudson look at this several years ago, but has not been looked at regarding for the saline incursions coming up the Kaiapoi River, which have increased in the last five years. Potentially the closing of the tide gate could prevent some saline incursion upstream, how much is not known. Another benefit would be for the weedbeds in the freshwater. S Allen however note that there are disadvantages of this, including the blocking of fish passage, increasing groundwater levels further upstream, flooding issues if the water is not drained out and the saltwater might permeate around the shallow aquifer of the flood gate.

This recommendation is just for a budget for a feasibility study, being a concept design, a list of the permissions and consents that would need to be obtained which could be quite lengthy and consultation with the Runanga. S Allen said the question is are there enough benefits to warrant a feasibility study.

Cr Brine asked why this would come from the general rate and not a Kaiapoi River Rehabilitation association fund for the $15,000. S Allen advised that the Kaiapoi River Rehabilitation working party have already allocated their funds for the Kaiapoi River realignment and some other projects.

Cr Blackie noted recommendation (d) and asked why the Council would not get the approval of Environment Canterbury and the Runanga before agreeing to the funding for the feasibility study. It was agreed to amend the recommendation wording in this regard.

There will need to be meters to monitor the salt levels in the water upstream.

unconfirmed minutes

Cr Blackie – suggested

Moved Councillor Stewart seconded Councillor Brine

THAT the Utilities and Roading Committee

(a) **Receives** report No. 191017145159.

(b) **Considers** inclusion of a budget of $15,000 in the Draft Annual Plan from the general rate for 2020-21 to scope feasibility of automating the Cam River Floodgate, to be used as a tidegate against saline incursions.

(c) **Notes** that a report summarising findings from the feasibility study will be presented to the Utilities and Roading Committee and Environment Canterbury in early 2021, for a decision whether to proceed, and costings in order to obtain required consents / permissions and construct the design.

(d) **Seeks** approval from Environment Canterbury as the asset owner and the Ngai Tuahuriri Rununga before the Council considers the funding for the feasibility study for the modifications to the Cam River floodgate.

(e) **Circulates** this report to the Kaiapoi-Tuahiwi Community Board and Waimakariri Water Zone Committee.

Cr Stewart supports this proposal getting wider circulation, particularly with the Kaiapoi-Tuahiwi Community Board and the Waimakariri Water Zone Committee. The suggestion of using this flood gate has been around for a long time and Cr Stewart noted the conflicts that have arisen with this suggestion. This has come up with the Kaiapoi River Rehabilitation Working Party as a technique to potentially halt salt water intrusion going up the Cam, though certainly an issue going up the Kaiapoi River.

Cr Brine believes this matter needs to be explored for the Council to have discussion with ECan and the Runanga. The perception of the community is that something needs to be done and this is an opportunity.

6.9 Approval of the Roading and Transportation Procurement Strategy – Joanne McBride (Roading and Transport Manager)

J McBride presented this report seeking approval of the committee of the Roading and Transportation Procurement Strategy. It is a requirement of the Council to have this Strategy and for it to be endorsed by NZTA to access funding subsidised through the National Land Transport Programme. The previous Strategy was adopted in 2011 and is out of date and due for review.

The Strategy does not monitor contractors performance, which is more of an operational matter that staff cover. NZTA have provided preliminary feedback on the strategy that it is very thorough and comprehensive and clearly shows strategic thinking.

Following endorsement of the Strategy by this Committee, the next step is for it to go to NZTA for endorsement.

Moved Councillor Williams seconded Councillor Doody

THAT the Utilities and Roading Committee

unconfirmed minutes

(a) **Receives** report No. 191105154423;

(b) **Approves** the Roading and Transportation Procurement Strategy (TRIM No. 190417057789);

(c) **Circulates** this report to Council and the Community Boards for information;

(d) **Notes** that shared services are considered and implemented with neighbouring local authorities where applicable.

CARRIED

7 PORTFOLIO UPDATES

7.1 Roading – Councillor Paul Williams

Nothing to report

7.2 Drainage and Stockwater – Councillor Sandra Stewart

Cr Stewart asked if there could be a report on the first year of the Stormwater Drainage and Waterways Protection Bylaw – having been in existence for over a year, asked could a report be provided on the number of complaints made, number of actions taken and if it is operating successfully. G Cleary agreed this information could be provided to the committee in a report.

7.3 Utilities (Water Supplies and Sewer) – Councillor Paul Williams

Noted the need to recently have the Cust water supply chlorinated.

7.4 Solid Waste– Councillor Robbie Brine

Transwaste AGM is next week. He will not be attending but noted that there will be a more comprehensive meeting early in 2020.

8 QUESTIONS

There were no questions.

9 URGENT GENERAL BUSINESS

There was no urgent general business.

NEXT MEETING

The next meeting of the Utilities and Roading Committee is scheduled for 9:30am, Thursday 19 December 2019 in the Council Chambers.

There being no further business, the meeting closed at 6.09pm.

unconfirmed minutes

CONFIRMED

_____
Chairperson

_____
Date

unconfirmed minutes

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	WAT-03 / 191206172141
REPORT TO:	Utilities and Roading Committee
DATE OF MEETING:	19 December 2019
FROM:	Colin Roxburgh, Water Asset Manager
SUBJECT:	Adoption of Drinking-water Commitment Statement and Approval of Draft Water Safety Plan for Woodend Pegasus

SIGNED BY:
(for Reports to Council, Committees or Boards)

Department Manager

Chief Executive

1. SUMMARY

1.1 This report is to request that the Utilities and Roading Committee:

- Recommend that Council adopt the proposed commitment statement relating to drinking-water.
- Approve the Woodend Pegasus Water Safety Plan for submission to the Council's Drinking-water Assessor.

1.2 Under the Health Act 1956, as amended by the Health (Drinking Water) Amendment Act 2007, water suppliers must:

a. Prepare a Water Safety Plan (WSP) for each water scheme supplying drinking water to more than 500 consumers.

b. Ensure each supply complies with the Drinking-water Standards for New Zealand.

1.3 Under new requirements released by the Ministry of Health, each Water Safety Plan must contain a 'commitment statement' that is endorsed by the organisation's senior leadership. This must outline how the organisation is committed to its obligation to provide safe drinking-water.

1.4 A draft statement has been prepared, for the Council's adoption. It is proposed that this is signed by the Mayor, Utilities portfolio holder, Chief Executive and Manager of Utilities and Roading.

1.5 In recognition of the requirement that senior leadership involvement in drinking-water safety be elevated, it is also recommended that all WSPs be approved by the Utilities and Roading Committee prior to adoption going forward, rather than being approved at a staff level.

1.6 The Woodend Pegasus WSP has been prepared under the new framework and is attached to this report for the Utilities and Roading Committee's approval prior to submission to the Drinking-water Assessor.

Attachments:

i. Woodend Pegasus Water Supply Water Safety Plan December 2019 (TRIM 191023148220)

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191206172141.

(b) **Notes** that each public drinking-water supply that Council manages is required to have a Water Safety Plan, as a requirement of the Health (Drinking-water) Amendment Act.

(c) **Notes** that as part of the new Water Safety Plan Framework, each Water Safety Plan must contain a statement endorsed by the senior leadership of the organisation, confirming the organisation's commitment to providing safe drinking-water.

(d) **Notes** that the Waimakariri District Council is committed to providing safe drinking-water to approximately 47,000 residents on one of its 12 public water supplies currently, and that with this responsibility comes significant consequences if this obligation is not adequately fulfilled.

(e) **Recommends** that the Council adopts the commitment statement below, on behalf of the organisation.

Commitment Statement
The Waimakariri District Council is committed to managing its community drinking-water supplies to ensure that consumers consistently receive a safe and reliable supply of high-quality drinking-water, and that the relevant legislation and standards are met. This commitment will be met through the Council maintaining oversight of its water systems, and being accountable for its performance. This encompasses the day to day operation and maintenance, the identification and delivery of required upgrades, and long term strategic planning to ensure that both current and future needs are met. Specifically, Council staff and its nominated contractors will ensure that this commitment is met through the following core areas: • **High Standard of Care:** At all points along the supply chain from source water to consumer a high standard of care will be embraced to manage water quality. • **Ownership and Responsibility:** A culture of collective ownership and responsibility is required throughout relevant members of the organisation. • **Continuous Improvement:** Council staff at all levels will be encouraged to raise issues and develop improvements to systems, to continuously improve the systems used to ensure the safety of drinking-water in the district.

(f) **Notes** that commitment statement will be signed by Mayor, Utilities portfolio holder, Chief Executive and Manager Utilities and Roading.

(g) **Approves** the Woodend Pegasus Water Safety Plan for submission to the Council's Drinking-water Assessor.

(h) **Notes** that at the time this report was published, no Water Safety Plans had been approved under the new framework within New Zealand, and it is likely that changes will be required prior to final approval of the plan by the Drinking-water Assessor, and that staff will report back to the Utilities and Roading Committee if significant changes are required.

(i) **Circulates** this report to the Council and to the Community Boards for their information.

3. BACKGROUND

3.1. Under the Health Act 1956, as amended by the Health (Drinking Water) Amendment Act 2007, water suppliers must:

a. Prepare a Water Safety Plan (WSP) for each water scheme supplying drinking water to more than 500 consumers.

b. Ensure that each supply complies with the Drinking-water Standards for New Zealand.

3.2. In December 2018 the Ministry of Health released the WSP Framework outlining the new requirements of WSP's.

3.3. The WSP Framework stipulates "organisational support and long-term commitment by senior leadership is the foundation to implementing an effective system for providing safe and secure drinking-water."

3.4. In May 2019, the Ministry of Health released a WSP Handbook outlining how to meet the WSP expectations of the Ministry of Health. The handbook details the specific requirements that must be included in a WSP.

3.5. The publication of both documents occurs in a context of change for the three waters sector. Both the Havelock North Drinking-water Inquiry and the Department of Internal Affairs Three Waters Review are expected to result in significant change and tighter regulations around the delivery of safe drinking water.

3.6. Part of the new requirements for WSP's is the inclusion of a drinking water commitment statement outlining the Council's commitment to deliver safe drinking water. The commitment statement must be endorsed by senior leadership of the water supplier, to demonstrate that the organisation as a whole understands the responsibility as a water supplier, and is committed to owning this responsibility.

3.7. While there are many staff across Council that are involved in the delivery of safe drinking-water to residents connected to Council schemes, there is currently no specific overarching statement outlining this commitment.

4. ISSUES AND OPTIONS

Commitment Statement

4.1. The statement below has been prepared to summarise the commitment that it is proposed that Council makes towards drinking-water. The intention is to succinctly outline this responsibility towards safe drinking-water, but also be meaningful at both an individual staff level as well as to Council's senior leadership.

Commitment Statement
The Waimakariri District Council is committed to managing its community drinking-water supplies to ensure that consumers consistently receive a safe and reliable supply of high-quality drinking-water, and that the relevant legislation and standards are met. This commitment will be met through the Council maintaining oversight of its water systems, and being accountable for its performance. This encompasses the day to day operation and maintenance, the identification and delivery of required upgrades, and long term strategic planning to ensure that both current and future needs are met. Specifically, Council staff and its nominated contractors will ensure that this commitment is met through the following core areas: • **High Standard of Care:** At all points along the supply chain from source water to consumer a high standard of care will be embraced to manage water quality. • **Ownership and Responsibility:** A culture of collective ownership and responsibility is required throughout relevant members of the organisation. • **Continuous Improvement:** Council staff at all levels will be encouraged to raise issues and develop improvements to systems, to continuously improve the systems used to ensure the safety of drinking-water in the district.

4.2. The above statement was initially based on a document within the WSP Handbook, but has been tailored to be more succinct and to be specific to Waimakariri.

4.3. The example statement within the handbook was comprehensive, but due to the large amount of content there is a risk that it may not be thoroughly read and understood by relevant staff. The draft Waimakariri specific statement is intended to reflect the required culture towards drinking-water quality management that all staff should take, rather than prescribe the detail of exactly how this should be done.

4.4. The proposed drinking-water commitment statement is also intended to align with key Council values, in particular *"We'll do better every day"* and *"We'll take responsibility"*.

4.5. It is recommended that the above statement be adopted by Council, following a recommendation from the Utilities and Roading Committee, for inclusion in all future WSPs.

4.6. It is proposed that this is signed by the Mayor, Utilities portfolio holder, Chief Executive and Manager Utilities and Roading.

4.7. Once adopted and included within a WSP, the WSP will be submitted to the Council's Drinking-water Assessor (DWA) for approval.

4.8. Once the statement is adopted by the Council, steps will be taken to ensure that the statement is visible within the organisation. Examples of how this may be done are:

- Inclusion within all future Water Safety Plans.
- Include statement on posters at key office sites with operational water supply staff (similar to other Council values posters), or at water supply headworks sites, or both.

<u>Approval of Water Safety Plans</u>

4.9. Consideration has also been given to approval of the Council's WSPs prior to submission to the Council's DWA. Previously the final step of approval has been for the Council's 3 Waters Manager to sign-off the documents.

4.10. Given the expectation that senior management of water suppliers have greater oversight of this function, it is proposed that the Utilities and Roading Committee be the final stage for approval of WSPs prior to submission. This will add an extra step in the approval process, but will ensure greater visibility of the risks of water supplies to Council's Management Team and elected members.

4.11. The alternative options for approval of Water Safety Plans would either be at staff level (either 3 Waters Manager, or Manager Utilities and Roading), or at Management Team Level. The option of these plans being approved by the Utilities and Roading Committee rather than at staff level is to ensure a greater level of ownership and oversight from elected members as well as staff, given the importance of the obligation to provide clean and safe water.

Woodend Pegasus Water Safety Plan Approval

4.12. The previous Woodend WSP expired in August 2019. Council staff have been working on a revised water safety plan for the combined Woodend Pegasus water supply under the new WSP framework. It was originally intended to submit the Woodend Pegasus WSP following feedback on the Waikuku Beach WSP, such that any feedback could be incorporated into this WSP. This approach was discussed with the Drinking-water Assessor but has not been formally documented or agreed. Council is therefore at risk of not having an approved WSP in place for the Woodend Pegasus water supply.

4.13. Given the experiences of other councils submitting WSPs under the new framework, it is very likely that the first version submitted will not be accepted by the DWA, and some further work will be required. In particular, focus is being put on how it is demonstrated that the reticulation network is safe without the use of residual disinfection in the system.

4.14. Staff will report back following the submission of the document to the DWA to inform the Utilities and Roading Committee either that the plan has been accepted with minor modifications, or for approval of an updated version if significant changes are required.

4.15. The final version of the Woodend Pegasus Water Safety Plan will be presented back to the Utilities and Roading Committee for adoption of the approved plan.

4.16. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. Groups and Organisations

No groups or organisations have been consulted regarding the commitment statement contained within this report.

5.2. Wider Community

The wider community has not been consulted regarding the contents of this report.

6. IMPLICATIONS AND RISKS

6.1. Financial Implications

Adopting the proposed commitment statement does not have any direct budgetary implications. While there are significant costs associated with the supply of safe water, this is already a core function of Council with or without the statement contained within this report.

6.2. Community Implications

This statement reinforces Council's commitment to provide safe and reliable drinking-water to the communities within the district, so that residents can be confident that their water is safe to drink.

6.3. Risk Management

The supply of drinking-water is an essential service that is relied upon by a large number of people, and with this comes inherent risk if not managed adequately. The proposed commitment statement acknowledges this level of responsibility that comes with this risk, and aims to reinforce the required level of commitment to adequately manage this.

6.4. Health and Safety

This commitment statement aims to improve the health and safety within the district, by working to continuously improve the safety of the Council's public water supplies.

7. CONTEXT

7.1. Policy

This matter is not a matter of significance in terms of the Council's Significance and Engagement Policy.

7.2. Legislation

The Health (Drinking-water) Amendment Act is relevant in this matter.

7.3. Community Outcomes

The following community outcomes are relevant in this matter:

SERVICES

k. Core utility services are provided in a timely and sustainable manner

- Council sewerage and water supply schemes, and drainage and waste collection services are provided to a high standard.

7.4. Delegations

While not specifically identified within the Utilities and Roading Committee's jurisdiction, this matter generally falls within the scope of the Utilities and Roading Committee's responsibility.

WAIMAKARIRI
DISTRICT COUNCIL

Water Safety Plan

Woodend Pegasus Water Supply

Prepared by Waimakariri District Council
December 2019

Prepared by:		Jigyasa Dhakal	Graduate Engineer
Reviewed by:		Mark Andrews	Utilities Project Team Leader
		Colin Roxburgh	Water Asset Manager
		Kalley Simpson	3 Waters Manager
Approved by:		Gerard Cleary	Manager Utilities & Roading

Formally approved for submission by Utilities & Roading Committee on the:

PDU Project Number: PD001622

Published: 10 December 2019

File / Record Number: WAT-05-23-03 / TRIM 191023148220

Revision Number	Prepared By	Trim Number	Date
1	Oana Macarie	091216039197	December 2009 (Pegasus only)
2	Oana Macarie	131216116993	December 2013 (Pegasus only)
3	Jigyasa Dhakal	180321030530	March 2018 (Pegasus only)
4	Jigyasa Dhakal	191023148220	December 2019 (Woodend and Pegasus)

Executive Summary

This Water Safety Plan (WSP) has been prepared in accordance with the New Zealand Drinking-water Safety Plan Framework (2018), and the Handbook for Preparing a Water Safety Plan (2019) in order to manage the safety of the Woodend Pegasus water supply, and to demonstrate compliance with Section 69Z of the Health (Drinking-water) Amendment Act.

This WSP embodies the six fundamental principles of drinking-water safety in New Zealand:

- Principle 1: A high standard of care must be embraced,
- Principle 2: Protection of source water is of paramount importance,
- Principle 3: Maintain multiple barriers against contamination,
- Principle 4: Change precedes contamination,
- Principle 5: Suppliers must own the safety of drinking-water, and
- Principle 6: Apply a preventive risk management approach

The WSP has been developed through collaboration between asset managers, operators, and engineers, and has been approved by the Waimakariri District Council's (WDC) Utilities and Roading Committee. The WSP will be reviewed every five years, or upon any significant changes to the water supply. This WSP will be available publicly on the Council's website and also held on site at the headworks sites to support the operators in making effective decisions on the management of the supply.

In developing this WSP, the key process involved assessing the water supply in its current configuration and completing a risk analysis. Where the residual risk was deemed to not be acceptable, additional works have been identified and included in the improvement plan for the water supply.

Overview of the Woodend Pegasus water supply:

The Woodend Pegasus drinking-water supply is a predominantly on-demand supply serving Pegasus, Woodend, and Tuahiwi. The total registered population is 7,325, and this value is expected to increase by approximately 208% in the next 50 years. The primary headworks for this supply is on Atkinson Lane, Pegasus which obtains water from six secure wells in Woodend and a secure well in Pegasus (PW1). There is also a non-secure backup well on Chinnerys Road available for emergencies. Water obtained for this supply is filtered through a biological sand filter for manganese and iron removal. The water that is delivered to Pegasus is chlorinated, while the water delivered to the Woodend-Tuahiwi part of the supply is un-chlorinated.

Historically, an additional bore Pegasus Well 2 (PW2) was used to supply Pegasus. This bore was decommissioned following the presence of Arsenic within the source. An additional decommissioned well exists in the Chinnerys Road headworks. This non-secure well has been capped and is no longer in use.

In the future, an additional bore (which has been drilled but not developed (EQ4)) within the Woodend borefield will be used to accommodate the growth demand. An additional bore had also been considered at Bramleys Road in Tuahiwi however due to potential drawdown impacts on neighbouring wells, this well is no longer being considered as an option for future growth demand.

The Woodend section of the scheme has a backup headworks site at Chinnerys Road, Woodend, which has a decommissioned biological sand filter and back-up chlorine dosing system. The Chinnerys Road headworks can supply Woodend only and has a non-secure backup well which can supply the Chinnerys Road headworks

during emergency situations. Currently, all source water is first pumped to the Pegasus treatment plant for manganese and iron removal. From here the Pegasus water is chlorinated and distributed into the reticulation, while the Woodend water is delivered to the Chinnerys Road headworks which is used as a reservoir and pump station for the Woodend reticulation.

Figure 1 illustrates the locations of the headwork buildings within the Pegasus and Woodend and areas.

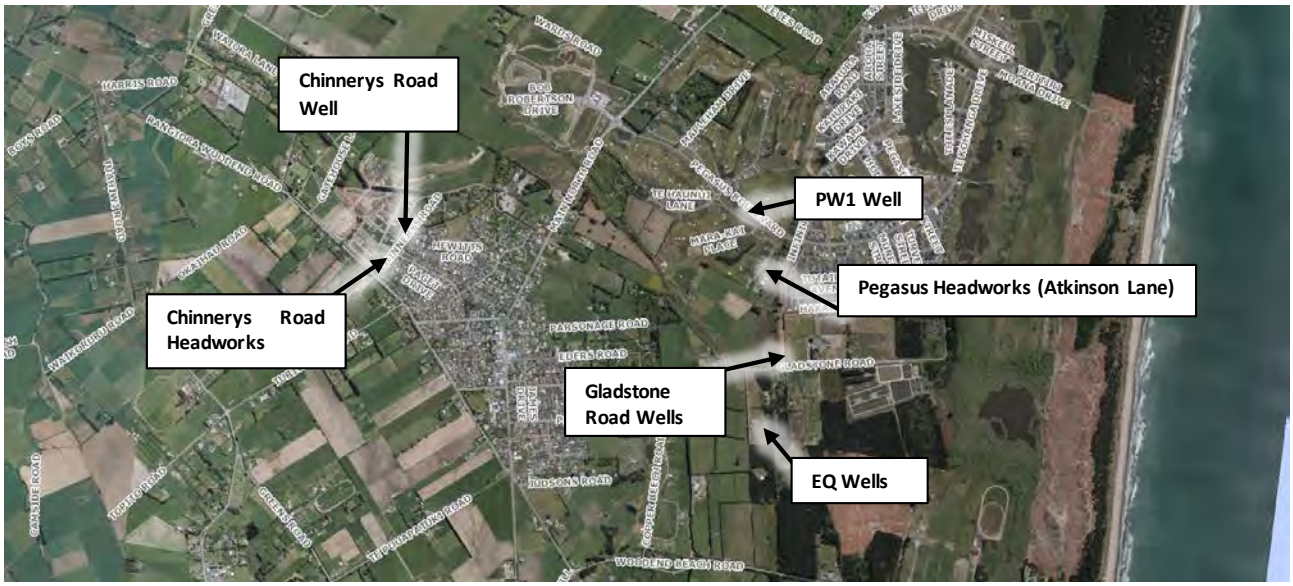

Figure 1: Locations of the drinking-water supply sites

The supply complied with the bacterial and protozoal requirements of the Drinking-water Standards for New Zealand (DWSNZ) for the last compliance year (2018-19). The secure groundwater obtained from the primary wells is filtered for aesthetic purposes only. Chlorine dosing equipment is installed at both headworks sites. With the anticipated changes to remove secure bore water as a means of protozoal compliance from the DWSNZ, designs are complete for the installation of a UV treatment system to operate at the Pegasus headworks to provide an additional barrier against contamination and to achieve compliance with the anticipated future standards. While this project is budgeted for and designed, it will not progress further until future requirements are more certain to ensure that future treatment systems align with future standards.

The Woodend water supply scheme was originally developed in 1975 and the separate Pegasus water supply scheme was developed in 2007. In 2019, the Pegasus and Woodend schemes joined to accommodate the demand from the Ravenswood development (1,500 lot subdivision to the north of Woodend), to improve the resilience of the two schemes and to improve the reliability of the aesthetic treatment process. The physical joining of the schemes is currently limited to the conveyance of source water between the secure wells, Pegasus Headworks and the Woodend Reservoir and pumping station (Chinnerys Road Headworks) locations. The distribution networks downstream are initially separate, however these will join in the future via the Woodend and Ravenswood reticulation.

A summary of the components making up the Woodend Pegasus water supply is provided in Table 1.

Table 1: Drinking-Water Supply Components

Supply	Zone	Plants	Sources
Pegasus PEG001	**Pegasus** PEG001PE	**Pegasus** *(Primary)* TP02780	**Pegasus Well 1** *(Primary)* G01759
			EQ1 *(Primary)* G01946
			EQ2 *(Primary)* G01947
			EQ3 *(Primary)* G02085
			EQ4 *(Future)*
	Woodend PEG001WO		**Gladstone Road Well 1** *(Primary)* G01166
			Gladstone Road Well 2 *(Primary)* G01916
		Chinnerys Road *(Backup)* TP00211	**Chinnerys Well** *(Backup)* G00152

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1. Commitment to Drinking-Water Quality Management

Council staff have prepared the following commitment statement towards drinking-water. This statement was endorsed by the Council's Utilities and Roading Committee at their December 2019 meeting.

<table>
<tr><th colspan="2">Commitment Statement</th></tr>
<tr><td colspan="2">The Waimakariri District Council is committed to managing its community drinking-water supplies to ensure that consumers consistently receive a safe and reliable supply of high-quality drinking-water, and that the relevant legislation and standards are met.

This commitment will be met through the Council maintaining oversight of its water systems, and being accountable for its performance. This encompasses the day to day operation and maintenance, the identification and delivery of required upgrades, and long term strategic planning to ensure that both current and future needs are met.

Specifically, Council staff and its nominated contractors will ensure that this commitment is met through the following core areas:

• High Standard of Care: At all points along the supply chain from source water to consumer a high standard of care will be embraced to manage water quality.
• Ownership and Responsibility: A culture of collective ownership and responsibility is required throughout relevant members of the organisation.
• Continuous Improvement: Council staff at all levels will be encouraged to raise issues and develop improvements to systems, to continuously improve the systems used to ensure the safety of drinking-water in the district.</td></tr>
<tr><td rowspan="3">Signatures</td><td>Mayor _____ Dan Gordon</td></tr>
<tr><td>Chief Executive _____ Jim Palmer</td></tr>
<tr><td>Manager Utilities and Roading _____ Gerard Cleary</td></tr>
</table>

1.1. Supporting Principles, Plans, Strategies and Policies

The Council's commitment to drinking-water is embedded within the organisation through the following principles, strategies, plans, policies and bylaws. At a higher level are overarching principles that the organisation is guided by, down to water supply specific strategies, plans and policies.

A list is provided in Table 2.

Table 2: List of supporting documentation

Principles	Description
Tā mātou mauri – our principles (TRIM 180323031595)	The overarching principles which the organisation is guided by in decision making, and day to day functions.
Community Outcomes	**Description**
Community Outcomes (TRIM 170524052750)	The Local Government Act defines community outcomes as: *"outcomes that a local authority aims to achieve in meeting the current and future needs of communities for good quality local infrastructure, local public services, and performance of regulatory functions."* Community outcomes are Council's statement of what they are trying to achieve, which also helps inform the rationale for service delivery, performance measures and targets, alongside Council's strategic direction.
Core Planning Documents	**Description**
Infrastructure Strategy (TRIM 171129129930)	The Infrastructure Strategy demonstrates how the Council will manage our major assets and address the key issues over the next 30 years. Key issues identified within the 2018 document included: • Catering for population growth. • Meeting increasing standards for drinking-water. • Assessing the risks arising from natural hazards. • Ensuring the renewal of assets are adequately planned for.
Activity Management Plans (TRIM 170724076981)	The Council's Activity Management Plans (AMPs) are key strategic documents that describe all aspects of the management of assets and services for an activity (including technical and financial) over the lifecycle of the asset in the most cost-effective manner to provide a specified level of service. There is a standalone document for each public water supply which the Council manages.
Bylaw	**Description**
Water Supply Bylaw 2018 (TRIM 181109132673)	To protect, promote and maintain public health and safety through the provision of water services in the Waimakariri District.
Policies	**Description**
Backflow Prevention	This policy sets out how Council is to protect its supplies from the risk of backflow, in line with obligations under the Health Act.
Water Supplies - Residential 4A-4B Zones	This policy ensures that privately developed water supplies or extensions to existing supplies are designed and constructed to the required standards.

Applications for Extension to Water Supply and Sewage Disposal	The purpose of this policy is to effectively manage and operate the extension of water and wastewater assets without putting excessive burden on existing schemes.
Transfer Surplus Water Units on Restricted Water Supplies	This policy enables water units to be allocated more efficiently on the schemes that do not have spare capacity available to supply the growing community needs.
Risk Register (TRIM 151223167626)	The purpose of the risk register is establish a central repository for all WDC risks and to reduce loss of knowledge about how we manage specific WDC risks when staff change jobs/roles. Currently this risk register is being updated into a software system to smooth the risk identification process. The WSP Risk Checklist will remain a standalone document to this, however all items identified as high risk within the updated water safety plans will been uploaded to the Council's Risk Register.
Strategies	**Description**
Chlorination Strategy (TRIM 170411035457)	This strategy seeks to protect the public by ensuring all potable water supplied by the Council to its customers are safe from bacterial contamination, while still respecting the community's choices regarding the level of service in regard to the degree of treatment versus aesthetic considerations.
Generator Strategy (TRIM 131219118904)	The aim of this strategy is to address generator requirements in a potential events occurrence (eg snow, high winds, flooding, lightning, and heavy rainfall) for all 3 Waters sites, including details of fuel requirements and fuel storage for each generators.
Water Conservation Strategy (TRIM 100520016879)	The key aim of the Water Conservation Strategy is to provide targets, initiatives and a monitoring regime to achieve higher levels of water conservation within the WDC community water supplies.

1.2. Stakeholders

All stakeholders who could affect, or be affected by, decisions or activities to do with the drinking-water supply are identified in the following table, along with the mechanisms and documentation that are used to keep stakeholders engaged and informed.

Table 3: External stakeholders

Stake Holder	Communications/ Engagement Plan
Residents / Scheme Members	Residents and property owners connected to a Council water scheme are communicated with through a series of channels, for a range of scenarios: • **Response to Customer Complaints:** Customer complaints are tracked through the Council's service request system. There are target response times which vary depending on the nature of the issue. The number of issues and responses are tracked and reported on as part of Council's performance measures. • **Community Notices:** These are sent out on specific issues, on a case by case basis. This may be to inform residents of planned construction works, or operational issues • **Special Consultative Procedures (SCP):** Council generally undertakes a SCP to gain community input where a significant change to a level of service is being considered, or when several options are being considered. For example they have been conducted in the past when considering joining schemes, or when assessing water treatment options. • **Long-Term Plan and Annual Plans:** Each year Council prepares either an Annual Plan or a Long Term Plan to gain feedback from the community on significant projects, and rates for the coming year or years. Residents are able to make either written or oral submissions which are considered by Council before adopting the budgets for the coming year/s.

Stake Holder	Communications/ Engagement Plan
	• **Text / Email Alert System:** There is a text / email alert system which can communicate with all residents with their details registered on a given scheme in a very short amount of time. This historically has been used for issuing and lifting boil water notices, and could be used in the event of a water shortage or other significant operational issue in the future. • **Website and Social Media:** The Council's website and social media pages are used to provide key information to residents and inform residents of operational issues (in additional to other engagement options above).
Elected Members (Mayor, Councillors and Community Board Members)	Each Community Board, Council Committee, or the full Council are communicated with through formal reports to keep elected members informed or where a decision is sought, or through a briefing for a less formal discussion where a decision is not required.
Environment Canterbury (ECan)	ECan are communicated with in the following ways: • **New Consents or Renewal of Consents:** This is through the submission of resource consent applications by Council to ECan. • **Compliance with Existing Consents:** Council submits data to demonstrate compliance with water take consents, or informs ECan of any known breaches of consent. • **Activities within Community Drinking-water Protection Zone (CDWPZ):** If an activity is proposed within a CDWPZ, ECan may request information from the Council on how the proposal may affect the water supply. • **General Discussion on Regional Issues:** These are discussed between key Council and ECan staff via the Canterbury Drinking-water Reference Group (CDWRG).
Drinking-water Assessors (DWAs)	The DWAs communicate and works with Council in the followings ways: • **Water Safety Plan (WSP) Preparation and Submission:** Council prepares WSPs for each scheme and submits them to the DWA. The DWA reviews the plan for compliance, and reports back to the Council with any required changes or clarifications. • **Implementation and Submission of WSP:** The DWA assesses that the Council is implementing each WSP, including requesting information from the Council, and visiting the scheme. This results in a report being presented to Council, which may include recommendations or corrective actions being required. • **Assessing Treatment System or Secure Bore:** If a new treatment system is modified, or a new source is constructed, the Council will submit information to the DWA to demonstrate compliance of the infrastructure with the relevant section of the DWSNZ. The DWA will then report back to Council to confirm whether the infrastructure complies, or whether any changes are required. • **In Response to a Transgression or Event:** If there is an event or transgression that occurs on any scheme, the Council will communicate with the DWA in accordance with the relevant incident plan, and agree on any necessary remedial actions. • **Other Clarifications:** The Council may contact the DWA for any other clarification of either the Health Act or DWSNZ on an as required basis.
Fire and Emergency New Zealand (FENZ)	Council communicates with FENZ in the following ways: • **Updating gazetted firefighting zone boundaries:** As schemes grow or zones are adjusted, Council provides information to FENZ to update their systems. • **Fire Hydrant Audits:** From time to time FENZ may carry out audits or testing on fire hydrants. In this event any defects found will be passed on to Council staff to rectify. • **Capital works:** the fire service are notified during capital works when hydrants become unavailable, or during water shut downs.

Stake Holder	Communications/ Engagement Plan
High Risk Users	The Council's Water Unit hold a list of residents who use dialysis machines, and are therefore reliant on the water supply system. This list is available on Water Unit staff members' tablets so that they are aware it any shutdown affects one of these customers. There is scope to extend this information to other critical customers in the future.

1.2.1. Operations and Management Team

All staff within Council involved in the operation, maintenance and management of the supply are divided into several categories, within two Council departments.

Utilities and Roading Department:

The Utilities and Roading department of Council is managed by Gerard Cleary, Manager Utilities and Roading. This department contains two relevant teams with some level of responsibility over water supplies:

> **3 Waters Team - Asset Management and Operational Responsibility:** The 3 Waters Team within the Utilities and Roading Committee of Council is responsibility for all functions relating to the management, operation, maintenance, compliance and reporting for the district's water supply schemes.
>
> **Project Delivery Unit - Engineering Support:** The 3 Waters Team is supported with professional services predominantly through the Council's internal consultant the Project Delivery Unit. Where there are insufficient resources, or where specialist expertise outside of the Project Delivery Unit is required an external consultant may be used.

Finance and Business Support:

The Finance and Business Support department of Council is managed by Jeff Millward, Manager Finance and Business Support. There is one unit within this department with direct responsibilities relevant to water supply operation:

> **Water Unit – Operation and Maintenance:** The Water Unit are contracted by the 3 Waters Team to operate and maintain the Council's three waters facilities sites. The Water Unit was formed within its current structure in 1998. The reticulation teams and water operators from all the Borough Councils joined together to undertake reticulation, maintenance and operational works within the Waimakariri District. The local knowledge and in-house skills provided by the Water Unit make them invaluable for the operation of the Council's drinking water supplies.

The department managers report to the Council's Chief Executive. All Council staff are accountable to the Chief Executive who is responsible to the elected officials comprising the Council (the Mayor and Councillors) who are ultimately responsible for all functions of Council, including drinking-water.

Key individual staff responsibilities are listed in Table 4 and Table 5.

Table 4: Key Water Unit staff involved in the operation and management of WDC drinking water supplies.

Staff	Role	Qualification	Responsibility
Richard Cookson	Water Unit Manager		Responsibility for the planning and operations and performance of the Water Unit, who are a division of the Council. Charged with the operation, repair and maintenance of the Council's water supplies; as well as

Staff	Role	Qualification	Responsibility
			running internal laboratory and external laboratory suppliers, to analyse samples taken by Water Unit staff.
Daniel Burt	Reticulation Supervisor	National Certification in Water Treatment Level 4 National Certificate in Water Reticulation Level 4 IANZ Approved Signatory	Team Leader at Water Unit responsible for delivery of capital projects assigned to the Water Unit, and assistance with maintenance of reticulation as required.
Phil Drozdowski	Reticulation Supervisor	National Certificate in Water Reticulation Level 4 New Zealand Certificate in Infrastructure Works (Contract Management) Level #6	Team Leader at Water Unit responsible for operation and maintenance of water reticulation.
Darryn Williams	Technician Team Leader	National Certification in Water Treatment Level 4 NZQA US17891 Undertake sampling and site analysis for water treatment IANZ Approved Signatory	Team Leader at Water Unit responsible for team of technicians who operate the three waters facilities sites throughout the district, and signatory to the Water Unit laboratory. Assistance with preparation of Water Safety Plan.
Les Clarke	Water and Wastewater Technician	Grade C Certificate Water Treatment	Operation of three waters facilities sites throughout the district.
Josh Palmer	Water and Wastewater Technician	Training to obtain National Certificate in Water Treatment.	Operation of three waters facilities sites throughout the district.
Kirk Hindmarsh	Water and Wastewater Technician	Enrolment process underway for National Certification in Water Treatment Level 4	Operation of three waters facilities sites throughout the district.
Bevan Stack	Water and Wastewater Technician	Training to obtain National Certificate in Water Treatment.	Operation of three waters facilities sites throughout the district.
Susan Dalzell	Laboratory Technician	NZQA US17878 US17890 Undertake sampling and site analysis for water treatment IANZ Approved Signatory	Primary water sampler and signatory at Water Unit laboratory.

Table 5: Key Utilities and Roading Department Staff with Responsibilities Relating to Water Supplies

Staff	Role	Qualification	Responsibility
Gerard Cleary	Manager Utilities and Roading	Bachelor of Civil Engineering (BSc, CMEngNZ, CPEng)	Overall responsibility for the roading, solid waste and three waters services within the district. Final level of approval of the Water Safety Plan before submitting to Management Team.
Kalley Simpson	3 Waters Manager	Bachelor of Natural Resources Engineering (MEngNZ)	Overall responsibility for asset management, operation and maintenance of three waters services within the district. Assistance with preparation of Water Safety Plan.
Colin Roxburgh	Water Asset Manager	Bachelor of Natural Resources Engineering (CPEng, CMEngNZ)	Overall responsibility for asset management of all Council water supplies. Assistance with preparation of Water Safety Plan.
Caroline Fahey	Water Operations Team Leader	Masters in Civil Engineering (MEngNZ)	Overall responsibility for operation and maintenance of three waters services within the district. Assistance with preparation of Water Safety Plan.
Daniel Wilkes	Control Systems Engineer	New Zealand Certificate of Engineering (NZCE) in Electronics and Computer Technology.	Responsible for operation and management of three waters SCADA communications systems.
Mark Andrews	Utilities Projects Team Leader	Bachelor of Mechanical Engineering (CEng MCIWEM C.WEM)	Team leader of Utilities Design Team within Council, responsible for designing and review of three waters infrastructure. Reviewer of Water Safety Plan.
Jigyasa Dhakal	Project Delivery Unit Engineer	Bachelor of Civil Engineering (BE civil)	Primary author of Water Safety Plan.

1.2.2. Employee awareness and training plan

Process mapping software called Promapp is used by WDC employees to ensure procedures are documented and correctly implemented.

The Water Unit have internal operator procedures specific to the operation of drinking-water supplies. For new and existing employees, actively managed employee awareness and training plans ensure well trained and highly competent staff are operating and maintaining the WDC water supplies. Refer to Section 4.1 for further Water Unit staff training information.

1.3. Engaging Community

Methods of community engagement are described in Table 3 within Section 1.2.

Specific contact lists for incidents and emergencies are described in Table 62 within Section 7.1.

2. Assessment of the Drinking-Water Supply System

2.1. Description, Analysis and Water Quality.

The flow diagram of this scheme has been attached as part of Appendix A.

2.1.1. Catchment Characteristics

Woodend and Pegasus are coastal urban towns between the Ashley and Kaiapoi rivers. The main activities within the area include residential housing, lifestyle properties, commercial activities and farming. Refer to Figure 2 for an aerial photograph of the catchment and the zoning of the land.

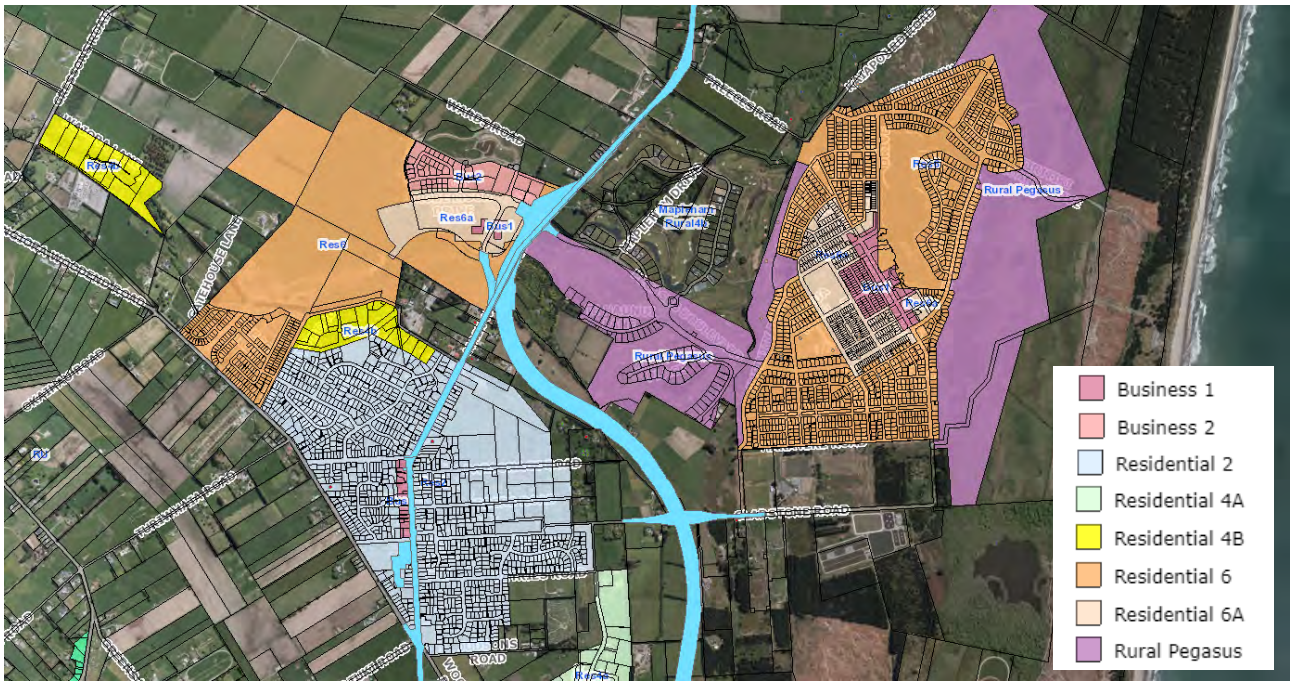

Figure 2: Zoning for Woodend and Pegasus (refer to the District Plan for zone definitions)

Equestrian wells (EQ1, EQ2, EQ3 and EQ4) are located in undeveloped land 500 metres to the south of Gladstone Park, Woodend, within a rural area. PW1 is located in Council owned land on Pegasus Boulevard. Two Gladstone Park Wells (Gladstone 1 and Gladstone 2), are located in Gladstone Park, within 500m of the Equestrian well field.

There is one more well (Chinnerys Road Well) which is located in a below ground chamber within the road reserve of Chinnerys Road, close to the Chinnerys Road Headworks. This is for emergency scenarios only, and is not used during normal operation.

The Community Drinking Water Protection Zone (CDWPZ) available on the Canterbury Maps data base has been considered for this WSP catchment analysis. Non-point source activities located within the CDWPZ have been identified from consents, aerial photographs confirmed by site investigations and by collating and verifying anecdotal information.

The following information has been found within the CDWPZ for the Gladstone and Equestrian wells:

- ECan discharge consents (locations indicated in Appendix B)

The following are within the CDWPZ for Chinnerys Road well:

- Landfill Site

The following are not within the CDWPZ however are considered as part of the risk analysis.

- Unmapped septic tanks
- Pegasus Lake
- Woodend Wastewater Treatment Plant
- Bores within the same aquifer as the source wells that may lead to 'short circuiting'.
- Gladstone Road Rubbish Pit

Refer to Appendix B for a location of the wells including their catchment area and protection zones.

Other risks associated with the catchment include nitrate, arsenic and flooding. These have been discussed in detail within the next sections.

Algal Bloom

All the primary sources for this supply are deep groundwater sources which are isolated from the risk of algal and/ or cyanobacterial bloom.

Nitrate

There are growing concerns regarding the presence of nitrate in groundwater within the Canterbury region. Nitrate levels are checked as part of chemical testing for the scheme. While they are currently significantly less than the Maximum Acceptable Value (MAV) of 11.3 mg/L, they are generally expected to increase over time. ECan has carried out modelling of expected future nitrate values based on a range of potential scenarios. The results of this modelling for this supply are summarised in Table 6.

Table 6: Nitrate assessment for Pegasus from Environment Canterbury's 2018 Nitrate Assessment for the northern Waimakariri River tributaries catchment (ECan, 2018).

		Future scenario Modelled			
	Current Actual (mg/L)	**Current Management Practices**	**Good Management Practices**	**Plan Change 5**	**Current Pathway**
Median Likelihood Expected Value	0.7	2.4	2	2	2
Range 5th percentile to 95th percentile likelihood future values	N/A	1.3 – 4.6	1.1 – 3.9	1.1 – 3.9	1.1 – 3.9

While all scenarios show that nitrate levels will remain well below the MAV, and below 50% of the MAV, the levels will be monitored over time. Ways that Council is monitoring and managing this generally includes the following:

- The issue of nitrates in groundwater has been raised at the Canterbury Drinking-Water Reference Group (CDWRG) which is a group made up of the territorial authorities, the Regional Council and Canterbury District Health Board where matters relating to public drinking-water supplies are discussed to ensure all parties work together for the protection of public health.

- The results of modelling works undertaken by Environment Canterbury to predict future nitrate levels have been presented to Council staff. Council staff will continue to work directly with Environment Canterbury to understand the outputs of this work, and to provide any additional input to Environment Canterbury to assist with refinement of modelling in the future.
- Council staff are working closely with the Waimakariri Water Zone Committee, which provides recommendations to Environment Canterbury on the proposed Waimakariri sub-regional chapter in the Land and Water Regional Plan, in particular regarding setting of nutrient limits within the zone. Potential impacts on drinking-water are considered by the Committee when considering and understanding these nutrient limits.
- All Council's primary wells are now tested for all key chemical parameters (including nitrate) annually to gain further confidence that unexpected changes are not occurring.

Arsenic

Historically, one of the Pegasus Wells (PW2) had detected presence of arsenic above the MAV. The well has since been capped and decommissioned.

Arsenic has been shown to be present above the MAV within some sources within the Waikuku, Woodend and Saltwater Creek Area. In 2001 a study was commissioned to review the occurrence of arsenic in the groundwater within the Waikuku and Woodend area (WDC TRIM reference number 190301024769). The study found that the confining layers in the Waikuku-Woodend area are much more intermittent than in the areas to the south (such as Kaiapoi). Further to this assessment, WDC is currently investigating the extents of the arsenic within private wells the Kaiapoi area.

The study suggests that arsenic occurs within some layers due to organic materials reacting in an anaerobic environment. The source water from the Gladstone, Equestrian and Pegasus wells have not shown presence of arsenic above detection limits, other than EQ1 which had arsenic measured at approximately 0.003 g/m^3 (30% of MAV). In accordance with DWSNZ, WDC is and will continue to test for arsenic within its source wells in this area as part of ongoing chemical monitoring.

Climatic Features

The Woodend Pegasus water supply is located close to the coast. The Ministry for the Environment preparing for Coastal Change guidance document suggests that for planning and decision timeframes out to 2120, councils should use a minimum transitional value for sea level rise of 1 metre relative to the 1986-2005 baseline (Category C).

The Equestrian and Gladstone park wells are greater than 2 km away from the sea at approximately 7m above sea level according the 2018 Lidar data.

The Council has undertaken flood modelling up to a 1 in 500 year event based on a rainfall event, as well as an Ashley River breakout. The results are plotted in the Council's GIS system, and are shown below. This demonstrates that the wells are not within the flood plains.

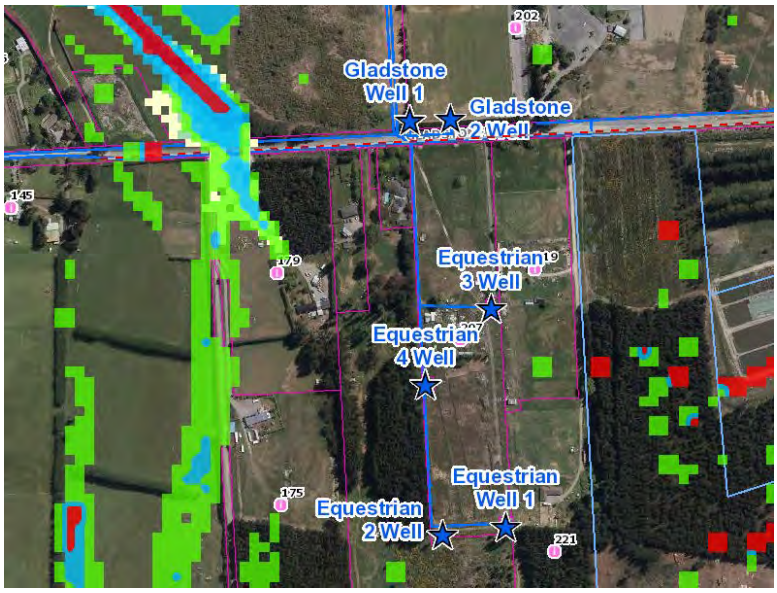

Figure 3: Flood Modelling for EQ and Gladstone Wells (coloured squares indicates flood zones).

Figure 4: Flood Modelling for PW1 Well (coloured squares indicates flood zones).

2.1.2. Source

The primary source for the Woodend Pegasus water supply consists of six secure groundwater wells (PW1, EQ1, EQ2, EQ3, Gladstone 1 and Gladstone 2). The back-up source for the Woodend zone of the supply consists of one non-secure well at the Chinnerys Road Headworks.

PW1, EQ1, EQ2 and EQ3 were drilled as part of the Pegasus development, while Gladstone 1 and Gladstone 2 were originally drilled for the Woodend water supply. The Chinnerys Road wells served the Woodend supply prior to the drilling of the Gladstone Road wells.

PW1 (G01759)

This well is located in Pegasus Boulevard, approximately 400m northwest of the Pegasus Headworks building.

Table 7 summarises all the relevant data relating to PW1.

Table 7: PW1 Summary information

Component		Detail
Source	Well Name	PW1
	Unique DW-Online identification code	G01759
	Type	Well
	Approximate percentage of supply	15%
	Reliability	Good
	Water quality issues	Manganese and iron above guideline values Secure source (granted June 2017)
Source infrastructure	Type (pumped/gravity/ equipped bore/etc)	Secure deep well with 30kW bore pump (installed 2010) (Grundfos SP60-4, 15 L/s, 35m duty head)
	Location	150 Pegasus Boulevard, approx. 400m northwest of the Pegasus Headworks building.
	Ecan Well Number	M35/10908
	Depth	145.8 m
	Diameter	250 mm
	Year	2007
	Ground Level	7.45 m above MSL
	Initial Static Water Level	4.85m BGL
	Screen Depth BGL	142.8 m to 145.8 m
	Original Pump Test Yield*	30 L/s
	Original Pump Test Drawdown*	48 m
	Specific Capacity	0.94 L/s/m
	Driller	McMillan Drilling Ltd
	Drill Method	Rotary/ Percussion

**In early 2017, Clemence Drilling Ltd. redeveloped the well and carried out another pump test. This showed that the well could achieve a yield of 24 L/s at 7.02 m drawdown.*

EQ1 (G01946)

Table 8 summarises all the relevant data relating to this well.

Table 8: EQ1 Summary information

Component		Detail
Source	Source Name	EQ1
	Unique DW-Online identification code	G01946
	Type	Well
	Approximate percentage of supply	21%
	Reliability	Good
	Water quality issues	Manganese and iron above guideline values Secure source (granted June 2017)
Source infrastructure	Type (pumped/gravity/ equipped bore/etc)	Secure deep well with 37kW bore pump (installed 2016) (Vansan VSP SS 08160/03, 30 L/s, 50m duty head)
	Location	207 Gladstone Road, approx. 800m south of the Pegasus Treatment building.
	Ecan Well Number	M35/18017
	Depth	218.8 m
	Diameter	300 mm
	Year	2009
	Ground Level	4.70 above MSL
	Initial Static Water Level	unknown
	Screen Depth BGL	212.2 m to 214.2m
	Pump Test Yield	30 L/s
	Pump Test Drawdown	20.73 m
	Specific Capacity	1.45 L/s/m
	Driller	Clemance Drilling
	Drill Method	Rotary Percussion Tool

EQ 1 was originally reported as yielding in the order of 37 L/s when running concurrently with all other wells, however following redevelopment in 2016 it was recommended that its capacity be limited to 30 L/s to ensure it does not draw through sand (refer 161220131051 for details on replacement pump undertaken at the time of redevelopment).

EQ2 (G01947)

Table 9 summarises all the relevant data relating to this well.

Table 9: EQ2 Summary information

Component		Detail
Source	Source Name	EQ2
	Unique DW-Online identification code	G01947
	Type	Well
	Approximate percentage of supply	1%*
	Reliability	Good
	Water quality issues	Manganese and iron above guideline values Secure source (granted June 2017)
Source infrastructure	Type (pumped/gravity/ equipped bore/etc)	Secure deep well with a 37kW bore pump (installed 2011) (Grundfos SP125-4, 41.1 L/s, 80m duty head)
	Location	207 Gladstone Road, approx. 800m south of the Pegasus Treatment building.
	Ecan Well Number	M35/18018
	Depth	250.7 m
	Diameter	250 mm
	Year	2010
	Ground Level	4.27 m below MP
	Initial Static Water Level	Not recorded
	Screen Depth BGL	244.7 m to 250.7 m
	Pump Test Yield	45 L/s
	Pump Test Drawdown	36 m
	Specific Capacity	1.26 L/s/m
	Driller	Clemence Drilling
	Drill Method	Rotary Percussion Tool

**This well is not used during normal operation as manganese removal achieved is not as good as the other wells using a biological process.*

EQ2 is reported as yielding in the order of 37 L/s when running concurrently with EQ 1 and EQ3 as part of the original commissioning.

EQ3 (G02085)

Table 10 summarises all the relevant data relating to this well.

Table 10: EQ3 Summary information.

Component		Detail
Source	Source Name	EQ3
	Unique DW-Online identification code	G02085
	Type	Well
	Approximate percentage of supply	21%
	Reliability	Good
	Water quality issues	Manganese and iron above guideline values Secure source (granted November 2016)
Source infrastructure	Type (pumped/gravity/ equipped bore/etc)	Secure deep well with a 37kW bore pump (installed 2014) (Grundfos SP125-4, 41.1 L/s, 80m duty head)
	Location	207 Gladstone Road, approx. 800m south of the Pegasus Treatment building.
	Ecan Well Number	M35/18019
	Depth	213 m
	Diameter	300 mm
	Year	2014
	Ground Level	3.76 above MSL
	Initial Static Water Level	5.38 m BGL
	Screen Depth BGL	208 m to 212 m
	Pump Test Yield	40 L/s
	Pump Test Drawdown	8.46 m
	Specific Capacity	16.48 L/s/m
	Driller	Clemence Drilling
	Drill Method	Rotary Percussion Tool

EQ3 is reported as yielding in the order of 37 L/s when running concurrently with EQ1 and EQ2 as part of the original commissioning.

EQ4

Table 11 summarises all the relevant data relating to this well. It is noted that the final drilling, screening and development were not completed as it was determined by the developer that they had sufficient capacity for the Pegasus supply without requiring this well. While currently capped, it is intended that this well construction be completed and the well utilised in the future to accommodate growth.

Table 11: EQ4 Summary information.

Component		Detail
Source	Source Name	EQ4
	Unique DW-Online identification code	Unassigned
	Type	Well
	Percentage of supply	0%
	Reliability	NA
	Water quality issues	NA
Source infrastructure	Type (pumped/gravity/ equipped bore/etc)	Future source
	Location	207 Gladstone Road, approx. 800m south of the Pegasus Treatment building.
	Ecan Well Number	M35/18020
	Depth	194.40 m
	Diameter	400 mm
	Year	2014
	Ground Level	3.82 above MSL
	Initial Static Water Level	0.15 m BGL
	Screen Depth BGL	No screens installed
	Pump Test Yield	Not developed
	Pump Test Drawdown	Not developed
	Specific Capacity	Not developed
	Driller	Clemence Drilling
	Drill Method	Rotary Percussion Tool

Gladstone 1 (G01166)

Table 12 summarises all the relevant data relating to this well.

Table 12: Gladstone 1 Summary information.

Component		Detail
Source	Source Name	Gladstone 1
	Unique DW-Online identification code	G01166
	Type	Well
	Percentage of supply	21%
	Reliability	Good
	Water quality issues	Manganese and iron above guideline values Secure source (granted October 2018)
Source infrastructure	Type (pumped/gravity/ equipped bore/etc)	Secure deep well with a 30kW bore pump (installed 1998) (Pleuger QN83-4 + M6-600, 40 L/s, 50m duty head)
	Location	202 Gladstone Road (southwest corner of Gladstone park)
	Ecan Well Number	M35/7542
	Depth	205.8 m
	Diameter	200 mm
	Year	1998
	Ground Level	4.92 above MSL
	Initial Static Water Level	2.88 m BGL
	Screen Depth BGL	201.8m and 205.8m
	Pump Test Yield	40 L/s
	Pump Test Drawdown	21 m
	Specific Capacity	3.37 L/s/m
	Driller	Clemence Drilling
	Drill Method	Cable Tool

Gladstone 2 (G01916)

Table 13 summarises all the relevant data relating to this well.

Table 13: Gladstone 2 Summary information.

Component		Detail
Source	Source Name	Gladstone 2
	Unique DW-Online identification code	G01916
	Type	Well
	Percentage of supply	21%
	Reliability	Good
	Water quality issues	Manganese and iron above guideline values
		Secure source (granted October 2018)
Source infrastructure	Type (pumped/gravity/ equipped bore/etc)	Secure deep well with a 37kW bore pump (installed 2009)
		(Grundfos SP125-4, 41.1 L/s, 80m duty head)
	Location	202 Gladstone Road (southwest corner of Gladstone park)
	Ecan Well Number	M35/11693
	Depth	210 m
	Diameter	300 mm
	Year	2007
	Ground Level	4.89 above MSL
	Initial Static Water Level	Ground Level
	Screen Depth BGL	200.7m and 205.4m
	Pump Test Yield	40 L/s
	Pump Test Drawdown	79.82 m
	Specific Capacity	0.5 L/s/m
	Driller	Clemence Drilling
	Drill Method	Rotary Percussion Tool

Chinnerys Road Well 2 (G00152)

Historically two wells existed on Chinnerys Road. Chinnerys Road Well 1 (M35/0470) and Chinnerys Road Well 2 (M35/0225). Chinnerys Road Well 1 is located within the western border the Chinnerys Road Headworks site. As the well has been capped and disconnected it is not considered suitable for backup supply. The Chinnerys Road Well 2 however is considered a backup well for this supply, although would only be used in an emergency event. It is located in the footpath of Chinnerys Road. When the Ravenswood development was underway and the road reconstructed, the footpath was extended such that the well was not within the road corridor. Refer to Figure 5 for a location of these wells.

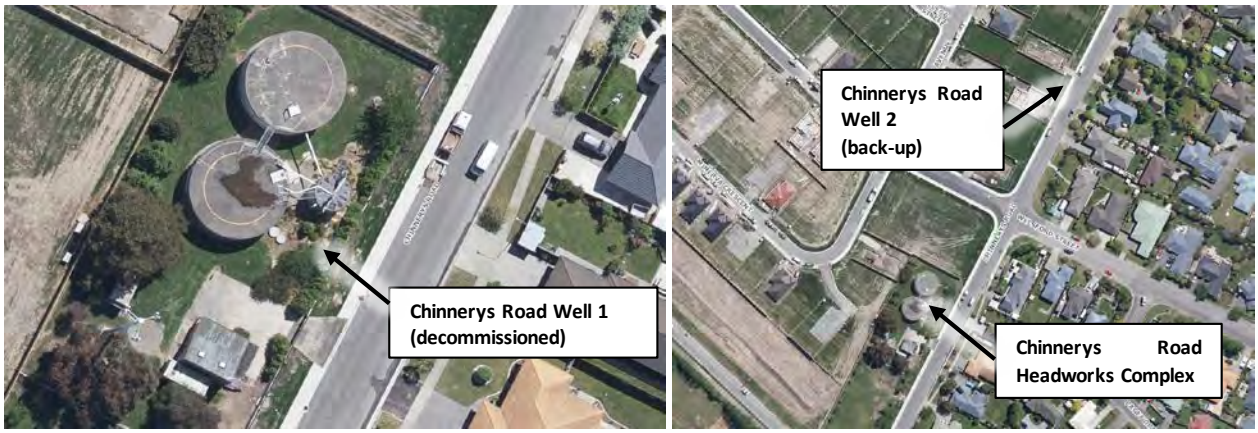

Figure 5: Location of Chinnerys Road Wells

Chinnerys Road Well 2 is now referred to as "Chinnerys Road Well" as it is the only remaining Chinnerys Road well since the capping of the first well. Table 14 summarises the key data relating to this well.

Table 14: Chinnerys Road Well Summary information.

Component		Detail
Source	Source Name	Chinnerys Road Well
	Unique DW-Online identification code	G00152
	Type	Well
	Percentage of supply	0%
	Reliability	Good
	Water quality issues	Elevated iron & manganese Non-secure shallow source within footpath of Chinnerys Road.
Source infrastructure	Type (pumped/gravity/ equipped bore/etc)	Non-Secure shallow well with 13 kW bore pump (installed 1982) (Pleuger Q83-2 T6, 25L/s)
	Location	Within footpath outside 122 Chinnerys Road
	Ecan Well Number	M35/0225
	Depth	22.7 m
	Diameter	250 mm
	Year	1982
	Ground Level	14.32m above MSL (Lyttelton 1937)
	Initial Static Water Level	10.22m BGL
	Screen Depth BGL	19.7 m to 22.7 m

Component	Detail
Pump Test Yield	25L/s
Pump Test Drawdown	2 m
Specific Capacity	12.5 L/s/m
Driller	A M Bisley & Co
Drill Method	Cable Tool

2.1.3. Treatment

The Pegasus Headworks (TP02780) is the primary headworks for the Woodend-Pegasus water supply scheme. In order to ensure reliable operation, the plant is provided with redundancy and automatic changeover, on a timed basis, minimising operator intervention. The following section discusses the treatment and processes in place at the Pegasus and Chinnerys Road Headworks and should be read in conjunction with the flow diagram in Appendix A.

Treatment Processes Summary

The following table summarises the key treatment processes for the scheme.

Table 15: Treatment types and target values for the scheme.

Treatment Process	Type	Capacity	Log Credit Achieved	Target Values *
Biological Filter (Chinnerys Road) *#offline and capped*	2 x Filtec gravity filter with 0.8mm – 1.2mm sand media (5m high, 3 m dia)	45 L/s (50L/s through a clean filter after backwash)	Aesthetic only	90% manganese removal from raw water levels
Biological Filter (Primary)	2 x 0.65 – 0.85 ES sand media 600 – 900mm depth	Hydraulic rate 18 m/hr 65-470 m3/hr flow per filter	Aesthetic only	90% manganese removal from raw water levels When UV Treatment is installed: <1 NTU 95 % of compliance monitoring time and <2 NTU for any three minute duration of the compliance period (DWSNZ section 5.10)
Sodium Hypochlorite (Pegasus Distribution)	Flow proportional dosing from 2,500 L tank	2,500L	< 0.25 for crypto (DWSNZ)	0.4 mg/L
Sodium Hypochlorite (Chinnerys Road Back-up)	Flow proportional dosing from 20 L containers	20L	< 0.25 for crypto (DWSNZ)	0.8 mg/L
UV Disinfection at Pegasus Headworks (Future)	TBC	TBC	3 (DWSNZ)	TBC

*Note: Operators should be cautious when using these values. CCP values displayed at the headworks site shall take precedence. The target values shown are the values set at the time that this WSP was written.

Treatment Plant Process Description

Water is obtained from the primary wells in a duty assist configuration. All bore pumps on these primary wells have variable speed drivers (VSDs) and are run in pre-determined configurations to meet the required demand. In normal operation the flow portion is generally intended to be balanced at as shown. The general intent is that PW1, EQ1, EQ3, Gladstone 1 and Gladstone 2 have equal priority, while EQ2 has lower priority due to poor manganese removal performance if this well is used in isolation for an extended period. PW1 has been assigned a lower proportion of flow as this yields less than the other wells. While it is intended to run for a similar proportion of the time, it will contribute less flow. Over time as the biological manganese removal filter continues to run, the flow split between wells may be optimized further.

Table 16: Typical flow proportion from wells

Well	Flow Proportion
PW1	15 %
EQ1	21 %
EQ2	1 %
EQ3	21 %
Gladstone 1	21 %
Gladstone 2	21 %

The raw water from the all the secure wells excluding PW1 are delivered to the treatment plant's raw water tank, through a circa 600m long, 400mm OD PE pipe. The raw water from PW1 is delivered to the raw water tank from a 315mm OD PE pipe. The Dissolved Oxygen (DO) blowers, (monitored by a DO sensor) provide air to the raw water tank prior to entering the filters, which is required as part of the biological manganese removal process.

Water passes through the filters and the naturally occurring microbes and air oxidise the manganese and iron so it can be removed through the sand filter. When in the automatic control mode (normal operation), the filters will be in one of three states: in service, back-washing or out of service. Filter flow control is by level and flow cascade controller and sand filter back-washing is programmed to occur once per week. This backwashing is usually carried out by the Council's Control Systems Engineer who minotors the backwash process remotely, or by a plant operator.

Following filtration, the system measures turbidity, and the line that supplies Pegasus is dosed with chlorine. Free Available Chlorine (FAC) is measured downstream of the dosing point, both prior to the reservoir and downstream of the reservoir prior to distribution. Actuated valves are included upstream of dosing points to ensure that, when flow paced chlorination is in use, chlorine does not backtrack into the filter and detrimentally impact the manganese and iron removal process.

The transfer pumps draw from the treated water tank and convey it to the two treated water reservoirs which can be operated either independently or in series. Currently one reservoir is dedicated for unchlorinated water being conveyed to Chinnerys Road for the Woodend reticulation, and the other dedicated to the Pegasus reticulation.

Water from the reservoirs at Pegasus Headworks is conveyed into the Pegasus reticulation via three 18.5kW surface pumps and two 4kW jockey pumps and to the reservoir at the Chinnerys Road plant via three 15kW

surface pumps and a dedicated transfer main. Water from the Chinnerys Road reservoir is conveyed via two 11 kW and two 22kW surface pumps to the Woodend and Tuahiwi reticulation network.

There is a bypass connection between the 400mm OD PE source water transfer pipeline to the Pegasus Headworks and the 355 OD PE/DN250 PVC transfer pipeline between the Pegasus Headworks and Chinnerys Road Headworks. Under normal operation there is an air gap between source water and water transferred to Chinnerys Road Reservoir (blank plates installed in place of short section of pipe in a below ground chamber near Gladstone Road). This bypass would allow source water to be pumped directly to the Chinnerys Road plant without passing through the Pegasus plant, in the unlikely event of a significant issue affecting the Pegasus plant. This adds to the overall resilience of the scheme.

The Chinnerys Road Headworks has a number of bypasses. In normal operation the water from Pegasus Headworks (or the source wells if required) bypass the redundant iron and manganese removal filter at the site. Water can also bypass one or both reservoirs and be distributed via the surface pumps.

The Chinnerys Road Well can also be bought online by opening valves and turning on the well pump. This well is not secure, and therefore would require emergency chlorine treatment to be used.

Protozoan Compliance

The scheme has a protozoal removal requirement of 0 log, based on meeting the secure groundwater criteria as set out in Section 4.4. Age dating analysis was undertaken for the following wells, with the results summarised below:

Table 17: Mean Age and Calculated Young Fraction from Woodend Pegasus Bores

Source	Mean Age (Yrs)	Young Fraction	Record number
M35/10908 (PW1)	>182	< 0.005%	170317026200
M35/180174 (EQ1)	>175	< 0.005%	
M35/18018 (EQ2)	>176	< 0.005%	
M35/18019 (EQ3)	> 172	< 0.005 %	150325046830
M35/7542 (Gladstone 1)	>177 *wells hydraulically linked*	< 0.005%	180611064696
M35/11693 (Gladstone 2)		< 0.005%	

The mean age of the water significantly exceeds the minimum requirements for secure groundwater (> 1 year). The young fraction, shows that less than 0.0005% of the water has been present in the aquifer for less than one year. In addition the well heads have been assessed as being secure. Therefore, all primary wells have been granted secure status and, in accordance with DWSNZ, do not require treatment for bacteria or protozoa (i.e. the protozoal removal required is 0 log).

Bacterial Compliance

Criterion 1 is currently used to demonstrate compliance (E. coli monitoring). The frequency requirements from the DWSNZ are as per Table 4.4 note 5. While E. coli is required to be sampled once per quarter leaving the plant, it is currently programmed for sampling once per month both at each plant, and at each individual primary source well.

Equipment

A list of all key treatment equipment relevant to the Pegasus Headworks are displayed in the table below:

Table 18: List of equipment avaliable at the Headworks.

Equipment	Quantity	Notes	Function
Dissolved Oxygen Blowers	2	Becker VT 4.4 60Hz 3-Phase pump	Provides air to the raw water tank using custom made diffusers. Air is required prior to filtration as air and bacteria oxidises the manganese and iron into chemical form which can removed using a sand filter.
Filter	2	0.65 – 0.85 ES sand media, 600 – 900mm depth, minimum bed dimensions: 8.0m length, 3.3m width, max hydraulic rate 18 m/hr, 65-470 m3/hr flow per filter	Manganese/iron removal is achieved by passing the water supply through two filters supported by Johnson screens. Filters operate in parallel with a maximum filtration rate of 470m m3/hr (one filter), although normal maximum flow is 240 m3/hr The filters are backwashed in regular intervals, or in response to high pressure loss or manual initiation. Backwash takes approximately 1 hour 20 minutes and are generally undertaken each Wednesday (weekly).
Backwash Blowers	2	Longtech Roots Blowers LT-156, 40kW, duty point: 25@ 10.0 psig	The backwash blowers pump air to the filters as part of the combined air and water backwashing sequence. Operate as duty and standby.
Backwash Pumps	2	Goulds GIS 250x200-315 30 kW 150 L/s	Takes water from treated water tank and pumps back through filters as part of combined air and water backwashing sequence. Operate as Duty and Standby.
Treated Water Tank	1	120 m3 tank	Acts as a balance tank prior to treated water pumps and is also used to supply treated water for backwash of the filters.
Treated Water Pumps	2	VSD controlled Goulds GIS 250x200-315 22kW providing duty of 135 L/s per pump.	Transfers water from the filters into the reservoirs.
Chlorine Dosing Pump	2	VSD controlled Siemens AAC4342 VPP-E peristaltic pumps with AAC4321 15 – 2000 ml/h tube.	The pumps operate on duty-standby configuration to maintain a achieve a target dose. While the system originally used carry water, it was found to be more reliable pumping neat chlorine.
Chlorine Analyser	1	In-line Wallace and Tiernan - Depolox 5 analysers with 4 – 20 mA output.	Chlorine is measured after the dosing point, prior to the reservoir, as well as after the reservoirs. Both points are alarmed and connected to the Council's SCADA system to alarm if levels are outside of target range.
Bulk Chlorine Tank	1	2.5 m^3 bulk storage tank, GRP, Vertical Cylindrical Vessel With Flat Base c/w ultrasonic	Stores the chlorine for the dosing pump the use. The low level alarm for the dosing tank is set at 25%, equating to 6 days remaining storage at average dose, maximum flow.

Equipment	Quantity	Notes	Function
		level sensor and conductivity sensor	
Booster Pumps (Pegasus reticulation)	4	VSD controlled 18.5kW Lowara SV92-03/2F185T	Located after Pegasus reservoir A to boost supply pressure to meet design flow. The 4kW pumps provide for low flow duties and 18.5kW for high flow duties. When the system pressure drops below the set point, the booster pumps operate, firstly using the low flow pumps and then higher flow pumps. The pumps are provided with VSD control to provide flexibility as the town develops to avoid surge and to deliver firefighting requirements.
	2	VSD controlled 4kW Lowara SV16-04F40T	
Booster Pumps (Chinnerys Road Headworks)	3	15kW Lowara 125SV02G150T 15kW (TRIM 190612083208)	Located after Pegasus reservoir B to transfer the water from the Pegasus Headworks to the Chinnery' Road Headworks.
Generator	1	Fixed 230kV Olympian GEH250	A permanent generator is available in the Pegasus headworks to maintain supply during outages
	1	Portable 15KVA	Portable generator available at the Water Unit.
	1	Portable 55kVA	Portable generator stored at the Pegasus Headworks.

The plant has duplication and duty/standby arrangements to allow for repairs/maintenance. The operator carries a spare dosing pump and other replacement equipment such that common faults can usually be repaired on site.

The back-up headworks at Chinnerys Road, Woodend (TP00211) has a decommissioned biological sand filter. Emergency chlorine dosing is also available at this headworks. Currently four surface pumps (2 x Goulds 100x65-100 with 22kW motor & 2 x 11 kW Lowara LM132B14S2/3110)

2.1.4. Reticulation Network

The Woodend Pegasus water supply services the reticulation to achieve the target level of service of a supply pressure at all properties of >250 kPa for 100% of the time and >300kPA for 99% of the time. In order to achieve this, the pressure setpoints that the pressure pumps work to maintain are between 400 and 450kPa at the headworks outlets.

The reticulation network and supplied area is shown on Appendix C.

Storage

The Pegasus Headworks has two reservoirs to provide water redundancy and firefighting capacity. One reservoir supplies the Pegasus distribution and the other supplies the Chinnerys Road Headworks for the Woodend supply. The Chinnerys Road Headworks has an additional two reservoirs to supply the distribution. The reservoirs generally operate between 75% and 95% full, leaving 75% for emergency or firefighting storage.

The reservoir suppling the Pegasus reticulation has a storage capacity sufficient to provide approximately 11.5 hours of emergency/firefighting storage at an average daily flow of 2,819 m3/day (2017/18 peak demand).

The combined volume of the three Woodend distribution reservoirs is sufficient to provide approximately 30 hours of emergency/firefighting storage at an average daily flow of 2,663 m3/day (2017/18 peak demand).

Table 19: Reservoir Capacity Summary

Location	Reservoir	Capacity (m^3)	Combined Storage (hours)
Pegasus Headworks	Pegasus Reservoir A (to Pegasus reticulation)	1,360	11.5
	Pegasus Reservoir B (to Woodend)	2,710	30
Chinnerys Road, Woodend	Chinnerys Reservoir 1	450	
	Chinnerys Reservoir 2	450	

Of the 80 restricted connections within this supply, all are required to provide onsite potable water storage on each dwelling lot equivalent to the minimum of 48 hours supply or 4 m^3, whatever is greater. Customers may require a pump to provide pressure from the tank to their individual water systems. Note this also provides an additional backflow prevention mechanism to the network with an air gap at the top of the tanks.

Pipeline

The transfer pipeline between Pegasus Headworks and the Chinnerys Road Headworks is a mixture of 355mm OD PE PE and 250mm PVC.

The pipes within the Pegasus reticulation are a combination of 100mm - 400mm diameter mains (PE or PVC mains) with 63mm OD PE rider mains. The pipes within the Woodend and Tuahiwi reticulation a combination of 100mm - 250mm mains predominantly PE or PVC, with a small proportion of asbestos cement. Generally the vast majority of the pipework is considered to be modern materials, with a large amount of remaining life. Refer to Table 20 for the details of the pipelines materials and sizes.

Table 20: Water Supply pipe length (m) by diameter and pipe materials

Pipe Material	Pipe Diameter (mm)									
	< 50	50	100	150	200	250	300	375	Total (m)	Total (%)
Asbestos cement	0	0	2,097	2,183	1,438	26	0	0	**5,744**	**5%**
PE	334	45,348	77	13	7	279	3,014	1,148	**50,221**	**44%**
PVC	0	9,654	22,375	16,810	3,015	5,802	19	0	**57,674**	**51%**
Other	0	7	0	0	0	0	0	0	**7**	**0%**
Total (m)	334	55,009	24,549	19,007	4,461	6,107	3,033	1,148	**113,647**	**100%**

The asset condition for the Woodend Pegasus water supply reticulation is assessed based on theoretical remaining useful life derived from component age and adopted useful life. Figure 6 below illustrates the remaining useful life profiles based on component age and asset design life.

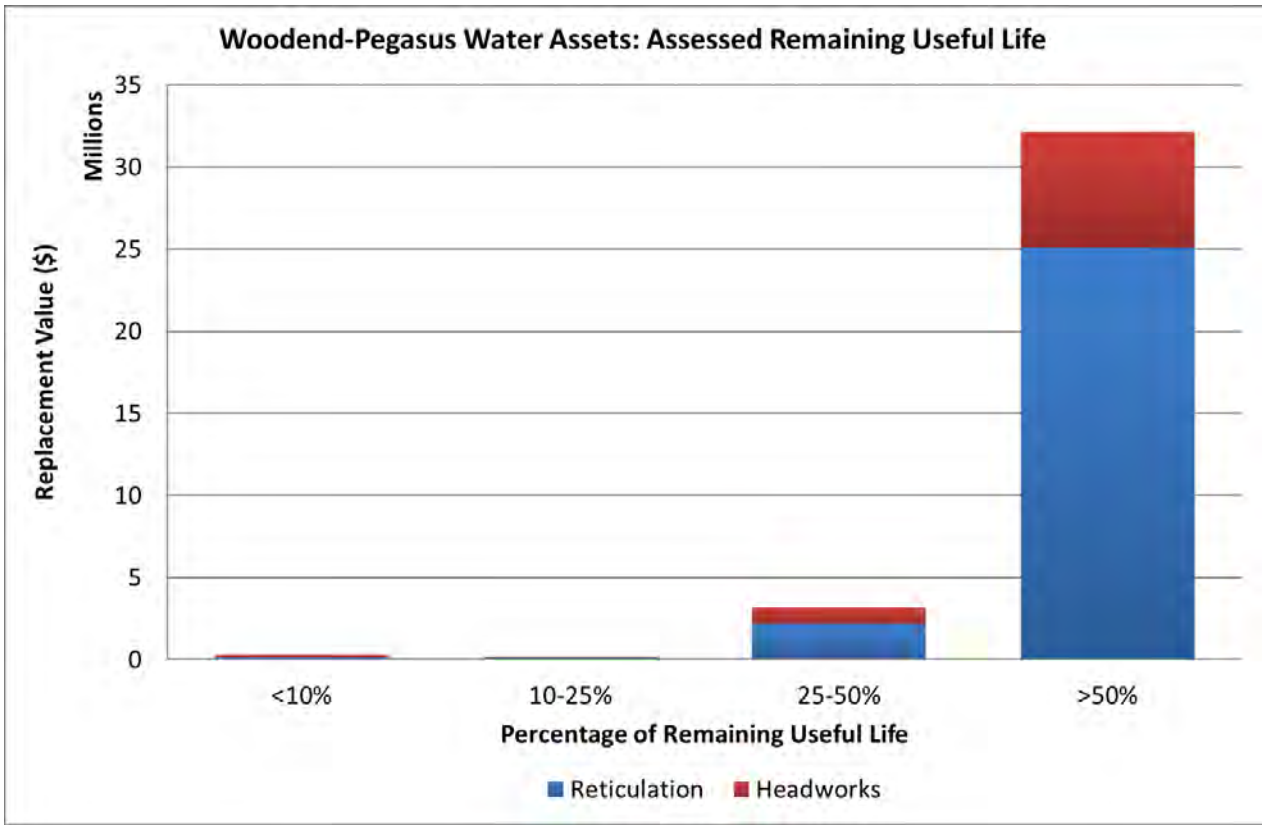

Figure 6: Assessed Remaining Useful Life of the Woodend Pegasus water supply assets

As is demonstrated above, the vast majority of assets have a large amount of remaining useful life.

Criticality Based Renewals

Criticality assessments are undertaken on all pipes, and the planned renewal date calculated using a combination of theoretical life and criticality. Essentially, highly critical pipes are replaced before the theoretical end of life, and lower criticality pipes may be left in service beyond the theoretical end of life if they are continuing to perform well. This ensures that the highly critical pipes are replaced proactively, before they fail, rather than only replacing them as a result of failure or bursts. For this reason, despite the large amount of remaining life, some renewals are undertaken annually in the Woodend scheme.

Leakage

Leakage is measured using the Infrastructure Leakage Index (ILI) from the Water Loss Guidelines Manual (2010).

The ILI method assigns a leakage band to each scheme based on a range of factors. In particular it takes into account the length of pipework, operating pressure, as well as the number of connections.

The ILI is determined to be the ratio of actual leakage relative to a calculated 'Unavoidable Annual Real Losses' (UARL). Essentially accepting that there is a level of leakage that cannot be realistically avoided for a given amount of pipework, connections and pressure and therefore calculating how much actual leakage is occurring relative to this unavoidable amount.

The bands of leakage adopted by Council are shown in Table 16 below:

Table 21: Performance measures for ILI

Band	ILI Range	Guideline Description of Real Loss Management Performance Categories for Developed Countries
A	< 2.0	Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective leakage management
B	2.0 – 4.0	Possibilities for further improvement; consider pressure management, better active leakage control, better maintenance
C	4.0 – 8.0	Poor leakage management, tolerable only if plentiful cheap resources; even then, analyse level and nature of leakage, intensify reduction efforts
D	<8.0	Very inefficient use of resources, indicative of poor maintenance and system condition in general, leakage reduction programs imperative and high priority

The 2017/18 report on leakage (TRIM 190130010451) includes assesses each scheme in the district using the minimum night flow method. The following table shows the results for Woodend and Pegasus scheme, both as separate distribution systems as well as their combined result as a scheme.

Table 22: Woodend and Pegasus Leakage Results

Scheme	ILI Score	Leakage Band
Pegasus	0.1	A
Woodend	1.8	A
Combined Total	0.8	A

As is demonstrated above, both schemes perform very well in terms of the ILI performance measure, demonstrating the good condition of the reticulation networks.

An annual leakage report is provided to Council by the Water Asset Manager for review of the systems performance. Leakage is additionally reported in the Activity Management Plans and the Water Safety Plans.

2.1.5. Supply and Demand Characteristics

The supply currently has 2,850 on-demand connections and 80 restricted connections. The estimated population is 7,325. The growth projections over the next 50 years is predicted to increase 208% for this supply.

Table 23: Demand for the Scheme as per WDC flow analysis data (TRIM 121108078783) and AMP (TRIM 161116117754).

	Current			50 Year
	Pegasus	Woodend	Total	Total
Total Connections	1,611	1,415	2,959	8,469
Average Demand (m^3/day)	1,032	956	1,751	8,047
Peak Demand (m^3/day)	2,819	2,663	2,102	21,177

The resource consent for Gladstone Road Well 1 and 2 (CRC074057) permits a combined flow of 80 litres per second, 6,912 m^3/day, and 1,200,000 cubic metres in any year. The resource consent for the Equestrian Park and PW1 well (CRC167262) permit an allowable combined abstraction from the to 12,288 m^3/day at a maximum rate of 142 L/s, or 1,756,015 cubic metres per year. The combined total limits for the supply are 222 L/s or 19,200 m^3/day.

The following table shows the values of the different source capacities.

Table 24: Capacity provided by each well when run independently.

Well	Capacity* (L/s)	Comments
Gladstone 1	34	SCADA Measured
Gladstone 2	33	SCADA Measured
Equestrian Park 1 (EQ1)	30	Reduced capacity following advice after re-development in 2016
Equestrian Park 2 (EQ2)	44	Commissioning Testing
Equestrian Park 3 (EQ3)	46	Commissioning Testing
Production Well 1 (PW1)	20	SCADA Measured
Backup Chinnerys Rd Well	25	Bore log

Note that these capacities are when the wells are run independently, flow rates will be different when a combination of wells are in operation.

There is not sufficient capacity at present to meet the 50 year projected demand. There is a well site in the EQ well field (EQ4) which has the potential to deliver similar flows to the other EQ wells, subject to completion of drilling, screening, developing and testing. This additional well would provide a sufficient capacity to meet the 50 year demand. However Council's operational policy is having one additional well available for redundancy reasons. This would mean an additional well would need to be constructed to meet the projected 50 year demands and provide the required level of redundancy, within the 50 year horizon.

There have been investigations undertaken into the feasibility of using a well along Bramleys Road. Initial investigations showed 20 L/s may be able to be drawn from this well. However, following further investigation (TRIM report 180323031876), this well was not considered a viable option due to the potential effects on other well owners in the area, and the potential extensive treatment requirements of this well.

2.1.6. Supply Management Systems

All Council owned drinking-water supplies are the responsibility of relevant asset managers. The asset managers are responsible for contracting the Water Unit to undertake the operations of all sites. The Water Unit are the head operation and maintenance contractor, who carry out the majority of the work themselves. Any work that they don't have the resource or expertise to complete is subcontracted out to appropriate specialists in the relevant fields. Examples of specialist work that is performed by subcontractors to the Water Unit are electrical work, generator maintenance and pump servicing. The Management System for the Council drinking water supplies is displayed in Figure 7.

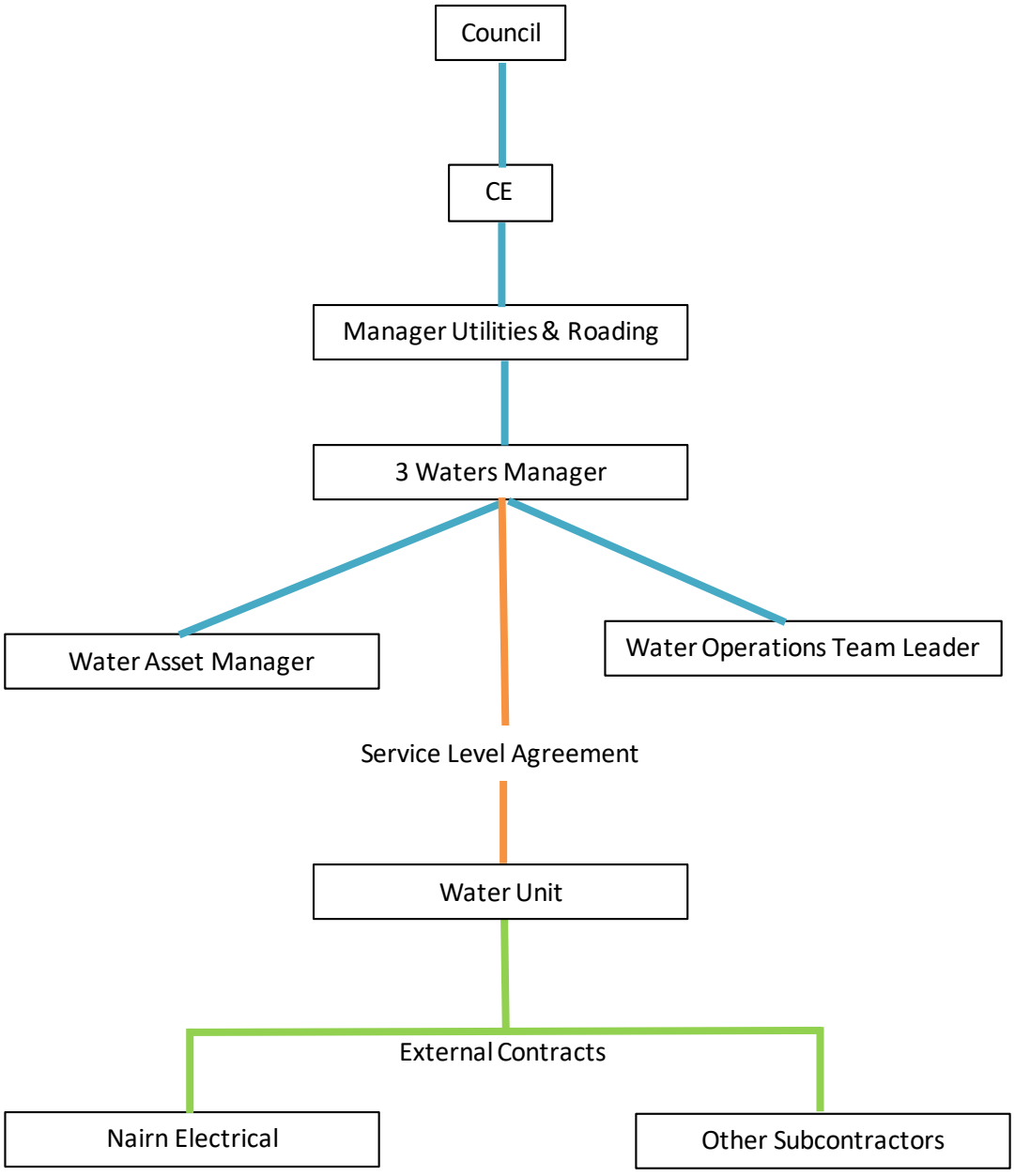

Figure 7: Supply Management Structure

2.2. Assessment of Water Quality Data

2.2.1. E. coli

The maximum acceptable value (MAV) for E. coli is less than 1 per 100 mL sample. Water samples are collected from this scheme at the headworks (treated and raw) and within the reticulation network. All results on the scheme are recorded in the Drinking Water Online (DWO) database currently, and previously in the WINZ database. There has been no E. coli detected on the Plant or Source however E.coli has been detected within the Woodend Reticulation in 2012, 2013 and 2014. The summary of the results for the last 17 years (which is as far back as the DWO and WINZ databases are available) has been displayed on the Figure 8 below.

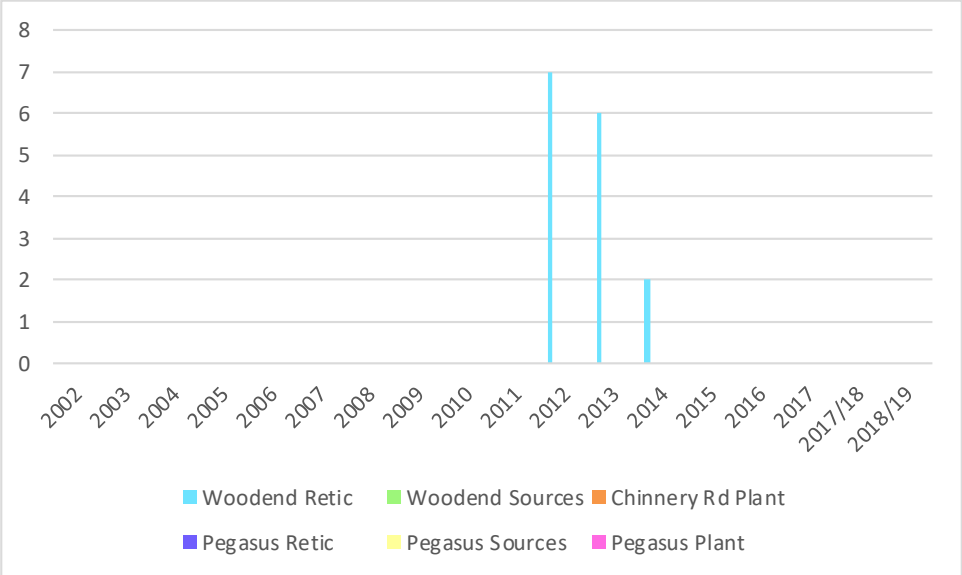

Figure 8: E.coli Sampling Trend for the Pegasus & Woodend Headworks

While discovered in the reticulation, subsequent testing determined that the source of contamination was at the reservoir at the headworks. Since the reservoir was repaired, no further contamination has been found. These events are discussed further in section 2.2.10

2.2.2. Protozoa

The Woodend Pegasus water supply has achieved secure groundwater status. Protozoa monitoring has not been undertaken for the scheme, however it is noted that protozoa has not been detected in a groundwater well within New Zealand, let alone a deep and secure well. This is based on research undertaken by Massey University (Jessamine et al, 2018).

2.2.3. Total Coliforms

While the requirement to monitor total coliforms has only recently been introduced into the DWSNZ, the presence of total coliforms have been monitored in conjunction with E. coli monitoring since at least 2002 for the Council's supplies.

It is important that the manganese removal process is considered, when assessing the total coliform data for this scheme. For aesthetic reasons, the Woodend and Pegasus water supply is treated with a biological filter. Microbes exists naturally within the source water. Once they are abstracted and provided with oxygen, the microbes oxidise the manganese and iron, to allow the manganese and iron to be filtered out of the source water. The microbes are not harmful to humans, however as conditions for them to grow are encouraged as part of the biological filter, they are thought to be a contributing factor to the higher total coliforms levels relative to other schemes within the district. This baseline presence of total coliforms does not indicate a

weakness in the system, but rather means that the use of total coliforms as an indicator for another contamination source is not as straightforward as it would be on other schemes.

To better understand this, a testing programme is proposed with ESR to speciate total coliforms when they are detected, to help confirm their origin.

Woodend

Total coliforms has been part of routine sampling for the Woodend Scheme since 2002 and 2007 for the Pegasus Scheme. 17 years of routine sampling from the source, headworks and reticulation is displayed Figure 9. The number of samples undertake per year is displayed in Table 25.

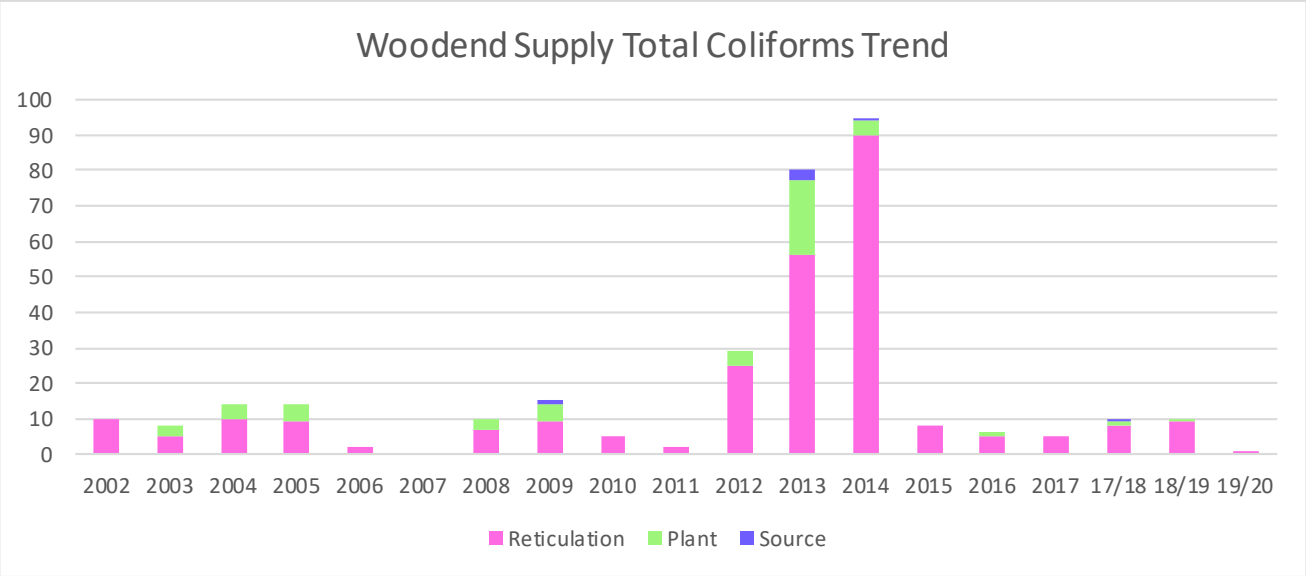

Figure 9: Total Coliforms Events per Year for Chinnerys Road Headworks, Source and Woodend Reticulation (2002 – 2019)

It is noted that the spike in the total coliforms from 2012 to 2014 is at the same time period of the E.coli detection within the distribution when the total number of samples were increased. This indicates that while there is a normal baseline level, likely attributed to the biological manganese removal process, this increase in presences was an indicator of a weakness in one of the barriers in the system at the time.

Table 25: Total Coliforms Trend for Woodend Supply (2002–2019)

	Reticulation			Plant			Source		
Year	Coliforms samples	Positive Results	Percent	Coliforms samples	Positive Results	Percent	Coliforms samples	Positive Results	Percent
2002	92	10	10.9%	0	0	0.0%	0	0	0.00%
2003	60	5	8.3%	10	3	30.0%	0	0	0.00%
2004	53	10	18.9%	15	4	26.7%	5	0	0.00%
2005	54	9	16.7%	13	5	38.5%	0	0	0.00%
2006	55	2	3.6%	12	0	0.0%	0	0	0.00%
2007	53	0	0.0%	10	0	0.0%	1	0	0.00%
2008	54	7	13.0%	12	3	25.0%	1	0	0.00%
2009	55	9	16.4%	15	5	33.3%	23	1	4.30%
2010	66	5	7.6%	21	0	0.0%	54	0	0.00%
2011	57	2	3.5%	8	0	0.0%	3	0	0.00%
2012	100	25	25.0%	17	4	23.5%	23	0	0.00%
2013	126	56	44.4%	62	21	33.9%	27	3	11.1%
2014	193	90	46.6%	11	4	36.4%	48	1	2.08%
2015	101	8	7.9%	6	0	0.0%	11	0	0.00%
2016	58	5	8.6%	10	1	10.0%	11	0	0.00%
2017	27	5	18.5%	0	0	0.0%	8	0	0.00%
17/18	54	8	14.8%	7	1	14.3%	18	1	5.56%
18/19	52	9	17.3%	12	1	8.3%	22	0	0.00%
19/20	8	1	12.5%	2	0	0.0%	0	0	0.00%
Total	1318	266	20.0%	243	52	21.0%	255	6	2.00%

The data above indicates that while the number of total coliforms presences in the reticulation are greater than the number detected at the plant, the percentage of samples with a presence is essentially the same at the plant and in the reticulation.

The trend in Woodend water supply total coliforms was investigated further in the 2019 annual compliance report (TRIM 190925134493). A graph displaying results from the source, plant and distribution with average the manganese levels are shown on Figure 10.

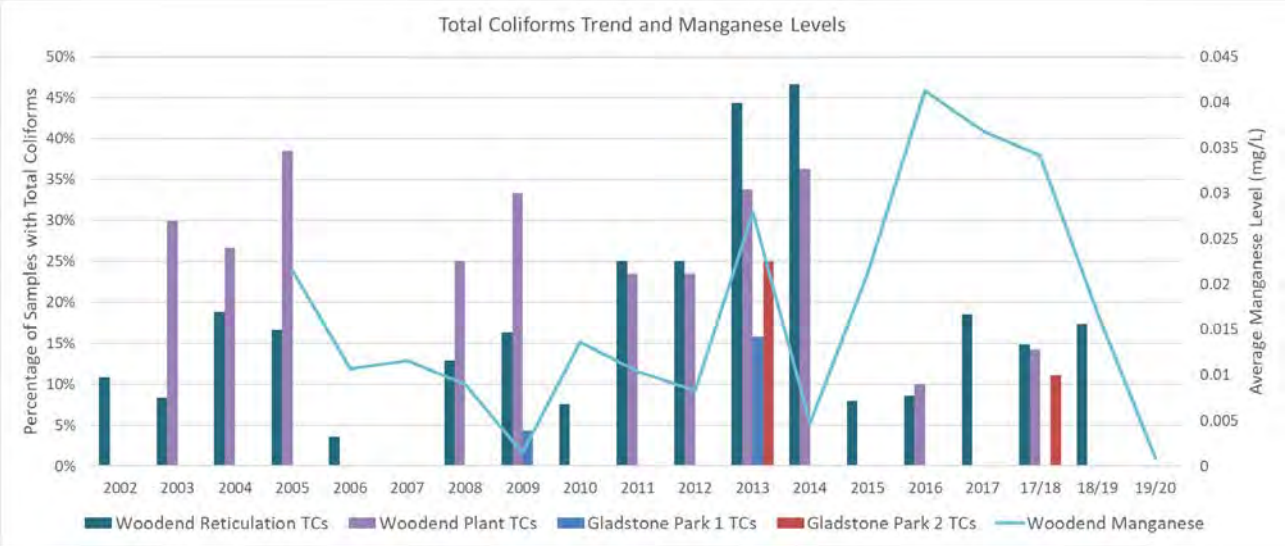

Figure 10: Comparison of Total Coliforms within the Woodend water supply with manganese levels.

Analysis of Total Coliform Results:

The following conclusions can be drawn from the above:

- The Chinnerys Road Headworks and the Woodend reticulation have had total coliforms present in approximately 20% of the samples over this time. If the 2012-2014 samples were removed (where there was an increased incidence rate), this value decreases to 10.6% in the distribution and 15% for the plant.
- Over time the incidence rate of total coliforms is similar at the plant and within the reticulation for Woodend. This suggests that plant (specifically the biological manganese removal filter), is the source of the total coliforms. Conversely, if the reticulation was the source of coliforms entering the system, a higher incidence rate would be expected in the reticulation samples than the plant samples.
- There have been sporadic incidences of total coliforms in the raw source water. This may either be linked to the naturally occurring microbes that are known to occur in this deep groundwater source, or it could have been linked to a defect with the well heads. It is noted that this has not occurred since well head upgrades were completed in August 2018, following security assessments.
- There is no obvious correlation between the manganese levels and the total coliforms levels.
- There had been issues with the performance of the Woodend filter over recent years, as evidenced by the higher manganese levels since approximately 2013. This has been resolved by the joining of the Woodend scheme to Pegasus, and abandoning the Woodend filter. This occurred at the end of the 2018/19 financial year, with very low manganese levels since this time.

In conclusion, while the data suggests that the total coliforms on this scheme are related to the biological manganese removal filter rather than a weakness in the security of the system, further work is proposed to better understand this. As noted earlier, staff have been working with ESR to speciate total coliforms samples after they are detected to confirm their origin.

As is common with schemes that have manganese in their source water, biofilm has built up in the pipework with the Woodend reticulation. This is managed through routine 3 monthly flushing of the pipe network to scour the pipes, as well as the improved manganese removal filter (since joining with Pegasus) to prevent the optimum environment for biofilm growth. It is however likely that there is a base level of biofilm on the pipework that is not easily removed using the methods above alone.

This biofilm needs to be considered if the emergency chlorination system is implemented. Other schemes that have had manganese that introduce chlorine often experience issues with the chlorine breaking down the manganese, which can cause issues to consumers receiving discoloured water (recent examples are the

Napier and Martinborough water supplies). Further consideration would need to be given to chlorine disinfection by-products in this event as well. While the emergency chlorination system is a useful tool to have available for certain events, the microbiological risk would need to outweigh the other risks that chlorine would introduce when implemented.

Pegasus

Total coliforms has been part of routine sampling for the Pegasus Scheme since the scheme's inception in 2007. 12 years of routine sampling from the source, headworks and reticulation is displayed in Figure 11. The number of samples undertake per year is displayed in Table 26.

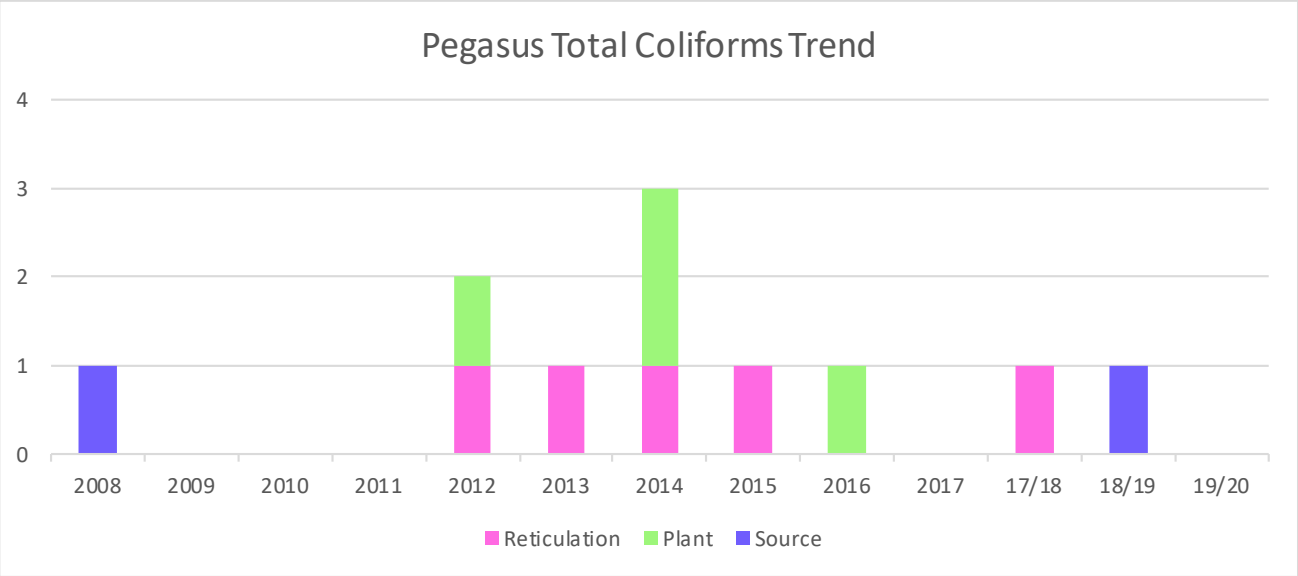

Figure 11: Total Coliforms Events per Year for Pegasus Headworks, Reticulation and Source (Pegasus and Equestrian Wells) (2008 – 2019)

Table 26: Total Coliforms Trend for Pegasus Supply (2008–2019)

	Reticulation			Plant			Source		
Year	Coliforms samples	Positive Results	Percent	Coliforms samples	Positive Results	Percent	Coliforms samples	Positive Results	Percent
2008	18	0	0.00%	28	0	0.0%	10	1	10.0%
2009	14	0	0.00%	55	0	0.0%	54	0	0.0%
2010	28	0	0.00%	63	0	0.0%	56	0	0.0%
2011	16	0	0.00%	33	0	0.0%	42	0	0.0%
2012	35	1	2.90%	7	1	14.3%	35	0	0.0%
2013	60	1	1.70%	6	0	0.0%	1	0	0.0%
2014	58	1	1.70%	7	2	28.6%	1	0	0.0%
2015	58	1	1.70%	7	0	0.0%	1	0	0.0%
2016	57	0	0.00%	6	1	16.7%	18	0	0.0%
2017	27	0	0.00%	0	0	0.0%	15	0	0.0%
17/18	56	1	0.00%	0	0	0.0%	35	0	0.0%
18/19	52	0	0.00%	7	0	0.0%	57	1	1.75%
19/20	8	0	0.00%	8	0	0.0%	0	0	0.0%
Total	487	5	1.03%	227	4	1.76%	325	2	0.62%

Generally chlorine prevents total coliforms from being detected. As there were instances where total coliforms were detected on the Pegasus scheme, which is chlorinated, further analysis was undertaken to determine if chlorine was present in the water when the coliforms were detected.

Table 27: Positive Samples of Total Coliforms for Pegasus Reticulation and Distribution.

Date of Positive Sample	Chlorine Residual	Location
19/12/2012	0.08	Reticulation
06/02/2013	-	
31/01/2014	0.1	
30/11/2015	0.09	
26/10/2017	0.3	
8/11/2012	0.15	Plant
10/02/2014	0.08	
18/02/2014	0.2	
14/01/2016	N/A	PW1
10/12/2008	N/A	
9/04/2008	N/A	
20/03/2008	0.01	Reticulation
12/03/2008	0.12	Plant

Note that some of the historic WINZ data does not match the values in the table. When records were checked against the original headworks sampling sheets, these were corrected to show the true value in the table above.

Analysis of Total Coliform Results:

The following conclusions can be drawn from the above:

- The chlorine residual was lower than the CCP target of 0.4mg/L during each total coliform incident. It is likely that the naturally occurring microbes that are known to exist (and which are utilised as part of the biological manganese removal process) result in coliforms being present in the Pegasus supply water, but that these are only able to be detected when chlorine has been less than the target level.
- The percentage of coliforms found within Pegasus water supply is much lower than the Woodend water supply. This is likely due to the residual chlorine within the Pegasus supply.

Any total coliforms presences are reported to the Water Asset Manager and Water Operations Team Leader for further consideration. This alert is generated from an automated email from the electronic laboratory book that is used to record samples to the Water Asset email address which is monitored by the Water Asset Manager and Water Operations Team Leader

2.2.4. Iron and Manganese

Iron and manganese is present in the source water of all the source wells for the Woodend Pegasus water supply at varying levels. The levels are generally similar to the guideline value within the DWSNZ, but less than the MAV. This means that manganese and iron need to be managed in order to avoid potential aesthetic issues such as staining of laundry, or taste issues.

The raw water manganese and iron levels from the most recent full chemical tests are summarised below, as well as the average treated water levels.

Table 28: Manganese and Iron Concentrations

	Manganese (mg/L)	Iron (mg/L)
EQ1	0.111	1.25
EQ2	0.110	1.18
EQ3	0.034	0.049
PW1	0.037	0.168
Gladstone 1	0.051	0.032
Gladstone 2	0.060	0.219
Average Raw	0.067	0.483
Average Treated (since biological filter commissioned)	0.0064	0.0035
GV	0.04 (staining) 0.10 (taste)	0.2
MAV	0.4	NA

Manganese and iron levels are sampled downstream of each filter twice per week at the Pegasus plant. The table above shows the average treated water levels, while the figure below shows the filter performance over time. As is demonstrated, the Filter has generally achieved very good removal rates of both manganese and iron.

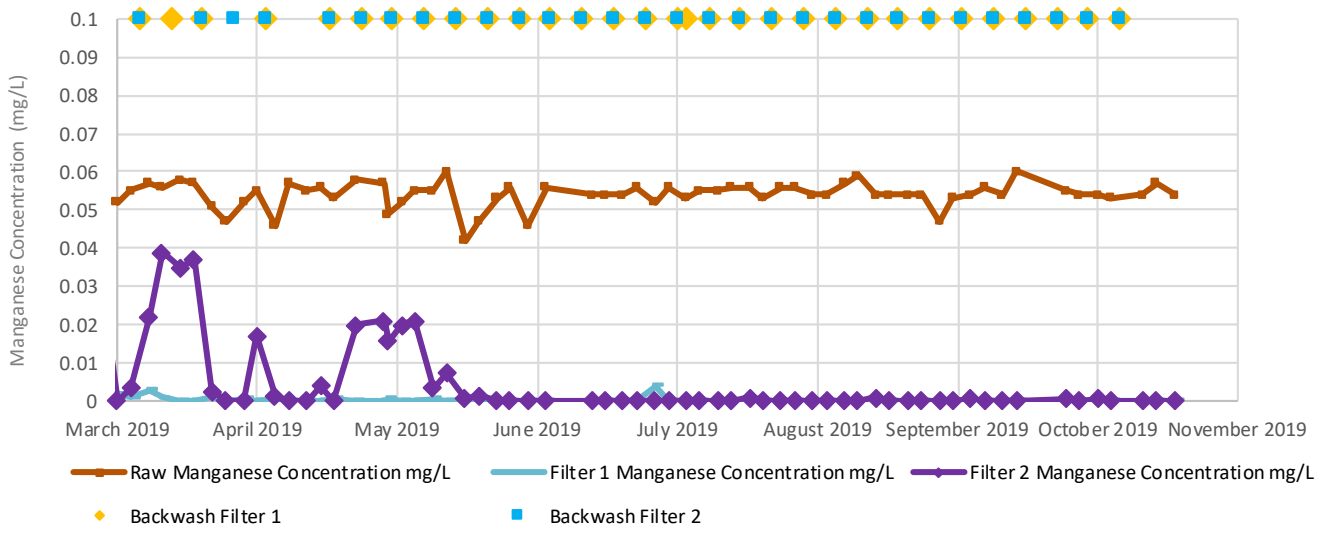

Figure 12: Filter Performance at the Pegasus Headworks.

2.2.5. Priority 2 Determinands

There are no Priority 2 determinands assigned to the Woodend Pegasus scheme.

2.2.6. Plumbosolvency

Certain water supplies have a risk of being plumbosolvent. The definition of plumbosolvent water is water that is able to dissolve lead easily. Water that has low pH and alkalinity tends to be slightly corrosive and therefore plumbosolvent. However testing for this characteristic is not an exact science.

The principal risk with plumbosolvent water is that metals from pipe fittings can be dissolved into solution and can consequently be ingested by people drinking the water. The health risks from drinking plumbosolvent water are relatively low as very small quantities are ingested and any health effects are chronic, rather than acute. Therefore many years of consumption of plumbosolvent water is required before the risk of adverse health effects are substantially increased.

Council complies with the requirements of the Drinking Water Standards for plumbosolvency by advertising twice per year advising customers to flush the first 500ml of water before taking water for drinking purposes. Adverts are district wide and do not distinguish between water supplies.

2.2.7. Chemical Testing of Raw Water

Chemical testing has historically been carried out every 5 years, as per the requirements of the DWSNZ. From 2019 onwards chemical analysis will be carried out annually, rather than 5-yearly to give a better understanding of any changes that may occur over time. The latest test results for the sources are displayed in Appendix D.

2.2.8. pH

The raw water quality test for the scheme shows pH in the guideline range. Most waters with a low pH have a high plumbosolvency, so with these values consistently above 7, the risk is deemed to be low. Regardless, consumers within this supply are informed twice yearly regarding their plumbosolvent water as part of advice given across the district.

Table 29: pH Analysis Results

Location	Sampling Type	Min	Max	Average	GV
Pegasus	Operator Checks	7.24	8.14	7.8	7.0 - 8.5
	Routine Sampling	7.65	7.93	7.83	

pH testing has been undertaken as part of routine sample monitoring since 2002 for Woodend and 2008 for Pegasus. A summary of the pH results within the source, zone and plant is illustrated on Figure 13.

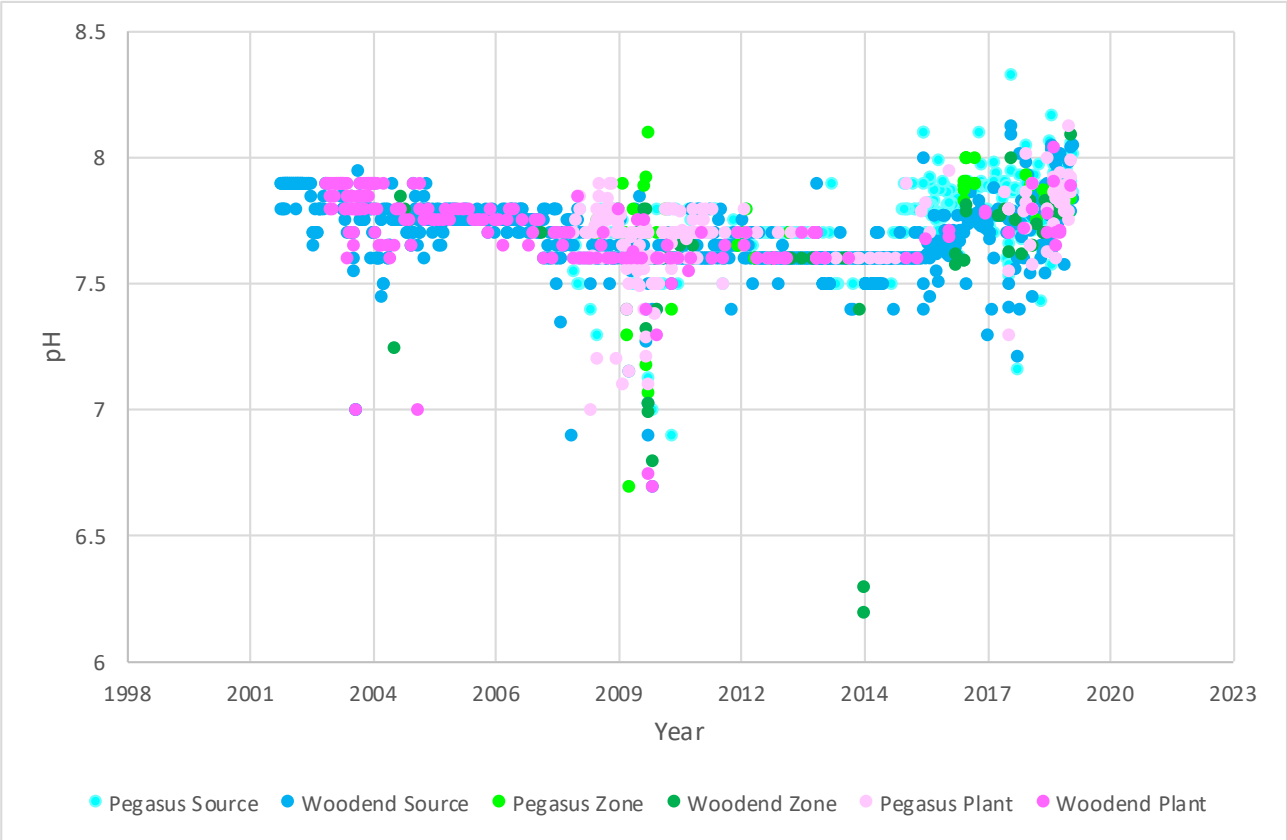

Figure 13: Routine Sample Monitoring for pH of the Woodend and Pegasus source, distribution zone and headworks

The above figure shows no distinct changes in pH for the source, plant or reticulation water, and values consistently within the guideline range.

2.2.9. Turbidity

Turbidity has historically been analysed by handheld meter as part of E. coli sampling undertaken on the scheme, and by plant operators during weekly operational checks on the plant.

The table below shows the results from turbidity samples taken by operators using their handheld instrument at the plant, as part of the plant operation. This shows the median results all less than 1 NTU, and the maximum below the guideline value, with the exception of one Woodend plant sample in 2004.

Table 30: Turbidity Analysis Results (2002 – August 2019)

Location	Sampling Type	Min	Max	Median	GV
Pegasus Source	Routine Sampling WINZ + DWO	0.01	1.5	0.2	<5 NTU
Woodend Source	Routine Sampling WINZ + DWO	0.1	4	0.3	
Pegasus Woodend Combined	Routine Sampling WINZ + DWO	0.01	4	0.25	
Pegasus Plant (Post Treatment)	Operator Check (25/01/19 – 21/10/19)	0.09	0.36	0.19	
	Routine Sampling WINZ + DWO	0.01	2.88	0.18	
Woodend Plant	Routine Sampling WINZ + DWO	0.09	6.2	0.3	
Pegasus Retic	Routine Sampling WINZ + DWO	0	3.6	0.1	
Woodend Retic	Routine Sampling WINZ + DWO	0.02	2.18	0.3	

Turbidity is also monitored as part of E. coli sampling undertaken on the scheme, with data available for this back to 2002 for Woodend, and 2007 for Pegasus. These results are displayed in Figure 14. The vast majority of the results are shown to be below 1 NTU. Some exceptions are seen particularly with raw water samples recently. This is a function of wells being run for monthly sampling that may not have run frequently over the preceding month which can result in moderate turbidity for a short period upon start-up. The results do however show no noticeable change in turbidity from the plant to the reticulation, with median results from the plants and reticulation zones in the range of 0.1 – 0.3 NTU.

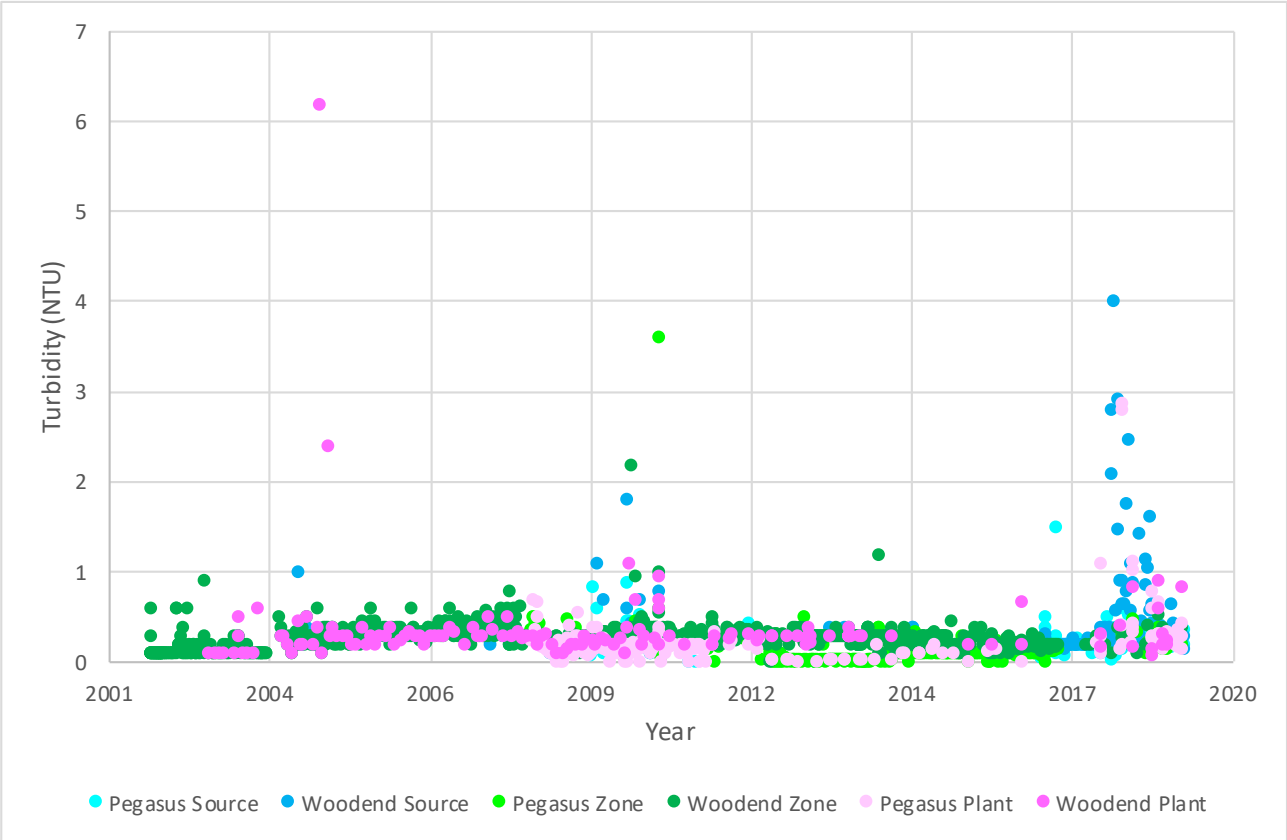

Figure 14: Routine Sample Monitoring for Turbidity of the Woodend and Pegasus sources, reticulation networks and headworks.

2.2.10. Free Available Chlorine FAC (Pegasus Only)

Operator checks for FAC are undertaken for the water leaving to the Pegasus treatment plant to supply the Pegasus distribution to ensure DWSNZ targets are met.

Table 31: FAC Analysis Results

Headworks Location	Sampling Type	Min	Max	Average	GV	MAV
Pegasus Post Treatment	Operator Checks	0	1.53	0.396	<0.6 – 1.0	5
Pegasus Post Reservoir	Operator Checks	0.31	0.7	0.453		

2.2.11. Water Quality Incidents

Seven positive samples of E.coli was recorded for the Woodend scheme from 2012 to 2014. A number of actions were undertaken during this time period in response to the transgression including, investigations, flushing, increased sampling and issuing a boil water notice. While the transgressions were initially discovered in the reticulation, investigations found the issue was linked to the reservoirs and filter and remedial works were undertaken to rectify this in 2014. Following remedial works, no further positive results have been received for the Woodend Reticulation. Refer to the 2014 transgression report (TRIM 140403034173) for more information.

2.3. Hazard, Hazardous Event Identification and Risk Assessment

2.3.1. Overview

WDC identifies hazards and evaluates risks within each water supply scheme through a risk assessment process. The process involves a team (Asset Manager, Engineer and Operational staff) assessing hazards and risks relevant to the scheme and using qualitative descriptors to access the likelihood and consequence. The purpose of the assessment is to highlight and document risks and define actions and responses to eliminate, reduce or manage risks with a view to improving resilience of the supply and ensuring compliance with DWSNZ. The key steps undertaken during the assessment process are identified in Table 32.

Table 32: Risk assessment process for drinking-water safety.

Step	Process
Step 1	Identify guidelines applicable as per Table 65.
Step 2	Present guideline in a table format as per Appendix E
Step 3	Identify risk events which are applicable to the scheme (preliminary risk screening).
Step 4	Analyse key risks in more detail that are identified in Step 3, by assessing likelihood and consequence taking into account preventative measures.
Step 5	Determine acceptability of risks
Step 6	Risk identified as unacceptable are prioritised and further analysed within section 3.1 (additional preventative measures assigned).

The Pegasus WSP had been approved recently (December 2018), when it was a standalone scheme. Given this was a relatively recent document, the risk assessment from this WSP was used as a starting point, but updated with information pertaining to the Woodend supply which is now joined to Pegasus.

2.3.2. Preliminary Screening Results

Following the preliminary screening, 17 hazards were referred for a more detailed risk assessment. This included 5 at the source, 6 at the plant, and 6 in the reticulation. This more detailed analysis involved assigning a consequence, likelihood and overall risk to each of the hazard types to determine a final risk score. The results of this initial screening, and follow up risk assessment are included within Appendix E.

The hazard types that were not escalated as part of the preliminary screening were deemed to be low risk events, for the reasons provided in the justification column of this initial screening document.

2.3.3. Risk Assessment Methodology

In order to undertake the risk assessment, definitions of the following were required:

- Likelihood
- Consequence
- Qualitative Risk Analysis Matrix (to convert Likelihood and Consequence into a Risk score)
- Acceptability Definitions

These definitions were generally derived from the WSP Handbook, with some modifications. The following key assumptions were made in the methodology followed in terms of the overall approach to the risk assessment.

The consequence of a microbiological event as a minimum was deemed to be either major or catastrophic in all cases as part of the risk assessment process. In reality, the consequence of a microbiological event could

be anywhere from minor to catastrophic. For example if a transient event occurs where a single colony forming unit of E. coli enters a submain within the reticulation and passes through the system without being consumed by anyone, there would be little impact on any of the population, and it would be an isolated exceedance of a MAV, thus fitting the criteria of either an insignificant or minor event. At the other end of the scale, if microbiological contaminants are distributed at high concentrations from the source, without treatment and distributed to the entire population for an extended period of time, the impact would almost certainly meet the definition of a catastrophic event.

The range of possible consequences for a given event type is evidenced in the paper 'Water contamination events in UK drinking-water supply systems' (Journal of Water and Health, 2008). In this paper 467 microbiological contamination events are referenced between 1990 and 2005, as well as a similar number of chemical events, yet it is concluded that 'few have resulted in significant adverse health effects'. This demonstrates that an event of a certain nature can have a range of consequences, depending on the scale and specific details of the event.

Similarly, the Australian Drinking Water Guidelines (2011) states, "in some cases variations of the same type of event can appear at both ends of the spectrum". An example given is "loss of disinfectant residual in the distribution system can have distinctly different meanings. A slight reduction or a loss in parts of a system may be fairly common and have limited health consequences; a total loss of disinfection should be rare but could have potentially severe consequences". While the specific example of loss of disinfectant residual is not relevant in all cases, this again demonstrates the potential range in consequence for a given event type.

The above examples are not to say that microbiological or chemical contamination events cannot lead to serious outcomes, as there are a large number of examples worldwide where they have. Rather, the scale of the event being considered must be determined and considered when assigning a frequency. Generally, the more significant scale of event being considered, the lower the frequency will be (or alternatively, the lower consequence version of the event being considered, the greater the frequency would generally be).

Taking into account the above, there are three potential options for the nature of the hazardous events to consider when assigning consequence and likelihood scores. These are:

1. Assess each event under the lowest conceivable consequence that may result from that event occurring. This would underestimate all events, and would not present a realistic description of the risks on a scheme. This approach was therefore not followed.

2. Assess each event under the most likely consequence to eventuate from the hazard occurring (ie consider what the impact to the population would be in the most common foreseeable case of that event occurring). This would lead to generally the consequence being more severe than the first option, however it may mean that the worst case scenarios are not considered as they may be considered unlikely to eventuate to a certain scale of consequence.

3. Assess each event under the most significant conceivable consequence that could eventuate from the hazard occurring. As worst case eventualities are being considered, this means that the frequency of these events may be less than the frequency of events under one of the first two options. For example the likelihood of an event occurring with moderate consequence may be higher than the assessed likelihood of the same event occurring to a scale and/or duration sufficient to cause either a major or catastrophic consequence.

Of the three possible approaches, the third option above has been followed for the purpose of undertaking the risk assessment, which is consistent with the approach of assuming all microbiological events are either major or catastrophic, as per the Handbook for Preparing a Water Safety Plan (2019).

The following tables summarise the definitions assigned to likelihood, consequence, the risk matrix, and the acceptability of the final risk score.

Table 33: WDC qualitative descriptors of likelihood for drinking-water safety assessment.

Likelihood	Description
Almost certain	Occurs more often than once per week
Likely	Occurs more often than once per month and up to once per week
Possible	Occurs more often than once per year and up to once per month
Unlikely	Occurs more often than once every five years and up to once per year
Rare	Occurs less than or equal to once every five years
Very Rare	Occurs less than or equal to once every 20 years

Table 34: Amended WSP handbook qualitative descriptors of consequence for drinking-water safety assessment.

Consequence	Description
Catastrophic	Major impact on most of the population, complete failure of systems, requirement for high level of monitoring and incident management. Potential acute harm to people, declared outbreak or widespread illness and possible deaths expected. For a consequence of this scale to occur, the event would need to involve the contaminant affecting a large number of people, for a reasonable duration of time (in order for a large number of people to consume the contaminant at the required dose to be affected), and would be most commonly attributed to events at or close to the source or plant, that are more than transient in nature.
Major	Major impact on a sub-population, significant compromise of systems and abnormal operation, requirement for high level of monitoring and incident management. Potential acute harm to people, declared outbreak or widespread illness expected. In order for only a sub-population to be affected, this is more likely to be attributed to the contaminant either entering the system in such a way that only a proportion of the population has the opportunity to be affected (ie in the distribution system), or the contaminant could only be introduced temporarily and be transient in nature, rather than event types in which the contaminant is introduced over a period of time.
Moderate	Minor impact on most of the population, significant (but manageable) disruption to normal operation, requirement for increased monitoring. Potential widespread aesthetic issues, or repeated breach of maximum acceptable value (MAV).
Minor	Minor impact on a sub-population, some manageable disruption to normal operation. Potential local aesthetic issues, isolated exceedance of MAV.
Insignificant	Insignificant impact, little disruption to normal operation. Isolated exceedance of aesthetic parameter.

Table 35: WDC qualitative risk analysis matrix for drinking-water safety assessment.

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

Table 36: Acceptability matrix for drinking-water safety assessment.

Risk level	Acceptability	Management Actions
Low	Acceptable	Manage within existing processes, adopting continuous improvement. Further improvements still should be considered on a case by case basis to lower risk level further if warranted.
Medium	Acceptable for chemical	Implement short-term measures, and plan and implement longer-term risk reduction measures within x-year timeframe.
	Unacceptable for microbial risk	Implement short-term measures, and investigate measures to reduce level of uncertainty as soon as possible
High	Unacceptable	Implement short-term measures immediately, and prioritise longer-term risk reduction measures.
	Unacceptable	Implement short-term measures immediately, and investigate measures to reduce level of uncertainty as soon as possible.
Extreme	Unacceptable	Implement short-term measures immediately, put emergency plans on stand-by and give longer-term risk reduction measures top priority.
	Unacceptable	Implement short-term measures immediately, put emergency plans on stand-by and immediately investigate measures to reduce level of uncertainty.

2.3.4. Risk Analysis Results

The full risk analysis results are contained within Appendix E. The key results are summarised below:

- There were no risks deemed to be extreme.
- There were no risks deemed to be high.
- There were 2 risks deemed to be medium. These have resulted in additional preventative measures in Section 3.2
- There were 121 risks deemed to be Low. This includes taking the 'No's' from the initial screening as 'Low' risk events. Some preventative measures have still been included for low risk items, as a low risk score is not the sole measure of whether additional actions should be considered.

It is noted that the one medium risk event (excessive formation of chlorine by-products) is not a risk the scheme is routinely exposed to during normal operation, as this risk would only eventuate when emergency chlorine was in use. This risk would have to be weighed up by the microbiological risk that causes the emergency chlorination to be considered for a given event type.

3. Existing Preventive Measures for Drinking-Water Quality Management

3.1. Assessment of Existing Preventive Measures and Multiple Barriers

The scheme has four barriers to contamination in place. These have been visually displayed in the flow diagram and also shown in Table 37.

Table 37: Barriers to Contamination

	Barriers		Preventative Measures	Status
Source	1	Protect the raw water source from contamination	• Contaminating actives regulated by resource consents. • Awareness of catchment from analysis of consents and known activities and land use types. This awareness will be improved through the CDWPZ redefinition. • Confined aquifer (mitigates risk of surface contaminates). • Caged well head, exclusion zone & check valve on transmission line. • Historic raw water sampling has not shown E.coli. • Cryptosporidium monitoring has not shown protozoa to exist in the source.	Effective
Treatment	2	Remove particles/chemical determinants from the water	• Natural filtration within aquifer (raw water quality <1 NTU >99% of the time), verified by good track record of source wells. • Sand filter at treatment plant.	Effective
	3	Inactivation or disinfection of protozoa and bacteria.	• Natural treatment of microbiological contaminants, both in terms of filtration provided through aquifer, and age of water significantly exceeding minimum requirements. • Chlorination of Pegasus supply • Emergency stand-by chlorination system in place for Woodend	Effective
Distribution	4	Prevention of recontamination after treatment	• Storage reservoirs covered and secured against entry of contaminants. • Backflow prevention being implemented through the reticulation in line with Council's Backflow Prevention Policy. Inspections and testing of backflow prevention devices is being implemented. • Water Unit (operations/reticulation) staff appropriately trained to maintain integrity of distribution system. Only Water Unit staff work on the live reticulation, or provide stand-overs to other contractors who may carry out connections under their supervision. • Pro-active renewals programme based on network models, pipe materials, criticality and previous repair locations. • Total coliform analysis shows no measurable difference in incidence rate of coliforms in reticulation relative to plant. • Assets have significant amount of useful remaining life. • Flow paced chlorination provides residual disinfection for the Pegasus distribution only.	Effective

3.2. Identification of Additional Preventive Measures

Following the risk assessment, the assessment team has determined additional preventative measures to include into the improvement plan to mitigate the unacceptable risks, as well as some of the acceptable risks where there is an opportunity to reduce them further.

Table 38: Additional preventative measures to manage the risks considered unacceptable during hazard assessment.

Element	Risk	Cause	Preventative measures	Essential Checks & Records	Immediate Corrective Actions	Additional Preventative Measures / Monitoring to Improve Certainty
S.1.1.4	Source water receives discharge from landfill sites	Historic landfill sites located in proximity of source well	The CDWPZ of the Chinnerys Road Well shows that the landfill site is located within its extents. Full chemical testing has not shown the landfill to influence the groundwater Water is used as an emergency back–up only.	Check Full Chemical test. Undertake E. coli counts for water sample at headworks and within the distribution. Perform tests in accordance with QS-O920. Collect sample as per Drinking Water Online scheduler. Record results on Worksheet QS-0920-AB. Refer Appendix F Check that turbidity is <1 NTU in the water at the headworks. Perform test procedures in accordance with QS-O910-AB. Collect samples as per schedule and following significant events (e.g. earthquake). Record any customer complaints relating to water quality and loss of supply on the Service Request Database. Monitor and respond to customer complaints of discolouration and taste.	Refer Table 49 incident plan for Loss of Source Raw Water Quality	Undertake annual full chemical test of wells, rather than 5-yearly. Consider whether back-up well is required, or should be removed as an option, due to the highly unlikely nature of event in which it may be required.
S1.1.16	Source water receives discharge from waste disposal	Waste disposal down holes or bores in the same aquifer depth as well	Knowledge of the catchment and the nature of land Source protection zones Monitor consents within the surrounding area during WSP (every 5 years) Treatment provided by aquifer	See above		Use knowledge of other bores within the same aquifer Consult with Environment Canterbury about further information relating to any other wells penetrating the same aquifer.
S1.1.17	Source water receives discharge from abandoned or decommissioned wells	Abandoned or decommissioned wells which are in the same aquifer depth as wells				
S1.1.19	Source water in contact with mineral deposits	Mineral deposits in catchment	Manganese / iron removal process in place.	If manganese and iron concentrations in samples are higher than historical sample results, GV and MAV: Check that turbidity is <1 NTU in the water at the headworks. Perform test procedures in accordance with QS-O910-AB. Collect samples as per schedule and following significant events (e.g. earthquake). Record any customer complaints relating to water quality and loss of supply on the Service Request Database. Monitor and respond to customer complaints of discolouration and taste.		Continue flushing mains programme, and consider alternative methods in future such as air-jetting or ice pigging. Review backwash and air injection systems to optimise if necessary, if less than optimal results are received from filter.

Element	Risk	Cause	Preventative measures	Essential Checks & Records	Immediate Corrective Actions	Additional Preventative Measures / Monitoring to Improve Certainty
P7.1.3.1	Excessive formation of chlorination by-products.	Natural organic matter present in the water being chlorinated from the manganese and iron removal process	Consider UV Treatment	Record any customer complaints relating to water quality on the Service Request Database. Monitor and respond to customer complaints of discolouration and taste.	Refer to Table 50 incident plan for Contaminated Distribution System.	Consider installation of UV Treatment which has been shown to reduce biofilm growth further. This is budgeted by Council, but subject to confirmation of future treatment requirements in updated DWSNZ. Consider additional measures to flush mains (air injection or ice pigging) if continued routine flushing not effective at reducing biofilm over time.
D2.3.1.3	Introduction of contaminating material into the distribution system	System pressure drop	Implementation of Backflow Prevention Policy, identify low pressure areas & extremities Scheme doesn't have hills and pressure well understood by reticulation model.	Undertake E. coli counts for the water sample and within the distribution. Perform tests in accordance with QS-O920. Collect sample as per Drinking Water Online scheduler. Record results on Worksheet QS-0920-AB. Refer Appendix A.1. Check that turbidity is <1 NTU in the water at the reticulation. Perform test procedures in accordance with QS-O910-AB. Confirm overall status using operator judgement. Collect samples as per Drinking Water NZ schedule and following extreme events (e.g. earthquakes). Record results of testing on the Water Supply Log. Record any customer complaints relating to water quality and loss of supply on the Service Request Database.	Refer to Table 54 incident plan for Backflow occurs into the Reticulation System	Continue to implement Backflow Prevention Policy. Continue to test existing back flow prevention devices annually in accordance with Health Act and Backflow Prevention Policy
D2.3.1.12	Introduction of contaminating material into the distribution system	Cross connections	All new connections are required to be approved by Council and either constructed or overseen by Council's Water Unit. Backflow prevention is considered as part of each new connection, in accordance with Council's Policy. Policy is being retrospectively implemented for all pre-existing connections to mitigate this risk.			
D2.4.1.1	Water pressure in the distribution system lower than pressure in supplied premises	A pressure drop in the reticulation system	See D2.3.1.3			
D2.4.2.4	No, inadequate, faulty, or incorrectly installed backflow prevention device	No backflow prevention device installed	Backflow prevention policy in process of being implemented.	Undertake E. coli counts for the water sample within the distribution. Perform tests in accordance with QS-O920. Collect sample as per Drinking Water Online scheduler. Record results on Worksheet QS-0920-AB. Refer Appendix F. Carry out annual testing of backflow prevention devices installed, in accordance with Backflow Prevention Policy and Health Act requirements.	If location is known, install backflow prevention device. If contamination event occurs, refer to Table 54 Backflow occurs into the Reticulation System	

4. Operational Procedures

This scheme is operated by the WDC in-house contractor the Water Unit in accordance with the Service Level Agreement. Scheme performance information is relayed to the Water Asset Manager (WAM) / Water Operations Team Leader (WOTL) via a number of different mechanisms. Some of these methods are for the purpose of longer term monitoring of data, while others are to respond to issues as they arise.

- By phone call if a critical event occurs (refer contingency plans, and Critical Control Point Plans which give guidance on this).
- By automated email for key exceedances in the water sampling data entered into the electronic log book.
- Headworks assessment data is uploaded to online reports which are available for viewing by the WAM / WOTL.
- Via monitoring of the SCADA system which alerts operators to issues who may escalate to the WOTL or WAM if necessary. Some targeted alerts are also built into the SCADA system to email the WAM / WOTL directly. The data within the SCADA system is also monitored by the Council's Control Systems Engineer who reports issues to the WOTL / WAM as they arise. Issues with the SCADA system itself are covered in the monthly SCADA report.
- Service request data is automatically linked to KPI data on the Council's intranet system to alert the WAM / WOTL of any increases in complaints or issues that may trigger a failure of a KPI. These KPIs are also reviewed periodically by the Council's Management Team, and feed into the Annual Report. Changes in service request patterns may indicate an issue with a water supply system.
- Water demand data is linked to the Council's intranet page on a district wide basis. If demand patterns change in order for the KPI for reasonable water use to fail, this would trigger an investigation.
- The Network Planning Team analysis night flow data annually to assess leakage and assign an ILI value to each scheme. This data is passed on to the WAM and any increasing trends in leakage investigated further, as well as reported to the Council's Utilities and Roading Committee.
- There are monthly meetings between the Water Unit staff and the WOTL to relay other operational issues that may have arisen that staff have not become aware of through the other mechanisms above.

In addition to the above, a new Asset Management Information System (AMIS) is currently being implemented. This will allow for key information about assets, faults, performance to be better tracked to assist with decision making going forward. This is due to be operational in early 2020.

4.1. Operational Procedures

4.1.1. Service Level Agreement

The Water Unit / 3 Waters Service Level Agreement (SLA) is an operations and maintenance contract which is currently being finalised. The purpose of this SLA is to clarify the requirements of the Water Unit, 3 Waters Team and other relevant parties with regard to the provision of 3 waters services that are the responsibility of WDC. The purpose of the SLA is to define the scope of maintenance required for all 3 water assets including drinking-water. The SLA cover all operation and maintenance of the community water supply, wastewater disposal and drainage pumping stations.

The scope of works incorporated within the SLA includes:

Table 39: Operational procedures as part of the Water Unit SLA.

Scope of Work	Description
Planned Works	Are programmed operations and maintenance of the water supply intakes/wells, headworks, pumping stations, backflow preventers and wastewater treatment plants; pumps and pump stations; and reticulation.
Reactive Works	Are unforeseen works required to respond to identified issues impacting public or operator health, safety, service delivery or environmental standards, usually reported through service requests, SCADA alarms or consent monitoring.
Instructed Works	Works required to address issues identified during the planned works (including all programmed operations and maintenance) that do not require immediate attention (i.e. that do not trigger immediate reactive works, but may instead first go into a triage system). These are also known as "out of scope" works.
Emergency Works	Works required to plan for or respond to natural events occurring outside of the usual work programme. They may require a coordinated and prioritised response across multiple agencies.

4.1.2. Operation and Maintenance Manual

Each WDC water supply site holds an operation and maintenance manual on site for operators to refer to.

This manual is also electronically available in Council's digital records database (TRIM 150525082222).

4.1.3. Quality Assurance System

Quality control is defined in the Water Unit Standard Operating Procedures Manual. The procedures documented in the quality management system ensure that controls are in place to ensure that in the field and laboratory agreed standards are met and comply with ISO 9000. Quality improvement is assured through monitoring current documented processes and investigation of any non-compliance. Table 40 details the key subject areas covered by the manual.

Table 40: Water Unit Operating Procedures Manual Sections

Section	Reference	Responsible Person
Management	QS-O001	WU Manager
Administration	QS-O030	
Staff Training	QS-O100	
Maintenance – General	QS-O440	
Maintenance – Water	QS-O450	
Operation	QS-O700	
Laboratory	QS-O900	

4.1.4. Operational Procedures

The requirements to operate and maintain the scheme are documented within the 3 Waters / Water Unit SLA document.

The current Standard Operating Procedures relate to the key water treatment operating procedures to ensure the satisfactory performance of the water supply system are detailed in Table 41.

Table 41: Water Unit Operational Procedures for Water Treatment

Section	Reference	Description
Grounds Maintenance	QS-O705	Standard Maintenance
Submersible pump maintenance	QS-O706	Maintenance of Well Pumps
Notifications – Public and Internal	QS-O708	Standard Notifications
Water Quality Monitoring and Reporting	QS-O710	Non-routine mechanical & electrical work carried out by operators and external contractors
pH Adjustment	QS-O711	Treatment
Chlorine Disinfection	QS-O712	Treatment
Water Pump Stations – Operation and Maintenance	QS-O714	Operation and Maintenance
Well and Intake Protection	QS-O715	Maintenance
Pipe Line Flushing	QS-O7124	Maintenance
Supervision Control & Data Acquisition (SCADA)	QS-O780	SCADA Operating Procedures

4.1.5. Process Mapping

All relevant Water Unit operating procedures are readily available to all staff members online on the Promapp system. Procedures including pipeline repairs, installations, inspections, testing, connections, flushing amongst others are available within this database to readily available standard operating procedures to any staff member.

Refer to attached Appendix K for an example of the processes for pipeline repairs. Note this is provided as an example only for this WSP and operators should use the latest version within Promapp for any required repairs.

4.1.6. Training Record

This supply has one main operator, Bevan Stack who works under the Technicians Team Leader (Darryn Williams) who oversees the system. Four other staff members are capable of performing this role if required. All operators hold a National Certificate in Water Treatment (Site Operator), or are working towards this. Refer to Table 42 for the list of operations staff their relevant training.

Table 42: Operator Staff Training.

Staff	Scheme Responsibility	Water Treatment Level
Darryn Williams	Team Leader overseeing main operator.	L4
Bevan Stack	Main Operator	Training towards L4
Josh Palmer	Backup Operator	Training towards L4
Kirk Hindmarsh	Backup Operator	Training towards L4
Les Clarke	Backup Operator	Grade B Water and Wastewater Operator
Daniel Burt	Emergency Backup Operator	L4

4.2. Operational Monitoring and Inspection

4.2.1. Water Supply Log

Routine monitoring visits are carried out at the water supply headworks site in accordance with the WDC Water Unit SLA. Results and observations from the visits are recorded on tablets and the Water Supply Log when required. All information is maintained in the TechOne asset management system, or the Council's record database (referred to as TRIM). SCADA results are managed by the Council's Control Systems Engineer and is stored in Councils database. Alarms are generated from the SCADA system that go to the duty operator to respond to and resolve or escalate as necessary.

Since September 2018, the Water Unit have been transitioning towards undertaking water supply logs on tablets and phones instead of the paper format. The Collector Survey 123 application allows all Water Unit staff to see the map of the district and the location of all three waters facilities sites. Sites that are due to be inspected show as red, and ones that have been inspected show as green. This improves transparency, and allows the operators to know which site has been visited in that week, and which site still require visiting.

4.2.2. Operational Log

A log of all non-routine mechanical & electrical work carried out by operators and external contractors and has been held on site. The log is intended to provide a complete record of faults and changes to how the supply is operated.

There are monthly meetings with supplies operators and periodic site visits to ensure that the activities recorded on the Operational Log are communicated to the Water Operations Team Leader.

4.2.3. Sample monitoring requirements

Compliance monitoring is carried out at the headworks and reticulation as per the sampling schedule which is based on DWSNZ requirements. Water Unit laboratory began enumeration samples from the 1st March 2019, in line with the DWSNZ requirements. Results of treated water sampling for E. coli, total coliforms, turbidity, FAC and pH are reported on the Drinking Water Online database.

Table 43 provides a schedule of checks carried out during the routine monitoring visits and SCADA Monitoring Results for the scheme.

Table 43: Monitoring, Inspections/ Observations Schedule for the scheme

	Parameter	Manual Monitoring Frequency	Alarmed
OPERATOR CHECKS	Water volume (m^3)	Weekly	
	Power usage (kWh)	Weekly	
	Pressure pump hours	Weekly	
	pH	Weekly	
	Turbidity	Weekly	
	FAC	Weekly	
	Manganese and Iron	Weekly	
	Generator Run	Monthly	
	Well Head Check	Monthly	
	pH Meter Calibration	In response to discrepancy between handheld and unit	
	Turbidity Meter Calibration	In response to discrepancy between handheld and unit, or monthly.	
SCADA	Mains Pressure	Continuous	Yes
	Outflow	Continuous	Yes
	Reservoir Level	Continuous	Yes
	Reservoir Outflow	Continuous	Yes
	FAC	Continuous	Yes
	Turbidity	Continuous	Yes
	pH	Continuous	No
	Power Supply	Continuous	Yes
DWO SAMPLING	E.coli	Weekly Reticulation Monthly Plant and Source	
	Total Coliforms		
	Turbidity		
	pH		
	Chlorine		

Exceedance procedures are as per the Critical Control Point Plans, and Contingency Plans included within this document. All critical events are alarmed, ensuring that operators are alerted immediately so that they can either resolve or escalate as necessary.

4.2.4. Sampling Locations

The sampling locations for the supply and frequency of sampling has been listed Table 44. These frequencies are based on DWSNZ requirements. In addition to minimum requirements of plant and distribution zone samples, raw source water samples are taken weekly as well to maintain a good understanding of the source water quality.

Table 44: Sampling Point Locations

Sampling Point Type	Location	Frequency
Raw Water (Primary Wells)	Pegasus Headworks Building	Monthly
Raw Water (Chinnerys Road Well)	Chinnerys Road Headworks	Annual Full Chemical, plus E. coli sampling initiated if required to be used.
Treated Water (Primary Sources)	Pegasus Headworks Building	Monthly
Treated Water (Chinnerys Road)	Chinnerys Road Headworks	Monthly
Distribution sampling points	Blackadder Road, Pegasus	Weekly (alternating with other distribution zone point)
	Rapaki Street, Pegasus	
	The Church, Woodend	
	Judsons Road, Woodend	
	Gladstone Road, Woodend	

4.2.5. Sampling equipment

The equipment used to conduct the water analysis for pH, turbidity, chlorine (where applicable) and UVT are listed below. There are DWSNZ 2005 (Revised 2018) requirements to have the equipment standardised for measurement of pH and turbidity as per manufacturer's specifications. These tests are carried out using handheld meters by the Water Unit operators. The hand held equipment is validated / calibrated periodically, and used to verify the online meters at the station.

Table 45: Water Chemistry Handheld Test Equipment for validation

Test	Device
pH	Hach HQ11d
Turbidity	Hach/Thermo Fisher Turbidity Meter
Chlorine	Hach Pocket Colorimeter 2
UVT	TBC

4.2.6. E. coli & Coliforms Testing

E. coli and total coliform enumerated tests are carried out at the WDC Water Unit Marsh Road Laboratory. The Laboratory is accredited (No. 827) to perform enumerated tests by International Accreditation New Zealand (IANZ). As part of maintaining accreditation IANZ conduct an annual external audit of equipment, records and processes. IANZ has adopted NZS ISO/IEC 17025:2018 as the general criteria for testing and

calibrating laboratory accreditation. This international standard specifies the general requirements for the competence to carry out tests and/or calibrations, including sampling. It covers testing and calibration performed using standard methods, non-standard methods, and laboratory-developed methods. Testing and calibration laboratories that comply with this International Standard also operate in accordance with ISO9001.

Table 46 lists the operators with Approved Signatory status in the field of drinking water testing by demonstrating the defined technical and professional standards to IANZ. The signatories are approved to sign reports endorsed in the name of IANZ.

Table 46: IANZ Approved Signatories

Approved Signatory
Darryn Williams
Susan Dalzell
Daniel Burt

In addition to the above, the Water Unit laboratory is a participant in the Global Proficiency Programme (No. 11062). Every two months a spiked sample is sent, analysed for E. coli and total coliforms via enumeration @MPN/100ml +/-.

4.2.7. Staff Training

A competency record is being developed at the Water Unit to document staff training of site specific equipment and monitoring requirements at all stations. The intent of the competency record is to refresh operators of the site every 6 months to ensure their competency to operate the site. The record is to be valid for 6 months when another refresher is required of that particular station.

List of staff and qualifications is referenced in Table 4.

4.3. Critical Control Points

A Critical Control Point (CCP) is an active barrier to contamination. It is required to have a continual monitoring of its performance if there is an issue with the control procedure. Chlorine disinfection for Pegasus (and if in operation at Woodend) are identified as critical control points for this water supply.

A Critical Control Point Plan has been developed and attached in Appendix G**.** These plans are displayed at the Pegasus and Woodend headworks sites.

4.4. Corrective Actions

Corrective actions are required for when the performance criteria are outside the target range set in the CCP document. The CCP documents a list of required adjustments and checks for the operators to undertake. Each corrective action is reviewed at the time of this WSP to determine the need for the corrective action.

Four incidents have been recorded where the target valve has been greater than the critical limits. These have been stated in Section 2.2.

As part of site specific competency testing, operations staff will be required to read and understand the CCP document within each site.

5. Verification Monitoring Programme

5.1. Drinking-Water Quality Monitoring

The Woodend Pegasus water supply serves a population of 7,325 people and the monitoring requirements are expected to change with the 50 year predicted growth of 208%.

Table 47 shows a list of sample results taken at the Pegasus Headworks.

Table 47: Manual Sampling Requirements

Parameter	Manual Monitoring Frequency	Undertaken By	MAV	Location
Chemical Determinands	Previously 5 yearly, now annually going forward	Eurofins	Refer DWSNZ	Each primary source well
Turbidity (NTU)	Weekly by operators, and as per DWO schedule	Water Unit	< 2.5 NTU (guideline value)	Headworks
E. Coli	As per DWO schedule	Water Unit	< 1 per 100mL	Raw water, headworks and reticulation
Total Coliforms	As per DWO schedule	Water Unit	NA	Headworks and reticulation
FAC	Weekly by operators, and as per DWO schedule	Water Unit	5	Headworks and reticulation
pH	Weekly by operators, and as per DWO schedule	Water Unit	-	Headworks and reticulation

5.2. Consumer Satisfaction

The WDC offers a range of options to report issues / feedback from the community. Customers can phone, email, submit a request online, Snap Send Solve or discuss in person at one of the Council Service Centres. All feedback and complaints enter the service request database.

Each type of request gets assigned to a team within Council. For water supply related requests, the Water Unit staff are required to respond and react to operational issues. Any escalations are sent to the Water Operations Team Leader or alternatively the Water Asset Manager.

The response period for service requests varies depending on the type of query. Urgent issues are required to be attended to within 60 minutes, and resolved within 8 hours.

Key Performance Indicators (KPIs) are available online on the Council's intranet. These are monitored by the WAM / WOTL and discretions or issues investigated further. These are also monitored periodically by the Council's Management Team, and ultimately feed into the Council's Annual Report.

Figure 15 shows the trends of complaints for all drinking water supplies owned by the Waimakariri District Council which are regularly reviewed by the Water Asset Manager and periodically by the Management Team.

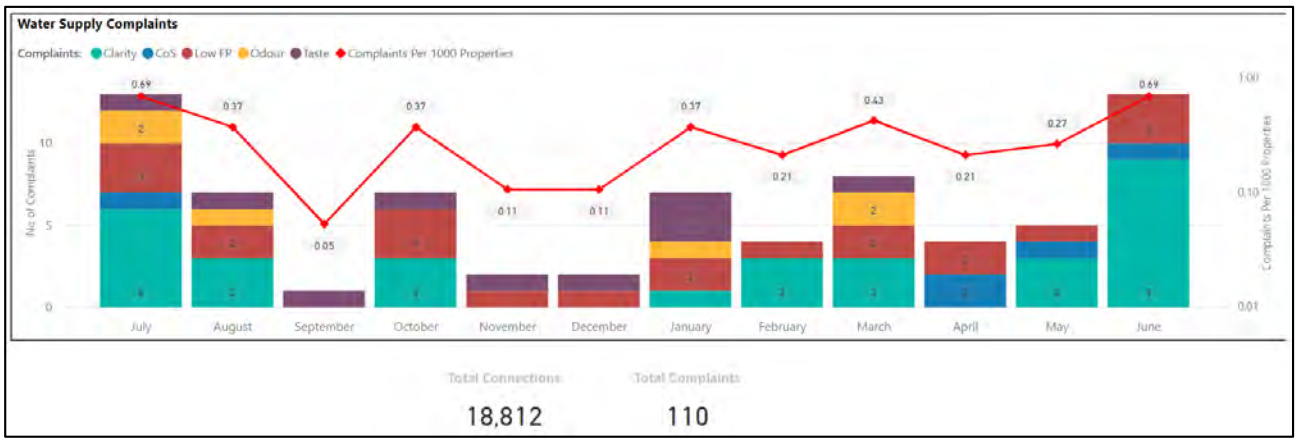

Figure 15: Total customer complains for all drinking water supplies operated by Waimakariri District.

The Service Request database has been interrogated to highlight public health related requests. Appendix I shows the No Water Supply and Water Quality service requests for the past 5 years for the water supply.

5.3. Short-Term Evaluation of Results

5.3.1. Continuous monitoring

Continuous monitoring of water quality data is reviewed through the SCADA database where any values outside the range on the CCP sends alerts to the Supply Operators to respond to, resolve or escalate as necessary. Continuously monitored parameters are described in Table 43.

5.3.2. Routine Water Quality Monitoring

The quality of the water being supplied is constantly being monitored, as detailed in Section 5.1. This is carried out both by the Laboratory Technician who undertakes sampling as required for DWSNZ bacterial compliance, as well as by operators who use handheld samples to verify the equipment being used for the online monitoring equipment.

The procedures for responding to exceedances are detailed in the relevant contingency plans (i.e. where E. coli is detected), or in the CCP where an operational parameter is outside of its target range.

For the case of total coliforms which are only a guideline value within the DWSNZ, emails are automatically generated when positive values are entered within the electronic laboratory book, so that the WOTL / WAM can investigate these issues and track any trends.

5.3.3. Full Chemical Testing

The full chemical water quality data is undertaken externally by an independent laboratory. The water quality data is emailed to laboratory staff, Asset Managers and Asset Information Management (AIM) team. The Water Operations Team Leader and Water Asset Manager are responsible for reviewing this full chemical data. Water quality results are compared against MAV and GV. Furthermore, the incident plans are referred to in order to determine an appropriate response in the event of any transgression.

6. Improvement Plan

6.1. Drinking-Water Quality Management Improvement Plan

The following table details the improvement schedule developed for this supply. While there is not a large degree of capital upgrades for this supply, the organisation is going through a process of improving documentation, systems and processes which is reflected in the improvement schedule below. A number of these items are district wide projects, which are relevant to the Woodend Pegasus water supply. The Water Asset Manager has the overall responsibility of the Improvement Plan.

Each task has been given a priority based on the following:

- Priority 1 is for tasks already committed to and underway. These are tasks that are considered an essential improvement, or where the cost is sufficiently low to allow them to proceed without requiring that a future budget be set.
- Priority 2 is for tasks committed to in a future budget. These are tasks that have been identified as being required, but not with an immediate need, or that may be dependent on an external factor before they can proceed.
- Priority 3 is for tasks where a need has been identified, but where there is currently no budgetary allowance to allow them to occur at this time (meaning that they are required to be proposed to Council as part of an Annual Plan or Long Term Plan process).

Table 48: Improvement Schedule.

Improvement	Scheduled	Estimated Cost	Priority
Continue to inform customers about plumbosolvent water	Twice annually	$100 per year	1
Chemical testing for raw water	Annually	$1,200 per year	1
Continue with implementation of the Water Conservation Programme	Ongoing	$15,000 per year	1
AMIS Project and 3 Waters / Water Unit Service Level Agreement	2020	Development included within department overhead budgets	1
Water Unit Mobility System Updates	2020	Funded from department budget	1
Carry out backflow surveys on remaining commercial properties and install backflow preventers as required.	2019/20	$55,000	1
Water Main Renewals	Ongoing	Approximately $100,000 per year	1
UV Treatment/ Installation*	2021/22	$750,000	2
Reticulation Water Quality Monitoring Equipment (Turbidity and Pressure)#	2020/21	$60,000	3

*This budget was approved by Council, but the project is subject to confirmation that it will meet the future DWSNZ, which are yet to be released. Therefore, timing may be adjusted depending on timing of new DWSNZ being released.
Included within Draft 2020 / 21 Annual Plan. Subject to Council confirmation.

7. Management of Incidents and Emergencies

7.1. Incident and Emergency Response Plan

The following incident and emergency response plans are guides for what to do if an event occurs despite the preventive measures and corrective actions in place to reduce the risk of occurrence.

Table 49: Loss of Source Raw Water Quality

Potential Indicator	• E.coli or coliforms are detected in the raw water quality test. • Widespread complaints of taste and odour from consumers. • Knowledge of sabotage or vandalism. • Damage or wear and tear. • Continuous high turbidity.
Required Actions	• Notify the DWA*, and in consultation consider next steps. • Follow the actions given in Figure 4.1 of the DWSNZ. • Consider whether there is any possibility that distribution is contaminated (Refer Table 50 for any untreated distribution zone affected, or if treatment not has not been effective for usually treated zones). • Investigate reasons for loss of quality and rectify if possible. • Consider whether to cease abstraction and switch to an alternative source of potable water (ie take well offline and utilise alternative primary well available) until water of acceptable quality can be again supplied. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

*E.coli / widespread illness will require immediate notification. Other indicators may require further investigation and assessment prior to notification. Contact details for incident and emergencies are displayed in Table 62.

Table 50: Contaminated Distribution System.

Potential Indicator	• E. coli or coliforms are detected in the distribution system. • Widespread complaints of taste and odour from consumers. • Widespread levels of illness in the community. • Turbidity fluctuations and levels greater than that in water leaving the treatment plant.
Required Actions	• Notify the DWA*, and in consultation consider next steps. • Follow the actions given in Figure 4.2 of the DWSNZ. Refer Appendix F for extract. • Flush distribution system. • If contamination found in one distribution zone, test the other zone, the reservoirs and filters to locate of the source of contamination. Identify the reason for the failure and rectify. • Consider chlorine dosing (refer Table 57). • Consider need for Boil Water Notice. If required refer Table 55. • Record cause of system failure and steps taken to correct. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

*E.coli / widespread illness will require immediate notification. Other indicators may require further investigation and assessment prior to notification. Contact details for incident and emergencies are displayed in Table 62.

Table 51: Back-up Supply Operation.

Potential Indicator / Cause	• Loss of supply of all primary wells or headworks • Multiple mains breaks in delivery main to Chinnerys Road Headworks that are not able to be repaired

Required Actions	• Notify the DWA*, and in consultation consider next steps.
	• Investigate reasons for loss of supply / loss of water quality. If backup well is required due to:
	  • Loss of Supply or Reduction in capacity at Pegasus Headworks.
	  - Lower pressure in distribution and implement other demand management strategies as required
	  - Investigate reasons for loss of supply
	  • Increased Demand at Pegasus Headworks
	  - Advise customers to conserve water
	  - Lower pressure in distribution network
	• If the primary sources cannot be treated in the short term or if issues cannot be rectified, consider starting up Chinnerys Road Well:
	Step 1 – Communication
	• Correspondence with DWA
	• Review most recent water quality data, consider need to issue Boil Water Notice / Do Not Drink Water Notice. If required refer Table 55.
	• Communicate with residents
	Step 2 – Start-up, Flushing & Monitoring
	• Isolate valve from Chinnerys Road Headworks to the reservoir. Monitor reservoir levels.
	• Turn on the power to the headworks (pump will be locked out, follow procedure for removing lock-out).
	• Prepare emergency chlorination system for use with backup well.
	• Confirm communications are functioning.
	• Flush the well via a hydrant to waste.
	• Open valve to Chinnerys Road Headworks and isolate valve connection from Pegasus.
	• Turn on surface pumps.
	• Allow water to flush to waste.
	• Check turbidity and water quality. Thoroughly check if appropriate prior to proceeding with step 3.
	• Take E.coli / total coliforms sample of the water. If possible, wait for results prior to proceeding to step 3. If sample shows E. coli is present in source, consult with DWA regarding next steps.
	Step 3 – Flow to Reticulation
	• Open the valves to allow the flow of water into Chinnerys Road Headworks
	• Close the Pegasus Headworks valves (if required).
	• Monitor system and maintain as required.
	• If long term continuous use is required, consider additional treatment options.
	• Ensure testing is undertaken when the well is in use. The minimum requirements shall be as per the DWSNZ (twice weekly), but consider more frequently during initial period.
	• Modify WSP if necessary.

Responsibility	Water Asset Manager / 3 Waters Manager

*E.coli / widespread illness will require immediate notification. Other indicators may require further investigation and assessment prior to notification. Contact details for incident and emergencies are displayed in Table 62.

Table 52: FAC Concentration below Target Level (Pegasus during normal operation and Woodend during emergency operation)

Potential Indicator	• A detectable chlorine residual cannot be obtained in the water leaving the treatment plant or in the reticulation. • E. coli or total coliforms are detected in the distribution system or post treatment sample. • Turbidity fluctuations or complaints of turbidity from consumers. • Widespread levels of illness in the community.
Required Actions	• In first instance of FAC dropping before target, refer CCP. If issues continue, consider following steps. • Notify the DWA*, and in consultation consider next steps. • Follow the actions given in Figure 4.2 of the DWSNZ. Refer Appendix F for extract. • Consider increasing chlorine doing as an interim measure. • Consider need to flush distribution system (depending on indicator). • Identify the reason for the failure and rectify. • Record cause of system failure and steps taken to correct. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

*E.coli / widespread illness will require immediate notification. Other indicators may require further investigation and assessment prior to notification. Contact details for incident and emergencies are displayed in Table 62.

Table 53: Tanker Water Supply Operation

Potential Indicator	• Loss of supply of all wells. • Water from all wells deemed unsafe. • Increased water demand, insufficient water supply of all wells.
Required Actions	• Notify the DWA, and in consultation consider next steps. • Contact Ashburton Contracting Ltd (ACL) – Geoff Haywood 03 308 4039 or 027 678 0515 which is a 24/7 number to access potable water for emergencies. Advise potable water tanker may be required. • Consider how many tanks are required. ACL have four 10,000L tankers capable of carrying potable water. They keep two tankers in potable readiness over the winter and bring the third in during the summer months as demand increases • Investigate causes of loss of supply and rectify if possible. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

Table 54: Backflow occurs into the Reticulation System

Potential Indicator	• Complaints of discoloured, tasting or smelling water coming from taps. • Backflow incident reported by industry. • Reports of illness in parts of the community. • E.coli or total coliforms found in the reticulation system that cannot be explained from other potential causes.
Required Actions	• Notify the DWA*, and in consultation consider next steps. • Follow the actions given in Figure 4.2 of the DWSNZ. Refer Appendix F for extract. • Consider need for Boil Water Notice / Do Not Drink notice (depending on nature of contaminant found). • Identify the source of the backflow incident, and isolate until a backflow prevention device can be fitted, or the one already installed can be made operational. • Flush the affected part of the reticulation system (where practicable), considering the need to flush with elevated chlorine concentrations if the incident may have involved microbiological contaminants. • Monitor an appropriate determinand in the affected area to determine the success of the contingency measures. • Notify consumers when the supply is safe to use, that they will need to flush their taps until good quality water can again be drawn. • Also refer Table 50. • Record cause of system failure and steps taken to correct. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

*E.coli / widespread illness will require immediate notification. Other indicators may require further investigation and assessment prior to notification. Contact details for incident and emergencies are displayed in Table 62.

Table 55: Issuing Boil Water Notice/ Do Not Drink Water Notice

Potential Indicator	• Refer to other contingency plans that indicate a Boil Water Notice may be required.

Required Actions	• Consider if Boil Water Notice is required or Do Not Drink Water is required.
	• Water Asset Manager (or Operations Team Leader) must discuss the issue with the 3 Waters Manager and/or Manager – Utilities and Roading to discuss if a Boil Water Notice / Do Not Drink Water Notice is required.
	• The decision to issue Boil Water Notice/ Do Not Drink Water Notice will only be made with approval from the Manger Utilities and Roading or the 3 Waters Manager (in the absence of these two parties, the Project Delivery Unit Manager).
	• Once the decision is made, the Water Asset Manager or 3 Waters Manager will either issue the notice themselves using the TechOne Software, or delegate this task to another staff member with the rights to do so within the software. Refer Appendix I for a boil water notice template.
	• The Communications and Engagement Manager shall be informed of the notice as information will be required to be made available to the public on the Council Website.
	• Notify the DWA*
	• Notify:
	  • Customer Services
	  • Chief Executive
	  • Water Unit Manager and Operators
	  • Elected Members (Councillors and relevant Community Board).
	• Identify the reason for the failure and rectify if possible.
	• Record cause of system failure and steps taken to correct.
	• Modify WSP if necessary.

Responsibility	Water Asset Manager / 3 Waters Manager

Table 56: Raw Water (Transmission Line) Pipeline Failure

Potential Indicator	• Unable to maintain supply pressure. • Complaints of turbidity or no supply. • Large volumes of water noticed at surface of pipeline, unexplained large volume of water noted within the Gladstone Road Borefield to Pegasus Headworks or imbalance in flows recorded at wells and at headworks inlet.
Required Actions	• Notify the DWA*, and in consultation consider next steps. • Undertake E.coli testing at the headworks and within distribution network. • Isolate section of pipeline defective and continue using other primary wells if available. • Fully shut off valve on failed transmission line and supply with reservoir storage. If the repairs can be undertaken quickly, it is recommended that water conservation strategies be undertaken instead of back-up supply operation. Consider which line the break is on, some wells may still be available (ie PW1 on separate line to Gladstone and EQ wells). • Water Unit reticulation team to undertake the repair of the pipeline. • Once a repair has been undertaken (including sterilisation and pressure testing as required), flush the line until turbidity settles to less than 1 NTU and put back into service. • Investigate causes of pipeline failure and rectify if possible. Consider implications for similar materials as part of renewals programme. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

*E.coli / widespread illness will require immediate notification. Other indicators may require further investigation and assessment prior to notification. Contact details for incident and emergencies are displayed in Table 62.

Table 57: Back-up Chlorination Operation at Chinnerys Road Headworks

Potential Indicator / Cause	• Unable to maintain water quality. • E.coli detected within distribution. • Reports of illness in parts of the community. • Chinnerys Road well required to be used.

Required Actions	• Notify the DWA*, and in consultation consider next steps.
	• Water Asset Manager / 3 Waters Manager to make the decision to undertaken chlorine dosing
	• Consider sending out text alert system to notify resident that water will be chlorinated
	• Operators to use Pegasus chlorine system as first choice, and only consider using the Chinnerys Road system if the Pegasus chlorine system is unable to be used to send water to Woodend for an unexpected reason, or if the Chinnerys Road well is to be used (which can't be treated at Pegasus). If Chinnerys Road chlorine system is the only option:
	  • Bring chlorine tank from Water Unit yard.
	  • Connect chlorine tank to chlorine dosing equipment.
	  • Turn on chlorine analyser and calibrate with handheld device.
	  • Turn on chlorine dosing pump.
	  • Refer CCP for emergency chlorination set points.
	  • Enable chlorine alarms in SCADA.
	  • Flush line (if required) by opening hydrant until chlorine residual can be maintained.
	  • Inform residents of need, and also of possibility of discoloured water due to biofilm build up that may react with chlorine.
	  • Investigate causes triggering chlorination and rectify if possible.
	  • Once causes rectified, plan for discontinuation of chlorine in consultation with DWA.
	  • Modify WSP if necessary.

Responsibility	Water Asset Manager / 3 Waters Manager

*E.coli / widespread illness will require immediate notification. Other indicators may require further investigation and assessment prior to notification. Contact details for incident and emergencies are displayed in Table 62.

Table 58: Chlorine Operation at Pegasus Headworks to supply Woodend Reticulation

Potential Indicator	• Unable to maintain water quality. • E.coli detected within Woodend distribution. • Reports of illness in parts of the community.
Required Actions	• Notify the DWA*, and in consultation consider next steps. • Water Asset Manager / 3 Waters Manager to make the decision to undertake chlorine dosing. In particular, consider if the residual disinfection will be able to be maintained within the Woodend distribution to improve the water quality. • Consider sending out text alert system to notify resident that water will be chlorinated. • Comms team to inform community via multiple media channels. • Turn off chlorine dosing pump. • Operators to reconfigure chlorination dosing point to the original location prior to where the pipes split to go to the separate reservoirs. • Turn on chlorine dosing pump • Consider increasing the chlorine dosing higher than the set point in the CCP to speed up initial dosing process • Consider flushing or draining reservoir with unchlorinated water at Pegasus WTP to waste to speed up process. • Turn on chlorine analyser at Chinnerys Road Headworks and calibrate using hand held device. • Enable Woodend chlorine alarms in SCADA. • Flush line (if required) by opening hydrant until chlorine residual can be maintained. • Monitor and respond to service requests by Woodend residents regarding water quality. • Investigate causes triggering chlorination and rectify if possible. • Once causes rectified, plan for discontinuation of chlorine in consultation with DWA. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

*E.coli / widespread illness will require immediate notification. Other indicators may require further investigation and assessment prior to notification. Contact details for incident and emergencies are displayed in Table 62.

Table 59: Loss of Telecommunications

Potential Indicator	• SCADA system not sending responses. • Site shows values outside of the CCP values but no text alerts are being received by operators. • Telecommunications company send alerts about the loss of communications. • Numerous customer complaints regarding an issue.
Required Actions	• Operator to check the site to identify any issues onsite. Rectify if possible, or engage electrical subcontractor for assistance. • Control Systems Engineer to investigate any issue with the system. Rectify if possible. • Operators to check if plant processes still continuing as normal. If action is required, refer Table 52. • Operators to periodically check the site (for FAC, supply pressure, reservoir level) until the commutations are back online. Note any customer complaints and check the site following issues. • Notify the DWA if any exceedance of the MAV has occurred during the loss of communications. • Investigate causes of loss of communications and rectify if possible. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

Table 60: Contaminated Reservoir Water

Potential Indicator	• E.coli or total coliforms are detectable downstream of the reservoir. • Widespread levels of illness in the community. • Knowledge of sabotage or vandalism. • Leaks/cracks identified at reservoir audit.
Required Actions	• Notify the DWA, and in consultation consider next steps. • Follow the actions given in Figure 4.2 of the DWSNZ. Refer Appendix F for extract. <u>Option 1 - If contaminated reservoir can be taken offline (contamination to one reservoir and not the other):</u> • Isolate the contaminated reservoir and use alternative reservoir. • Implement water restrictions if necessary and notify residents of potential pressure drop if this is deemed to be a likely outcome. • Investigate potential source by sampling all sources, pre/post reservoir and reticulation. • Remedy identified cause. • Drain reservoir to waste and disinfect, and sample to confirm procedure successful. • Bring reservoir back online. <u>Option 2 – If contaminated reservoir cannot be taken offline:</u> • Increase chlorine dose rate / set point and consider shock dosing. • Drain 20% of stored water if necessary to get inflow for mixing and shock dosing the rest of the reservoir (2 ppm target). Turn on emergency chlorine system (refer applicable CCP). • Investigate potential source (sampling). • Remedy potential source. • Consider possibility of contaminated distribution system and the need to implement Table 50. • Record cause of system failure and steps taken to correct. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

Table 61: Elevated Manganese and Iron Levels

Potential Indicator	• Measured value of iron and manganese in the treated water exceeds the GV or MAV • Discoloured water in reticulation. • Customer complaints.
Required Actions	In all events: • Monitor post filter manganese and iron levels. • Check oxygen dosing system, backwash frequency, headloss across filters to determine if anything out of the ordinary that can be rectified. • Review recent cycling of wells, and consider taking a well offline if suspected to be cause. If levels exceed MAV: • Follow the actions given in Section 8.4 of the DWSNZ • Check scheme is compliant as per Section 3.1 of the *DWSNZ* and confirm the exceedance as per guidelines • Notify the DWA, and in consultation consider next steps. • Investigate reasons for exceedance and rectify. • Consider the need to implement incident plan for Contaminated Reservoir Water (Table 60) and Contaminated Distribution System (Table 50). • Conduct an investigation and determine appropriate remedial action. • All incidents of MAV exceedance must be recorded including monitoring results actions taken and outcomes. In all events: • Investigate reasons for exceedance and rectify. • Record cause of system failure and steps taken to correct. • Modify WSP if necessary.
Responsibility	Water Asset Manager / 3 Waters Manager

Table 62: Contact details for incident and emergency reporting

Organisation	Name	Contact
Canterbury District Health Board	Laura Bruce	laura.bruce@cdhb.health.nz 03 378 6830 027 348 4513
	Fiona Humpheson	fiona.humpheson@cdhb.health.nz 03 378 6827
	Denise Tully	denise.tully@cdhb.health.nz 03 378 6726 027 458 2552
	After Hours	cphoncall@cdhb.health.nz 03 364 0640
WDC Asset Managers	Colin Roxburgh (Water Asset Manager)	colin.roxburgh@wmk.govt.nz 021481873
	Caroline Fahey (Operations Team Leader)	caroline.fahey@wmk.govt.nz 0274065138
	Kalley Simpson (3 Waters Manager)	kalley.simpson@wmk.govt.nz 021 223 3428
	General	water.asset@wmk.govt.nz 0800 965 468
WDC Water Unit	Darryn Williams (Technicians Team Leader)	darryn.williams@wmk.govt.nz 021 416 488
	After Hours	03 311 8900

7.1.1. Review of Incident / Emergency Response Plan.

The following tasks are carried out to ensure the ongoing adequacy and currency of the District's water safety plans.

1. Water quality monitored in accordance with the DWSNZ. Any exceedances with the MAV reported to the DWA. Annual compliance of sampling programme reported through annual report.

2. If MAV has been exceeded, documentation to be produced to demonstrate what happened and what the response was. This should include a review of information leading up to the event to determine what may have caused the event or what lessons could be learnt.

3. Where lessons are learnt on one scheme, consider their applicability to other schemes and update other WSPs if required.

4. If contingency plan have been implemented, the suitability of the plan should be considered following the event and the plan updated if necessary.

5. Maintain record of key changes to any schemes that have occurred, such that they will be incorporated into future updated of the WSP.

The improvement schedule includes capital projects which go into the Council's capital programme. Progress on the delivery of the capital programme is measured by the Water Asset Manager and reported through to the Manager - Utilities and Roading who reports to the Council's Audit and Risk Committee.

7.1.2. Organisational Level Emergencies

The WDC's Civil Defence Unit is responsible for the policies, plan and procedures for emergency response. A list of national, regional and local documents have been compiled and is available on our website. These documents provide a list of procedures for major hazardous events. These documents briefly discuss water supply however does not cover step by step response specific to the water supply operation.

8. Documentation and Reporting

8.1. Management of Documentation and Records

8.1.1. Water Supply Log

As of 2019, the Water Unit are transitioning towards an electronic reporting system where monitoring is recorded on the operators tablets. This allows the information to be uploaded and viewed instantly so that the Water Unit Operations Team Leader can review all sites in a live status and ensure activities are completed on time. This tablet system is currently in progress with majority of the sites transitioned to recording operational data through this method.

Contractors who are undertaking maintenance activities are still required to fill out hard copy Operational Logs which are kept at the relevant sites.

For more information on Water supply logs and operations logs, refer Sections 4.2.1 and 4.2.2.

8.1.2. Water Sampling Data

Water sampling data is recorded by the Water Unit and initially saved into the electronic laboratory book. Each month laboratory reports are generated, and uploaded into Council's record management system. The data is also uploaded into the DWO website by either the WAM or WOTL.

Historic sampling data has been extracted from the WINZ database and saved in a spreadsheet available to staff for analysis and historical trending and investigations.

8.1.3. General Record Keeping

All Council records are kept in the overarching record management system (TRIM). This ensures that all historical records are easily discoverable and searchable. This ensures that all future decision making is as informed as possible. An example of the file structure for the Woodend Pegasus scheme is below.

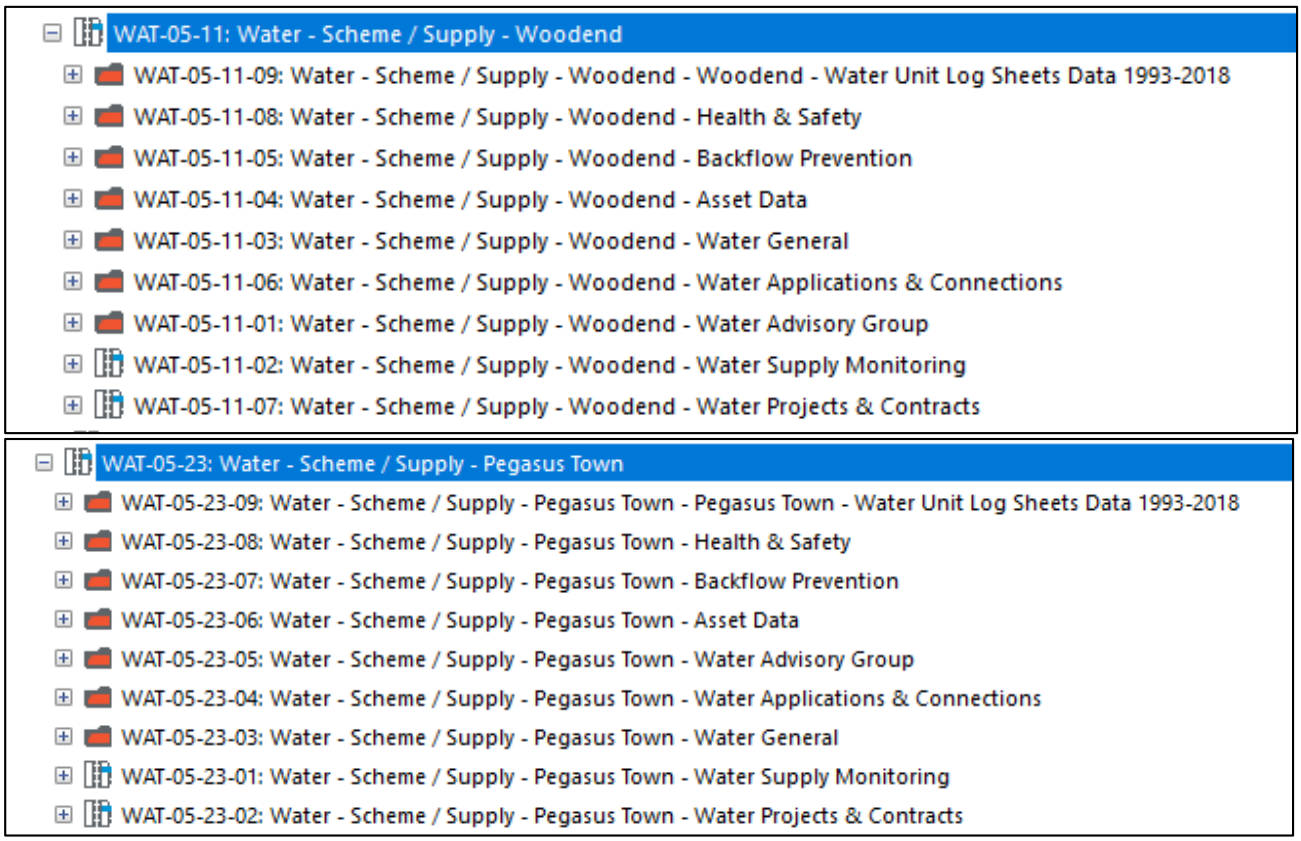

Figure 16: Record Management Structure for Woodend Pegasus Water Supply

8.1.4. Water Safety Plan

Currently, all WSPs are available via the Council website which operators can access via the internet on their tablets. All headworks sites hold hardcopies of the WSP document and the operations and maintenance manual. All sites also have the latest CCPs available on the wall so that they are visible to operators.

8.2. Reporting

8.2.1. Internal reporting

Operational reporting of events is covered in Section 4.

The following reports are generated periodically relating to water supply, or with sections relevant to water supply as well as covering wider parts of the business.

Table 63: Reports Summary

Report Description	Frequency / Timing	Author	Audience
Water Conservation Implementation Report (including update on leakage rates).	Annually after Council financial year end	Water Asset Manager	Utilities and Roading Committee (agenda and report content is publicly available on the Council's website).
Annual Drinking Water Compliance Report	Annually, after annual report from Drinking-water Assessor received	Water Asset Manager	Utilities and Roading Committee (agenda and report content is publicly available on the Council's website).
SCADA Report on overall performance of SCADA system	Monthly	Control Systems Engineer	Water Operations Team Leader / Water Asset Manager

Annual Report. This reports is a comprehensive account of council's activities from the previous year and includes key financial and non-financial performance measures.	Annually after end of Council financial year	Chief / Executive Mayor	General Public

Other reports currently being developed are as below:

- Monthly operations report from Water Unit to Water Operations Team Leader. This is being developed by the Water Unit Manager.
- Periodic automated reporting on overall system performance from SCADA data (i.e summarising each plant's performance over a given period to allow for easier analysis and potential identification or issues or opportunities for improvements). This is being developed by the Control Systems Engineer.

8.2.2. External reporting

No annual reports are prepared directly for external organisations, however the reports that go to either the Utilities and Roading Committee or the general public are publicly available.

8.2.3. Annual Report

It is acknowledged that within the Handbook for preparing a Water Safety Plan there are criteria that are to be considered for incorporating into an annual drinking-water report. As an annual drinking-water report is already produced, consideration will be given to broadening the scope of this report to include some of the additional details recommended (performance against Health Act, water quality trends and problems, system failures and remedial actions, etc).

9. Investigations

9.1. Investigative Studies

Investigations are undertaken following incidents. Refer to Section 7.1 for incident and emergencies which would trigger investigations.

9.2. Validation of Equipment, Processes and Practices

Validation of equipment is undertaken to ensure critical assets are preforming at the level expected. Table 64 provides an overview of the equipment which operators are required to validate.

Table 64: Validation of equipment, processes and practices.

Equipment requiring validation	Person responsible	Performance Value
pH	Main operator	As pre DWSNZ
Turbidity Meter	Main operator	As per DWSNZ
Chlorine Analyser	Main operator	Refer CCP

If unsatisfactory results are received and corrections made, operators must state this in the Water Unit electronic logs. Operational issues that could not be resolved are raised and reviewed at the Water Unit

monthly meeting with the Water Operations Team Leader. Any trends or equipment issues are discussed and considered for further investigation.

Water quality is measured by operators though headworks checks. This is validated by the routine sampling undertaken by Water Unit laboratory staff. For more information on sampling, training and sampling checks, refer to sections 4.2 and 5.3.

10. Oversight, Review and Continual Improvement

10.1. Long-Term Evaluation of Results

Every 5 years, or when there is a change to the supply, the Water Safety Plan is updated. This assessment triggers a long term evaluation of the supply where all aspects of the supply and potential new improvements to the supply are considered. In particular this triggers a full review of risks on the water supply, which incorporates a further review and analysis of water quality data trending.

Every 3 years, Council produces Activity Management Plans for each scheme, which feed into the Long Term Plan document. Through this process the capacity of each scheme is considered, growth patterns reviewed, as well as overall asset condition, levels of service, and renewal requirements. The Water Asset Manager is responsible for the water supply Activity Management Plans, as well as input into the Long Term Plan. Through each Long Term Plan, new projects and budgets may be approved. The Water Asset Manager is then responsible for implementing projects that are identified through this process.

10.2. Audit of Drinking-Water Quality Management

Following the launch of AMIS and the Water Unit Service Level Agreement, both the Water Unit and the Asset Management Team will have improved transparency regarding operational and maintenance activities and performance. This system will ensure all activities undertaken by the Water Unit are logged, and more easily auditable. Reports can then be generated to confirm that inspections are being completed as per the requirements.

In the interim, the data uploaded from the operators via their tablets to the TechOne system provides confidence that operational visits to sites are being undertaken as required. Further to this, the Service Request reporting system that tracks median response times and resolution times to urgent and not urgent issues provides a high degree of oversight and accountability that these performance targets are being met.

10.3. Review by Senior Leadership

All Water Safety Plans will be issued to the Utilities and Roading committee for endorsement.

References Documents

This document has been prepared in accordance with:

- Section 69Z of the Health Act (1956)
- New Zealand Drinking Water Safety Plan Framework (2018)
- Water Safety Plan Guides for Drinking-water Supplies (2018)
- Drinking-water Standards for New Zealand 2005 (Revised 2018)
- Guidelines for Drinking-water Quality Management for New Zealand (2017)
- Handbook for Preparing a Water Safety Plan (2019)
- Ministry for the Environment Preparing for coastal change. A summary of costal hazards and climate change guidance for local government (2017)

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APPENDIX A. Flow Diagram

Barrier 1

(Stop Contamination)

- Resource Consents
- Catchment Knowledge
- Deep Confined Aquifer

Barrier 2

(Remove Particles)

- Effective Particle Removal Turbidity < 1 NTU

Barrier 3

(Kill Germs)

- Treatment Through Aquifer

Barrier 4

(Prevention Recontamination)

- Trained Staff
- Secure Post Treatment Tanks
- Back Flow Prevention Policy Being Implemented
- Good Condition Plastic Pipe
- Low Leakage

Community Drinking Water Supply Protection Zone

G01759 PW1 M35 / 10908 — 145.8m

G01760 Decommissioned PW2 M35 / 10908

Community Drinking Water Supply Protection Zone

G01946 EQ1 M35 / 18017 — 214m

G01947 EQ2 M35 / 18018 — 250m

G02085 EQ3 M35 / 18019 — 212m

Not Connected EQ4 M35 / 18020 — 194m

Community Drinking Water Supply Protection Zone

G01166 Gladstone Road Well 1 M35 / 7542 — 205.8m

G01916 Gladstone Road Well 2 M35 / 11693 — 210m

Community Drinking Water Supply Protection Zone

G00152 Back-up Chinnerys Road Well M35 / 0225 — 22.7m

Decommissioned Chinnerys Road Well M35 / 0470

Normally Closed

Backwash (Wastewater)

Mn Removal Filter 1

Pegasus Headworks

Dissolved Oxygen Blowers

Motorised Valve

Dissolved Oxygen Meter

Backwash Blowers

Backwash Pumps

pH

Dissolved Oxygen Meter

65m³ Raw Water Tank

Backwash Tank (Wastewater)

Motorised Valve

Mn Removal Filter 2

Motorised Valve

Chlorine Dosing

2.5m³

Treated Water Tank

120m³

Turbidity pH Analysers

Emergency Chlorine Dosing Point

22kW

22kW

Chlorine Analyser

Pegasus Reservoir A

1360m³

Woodend Reservoir B

2710m³

Normally Closed

Normally Closed

VSD 4kW Jockey

VSD 18.5kW

VSD 18.5kW

VSD 18.5kW

VSD 4kW future

VSD 15kW

VSD 15kW

VSD 15kW

Headworks Sampling Point

Chlorine Analyser

Normally Closed

Pegasus Reticulation (1,611 On-demand & Restricted Connections)

Reticulation Sampling Points

Blackadder Road Rapaki Street

Normally Closed

Reticulation Sampling Points

The Church Judsons Road Gladstone Road

Woodend Reticulation (1,415 On-demand & Restricted Connections)

Emergency Chlorine Dosing

Mn Removal Filter

Normally Closed

Normally Closed

450m

450m

Normally Closed

VSD 22kW

VSD 11kW

VSD 22kW

VSD 11kW

Chlorine Analyser

Chinnerys Road Headworks

KEY

- PROCESS CONTROL
- SAMPLING POINT
- SCADA ALARMS
- FLOW METER
- ANALYSER
- BARRIER STATUS
  - EFFECTIVE
  - PARTIALLY EFFECTIVE
  - INEFFECTIVE

FOR INFORMATION

NOT FOR CONSTRUCTION

WAIMAKARIRI DISTRICT COUNCIL

ISSUE	AMENDMENT	DRAWN	CHKD	APPD	DATE
A	FIRST ISSUE	JD	MA	CR	03/12/2019

SCALE NTS

N

SHEET TITLE: FLOW DIAGRAM

PROJECT TITLE: WOODEND PEGASUS WATER SAFETY PLAN

PLAN No. 4048

ISSUE A | SHEET 1

PLOT DATE: 09/12/2019 FILE: J:\WDC DRAWINGS\4001-6000\4048\4048 - SHT 1 - A.DWG

APPENDIX B. CDWPZ

COMMUNITY DRIKING WATER SUPPLY PROTECTION ZONE
WELL SOURCE
HUMAN EFFULENT DISCHARGE CONSENT
DISTURB GROUND CONSENT
RAVENSWOOD WATER DISCHARGE CONSENTS

BOB ROBERTSON DRIVE
GARRICK STREET
BURNTWOOD LANE
MAPLEHAM DRIVE
TAERUTU LANE
GATEHOUSE LANE
TARA CRESCENT
GODLEY PLACE
CLEGG STREET
SHRIMPTON AVENUE
MINERVA CRESCENT
CHINNERYS ROAD
GRANGE VIEW
TE HAUNUI LANE
PEGASUS BOULEVARD
MARA-KAI PLACE
ATKINSONS LANE
HEWITTS ROAD
BUNTING PLACE
COBDEN PLACE
WELSFORD STREET
PAGET DRIVE
TARANAKI DRIVE
APPLETON PLACE
THORNLEY PLACE
WOODGLEN DRIVE
NORTON PLACE
MANAHI PLACE
WOODFIELD PLACE
MANNORTH ROAD
THE STABLES
BOWIE DRIVE
CASSIDY PLACE
WOODEND ROAD
GREENWOOD CLOSE
TURIWHATA ROAD
RANGIORA WOODEND ROAD
STANTON PLACE
LACY GATE PLACE
GIBBS DRIVE
SOMERSET PLACE
SCHOOL ROAD
LITTLES LANE
PARSONAGE ROAD
STOPFORTH STREET
EDERS ROAD
ZUPPICICH LANE
JAMES DRIVE
BENJES PLACE
HAMLETT DRIVE
PASCOE DRIVE
KEEPER CLOSE
FEARNE DRIVE
RANBY PLACE
PETRIES ROAD
SIMON PLACE
PANCKHURST DRIVE
CATCHPOLE PLACE
McLEAN PLACE
LYDNEY LANE
HURIA LANE
MANSON LANE
JUDSONS ROAD
TE POUAPATUKI ROAD
WOODEND BEACH ROAD
COPPER BEECH ROAD
EVERGREEN DRIVE
GLADSTONE ROAD
KOKOPU STREET
HOUHERE COURT
TANGIWAI STREET
ARAHURA ROAD
KAHIKATEA LANE
HOAKA LANE
KAWARI DRIVE
TUKA ROAD
AWARUA ROAD
WHAKATIPU STREET
INFINITY DRIVE
TAHUTAHI LANE
TARAMAKAU LANE
MEREDITH LANE
SOUNDER ROAD
POUNAMU PLACE
TOMLINSON LANE
HODGKINSON ROAD
BARNES STREET
MARGOLISH LANE
MATAMATA QUAY
MARY ELLEN STREET
GILLMAN PLACE
PEGASUS MAIN STREET
TATA LANE
TAHUNA STREET
PEGLER COURT
PAKURA STREET
TURVEY STREET
KUTA STREET
PIPI-WAI STREET
TOMMY STREET
MURFITT STREET
PAUA PLACE
EYREWELL ROAD
WAIREKA STREET
DEANS LANE
TARSUS PLACE
BLACKADDER ROAD
COULTER STREET
KESSEN STREET
HOROMAKA STREET
TUTAIPATU AVENUE
PATIKI LANE
MANUKA STREET
TANIWHA STREET
FORBES STREET
PURRI STREET
PUAKA STREET
SEAWARD STREET
WAIPARA ROAD
MOA STREET
PIPIRI STREET
WAIMARIE STREET
HAKATERE ROAD
PEEGASUS MAIN STREET
HOWARD PLACE

ISSUE	AMENDMENT	DRAWN	CHKD	APPD	DATE
A	FIRST ISSUE	MSB	JD	CR	6.11.19

SCALE (A3) 1:10,000

SHEET TITLE: COMMUNITY DRINKING WATER PROTECTION ZONE

PROJECT TITLE: WOODEND PEGASUS WATER SAFETY PLAN

PLAN No 4048
FILE 2702-sht3 Well Protection.MXD
VERSION B
SHEET 03

APPENDIX C. Supply Area

RATED AREA
WATERMAIN
WELLS
Reservoir
PRESSURE PUMPS
RETICULATION SAMPLING POINT
HEADWORKS SAMPLING POINT

Chinnerys Road Well 1
Chinnerys Road Headworks
Church
Pegasus Well 1
Pegasus Headworks
Rapaki Street
Blackadder Road
Gladstone Road
Gladstone Wells
Equestrian Wells
Judsons Road
Tuahiwi Road

ISSUE	AMENDMENT	DRAWN	CHKD	APPD	DATE
A	FIRST ISSUE REVIEW CHANGES	JD	MA	CR	19.08.19

SCALE (A3) 1:20,000

SHEET TITLE: SCHEME BOUNDARY

PROJECT TITLE: PEGASUS WOODEND WATER SAFETY PLAN

PLAN No 4048

FILE Sample scheme Boundary - Service Area.r

VERSION B

SHEET 02

APPENDIX D. Full Chemical Data

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Eurofins ELS Limited

Analytical Report

Waimakariri District Council
Private Bag 1005
RANGIORA

Attention: Susan Dalzell

Report Number: 18/46541
Issue: 2
09 October 2018

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
18/46541-01	WDC Domestic Water Supply		01/10/2018 11:00	02/10/2018 07:45	0

Notes: SD18537 Pegasus EQ1

	Test	Result	Units	Comments	Signatory
0001	pH	7.9		Passes GV of 7.0 to 8.5	Marylou Cabral KTP
0040	Total (NP) Organic Carbon	0.2	g/m³	Below US-EPA Limit of 2	Sharon van Soest KTP
0052	Alkalinity - Total	100	g CaCO3/m³	Not a NZDWS test	Marylou Cabral KTP
0055	Conductivity at 25°C	23.3	mS/m	Not a NZDWS test	Gordon McArthur KTP
0055B	Total Dissolved Solids	128	g/m³	Below GV of 1000	Gordon McArthur KTP
0069	Saturation Index	-0.24		Passes GV of -1.5 to 0.5	Gordon McArthur .
0073	Bicarbonate	99	g CaCO3/m³	Not a NZDWS test	Marylou Cabral .
0074	Carbonate	< 1	g CaCO3/m³	Not a NZDWS test	Marylou Cabral .
0076	Free CO2	3	g CO2/m³	Not a NZDWS test	Marylou Cabral .
0084	Turbidity	1.02	NTU	Below GV of 2.5	Marylou Cabral KTP
0601	Fluoride	0.10	g/m³	See Notes Below	Shanel Kumar KTP
0602	Chloride	7.84	g/m³	Below GV of 250	Shanel Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	Passes MAV Limit of 11.3	Shanel Kumar KTP
0607	Sulphate	0.05	g/m³	Below GV of 250	Shanel Kumar KTP
1602	Arsenic - Acid Soluble	< 0.005	g/m³	Passes MAV Limit of 0.01	Shanel Kumar KTP
1606	Boron - Acid Soluble	0.02	g/m³	Passes MAV Limit of 1.4	Shanel Kumar KTP
1610	Calcium - Acid Soluble	20.2	g/m³	See Total Hardness	Shanel Kumar KTP
1615	Copper - Acid Soluble	< 0.005	g/m³	Below GV of 1	Shanel Kumar KTP
1619	Iron - Acid Soluble	1.25	g/m³	Above GV of 0.2	Shanel Kumar KTP
1622	Magnesium - Acid Soluble	2.52	g/m³	See Total Hardness	Shanel Kumar KTP
1623	Manganese - Acid Soluble	0.111	g/m³	Passes MAV Limit of 0.4	Shanel Kumar KTP
1629	Potassium - Acid Soluble	1.00	g/m³	Not a NZDWS test	Shanel Kumar KTP
1634	Sodium - Acid Soluble	26.2	g/m³	Below GV of 200	Shanel Kumar KTP
1641	Zinc - Acid Soluble	< 0.005	g/m³	Below GV of 1.5	Shanel Kumar KTP
1642	Total Hardness	61	g CaCO3/m³	Below Moderate Hardness Level of 100	Shanel Kumar KTP
1644	Calcium Hardness	51	g CaCO3/m³	See Total Hardness	Shanel Kumar KTP
M0403	Total Coliforms	< 1	MPN/100ml	No limit listed in NZDWS	Juana Tamayo KTP
M0404	E. coli	< 1	MPN/100mL	Passes MAV Limit of 0	Juana Tamayo KTP
Z9602B	Overall Compliance	NZDWS		See Notes Below	

Comments:

Sampled by customer using ELS approved containers.

Report re-issued with amended conductivity result

This report cancels and replaces report 18/46541-1. Please dispose of all previous versions.

Comments on Individual Test Results

pH

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Eurofins ELS Limited

Analytical Report

Waimakariri District Council
Private Bag 1005
RANGIORA

Attention: Susan Dalzell

Report Number: 18/46542
Issue: 2
09 October 2018

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
18/46542-01	WDC Domestic Water Supply		01/10/2018 11:20	02/10/2018 07:45	0

Notes: SD18538 Pegasus EQ2

	Test	Result	Units	Comments	Signatory
0001	pH	7.9		Passes GV of 7.0 to 8.5	Marylou Cabral KTP
0040	Total (NP) Organic Carbon	0.8	g/m³	Below US-EPA Limit of 2	Sharon van Soest KTP
0052	Alkalinity - Total	103	g CaCO3/m³	Not a NZDWS test	Marylou Cabral KTP
0055	Conductivity at 25°C	25.7	mS/m	Not a NZDWS test	Gordon McArthur KTP
0055B	Total Dissolved Solids	141	g/m³	Below GV of 1000	Gordon McArthur KTP
0069	Saturation Index	-0.41		Passes GV of -1.5 to 0.5	Gordon McArthur .
0073	Bicarbonate	102	g CaCO3/m³	Not a NZDWS test	Marylou Cabral .
0074	Carbonate	< 1	g CaCO3/m³	Not a NZDWS test	Marylou Cabral .
0076	Free CO2	2	g CO2/m³	Not a NZDWS test	Marylou Cabral .
0084	Turbidity	1.12	NTU	Below GV of 2.5	Marylou Cabral KTP
0601	Fluoride	0.15	g/m³	See Notes Below	Shanel Kumar KTP
0602	Chloride	13.5	g/m³	Below GV of 250	Shanel Kumar KTP
0605	Nitrate - Nitrogen	0.01	g/m³	Passes MAV Limit of 11.3	Shanel Kumar KTP
0607	Sulphate	0.03	g/m³	Below GV of 250	Shanel Kumar KTP
1602	Arsenic - Acid Soluble	< 0.005	g/m³	Passes MAV Limit of 0.01	Shanel Kumar KTP
1606	Boron - Acid Soluble	0.02	g/m³	Passes MAV Limit of 1.4	Shanel Kumar KTP
1610	Calcium - Acid Soluble	11.4	g/m³	See Total Hardness	Shanel Kumar KTP
1615	Copper - Acid Soluble	< 0.005	g/m³	Below GV of 1	Shanel Kumar KTP
1619	Iron - Acid Soluble	1.18	g/m³	Above GV of 0.2	Shanel Kumar KTP
1622	Magnesium - Acid Soluble	1.95	g/m³	See Total Hardness	Shanel Kumar KTP
1623	Manganese - Acid Soluble	0.110	g/m³	Passes MAV Limit of 0.4	Shanel Kumar KTP
1629	Potassium - Acid Soluble	0.97	g/m³	Not a NZDWS test	Shanel Kumar KTP
1634	Sodium - Acid Soluble	39.6	g/m³	Below GV of 200	Shanel Kumar KTP
1641	Zinc - Acid Soluble	0.012	g/m³	Below GV of 1.5	Shanel Kumar KTP
1642	Total Hardness	36	g CaCO3/m³	Below Moderate Hardness Level of 100	Shanel Kumar KTP
1644	Calcium Hardness	28	g CaCO3/m³	See Total Hardness	Shanel Kumar KTP
M0403	Total Coliforms	< 1	MPN/100ml	No limit listed in NZDWS	Juana Tamayo KTP
M0404	E. coli	< 1	MPN/100mL	Passes MAV Limit of 0	Juana Tamayo KTP
Z9602B	Overall Compliance	NZDWS		See Notes Below	

Comments:

Sampled by customer using ELS approved containers.

Report re-issued with amended conductivity result

This report cancels and replaces report 18/46542-1. Please dispose of all previous versions.

Comments on Individual Test Results

pH

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Eurofins ELS Limited

Analytical Report

Waimakariri District Council
Private Bag 1005
RANGIORA

Attention: Susan Dalzell

Report Number: 18/46545
Issue: 2
09 October 2018

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
18/46545-01	WDC Domestic Water Supply		01/10/2018 11:40	02/10/2018 07:45	0

Notes: SD18539 Pegasus EQ3

	Test	Result	Units	Comments	Signatory
0001	pH	7.8		Passes GV of 7.0 to 8.5	Marylou Cabral KTP
0040	Total (NP) Organic Carbon	< 0.1	g/m³	Below US-EPA Limit of 2	Sharon van Soest KTP
0052	Alkalinity - Total	98	g CaCO3/m³	Not a NZDWS test	Marylou Cabral KTP
0055	Conductivity at 25°C	23.1	mS/m	Not a NZDWS test	Gordon McArthur KTP
0055B	Total Dissolved Solids	127	g/m³	Below GV of 1000	Gordon McArthur KTP
0069	Saturation Index	-0.27		Passes GV of -1.5 to 0.5	Gordon McArthur .
0073	Bicarbonate	97	g CaCO3/m³	Not a NZDWS test	Marylou Cabral .
0074	Carbonate	< 1	g CaCO3/m³	Not a NZDWS test	Marylou Cabral .
0076	Free CO2	3	g CO2/m³	Not a NZDWS test	Marylou Cabral .
0084	Turbidity	0.35	NTU	Below GV of 2.5	Marylou Cabral KTP
0601	Fluoride	0.10	g/m³	See Notes Below	Shanel Kumar KTP
0602	Chloride	7.44	g/m³	Below GV of 250	Shanel Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	Passes MAV Limit of 11.3	Shanel Kumar KTP
0607	Sulphate	0.69	g/m³	Below GV of 250	Shanel Kumar KTP
1602	Arsenic - Acid Soluble	< 0.005	g/m³	Passes MAV Limit of 0.01	Shanel Kumar KTP
1606	Boron - Acid Soluble	< 0.01	g/m³	Passes MAV Limit of 1.4	Shanel Kumar KTP
1610	Calcium - Acid Soluble	22.1	g/m³	See Total Hardness	Shanel Kumar KTP
1615	Copper - Acid Soluble	< 0.005	g/m³	Below GV of 1	Shanel Kumar KTP
1619	Iron - Acid Soluble	0.049	g/m³	Below GV of 0.2	Shanel Kumar KTP
1622	Magnesium - Acid Soluble	3.04	g/m³	See Total Hardness	Shanel Kumar KTP
1623	Manganese - Acid Soluble	0.034	g/m³	Below GV of 0.04	Shanel Kumar KTP
1629	Potassium - Acid Soluble	1.07	g/m³	Not a NZDWS test	Shanel Kumar KTP
1634	Sodium - Acid Soluble	21.5	g/m³	Below GV of 200	Shanel Kumar KTP
1641	Zinc - Acid Soluble	0.006	g/m³	Below GV of 1.5	Shanel Kumar KTP
1642	Total Hardness	68	g CaCO3/m³	Below Moderate Hardness Level of 100	Shanel Kumar KTP
1644	Calcium Hardness	55	g CaCO3/m³	See Total Hardness	Shanel Kumar KTP
M0403	Total Coliforms	< 1	MPN/100ml	No limit listed in NZDWS	Juana Tamayo KTP
M0404	E. coli	< 1	MPN/100mL	Passes MAV Limit of 0	Juana Tamayo KTP
Z9602B	Overall Compliance	NZDWS		See Notes Below	

Comments:

Sampled by customer using ELS approved containers.

Report re-issued with amended conductivity result

This report cancels and replaces report 18/46545-1. Please dispose of all previous versions.

Comments on Individual Test Results

pH

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Analytical Report

Waimakariri District Council
Private Bag 1005
RANGIORA

Attention: Susan Dalzell

Report Number: 18/46546
Issue: 2
09 October 2018

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
18/46546-01	WDC Domestic Water Supply		01/10/2018 12:00	02/10/2018 07:45	0

Notes: SD18540 Pegasus PW1

	Test	Result	Units	Comments	Signatory
0001	pH	7.8		Passes GV of 7.0 to 8.5	Marylou Cabral KTP
0040	Total (NP) Organic Carbon	0.1	g/m³	Below US-EPA Limit of 2	Sharon van Soest KTP
0052	Alkalinity - Total	97	g CaCO3/m³	Not a NZDWS test	Marylou Cabral KTP
0055	Conductivity at 25°C	22.6	mS/m	Not a NZDWS test	Gordon McArthur KTP
0055B	Total Dissolved Solids	124	g/m³	Below GV of 1000	Gordon McArthur KTP
0069	Saturation Index	-0.40		Passes GV of -1.5 to 0.5	Gordon McArthur .
0073	Bicarbonate	96	g CaCO3/m³	Not a NZDWS test	Marylou Cabral .
0074	Carbonate	< 1	g CaCO3/m³	Not a NZDWS test	Marylou Cabral .
0076	Free CO2	3	g CO2/m³	Not a NZDWS test	Marylou Cabral .
0084	Turbidity	0.44	NTU	Below GV of 2.5	Marylou Cabral KTP
0601	Fluoride	0.10	g/m³	See Notes Below	Shanel Kumar KTP
0602	Chloride	7.59	g/m³	Below GV of 250	Shanel Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	Passes MAV Limit of 11.3	Shanel Kumar KTP
0607	Sulphate	0.04	g/m³	Below GV of 250	Shanel Kumar KTP
1602	Arsenic - Acid Soluble	< 0.005	g/m³	Passes MAV Limit of 0.01	Shanel Kumar KTP
1606	Boron - Acid Soluble	0.01	g/m³	Passes MAV Limit of 1.4	Shanel Kumar KTP
1610	Calcium - Acid Soluble	15.9	g/m³	See Total Hardness	Shanel Kumar KTP
1615	Copper - Acid Soluble	< 0.005	g/m³	Below GV of 1	Shanel Kumar KTP
1619	Iron - Acid Soluble	0.168	g/m³	Below GV of 0.2	Shanel Kumar KTP
1622	Magnesium - Acid Soluble	3.49	g/m³	See Total Hardness	Shanel Kumar KTP
1623	Manganese - Acid Soluble	0.037	g/m³	Below GV of 0.04	Shanel Kumar KTP
1629	Potassium - Acid Soluble	0.97	g/m³	Not a NZDWS test	Shanel Kumar KTP
1634	Sodium - Acid Soluble	25.9	g/m³	Below GV of 200	Shanel Kumar KTP
1641	Zinc - Acid Soluble	< 0.005	g/m³	Below GV of 1.5	Shanel Kumar KTP
1642	Total Hardness	54	g CaCO3/m³	Below Moderate Hardness Level of 100	Shanel Kumar KTP
1644	Calcium Hardness	40	g CaCO3/m³	See Total Hardness	Shanel Kumar KTP
M0403	Total Coliforms	< 1	MPN/100ml	No limit listed in NZDWS	Juana Tamayo KTP
M0404	E. coli	< 1	MPN/100mL	Passes MAV Limit of 0	Juana Tamayo KTP
Z9602B	Overall Compliance	NZDWS		See Notes Below	

Comments:

Sampled by customer using ELS approved containers.

Report re-issued with amended conductivity result

This report cancels and replaces report 18/46546-1. Please dispose of all previous versions.

Comments on Individual Test Results

pH

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Analytical Report

Waimakariri District Council
Private Bag 1005
RANGIORA
Attention: Susan Dalzell

Report Number: 18/46547
Issue: 3
21 November 2018

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
18/46547-01	Gladstone Number 1 Well	G01166	01/10/2018 12:20	02/10/2018 07:45	0

Notes: SD18541 Gladstone #1

	Test	Result	Units	Comments	Signatory
0001	pH	7.8		Passes GV of 7.0 to 8.5	Marylou Cabral KTP
0040	Total (NP) Organic Carbon	0.2	g/m³	Below US-EPA Limit of	Sharon van Soest KTP
0052	Alkalinity - Total	98	g CaCO3/m³	Not a NZDWS test	Marylou Cabral KTP
0055	Conductivity at 25°C	23.0	mS/m	Not a NZDWS test	Gordon McArthur KTP
0055B	Total Dissolved Solids	127	g/m³		Rob Deacon KTP
0069	Saturation Index	-0.24			Rob Deacon .
0073	Bicarbonate	97	g CaCO3/m³		Rob Deacon .
0074	Carbonate	< 1	g CaCO3/m³		Rob Deacon .
0076	Free CO2	3	g CO2/m³		Rob Deacon .
0084	Turbidity	0.17	NTU	Below GV of	Marylou Cabral KTP
0601	Fluoride	0.10	g/m³	See Notes Below	Shanel Kumar KTP
0602	Chloride	7.44	g/m³	Below GV of	Shanel Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	Passes MAV Limit of	Shanel Kumar KTP
0607	Sulphate	0.44	g/m³	Below GV of	Shanel Kumar KTP
1602	Arsenic - Acid Soluble	< 0.005	g/m³	Passes MAV Limit of	Shanel Kumar KTP
1606	Boron - Acid Soluble	< 0.01	g/m³	Passes MAV Limit of	Shanel Kumar KTP
1610	Calcium - Acid Soluble	21.3	g/m³	See Total Hardness	Shanel Kumar KTP
1615	Copper - Acid Soluble	< 0.005	g/m³	Below GV of	Shanel Kumar KTP
1619	Iron - Acid Soluble	0.032	g/m³	Below GV of	Shanel Kumar KTP
1622	Magnesium - Acid Soluble	2.81	g/m³	See Total Hardness	Shanel Kumar KTP
1623	Manganese - Acid Soluble	0.051	g/m³	Passes MAV Limit of 0.4	Shanel Kumar KTP
1629	Potassium - Acid Soluble	1.08	g/m³	Not a NZDWS test	Shanel Kumar KTP
1634	Sodium - Acid Soluble	22.9	g/m³	Below GV of	Shanel Kumar KTP
1641	Zinc - Acid Soluble	0.011	g/m³	Below GV of	Shanel Kumar KTP
1642	Total Hardness	65	g CaCO3/m³	Below Moderate Hardness Level of	Shanel Kumar KTP
1644	Calcium Hardness	53	g CaCO3/m³	See Total Hardness	Shanel Kumar KTP
M0403	Total Coliforms	< 1	MPN/100ml	No limit listed in NZDWS	Juana Tamayo KTP
M0404	E. coli	< 1	MPN/100mL	Passes MAV Limit of 0	Juana Tamayo KTP
Z9602B	Overall Compliance	NZDWS		See Notes Below	

Comments:

Sampled by customer using ELS approved containers.

Report regenerated to include DWO Location Code.

This report cancels and replaces report 18/46547-2. Please dispose of all previous versions.

Comments on Individual Test Results

pH for sample 18/46547-01

pH measures how acidic or basic the water sample is. Waters with low pH can be corrosive and those with a high pH can promote scale formation in pipes and hot water cylinders. The guideline value for pH in the NZ Drinking Water Standards is 7.0 to 8.5 so the pH of this sample complies with this value.

Total (NP) Organic Carbon for sample 18/46547-01

Total Organic Carbon can be seen in water as particulate or sometimes colour (ie humic acid) and is not listed in the NZ Drinking Water Standards. However, the US EPA gives a maximum drinking water limit of 2 g/m3. The result for this sample is below this limit indicating there is very little organic matter in the water.

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Analytical Report

Waimakariri District Council
Private Bag 1005
RANGIORA
Attention: Susan Dalzell

Report Number: 18/46548
Issue: 3
21 November 2018

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
18/46548-01	Gladstone Number 2 Well	G01916	01/10/2018 12:40	02/10/2018 07:45	0

Notes: SD18542 Gladstone #2

	Test	Result	Units	Comments	Signatory
0001	pH	7.9		Passes GV of 7.0 to 8.5	Marylou Cabral KTP
0040	Total (NP) Organic Carbon	< 0.1	g/m³	Below US-EPA Limit of	Sharon van Soest KTP
0052	Alkalinity - Total	98	g CaCO3/m³	Not a NZDWS test	Marylou Cabral KTP
0055	Conductivity at 25°C	22.9	mS/m	Not a NZDWS test	Gordon McArthur KTP
0055B	Total Dissolved Solids	126	g/m³		Rob Deacon KTP
0069	Saturation Index	-0.22			Rob Deacon .
0073	Bicarbonate	97	g CaCO3/m³		Rob Deacon .
0074	Carbonate	< 1	g CaCO3/m³		Rob Deacon .
0076	Free CO2	3	g CO2/m³		Rob Deacon .
0084	Turbidity	0.84	NTU	Below GV of	Marylou Cabral KTP
0601	Fluoride	0.10	g/m³	See Notes Below	Shanel Kumar KTP
0602	Chloride	7.40	g/m³	Below GV of	Shanel Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	Passes MAV Limit of	Shanel Kumar KTP
0607	Sulphate	0.39	g/m³	Below GV of	Shanel Kumar KTP
1602	Arsenic - Acid Soluble	< 0.005	g/m³	Passes MAV Limit of	Shanel Kumar KTP
1606	Boron - Acid Soluble	< 0.01	g/m³	Passes MAV Limit of	Shanel Kumar KTP
1610	Calcium - Acid Soluble	21.4	g/m³	See Total Hardness	Shanel Kumar KTP
1615	Copper - Acid Soluble	< 0.005	g/m³	Below GV of	Shanel Kumar KTP
1619	Iron - Acid Soluble	0.219	g/m³	Above GV of	Shanel Kumar KTP
1622	Magnesium - Acid Soluble	2.90	g/m³	See Total Hardness	Shanel Kumar KTP
1623	Manganese - Acid Soluble	0.060	g/m³	Passes MAV Limit of 0.4	Shanel Kumar KTP
1629	Potassium - Acid Soluble	1.08	g/m³	Not a NZDWS test	Shanel Kumar KTP
1634	Sodium - Acid Soluble	22.7	g/m³	Below GV of	Shanel Kumar KTP
1641	Zinc - Acid Soluble	0.039	g/m³	Below GV of	Shanel Kumar KTP
1642	Total Hardness	66	g CaCO3/m³	Below Moderate Hardness Level of	Shanel Kumar KTP
1644	Calcium Hardness	54	g CaCO3/m³	See Total Hardness	Shanel Kumar KTP
M0403	Total Coliforms	< 1	MPN/100ml	No limit listed in NZDWS	Juana Tamayo KTP
M0404	E. coli	< 1	MPN/100mL	Passes MAV Limit of 0	Juana Tamayo KTP
Z9602B	Overall Compliance	NZDWS		See Notes Below	

Comments:

Sampled by customer using ELS approved containers.

Report regenerated to include DWO Location Code.

This report cancels and replaces report 18/46548-2. Please dispose of all previous versions.

Comments on Individual Test Results

pH for sample 18/46548-01

pH measures how acidic or basic the water sample is. Waters with low pH can be corrosive and those with a high pH can promote scale formation in pipes and hot water cylinders. The guideline value for pH in the NZ Drinking Water Standards is 7.0 to 8.5 so the pH of this sample complies with this value.

Total (NP) Organic Carbon for sample 18/46548-01

Total Organic Carbon can be seen in water as particulate or sometimes colour (ie humic acid) and is not listed in the NZ Drinking Water Standards. However, the US EPA gives a maximum drinking water limit of 2 g/m3. The result for this sample is below this limit indicating there is very little organic matter in the water.

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Eurofins ELS Limited

Analytical Report

Waimakariri District Council
Private Bag 1005
RANGIORA
Attention: Susan Dalzell

Report Number: 18/54250
Issue: 1
28 November 2018

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
18/54250-01	Waimakariri DC		13/11/2018 09:00	14/11/2018 07:50	0

Notes: SD18663, Chinnerys Road Well Woodend

	Test	Result	Units	Comments	Signatory
0001	pH	7.0			Marylou Cabral KTP
0040	Total (NP) Organic Carbon	0.3	g/m³		Sharon van Soest KTP
0052	Alkalinity - Total	50	g CaCO3/m³		Marylou Cabral KTP
0055	Conductivity at 25°C	13.3	mS/m		Marylou Cabral KTP
0055B	Total Dissolved Solids	73	g/m³		Marylou Cabral KTP
0069	Saturation Index	-1.54			Sharon van Soest .
0073	Bicarbonate	50	g CaCO3/m³		Marylou Cabral .
0074	Carbonate	< 1	g CaCO3/m³		Marylou Cabral .
0076	Free CO2	9	g CO2/m³		Marylou Cabral .
0084	Turbidity	11.0	NTU		Jennifer Mont KTP
0601	Fluoride	0.09	g/m³		Amit Kumar KTP
0602	Chloride	4.43	g/m³		Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³		Amit Kumar KTP
0607	Sulphate	2.40	g/m³		Amit Kumar KTP
1602	Arsenic - Acid Soluble	< 0.005	g/m³		Shanel Kumar KTP
1606	Boron - Acid Soluble	0.02	g/m³		Shanel Kumar KTP
1610	Calcium - Acid Soluble	12.4	g/m³		Shanel Kumar KTP
1615	Copper - Acid Soluble	< 0.005	g/m³		Shanel Kumar KTP
1619	Iron - Acid Soluble	1.19	g/m³		Shanel Kumar KTP
1622	Magnesium - Acid Soluble	3.27	g/m³		Shanel Kumar KTP
1623	Manganese - Acid Soluble	0.008	g/m³		Shanel Kumar KTP
1629	Potassium - Acid Soluble	1.34	g/m³		Shanel Kumar KTP
1634	Sodium - Acid Soluble	7.57	g/m³		Shanel Kumar KTP
1641	Zinc - Acid Soluble	0.011	g/m³		Shanel Kumar KTP
1642	Total Hardness	44	g CaCO3/m³		Shanel Kumar KTP
1644	Calcium Hardness	31	g CaCO3/m³		Shanel Kumar KTP
M0403	Total Coliforms	< 1	MPN/100ml		Juana Tamayo KTP
M0404	E. coli	< 1	MPN/100mL	Complies	Juana Tamayo KTP
Z9602B	Overall Compliance	NZDWS			

Comments:

Sampled by customer using ELS approved containers.

Test Methodology:

Test	Methodology	Detection Limit
pH	Dedicated pH meter following APHA Online Edition Method 4500 H.	0.1
Total (NP) Organic Carbon	Total Non-Purgeable Organic Carbon using TOC analyser. APHA Online Edition 5310B,C, ASTM D2579, D4839.	0.1 g/m³
Alkalinity - Total	APHA Online Edition Method 2320 B	1 g CaCO3/m³
Conductivity at 25°C	APHA Online Edition Method 2510 B.	0.1 mS/m
Total Dissolved Solids	Conductivity reading in mS/m x 5.5. The result by this method should be considered approximate only.	1 g/m³
Saturation Index	This result is a calculation based on APHA Online Edition Method 2330B using results from the pH, Alkalinity, Conductivity, Calcium Hardness and Temperature tests. (Note: A default temperature of 15'C is used if this is not provided). A negative value of <-1.5 indicates the water is corrosive, while a positive value of >0.5 indicates the water will form scale.	n/a

APPENDIX E. Risk Analysis

Table 65: Guidelines considered applicable to supply.

Source		
S1	**Raw water**	
S1.1	Surface and Groundwater Sources	X
S1.2	Roof Water Sources	
S2	**Development of new supplies**	
S2	Development of New Supplies	
Treatment Processes		
P1	**Source abstraction**	
P1.1	Surface Water Abstraction – Rivers, Streams and Infiltration Galleries	
P1.2	Surface Water Abstraction – Lakes and Reservoirs	
P1.3	Ground Water Abstraction – Bores and Wells	X
P1.4	Ground Water Abstraction – Springs	
P2	**Water transmission**	
P2	Treatment Processes – Water Transmission	X
P3	**Pre-treatment storage**	
P3	Treatment Processes – Pre-Treatment Storage	
P4	**Pre-treatment processes**	
P4.1	Algicide Application	
P4.2	Destratification	
P4.3	Pre-oxidation	
P4.4	Waste Liquor Reintroduction	
P5	**Coagulation/flocculation processes**	
P5.1	Conventional Coagulation/Flocculation/Sedimentation	
P5.2	Dissolved Air Flotation	
P5.3	Direct Filtration	
P6	**Filtration**	
P6.1	Rapid Sand Filtration	
P6.2	Slow Sand Filtration	
P6.3	Cartridge Filtration	
P6.4	Diatomaceous Earth Filtration	
P6.5	Membrane Filtration	
P7	**Disinfection**	
P7.1	Chlorine Disinfection (Pegasus Only)	X
P7.2	Chlorine Dioxide Disinfection	
P7.3	Ozone Disinfection	
P7.4	Ultraviolet Irradiation Disinfection	

P8	**Aesthetic property adjustment**	
P8.1	pH Adjustment	
P8.2	Iron and Manganese Removal	X
P8.3	Softening	
P8.4	Trace Organics Removal	
P9	**Fluoridation**	
P9	Fluoridation	
P10	**Pump operation**	
P10	Pump Operation	X
P11	**Plant construction and operation**	
P11	Plant Construction and Operation	X
Distribution System		
D1	**Post-treatment storage**	
D1	Post-Treatment Storage	X
D2	**Reticulation network**	
D2.1	Construction Materials	X
D2.2	System Pressure	X
D2.3	Operation	X
D2.4	Backflow Prevention	X
General Elements		
G1	Staff Training	X
G2	Monitoring	X

Risk Checklist

Pegasus Risk Checklist

MoH Potential Risk Identification (Guides)				WDC Risk Analysis	
Ref	**Event**	**Cause[1]**	**Preventative Measures**	**Initial Risk Screening:** **yes =** analyse in detail **no =** risk adequately managed	**Justification/Action**
Surface and Groundwater Sources					
S1.1.1	Source water receives discharge from, or is influenced by	Contaminated sites	**Knowledge of catchment and nautre of land.** **Source protection zones.**	No	Water obtained from deep reservoirs. Groundwater has achieved secure status. Discharge consents in the area are analysed.
S1.1.2		Domestic or industrial processes		No	
S1.1.3		Mining operations		No	
S1.1.4		Landfill site		Yes	Landfill site identified within protection zone of backup well at Chinnerys Road. Refer to WSP risk table. Chemical testing has not shown contaminants.
S1.1.5		Waste discharge to land		No	Water obtained from deep and secure aquifers. Groundwater has achieved secure status. Discharge consents in the area are analysed.
S1.1.6		**Storage of hazardous substances**		No	
S1.1.7		Septic tanks		No	
S1.1.8		Urban or industrial run-off		No	
S1.1.9		Surface impoundments		No	
S1.1.10		Effluent ponds		No	
S1.1.11		Animals and faecal matter		No	
S1.1.12		Agrichemicals		No	
S1.1.13		Irrigation		No	
S1.1.14		Forestry		No	
S1.1.15		Fertiliser		No	
S1.1.16		Waste disposal down holes or Bores		Yes	Transferred for more detailed assessment
S1.1.17		Abandoned or decommissioned wells		Yes	Transferred for more detailed assessment
S1.1.18		**Geothermal activity**		No	No evidence of geothermal activity in area.
S1.1.19		**Mineral deposits**	**Monitoring**	Yes	Manganese in source water above guideline value in standards. Risk discussed in section 11 of WSP.
S1.1.20		**Saline water**		No	Deep bores have no evidence of connection to sea water
S1.1.21		Algal bloom	Limit nutrients	No	No connection between surface activities and deep groundwater
S1.1.22		**Insufficient water**	**Abstraction does not exceed consent**	No	Redudant capacity avaliable with large number of primary wells and storage. Demand management could be utilised, or lowering reticulation pressure could be considered in an extreme event.
				-	
				-	
Groundwater Abstraction				-	
P1.3.1.1	**Not enough source water available for abstraction**	Drought	Water conservation	No	Initiate water restrictions if necessary and lower pressure in distribution
P1.3.1.2		Resource consent limitations	Consent valid till 2043, water conservation	No	Redundant capacity avaliable to serve scheme for next 20 years (approx), after this time additional wells can be brought online.
P1.3.2.1	Contamination of bore/well during construction	Cross-contamination of drilling equipment	Follow NZDS's requirements	No	Wells drilled in 1998, 2007, 2009, 2010, 2014 and subsequent testing and checks are undertaken to ensure the quality is good.
P1.3.2.2		Residual substances used in drilling	Follow NZDS's requirements	No	See above
P1.3.3.1	**Contaminated water getting into the bore/well from shallower depths**	Corrosion and cracks in bore casing	Appropriate casing material	No	Wells are new relative to expected life, and no evidence of damage. Turbidity and quality parameters are reguarly monitored.
P1.3.3.2		Drawdown bringing contaminants	Water conservation	No	Secure well heads and assessed reguarly
P1.3.4.1	**Contaminated water getting into the bore/well from the surface**	Inappropriate bore/well head design or poor construction	Follow NZDS's requirements	No	Relatively new wells built to modern standards, or recently upgraded as required prior to recent security assessments.
P1.3.4.2		Bore/well head or casing damaged	**Regular inspection, intake fenced**	No	Primary well heads protected, located on fenced Council sections, reguarly inspected.
P1.3.4.3		Contamination sources too close to the bore/well head	Construct fence	No	Well heads fenced to ensure no sources of contamination close to well heads.
P1.3.4.4		Bore/Well situated in low ground	Elevated bore/well	No	Wells not located within flood zone (based on 500 year flood mapping).
P1.3.4.5		Back - siphoning	Bore equipped with backflow prevention.	No	Backflow prevention for all wells and air gap where well water enters treatment plant
P1.3.5.1	**Contamination of the aquifer**	Stock, septic tanks, chemicals in closer proximity	Investigate vulnerabilitys and restrict activities	No	Refer to S1.1.7 and S1.1.13
P1.3.5.2		Aquifer is not secure	Restrict activities in the recharge zone	No	Deep aquifer certified as secure by age dating data
P1.3.6.1	**Too little water can be drawn from intake to meet demand**	Damage to the pump or bore/well head by animals	Regular inspection, intake fenced	No	No animals in the vicinity of the well head. Redundant wells in case of damage to an individual well.
P1.3.6.2		Catastrophic intake failure	**Inspect after earthquake/flood, alarm low flows.**	No	System has redundant wells with individual alarms
P1.3.6.3		Pump failure	**Maintenance, standby pump, alarmed**	No	System has redundant pumps with individual alarms
P1.3.6.4		Power failure	Portable generator, inspections	No	Fixed generators at headworks sites, and portable generator available for wells, and storage to meet short term power outage at wells.
P1.3.6.5		Vandalism sabotage	Fence off intake, intruder alarm	No	Wells in secure locked enclosures, in fenced sections.
P1.3.6.6		Screens damaged or clogged	**Regular inspection & cleaning of screens**	No	Screen is within deep well and protected by gravels. Water quality and flow monitoring data would show any issues if they arised. Redundant wells available in the event of an issue.
				-	
				-	
Treatment Process - Water Transmission				-	
P2.1.1	**Contamination gets into the trunk mains**	Mains breaks	**Regular inspections**	No	Modern materials used for the pipeline reduces risk of failure. The flow is measured at both ends of the network to monitor leaks. Any repairs are carried out by Council's Water Unit who are experienced and qualified to work on water mains.
P2.1.2		Air release valves entrain contaminated water or air	**Monitor demand and pressure**	No	Air release valves at well heads are above ground. Air release valves specified have ingress protection.
P2.1.3		Leaks	**Leak detection and repair programme**	No	Modern materials used for the pipeline reduces risk of failure. The flow is measured at both ends of the network to monitor leaks. Any repairs are carried out by Council's Water Unit who are experienced and qualified to work on water mains. Proactive renewal programme where critical assets are renewed prior to end of useful life.
P2.1.4		Incidental damage	Regular inspections	No	Adequate cover for trunk mains. Before-U-dig permit system for any works close to trunk mains.
P2.1.5		Poor repairs of breaks, leaks, incidental damage	Refer guides D2.3	No	Only internal trained and qualified staff undertaken repairs on water mains, following standard procedure.
P2.2.1	Sediment containing contaminants stirred up	Sediment or biofilm allowed to develop		No	The constant high velocity from the well pumps ensures biofilm doesn't develop. This was verified during construction phase of joining of schemes where the delivery main was inspected.
P2.2.2		Velocity too high		No	
P2.3.1	**Contamination gets into open channel conduits and break-pressure tanks**	Stock access to the channel and break tanks	Secure channel and tanks and control activities in the area	NA	No open channels or break pressure tanks
P2.3.2		Surface run-of and sub-surface leaching of contaminated water			
P2.3.3		Deterioration of water quality			
P2.3.4		Collapse of the channel sides			
P2.4.1	**No flow through the trunk mains**	Mains breaks	Refer guides P2.1.1	No	Storage allows adequate time to undertake repairs without a loss of supply. Maintenance contractor is on-call. There are two trunk mains (one from PW1, and one from the other wells) so that some well supply could continue if either of the supply line breaks.
				-	

Pegasus Risk Checklist

MoH Potential Risk Identification (Guides)				WDC Risk Analysis	
Ref	**Event**	**Cause[1]**	**Preventative Measures**	**Initial Risk Screening:** **yes =** analyse in detail **no =** risk adequately managed	**Justification/Action**
				-	
Treatment Processes - Iron and Manganese Removal				-	
P8.2.1.1	Not all Manganese removed	Treatment option not right for the water chemistry	Adequate treatment design	No	Plant infrastructure in good condition, trained operators, extensive trialling of methodology, dual filters, very good track record in results. Continuous monitoring of key parameters (turbidity, DO) and regular manganese checks.
P8.2.1.2		pH level is unsatisfactory for the water chemistry	Adequate treatment design	No	pH constant amoung deep wells and compatible with treatment system, regualry checked by operators. No pH correction required.
P8.2.1.3		Oxidant concentration is too low	Refer to P7.1, P7.2 or P7.3	Yes	Transferred for more detailed assessment
P8.2.1.4		Dose set-point incorrect	Calculation checks	No	DO meter to monitor correct oxygen level which can be adjusted if outside of design parameters
P8.2.1.5		Dosing controller incorrectly calibrated	Calibrate controller	No	Trained and experienced staff, regular manganese samples to verify process is functioning correctly
P8.2.1.6		Supply exhausted	Online monitoring	NA	No inputs to treatment other than air
P8.2.1.7		Dosing pump failure or dosing line blocked	Online monitoring	No	Redundancy in pumps (ie duty / standby)
P8.2.1.8		Dose controller malfunction	Routine maintenance	No	DO meter to monitor correct oxygen level which can be adjusted if outside of design parameters
P8.2.1.9		Dosing solution incorrect	Check chemicals specification	NA	No chemicals required
P8.2.1.10		Poor air circulation for droplet	Adequate treatment design	NA	No droplet in design
P8.2.1.11		Poor nozzle design in spray aerator	Adequate treatment design	No	DO meter monitors this parameter so it can be remedied if necessary
P8.2.1.12		Poor design of aerator	Adequate treatment design	No	Experienced engineers designed plant which has a succesful track record. Pilot trials proved concept prior to full scale
P8.2.1.13		Poor removal of precipitated metal by filtration	Refer to P6	No	Monitoring of sand level, and sampling to verify process. Dual filters if an issue with one of them.
P8.2.1.14		Greensand performance inadequate	Adequate treatment design	No	Filter media has proven succesful.
P8.2.1.15		Power failure	Portable generator, inspections	No	Generator on site, regular testing and maintenance
P8.2.2.1	Oxidant dose too high	See individual oxidants	Refer to P7.1 and P7.2	No	DO meter to monitor correct oxygen level which can be adjusted if outside of design parameters
P8.2.2.2		Dose rate set incorrectly	Calculation checks	No	Dose rate verified by pilot trials
P8.2.2.3		Dosing controller malfunction	Routine maintenance	No	Trained and experienced staff, regular manganese samples to verify process is functioning correctly. Dual vacuum pumps to inject oxygen.
P8.2.2.4		Dosing controller incorrectly calibrated	Calibrate controller	No	Trained and experienced staff, regular manganese samples to verify process is functioning correctly
P8.2.2.5		Dosing solution concentration too high	Controller maintenance	NA	Only air is injected
P8.2.3.1	Germs introduced during aeration	Germs introduced by airstream or animals	Secure the area against larger animals	No	Treatment housed in headworks building, not accessible by animals. Air pump rated for food grade to ensure sanitary.
P8.2.4.1	Incomplete removal of manganese	Ion-exchange resin exhausted		No	Not applicable
P8.2.4.2		Ion-exchange resin is fouled		No	Not applicable
P8.2.4.3		Channels in the ion-exchange resin bed		No	Not applicable
P8.2.5.1	Build-up of germs in the resin bed	Organic matter and micro-organism trapped		No	Not applicable
				-	
				-	
Treatment Processes - Chlorine Disinfection at Pegasus Headworks				-	
P7.1.1.1	**Not enough free available chlorine**	Dosing malfunction	**Dose pump & controller maintenance, FAC alarm**	Yes	Transferred for more detailed assessment
P7.1.1.2		Dose control sensor incorrectly calibrated	**Manual checks on calibration of FAC sensor**		
P7.1.1.3		Dose controller set point incorrect	**Manual FAC checks, calculation checks**		
P7.1.1.4		High chlorine demand & poor dose control	Monitor process to ensure FAC at all times		
P7.1.1.5		Power failure	Portable generator, inspections	No	Generator on site
P7.1.1.6		Chlorine supply exhausted	**Regular inspection of Chlroine tanks**	No	Online monitoring, and regular site visits.
P7.1.1.7		Low concentration in dosing solution	Solution kept dark, check FAC after adding solution	No	Quality control procedures & experienced operators, set-point control system would accommodate this, or would alarm if it couldn't.
P7.1.1.8		Insufficient chlorine reaching dosing point	Visual, flow meters, record any blockages	No	Trained operators, alarms to notify them of any issues with water entering reservoirs so that issues can be resolved.
P7.1.1.9		Inadequate output from chlorine booster		No	Not applicable
P7.1.1.10		FAC monitoring samples taken incorrectly	Staff training, monitoring schedule	No	Online monitoring verified by handheld meters during weekly site visits. Handheld meters calibrated externally.
P7.1.1.11		Method of FAC measurement incorrect	Staff training, record keeping	No	Online monitoring verified by handheld meters during weekly site visits. Handheld meters calibrated externally.
P7.1.1.12		pH too high	Refer to Guide 8.1	No	pH levels not adjusted, and constant with deep groundwater sources.
P7.1.2.1	Too much free available chlorine	Dosing malfunction	Dose pump & controller maintenance, FAC alarm	No	Trained operators, alarms to notify them of any issues with water entering reservoirs so that issues can be resolved.
P7.1.2.2		Dose control sensor incorrectly calibrated	Manual checks on calibration of FAC sensor	No	Online monitoring verified by handheld meters during weekly site visits. Handheld meters calibrated externally.
P7.1.2.3		Dose controller set point incorrect	Manual FAC checks, calculation checks	No	Trained operators, alarms to notify them of any issues with water entering reservoirs so that issues can be resolved.
P7.1.2.4		Low chlorine demand & poor dose control	Link dose control to FAC residual sampling point	No	Very low chlorine demand in deep secure source water
P7.1.2.5		Chlorine solution concentration too high	Check FAC when new chlorine added	No	Quality control procedures & experienced operators, set-point control system would accommodate this, or would alarm if it couldn't.
P7.1.2.6		Spillage of chlorine concentrate into dosing solution	Staff training on chemical handling	No	Quality control procedures & experienced operators, set-point control system would accommodate this, or would alarm if it couldn't.
P7.1.2.7		Chlorine overdose at a chlorine booster station		No	Not applicable
P7.1.3.1	Excessive formation of chlorination by-products	Natural organic matter in water being chlorinated	Treatment upstream to reduce organic matter	Yes	Potential risk of chlorine by-products reacting with biofilm in Woodend system. Regular flushing of Woodend mains to manage this, but some residual risk.

Pegasus Risk Checklist

MoH Potential Risk Identification (Guides)				WDC Risk Analysis	
Ref	**Event**	**Cause[1]**	**Preventative Measures**	**Initial Risk Screening: yes = analyse in detail no = risk adequately managed**	**Justification/Action**
Treatment Process - Pump Operation					
P10.1.1	**Changes in pressure, or water hammer, suck contaminants into the water**	Pump failure due to mechanical failure or overload	Maintenance & replacement programme, standby pumps, installation of water hammer reducing devices.	No	Sufficient pumps in both headworks to allow redunancy in the event of an issue. Regular inspections by operators, and maintenance as required. Pumps are alarmed which is sent to operators 24/7 if they go into fault, and standby pumps automatically start in this event. Pumps operate on VSD to maintain stable pressure.
P10.1.2		Pump failure due to no power	Check power source every 2 years, standby generator.	No	Generator at both headworks which starts automatically and portable generator for wells. Maintenance contract for generators, plus monthly checks by operators. Generators and power supplies are alarmed.
P10.1.3		Pump failures due to flooding or other damage	Design pumps above flood level, bolt pumps to plinth, protect pump from weather.	No	Pump is housed in concrete building on Plinth. No history of flooding of pumps in life of station.
P10.2.1	**Incorrect chemical dosing leads to poor treatment**	Incorrect dosing	Maintenance, calibration, standby pumps, daily checks, post treatment tank to buffer spikes.	No	For Pegasus distribution zone which is chlorinated, there is a standby pump, analyser pre and post tank which are verified reguarly and calibrated as required, analysers are connected to SCADA and alarmed if high or low residual, and there is a post treatment tank to buffer spikes.
P10.2.2		Monitoring equipment fail	Maintenance, use strainers to remove debris, check pump is fit for purpose and rate is within manufacturers recommendations.	No	No pumps required for the specific purpose of delivering water to the analyser. The analyser is located very close to the treated water line and is fed by the pressure already in the treated water line.
P10.3.1	Changes in pressure from the bore suck contaminants into the water	Failure of bore pump	Monitoring and maintenance.	No	There is sufficent source capacity and redundancy such that a bore pump failure would not lead to any change in the pressure able to be delivered to the reticulation.
				-	
				-	
Treatment Process - Plant Construction and Operation				-	
P11.1.1	**Treatment plant cannot produce water of satisfactory quality**	Poor plant design	Adequate plant design	No	Plant infrastructure in good condition, and has a good track record of producing high quality water. Designed by qualified engineers.
P11.1.2		Structural failure of part of the plant	Adequate plant design	No	Plant infrastructure in good condition. Designed by qualified engineers. Structural inspections would be undertaken following sufficiently sized seismic events.
P11.1.3		Inadequate maintenance resulting in mechanical failure	Maintenance schedule	No	Trained staff undertaking regular inspections and maintenance as required.
P11.1.4		Inadequate quality assurance systems	Quality assurance systems in place	No	Regular monitoring of performance parameters by trained staff. Performance data captured in SCADA system and on tablets to allow trending and analysis.
P11.1.5		Inadequate monitoring	Monitoring plan	No	
P11.1.6		Inadequate security measures to prevent vandalism/sabotage	Secure the plant	No	Secure plant
P11.1.7		Event affecting the source	Water monitoring	No	Deep secure wells with redundancy. Monitoring of key quality parameters.
P11.1.8		Unhygienic practices	Plant code of practice	No	Adequate maintenance procedures, trained staff. Standard operating procedures on key tasks incorporate consideration of hygiene.
P11.1.9		Inadequate labeling of chemicals	Manufacturer certification	No	Sufficient signage on site, experienced operators.
P11.1.10		Destruction by fire or explosion	Proper storage	No	Diesel in certified double skinned tank. Fire extinguishers on site. Hot works permit system in place.
P11.1.11		Lack of chemicals due to industrial action	Back-up storage	No	Sufficient storage on site for reasonably foreseeable events.
P11.1.12		Power failure	Generator strategy	No	Fixed generator available
P11.2.1	**Treatment plant cannot produce enough water**	Structural failure of part of the plant	Adequate plant design	No	Plant infrastructure in good condition. Designed by qualified engineers. Structural inspections would be undertaken following sufficiently sized seismic events.
P11.2.2		Inadequate plant design	Adequate plant design	No	Plant infrastructure in good condition, and has a good track record of producing high quality water. Designed by qualified engineers.
P11.2.3		Inadequate maintenance resulting in mechanical failure	Maintenance schedule	No	Trained staff undertaking regular inspections and maintenance as required.
P11.2.4		Inadequate security measures to prevent vandalism/sabotage	Secure the plant	No	Secure plant
P11.2.5		Destruction by fire or explosion	Proper storage	No	Diesel in certified double skinned tank. Fire extinguishers on site. Hot works permit system in place.
P11.2.6		Power failure	Generator strategy	No	Fixed generator on site, portable generator available for wells.
P11.2.7		Natural disasters	Adequate plant design	No	Seismic Design of plant by experienced and qualified engineers.
				-	
				-	
Distribution System - Post Treatment Storage				-	
D1.1.1	**Not enough water in post-treatment storage to meet demand**	Insufficient supply of raw water	Raw water storage, auxiliary source	No	6 primary wells available to ensure sufficient redundancy if any issues arise to still be able to meet demand.
D1.1.2		Insufficient water treatment capacity	Treatment capacity, WSP to limit down time	No	Treatment is for aesthetic compliance only, no treatment required for microbiological compliance. The manganese filter has the capacity for the expected demand, and there is redundancy in the filters to still provide treatment during maintenance works on any one filter.
D1.1.3		Inadequate post-treatment storage capacity	**Additional storage, water conservation**	No	Adequate storage volume, 2 reservoirs at Pegasus and 2 at Woodend.
D1.1.4		Inability to transmit water	Standby generation, pipeline inspections	No	Generators at the two headworks sites, portable generator can be used for wells. Automated checks being put in place between source and treatment plant to check for leaks or changes.
D1.1.5		Leakage from storage facility	Test water tanks for leaks	No	Tanks in excellent condition and regular inspection in place. Sealant recently replaced at Pegasus.
D1.2.1	**Introduction of contaminated material into service reservoir**	Access by animals/birds	**Covered, mesh, inspections, document condition**	No	Tanks covered, secured, and inspected reguarly by operators.
D1.2.2		Unauthorised access/ vandalism/ sabotage	**Locked fence, locked hatches, intruder alarm**	No	Locked security fencing at headworks sites, ladders requried to access top of reservoir, and access hatches are locked.
D1.2.3		Human access for sampling	**Staff training for entering tanks, chlorine residual**	No	Internal access not required for sampling.
D1.2.4		Leaching/ corrosion from construction material	**Specify material, low residual time in tanks**	No	Tanks in good condition. Scheduled full internal inspections every 5 years, as well as regular external inspections. Water is not acidic so unlikely to corrode concrete.
D1.2.5		Entry of roof drainage	**Rainwater discharge, restrict access, hatch design**	No	Tanks covered & secured. Hatches raised so do not receive runoff from roof. Sealant recently replaced at Pegasus.
D1.2.6		Entry of contaminated groundwater		No	Tanks above ground.
D1.2.7		Animal entry from upstream source	Screen source outlet	No	Groundwater sources with secure well heads.
D1.2.8		Chemical contamination from incorrect dosing	Train staff to optimise treatment, document procedures	No	Chlorine analysers both upstream and downstream of tank at Pegasus which are alarmed
D1.2.9		Backflow from drains	Air gap between tank overflow and drains	No	Air gap for overflow, valve used to isolate drain, plus non-return fitted at outlets
D1.3.1	Development, or re-suspension, of sediment within tank or reservoir	Sediment/ slime accumulation & release	Regular cleaning of reservoirs	No	Schedule to clean tanks every 5 years. High quality groundwater sources mitigate risk of contaminant / sediemnt entry. Turbidty meter at outlet of Pegasus filter prior to tanks to alert of any issues.
D1.4.1	Chlorine contact time too short	Storage tanks too small	Check hydraulics using model	No	Storage hydraulics checked by reticulation model.
D1.4.2		Short circuiting	Audit tanks for baffles, top fill bottom drain	No	Pegasus tanks are top fill bottom drain. Woodend is currently bottom filling (since filter was bypassed) however design is underway to construct new riser.

Pegasus Risk Checklist

MoH Potential Risk Identification (Guides)				WDC Risk Analysis	
Ref	**Event**	**Cause[1]**	**Preventative Measures**	**Initial Risk Screening:** **yes =** analyse in detail **no =** risk adequately managed	**Justification/Action**
				-	
				-	
Distribution System - Construction Materials				-	
D2.1.1.1	Dissolution of chemical from construction materials	Poor quality materials.	Use of approved or certified materials	No	Engineering Code of Practice to ensure suitable materials are used. Renewals programme to replace pipes at end of asset life. Majority of pipes (95%) are plastic (PE or PVC) with small proportion of AC (5%)
D2.1.1.2		Inadequate flushing of new materials.	Develop flushing protocol	No	Flushing required as part of Engineering Code of Practice requirements for new pipework. Periodic flushing scheduled on all schemes.
D2.1.1.3		Inadequate maintenance or replacement of worn materials.	Monitor the condition of assets and develop a renewal programme.	No	Renewals programme based on asset age and criticality, with more critical assets replaced before end of life. AMP shows no reticulation assets within 25% of end of useful life.
D2.1.1.4		Materials insufficiently resistant to dissolution by the water and the surrounding environment.	Ensure materials are resistant to dissolution by the water and the surrounding environment. Ensure the treatment of water minimises its ability to dissolve materials it contacts	No	Materials are specified based on ECoP requirements, and ground conditions considered as part of new designs. Water pH is non-acidic, and not at risk of dissolving pipe materials. Water quality parameters actively monitored as part of routine sampling. Pipes are in good condition.
D2.1.2.1	Germs enter the distribution system through failed construction materials	Deterioration of distribution system, leading to ingress of micro-organisms.	Routine maintenance, renewal programme, use of resistant materials	No	Engineering Code of Practice to ensure suitable materials are used. Renewals programme to replace pipes at end of asset life. Majority of pipes (95%) are plastic (PE or PVC) with small proportion of AC (5%). Renewals programme in place to proactively replace pipes, AMP shows no reticulation assets within 25% of end of useful life.
D2.1.2.2		Biofilm development sustaining pathogens	Routine maintenance, use of materials resistant to biofilm	Yes	Regular flushing in Woodend to manage biofilm (currently 3-monthly), dead-ends being eliminated to ensure circulation of water. Manganese levels significantly reduced after joining to Pegasus, so less prone to future biofilm development. Pilot trials undertaken to minimise biofilm growth.
D2.1.3.1	Entry of chemical contaminants through pipe materials	Inappropriate materials in use (predominantly occurs with plastic pipes)	Investigate the possibility of sources of organic chemical contamination in the soil before laying new plastic pipes.	No	Hazardous activities leading to ground contamination controlled by Ecan. Risk assessed as part of new asset designs as part of consideration of alignment and/or materials used.
D2.1.4.1	**No water available**	Material Failure	See D2.1.1.1, D2.1.1.3 and D2.1.1.4	No	Engineering Code of Practice to ensure suitable materials are used. Renewals programme to replace pipes at end of asset life. Majority of pipes (95%) are plastic (PE or PVC) with small proportion of AC (5%). Renewals programme in place to proactively replace pipes, AMP shows no reticulation assets within 25% of end of useful life.
				-	
				-	
Distribution System - System Pressure				-	
D2.2.1.1	**Introduction of contamination by pressure fluctuations**	Mains pressure failure or high instantaneous demand	**Model network, mains repairs, leak detection**	No	Network modelled and upgrades planned to ensure demand can be met at all times. Night flow analysis indicates an Infrastructure Leakage Index of A, indicating pipework is in good condition and leakage rates are low. Only trained and qualified staff undertake repairs, following standard procedure.
D2.2.1.2		Pipe failure or accidental penetration	**Monitor flow & reservoir levels, service targets**	No	Before-u-dig system triggers alerts to any contractor undertaking repair work, which links to GIS map of assets. Standovers for critical mains and locates initiated as required. Marker tape required through ECoP. Reservoirs alarmed when level lower than normal.
D2.2.1.3		Unpredicted event such as major fire	Check air valves, locate reservoirs to minimise impact	No	Schemes designed to provide fire flows while still maintaining pressure, and this is verified by reticulation models. Air valve inspections are scheduled through new AMIS system.
D2.2.1.4		Failure of network pumps	**Standby pump, backup generator, pump maintenance**	No	Standby pumps, generators at both headworks, regular inspections conducted by operators. Alarms for any faults.
D2.2.1.5		Failure of bore pumps	**Bore performance, preventative maintenance**	NA	Bore pumps not directly linked to reticulation.
D2.2.2.1	Resuspension of sediment or biofilm within the mains by pressure fluctuation	Sediment or biofilm allowed to develop		Yes	Regular flushing in Woodend to manage biofilm (currently 3-monthly), dead-ends being eliminated to ensure circulation of water. Manganese levels significantly reduced after joining to Pegasus, so less prone to future biofilm development. Pilot trials undertaken to minimise biofilm growth.
D2.2.2.2		Significant fluctuations in reticulation pressure		No	Reticulation pumps on variable speed drives to maintain pressure and minimise risk of fluctuations.
				-	
				-	
Distribution System - Operation				-	
D2.3.1.1	**Introduction of contaminating material into the distribution system**	Breaks, leaks, incidental damage to water mains	Refer guides P2 & D2.2	No	Before-u-dig system triggers alerts to any contractor undertaking repair work, which links to GIS map of assets. Standovers for critical mains and locates initiated as required. Marker tape required through ECoP. Reservoirs alarmed when level lower than normal. Pipes not yet at end of useful life and renewed proactively, so rate of breaks is low. Water Unit have SoP for repairing pipes and managing contamination risk.
D2.3.1.2		Affected area not correctly isolated	Network plans, service valves, staff training,	No	GIS map available on tablets which reticulation staff have available in the field, maintenance staff are internal, experienced and qualified, and have good knowledge of systems. Isolaton valves installed in accordance with ECoP to minimise the number of valves required per shutdown. A valve maintenance programme is scheduled for all criticality A or B valves.
D2.3.1.3		System pressure drop	**Backflow prevention, ID low pressure areas & extremities**	Yes	Scheme doesn't have hills, pressure well understood by reticulation model. Backflow prevention policy is in place to mitigate this risk. See WSP for more detail.
D2.3.1.4		Flow direction in affected area unknown	Determine flow direction	No	Good understanding of network supported by model. Experienced maintenance staff who are employed by Council and have good local knowledge and experience. Staff have information available on tablets in the field to determine flow direction if any uncertainty.
D2.3.1.5		Standard hygiene practices not adopted	**Work practices comply with standard procedures**	No	Standard procedures developed for all key maintenance tasks, which include reference to hygiene requirements. Staff who work on water supplies are qualified to do so, and specialise in this work.
D2.3.1.6		Inadequate staff training	**Staff training**	No	Only internal and qualified staff undertake work on reticulation system. This is their core work, and they are very experienced in work of this nature.
D2.3.1.7		Inappropriate materials used	Certified materials	No	Only certified materials used which comply with relevant Australian / New Zealand standards and Council's Engineering Code of Practice, and the contract specifications where relevant.
D2.3.1.8		Inadequate flushing & disinfection practices	**CoP for cleaning & disinfection, chlorine residual**	No	All new mains are sterilised and flushed before being brought online as per ECoP requirements. This is always overseen by an appropriately qualified and experienced engineer, and signed off before being brought online. A standard form has been developed to ensure all checks are completed before connection is made. For repairs, Water Unit staff follow sterilisation requriements as detailed in standard procedure (chlorine spray etc).
D2.3.1.9		Unsuitable temporary bypass	Dedicated water supply equipment, chlorine residual	NA	Bypasses are not required as part of repair process as systems are ring fed, so can be adequately isolated during any repairs. If a temporary feed is used during the installation of a new main (ie for water main renewal) this is only done by internal qualified staff using new pipework etc dedicated this task).
D2.3.1.10		Contamination during sampling	Sampling locations reduce risk of introduction	No	Only trained and qualified operators & appropriate and dedicated sampling locations which are protected from contaminants.
D2.3.1.11		Unsatisfactory location of water pipes	Proximity to sewer, contaminated sites	No	Water and sewer mains are constructed in accordance with Engineering Code of Practice requriements, which have minimum separation and cover requriements. All designs are reviewed and accpeted by appropriately qualified Council staff before acceptance. Checks for contaminated sites are considered as part of design process.
D2.3.1.12		Cross connections	Inspect system, qualified personnel	Yes	All new connections are requried to be approved by Council and either constructed or overseen by Council's Water Unit. Backflow prevention is considered as part of each new connection, in accordance with Council's Policy. Policy is being retrospectively implemented for all pre-existing connections to mitigate this risk.

Pegasus Risk Checklist

MoH Potential Risk Identification (Guides)				WDC Risk Analysis	
Ref	**Event**	**Cause[1]**	**Preventative Measures**	**Initial Risk Screening:** **yes =** analyse in detail **no =** risk adequately managed	**Justification/Action**
D2.3.2.1	Re-suspension of contaminants in sediments in the distribution system	Sediment or biofilm allowed to develop	Treatment to remove manganese forming minerals Regular cleaning and flushing programme	No	Regular flushing in Woodend to manage biofilm (currently 3-monthly), dead-ends being eliminated to ensure circulation of water. Manganese levels significantly reduced after joining to Pegasus, so less prone to future biofilm development. Pilot trials undertaken to minimise biofilm growth.
D2.3.2.2		Water velocity too high	Controlled valve & pump operation, pipe design	No	Distribution network design confirmed by modelling to ensure velocities not excessive, by ensuring pipe sizes adequate for demand. Regular flushing ensures high velocity events occur in controlled manner. Pumps are all on variable speed drives to ensure no excessive fluctuations, and multiple pumps with redundancy place.
D2.3.3.1	Development of sediment or biofilm	Poor chemical water quality leaving treatment plant	Optimise treatment, regular flushing / cleaning	No	Filter performance very good after changing to Pegasus filter and abandoning Woodend filter. Quality of water minotired frequently to ensure continued good performance. Turbidity monitored at plant and is reliable with high quality secure source wells.
D2.3.3.2		Poor microbiological water quality leaving plant	FAC, regular flushing / cleaning	No	Microbiological quality at treatment plant has a very good track record with high quality source water, turbidity monitored at plant, and filter and reservoirs are secured from contaminant entry and inspected reguarly.
D2.3.3.3		Water flows too low resulting in decay of chlorine	Review zones, good design to ensure flows	No	Adequate water flows confirmed by modelling. Rings mains designed as standard practice to ensure water circulates, small number of existing dead ends are being eliminated through renewals / upgrades.
D2.3.3.4		Poor repair practices allowing colonisation	Refer D2.3.1.5 & D2.3.1.8	No	Refer to D2.3.1.5 (Hygiene) & D2.3.1.8 (Flushing)
D2.3.3.5		Inadequate cleaning programme	Regular cleaning / flushing, ID low flows & dead ends	No	Refer to D2.3.1.8 (Flushing & Disinfection) and D2.3.2.1 (Sediment and Biofilm).
D2.3.4.1		Insufficient water available from the source/plant	Refer P1	No	Refer to source water abstraction (P1.3)
D2.3.4.2	**Failure to maintain sufficient water pressure**	Leaks in reticulation	Refer P2	No	Leakage rate relatively low, and plant has adequate surplus capacity to cater for demand while maintaining pressure. There is sufficient redundancy in pumps.
D2.3.4.3		Transmission pump failure	Refer P10	No	Sufficient redundancy in transmission pumps (ie standby pump available).
				-	
				-	
Distribution System - Backflow Prevention				-	
D2.4.1.1	Water pressure in the distribution system lower than pressure in supplied premises	A pressure drop in the reticulation system	**Install approved backflow device, inspect & test devices**	Yes	Refer D2.3.1.3.
D2.4.1.2		An elevated pressure in the premise above system		No	System elevation is flat so unlikely to have pressures higher than those supplied. Backflow prevention policy mitigates this risk if there were any relevant cases.
D2.4.2.1	**No, inadequate, faulty, or incorrectly installed backflow prevention device**	Backflow prevention device connected improperly		No	Backflow preventers either installed by the Council's Water Unit who are suitably qualified, or by a suitably qualified plumber. After installation they are tested and certified annually to confirm continued satisfactory performance.
D2.4.2.2		Illegal cross connection to the reticulation system	Annual inspection & test, qualified connection work	No	All new connections are requried to be approved by Council and either constructed or overseen by Council's Water Unit. Backflow prevention is considered as part of each new connection, in accordance with Council's Policy. Policy is being retrospectively implemented for all pre-existing connections to mitigate this risk.
D2.4.2.3		Fail safe backflow device removed	Spare parts policy	No	Annual inspection and testing by Council's Water Unit. Backflow preventer types are being standardised to ensure parts are easily accesible. Common sizes are readily available.
D2.4.2.4		No backflow device installed	Annual inspection & testing	Yes	Backflow surveys are required on all commercial properties to identify risk level, in accordance with Council's Backflow Prevention Policy. Steps are then put in place to ensure appropriate device is installed.
D2.4.2.5		Failure of backflow device	Annual inspection & testing	No	Annual testing and inspection by Council's Water Unit. Issues are then either rectified by the Water Unit, or the property owner if identified.
D2.4.2.6		Vandalism or accidental damage	Lockable enclosure for backflow device	No	Backflow preventers either in toby box to protect from damage / interference for medium hazard sites, or within above ground box for high hazard (RPZs). Annual inspections / testing would identify any issues. Boxes are lockable, and locks provided for sites where there is perceived to be risk.
				-	
				-	
General - Monitoring				-	
G2.1.1	**Incorrect water quality data used for supply management**	Inappropriate / incorrect sampling	**Prepare a sampling plan, frequency, location, procedure**	No	Comprehensize sampling plan, daily checks that correct samples are taken, only trained internal staff take samples and process in accredited laboratory.
G2.1.2		Inadequate / incorrect test equipment or uncalibrated	**Routine equipment maintenance & calibration**	No	Council operators and samplers are appropriately trained and qualified. Laboratory is accredited to ensure correct QA is in place. Handheld instrumentation is required to be externally calibrated as per recommended frequncies.
G2.1.3		Inadequate reagents	**Reagent shelf life & storage, cross check quality**	No	Trained and qualified staff operate laboratory which is IANZ accredited.
G2.1.4		Inappropriate method or incorrect calibration	**Staff training, calibration method**	No	Trained and qualified staff maintain equipment. Manuals of equipment are followed. Equipment is standardised where possible to ensure consistent methodology.
G2.1.5		Inadequate monitoring records	**Audit records, staff training**	No	Records are kept on tablet based system which is available to 3 Waters staff for oversight, and linked to asset database for sound record keeping. Duplicate records, both in tablets from handheld devices plus in SCADA for continous monitoring, which can be used to cross check each other accuracy.
G2.1.6		Failure of staff to follow analytical methods	**Split sample for independent analysis**	No	Water quality parameters are checked by different staff members which verifies the accuracy and reliability of data received (i.e key parameters measured both as part of routing sampleing, and operator checks).
G2.1.7		Use of non MoH approved laboratory	Consult Register of Approved Laboratories	No	Only accredited and reputable laboratories are used.
				-	
				-	
General - Staff Training				-	
G1.1.1	Introduction of microbiological, & inadequate inactivation or removal	Inadequate training	**Prepare a sampling plan, frequency, location, procedure**	No	Water supplies are managed by the Council's Water Unit, who ensure staff undertake appropriate training. Standard procedures developed for core tasks to ensure correct systems followed.
G2.1.2	Introduction of chemical, & inadequate inactivation or removal	Inadequate training	**Routine equipment maintenance & calibration**	No	
Notes					
1	*Events in blue text indicate highest risk as defined by MoH Guides*				

Element	Ref	Risk Event	Potential Cause	Hazard	Consequence	Likelihood	Risk	Rational
Groundwater Source and Abstraction	S1.1.4	Source water receives discharge from or is influenced by	Landfill Site	Microbial and Chemical Determinands	Moderate	Very Rare	L	Full chemical testing of Chinnerys Road Well has not shown signs of influence from the landfill site. There are multiple sources for the supply and and redudant capacity avaliable, therefore this emergency well is very likely to be used. If influence were to occur, scheme is able to cope with just primary wells therefore consequence is minor.
	S.1.1.16	Source water receives discharge from, or is influenced by	Waste disposal down holes or bores	Microbial and Chemical Determinands	Insignificant	Very Rare	L	Modern bores are required to have backflow prevention in place. No evidence has been found of contaminants from these activities affecting source based on record of no E.coli within raw source water. Full chemical tests have not shown any evidence of this activity occuring with a connection to the source wells. Consequence is considered insignficant as the hazard is likely to be diluted within the aquifer, and treated through filtration provided by gravels in aquifer prior to abstraction. Consequence deemed to be insignificant, due to treatment process provided by aquifer, and verification by track record of sources.
	S.1.1.17		Abandoned or decommissioned wells	Microbial and Chemical Determinands	Insignificant	Very Rare	L	
	S.1.1.19	Source water in contact with mineral deposits	Mineral deposits in catchment	Chemical (manganese)	Insignificant	Almost Certain	M	Manganese and iron removal process in place, therefore while it is known there are mineral desposits the consequence is insigificant, as there is a suitable treatment process in place.
Treatment	P8.2.1.3	Not all managese removed	Oxidant concentration is too low	Managense	Minor	Unlikely	L	Manganese is an aesthetic determinand only. Raw water managese is below MAV
	P7.1.1.1	Not enough free available chlorine	Dosing malfunction	Bacteria & Viruses	Insignificant	Unlikely	L	Chlorine is not used for complaince. Secure source ensures bacteria and viruses are not within the source water. Additionally, FAC is alarmed and the Pegasus reservoir would buffer low chlorine untill operators can fix the issue.
	P7.1.1.2		Dose control sensor incorrectly calibrated	Bacteria & Viruses	Insignificant	Unlikely	L	
	P7.1.1.3		Dose controller set point incorrect	Bacteria & Viruses	Insignificant	Unlikely	L	
	P7.1.1.4		High chlorine demand & poor dose control	Bacteria & Viruses	Insignificant	Unlikely	L	
	P7.1.3.1	Excessive formation of chlorination by-products	Natural organic matter in water being chlorinated	Disinfection by-products	Moderate	Unlikely	M	If chlorination was to begin in Woodend, the chlorine would likely react with the manganese biofilm. It is expected that this would cause widespread aesthetic issues (ie moderate event). This is considered unlikely, as this is not usually in place and would only be used in the event that the microbiological risk was deemed to outweight the risk of byproducts and aesthetic issues.
	D2.1.2.2	Germs enter the distribution system through failed construction materials	Biofilm development sustaining pathogens	Microbial Determinands	Major	Very Rare	L	Regular flushing in Woodend to manage biofilm (currently 3-monthly), dead-ends being eliminated to ensure circulation of water. Manganese levels significantly reduced after joining to Pegasus, so less prone to future biofilm development. Pilot trials undertaken to minimise biofilm growth. While contamination has been found in the reticulation, the source of this has been the plant. When the issues in the plant were resolved, the contaminants were no longer found (verifying that this issue did not eventuate in reality during the previous event).

Storage & Distribution System	D2.2.2.1	Resuspension of sediment or biofilm within the mains by pressure fluctuation	Sediment or biofilm allowed to develop	Chemical Determinands. Colour & turbidity.	Minor	Unlikely	L	As above & Pumps operate on VSD to control pressure fluxulations in the distribution. Very unlikely that resusption. Consequence Minor, as only aesthetic issues would arise from re-suspension of biofilm.
	D2.3.1.3	Introduction of contaminating material into the distribution system	System pressure drop	Microbial and Chemical Determinands	Major	Very Rare	L	Distribution is split into two zones and any contamintion within the distribution would effect part of the supply. Event would likely be transient in nature, limiting the number of people and concentration of contaminants which in turn limits the consequence. Pressure is maintained through each of the headworks, which have multiple pumps, generators, VSDs and alarms, so pressure drop very unlikely. Pipes are in good condition with low leakage, and combined with the unlikely nature of a pressure drop, the likelihood of a pressure drop causing contaminants to be drawn in is lower still. This is verified by track record of schemes with no events attributed to this cause.
	D2.3.1.12		Cross connections	Microbial and Chemical Determinands	Major	Very Rare	L	All new connections are required to be approved by Council and either constructed or overseen by Council's Water Unit. Backflow prevention is considered as part of each new connection, in accordance with Council's Policy. Policy is being implemented for all pre-existing connections to mitigate this risk.
	D2.4.1.1	Water pressure in the distribution system lower than pressure in supplied premises	A pressure drop in the reticulation system	No Supply	Minor	Unlikely	L	Pumps are VSD controlled and wll ramp up to meet pressure if demand increases. There is redundancy in pumps, and generators available to ensure that supply is maintained.
	D2.4.2.4	No, inadequate, faulty, or incorrectly installed backflow prevention device	No backflow prevention device installed	Microbial and Chemical Determinands	Major	Very Rare	L	All new connections are required to be approved by Council and either constructed or overseen by Council's Water Unit. Backflow prevention is considered as part of each new connection, in accordance with Council's Policy. Policy is being implemented for all pre-existing connections to mitigate this risk. Consequence of event occuring is likely to be transient, and limited to a sub-part of the population. The event would likely have to conicide with another event (complete loss of pressure for example), which limits the likelihood. This is verified by the track record of the scheme in which there is no record of an event of this nature occuring.

APPENDIX F. Bacteria Testing For E.coli and Total Coliforms (WDC & DWSNZ)

WAIMAKARIRI DISTRICT COUNCIL

WATER QUALITY TESTING

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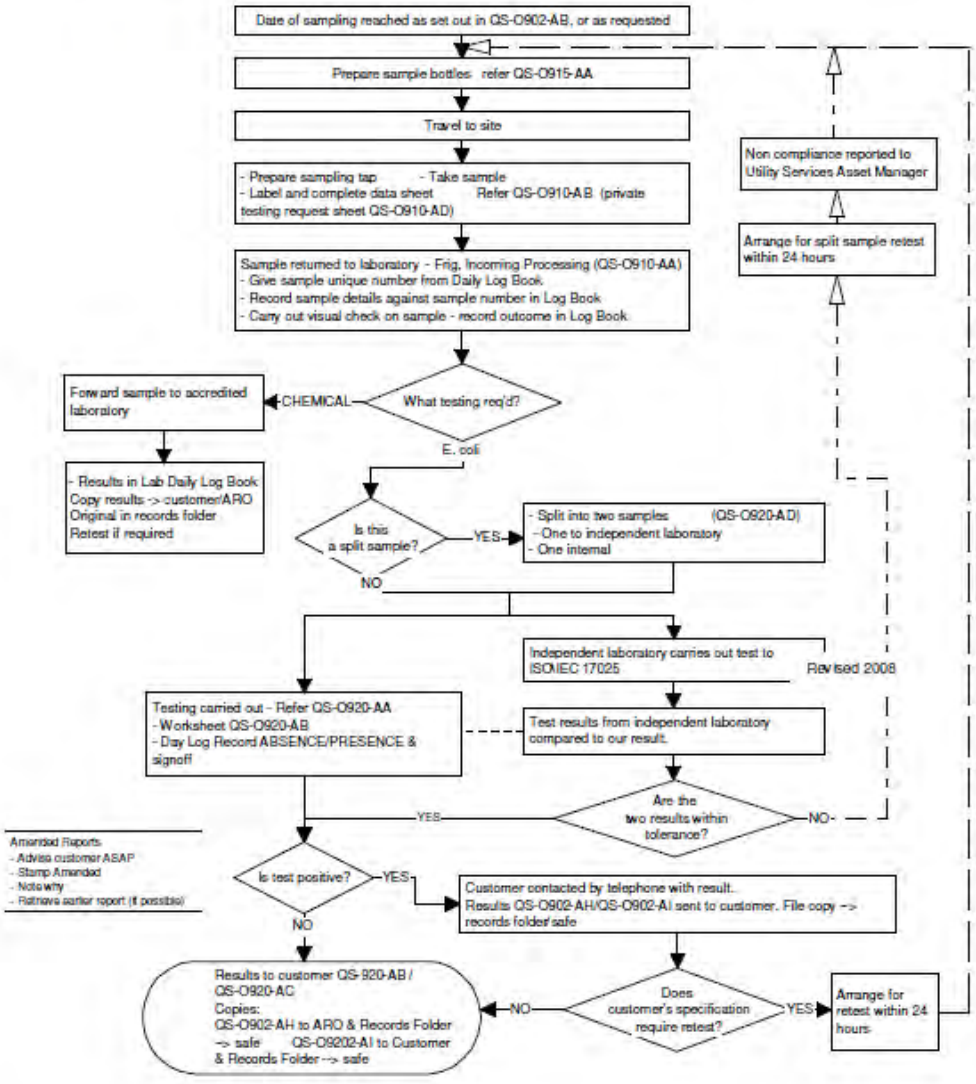
LABORATORY TESTING OF DRINKING WATER

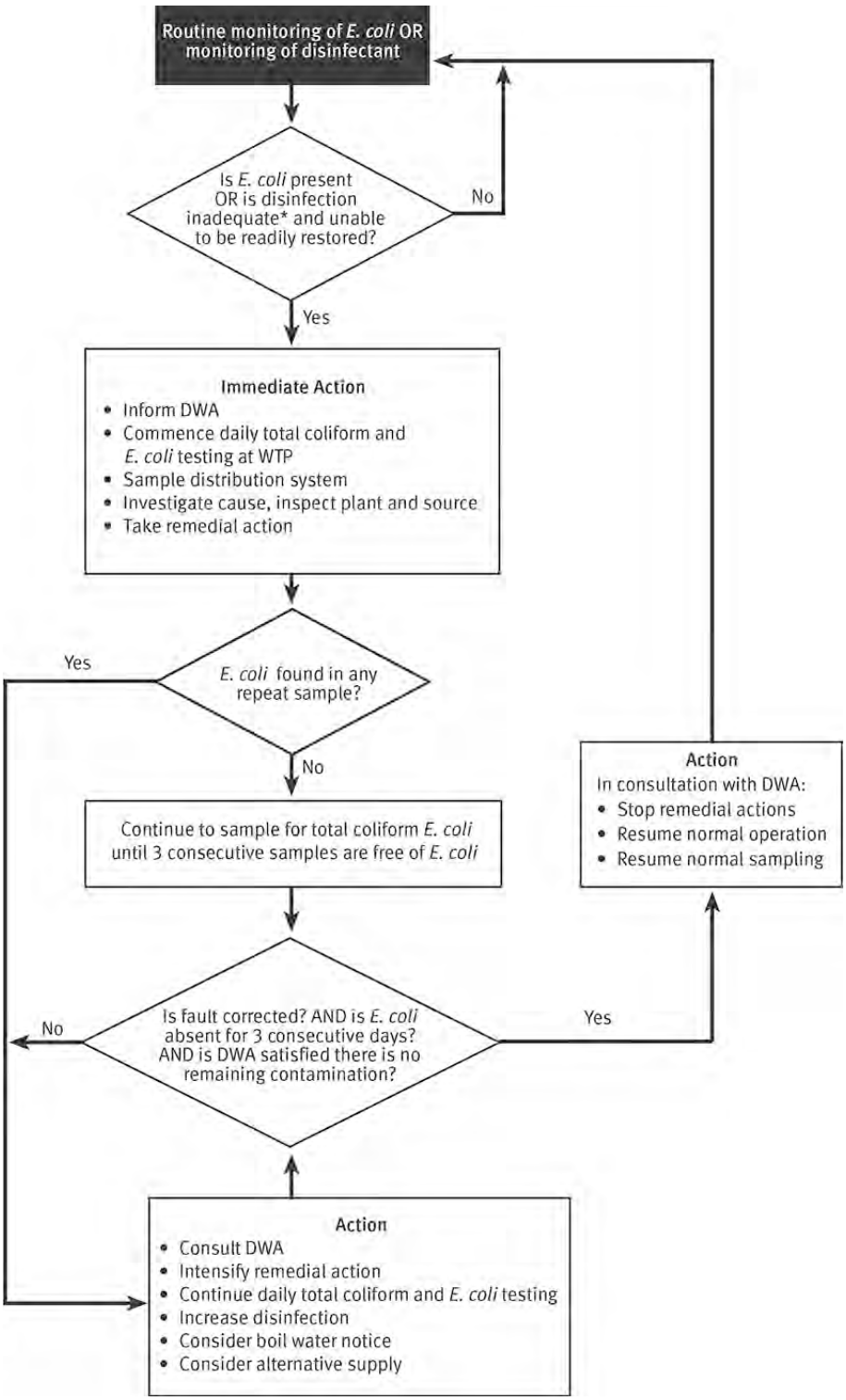
9. Bacteriological Testing for E. coli and Klebsiella (total coliforms)



9.1 Unexpected results – retest.

120727047987

Figure 4.1: Response to a transgression in drinking-water leaving the treatment plant

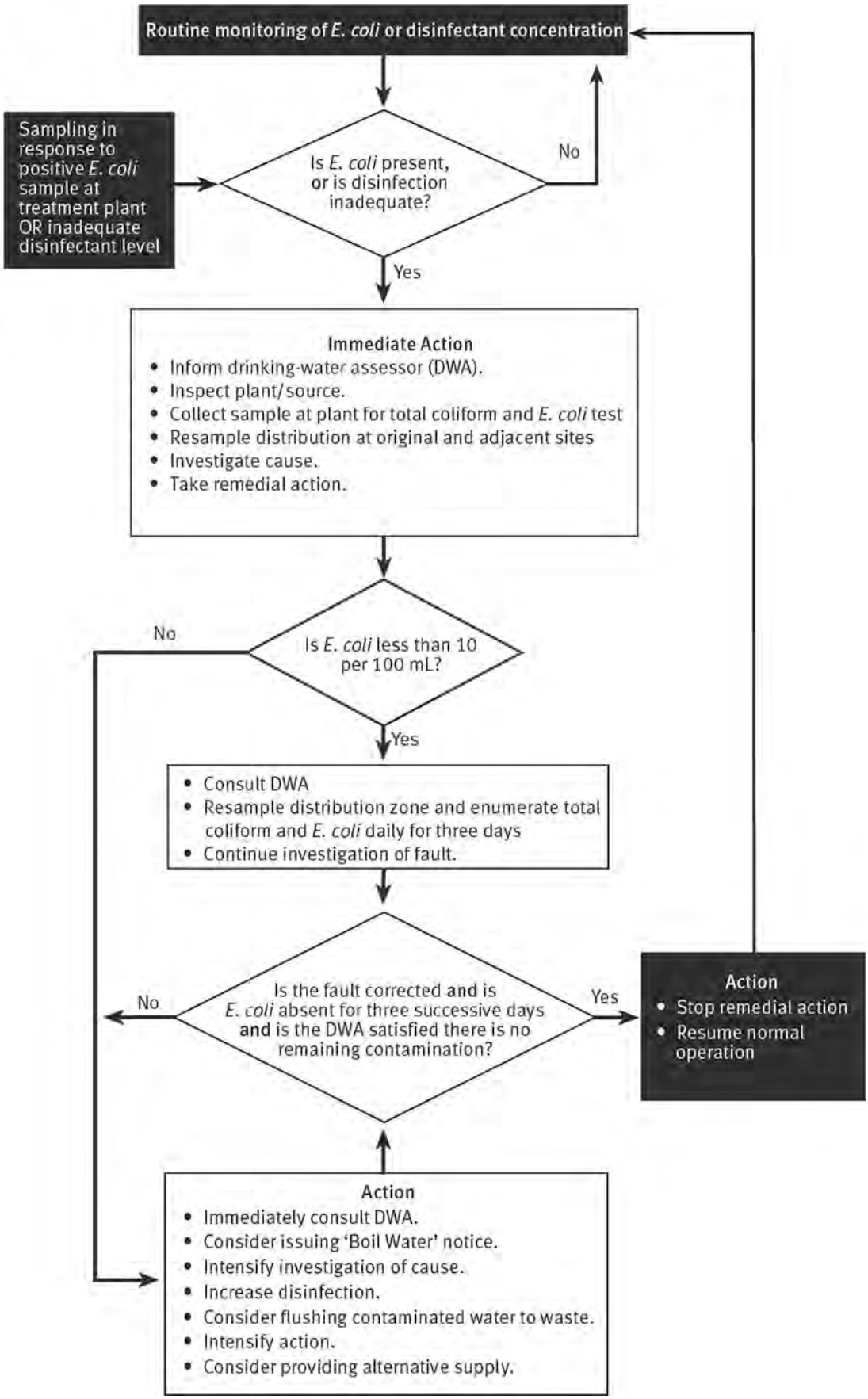


Notes:

* Inadequate disinfection occurs in the following situations.

- For FACE and chlorine dioxide (criteria 2A, 2B and 3): when the residual in the water leaving the plant is less than 0.20 mg/L for more than an hour or falls below 0.10 mg/L.
- Ozone (criterion 4): when the ozone C.t value is not achieved.
- UV (criterion 5): when the target UV dose or intensity is not achieved.
- When turbidity or UV transmittance are outside the compliance criteria.

Figure 4.2: Response to a transgression in a drinking-water supply distribution zone



APPENDIX G. Critical Control Point Plan

Critical Control Point Process Summary
Woodend Pegasus Water Supply [v2]

A Critical Control Point (CCP) is a point, step or procedure at which controls can be applied and a water safety hazard can be prevented, eliminated or reduced to an acceptable level.

Pegasus Headworks

The Pegasus Woodend water supply abstracts secure bore water from the Equestrian wells (EQ1, EQ2 and EQ3), PW1 well on Pegasus Boulevard and Gladstone Road Wells 1 and 2. Under normal circumstances no disinfection process is required for this system for compliance with the Drinking-water Standards for New Zealand, however for the Pegasus water, chlorine is injected downstream of a biological manganese removal filter to provide an additional barrier to contamination and to mitigate the risk of biofilm growth within the reticulation.

There is one critical control point relating to the Pegasus water supply at this site.

Critical Control Points:

- CCP-02 Permanent Chlorination (Secure Source)

There are no critical control points relating to the primary Woodend Township water supply where controls can be applied.

Chinnerys Road Headworks (Back-up Headworks)

In an emergency, the Chinnerys Road Headworks can abstract secure bore water from the Gladstone Park wells (1 and 2) and the Pegasus Equestrian Wells (EQ1, 2 and 3) to supply the Woodend Reticulation Network. Under normal circumstances, no disinfection process is used and untreated water is distributed to consumers. In this situation, there are no critical control points within the supply system where controls can be applied. However, chlorine dosing equipment is installed at this site and would be used in an emergency event or if the Chinnerys Road well is operated (to supply directly to the reservoir).

There is a back-up biological filter at the headworks for manganese removal (aesthetic). This is not considered to be a Critical Control Point as this relates to the water meeting the aesthetic requirements of the Drinking-water Standards for New Zealand only (i.e. does not affect the safety of the water).

Provision is made at the supply headworks to operate a disinfection process (chlorination) when the Chinnerys Road back-up source is operational. When this is operational there is one of two critical control point.

Critical Control Points:

- CCP-01 Stand-by Chlorination (Non-Secure Source)
- CCP-01 Stand-by Chlorination (Secure Source)

CCP-02 Permanent Chlorination (Secure Source)

Sodium hypochlorite dosing is set-point controlled to achieve a target concentration.

Process Objectives:

i. Provide a **primary disinfection critical control point** to inactivate bacterial, viral and some protozoan pathogens that may have entered the water supply system upstream of the dosing point, and
ii. Provide **residual disinfection quality control point** to help inactivate pathogens entering downstream of the dosing point.

Operational day-to-day monitoring of control process	
What	Chlorine residual (FAC) in mg/L
When	Continuous, on-line & Manual check by operators when on site
Where	Continuous data from chlorine analyser located in headworks building Manual samples from post reservoir sample tap
How	Manual data from operators hand-held chlorine analyser Continuous data from chlorine analyser connected to SCADA
Who	WDC operator records manual readings via tablet when visiting site WDC operator(s) alerted via mobile phone when result is outside of target range
Records	All data are recorded digitally to the Council SCADA system, and accessible to Council staff and Operators using the Datran software The manual data is stored in TechOne via tablets for manual readings

Sites: Pegasus Headworks		
CCP-02: Permanent Chlorination (Secure Source)		
Process performance criteria at the operational monitoring point.		***Correction required if performance criteria are not met.***
Target Range	FAC 0.2 - 0.8 mg/L Target = 0.4 mg/L	**Operator** to check accuracy of reading with handheld instrument during routine operational checks and adjust dosing system as necessary to achieve target range.
Action Limits	FAC <0.2 mg/L (15 min duration) FAC >0.8 mg/L (15 min duration)	**Duty Operator** to attend site, **check accuracy of reading with handheld instrument** and resolve by trying the following tasks in order to achieve target range: - **Check for faults with dose pump.** - **Check for faults with line to analyser.** - **Calibrate analyser.** - **Replace dose pump with spare if faulty.** - **Adjust dose rate if incorrect rate.**
Critical Limits	FAC <0.1 mg/L (15 min duration) FAC >1.6 mg/L (15 min duration)	**Duty Operator to:** - **If dosing pump still not dosing sufficient chlorine pre reservoir:** o **Shut down well pumps** and operate supply from storage until problem rectified and parameters return within critical limits. - **If dosing into reservoir is now functioning, but lower chlorine water going out of reservoirs:** o **Increase dose rate** into reservoirs manually to compensate for lower chlorine water, then return to normal operation. - **If high chlorine water leaving reservoir,** turn off chlorine dose pump and consider flushing system to clear high chlorine water. **Duty Operator** to notify **Duty Supervisor** and discuss additional measures to identify and rectify fault / provide assistance if required**.** **Duty Supervisor** to notify **Water Asset Manager / Water Operations Team Leader.** **Water Asset Manager** not required to notify **DWA** if inadequately disinfected water needs to be supplied or has been supplied (as source is secure).#

#Chlorination at the Pegasus headworks, when in normal operation, is not required for compliance of the scheme but just to provide an additional barrier to contamination and to mitigate the risk of biofilm growth within the reticulation.

<0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	>1.6
Critical	Action		Target Range						Action								Critical

Figure 17: Summary of target, action and critical range (chlorine level, mg/L)

CCP-01 Stand-by Chlorination (Secure Source)

Sodium hypochlorite dosing is flow controlled to achieve a target concentration.

Process Objectives:

iii. Provide a **primary disinfection critical control point** to inactivate bacterial, viral and some protozoan pathogens that may have entered the water supply system upstream of the dosing point, and

iv. Provide **residual disinfection quality control point** to help inactivate pathogens entering downstream of dosing point.

Operational day-to-day monitoring of control process	
What	Chlorine residual (FAC) in mg/L
When	Continuous, on-line (when process is operational) & Manual check by operators when on site
Where	Continuous data from chlorine analyser located in headwork buildings Manual samples from treated water sample tap in treatment building
How	Continuous data from chlorine analyser connected to SCADA Manual data from operators hand-held chlorine analyser
Who	WDC operator records manual readings in site log book when visiting site WDC operator(s) alerted via mobile phone when result is outside of target range
Records	All data are recorded digitally to the Council SCADA system, and accessible to Council staff and Operators using the Datran software The manual data is stored in TechOne via tablets for manual readings

Sites: Chinnerys Road Headworks supplied by Gladstone Park Wells		
CCP-01: Stand-by Chlorination (Secure Source)		
Process performance criteria at the operational monitoring point.		***Correction required if performance criteria are not met.***
Target Range	FAC 0.6 - 1.2 mg/L Target = 0.8 mg/L	**Operator** to check accuracy of reading with handheld instrument during routine operational checks and adjust dosing system as necessary to achieve target range.
Action Limits	FAC <0.6 mg/L (15 min duration) FAC >1.2 mg/L (15 min duration)	**Duty Operator** to attend site, **check accuracy of reading with handheld instrument** and resolve by trying the following tasks in order to achieve target range: - **Check for faults with dose pump.** - **Check for faults with line to analyser.** - **Calibrate analyser.** - **Replace dose pump with spare if faulty.** - **Adjust dose rate if incorrect rate.**
Critical Limits	FAC <0.4 mg/L (15 min duration) FAC >1.6 mg/L (15 min duration)	**Duty Operator to shut down well pump** and operate supply from storage until problem rectified and parameters return within critical limits. **Duty Operator** to notify **Duty Supervisor** and discuss additional measures to identify and rectify fault / provide assistance if required. **Duty Supervisor** to notify **Water Asset Manager / Water Operations Team Leader** and consider additional interventions (shock dosing reservoirs) if risk of running out of water or non-chlorinated water being sent out before problem rectified. **Water Asset Manager** to notify **DWA** if inadequately disinfected water needs to be supplied or has been supplied. **Water Asset Manager** in consultation with **DWA**, considers the need to **issue a boil water notice.** #

#Need for boil water notice depends on reason for implementing chlorination as it would not normally be required to be added.

<0.4	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	>1.6
Critical	Action			Target Range						Action				Critical

Figure 18: Summary of target, action and critical range (chlorine level, mg/L)

Sites: Chinnerys Road – Chinnerys Road Well Operation		
CCP-01: Stand-by Chlorination (Non-Secure Source)		
Process performance criteria at the operational monitoring point.		***Correction required if performance criteria are not met.***
Target Range	FAC 0.6 - 1.2 mg/L Target = 1.0 mg/L	**Operator** to check accuracy of reading with handheld instrument during routine operational checks and adjust dosing system as necessary to achieve target range.
Action Limits	FAC <0.6 mg/L (15 min duration) FAC >1.2 mg/L (15 min duration)	**Duty Operator** to attend site, **check accuracy of reading with handheld instrument** and resolve by trying the following tasks in order to achieve target range: - **Check for faults with dose pump.** - **Check for faults with line to analyser.** - **Calibrate analyser.** - **Replace dose pump with spare if faulty.** - **Adjust dose rate if incorrect rate.**
Critical Limits	FAC <0.4 mg/L (15 min duration) FAC >1.6 mg/L (15 min duration)	**Duty Operator to shut down well pump** and operate supply from storage until problem rectified and parameters return within critical limits. **Duty Operator** to notify **Duty Supervisor** and discuss additional measures to identify and rectify fault / provide assistance if required. **Duty Supervisor** to notify **Water Asset Manager / Water Operations Team Leader** and consider additional interventions (shock dosing reservoirs) if risk of running out of water or non-chlorinated water being sent out before problem rectified. **Water Asset Manager** to notify **DWA** if inadequately disinfected water needs to be supplied or has been supplied. **Water Asset Manager** in consultation with **DWA**, considers the need to **issue a boil water notice.**

<0.4	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	>1.6
Critical	Action			Target Range						Action				Critical

Figure 19: Summary of target, action and critical range (chlorine level, mg/L)

APPENDIX H. Service Requests

Full Details	Primary Address	Received On	Resolution
Water - No Supply - Private- New connection made but no water coming through. Called through to WU	5 Copper Beech Road, WOODEND	8/10/2018 2:19:49 PM	No water. Connection no hole in 63 main. Dug out lateral drill hole in main
Water - No Supply - water pressure went low about 30 minutes ago and now no water. Called cheryl at WU to advise. Please call Jasmine back on 039203304.	8 Mapleham Drive, PEGASUS	10/10/2018 3:20:47 PM	techs were working in area and valves shown on waimap are wrong, therefore a valve had been shut off turning the water off incorrectly. This was rectified as soon as advised of no water
Water - No Supply - Water out all day - caller Scott 02108887702	14 Woodend Beach Road, WOODEND	23/10/2018 11:58:22 AM	no work done owner called back saying water back on
Water - No Supply - has no water - please call	33 Taranaki Drive, WOODEND	22/10/2018 8:06:13 PM	was called out to woodend, then owner called back saying problem was fixed
Water - No Supply - no water at the property. Called the Water Unit and spoke with Phil. Please call Deidre back once resolved to advise what had happened as she does not live at the property	9 Copper Beech Road, WOODEND	29/11/2018 10:26:00 AM	spoke to owner. restrictor is working and flow pressure is correct. advised to contact plumber to check private side from restictor to tank
Water - No Supply - Preschool has no water, They realise they are flushing the pipes - But they have no water - Please can you contact Sue 03 3122179.	6 Judsons Road, WOODEND	9/01/2019 9:25:13 AM	water lost due to flushing of hydrants in area. water back on when Arch called into preschool to check.
Water - No Supply - Caller advised that he has had no water since 10.30am. ***I called WU and advised Cheryl. ***13.02.19 1.49pm Owen called back and advised they have Water now, Turned off at the mains. Please cancel the request. JW	28 Taranaki Drive, WOODEND	13/02/2019 1:34:38 PM	tunrned off at mains
Water - No Supply Filter was blocked and Allan has cleaned out. the They now need a quick fill please. He said that he also noted that there is a leak at the flush point. I mentioned the charge but he mentioned that it was our filter that was blocked.	390 Tuahiwi Road, TUAHIWI	21/02/2019 10:41:34 AM	No water. Return quickfill
Water - No Supply - Tank empty last night, No water, Got some water from the neighbour, Please can we look into this. Mark said is may have a blockage in the pipe after the last flush. Please all Mark on 0275349112	250 Woodend Beach Road, WOODEND	30/04/2019 9:28:42 AM	blocked restrictor/ dirty filter
Water - No Supply - Tania called and advised that they have no water. I called WU and spoke with Cheryl and she advised that there are Technicians nearby to the site and they will go there to fix the issue. Caller wants to know how long this will take as they have toilets, coffee machines and food to prepare. Please call her on 037415741 to advise her when this will be fixed by as she has to inform her manager.	8 Bob Robertson Drive, WOODEND	6/05/2019 11:48:34 AM	Josh R has spoken to BP and advised that OnGrade are working in area. WU is on site to try and fix the issue of no water and low pressure

Full Details	Primary Address	Received On	Resolution
Water - No Supply - have no water checked valves they seem ok, no cold water at all. Water unit duty has message.	42 Gibbs Drive, WOODEND	18/05/2019 12:40:00 PM	Private Issue.
Water - No Supply - Notes: No water in woodend Photos: none	15 Thornley Place, WOODEND	4/06/2019 3:02:37 PM	after hours reported late. storm event. lightening strike in woodend pump station. 31/5/2019 - 3/6/2019 comms failure.
Water - No Supply - no water - heaps of calls	185 Tuahiwi Road, TUAHIWI	3/06/2019 7:25:00 PM	monday 03/06/2019 - respond to straight away comms issue resulting in reservoir running out of water, had to manually drill reservoir to turn woodend water supply back on 03/06/2019 9.30. lightening strike, storm event 31/5 - 03/06/19
Water - No Supply - has no water or pressure - neighbours are the same.	116 B Rangiora Woodend Road, WAIMAKARIRI DISTRICT	3/06/2019 6:50:00 PM	monday 03/06/2019 - respond to straight away comms issue resulting in reservoir running out of water. had to manually drill reservoir to turn woodend water supply back on. 3/6/19 9.30pm
Water - No Supply - has no water.	120 Chinnerys Road, WOODEND	3/06/2019 6:53:00 PM	monday 3/6/19 respond to straight away comms issue resulting in reservoir running out water. had to manually drill reservoir to turn water supply back on 03/06/2019 9.30 pm
Water - No Supply - has no water	15 Bowie Drive, WOODEND	3/06/2019 7:01:00 PM	monday 03/06/2019. respond to straight away comms issue resulting in reervoir running out of water. had to manually drill reservoir to turn woodend water supply back on
Water - No Supply has no water	8 Bunting Place, WOODEND	3/06/2019 6:56:00 PM	monday 03/6/2019 respond to straight away. comms issue resulting in reservoir running out of water. had to manually drill reservoir to turn woodend water supply back on
Water - No Supply - caller had no water earlier, now has hot water but no cold water coming through. Please ring., advised caller water being pumped through and could take a while to settle down. Passed to oncall duty.	2 A Bowie Drive, WOODEND	3/06/2019 9:25:00 PM	monday 3/6/2019 respond to straight away comms issue esulting in reservoir running out of water. had manually drill reservoir to turn water back on
Water - No Supply - function to be held at the above address today. No water in the back building. There was water yesterday. Passed to water unit.	206 Tuahiwi Road, TUAHIWI	8/06/2019 12:29:00 PM	No Water, Spoke to Melanie, sounds like their pump on site failed. Resulted in private issue.
Water - No Supply - Property has little to no water coming through the taps and toilet won't flush. Please investigate***23072019 Customer called to say water toby was turned off and no assistance required. DW	5 Main North Road (Sh 1), WOODEND	23/07/2019 10:07:17 AM	
Water - No Supply - Public-No water -called through to WU- also reported from near golf course, Tahuna Lane	18 Mara-Kai Place, PEGASUS	10/10/2018 3:29:18 PM	refer wa1801052
Water - No Supply - water is totally off for the 2nd time tonight. Duty has message	62 Pegasus Main Street, PEGASUS	14/01/2019 9:02:00 PM	pipeline inspection - flushed 8 f/h

Full Details	Primary Address	Received On	Resolution
Water - No Supply - No Supply of water last night for about 30 minutes to an hour. Andy wants to know why they lost Water. Please can someone call him 021946798	52 Pegasus Main Street, PEGASUS	15/01/2019 11:00:06 AM	Talked to Andy on the phone and explained what happend. All ok.
Water - No Supply - have no cold water. Passed to water unity duty.	53 Kawari Drive, PEGASUS	27/01/2019 10:39:00 AM	Tank quick fill.
Water - No Supply No water (down to a trickle) and Lynn needs to have a shower and get to work. Water Unit advised they will attend.	1 Blackadder Road, PEGASUS	13/05/2019 9:51:30 AM	darryn already on site trying to resolve issue

APPENDIX I. Template Boil Water Notice

WAIMAKARIRI DISTRICT COUNCIL

215 High Street
Private Bag 1005
RANGIORA 7440
New Zealand

Phone: (03) 311 8900
or: (03) 327 6834
Fax: (03) 313 4432
www.waimakariri.govt.nz

Our Reference: File Number / Record Number

DATE

Dear Resident

Scheme Name Water Supply

BOIL WATER NOTICE

The Waimakariri District Council advises that routine sampling has detected low levels of contamination in the Scheme Name Water Supply.

As a precautionary measure you are advised to boil water used for drinking until further notice.

Please boil your water, on a rolling boil for at least 3 minutes, before consuming.

Please pass this information on to any other people on the scheme to advise them of this notice.

When the boil water notice is lifted, this will be made public through the Council's website (waimakariri.govt.nz).

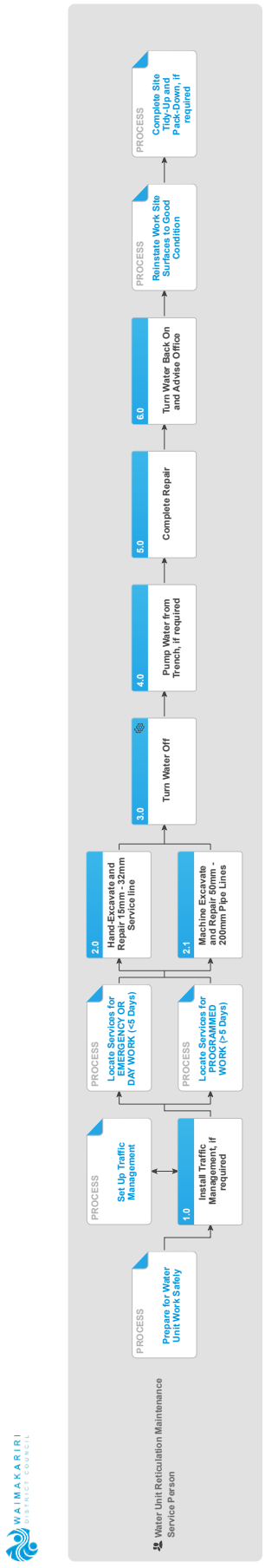
Yours sincerely

Kalley Simpson
3 Waters Manager

Accredited as an International 'Safe Community'
by the World Health Organisation Collaborating Centre on Community Safety.

APPENDIX J. Promapp Process Example – Pipeline Repairs

Note: Attached as an example only. Operators to refer to latest version on Promapp.


Water Unit Reticulation Maintenance Service Person
PROCESS
Prepare for Water Unit Work Safely
PROCESS
Set Up Traffic Management
1.0
Install Traffic Management, if required
PROCESS
Locate Services for EMERGENCY OR DAY WORK (<5 Days)
PROCESS
Locate Services for PROGRAMMED WORK (>5 Days)
2.0
Hand-Excavate and Repair 15mm - 32mm Service line
2.1
Machine Excavate and Repair 50mm - 200mm Pipe Lines
3.0
Turn Water Off
4.0
Pump Water from Trench, if required
5.0
Complete Repair
6.0
Turn Water Back On and Advise Office
PROCESS
Reinstate Work Site Surfaces to Good Condition
PROCESS
Complete Site Tidy-Up and Pack-Down, if required

Summary

Objective
This process provides the safe guidelines for pipeline repairs.

Background
Traffic management is the most important hazard control. Underground services must be carefully excavated. Other risks include conflicts with public (following water disconnection).

@todo: complete hazard/risk assessment below:
HAZARDS:

RISKS ASSOCIATED WITH THOSE HAZARDS:

RISK CONTROL FRAMEWORK:
Elimination:
Substitution:
Isolation:
Engineering controls:
Administrative controls:
PPE:
Recovery Controls:

Owner Richard Cookson

Expert Phil Drozdowski

Procedure

PROCESS **Prepare for Water Unit Work Safely**
Water Unit Reticulation Maintenance Service Person

1.0 Install Traffic Management, if required
Water Unit Reticulation Maintenance Service Person

CONDITIONAL **Set Up Traffic Management**
Water Unit Reticulation Maintenance Service Person

PROCESS **Locate Services for EMERGENCY OR DAY WORK (<5 Days)**
Water Unit Reticulation Maintenance Service Person

PROCESS **Locate Services for PROGRAMMED WORK (>5 Days)**
Water Unit Reticulation Maintenance Service Person

2.0 Hand-Excavate and Repair 15mm - 32mm Service line
Water Unit Reticulation Maintenance Service Person

a Use hand excavation for <32mm pipelines.

b Clamp <32mm service line, if possible, and complete repair.

NOTE **What do I do if the line cannot be clamped prior to the repair?**
Notify the office that you need to turn water off to complete the repair, if the line cannot be clamped, and complete the repair.

2.1 Machine Excavate and Repair 50mm - 200mm Pipe Lines
Water Unit Reticulation Maintenance Service Person

a Turn water off when required in order to see within trench, and notify Main Office immediately.

NOTE **How do I notify Main Office?**
Call Customer Services on 0800 965 468 to inform them of any disruption to water supply.

b Excavate the work area carefully.

NOTE **How should excavation be carried out?**
Refer to the process below.
PROCESS Operate an Excavator

c Stop excavating at 1.4m and notify WorkSafe of Notifiable Work if the excavation is likely to be over 1.5m.

NOTE **How do I notify WorkSafe of Notifiable Work?**
The notification can be completed online by using the website form attached below.

WorkSafe Hazardous Work Notification Form
https://forms.worksafe.govt.nz/hazardous-work-notification

d Get or request trench box if excavation is going to be over 1.5m deep, or if the ground conditions require shoring.

NOTE **How do I install a trench box safely?**
Refer to the process below.
PROCESS Complete Installation of Trench Box (Shoring)

3.0 Turn Water Off
Water Unit Reticulation Maintenance Service Person

a Check WAIMAP to determine which valves to isolate to make repair, and so you can advise Main Office.

b Confirm there are no dialysis patients in the area that need to be notified.

NOTE **Where do dialysis patients live currently?**
Refer to the list here.
PROCESS Locate Registered Dialysis Patients (Locations from DHB)

c Notify Main Office that water is being turned off and advise them all areas that will be affected.

NOTE **How do I notify Main Office?**
Call Customer Services on 0800 965 468 to inform them of any disruption to water supply.

d Turn water off.

e Care must be taken if valves are located in the road. CAUTION: Traffic management will be required if the valve is in the live lane.

f Use hydrant or flush point in isolated area to bleed water pressure, if available.

g If there is no hydrant or flush point available then a V should be cut in the bottom of the pipe to relieve the water pressure.

4.0 Pump Water from Trench, if required

Water Unit Reticulation Maintenance Service Person

NOTE **How do I pump water from a trench?**

Use a mechanical pump to remove excess water in order to be able to see work area.
See the below process for full guidance.

PROCESS Operate a Pump (Trash/ Volume)

5.0 Complete Repair

Water Unit Reticulation Maintenance Service Person

a Use 1% chlorine spray to disinfect all fittings and pipes throughout the repair.

b Complete repair.

c Backfill and haunch over the pipe to add weight so that repair does not rupture.

6.0 Turn Water Back On and Advise Office

Water Unit Reticulation Maintenance Service Person

a Turn water back on.

b Advise the Main Office that the water is back on.

PROCESS **Reinstate Work Site Surfaces to Good Condition**

Water Unit Reticulation Maintenance Service Person

PROCESS **Complete Site Tidy-Up and Pack-Down, if required**

Water Unit Reticulation Maintenance Service Person

Triggers & Inputs

TRIGGERS

None Noted

INPUTS

None Noted

Outputs & Targets

OUTPUTS

None Noted

PERFORMANCE TARGETS

None Noted

Process Dependencies

PROCESS LINKS FROM THIS PROCESS

Process Name	Type of Link	Assigned Role
Complete Installation of Trench Box (Shoring)	Note	Water Unit Reticulation Maintenance Service Person
Complete Site Tidy-Up and Pack-Down, if required	Process	Water Unit Reticulation Maintenance Service Person
Locate Registered Dialysis Patients (Locations from DHB)	Note	Water Unit Reticulation Maintenance Service Person
Locate Services for EMERGENCY OR DAY WORK (<5 Days)	Process	Water Unit Reticulation Maintenance Service Person
Locate Services for PROGRAMMED WORK (>5 Days)	Process	Water Unit Reticulation Maintenance Service Person
Operate a Pump (Trash/ Volume)	Note	Water Unit Reticulation Maintenance Service Person
Operate an Excavator	Note	Water Unit Reticulation Maintenance Service Person
Prepare for Water Unit Work Safely	Process	Water Unit Reticulation Maintenance Service Person
Reinstate Work Site Surfaces to Good Condition	Process	Water Unit Reticulation Maintenance Service Person
Set Up Traffic Management	Conditional	Water Unit Reticulation Maintenance Service Person

PROCESS LINKS TO THIS PROCESS

None Noted

RACI

RESPONSIBLE
Roles that perform process activities

Water Unit Reticulation Maintenance Service Person

Systems that perform process activities

None Noted

ACCOUNTABLE
For ensuring that process is effective and improving

Process Owner Richard Cookson

Process Expert Phil Drozdowski

CONSULTED
Those whose opinions are sought

STAKEHOLDERS
None Noted

STAKEHOLDERS FROM LINKED PROCESSES

Process	Owner	Expert	Process

			Group
Complete Installation of Trench Box (Shoring)	Richard Cookson	Daniel Burt	Water Unit Reticulation Processes
Complete Site Tidy-Up and Pack-Down, if required	Richard Cookson	Phil Drozdowski	Water Unit Reticulation Processes
Locate Registered Dialysis Patients (Locations from DHB)	Richard Cookson	Sean de Roo	Water Unit Safe Work Processes
Locate Services for EMERGENCY OR DAY WORK (<5 Days)	Richard Cookson	Sean de Roo	Water Unit Safe Work Processes
Locate Services for PROGRAMMED WORK (>5 Days)	Richard Cookson	Sean de Roo	Water Unit Safe Work Processes
Operate a Pump (Trash/Volume)	Richard Cookson	Phil Drozdowski	Water Unit Reticulation Processes
Operate an Excavator	Richard Cookson	Sean de Roo	Water Unit Safe Work Processes
Prepare for Water Unit Work Safely	Richard Cookson	Sean de Roo	Water Unit Safe Work Processes
Reinstate Work Site Surfaces to Good Condition	Richard Cookson	Phil Drozdowski	Water Unit Reticulation Processes
Set Up Traffic Management	Richard Cookson	Sean de Roo	Water Unit Safe Work Processes

INFORMED
Those notified of changes

All of the above, as well as; Sheryl Cowan[System Stakeholder], GIS Team[System Stakeholder]. These parties are informed via dashboard notifications.

Systems

WAIMAP

Lean

None Noted

Process Approval

Date	Approver	Type
Approval bypassed	Adam Cresswell	Process Group Approver
Approval bypassed	Phil Droz-dowski	Process Expert
Approval bypassed	Richard Cookson (DELETED)	Process Owner
08-07-2019 (GMT)	Adam	Promaster

Published on 08-07-2019 (GMT) by Adam Cresswell

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WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	SHW-02-01 /191202168626
REPORT TO:	Utilities & Roading Committee
DATE OF MEETING:	19 December 2019
FROM:	Kitty Waghorn, Solid Waste Asset Manager
SUBJECT:	Installation of RPZ (potable water supply protection) devices at Southbrook resource recovery park and Oxford transfer station

SIGNED BY:
(for Reports to Council, Committees or Boards)

Department Manager | Chief Executive

1. SUMMARY

1.1 This report is to inform the Utilities & Roading Committee of the outcomes of investigations into options to protect the public and internal water supplies from backflow of contaminated water from Southbrook resource recovery park and Oxford transfer station and seek the Committee's approval to commence these works.

1.2 In order to comply with the Council's Backflow Prevention Policy and Water Supply Bylaw, budget allowances for $50,000 were requested for each site to install reduced pressure zone (RPZ) units, based on two 100mm diameter RPZ units at each site.

1.3 When the budgets were approved, the Council instructed staff to investigate whether there were any cost-savings to be made and to report back to the Utilities & Roading Committee about the outcomes prior to undertaking any installation work.

1.4 The budget allowance for the Oxford RPZ was subsequently reduced to $43,900.

1.5 Investigations have now been completed, and the following solutions have been identified as the most cost-effective backflow-prevention measures that will protect the public and site potable water supplies:

a. Installation of a 100mm diameter RPZ at the road frontage of both sites, in accordance with the Council's Backflow Prevention Policy;

b. Installation of vacuum breakers at five standard taps at Southbrook RRP;

c. Installation of a gate valve at one fire hose reel at Southbrook RRP;

d. Relocate the fire hose reel from the kiosk to the hazardous waste storage shed at Oxford transfer station;

e. Install a 25mm RPZ unit in the supply line between the relocated fire hose reel and the potable water supply connection for the kiosk.

1.6 The cost of the work at Southbrook RRP has been estimated at $20,719.13, and the work at Oxford transfer station been estimated at $25,659.44. Investigations have cost $4,825.40 to date. Overall cost savings are estimated to be in the region of $42,700.

Attachments:

(i) Southbrook RRP Water protection Devices (191202168623)
(ii) Oxford RRP Water protection Devices (191202168624)

2. RECOMMENDATION

THAT the Utilities & Roading Committee:

(a) **Receives** report No. 191202168626.

(b) **Notes** that the estimated cost for the backflow protection installations at Southbrook resource recovery park is $23,581.83, which is within the $50,000 budget.

(c) **Notes** that the estimated cost for the backflow protection installations at Oxford transfer station is $27,622.14, which is within the $43,900 budget.

(d) **Approves** staff proceeding with the installation of backflow protection at Southbrook resource recovery park and Oxford transfer station.

3. BACKGROUND

3.1 The Council's Water Supply Bylaw and Backflow Prevention Policy requires all businesses that are high hazard sites are required to install reduced pressure zone or reduced pressure zone detector (RPZ) devices on the customer's side of the point of supply, located as near as practicable to the property boundary.

3.2 We are required to protect one zone of the site where water may be consumed (e.g. offices) from another part of the site where a hazardous activity may be occurring, under the Building Act.

3.3 Activities at Southbrook RRP include operation of the recycling pit, greenwaste area, kerbside collection consolidation and bulk storage of cardboard & scrap steel, resource recovery, recycling and hazardous waste storage areas. Many areas of this site have taps and fire hoses, which are potential sources of contamination to both the Rangiora and on-site potable water supplies.

3.4 Activities at Oxford TS include operation of the recycling pit, greenwaste area bulk storage of white-ware & scrap steel, recycling and hazardous waste storage areas. There are fire hoses at the kiosk, hazardous good and rubbish pit which are potential sources of contamination to the Oxford and on-site potable water supplies.

3.5 Southbrook resource recovery park and Oxford transfer station were identified as high hazard sites to the public water supply, therefore each site is required to have a boundary RPZ unit installed to comply with the Backflow Prevention Policy.

3.6 The internal water supply is also at risk of contamination, and the existing internal backflow prevention has to be improved in order to protect the kiosks at both sites, and the second-hand shop at Southbrook, where staff tea making facilities are located.

3.7 A budgetary allowance of $50,000 for each site was requested, for the installation of two 100mm RPZ units at each site. In approving the budgets, the Council requested staff that investigate other more cost-effective options and report back to the Utilities & Roading Committee before commencement of works. The budget allowance for the Oxford RPZ was subsequently reduced to $43,900.

3.8 Staff have undertaken investigative work to confirm pipe sizes and locations on both sites, and considered options that would protect the potable water supply to staff working on both sites as well as to the public water supplies. The following solutions have been proposed, and work will commence once the Utilities & Roading Committee has been informed about the proposed works and costs.

4. ISSUES AND OPTIONS

Southbrook Resource recovery park

4.1. A 100mm diameter RPZ will have to be installed in the 100mm diameter supply main at the Flaxton Road boundary of the site, which will provide the necessary protection for the public water supply as specified by the Backflow Protection Policy.

4.2. It has been identified that five out of the ten taps on the site currently do not have backflow prevention devices, which can be remedied by the installation of vacuum breakers. One unit that currently has a back flow preventer needs to have a gate valve installed in order to make it fully compliant.

4.3. By undertaking this work, the potable water supply to the kiosk and shop buildings will be adequately protected from cross contamination, as required under the Building Act. There will be ongoing operational costs to maintain these backflow prevention devices, however this is a minor component of the site operations costs.

4.4. The costs to install the identified backflow prevention devices are estimated to be less than $21,000 for Southbrook resource recovery park.

Oxford Transfer station

4.5. A 100mm diameter RPZ will have to be installed in the 100mm diameter supply main at the High Street boundary of the site, which will provide the necessary protection for the public water supply as specified by the Backflow Protection Policy.

4.6. It has been noted that by relocating the fire hose from the kiosk to the corner of the hazardous waste storage building and installing a 25mm RPZ between the RPZ and the kiosk water supply point, the potable water supply to the kiosk will be adequately protected from cross contamination.

4.7. There will be ongoing operational costs to maintain these backflow prevention devices, however this is a minor component of the site operations costs.

4.8. There will be sufficient coverage for fire protection for the kiosk from the new location.

4.9. The costs to install the identified backflow prevention devices are estimated to be less than $26,000 for Oxford transfer station.

Other alternatives considered

4.10. **Do minimum:** install a 100mm diameter RPZ unit at both sites, and not undertake the on-site minor works. While this would meet the requirement set under the Council's Backflow Protection Policy, it would not provide protection to the staff's potable water supply, and would not comply with the Building Act requirements. Staff do not consider that this is an acceptable alternative.

4.11. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. **Groups and Organisations**

5.1.1. This has not been specifically consulted on as it is an operational matter.

5.2. **Wider Community**

5.2.1. This has not been specifically consulted on as it is an operational matter.

6. IMPLICATIONS AND RISKS

6.1. **Financial Implications**

Southbrook Resource Recovery Park

6.1.1. The costs for the planned solution for **Southbrook Resource recovery park** have been estimated at $23,581.83 including a 10% contingency, as tabulated below.

Item	Description	Quantity	Unit Cost	Amount
1	Boundary RPZ (100mm)	1	$18,402.88	$18,402.88
2	Vacuum Breakers on existing taps	5	$51.75	$258.75
3	15mm Gate Valve (on RPZ)	1	$172.50	$172.50
4	Contingency	10%		$1,885.00
Sub Total				**$20,719.13**
Cost of Investigations (incurred to date)				$2,862.70
TOTAL				**$23,581.83**
Budget				$50,000.00

6.1.1. Overall costs, including the investigation costs incurred to date, are estimated at $23,581.83. This is approximately 47% of the budgeted allowance of $50,000 for RPZ installations at the Southbrook site. The total estimated cost savings to the Council for installation of back flow prevention devices is approximately $26,400.

Oxford Transfer station

6.1.2. The costs for the planned solution for **Oxford transfer station** have been estimated at $25,695.44 including a 10% contingency, as tabulated below.

Item	Description	Quantity	Unit Cost	Amount
1	Boundary RPZ (100mm)	1	$18,402.88	$18,402.88
2	Relocate hose-reel from kiosk to corner of Haz. Waste shed	1	$1,761.56	$1,761.56
3	25mm RPZ on supply to hose-reels	1	$3,160.00	$3,160.00
4	Contingency	10%		$2,335.00
Sub Total				**$25,659.44**
Cost of Investigations (incurred to date)				$1,962.70
TOTAL				**$27,622.14**
Budget				$43,900.00

6.1.3. Overall costs, including the investigation costs incurred to date, are estimated at $27,622.14. This is approximately 63% of the budgeted allowance of $43,900 for RPZ installations at the Oxford site. The total estimated cost savings to the Council for installation of back flow prevention devices is approximately $16,300.

6.2. **Community Implication**

6.2.1. The lower capital expenditure will result in a higher account balance than forecast in the 2019/20 annual plan budgets.

6.3. **Risk Management**

6.3.1. There is a potential risk to public health if the RPZ units and the other backflow protection devices are not installed.

6.3.2. Staff propose to commence work as soon as Water Unit resourcing allows, after the Utilities & Roading Committee has received this information, in order to minimise risk to staff and the general public.

6.4. **Health and Safety**

6.4.1. There is a potential risk that the public water supply will become contaminated if these works are not carried out.

7. CONTEXT

7.1. **Policy**

7.1.1. This matter is not a matter of significance in terms of the Council's Significance and Engagement Policy.

7.2. **Legislation**

7.2.1. The *Health (Drinking Water) Amendment Act:* 69 (ZZZ) Protecting water supplies from risk of back-flow

7.2.2. The *Local Government Act 2002: Part 8 Subpart 1:* Powers of local authorities to make bylaws

7.2.3. The *Building Act 2004: Building Code G12 3.7* Safeguard potable water supply

7.2.4. The *Health and Safety in Employment Act 1992:* Prevent harm from occurring to employees, visitors, contractors and subcontractors

7.3. **Community Outcomes**

7.3.1. Core utility services are provided in a timely and sustainable manner

- Council sewerage and water supply schemes, and drainage and waste collection services are provided to a high standard.
- Waste recycling and re-use of solid waste is encouraged and residues are managed so that they minimise harm to the environment.

7.4. **Delegations**

7.4.1. The Council has approved budgets for installation of backflow devices, of $50000 at Southbrook RRP and $43,900 at Oxford transfer station.

7.4.2. The Utilities & Roading Committee has the delegated authority to consider the matters raised in this report.

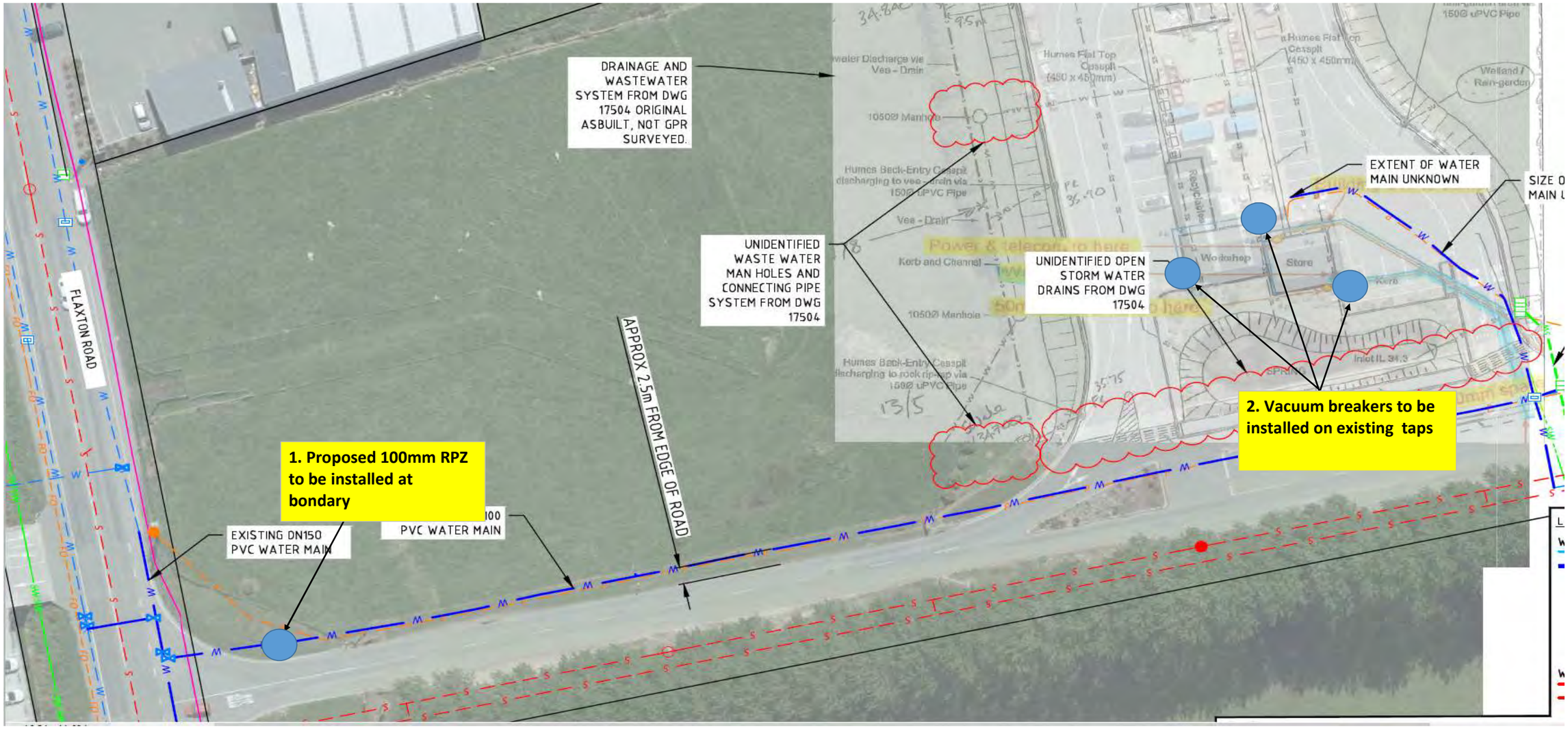
Kitty Waghorn
Solid Waste Asset Manager

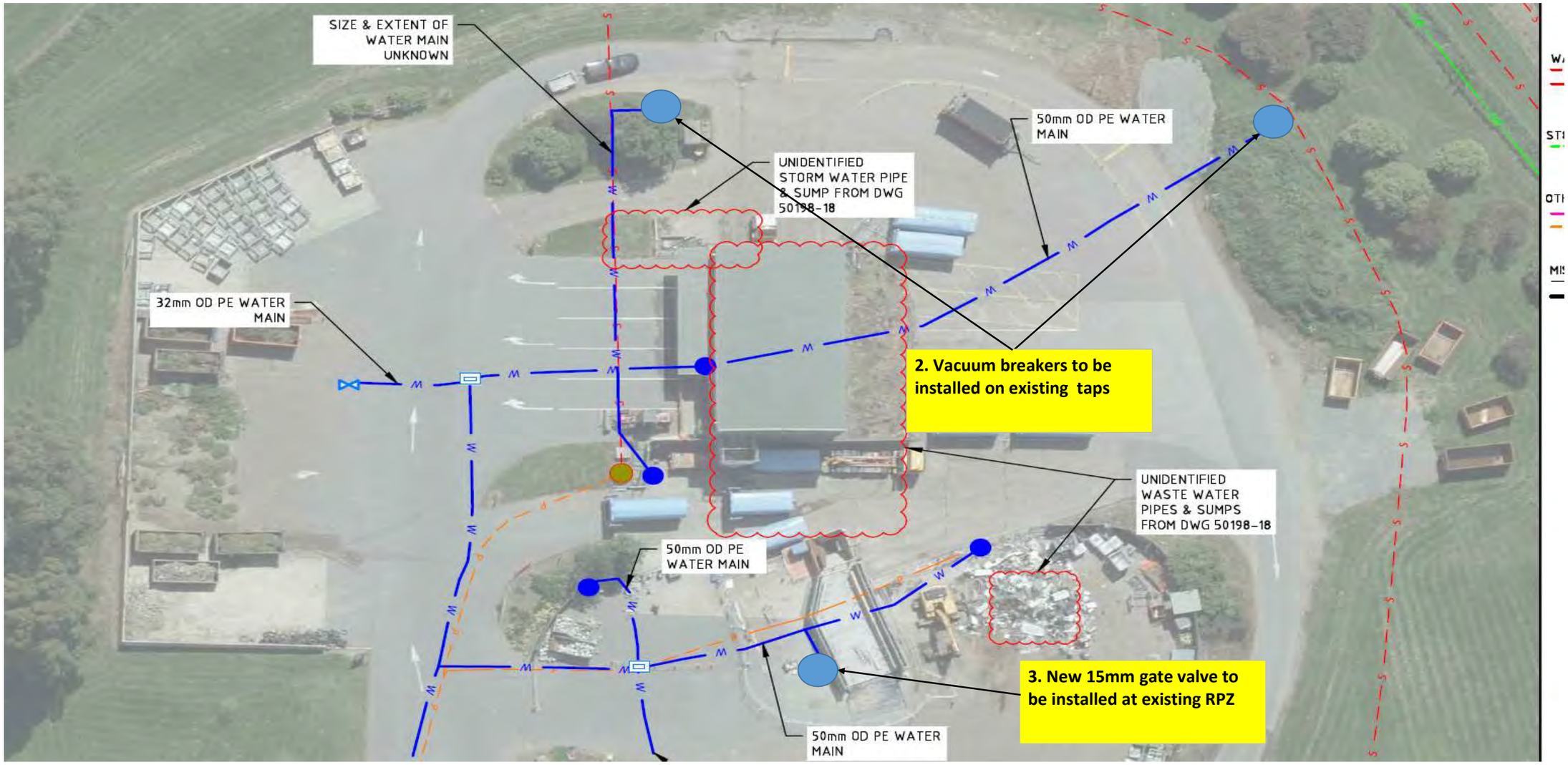
Attachment i

Backflow Prevention Southbrook RRP

Southbrook Transfer Station

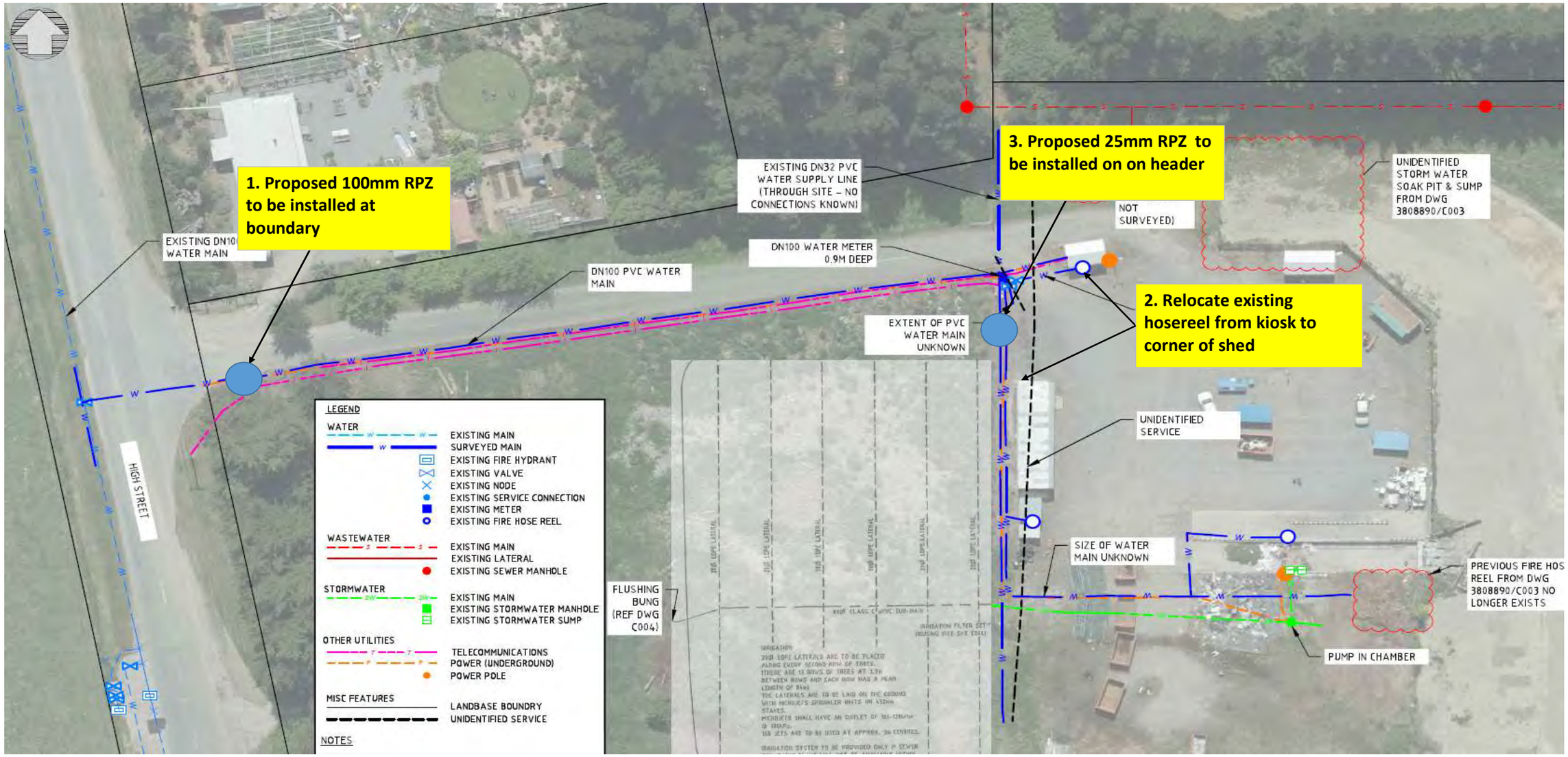
Item	Description	Quantity	Unit Cost	Amount	Comments
1	Boundary 100mm RPZ	1	$ 18,402.88	$ 18,402.88	Water Unit Quote 17/5/19
2	Vacuum Breaker on existing taps	5	51.75	$ 258.75	Water Unit Quote 19/11/20
3	15mm Gate Valve (on RPZ)	1	172.5	$ 172.50	Water Unit Quote 17/5/19
	Total			**$ 18,834.13**	




SIZE & EXTENT OF WATER MAIN UNKNOWN
UNIDENTIFIED STORM WATER PIPE & SUMP FROM DWG 50198-18
50mm OD PE WATER MAIN
32mm OD PE WATER MAIN
2. Vacuum breakers to be installed on existing taps
UNIDENTIFIED WASTE WATER PIPES & SUMPS FROM DWG 50198-18
50mm OD PE WATER MAIN
3. New 15mm gate valve to be installed at existing RPZ
50mm OD PE WATER MAIN

Oxford Transfer Station

Item	Description	Quantity	Unit Cost	Amount	Comments
1	Boundary RPZ 100mm	1	$ 18,402.88	$ 18,402.88	Water Unit Quote 17/5/19
2	Relocate hosereel from kiosk to corner of shed	1	$ 1,761.56	$ 1,761.56	Water Unit Quote 19/11/20
3	25mm RPZ on header to hosereels	1	$ 3,160.00	$ 3,160.00	Water Unit Quote 17/5/19
	Total			**$ 23,324.44**	



WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR INFORMATION

FILE NO and TRIM NO:	DRA-21 / 191205171455
REPORT TO:	Utilities and Roading Committee
DATE OF MEETING:	19 December 2019
FROM:	Janet Fraser, Utilities Planner
SUBJECT:	Stormwater Network Discharge Consents Issues and Implications
SIGNED BY: (for Reports to Council, Committees or Boards)	Department Manager / Chief Executive

1. SUMMARY

1.1 This report updates the Utilities and Roading Committee on progress preparing and lodging the district's stormwater network discharge consent applications.

1.2 The Rangiora and Woodend stormwater network consent applications are lodged and currently being processed by Environment Canterbury. The Kaiapoi and Oxford applications are currently being finalised. These should be lodged by 20 December 2019, subject to receipt of cultural advice on each application.

1.3 There are various issues and implications of the pending consents for management of water quantity and water quality in the district affecting existing and future urban stormwater network discharges. These are discussed in detail in this report.

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191205171455.

(b) **Notes** the ongoing lodgement and processing of stormwater network consent applications, including applications for Kaiapoi and Oxford to be submitted by 20 December 2019, introducing new regulation of urban stormwater quality and stormwater quantity.

3. BACKGROUND

3.1 The district stormwater consent applications are a requirement of the Canterbury Land and Water Regional Plan (CLWRP). The CLWRP requires the Council as network operator to obtain consent for all its urban reticulated stormwater network discharges into the receiving environment (land and water) in the District.

3.2 The consenting of existing and future discharges has implications for the Council as network operator, for residents and businesses discharging stormwater and for the receiving environment.

3.3 The Council is seeking stormwater network discharge consents for a term of 35 years. A shorter term of consent may however be confirmed at the discretion of Environment Canterbury.

3.4 All applications must be lodged with Environment Canterbury by 30 June 2018 or later date as agreed between Environment Canterbury and the Waimakariri District Council (the current lodgement extension timeframe is until 20 December 2019).

3.5 The Rangiora stormwater network consent application was lodged in May 2018 and the Woodend application lodged in June 2019. Processing of the Rangiora application by Environment Canterbury is now almost complete with draft conditions to be available shortly for Waimakariri District Council review (expected in December 2019).

4. ISSUES AND OPTIONS

Stormwater Quality

4.1. During the period from 2020 to 2025 the Council will develop a comprehensive stormwater management plan to replace the current interim stormwater management plans. These will include a water quality strategy which will set out how the Council will improve the quality of the stormwater discharges.

4.2. This strategy will also determine how the Council will achieve CLWRP water quality standards for all the district's urban stormwater network discharges by or before 2040.

4.3. This strategy will include mitigation projects that are developed following review of results from a comprehensive stormwater monitoring programme. The programme proposes to take multiple samples/ surveys of the following:

- surface water quality from selected major network outlets and receiving streams or drains
- stormwater basin sediment toxicity accumulation
- stream bed sediment toxicity
- stream bed fine sediment depth and % cover
- ecological surveys in receiving streams

4.4. This data is to be gathered and analysed in the period 2020 to 2025. The monitoring programme from 2025 onwards will have a revised focus of tracking progress from implementing the physical stormwater quality improvements toward achieving the targets.

4.5. Baseline sampling from 2014 to 2016 has indicated particular urban sub-catchments now known to be generating exceedances of CLWRP standards. Hot spots indicated in the baseline will now be verified through more comprehensive sampling and potential future solutions investigated.

4.6. The monitoring programme will inform the prioritisation within towns and between towns of where the expenditure is best allocated to achieve the CLWRP standards. This will take into account where the expenditure would have the greatest benefit in reducing the discharge of the urban contaminants, thereby improving the stream water quality and protecting the aquatic habitat.

4.7. The Council's target is to ensure all urban network discharges comply with all applicable plan standards by or before 2040.

Stormwater Quantity

4.8 In each of its consent applications the Council undertakes to provide a 5 yearly localised flood model update to Environment Canterbury for each town. This will demonstrate changes over time to its peak network discharges at the major outlets from any future

increase in urban hardstand area. The flood models show interaction between up-gradient catchment rural runoff and urban runoff from hardstand areas.

4.9 It is the responsibility of Council as network operator to ensure there is no increase in modelled peak stormwater network discharges over the term of consent resulting from any urban development activity which the Council controls. It achieves this role through its existing District Plan and resource consent functions.

4.10 It is not anticipated that these model updates will show any increase in discharges as a result of any increase in any urban hardstand between each 5 yearly review period. This is because the model presents a *full development scenario* for every urban zone. The model assumes that all existing urban zones are fully developed, including that maximum permitted hardstand area and site coverage are achieved for every lot. Therefore any increase in peak network discharge would be from other factors such as non-complying urban infill or unapproved rural drainage diversion.

4.11 If the 5 yearly model update did show an increase in hardstand that had occurred within existing District Plan zone rules that increased peak discharges, then the Council would need to explain how the increase had occurred and may need to address downstream effects (if any identified).

4.12 Any proposed District Plan zone change or resource consent application for development or increased urban infill would have effects assessed via that process. All developments are required to provide attenuation to match pre-development flows.

4.13 The Council could require mitigation to be provided by any person undertaking any non-complying activity that affects urban stormwater drainage conveyance via its Stormwater Drainage and Watercourse Protection Bylaw.

4.14 It is uncertain whether rising groundwater which will increasingly inundate the Kaiapoi stormwater network over time will be captured in the future Kaiapoi flood hazard model. It is also uncertain whether this would be linked to any future consent mitigation requirements.

Stormwater Management Plans

4.15 An interim stormwater management plan has been prepared and lodged with each application. Key proposals include:

- Investigating source control options for identified contaminants.
- Investigate low impact design options to improve treatment at a sub-catchment level.
- Where practicable, incorporating measures to improve stormwater treatment as part of the capital works programme.
- Phase in use of pollution prevention plans through the district towns to manage discharges from medium risk premises.
- Phase in a new Council approval process for stormwater discharges from high risk sites by 1 January 2025. At this time the Council will assume responsibility for managing quality of discharges from these sites into and from its network.

General Implications

4.16 Achievement of Canterbury Land and Water Regional Plan standards will likely require a combination of at source controls and new sub-catchment treatment systems to capture diffuse contaminant discharges of zinc, copper and sediment.

4.17 A significant increase in drainage team workload is anticipated for approving on-site pre-treatment systems for high risk sites and approving medium risk site pollution prevention plans.

4.18 Review of the Stormwater Drainage and Watercourse Protection Bylaw will be required before 1 January 2025, to include a new process for the Council to approve discharges from high risk sites into the stormwater networks.

4.19 A significant increase in drainage team and water unit workload will be required for implementation of the stormwater monitoring programme.

4.20 Development of a basic contaminant load model will be undertaken to estimate and identify diffuse source/s of each contaminant.

4.21 A review and upgrade on the current water quality management database functionality is required – potentially from MS Access to something like Water Outlook or the ECan Water 2020 based on Hilltop with improvements.

4.22 Additional costs associated with investigation and design of new stormwater treatment will be incurred.

4.23 Stormwater baseline sampling indicates potential wastewater overflows or wastewater cross connections occurring in Kaiapoi, Oxford, Rangiora and Woodend. Additional targeted sampling is proposed to identify and verify the actual sources of contamination.

4.24 Note that developers in other districts are awaiting issue of network consents to enable their future stormwater discharges to be approved by the relevant territorial local authority and accepted through the network consent. There is an assumed reduction of costs and simplification of requirements for developers. This should not be the case as the same environmental outcomes still need to be met.

4.25 There is a need to encourage central Government to “lead” on certain issues, including:

- reduction of copper discharges from the stormwater networks, by introducing a national ban on use of copper brake pads in vehicles
- introduce a national “behaviour change” website and other promotional material to inform communities of necessary changes

4.26 The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. Groups and Organisations

5.1.1. The network consent applications have been consulted with the Waimakariri Water Management Zone Committee. Other committees (e.g. Cam River Enhancement Subcommittee, Drainage Advisory Committees) and organisations (e.g. Fish and Game, Canterbury District Health Board) are aware of the network consent programmes via various ongoing communications on related issues with the Council drainage team.

5.1.2 This report was presented to the Waimakariri Water Management Zone Committee on 2 December 2019.

5.2. **Wider Community**

5.2.1. Each application includes a summary of public consultation on stormwater management as a component of previous Long Term Plan and Annual Plans. These plans have indicated a growing community aspiration in recent years for work to be undertaken toward improving quality of water in district waterways. However affordability is an ongoing concern.

5.2.2 A public communications plan will be developed in line with implementation of the stormwater monitoring programme. This will advise urban communities of actions to be taken to improve the quality of the stormwater discharges.

5.2.3 Public education and behaviour change is a significant component of the consent applications. The Canterbury Regional Stormwater Forum at its most recent meeting agreed it would request the Ministry for the Environment to lead the development of a new national public "behaviour change" website to address topical 3 water's issues. These include promoting actions the public can take to improve stormwater quality and reduce discharges of contaminants from private property into the stormwater systems.

6. IMPLICATIONS AND RISKS

6.1. **Financial Implications**

6.1.1. There is an existing budget of $65,000 per annum for environmental monitoring which will be used to undertake the district stormwater monitoring programme. This budget may need to be revised following the first completed year of monitoring, once actual costs are confirmed. The Council will need to ensure its programme is sufficiently resourced to enable it to meet the pending Environment Canterbury consent conditions for each network (yet to be issued).

6.1.2. Staff are currently working with Environment Canterbury on the detail of each application, seeking that conditions will be reasonable and achievable. It is noted additional resources will be required given the pending scale of the monitoring programme and associated improvement works required.

6.1.3 There is a preliminary budget of $20 million to be funded across the district urban drainage schemes to improve stormwater quality in the period 2025 to 2035. This budget has a preliminary allocation between Rangiora ($7.98 million), Kaiapoi ($7.7 million), Woodend ($2.6 million), and Oxford ($1.72million). The budget is indicative, with actual costs likely to vary in accordance with consent conditions.

6.1.4 There is no additional future budget to meet any water quantity requirements in the pending consent conditions. At this stage it is assumed that the Council will meet its consent requirements for water quantity management by ensuring there are no increases in peak network discharges as a result of future urban development, subdivision or infill. This is considered to be adequately managed via existing processes and will be demonstrated in the stormwater model updates provided 5 yearly to Environment Canterbury via the 35 year term of consent.

6.1.5 These are preliminary budgets, subject to confirmation once the stormwater consents are issued and when more comprehensive stormwater quality data is available. The data will better inform the locations, nature and scale of the improvements required.

6.2. **Community Implications**

6.2.1. There are implications for residents in the major urban towns associated with implementation of the consents. These include requirements for businesses and households to manage activities on their properties to avoid discharge of contaminants into the Council stormwater networks.

6.2.2. These actions will be measured via the proposed monitoring programme and consent compliance conditions (to be determined). Actions taken by the public will support the Council to achieve, over time, the discharge standards that will apply at the point of discharge or in the receiving waterway. The costs of the actions will be borne by urban communities, either through improving on-site stormwater management at the individual property level, or in drainage rates which will fund sub-catchment level stormwater treatment.

6.2.3 Residents will ultimately benefit from these requirements and actions which should result in future improvements in receiving water quality in urban streams with flow on improvements in the downstream environment. Over time there is anticipated to be improved recreation opportunities for residents including improved fishing, amenity, mahinga kai and safer recreational contact with water in local waterways.

6.3. **Risk Management**

6.3.1. There is a risk that water quality standards will not be achieved by the Council's target of 2040. There is a risk that the actual costs will exceed estimates, or that actions will be required that have not yet been identified.

6.3.2 There is a further risk that climate change affecting capacity and conveyance of the Kaiapoi stormwater network will result in uncertain outcomes for that town.

6.3.3 Staff will continue to report on likely outcomes and implications of the consenting process as consent conditions are confirmed in coming months.

6.4. **Health and Safety**

The network consents will target improvements to the health and safety of stormwater discharges including improving safety of: a) mahinga kai harvested from streams; b) human contact with waterways downstream of the stormwater outlets.

This will be achieved by developing mitigation strategies to reduce common contaminants found in stormwater such as bacteria, nutrients, metals and hydrocarbons. The Council will work toward reducing contamination from a wide variety of urban activities including wastewater overflows, urban construction discharge of sediment, fertiliser use on parks & gardens, runoff from manufacturing or storage yards, discharges of refrigerants or cleaning products, paints, detergents, oil or any other substances conveyed into streams from the stormwater networks.

7. CONTEXT

7.1. **Policy**

7.1.1. This matter is not a matter of significance in terms of the Council's Significance and Engagement Policy.

7.1.2 The actions to be undertaken to improve water quality which are required by the stormwater network discharge consents will assist the District to meet pending new national freshwater policies and standards. These are being introduced via

the Action for Healthy Waterways programme currently being consulted by the Ministry for the Environment. The programme includes a proposed new Draft National Policy Statement for Freshwater Management and proposed new National Environmental Standards for Freshwater.

7.2. Legislation

7.2.1. Consents are required under the Canterbury Land and Water Regional Plan (CLWRP), outlining requirements for water quality and water quantity to be met by the Council as the stormwater network operator.

7.2.2. The CLWRP is a requirement of the *Resource Management Act 1991*.

7.3. Community Outcomes

7.3.1. There is a healthy and sustainable environment for all.

7.3.2 Harm to the environment from the impacts of land use, use of water resources and air emissions is minimised.

7.3.3 Cultural values relating to water are acknowledged and respected.

7.4. Delegations

7.4.1. The Council holds the authority to allocate budget to implement the stormwater network discharge consent requirements in the Annual Plan.

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	RDG-32-10 / 191205171461
REPORT TO:	Utilities & Roading Committee
DATE OF MEETING:	19 November 2019
FROM:	Joanne McBride, Roading & Transport Manager Gerard Cleary, Manager Utilities & Roading
SUBJECT:	Subdivision Contribution Programme Update

SIGNED BY:
(for Reports to Council, Committees or Boards)

Chief Executive

1. SUMMARY

1.1. This report is to:

- Update Utilities & Roading Committee on the Roading Subdivision Contribution Programme for 2019/20;
- Seek approval to proceed with a short seal extension on Burgesses Road under the private funding of seal extensions policy.

1.2. There are a number of developments around the district each year where Council contributes to the cost of upgrading Roading infrastructure. These include housing and commercial developments as well as requests for seal extensions in line with the Private Funding of Seal Extension Policy.

1.3. There are various developments currently underway which require Council to fund a share of the upgrade costs.

1.4. As developments progress through the year and further information becomes available, the funding contributions required by Council are confirmed and reported to the Utilities & Roading Committee.

1.5. A summary of updated commitments is included in the Financial Implications section as Table One.

1.6. A request has been received from a resident on Burgesses Road to seal a portion of the road outside the property, under the private funding of seal extensions policy. The length requested for sealing is 98m and the cost of sealing is $26,000 including GST. As such Council share of sealing is estimated at $13,000.

1.7. The full extent and timing of the commitments is in a number of cases, dependent on development and therefore difficult to predict. As such any budget changes are only requested when there is certainty around the timing of projects.

2. RECOMMENDATION

THAT the Utilities & Roading Committee:

(a) **Receives** report No. 191205171461;

(b) **Approves** that sealing of a 98m section of Burgesses Road under the Private Funding of Seal Extensions Policy noting that this is subject to the property owner agreeing to fund 50% of the cost of the work;

(c) **Notes** the updated commitments as summarised in Table One of this report;

(d) **Notes** that there is still uncertainly around the timing of some projects and therefore if projects progress ahead of time additional funding may be required;

(e) **Circulates** this report to the Oxford-Ohoka and Rangiora-Ashley Community Boards for information.

3. BACKGROUND

3.1. The Roading Subdivision Contribution Budget is the funding source for financial contribution driven seal extensions and for 50% cost share seal extensions. It also funds other cost share projects where existing roads need to be upgraded in response to development, such as the urbanisation. The funding covers the cost of the benefit to existing ratepayers resulting from the work.

3.2. As this work is driven by developers it is difficult to budget accurately and in the past funding has regularly been carried forward at year end due to expected work not being completed in the time anticipated.

3.3. Council often doesn't have control over when this work is carried out. The exception is Council managed projects and that is normally where financial contributions have been taken and Council completes the work, such as seal extensions.

3.4. In the 2019/20 year the commitments (confirmed and likely) are as follows:

- Cone Street Kerb & Channel and Footpath Stage One – Completed.
- Urbanisation of Railway Road in conjunction with NPD Service Station Development – Work completed. Costs to come.
- Ravenswood Urbanisation of Rangiora Woodend Road – Work completed. Costs to come.
- Ravenswood Shared Path – Construction likely to start early 2020.
- Pentecost Road Urbanisation adjacent to the school (Johns Rd to Charles St) – Construction underway.
- Browns Road / North Eyre Road Seal Extension. Currently underway. Council share is $110,000.
- Charles Street at Riverview Development – Replacement if K&C in conjunction with development.
- Two Roads Urbanisation of Gladstone Road – Construction likely to start early 2020.
- Burgesses Rd – Request for private funding of seal extension to be considered. Estimated cost is $13,000.

3.5. The following is a list of the possible commitments for 202/21 and beyond:

- Pentecost Road Urbanisation – Charles Street to South Belt. Timing dependent on development.
- Urbanisation of Parsonage Road – Council share of urbanisation costs in conjunction with the Freeman Woodend development. Currently being tendered and construction likely to start early 2020. Value to be confirmed however estimated cost is $200,000.
- Flaxton Rd / Fernside Rd Intersection – Council contribution to match developer contribution towards the intersection upgrade of $127,000.
- Topito Road Upgrade - Council share of sealing costs in conjunction with development occurring along the road. Estimated cost is $175,000.
- Todds Road Urbanisation - Council share of urbanisation costs in conjunction with the industrial development. Value to be confirmed however estimated cost is $100,000
- Enverton Drive Urbanisation (at River Road end) - Council share of urbanisation costs in conjunction with development occurring along the road. Estimated cost is $100,000

3.6. The following two projects had previously been noted however are no longer being allowed for within the estimates, as the residents have not confirmed their private share can be met:

- Broad Road / Rangiora Leithfield Road Seal Extension.
- Duffs Road Seal Extension outside no. 223. Sealing of a 100m section.

3.7. The sealing of Burgesses Road has been requested under the Private Funding of Seal Extension Policy by the property owner at 15 Burgesses Road due to ongoing issues with dust nuisance.

3.8. Burgesses Road starts at South Eyre Road and continues through to Tram Road. There are two sealed sections on this road, one at the South Eyre Road intersection and one a kilometre further to the north. This proposed seal extension continues from the end of the existing seal at South Eyre Road and will extend for a distance of 98 metres as shown in the picture below.

4. ISSUES AND OPTIONS

4.1. The issues to be considered are as follows:

4.2. The Roading Financial Contribution Budget is an allocation each year and as a high proportion of the work depends on developers and their timing, often budget needs to be carried over at year end.

4.3. Current estimates indicate that the current budget is likely to be sufficient to cover the commitments for the 2019/20 financial year, however this is dependent on assumptions around development timing and therefore outside of Council control.

4.4. Options are to only budget for the confirmed projects with a contingency to cover unknowns, or to budget an annual allocation each year based on knowledge and experience and accept that in some years the budget will be too high and in others it may be too low.

4.5. The approach taken previously is to be conservative and only budget for confirmed projects, accepting that in some situations funding may have to be brought forward. This option is adopted to minimise unnecessary carry overs at year end. It may result in funding having to be brought forward if projects advance more quickly or developments happen and the Council has to respond with a contribution. This will result in more staff time having to write more reports.

4.6. There is sufficient budget to allow the Burgesses Road Sealing to proceed should this be approved.

4.7. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. **Groups and Organisations**

5.2. No specific consultation has been undertaken on this however the view of the community has been monitored through Service requests and Long Term Plan submissions.

5.3. Staff work with developers and property owners where works are requested which may require a Council contribution towards the cost of upgrading a road.

5.4. **Wider Community**

5.5. As above.

6. IMPLICATIONS AND RISKS

6.1. **Financial Implications**

6.2. The following table outlines the projects that will likely be completed in 2019/20 and 2020/21:

DESCRIPTION	TIMELINES			ESTIMATED COST $$
	2019/20	2020/21	Likelihood	
PROJECTS for 2020/21				
Cones Street Kerb & Channel and footpath – Stage 1	✓		Completed	55,000
Urbanisation of Railway Road with NPD Fuel Station	✓		Complete	35,000
Ravenswood Urbanisation	✓		Complete	365,000
Ravenswood Shared Path	✓		High	100,000
Pentecost Road Upgrade in conjunction with new school	✓		Underway	250,000
Browns Road / North Eyre Road Sealing	✓		Underway	110,000
Charles St at Riverview Development – K&C	✓		Complete	24,938
Two Roads Urbanisation of Gladstone Rd	✓		Medium	155,000
Burgesses Road Sealing (requesting approval)	✓		High	13,000
Broad Road/Rangiora Leithfield Road Sealing	✗		Not proceeding	-
Duffs Road Sealing	✗		Not proceeding	-
Total (estimate) for 2019/20				**$1,107,938**
Available Budget				**$1,159,891**

POSSIBLE PROJECTS for 2020/21				
Pentecost Road Upgrade (south of the school)		✓	Medium	350,000
Urbanisation of Parsonage Road		✓	High	200,000
Flaxton Rd / Fernside Rd Intersection		✓	High	127,000
Cone Street Upgrade –Stage 2		✓	Medium	140,000
Beach Grove Shared Path		✓	Medium	210,000
Topito Road Upgrade		✓	Medium	175,000
Todds Road Urbanisation		✓	Low	100,000
Enverton Drive Urbanisation		✓		100,000
Total (estimate) for 2020/21				**$1,372,000**

Table One – Projects for 2019/20 and 2020/21

6.3. The current overall Subdivision Contribution Area budget is $1,159,891 made up of the following areas:

- Council Performed Works – PJ 100361.000.5133 - $100,000
- Direct Payment to Developers – PJ 100364.000.5133 - $254,953
- Rangiora Woodend Road Urbanisation – PJ 101468.000.5133 - $365,000
- Charles K&C at Riverview Development – PJ 101509.000.5133 - $24,938
- Cone Street Upgrade Stage 1 – PJ 101059.000.5133 - $55,000
- Pentecost Rd Upgrade in Conjunction with New School – PJ 101477.000.5133 - $250,000
- North Eyre Rd / Browns Rd Seal Extension – PJ 101505.000.5133 - $110,000

6.4. There is currently unallocated budget of $354,953 in the Council Performed Works and Direct Payments to Developers areas which can be allocated to specific projects as they occur.

6.5. Projects which are likely to occur but which do not have budget currently allocated to them total a value of $303,000 which means there is currently sufficient budget to carry out these works, however noting that if any developments occur ahead of the anticipated timing then further funding may need to be brought forward. If this occurred then a report would be brought to Council on this matter.

6.6. **Community Implications**

6.7. The construction phase of the proposed projects have the potential to cause disruption to traffic. Staff will work with the Communications Team and ensure notification is carried out.

6.8. **Risk Management**

6.9. Normal construction risks will apply.

6.10. There is a risk that development may occur ahead of the anticipated programme. Staff will liaise with developers to better understand timing of proposed developments with an aim to mitigate the risk around this issue.

6.11. **Health and Safety**

6.12. As part of a construction contract the contractor will be required to submit a Site Specific Health & Safety Plan for approval, prior to work commencing on site.

7. CONTEXT

7.1. **Policy**

This is not a matter of significance in terms of the Council's Significance and Engagement Policy.

7.2. **Legislation**

The Land Transport Management Act is the relevant legislation in this matter.

7.3. **Community Outcomes**

This report consider the following outcomes:

There is a safe environment for all

- Harm to people from natural and man-made hazards is minimised.

- Our district has the capacity and resilience to quickly recover from natural disasters and adapt to the effects of climate change.
- Crime, injury and harm from road crashes, gambling, and alcohol abuse are minimised.

Transport is accessible, convenient, reliable and sustainable

- The standard of our District's roads is keeping pace with increasing traffic numbers.
- Communities in our District are well linked with each other and Christchurch is readily accessible by a range of transport modes.

7.4. **Delegations**

Utilities & Roading Committee has the authority to receive this report and to approve work programmes for works that the Council has budgeted a general expenditure for.

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	RDG-32-83/191204170541
REPORT TO:	Utilities and Roading Committee
DATE OF MEETING:	19th December 2019
FROM:	Don Young, Senior Engineering Advisor
SUBJECT:	Flaxton Rd / Fernside Rd intersection
SIGNED BY: (for Reports to Council, Committees or Boards)	Department Manager / Chief Executive

1. SUMMARY

1.1 This report is to request approval for the concept design of a roundabout at the Fernside Flaxton intersection.

1.2 It recommends adopting a roundabout which provides safety benefits to the users of both Fernside and Flaxton Roads, and includes a fourth leg into the future development site to the east.

Attachments:

i. Scheme Assessment report Flaxton Rd/Fernside Rd Intersection - 191011142625

ii. Extract from draft Rangiora West Route Scheme Assessment - Flaxton / Fernside details – 191204170626

iii. Extract from draft Rangiora West Route Scheme Assessment – roundabout options – 191204170628

iv. Flaxton / Fernside Intersection recommended option - Option 6D - 191108156724

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191204170541

(b) **Adopts** Option 6D for the Flaxton Fernside roundabout as per attachment iv.

(c) **Authorises** staff to progress the design of the intersection utilising existing budgets (Rangiora West Route Assessment)

(d) **Recommends** to the Council that it adopts, for consultation as part of the draft 20/21 Annual Plan, the requested budget to allow this work to proceed in 2020/21

(e) **Circulates** to all Community Boards for information.

3. BACKGROUND

3.1 The Flaxton Rd / Fernside Rd intersection has been an issue for the community for many years. In 2011 a realignment of the intersection formed a staggered intersection, with Fernside (West) swinging to the north to provide a squared up tee-intersection.

3.2 This improved the situation significantly, but since the increase in growth in West Rangiora, the increased usage has again raised issues.

3.3 Traffic count numbers in the area support the amount of growth, with the following daily traffic volumes being recorded

3.4 The safety issue is also a major concern with five crashes being recorded between 2015 and 2018, this does not include the recent serious crash.

4. ISSUES AND OPTIONS

4.1. The Council is currently undertaking a holistic review of the adequacy of the Rangiora West Route (i.e. Lehmans/Townsend, Fernside, Flaxton, Skewbridge Rds). The intention is to develop a long term work programme that standardises the full route length to an agreed standard.

4.2. This report is currently in draft form, and will be reported to the various community Boards, and then the Utilities and Roading Committee in the first quarter of 2020, with the intention to include the adopted works in the 2021-2031 LTP.

4.3. In the interim, a significant development has been proposed on the Flaxton Rd/Fernside Rd intersection. There are significant advantages to both the Council and the developer to firstly agree on the intersection details, secondly agree on funding, and thirdly coordinate the timing of the construction.

4.4. These advantages include ensuring that the appropriate land can be made available, ensuring that the proposed solution meets both parties' needs, and ensuring that an equitable contribution is received from the parties.

4.5. To this end, the investigation of the intersection has been advanced ahead of the other works, so that the developer can plan his development around a well-considered solution, and the works can be installed in time to assist with the developer's timeframe.

4.6. This approach also allows for a significant safety improvement at this intersection in a timely manner.

4.7. The Scheme Assessment report (Attachment i) looked at the issues, and considered a long list of options for the intersection. The outcome of this was that a single roundabout was recommended as the appropriate solution, with different sizing and alignments being considered as the short list.

4.8. Following on from that, a draft Scheme Assessment Report was prepared for the full length of the Rangiora West Route. While this report has not been reviewed and discussed by staff, it is sufficiently advanced that the appropriate sections on the Flaxton / Fernside intersection have been included as attachments to this report (Attachments ii. And iii.)

4.9. The outcome of this process is that the Option 6D is recommended for adoption.

4.10. It should be noted that it is likely that a speed limit review will be undertaken for both Flaxton and Fernside Roads in the near future. While it is too early to predict the outcome, the intersection is being designed to take this into account.

4.11. This is because it complies with recommended Ausroads sizing relating to speed limits, has been designed to allow for the oversized vehicles that will access the Southbrook Industrial area, aligns well with the existing and proposed roads, and provides for an affordable budget.

4.12. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. Groups and Organisations

5.1.1. Discussions have been held with the developer on a number of occasions. We have now reached the point where he has formally responded, agreeing to the roundabout concept, the required land, and the cash contribution.

5.1.2. Ongoing discussions will continue with the developer as the detailed design progresses.

5.1.3. A meeting has been arranged with the four residents behind the developer's land, who have a common access way within the extent of the roundabout islands. Consideration will be required as to how to cater for all entry and exit manoeuvres for these residents. An update will be provided at the meeting.

5.2. Wider Community

5.2.1. The Rangiora Ashley Community Board has been briefed on the proposal and appeared to be in agreement.

5.2.2. The wider community have made comment on the intersection from time to time in various Council consultation processes.

6. IMPLICATIONS AND RISKS

6.1. Financial Implications

6.1.1. The estimated cost of the roundabout is $1,550,000, including fees and contingencies.

6.1.2. An application to allow for a budget of $1,604,000 has been submitted to the draft Annual Plan along the following lines:

6.1.2.1. Low Cost/low risk category – $950,000 (funded 51% NZTA, includes $110,000 brought forward from 2021/22)

6.1.2.2. Developer contribution in cash - $127,000

6.1.2.3. Council matching contribution from Subdivision account - $127,000

6.1.2.4. Shortfall – funded from unsubsidised new budget - $400,000

6.1.3. In addition, the vesting at no cost of 2000m2 of the developers land is on top of this.

6.1.4. Therefore the project as currently envisaged could be afforded to be constructed in 2020/21, provided the Council approved the Annual Plan request from staff.

6.1.5. There is sufficient funding available in the Rangiora West Route Assessment budget to allow design and procurement to progress in 2019/20.

6.2. **Community Implication**

6.2.1. The safety of the travelling public will be improved by installing the roundabout. It will also assist with better defining limits to the commercial and industrial area

Risk Management

6.2.2. Given that the council would be making a decision on this intersection before seeing the full outcome of the Rangiora west route scheme assessment, there is a risk that this project is not the most urgent on that route. This is partially mitigated by the fact that this is still an intersection with serious issues, and that the importance of a timely decision outweighs the extra robustness of further prioritisation.

6.2.3. There is a risk that the project cost will exceed the estimate. This will be managed by good planning, procurement, and construction supervision.

6.2.4. There is a risk that the construction won't proceed as quickly as is hoped. This will be mitigated by good engagement with the affected parties, and good planning.

6.3. **Health and Safety**

6.3.1. The health and safety elements of the project will be managed during the project planning and implementation.

7. CONTEXT

7.1. **Policy**

7.1.1. This matter is not a matter of significance in terms of the Council's Significance and Engagement Policy.

Legislation

7.1.2. This work is authorised under the Local Government Act.

7.2. **Community Outcomes**

7.2.1. Transport is accessible, convenient, reliable and sustainable

7.2.1.1. The standard of our District's roads is keeping pace with increasing traffic numbers.

7.2.1.2. Communities in our District are well linked with each other and Christchurch is readily accessible by a range of transport modes.

7.2.1.3. Public transport serves our District effectively.

7.2.1.4. Opportunities to increase the occupancy of commuter vehicles is actively encouraged.

7.3. **Delegations**

7.3.1. The Utilities and Roading Committee have delegated authority to adopt a concept. However the Council have the authority to approve additional budgets.

SCHEME ASSESSMENT REPORT

FLAXTON ROAD / FERNSIDE ROAD INTERSECTION

PREPARED FOR WAIMAKARIRI DISTRICT COUNCIL

11 October 2019

Stantec

This document has been prepared for the benefit of Waimakariri District Council. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

QUALITY STATEMENT

PROJECT MANAGER	PROJECT TECHNICAL LEAD
Ali Sher Siddiqui	Chris Rossiter

PREPARED BY		
Laura Goodman	.....	...../...../.....
CHECKED BY		
	.....	...../...../.....
REVIEWED BY		
Oliver Brown	.....	...../...../.....
APPROVED FOR ISSUE BY		
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REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
1	04/10/2019	Draft	L Goodman	C Rossiter	O Brown	A Siddiqui
2	11/10/2019	Final	C Rossiter		O Brown	A Siddiqui

Abbreviations

CAS	Crash Analysis System
MCA	Multi-Criteria Analysis
WDC	Waimakariri District Council

Waimakariri District Council

Flaxton Road / Fernside Road Intersection

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1. Overview

1.1 Background

This report documents the multi-criteria analysis (MCA) undertaken to inform the decision making for upgrade options at the Flaxton Road / Fernside Road intersection in Rangiora. The Flaxton Road / Fernside Road intersection forms part of the Rangiora West Route and was reconfigured in 2011 from a cross-road intersection to a staggered T-intersection (right-left stagger). Post improvements, the intersection continues to have a poor safety record and has now been identified as a priority for improvements by Waimakariri District Council's (WDC) roading department.

The options considered through the first phase of this report are focused on meeting the objectives of the Design Philosophy Statement for the Rangiora West Route. However, since a large, multi-use development is being considered for the eastern side of the intersection, the list of potential options has been extended to consider safe and efficient access to the site.

This report should be read alongside the Design Philosophy Statement prepared by Stantec (2019).

1.2 Rangiora West Route

Waimakariri District Council has been investigating alternative routes between Rangiora and Christchurch, to redistribute some of the existing, and future projected travel demands on Lineside Road to Flaxton Road. The western route option, presented in Figure 1-1, aims to promote use of Fernside Road and Flaxton Road to reduce the need for residents on the western side of Rangiora to travel through the town. It is expected this will provide a more efficient and economic route to Christchurch.

Figure 1-1: Extent of Investigation for Rangiora West Route (source: WDC, 2019)

One objective of this project includes the identification of safety concerns along the route and potential options to mitigate these concerns. Options seek to achieve a safe road environment for the anticipated traffic volumes on this route. Stantec have been commissioned to review the network, understand the issues and to identify potential solutions that would improve the safety, efficiency and amenity across the local area.

2. Flaxton Road / Fernside Road Intersection

Figure 2-1 shows the location of the Flaxton Road / Fernside Road intersection in relation to the wider road network with Rangiora to the north and Kaiapoi to the south.

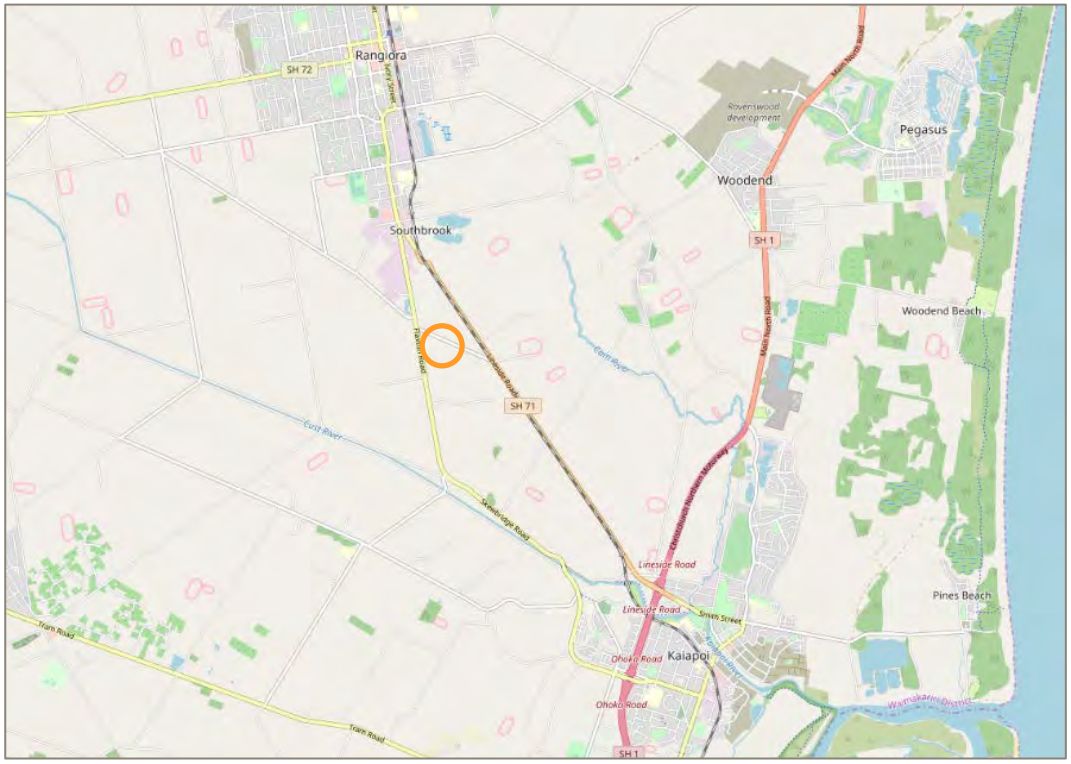

Figure 2-1: Flaxton Road / Fernside Road intersection – network level[1]

Flaxton Road runs generally north-south from Rangiora to the Cust River, a distance of approximately 3.8km. The road is classified as an arterial road in the District Plan, providing one of the main routes to Rangiora from Kaiapoi and Christchurch. To the north, Flaxton Road meets Lineside Road (State Highway 71). To the south, Flaxton Road continues as Skewbridge Road to Silverstream. Flaxton Road has a flat gradient with a straight alignment, except for the horizontal curve where it becomes Skewbridge Road; this curve has a radius of approximately 550m.

Fernside Road intersects Flaxton Road at two T-intersections, forming a right-left stagger, following a realignment in 2011. Fernside Road West runs generally northwest-southeast from Flaxton Road to Plaskett Road, a distance of approximately 4.5km. Fernside Road has a flat gradient and straight alignment. The road is currently classified as collector road. However, following the anticipated improvements as part of the Rangiora West Route project, it is expected that the function of the road will become more consistent with the description of an arterial road.

The surrounding road environment is characterised by the following elements:

- The surrounding topography is flat with straight road alignments. On the western approach to the intersection, Fernside Road has a horizontal curve with 55km/h curve advisory speed.
- The intersection operates under a posted speed limit of 80km/h following a speed reduction on Flaxton Road on 23 December 2016[2]. Approximately 1km south of the intersection, Flaxton Road becomes 100km/h road and approximately 370m north of the intersection, the speed limit on Flaxton Road reduces to 60km/h at the start of the industrial area. Fernside Road is posted at 80km/h.
- Flaxton Road has one lane in each direction with a northbound no passing restriction. North of the intersection the no passing restriction applies to southbound traffic.
- Fernside Road west, on its approach to the intersection, has one lane in each direction, divided by a dashed white centerline which becomes a solid white centerline 50m prior to the intersection.

[1] Base map sourced OpenStreetMap
[2] https://www.waimakariri.govt.nz/__data/assets/pdf_file/0020/27281/Register-of-Speed-Limits.pdf

- The intersection operates under a Give-Way control, with Flaxton Road being the priority route. The intersection is formed with an auxiliary left turn lane (approximately 150m long including the taper) and a right turn bay (approximately 140m long including the taper). Fernside Road has a single approach lane, however operates as having two lanes at the limit line due to the large curve radius (to accommodate HCV tracking). The intersection form is shown in Figure 2-2.
- Fernside Road east is located approximately 140m south of Fernside Road west. It has a single approach lane and no auxiliary turn lanes on Flaxton Road.
- A line of power poles runs alongside the northeastern boundary of Fernside Road, generally offset from the edge of the traffic lane by 3.5m. The power poles follow the old alignment of Fernside Road and therefore cross to the south side of Fernside Road approximately 100m prior to the intersection.
- A line of power poles runs alongside the eastern boundary of Flaxton Road, generally offset from the edge of the traffic lane by 5m.
- The intersection includes street lighting with light poles located on the western side of Flaxton Road and on the southern side of Fernside Road.
- A deep water race runs alongside the northeastern boundary of Fernside Road, crossing under Fernside Road through a culvert, approximately 40m west of the intersection. The water race then continues along the western side of Flaxton Road. Guard railing is provided on Fernside Road where it crosses the culvert. The width of the sealed shoulder over the culvert is approximately 2m wide.
- The section of land immediately north of the intersection hosts a large stormwater retention basin.
- A mature shelter belt is planted along the eastern boundary of Flaxton Road, as well as along the southwestern boundary of the original alignment of Fernside Road.
- Delineation is provided through edge lines, edge marker posts (EMPs), and reflective raised pavement markers (RRPMs) on both roads. Fernside Road also has hazard markers on some of the guard rail end terminals, as well as bridge width markers.
- The surrounding land use to the south is predominantly pastoral land. To the north of the intersection is the industrial development in Rangiora. A development is currently under construction on the land to the east, directly opposite the Fernside Road West intersection.

Figure 2-2: Flaxton Road / Fernside Road intersection aerial[3]

[3] Canterbury Maps

3. Traffic Counts

Table 3-1 shows the relevant estimated 2018 volumes from the Christchurch Assignment Transport Model (CAST), with the 2048 volumes shown in Table 3-2.

Table 3-1: 2018 estimated Traffic Volumes for Flaxton Road and Fernside Road (CAST)

Road	AM Peak (vph)	PM Peak (vph)	ADT (vpd)
Flaxton Road (north of Fernside Road West) - NBD	172	192	1,905
Flaxton Road (north of Fernside Road West) - SBD	200	326	1,938
TOTAL	**372**	**518**	**3,843**
Flaxton Road (south of Fernside Road West) - NBD	272	628	4,206
Flaxton Road (south of Fernside Road West) - SBD	532	494	4,282
TOTAL	**804**	**1,122**	**8,488**
Flaxton Road (south of Fernside Road East) - NBD	260	594	3,628
Flaxton Road (south of Fernside Road East) - SBD	491	476	3,623
TOTAL	**751**	**1,070**	**7,251**
Fernside Road East (at Flaxton Road) - EBD	48	30	737
Fernside Road East (at Flaxton Road) - WBD	19	44	656
TOTAL	**67**	**74**	**1,393**
Fernside Road West (at Flaxton Road) - EBD	350	178	2,415
Fernside Road West (at Flaxton Road) - WBD	118	446	2,372
TOTAL	**468**	**624**	**4,787**
Fernside Road West (west of Townsend Road) - EBD	351	187	2,447
Fernside Road West (west of Townsend Road) - WBD	120	424	2,355
TOTAL	**471**	**611**	**4,802**
Fernside Road West (west of Lehmans Road) - EBD	162	131	1,354
Fernside Road West (west of Lehmans Road) - WBD	98	165	1,302
TOTAL	**260**	**296**	**2,656**

Table 3-2: 2048 estimated Traffic Volumes for Flaxton Road and Fernside Road (CAST)

Road	AM Peak (vph)	PM Peak (vph)	ADT (vpd)
Flaxton Road (north of Fernside Road West) - NBD	172	192	1,905
Flaxton Road (north of Fernside Road West) - SBD	200	326	1,938
TOTAL	**372**	**518**	**3,843**
Flaxton Road (south of Fernside Road West) - NBD	272	628	4,206
Flaxton Road (south of Fernside Road West) - SBD	532	494	4,282
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TOTAL	**751**	**1,070**	**7,251**
Fernside Road East (at Flaxton Road) - EBD	48	30	737
Fernside Road East (at Flaxton Road) - WBD	19	44	656
TOTAL	**67**	**74**	**1,393**
Fernside Road West (at Flaxton Road) - EBD	350	178	2,415
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Fernside Road West (west of Townsend Road) - EBD	351	187	2,447
Fernside Road West (west of Townsend Road) - WBD	120	424	2,355
TOTAL	**471**	**611**	**4,802**
Fernside Road West (west of Lehmans Road) - EBD	162	131	1,354
Fernside Road West (west of Lehmans Road) - WBD	98	165	1,302
TOTAL	**260**	**296**	**2,656**

4. Crash History

4.1 Historical Crashes

The New Zealand Transport Agency Crash Analysis System (CAS) database shows that there have been ten reported crashes (including this crash) within a 300m radius of the crash site in last ten years (2009 to 2018, and the available crash records for 2019[4]). There are three crashes that resulted in serious injury, two crashes that resulted in minor injuries, and five crashes that were without injury. The corresponding collision diagram is presented in Figure 4-1.

Note that the intersection form was modified in 2011 changing the layout from a cross-road to Fernside Road forming a right-left stagger with Flaxton Road. Review of the crash data indicates two crashes in the ten year history were from prior to the intersection realignment. It is considered that the serious injury crash in 2009, where a vehicle hit a truck and trailer parked blocking the carriageway, is still relevant to the new alignment and has not been excluded from the analysis. The non-injury crash in 2011 where a vehicle on the eastbound approach failed to yield to a northbound vehicle which was reportedly masked by the vehicle it overtook whom was slowing to turn left. As this crash relates to the old intersection alignment, it has been excluded from this review.

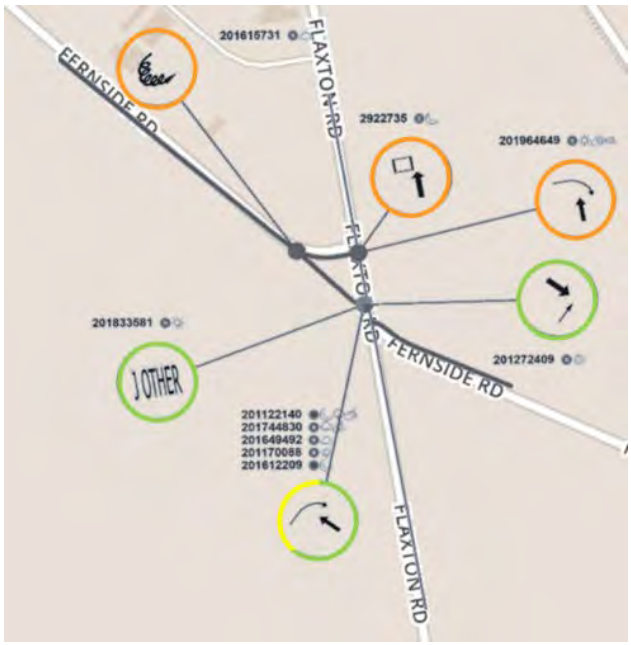


Figure 4-1: Collision diagram, 2009-2018 (300m radius)[5]

Note: all intersection crashes except 201744830, 201170088 occurred at the intersection of Flaxton Road / Fernside Road West

The nine historical crashes have been reported as follows:

- One serious injury crash (2009) occurred midblock on Flaxton Road (100m north of Old Fernside Road intersection) and involved a car hitting the side of a truck and trailer unit; the driver of the truck and trailer unit had parked on Flaxton Road whilst they opened a gate to a private access, with the trailer blocking oncoming traffic.
- A serious injury crash (2016) occurred on the eastbound approach (Fernside Road West) to the intersection with loss of control following a medical event.
- A non-injury crash (2017) occurred at the intersection of Flaxton Road and Fernside Road East. A driver failed to give way to an oncoming southbound vehicle as it was reportedly masked by oncoming vehicles indicating to turn left into Fernside Road.
- The remaining six crashes occurred at the intersection of Flaxton Road and Fernside Road West when drivers from Fernside Road West failed to give way to oncoming traffic. Specific factors noted include:

[4] Data extracted 10/09/2019
[5] NZ Transport Agency CAS database

- Sun strike was noted as a possible factor in two of the crashes (one crash that occurred at 12:35pm and one at 7:20am).
- Two crashes where drivers failed to give way to oncoming northbound traffic when turning right, drivers said they did not see the oncoming vehicle as it was masked by a vehicle in the left turn lane turning into Fernside Road. A third crash noted visibility was obstructed.
- Crashes occurred during weekdays.

- The environmental factors from the nine crashes are shown in Table 4-1.

Table 4-1: Environmental Factors in Reported Crashes

Factor	Description	Crash Count
Surface Condition	Dry	6
	Wet	3
Natural Light	Overcast	2
	Bright Sun	3
	Twilight	1
	Dark	3
Weather	Fine	7
	Light Rain	2

4.2 Serious Crash – 27th August 2019

A serious injury crash occurred at the intersection of Flaxton Road and Fernside Road West in Waimakariri on Tuesday 27th August 2019. The crash was reported to emergency services at approximately 7:20am. The weather conditions were reported as bright sun and fine with sunrise at 7:06am. The road surface condition was reported as wet.

The crash was a right turn right side (movement code JA) collision between a hatchback car with one occupant and a motorcyclist. The motorcyclist was taken to hospital in a serious condition. The Police Crash Incident Report emailed to Waimakariri District Council stated:

> *"The motorbike was travelling North on Flaxton Road. The car was travelling east on Fernside Road and was at the give way sign preparing to make a right turn onto Flaxton Road. As the car was sitting at the give way sign of the intersection of Flaxton Road and Fernside Road the driver experienced sun strike. The driver of the car thought the road was clear to make the right turn, moving straight into the path of the northbound motorbike which was travelling on Flaxton Road. The car struck the motorbike with the front bumper and sent the rider of the motorbike flying onto the road.*

Stantec received notification of the crash from Waimakariri District Council at 10:09am on Friday 6th September 2019 and were asked to undertake an investigation of the crash. The crash investigation concluded:

> *"Our crash investigation has considered how the elements of the road environment relate to the crash of Tuesday 27th August 2019. It is our opinion, from inspection on site, that the road environment was in an acceptable condition, and therefore it is unlikely that the road environment was a causative or contributing factor in this crash.*
>
> *Going forward, it is our opinion that while this intersection is operating efficiently, it is not operating safely. There are multiple drivers turning right from Fernside Road who are not adequately checking for through traffic on Flaxton Road. It is recommended that WDC progress with the optioneering for upgrading the Flaxton/Fernside intersection considering the following factors:*
>
> - *WDC review the design of this intersection, with consideration of adding a flush median separation between the through lane and the left turn lane as a 'do minimum', as is now considered best practice in auxiliary left turn treatments in recognition of the masking issue.*
> - *Optioneering for upgrading the Flaxton/Fernside intersection to address, if possible, the sun strike issue at this intersection, potentially via an alternative intersection form or speed limit change.*
> - *Consider islands at the intersection on Fernside Road to permit gating of give way signs. This would need to be balanced with the tracking of heavy vehicles.*
> - *Review turning volumes through this intersection so that the intersection design is appropriate for demand."*

5. Long-list Options

5.1 Overview

The range of options considered in this study include road re-alignments, changes of priority and roundabouts. The option of forming a signalised intersection has been discounted because this form of control is not considered appropriate in this high-speed environment.

Table 5-1 provides a summary of the longlist of options considered for the Flaxton Road / Fernside Road intersection. The potential options aimed at delivering all the desired benefits were reviewed during a workshop held between WDC and Stantec on the 26th September 2019. Concept level designs are provided for each option in Appendix A.

Table 5-1: Options for Flaxton Road / Fernside Road Intersection Safety Improvements

Option	Description
1A	3-leg roundabout – desirable radius
1B	3-leg roundabout – intermediate radius
1C	3-leg roundabout – minimum radius
1D	3-leg roundabout – minimum radius, offset from centre line
2A	4-leg roundabout - desirable radius
2B	4-leg roundabout – intermediate radius
2C	4-leg roundabout – minimum radius
3A	Reverse priority – minimum radius curve
3B	Reverse priority – large radius curve
3C	Reverse priority – reverse curves
3D	Reverse priority – large radius curve and roundabout
4A	4-leg roundabout with Fernside Road East
4B	4-leg roundabout with Fernside Road East and Development Access
5A	Dual roundabout (NS)
5B	Dual roundabout (NS) – with development access
6A	Dual roundabout (EW) – with development access

5.2 Roundabout Options – Options 1 & 2

Observations of driver risk-taking behaviour at the intersection indicate a need to increase the capacity of the right turn movement from Fernside Road into Flaxton Road and reduce vehicle speeds along Flaxton Road. A roundabout configuration provides the most appropriate way to achieve this. Three roundabout island sizes have been considered as part of the West Route investigations.

Option 1A is based on the Austroads desirable central island radius for an 80km/h road and is based on three legs. With the island centred on the existing Flaxton Road centre line, this will require land on the eastern side of Flaxton Road.

Option 1B is based on a smaller size central island. Although this requires less land, it will not provide the same level of speed control at the intersection compared to Option 1A. With the smaller island, there is a need to widen the circulating carriageway to cater for heavy vehicle tracking paths.

Option 1C represents the smallest size of central island that is recommended in Austroads and has been considered because it reduces the land requirements.

Option 1D further reduces the land required by recentering the roundabout to west of the Flaxton Road centreline.

Options 2A, 2B and 2C involves the introduction of a fourth leg to Options 1A, 1B and 1C to provide a safe, high capacity access to the land to the east.

None of these options involve any change to the Fernside Road East intersection.

5.3 Reverse Priority – Option 3

These options involve changing the movement priority at the intersection so that the Flaxton Road south to Fernside Road West Route has a continuous movement and Flaxton Road north is priority controlled. The change in priority will address the common type of crashes reported at the intersection.

Option 3A involves a 250m radius curve to link Flaxton Road with Fernside Road to reduce land required on the western side of the road. This reflects he minimum radius size recommended in the Austroads Guide to Road Design for an 80km/h road. Option 3B has a larger radius curve but will require more land.

Option 3C involves a reverse curve to reduce the additional land required.

Option 3D retains the alignment of the larger radius curve but includes a roundabout rather than a priority control.

Each of these options would allow access to the land east of Flaxton Road in the form of a priority control.

None of these options involve any change to the Fernside Road East intersection.

5.4 Fernside Road East – Option 4

Option 4A shows a 4-leg roundabout option that links Fernside Road East to the intersection with Fernside Road West. There is some scope to adjust the roundabout centre but this will affect the design of the Fernside Road approaches.

Option 4B shows how access can be provided to the land to the east.

5.5 Dual Roundabout Options – Options 5 & 6

Options 5A and 5B are extensions to Options 1A and 2A to address safety concerns with the Fernside Road East intersection.

Option 6A shows a different configuration with two closely spaced roundabouts.

5.6 Other Options

The safety investigation of the most recent serious crash at the intersection identified the design of the auxiliary left turn lane as a potential contributing factor for crashes. The report suggested that modifying the intersection design to ensure that vehicles using the auxiliary lane do not obstruct sight lines for drivers turning right out of Fernside Road. This has been assessed as Option 7 but is only considered to represent a short-term improvement.

6. Long-List Multi-Criteria Analysis

6.1 Overview

The assessment of the long-list options took the form of a multi-criteria analysis (MCA). The MCA has been undertaken in line with the NZTAs 'Multi Criteria Analysis for Transport Business Cases Guidance Document' (February 2017), the following assessment scoring scale has been used:

Table 6-1: Multi-Criteria Analysis Scoring

Score	Definition
1	The option presents few difficulties on the basis of the criterion being evaluated and may provide significant benefit, especially in the long term.
2	The option presents only minor aspects of difficulty on the basis of the criterion being evaluated and may provide some benefits.
3	The option presents some aspects of reasonable difficulty in terms of the criterion being evaluated and problems cannot be avoided. There are few apparent benefits.
4	The options include clear aspects of difficulty in terms of the criterion being evaluated, and very few perceived benefits.
5	The options include significant difficulties in term of the criterion being evaluated, and no apparent benefits.

The criteria against which the options have been assessed have been grouped into four categories:

- **Implementability -** criteria measuring need for land acquisition, engineering degree of difficulty, existing infrastructure (culverts, storm water channel, power), and effects on the natural environment.
- **Safety -** criteria measuring crash reduction on key crash types (lost control/head on and crossing/turning), evaluation of other transport modes, access and the extent to which the option supports the target speed environment.
- **Network Effects -** criteria measuring efficiencies (intersection delays and travel time), re-routing of current trips, network legibility, community cohesion, and operational maintenance.
- **Mode Neutrality -** criteria measuring ability to cater for changes in travel mode.

Appendix C provides description of the assessment scoring criteria.

6.2 Weightings

Each option was scored against the extent to which it would deliver each of the desired benefits and the assessment of effects of each option. For the initial assessment, all criteria were weighted equally

Table 6-2: Weightings for Sensitivity Tests

Category	Criteria	Workshop Weighting
Implementability	Land Acquisition	1
	Engineering Degree of Difficulty	1
	Affects Existing Infrastructure	1
	Natural Hazards / Natural Environment	1
Safety	Speed Reduction	1
	Vehicle – Loss of Control	1
	Vehicle – Crossing / Turning	1
	Vehicle – Head On	1
	Vehicle – Other	1
	Motorcyclist – Loss of Control	1
	Motorcyclist – Sideswipe	1
	Motorcyclist – Crossing / Turning	1
	Motorcyclist – Other	1
	Cyclist – Midblock	1

Category	Criteria	Workshop Weighting
	Cyclist – Intersection (turning)	1
	Cyclist – Intersection (sideswipe)	1
	Cyclist – Intersection (vehicle straight)	1
	Pedestrians	1
	Accesses	1
Network Effects	Intersection Delay / Travel Time	1
	Network Legibility	1
	Community Cohesion and Property Accesses	1
	Rerouting of Existing Routes	1
	Operational / Maintenance	1
Mode Neutrality	Multi Modal / Mode Shift	1

For the purposes of the MCA, a normalised score is generated for each group so that the scores fall within a standard range before combining the group scores.

6.3 MCA Results

Table 6-3 provides a summary of the scoring for each option based on equal weighting of each assessment criteria. The full table with all individual scores is included in Appendix B. All options with a roundabout score better than the alternative configurations. The small differences in scores are largely related to the differences in land requirements as the smaller central island size requires less land but does not provide the level of safety improvement that would be associated with the larger islands.

Option	Description	Score
1A	3-leg roundabout – desirable radius	8.1
1B	3-leg roundabout – intermediate radius	8.1
1C	3-leg roundabout – minimum radius	8.2
1D	3-leg roundabout – minimum radius, offset from centre line	8.5
2A	4-leg roundabout - desirable radius	8.2
2B	4-leg roundabout – intermediate radius	8.2
2C	4-leg roundabout – minimum radius	8.3
3A	Reverse priority – minimum radius curve	10.8
3B	Reverse priority – large radius curve	10.8
3C	Reverse priority – reverse curves	11.1
3D	Reverse priority – large radius curve and roundabout	11.3
4A	4-leg roundabout with Fernside Road East	10.1
4B	4 leg roundabout with Fernside Road East and Development	10.1
5A	Dual roundabout (NS)	9.7
5B	Dual roundabout (NS) – with development access	11.0
6A	Dual roundabout (EW) – with development access	9.2

Table 6-3: Preliminary assessment results

6.4 Sensitivity Tests

If the weighting applied to the safety group was doubled compared with the other categories, effectively increasing its weighting factor from 25% to 40%, then the roundabouts remain the preferred configuration but the larger size of roundabout island would be better.

If the weighting for the implementation group was increased, roundabouts still remain the preferred intersection.

During the workshop, it was noted that the island size selection should take into account the likely size of any roundabouts that are proposed elsewhere along the Rangiora West Route corridor. Although the assessment of other intersections has not been completed, it was considered likely that this would lead to a preference for an intermediate size of roundabout.

6.5 Other Matters

The roundabout options only provide minor safety improvements for the Fernside Road east intersection. Although this section of road provides one approach to the Southbrook area from Kaiapoi, the safety assessments completed for KiwiRail of the Fernside Road / Lineside Road raise significant concerns with the intersection and identify a desire for the Fernside Road approach to Lineside Road to be closed. If this occurred, then this section of Fernside Road would carry only low volumes of traffic and the potential for crashes to occur at Flaxton Road would reduce accordingly.

There is a residential driveway located about 30m north of the proposed roundabout location. It will be necessary to restrict turning movements at the access, ideally preventing the right turn out because this can be accommodated via the roundabout.

The concept designs do not explicitly address provision of cycle facilities because no cycle lanes are proposed on any of the approach roads. However, it is recognised that the route is used by cyclists and it is recommended that provision for cycle crossing and turning through the intersection is incorporated into the design.

7. Short List Assessment

7.1 Options

Based on the long-list assessment process, a roundabout configuration has been identified as the preferred option for the Flaxton Road / Fernside Road intersection due to the safety benefits. Three sizes of island have been considered for the short list assessment ranging from the Austroads minimum to the desirable size.

The basic configuration of the roundabout will include three legs at right angles so that a fourth leg can be added to provide access to the land to the east of Flaxton Road.

7.2 Additional Assessment Criteria

To assist in identification of a preferred option, the following additional assessment criteria have been adopted:

1. Indicative construction cost;
2. Effects on Fernside Road culvert;
3. Effects on services;
4. Ability to cater for over-sized transporter vehicles, and
5. Consistency with other Rangiora West Route intersection configurations.

A breakdown of the indicative construction costs for the roundabout options is included in Appendix F.

With the first four additional criteria included in the implementability group, the intermediate sized roundabout achieves the lowest score. This reflects the fact that the larger roundabout would require more land and would require more widening of the culvert on Fernside Road which together increase the engineering difficulty and associated costs.

Option	Description	Score
2A	4-leg roundabout - desirable radius	8.5
2B	4-leg roundabout – intermediate radius	8.3
2C	4-leg roundabout – minimum radius	8.6

Table 7-1: Short-list assessment results

Although the smallest roundabout option requires less land, it is not expected to provide the same safety benefit as the larger roundabouts. This is associated with a mountable apron being required to accommodate the tracking of large transporters and therefore less speed control for general traffic. The resultant higher speeds increases the likelihood and severity of crashes.

In terms of roundabout consistency along the Rangiora West Route, one objective would be to have similar sizes of roundabout wherever they are required and the same geometric design philosophy. The largest size of roundabout is considered to be out of context on the lower volumes roads to the west and a smaller size of roundabout is likely to be preferred. The intermediate size roundabout is likely to be comparable in size to any other roundabouts that might be recommended elsewhere along the route.

Based on the analysis completed to date, an intermediate size roundabout has been identified as the preferred option for the intersection because;

1. The island size is consistent with an 80km/h speed environment;
2. Allows provision of good speed control;
3. Provides safe turning movements, particularly from Fernside Road West;
4. Can accommodate a wide range of vehicle sizes;
5. Provides a good balance of land take against safety;
6. Provides efficient access to the land to the east;
7. Minimises construction effects on existing infrastructure; and
8. Minimises effects on water race and storm water detention ponds.

Consultation with Mr Smith who owns the land on the eastern side of the intersection has also been undertaken. He has indicated that he is prepared to provide the necessary land for the intersection and supports the implementation of the intermediate sized roundabout.

8. Conclusions and Recommendations

8.1 Conclusions

Following the review of a wide range of options for improvements to the Flaxton Road / Fernside Road intersection, it has been concluded that a roundabout configuration will provide the greatest benefits and is consistent with the long-term objectives of promoting a safe and efficient western route around Rangiora. This option also provides an opportunity to create a safe access to the land to the east of the intersection.

A range of roundabout sizes have been reviewed and the preferred size is an 18m radius island. This represents a size that will provide good speed control and can be designed to safely accommodate all sizes of vehicle that will travel through the intersection.

One potential criticism of the preferred option is that it does not address safety concerns at the Fernside Road east intersection. This would be largely addressed if the Fernside Road approach to Lineside Road was closed to address safety concerns raised by KiwiRail. As an alternative, the Fernside road east approach to Flaxton Road could be closed and a new link formed to connect to the roundabout. However, this option would involve land that is not owned by Council and will require further investigation to best alignment for any future link.

The construction of the roundabout will result in a residential driveway being located about 30m north of the roundabout. In order to address any safety concerns arising from this, either turn restrictions would need to be enforced or a link should be constructed through the Smith land to the roundabout.

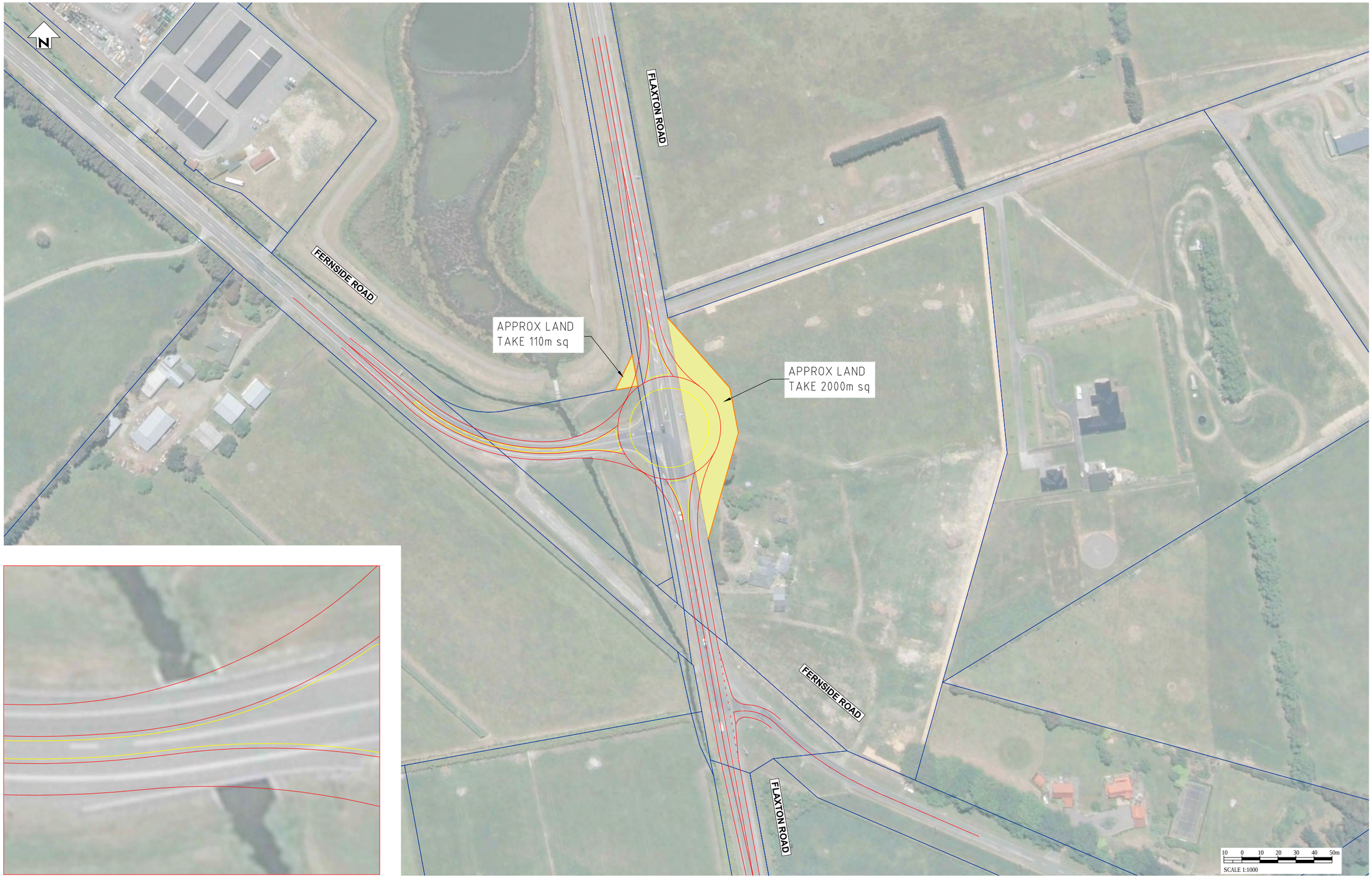
8.2 Recommendations

Option 2B with an 18m radius island has been identified as the preferred option for the intersection. It is recommended that Council progresses the concept design to the next stage of design to allow a road safety audit to be completed and also allow refinement of construction cost estimates.

As a separate exercise, it is recommended that Council initiates discussion with Mr D Smith to investigate options for the creation of a safe, public connection from Fernside Road East to the roundabout. This investigation should investigate options for provision of access between the residential properties to the east and the roundabout so that their existing access to Flaxton Road can be removed.

Appendices

Appendix A Long-list Drawings



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DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 1A
Roundabout Central Island Radius 22m

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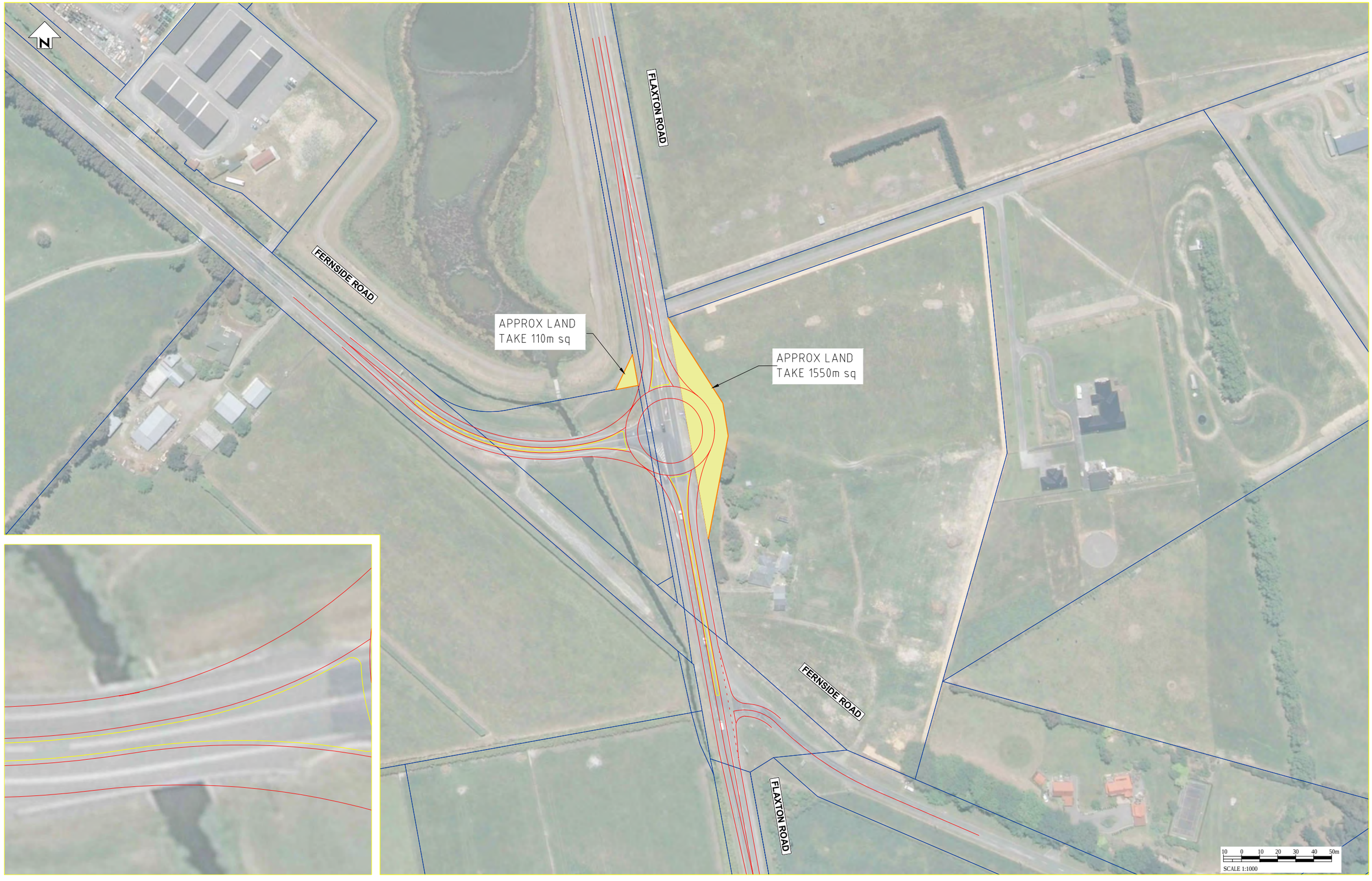

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Flaxton Fernside Intersection

Option 1B
Roundabout Central Island Radius 18m

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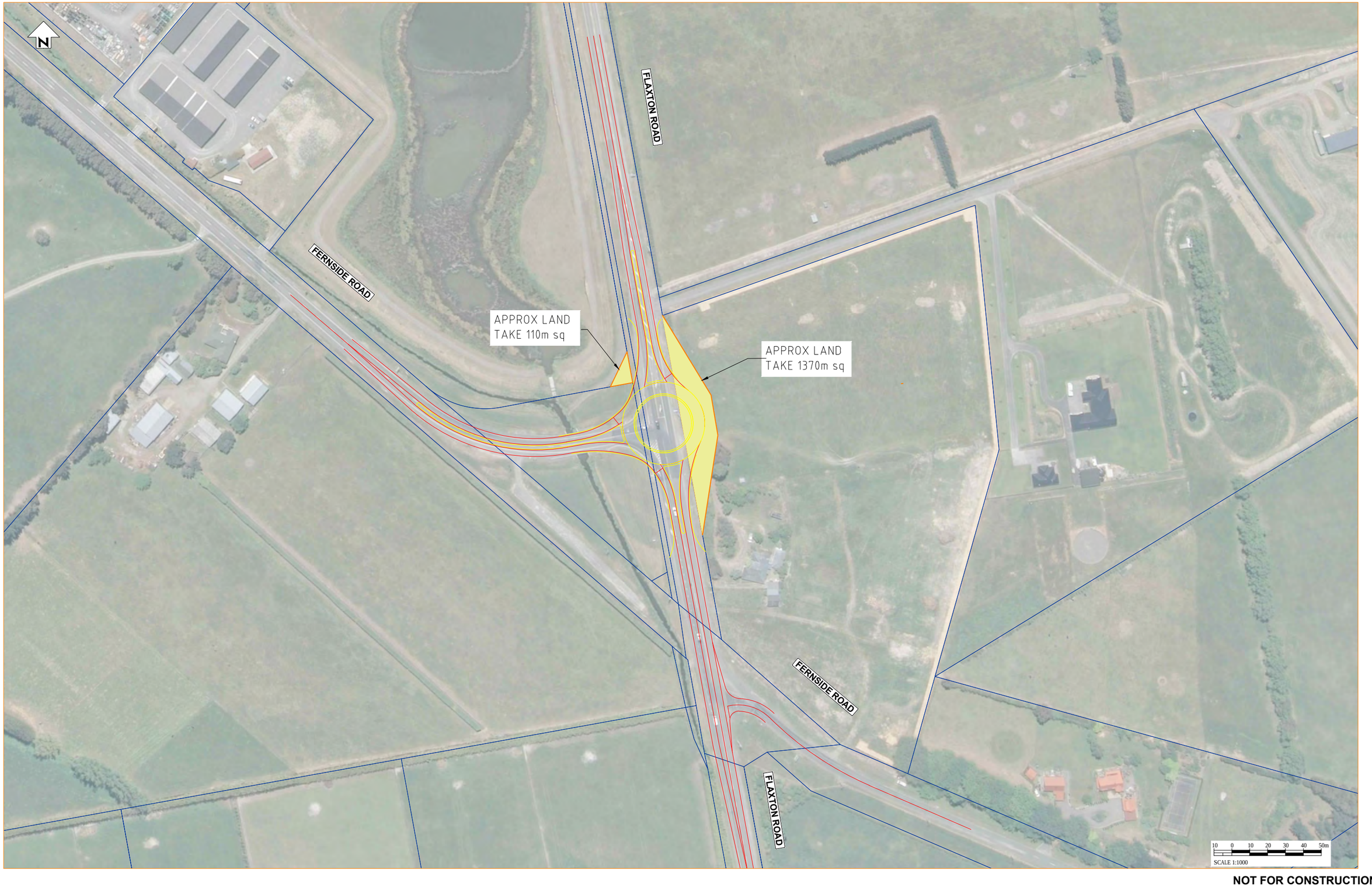

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Flaxton Fernside Intersection

Option 1C
Roundabout Central Island Radius 16.5 (15.5 m Radius with1.0m apron)

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Flaxton Fernside Intersection

Option 2A
Roundabout Central Island Radius 22m

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Flaxton Fernside Intersection

Option 2B
Roundabout Central Island Radius 18m

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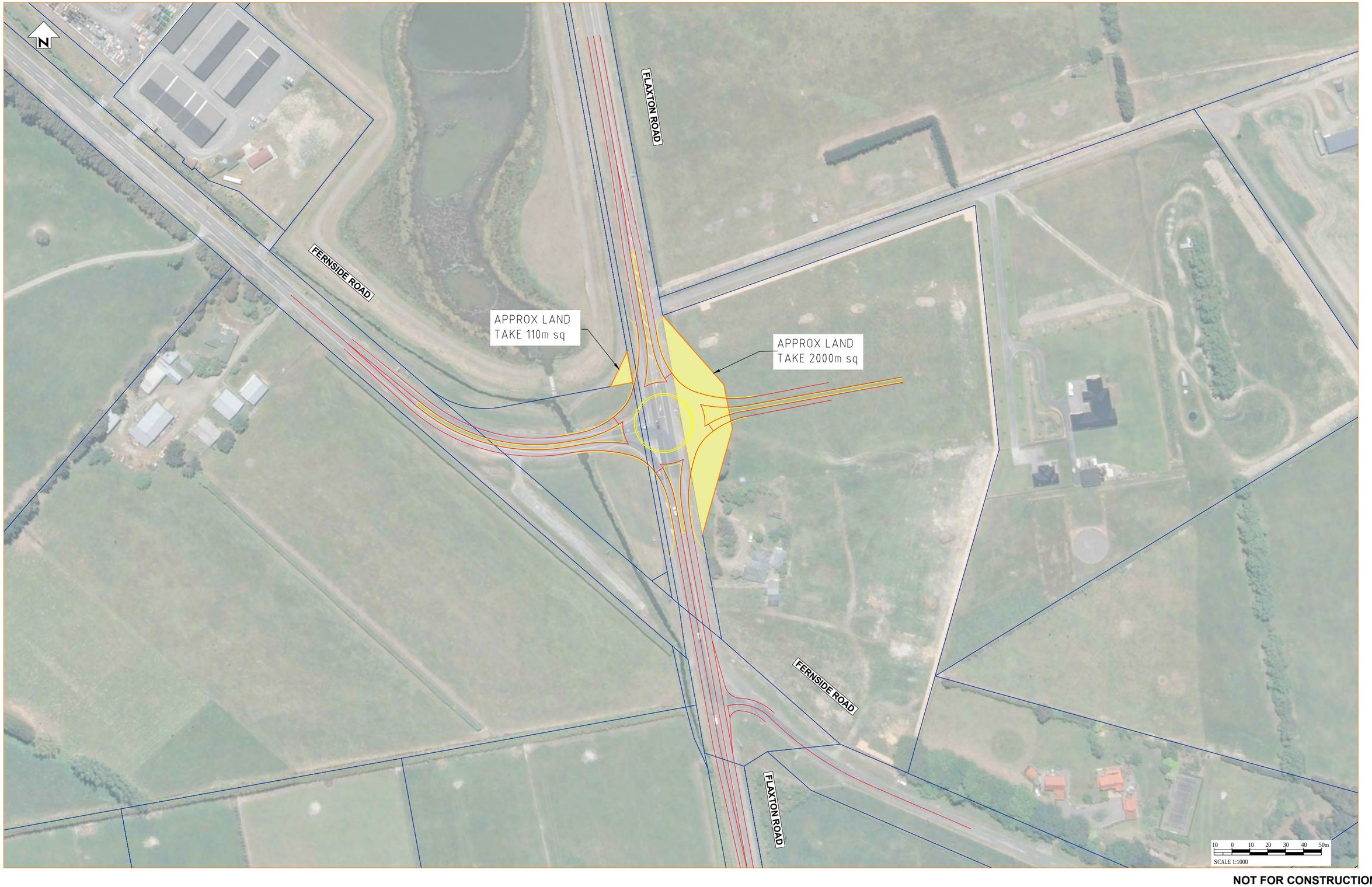

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Flaxton Fernside Intersection

Option 2C
Roundabout Central Island Radius 16.5 (15.5 m Radius with1.0m apron)

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Flaxton Fernside Intersection

Option 3A

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Flaxton Fernside Intersection

Option 3B

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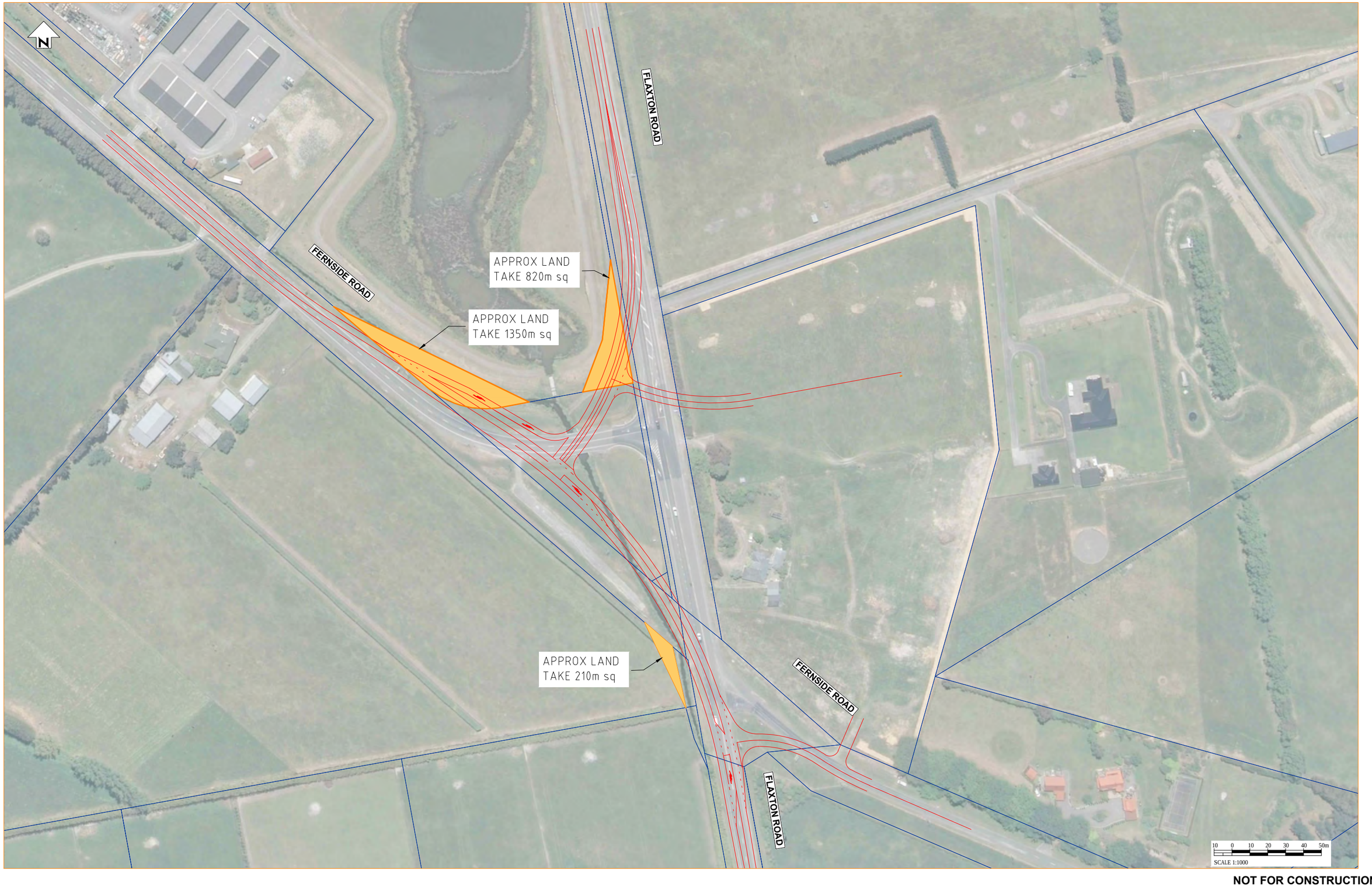

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Stantec

Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 3C

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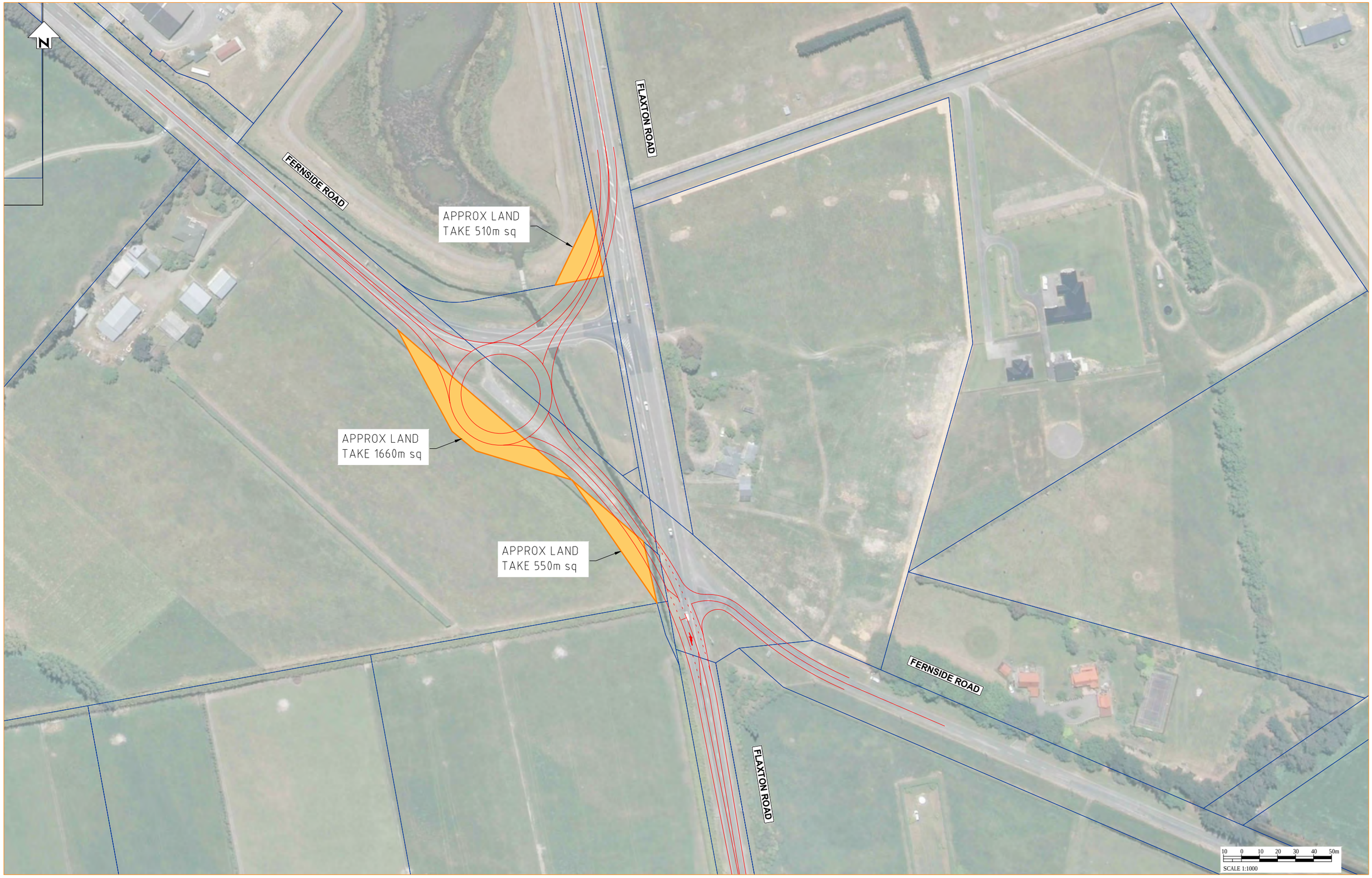

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DESIGNED	B BROWNE	16.9.2019
DRAWN	B BROWNE	16.9.2019
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
PROF REGISTRATION:		

Stantec

Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option3D

Status Stamp: **WORKING PLOT**

Date Stamp: **16.9.2019**

Scales

Drawing No.: Sketch 9

Rev.: A

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DO NOT SCALE - IF IN DOUBT, ASK

200 mm 150 100 90 80 70 60 50 40 30 20 10 0

ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED	B BROWNE	16.9.2019
DRAWN	B BROWNE	16.9.2019
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	**NOT APPROVED**	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 3E

Status Stamp: **WORKING PLOT**

Date Stamp: **16.9.2019**

Scales

Drawing No.: Sketch 4

Rev.: A

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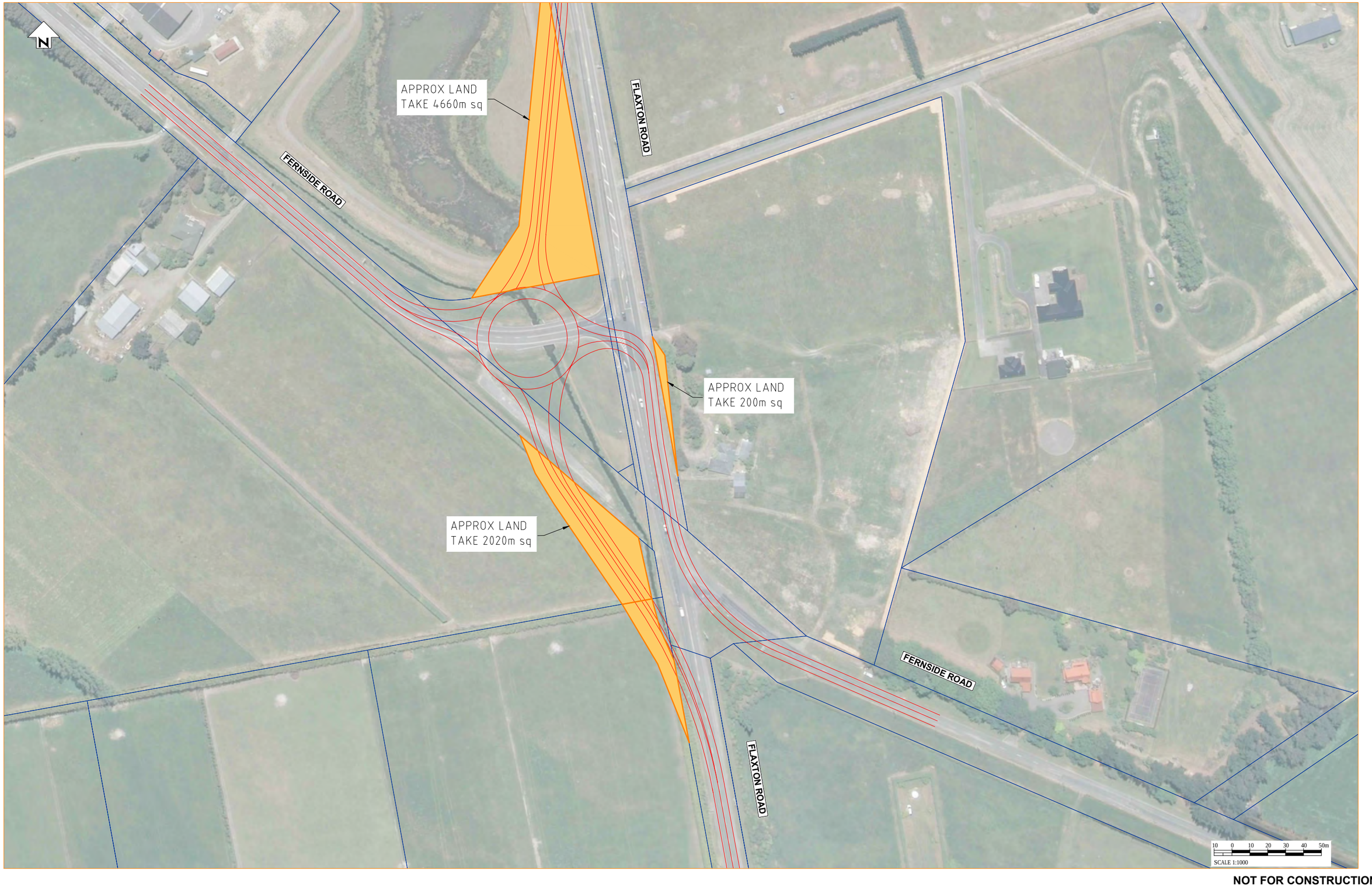

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ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED	B BROWNE	16.9.2019
DRAWN	B BROWNE	16.9.2019
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 4A

Status Stamp: WORKING PLOT

Date Stamp: 16.9.2019

Scales

Drawing No.: Sketch 7

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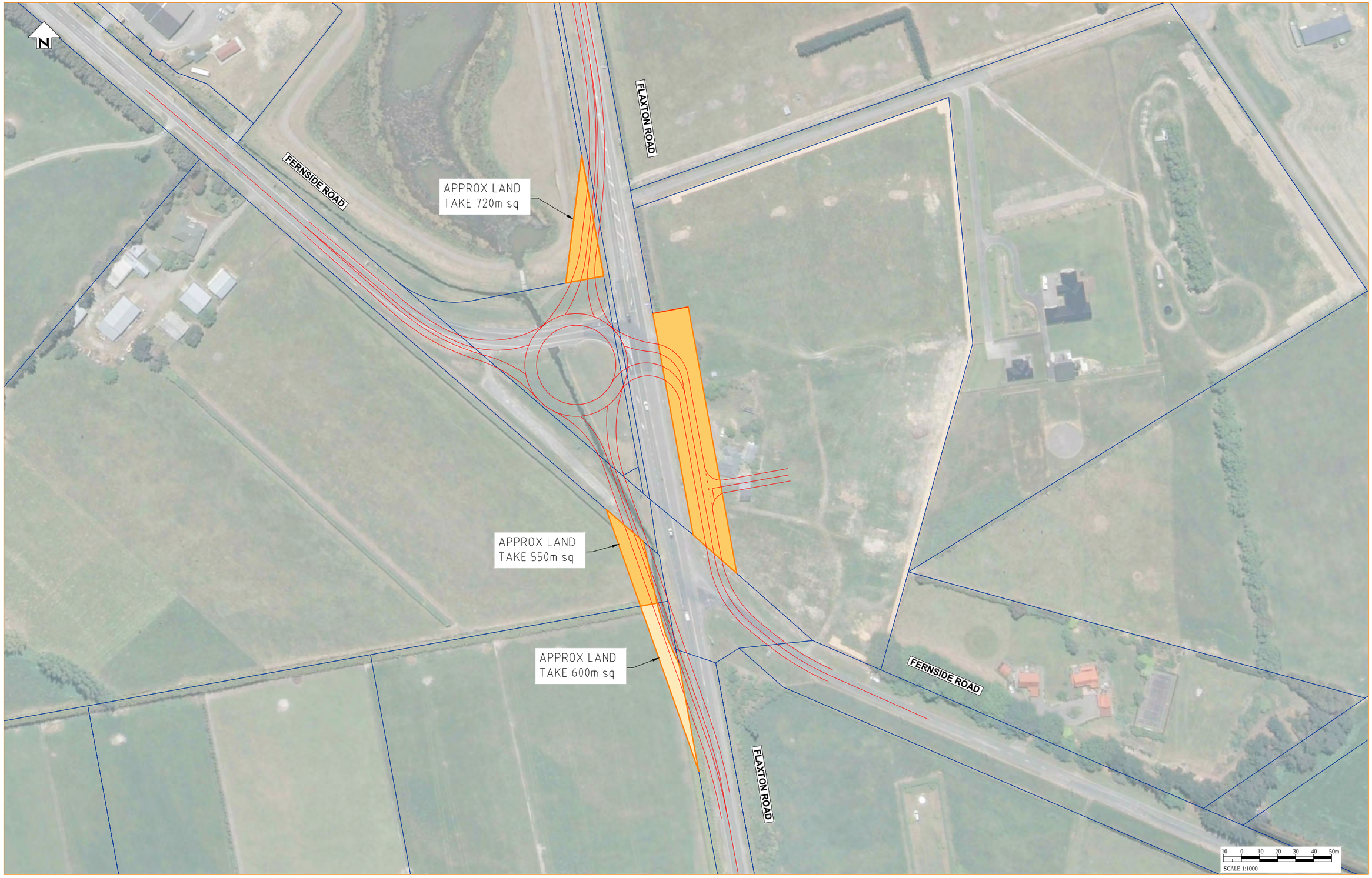

DO NOT SCALE - IF IN DOUBT, ASK

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ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED	B BROWNE	16.9.2019
DRAWN	B BROWNE	16.9.2019
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
PROF REGISTRATION:		

Stantec

Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 4B

Status Stamp: **WORKING PLOT**

Date Stamp: **16.9.2019**

Scales

Drawing No.: Sketch 5

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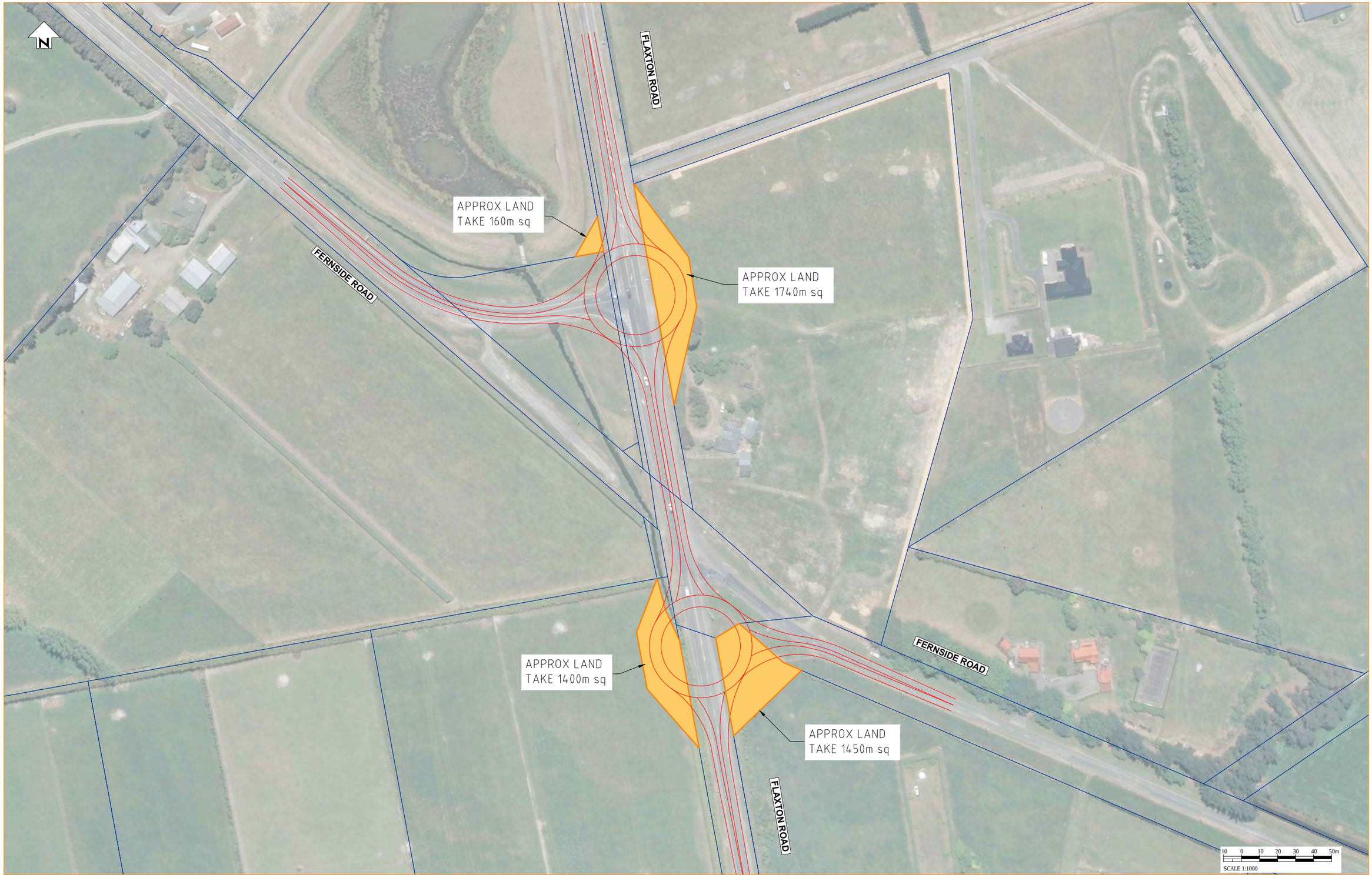

DO NOT SCALE - IF IN DOUBT, ASK

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ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED	B BROWNE	16.9.2019
DRAWN	B BROWNE	16.9.2019
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
PROF REGISTRATION:		

Stantec

Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 5A

Status Stamp: **WORKING PLOT**

Date Stamp: **16.9.2019**

Scales

Drawing No.: Sketch 6

Rev.: A

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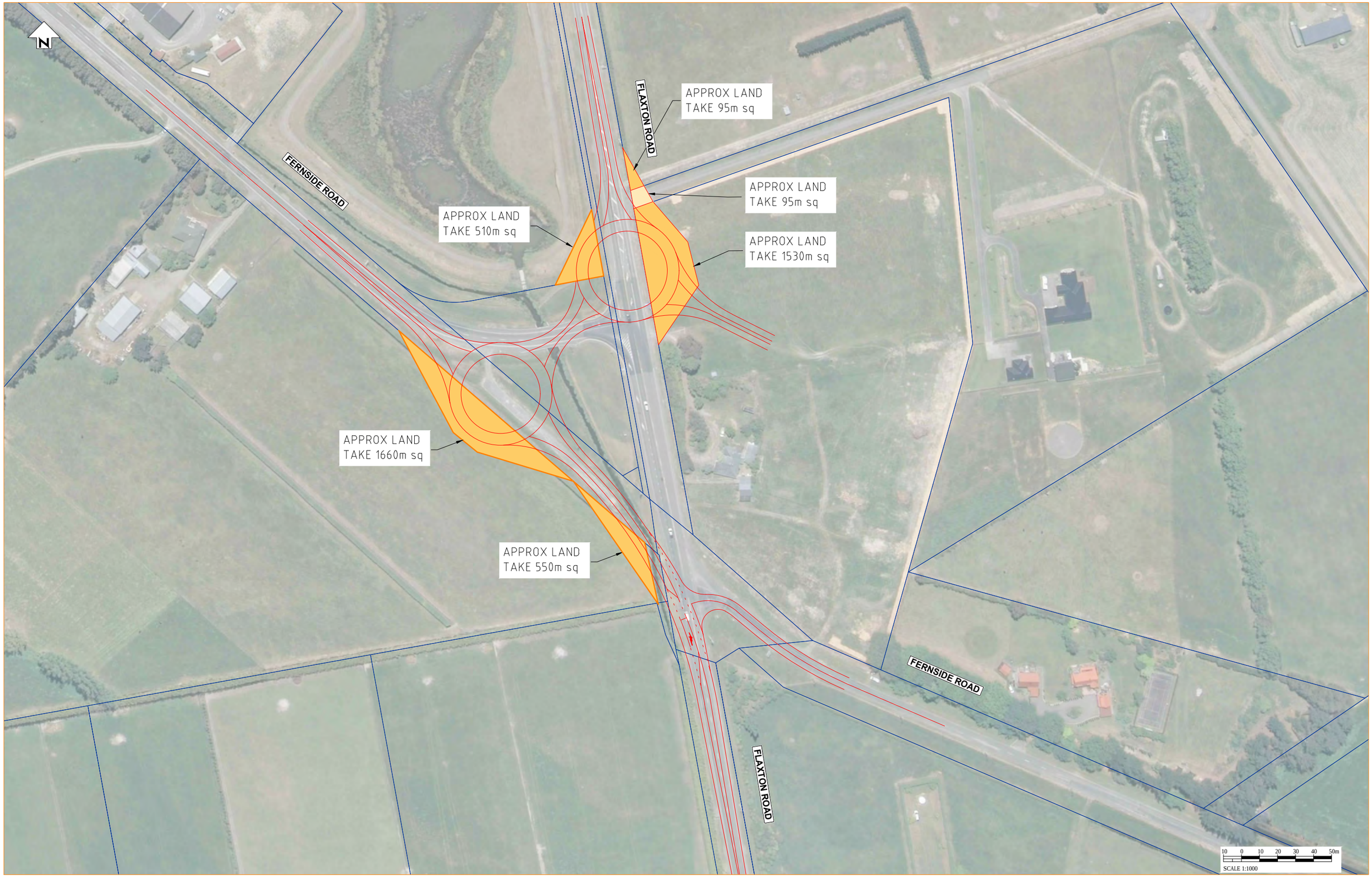

DO NOT SCALE - IF IN DOUBT, ASK

200 mm 150 100 90 80 70 60 50 40 30 20 10 0

ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED	B BROWNE	16.9.2019
DRAWN	B BROWNE	16.9.2019
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
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Stantec

Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 6A

Status Stamp: **WORKING PLOT**

Date Stamp: **16.9.2019**

Scales

Drawing No.: Sketch 10

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Appendix B Long List MCA Results

Fernside Road / Flaxton Road Intersection			Scores (1= Very Good Outcomes, 5 = Very Poor Outcomes)																													GRAND SCORE
			Implementability				1.0	Safety																		1.0	Network Effects					1.0	Mode Neutrality	0.5	
		Weighting	1.0	1.0	1.0	1.0	4.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	10.0	1.0	0.0	1.0	1.0	0.0	3.0	1.0	1.0	
	Option	Description	Land Acquisition	Engineering Degree of Difficulty	Affects Existing Infrastructure	Natural Hazards / Natural Environment	Subtotal	Speed Reduction *consistency with target speed*	Vehicle - Loss of Control	Vehicle - Crossing / Turning	Vehicle -Head On	Vehicle - Other	Motorcyclist - Loss of Control	Motorcyclist - Sideswipe	Motorcyclist - Crossing / Turning	Motorcyclists - Other	Cyclists - Midblock	Cyclists - Intersection (turning)	Cyclists - Intersections (sideswipe)	Cyclists - Intersections (vehicle straight)	Pedestrians	Accesses	Subtotal	Intersection Delays / Travel Time	Network Legibility	Community Cohesion & Property Accesses	Rerouting of Existing Trips	Operational / Maintenance	Subtotal	Multi Modal / Mode Shift	Subtotal	
West Route	1A	Roundabout - desirable size	4	2	3	2	11	2	2	2			2	2	2			2	3	3		2	22	2		2	1		5	3	3	8.1
	1B	Roundabout - intermediate size	3	2	3	2	10	3	2	2			3	2	2			2	3	3		2	24	2		2	1		5	3	3	8.1
	1C	Roundabout - minimum size	2	2	3	2	9	3	3	3			3	3	3			2	3	3		2	28	2		2	1		5	3	3	8.2
	1D	Roundabout - minimum size, offset	1	3	3	2	9	3	3	3			2	2	3			3	3	3		2	27	2		3	1		6	3	3	8.5
Smiths	2A	Four arm roundabout - desirable size	4	2	3	2	11	2	2	2			2	2	2			3	3	3		2	23	2		2	1		5	3	3	8.2
	2B	Four arm roundabout - intermediate	3	2	3	2	10	3	2	2			3	2	2			3	3	3		2	25	2		2	1		5	3	3	8.2
	2C	Four arm roundabout - minimum	2	2	3	2	9	3	3	3			3	3	3			3	3	3		2	29	2		2	1		5	3	3	8.3
West Route	3A	Change of priority - minimum radius	3	5	3	4	15	2	3	4			3	4	4			4	4	4		3	35	3		2	1		6	3	3	10.8
	3B	Change of priority - larger radius	5	3	3	3	14	4	3	4			3	4	4			4	4	4		3	37	3		2	1		6	3	3	10.7
	3C	Change of priority - reverse curve	3	5	3	4	15	3	4	4			4	4	4			4	4	4		3	38	3		2	1		6	3	3	11.1
	3D	Roundabout	5	5	3	4	17	2	2	2			2	2	2			3	3	3		3	24	2		2	1		5	3	3	9.8
	3E	Change of priority & roundabout	5	5	3	3	16	3	3	4			3	4	4			4	4	4		2	35	4		2	1		7	3	3	11.3
West Route	4A	Roundabout with Fernside E	5	5	2	4	16	2	2	2			2	2	2			3	3	3		2	23	2		3	2		7	3	3	10.1
	4B	Roundabout with Fernside E&Smiths	5	5	4	3	17	2	2	2			2	2	2			3	3	3		2	23	2		2	2		6	3	3	10.1
Smiths	5A	Double Roundabout (N/S)	5	4	3	2	14	3	3	3			2	2	3			3	3	3		2	27	3		2	1		6	3	3	9.7
	6A	Double Roundabout (E/W)	5	5	4	4	18	3	3	3			2	2	3			3	3	3		2	27	3		3	1		7	3	3	11.0
West Route	7A	Re-align left lane	1	2	2	2	7	4	4	4			4	3	4			4	3	4		2	36	4		2	1		7	3	3	9.2

Appendix C Long-List Assessment Criteria

CRITERIA	1	2	3	4	5
Implementability					
Land Acquisition	No land acquisition expected	<500m^2	<1,000m^2	<2,000m^2	>2,000m^2
Engineering Degree of Difficulty	Based on engineering judgement considering anticipated technical assessments required (e.g. geotechnical, structural, 3 waters etc.)				
Affects Existing Infrastructure *(e.g. power poles, stormwater, water supply, cabling)*	No existing infrastructure anticipated to be affected	Minor impacts to existing infrastructure anticipated e.g. rerouting water supply a short distance	Moderate impacts to existing infrastructure anticipated e.g. relocating power poles in road corridor	Significant impacts to existing infrastructure anticipated e.g. undergrounding power lines	Fatal / unsurmountable impacts to existing infrastructure anticipated
Natural Hazards / Natural Environment	No natural hazards, no expected impacts to natural environment	Minor impacts to environment anticipated or minor natural hazards e.g. sealing gravel shoulders (increasing impermeable surfaces)	Moderate impacts to environment anticipated or moderate natural hazards e.g. slip prone land, rerouting water course	Significant impacts to environment anticipated or significant natural hazards e.g. protected trees impacted	Fatal / unsurmountable impacts to environment anticipated e.g. impact on protected species habitat / sacred land
Safety					
Speed Reduction *(consistency with target speed)*	Road environment actively (and appropriately) contributes to reducing driver speeds e.g. side friction, thresholds, line marking, RIAWLS	engineering judgement	Road environment contributes to reducing driver speeds e.g. vertical elements, in context horizontal curves, road narrowing, route quality	engineering judgement	Road environment encourages speeds at 100kph (or excess) e.g. wide lanes, wide shoulders
Vehicle - Loss of Control	No exposure to loss of control type crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. median barrier and edge barrier	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. wide run out areas / batters / clear zones	Reduction but still exposure / chance of DSi is moderate e.g. protection for road side hazards, sealed shoulders (2m), improved skid resistance	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. rumble strips	No anticipated reduction in loss of control type crashes
Vehicle - Crossing / Turning	No exposure to crossing / turning crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. side roads closed / grade separation	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. LILO treatment / roundabout	Reduction but still exposure / chance of DSi is moderate e.g. raised platforms (if appropriate), aux. turning lanes	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. lower speed	No anticipated reduction in crossing / turning type crashes
Vehicle -Head On	No exposure to head on crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. median barrier, one way traffic	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. raised median	Reduction but still exposure / chance of DSi is moderate e.g. wide median	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. no overtaking lines, improved skid resistance	No anticipated reduction in head on type crashes
Vehicle - Other	No exposure to other crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. low speeds, low volumes	engineering judgement	Reduction but still exposure / chance of DSi is moderate e.g. reduce conflict points	engineering judgement	No anticipated reduction in other type crashes
Motorcyclist - Loss of Control	No exposure to loss of control type crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. median barrier and edge barrier (Motorcyclist friendly design)	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. wide run out areas / batters / clear zones	Reduction but still exposure / chance of DSi is moderate e.g. protection for road side hazards, sealed shoulders (2m), improved skid resistance	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. rumble strips	No anticipated reduction in loss of control type crashes
Motorcyclist - Sideswipe	No exposure to sideswipe crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. lane changing prohibited / separate motorcycle lanes	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. lower speeds, clear zones	Reduction but still exposure / chance of DSi is moderate e.g. improve driver awareness of motorcyclists, wide shoulders (escape paths)	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. improved skid resistance	No anticipated reduction in sideswipe type crashes

Motorcyclist - Crossing / Turning	No exposure to crossing / turning crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. side roads closed / grade separation	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. LILO treatment , turning arrows at signalised intersection	Reduction but still exposure / chance of DSi is moderate e.g. raised platforms (if appropriate), aux. turning lanes	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. reduce speed from 100kph to 80kph	No anticipated reduction in crossing / turning type crashes
Motorcyclists - Other	No exposure to other crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. low speeds, low volumes, separate motorcycle lanes	engineering judgement	Reduction but still exposure / chance of DSi is moderate e.g. reduce conflict points	engineering judgement	No anticipated reduction in other type crashes
Cyclists - Midblock	No exposure to midblock crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. separated / off road cycle facility	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. on road cycle lane	Reduction but still exposure / chance of DSi is moderate e.g. wide sealed shoulders	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. improved skid resistance, narrow lanes (near parking)	No anticipated reduction in midblock crashes
Cyclists - Intersection (turning)	No exposure to turning crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. side roads closed / separated cycle way	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. cycle lane and bicycle box	Reduction but still exposure / chance of DSi is moderate e.g. wider traffic lanes and good visibility	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. reduce speed from 100kph to 80kph	No anticipated reduction in turning type crashes
Cyclists - Intersection approaches (sideswipe)	No exposure to sideswipe crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. no cyclists (i.e. off road route provided)	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. cycle lane / wide kerbside lane	Reduction but still exposure / chance of DSi is moderate e.g. pavement markings at intersections, good visibility	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. reduce speed from 100kph to 80kph	No anticipated reduction in sideswipe type crashes
Cyclists - intersections (vehicle straight)	No exposure to intersection (veh. Straight) crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. no cyclists / off road route provided	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. traffic signals with cyclist facilities	Reduction but still exposure / chance of DSi is moderate e.g. minor priority crossroads	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. major priority controlled crossroads	No anticipated reduction in intersection (veh. straight) type crashes
Pedestrians	No exposure to pedestrian crashes or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. off road route provided with clear separation from cyclists (if shared use)	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. wide shared path, single lane crossing (refuge island)	Reduction but still exposure / chance of DSi is moderate e.g. narrow shared path, uncontrolled crossing of 2 lanes	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. uncontrolled crossing of three lanes, cycling on footpath	No anticipated reduction in pedestrian crashes
Accesses	No exposure to crashes at accesses or if a crash is to occur, there is only minimal chance of it resulting in a DSi, e.g. no accesses from road	It is unlikely that this crash type will occur / low volumes / kinetic energies are low so chance of DSi is low e.g. right turn bays (i.e. form as a full intersection)	Reduction but still exposure / chance of DSi is moderate e.g. median	Slight reduction but potentially still high exposure to this type of crash / likelihood of road user errors leading to a crash is high given the infrastructure e.g. 2m shoulder	No anticipated reduction in crashes at accesses
Network Effects					
Intersection Delays / Travel Time	LOS A	LOS B	LOS C	LOS D	LOS E or LOS F
Network Legibility	Based on engineering judgement considering continuity of treatments, self explaining roads, no out of context curves etc.				

Community Cohesion & Property Accesses	No property accesses affected, no perceived community severance issues etc.	1 property access affected	<3 property accesses affected	<5 property accesses affected	>5 property accesses affected
Rerouting of Existing Trips	<100vpd	<500vpd	<10,000vpd	<25,000vpd	>25,000vpd
Operational / Maintenance	OPEX est. <$1,000	OPEX est. <$5,000	OPEX est. <$10,000	OPEX est. <$25,000	OPEX est. >$25,000
Mode Neutrality					
Multi Modal / Mode Shift	Separated / off road cycleway	On road cycle way	2.0m shoulders / cyclist treatments at intersections	1.5m shoulders	No cyclist facilities

Appendix D Short List MCA

		Scores (1= Very Good Outcomes, 5 = Very Poor Outcomes)																																		
		Implementability									**1.0**	**Safety**															**1.0**	**Network Effects**					**1.0**	**Mode Neutrality**	0.5	
	Weighting	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	8.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	10.0	1.0	0.0	1.0	1.0	0.0	3.0	1.0	1.0	
Option	Description	Land Acquisition	Affects Culvert	Affects Power lines	Affects Street Lighting	Affects Transpower Fibre	Engineering Degree of Difficulty	Oversize Vehicles	Natural Hazards / Natural Environment	Indicative Cost	**Subtotal**	Speed Reduction *consistency with target speed*	Vehicle - Loss of Control	Vehicle - Crossing / Turning	Vehicle -Head On	Vehicle - Other	Motorcyclist - Loss of Control	Motorcyclist - Sideswipe	Motorcyclist - Crossing / Turning	Motorcyclists - Other	Cyclists - Midblock	Cyclists - Intersection (turning)	Cyclists - Intersections (sideswipe)	Cyclists - intersections (vehicle straight)	Pedestrians	Accesses	**Subtotal**	Intersection Delays / Travel Time	Network Legibility	Community Cohesion & Property Accesses	Rerouting of Existing Trips	Operational / Maintenance	**Subtotal**	Multi Modal / Mode Shift	Subtotal	**GRAND SCORE**
2A	Four arm roundabout - desirable size	4	4	3	3	3	4	2	2	4	**25**	2	2	2			2	2	2			2	3	3		2	**22**	2		2	1		**5**	3	**3**	8.5
2B	Four arm roundabout - intermediate	3	3	3	3	3	3	2	2	3	**22**	3	2	2			3	2	2			2	3	3		2	**24**	2		2	1		**5**	3	**3**	8.3
2C	Four arm roundabout - minimum	2	2	3	3	3	3	3	2	2	**21**	3	3	3			3	3	3			2	3	3		2	**28**	2		2	1		**5**	3	**3**	8.6

Notes

1 Land acquistion cost has been zero weighted as the affected land owner has offered the land

Appendix E NZTA CAS Report

CODED CRA	Crash road	Distance	Direction	Side road	ID	Date	Day of wee	Time	Description of events	Crash factors	Surface cor	Natural ligh	Weather	Junction	Control	Crash count fatal	Crash count severe	Crash count minor	
1074088	FERNSIDE F	180	W	FLAXTON R	201615731	23/08/2016	Tue	9:00	Car/Wagon1 EDB on Fernside Rd lost control turning left, Car/Wagon1 hit non specific animal, bank	CAR/WAGON1, alcohol suspected, sudden illness CAR/WAGON1, alcohol test below limit	Dry	Overcast	Fine	Nil (Default	Unknown		0	2	0
1159341	FERNSIDE ROAD		I	FLAXTON R	201833581	19/02/2018	Mon	8:35	Car/Wagon1 NDB on Flaxton rd hit turning Car/Wagon2	CAR/WAGON2, did not check/notice another party from other dirn, failed to give way at priority traffic control	Dry	Bright sun	Fine	T Junction	Give way		0	0	0
1199611	FLAXTON RD		I	FERNSIDE F	201964649	27/08/2019	Tue	7:20	Motorcycle1 NDB on FLAXTON ROAD, RANGIORA, WAIMAKARIRI hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, alcohol test below limit, driver dazzled, failed to give way at priority traffic control, ENV: dazzling sun	Wet	Bright sun	Fine	T Junction	Give way		0	1	0
1131081	FLAXTON ROAD		I	FERNSIDE F	201744830	27/07/2017	Thu	17:00	SUV1 NDB on Flaxton hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, didnt look/notice other party - visibility obstruc, ENV: slippery road due to rain	Wet	Twilight	Light rain	T Junction	Stop		0	0	0
1070623	FLAXTON ROAD		I	FERNSIDE F	201612209	7/04/2016	Thu	6:20	Car/Wagon1 NDB on FLAXTON ROAD hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, did not check/notice another party from other dirn, didnt look/notice other party - visibility obstruc, failed to give way at priority traffic control	Dry	Dark	Fine	T Junction	Give way		0	0	2
941762	FLAXTON ROAD		I	FERNSIDE F	201170088	1/02/2011	Tue	8:15	Car/Wagon1 NDB on FLAXTON ROAD hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, didnt look/notice other party - visibility obstruc, failed to give way at priority traffic control	Dry	Bright sun	Fine	Crossroads	Stop		0	0	0
921965	FLAXTON ROAD		I	FERNSIDE F	201122140	8/06/2011	Wed	6:37	Car/Wagon1 NDB on FLAXTON ROAD hit Car/Wagon2 turning right onto AXROAD from the left	CAR/WAGON2, did not check/notice another party from other dirn, failed to give way at priority traffic control, ENV: road under construction or maintenance	Wet	Dark	Light rain	Crossroads	Stop		0	0	1
1097387	FLAXTON ROAD		I	FERNSIDE F	201649492	29/09/2016	Thu	17:11	Car/Wagon1 NDB on Flaxton Road hit SUV2 turning right onto AXROAD from the left	SUV2, did not check/notice another party from other dirn, failed to give way at priority traffic control	Dry	Overcast	Fine	T Junction	Give way		0	0	0
974770	FLAXTON ROAD		I	FERNSIDE F	201272409	23/08/2012	Thu	12:35	Truck1 SDB on FLAXTON ROAD hit Car/Wagon2 crossing at right angle from right	CAR/WAGON2, failed to give way at priority traffic control, ENV: dazzling sun	Dry	Bright sun	Fine	Crossroads	Stop		0	0	0
350918	FLAXTON R	100	N	FERNSIDE F	2922735	7/08/2009	Fri	23:30	Car/Wagon1 NDB on FLAXTON ROAD hit parked veh, Car/Wagon1 hit portal structure	TRUCK2, other lights and reflectors CAR/WAGON1, too far left	Dry	Dark	Fine	Nil (Default	Unknown		0	1	0

Appendix F Indicative Construction Costs

WDC - Flaxton / Fernside Roundabout Options Budget Estimate				
Item	Description	Opt 1A	Opt 1B	Opt 1C
1	**Design and Investigation Professional Fees**	$ 136,429.10	$ 124,526.60	$ 114,845.90
2	**MSQA Professional Fees**	$ 154,740.00	$ 141,240.00	$ 130,260.00
3	**Property Purchase (m2 quantity)**	2110	1660	1480
	Physical Works			
4	**Preliminary and general**	$ 300,000.00	$ 250,000.00	$ 225,000.00
5	**Traffic management and temporary works**	$ 50,000.00	$ 50,000.00	$ 50,000.00
6	**Environmental Compliance**	$ 12,000.00	$ 12,000.00	$ 12,000.00
7	**Earthworks**	$ 260,885.00	$ 227,404.00	$ 203,996.00
8	**Ground Improvements**	$ 9,174.00	$ 8,610.00	$ 8,412.00
9	**Drainage**	$ 133,265.00	$ 126,920.00	$ 131,230.00
10	**Pavement and surfacing**	$ 401,925.75	$ 373,788.00	$ 363,237.00
11	**Bridges**	$ 168,000.00	$ 112,000.00	$ 56,000.00
12	**Retaining Walls**	$ -	$ -	$ -
13	**Traffic Services**	$ 219,050.00	$ 216,925.00	$ 195,375.00
14	**Service relocations**	$ 507,200.00	$ 507,200.00	$ 507,200.00
15	**Landscaping**	$ 86,750.00	$ 76,450.00	$ 56,150.00
16	**Contengency/Unscheduled work**	$ 429,800.00	$ 392,400.00	$ 361,800.00
Base Estimate		**$ 2,869,218.85**	**$ 2,619,463.60**	**$ 2,415,505.90**

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14. Flaxton Road / Fernside Road

14.1 Overview

Flaxton Road runs generally north-south from Rangiora to Cust River, a distance of approximately 3.8km. The road is classified as an arterial road in the District Plan, providing one of the main routes to Rangiora from Kaiapoi and Christchurch. To the north, Flaxton Road meets Lineside Road (State Highway 71). To the south, Flaxton Road continues as Skewbridge Road to Silverstream. Flaxton Road has a flat gradient with a straight alignment, except for the horizontal curve where it becomes Skewbridge Road; this curve has a radius of approximately 550m.

Fernside Road intersects Flaxton Road at two T-intersections, forming a right-left stagger, following a realignment in 2011. Fernside Road West runs generally northwest-southeast from Flaxton Road to Plaskett Road, a distance of approximately 4.5km. Fernside Road has a flat gradient and straight alignment. The road is currently classified as collector road.

Figure 14-1: Flaxton Road / Fernside Road (Source: Canterbury Maps)

The surrounding road environment is characterised by the following elements:

- The surrounding topography is flat with straight road alignments. On the western approach to the intersection, Fernside Road has a horizontal curve with 55km/h curve advisory speed.
- The intersection operates under a posted speed limit of 80km/h following a speed reduction on Flaxton Road on 23 December 2016[3]. Approximately 1km south of the intersection, Flaxton Road becomes open road and approximately 370m north of the intersection, the speed limit on Flaxton Road reduces to 50km/h at the start of the industrial area. Fernside Road is posted at 80km/h.
- Flaxton Road has one lane in each direction with a northbound no passing restriction. North of the intersection the no passing restriction applies to southbound traffic.
- Fernside Road west, on its approach to the intersection, has one lane in each direction, divided by a dashed white centerline which becomes a solid white centerline 50m prior to the intersection.
- The intersection operates under a give-way control, with Flaxton Road being the priority route. The intersection is formed with an auxiliary left turn lane (approximately 150m long including the taper) and a right turn bay (approximately 140m long including the taper). Fernside Road has a single approach

[3] https://www.waimakariri.govt.nz/__data/assets/pdf_file/0020/27281/Register-of-Speed-Limits.pdf

lane, however operates as having two lanes at the limit line due to the large curve radius (to accommodate HCV tracking).

- Fernside Road east is located approximately 140m south of Fernside Road west. It has a single approach lane and no auxiliary turn lanes on Flaxton Road.
- A line of power poles runs alongside the northeastern boundary of Fernside Road, generally offset from the edge of the traffic lane by 3.5m. The power poles follow the old alignment of Fernside Road and therefore cross to the south side of Fernside Road approximately 100m prior to the intersection.
- A line of power poles runs alongside the eastern boundary of Flaxton Road, generally offset from the edge of the traffic lane by 5m.
- The intersection is lit with light poles located on the western side of Flaxton Road and on the southern side of Fernside Road.
- A deep water race runs alongside the northeastern boundary of Fernside Road, crossing under Fernside Road through a culvert, approximately 40m west of the intersection. The water race then continues along the western side of Flaxton Road. Guard railing is provided on Fernside Road where it crosses the culvert. The width of the sealed shoulder over the culvert is approximately 2m wide.
- The section of land immediately north of the intersection hosts a large stormwater retention basin.
- A mature shelter belt is planted along the eastern boundary of Flaxton Road, as well as along the southwestern boundary of the original alignment of Fernside Road.
- Delineation is provided through edge lines, edge marker posts (EMPs), and reflective raised pavement markers (RRPMs) on both roads. Fernside Road also has hazard markers on some of the guard rail end terminals, as well as bridge width markers.
- The surrounding land use to the south is predominantly pastoral land. To the north of the intersection is the industrial development in Rangiora.
- Development of the land to the east of the intersection is in the early planning stages.

Photograph 22 shows the intersection from south of Fernside Road West. It shows a view north with the left turn lane into Fernside Road.

Photograph 22: Flaxton Road / Fernside Road West intersection - View North

Photograph 23 shows the culvert on Fernside Road west of the Flaxton Road intersection.

Photograph 23: Culvert on Fernside Road west of Flaxton Road

14.2 Long-List Options

14.2.1 Overview

The range of options considered in this study included road re-alignments, changes of priority and roundabouts. The option of forming a signalised intersection has been discounted because this form of control is not considered appropriate in this high-speed environment.

Table 14-1 provides a summary of the longlist of options considered for the Flaxton / Fernside intersection. The potential options aimed at delivering all the desired benefits were reviewed during a workshop held between WDC and Stantec on the 26th September 2019.

Table 14-1: Options for Flaxton Road / Fernside Road Intersection Safety Improvements

Option	Description
1A	3-leg roundabout – desirable radius
1B	3-leg roundabout – intermediate radius
1C	3-leg roundabout – minimum radius
1D	3-leg roundabout – minimum radius, offset from centre line
2A	4-leg roundabout - desirable radius
2B	4-leg roundabout – intermediate radius
2C	4-leg roundabout – minimum radius
3A	Reverse priority – minimum radius curve
3B	Reverse priority – large radius curve
3C	Reverse priority – reverse curves
3D	Reverse priority – large radius curve and roundabout
4A	4-leg roundabout with Fernside Road East
4B	4-leg roundabout with Fernside Road East and Development Access
5A	Dual roundabout (NS)
5B	Dual roundabout (NS) – with development access
6A	Dual roundabout (EW) – with development access

14.2.2 Roundabout Options – Options 1 & 2

Observations of driver risk-taking behaviour at the intersection indicate a need to improve safety of the right turn movement from Fernside Road into Flaxton Road and reduce vehicle speeds along Flaxton Road. A roundabout configuration provides the most appropriate way to achieve this. Three roundabout island sizes have been considered as part of the West Route investigations.

Option 1A is based on the Austroads desirable central island radius for an 80km/h road and is based on three legs. With the island centred on the existing Flaxton Road centre line, this will require land on the eastern side of Flaxton Road.

Option 1B is based on a smaller size central island. Although this requires less land, it will not provide the same level of speed control at the intersection compared to Option 1A. With the smaller island, there is a need to widen the circulating carriageway to cater for heavy vehicle tracking paths.

Option 1C represents the smallest size of central island that is recommended in Austroads and has been considered because it reduces the land requirements.

Option 1D further reduces the land required by recentering the roundabout to west of the Flaxton Road centreline.

Options 2A, 2B and 2C involve the introduction of a fourth leg to Options 1A, 1B and 1C to provide a safe, high capacity access to the land to the east.

None of these options involve any change to the Fernside Road East intersection.

14.2.3 Reverse Priority – Option 3

These options involve changing the movement priority at the intersection so that the Flaxton Road south to Fernside Road West Route has a continuous movement and Flaxton Road north is priority controlled. The change in priority will address the common type of crashes reported at the intersection.

Option 3A involves a 250m radius curve to link Flaxton Road with Fernside Road to reduce land required on the western side of the road. This reflects he minimum radius size recommended in the Austroads Guide to Road Design for an 80km/h road. Option 3B has a larger radius curve but will require more land.

Option 3C involves a reverse curve to reduce the additional land required.

Option 3D retains the alignment of the larger radius curve but includes a roundabout rather than a priority control.

Each of these options would allow access to the land east of Flaxton Road in the form of a priority control.

None of these options involve any change to the Fernside Road East intersection.

14.2.4 Fernside Road East – Option 4

Option 4A shows a 4-leg roundabout option that links Fernside Road East to the intersection with Fernside Road West. There is some scope to adjust the roundabout centre but this will affect the design of the Fernside Road approaches.

Option 4B shows how access can be provided to the land to the east.

14.2.5 Dual Roundabout Options – Options 5 & 6

Options 5A and 5B are extensions to Options 1A and 2A to address safety concerns with the Fernside Road East intersection.

Option 6A shows a different configuration with two closely spaced roundabouts.

14.2.6 Other Options

The safety investigation of the most recent serious crash at the intersection identified the design of the auxiliary left turn lane as a potential contributing factor for crashes. The report suggested that modifying the intersection design to ensure that vehicles using the auxiliary lane do not obstruct sight lines for drivers turning right out of Fernside Road. This has been assessed as Option 7 but is only considered to represent a short-term improvement.

14.2.7 Multi-Criteria Assessment

Table 14-1 provides a summary of the scoring for each option based on equal weighting of each assessment criteria. All options with a roundabout score better than the alternative configurations. The small differences in scores are largely related to the differences in land requirements as the smaller central island size requires less land but does not provide the level of safety improvement that would be associated with the larger islands.

Table 14-2:Flaxton Road / Fernside Road Long List MCA

Option	Implementability	Safety	Network	Mode	Score
1A	2.8	2.2	1.3	1.5	7.7
1B	2.5	2.4	1.3	1.5	7.7
1C	2.3	2.8	1.3	1.5	7.8
1D	2.3	2.7	1.5	1.5	8.0
2A	2.8	2.3	1.3	1.5	7.8
2B	2.5	2.5	1.3	1.5	7.8
2C	2.3	2.9	1.3	1.5	7.9
3A	3.8	3.5	1.5	1.5	10.3
3B	3.5	3.7	1.5	1.5	10.2
3C	3.8	3.8	1.5	1.5	10.6
3D	4.3	2.4	1.3	1.5	9.4
3E	4.0	3.5	1.8	1.5	10.8

Option	Implementability	Safety	Network	Mode	Score
4A	4.0	2.4	1.8	1.5	9.6
4B	4.3	3.5	1.5	1.5	9.6
5A	3.5	2.7	1.5	1.5	9.2
6A	4.5	2.7	1.8	1.5	10.5

Following a workshop with WDC, the three roundabout options were recommended for inclusion in the short-list for further evaluation.

14.3 Short-List Options

14.3.1 Option Descriptions

Based on the long-list assessment process, a roundabout configuration has been identified as the preferred option for the Flaxton Road / Fernside Road intersection due to the safety benefits. Three sizes of island will be considered for the short list assessment ranging from the Austroads minimum to the desirable size.

The three roundabout island sizes considered were; 22m radius, 18m radius and 15m radius with apron.

The basic configuration of the roundabouts include three legs at right angles so that a fourth leg can be added to provide access to the land to the east of Flaxton Road.

14.3.2 Multi-Criteria Assessment

To assist in identification of a preferred option, the following additional assessment criteria have been adopted:

1. Indicative construction cost;
2. Effects on Fernside Road culvert;
3. Effects on services;
4. Ability to cater for over-sized transporter vehicles, and
5. Consistency with other Rangiora West Route intersection configurations.

With the first four additional criteria included in the implementability group, Option 1B intermediate sized roundabout achieves the lowest score. This reflects the fact that the larger roundabout would require more land and would require more widening of the culvert on Fernside Road which together increase the engineering difficulty and associated costs.

Table 14-3:Flaxton Road / Fernside Road Sort List MCA

Option	Implementability	Safety	Network	Mode	Score
1A	3.1	2.3	1.5	1.5	8.4
1B	2.8	2.5	1.5	1.5	8.2
1C	2.6	2.9	1.5	1.5	8.5

Although the smallest roundabout option requires less land, it is not expected to provide the same safety benefit as the larger roundabouts. This is associated with a mountable apron being required to accommodate the tracking of large transporters and therefore less speed control for general traffic. The resultant higher speeds increases the likelihood and severity of crashes.

In terms of roundabout consistency along the Rangiora West Route, one objective would be to have similar sizes of roundabout wherever they are required and the same geometric design philosophy. The largest size of roundabout is considered to be out of context on the lower volume roads to the west and a smaller size of roundabout is preferred. The intermediate size roundabout is comparable in size to other roundabouts recommended elsewhere along the route.

Based on the analysis completed to date, Option 1B an intermediate size roundabout has been identified as the preferred option for the intersection because;

1. The island size is consistent with an 80km/h speed environment;
2. Allows provision of good speed control;
3. Provides safe turning movements, particularly from Fernside Road West;

4. Can accommodate a wide range of vehicle sizes;
5. Provides a good balance of land take against safety;
6. Provides efficient access to the land to the east;
7. Minimises construction effects on existing infrastructure; and
8. Minimises effects on water race and storm water detention ponds.

14.4 Other Matters

The roundabout options only provide minor safety improvements for the Fernside Road east intersection. Although this section of road provides one approach to the Southbrook area from Kaiapoi, the safety assessments completed for KiwiRail of the Fernside Road / Lineside Road rail crossing raise significant concerns with the intersection and identify a desire for the Fernside Road approach to Lineside Road to be closed. If this occurred, then this section of Fernside Road would carry only low volumes of traffic and the potential for crashes to occur at Flaxton Road would reduce accordingly.

There is a residential driveway located about 30m north of the proposed roundabout location. It will be necessary to restrict turning movements at the access, ideally preventing the right turn out because this can be accommodated via the roundabout.

The concept designs do not explicitly address provision of cycle facilities because no cycle lanes are proposed on any of the approach roads. However, it is recognised that the route is used by cyclists and it is recommended that provision for cycle crossing and turning through the intersection is incorporated into the design, likely through wide splitter islands.

14.5 Summary

Following the review of a wide range of options for improvements to the Flaxton Road / Fernside Road intersection, it has been concluded that a roundabout configuration will provide the greatest benefits and is consistent with the long-term objectives of promoting a safe and efficient western route around Rangiora. This option also provides an opportunity to create a safe access to the land to the east of the intersection.

A range of roundabout sizes have been reviewed and the preferred size is an 18m radius island. This represents a size that will provide good speed control and can be designed to safely accommodate all sizes of vehicle that will travel through the intersection.

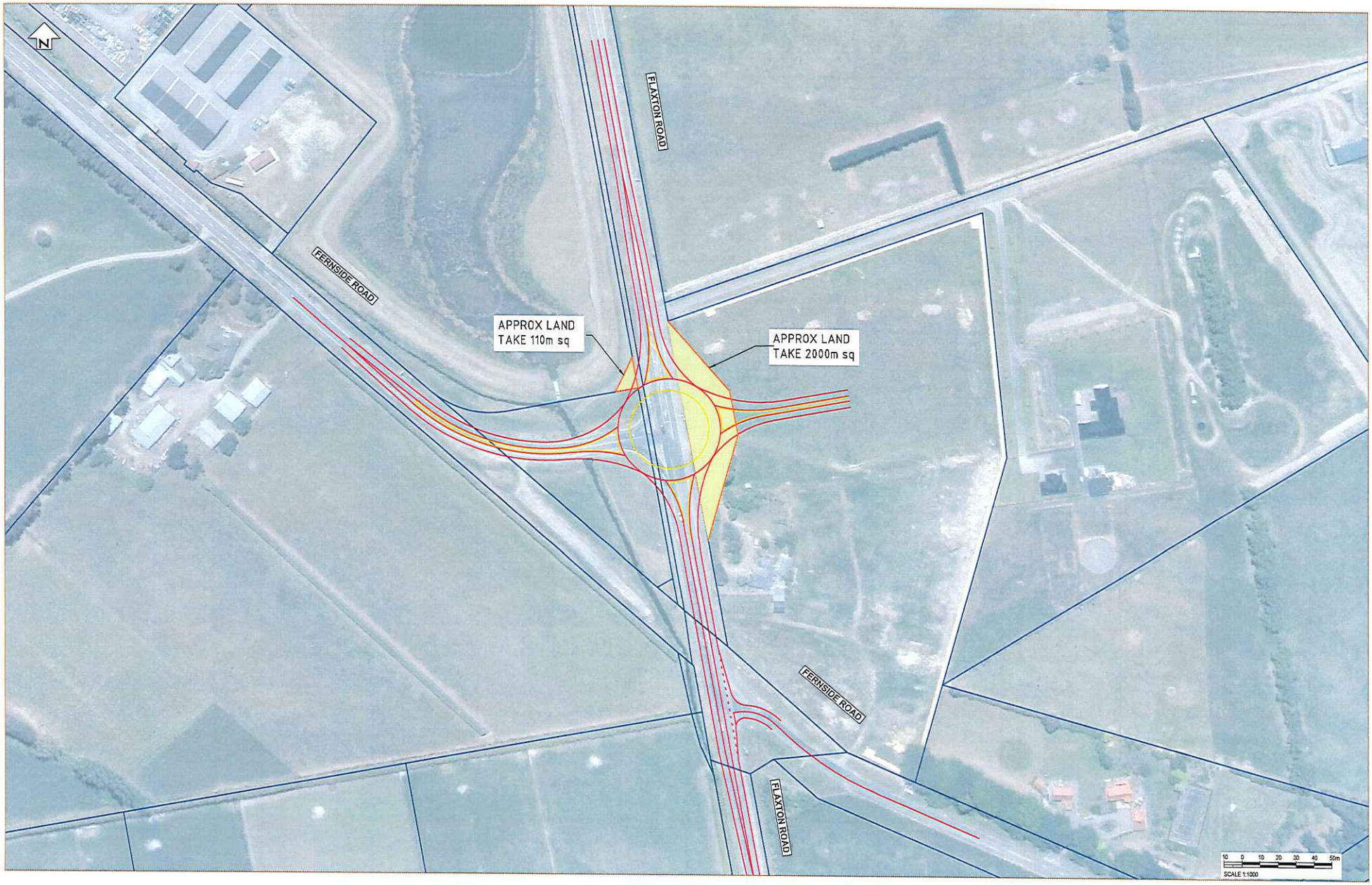
One potential criticism of the preferred option is that it does not address safety concerns at the Fernside Road east intersection. This would be largely addressed if the Fernside Road approach to Lineside Road was closed to address safety concerns raised by KiwiRail. As an alternative, the Fernside road east approach to Flaxton Road could be closed and a new link formed to connect to the roundabout. However, this option would involve land that is not owned by Council and will require further investigation to best alignment for any future link.

The construction of the roundabout will result in a residential driveway being located about 30m north of the roundabout. In order to address any safety concerns arising from this, either turn restrictions would need to be enforced or a link should be constructed through the Smith land to the roundabout.

14.6 Recommendations

Option 1B with an 18m radius island has been identified as the preferred option for the intersection. It is recommended that Council progresses the concept design to the next stage of design to allow a road safety audit to be completed and also allow refinement of construction cost estimates. Option 1b allows for a fourth leg to be constructed to provide access to the land to the east, Option 2B.

As a separate exercise, it is recommended that Council initiates discussion with Mr D Smith to investigate options for the creation of a safe, public connection from Fernside Road East to the roundabout. This investigation should investigate options for provision of access between the residential properties to the east and the roundabout so that their existing access to Flaxton Road can be removed.



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ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

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DRAWN	B BROWNE	16.9.2019
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	~~NOT APPROVED~~	
PROF REGISTRATION:		

Stantec

Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 6A
Roundabout Central Island Radius 22m

Status Stamp: WORKING PLOT
Date Stamp: 16.9.2019
Scales:
Drawing No.: Sketch 13
Rev.: A

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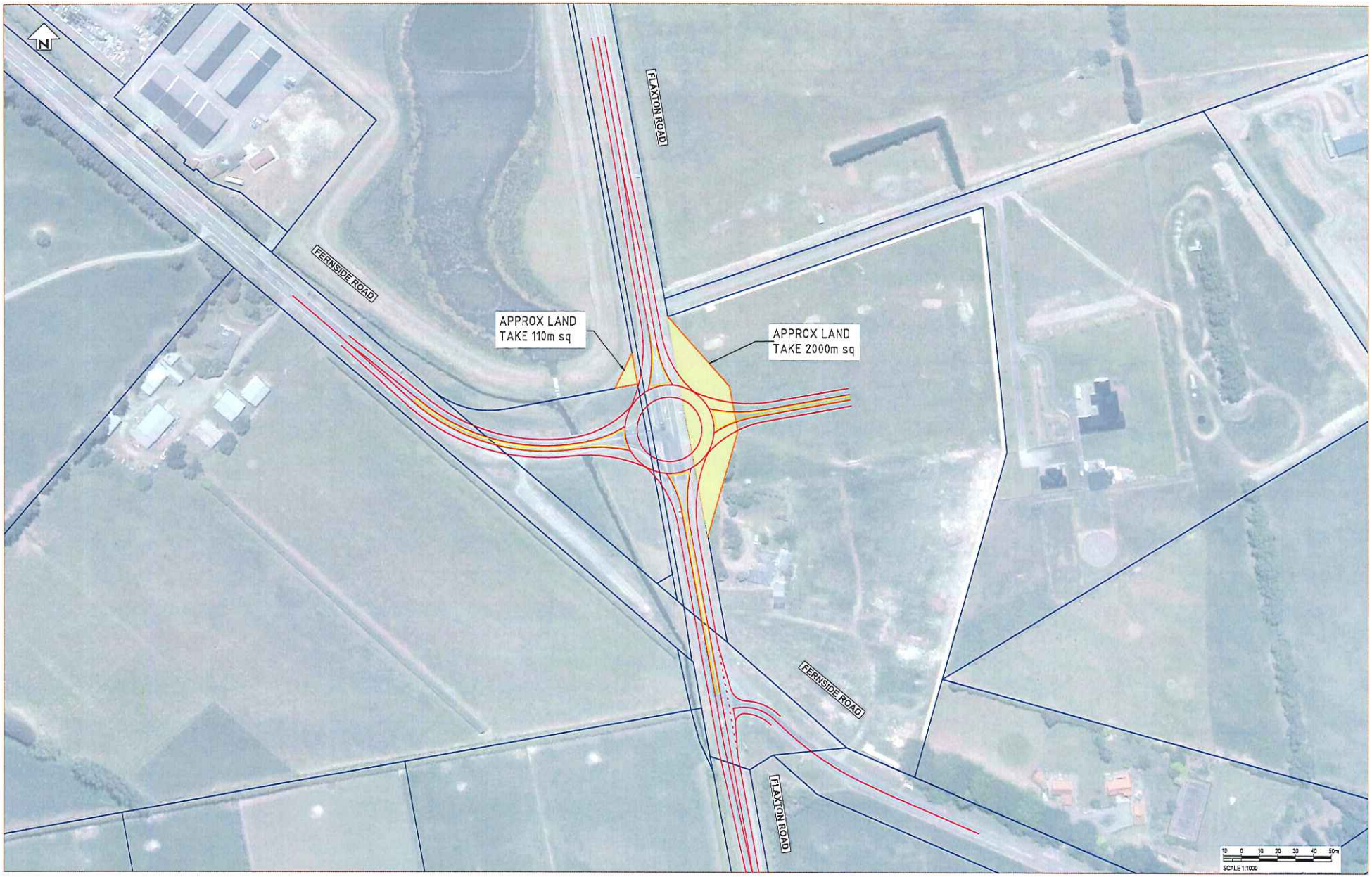

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DRAWN	B BROWNE	16.9.2019	
CAD REVIEW			
DESIGN CHECK			
DESIGN REVIEW			
APPROVED	~~NOT APPROVED~~		
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Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 6B
Roundabout Central Island Radius 18m

Status Stamp: WORKING PLOT

Date Stamp: 16.9.2019

Scales:

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Rev.: A

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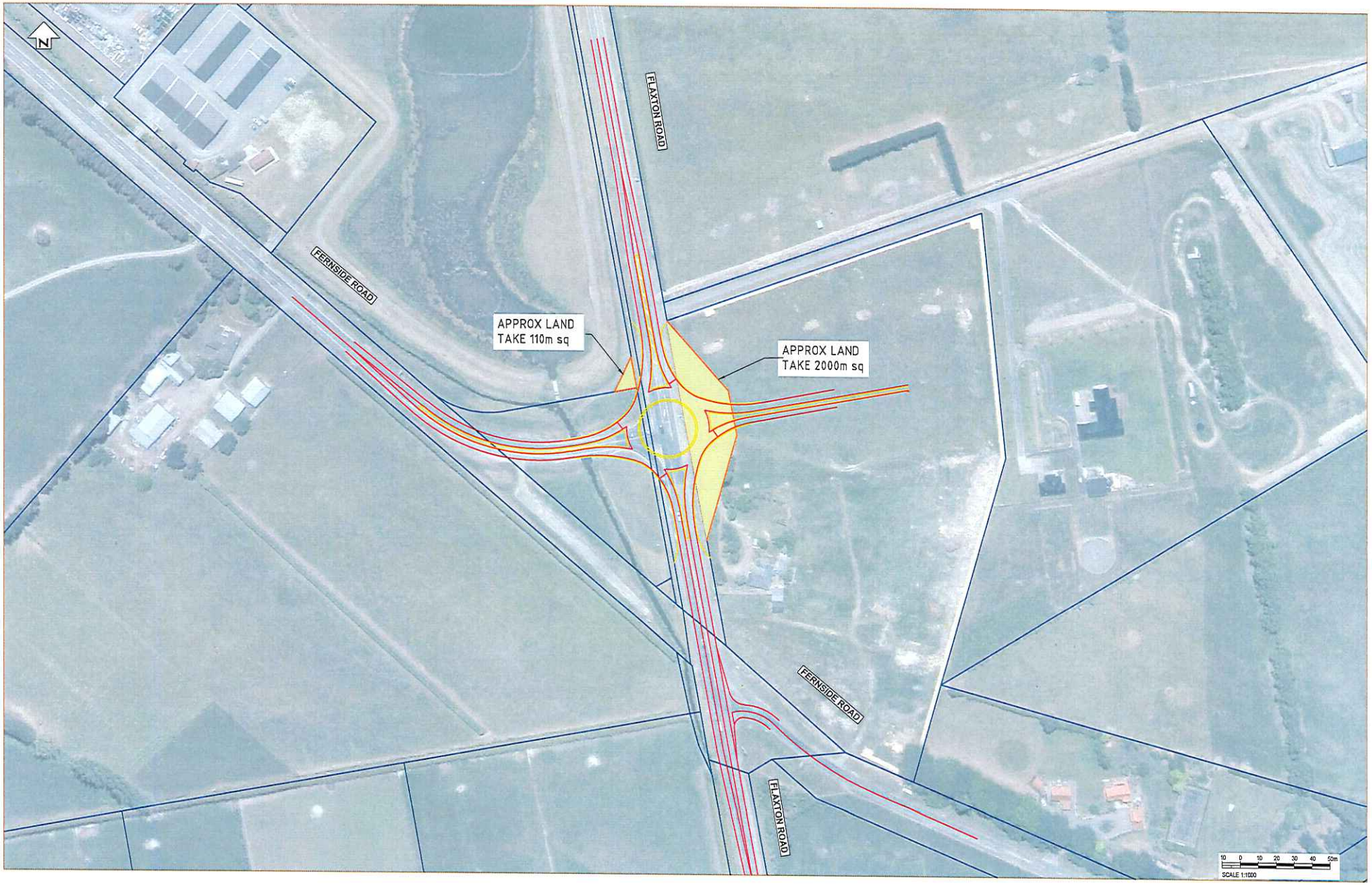

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CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
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Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 6C
Roundabout Central Island Radius 16.5 (15.5 m Radius with1.0m apron)

Status Stamp: WORKING PLOT

Date Stamp: 16.9.2019

Scales

Drawing No.: Sketch 1

Rev: A

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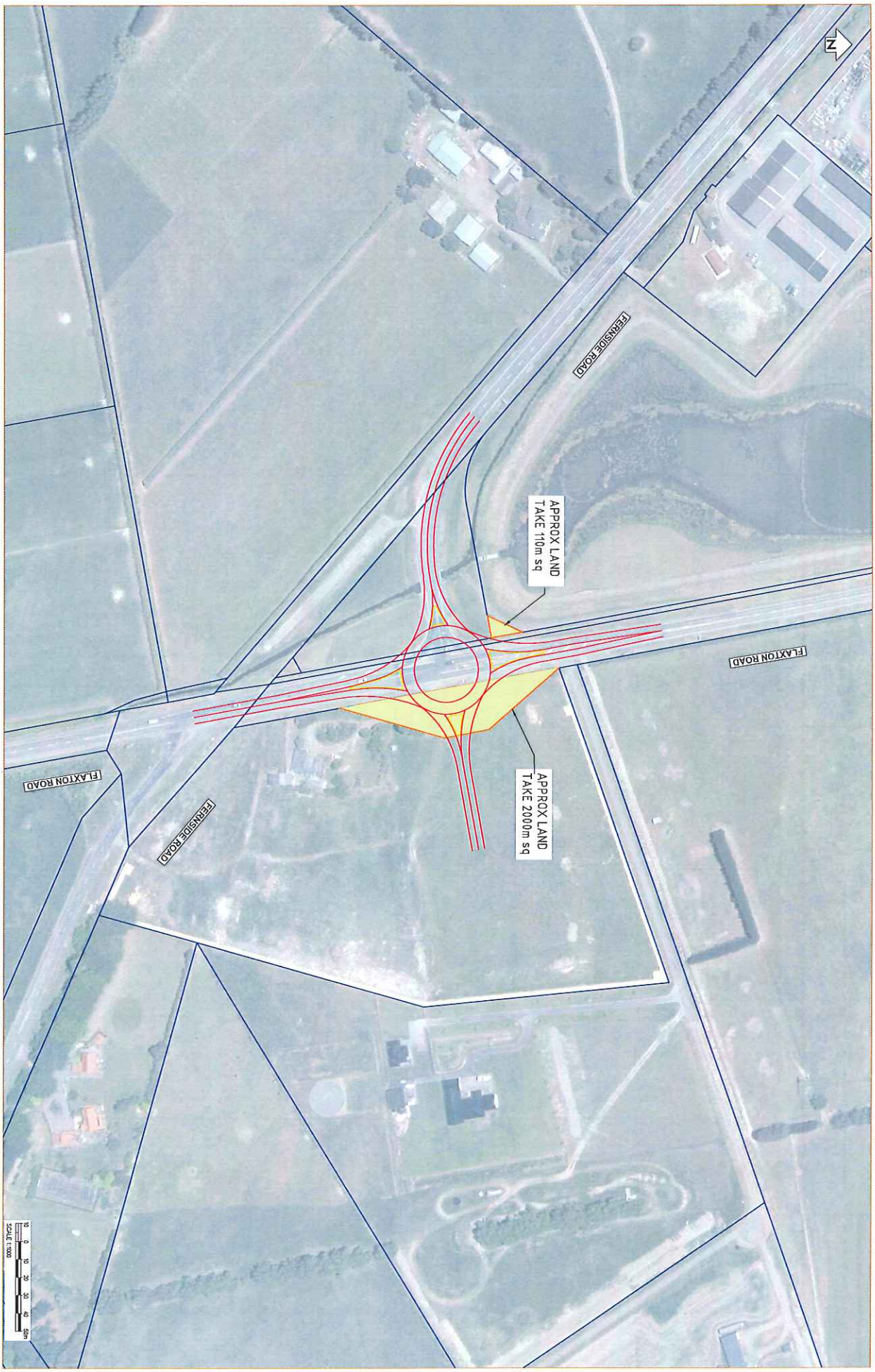

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CAD REVIEW			
DESIGN CHECK			
DESIGN REVIEW			
APPROVED			
PROF. REGISTRATION:	NOT APPROVED		

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Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 6D
Roundabout Central Island Radius 18m

NOT FOR CONSTRUCTION

Status: WORKING PLOT

Date Plotted: 16.9.2019

Drawing No.: Sketch 18

Rev: A

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ORIGINAL SIZE A1

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REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED	B BROWNE	16.9.2019
DRAWN	B BROWNE	16.9.2019
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

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Client: WAIMAKARIRI DISTRICT COUNCIL

Flaxton Fernside Intersection

Option 6D
Roundabout Central Island Radius 18m

Status Stamp: **WORKING PLOT**

Date Stamp: **16.9.2019**

Scales:

Drawing No.: Sketch 18

Rev.: A

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WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR INFORMATION

FILE NO and TRIM NO:	SEW-03-02-05 /190527075051
REPORT TO:	Utilities and Roading Committee
DATE OF MEETING:	19th December 2019
FROM:	Gavin Hutchison, Wastewater Asset Manager
SUBJECT:	Rangiora WWTP Solar Power Business Case

SIGNED BY:
(for Reports to Council, Committees or Boards)

Department Manager

Chief Executive

1. SUMMARY

1.1 This report is to provide an update to the Utilities and Roading Committee on the business case for installation of solar power at the Rangiora Wastewater Treatment Plant.

1.2 The business case has shown that solar is a viable option in reducing plant operating costs.

1.3 The recommendation from the business case is to install 280kW of solar capacity. The size of the solar array has been selected to maximise the return on investment.

1.4 A capital investment of $600,000 would reduce operating costs by approximately $59,000 per year.

1.5 The reduction in operating costs would reduce the Eastern Districts Sewer Scheme rates by approximately $0.88 per individual sewer rate per annum.

1.6 Carbon emission generated through energy consumption at the plant would be reduced by 47 tonne per year.

1.7 The next step for this project is to investigate options for capital funding. The two options are Council owned and Power Purchase Agreement with a third party. A report will be provided to the U&R committee in April 2020 with recommendations.

Attachments:

i. Rangiora WWTP Solar Power Business Case – Pacific Energy Solutions (Trim 190527073878)

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 190527075051.

(b) **Notes** that a review of possible capital funding options by energy companies will be undertaken and a report presented with recommendations in April 2020.

(c) **Note** that if recommendations presented in April 2020 are adopted, recommendations will be included in the draft LTP 2021/22.

3. BACKGROUND

3.1. In March 2018 the new Rangiora WWTP Inlet works was commissioned. This resulted in a substantial increase in power consumption at the plant. The 2019/20 budget for electricity at the Rangiora WWTP is $280,000.

3.2. Work is ongoing to look at options to reduce energy costs. To date the following has been undertaken:

- Review of the system process control to minimise energy consumption
- Power monitoring across the site

3.3. The site has a large base demand that cannot not be reduced. Initial discussions with suppliers (Power Smart Ltd) in December 2018 indicated that installation of solar power was a feasible option to reduce operational costs. An independent consultant (Pacific Energy Solutions Ltd) was engaged to undertake a business case for solar power at the Rangiora WWTP. Pacific Energy Solutions have provided a report (refer to attached report, TRIM 190527073878) that describes the approach undertaken to select an optimal system configuration, and the financial analysis supporting the business case.

4. ISSUES AND OPTIONS

4.1. The primary purpose to consider solar power systems is to reduce the Rangiora WWTP annual operational costs through lower long-term energy costs. The installation of solar would also help in achieving the following goals:

- Council sustainability goals
- Community leadership in reduction of carbon footprint

4.2. In recent years the cost of solar power has dropped dramatically becoming a cost competitive option to main grid supply. In the last 12 months some utility providers in the North Island have started to install solar power on an increasing scale.

4.3. Transpower has recently completed a study into the future of New Zealand's electricity system. This report '*The sun rises on a solar energy future, January 2019*[1]' discusses the case for solar in New Zealand. The report highlights the sustainability of solar power and the importance it plays in New Zealand becoming a low carbon economy.

4.4. There is already 85MW of solar installation in New Zealand, half of which was installed in the last 2 years. This is a reflection of the drop in the cost of solar installations.

4.5. There are various options for ownership models, the two considered are Council owned and Power Purchase Agreement (PPA). The PPA model requires no capital outlay, this is funded by a third party who build and operate the system for the contract duration, and the

[1] https://www.transpower.co.nz/about-us/transmission-tomorrow/sun-rises-solar-energy-future

energy user pays for the electricity generated for the contracted price. Key factors in PPA contracts are:

- Pricing terms for the duration of the contract
- Duration of the contract
- Production guarantees

4.6. PPA allows the benefits from a solar system without the initial capital outlay. However, because the project must generate financial returns for the third party, not all of the projects benefits will be realised by Council. PPA's also mean being locked into a long-term agreement at a slightly reduced rate.

4.7. Further review of the funding of capital is required to select the best option for Council. This work will be completed before the end of April 2020.

Financial Analysis

4.8. Data on energy consumption at the plant and current tariff structure was provided to Pacific Energy Ltd to undertake modelling to select an optimal solar power configuration that returned the best Net Present Value (NPV). This included modelling of the solar irradiance of the Rangiora WWTP site.

4.9. To maximise the NPV the system selection has to maximise the use of power generated onsite. Excess power can be sold to the energy company but the return is low and not economically viable.

4.10. The system configuration selected through modelling is summarised in the table below.

Table 4.1: System Configuration

Item	**Optimised Solution**
Array orientation	North (0^o)
Tilt angle	30^o
No of PV panels ($370W_p$)	760
KW_p Rating of the Array	281.2 KW_p

4.11. The solar panels would require an area of approximately 1,800m^2. There is sufficient land immediately adjacent to the inlet works and new aeration basin. Figure 4.1 below shows an indicative area for placing the PV panels.

Figure 4.1: Possible Location of Solar Panels

4.12. The layout will need to consider the possibility of a future Eastern Link road passing through this area (refer to Figure 4.2 below). The timing of the future road has yet to be determined.

Figure 4.2: Eastern link alignment option

4.13. The solar array would be installed close to the ground. Figure 4.3 is an example of solar units recently installed at a North Island wastewater treatment plant.

Figure 4.3: Example of a solar array installed at a North Island WWTP

4.14. The installation of solar power at the Rangiora Wastewater Treatment Plant was assessed against three key drivers to test the justification of the project. These were as follow:

- Strategic case
- Financial case
- Sustainability case

Strategic Case

4.15. Installation of a solar power system would be in line with the following Community Outcomes defined in the Long Term Plan:

- Core utility services are provided in a timely and sustainable manner, 'Renewable energy technologies and their efficient use is encouraged.
- There is a healthy and sustainable environment for all, ' Harm to the environment from the impacts of land use, use of water resources and air emissions is minimised'

4.16. Installation of solar will reduce operational costs having a positive impact on the sewer rates. This is shown in Table 4.3 below.

Financial Case

4.17. The optimised system has an estimated capital cost of $590,801. Modelling results from Pacific Energy Solutions Ltd are summarised in the table below. The system returns a positive NPV, and operational savings of approximately $60,398 per annum.

Table 4.2: Optimised System Performance - Pacific Energy Solutions Ltd

Factor	Optimised Solution
Capital Cost	$590,801
Annual Savings in operating costs	$60,398
Savings over project life	$1,449,963
Maintenance costs (cleaning etc)	$473 pa
Simple Payback	10 years
Discounted Payback	15 years
NPV	$257,887
IRR	8.60%
Project Life	25 Years
Discount Rate	4.50%

4.18. The impact of undertaking this project on the Eastern District Sewer Rate (EDSS) has been assessed. The assessment was undertaken using the 2019/20 financial budget spreadsheet with the following inputs:

- Capital cost $660,000 (includes allowance for project contingency)
- Change in operating expenditure $-59,000[2]

4.19. The installation of solar would reduce the EDSS sewer rate by 0.18%. This equates to approximately a saving of $0.88 per individual sewer rate per annum.

4.20. The investment in solar at the Rangiora WWTP provides a mIRR[3] of 3.27%.

4.21. The financial analysis is based on the infrastructure for solar not being depreciated.

Sustainability Case

4.22. Installation of solar at the Rangiora WWTP as per the system configuration recommended by Pacific Energy Solutions Ltd would reduce the Council's carbon footprint by approximate 47[4] tonnes of CO_2 per annum. There will be opportunity to increase this further in the future with the development of battery technology.

4.23. Such a project would demonstrate Council's commitment to reducing its carbon footprint.

[2] This is $1,398 less than that calculated by the consultant. This is an additional allowance for grounds maintenance.
[3] Modified Internal Rate of Return. This is based on an interest rate of 4.5% and a reinvestment rate of 2%.
[4] Calculated using the EECA CO2 emission calculator (https://www.eecabusiness.govt.nz/tools/wood-energy-calculators/co2-emission-calculator/)

Risks

4.24. The main risk in this type of project would be in the procurement of the solar system. This would be managed with input from suitably experienced consultants. Should the project be approved procurement options will be fully assessed.

4.25. The business case assessment has assumed stable power costs. This would normally be considered a conservative approach. However there have been recent discussions in the media regarding the Rio Tinto Group considering the future of Tiwai Point. If Tiwai Point was to close there would likely be a reduction in the cost of power.

Conclusion

4.26. The installation of solar power at the Rangiora WWTP is an economically viable solution to reduce operational costs.

4.27. The project meets the Council's objectives to encourage the use of renewable energies.

4.28. Opportunities for the installation of solar power will increase as the technology becomes more affordable. There needs be consideration to what Council defines as a viable solar project. The criteria that are assessed for a "go/no-go" decision need to be clearly defined. The recommendation for this study has been solely been based on financial performance. Although we have discussed the benefits solar provides in meeting non-financial criteria such as reduction in carbon emissions and using renewable energies, these were not key criteria in providing a recommendation.

4.29. There are number of other sites in the district that have high power usage that can be considered for solar power. The two other significant users are:

- Kaiapoi WWTP - $210,000 per annum
- Woodend WWTP - $130,000 per annum

4.30. Installation of solar power at Rangiora would be a lead project that would provide valuable knowledge in the implementation of such projects. The learning could be applied to other sites across the district.

4.31. Options for the funding of the project are to be investigated. This includes options for PPA with suitable providers in the current market.

4.32. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. The community has not been consulted on this work. The community will have the opportunity to lodge submissions for the 2020/21 Draft Annual Plan.

6. IMPLICATIONS AND RISKS

6.1. Financial Implications

6.1.1. There are no financial implications associated with this report. Further work will be undertaken to assess and recommend options for funding capital for the project.

6.2. Community Implications

The installation of solar will provide a minor reduction in rates and carbon emissions.

6.3. Risk Management

Projects risks will continue to be managed. These risks include consideration of the security of the PV panels.

6.4. Health and Safety

The recommended installation of solar power does not present a health and safety issue. Safety in design will be completed at each design stage.

7. CONTEXT

7.1. Policy

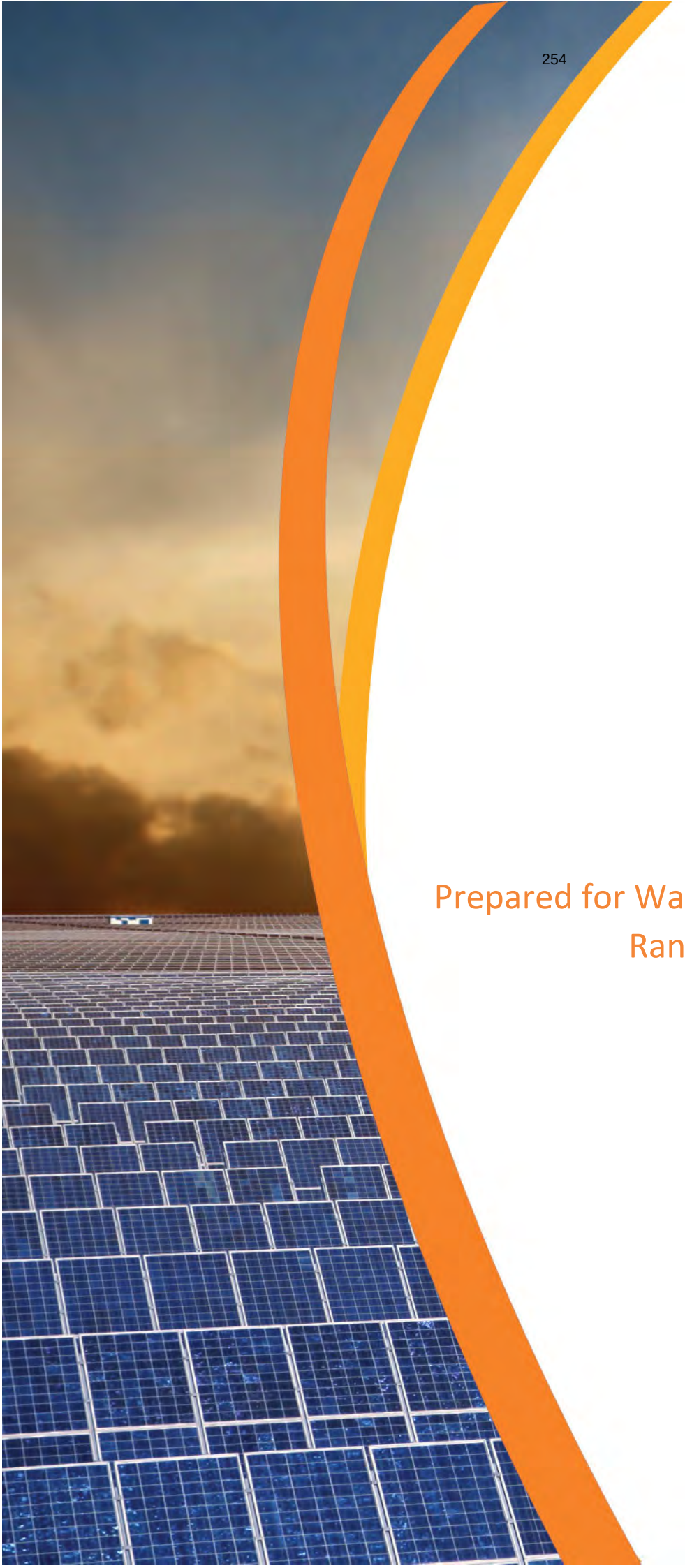
This matter is not a matter of significance in terms of the Council's Significance and Engagement Policy.

7.2. Legislation

There is no legislation applicable to this project.

7.3. Community Outcomes

- Harm to the environment from the impacts of land use, use of water resources and air emissions is minimised.
- Renewable energy technologies and their efficient use is encouraged.



PACIFIC ENERGY
solutions ltd

Business Case

Prepared for Waimakariri District Council, Rangiora WWTP Solar Power

www.pacificenergy.co.nz

perry@pacificenergy.co.nz

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SEANZ

Member of Sustainable Energy Association of NZ

Issue	Description	By	Date
A	Issued for Review	PH	26/2/19
B	Final Issue	PH	28/2/19

1 Glossary

BES	Battery Energy Storage System
DOD	Depth of discharge
DSM	Demand Side Management
FIT	Feed In Tariff
GW	Giga Watt
IRR	Internal Rate of Return
W_p	Peak power rating at standard test conditions (STC), watts
kW	Kilo Watt
kW_p	Peak power rating at standard test conditions (STC), kilo W
Standard Test Conditions (STC)	$1kW/m^2$ Irradiance, cell temperature at 25^oC
kWh	Kilo Watt Hour
MW	Mega Watt
NPV	Nett Present Value
PV	Photovoltaic
SOC	State of Charge

2 Executive Summary

In mid-January 2019, council received an indicative proposal from Powersmart Ltd for the installation of a photovoltaic (PV) array at the Rangiora Waste Water Treatment Plant. Basic economic indicators were provided to support a business case for implementing the project. Details of this proposal can be found in Appendix 1, Powersmart Proposal.

Pacific Energy Solutions was then engaged to undertake an independent assessment of the viability of the project by undertaking more detailed modelling and economic evaluation.

Modelling inputs included the tariff structure, load profile and solar irradiation data from NIWA. As the plant didn't become fully operational until mid-May, some data was synthesised to cover data gaps.

The modelling indicates that this is an economically viable project with a positive NPV of $143,339 after 25 years and an internal rate of return (IRR) of 8.85%.

It should also be mentioned that this project is consistent with outcomes specified in the *"Long Term Plan 2018 – 2028",* specifically:

- Renewable energy technologies and their efficient use is encouraged;
- Harm to the environment from the impacts of land use, use of water resources and air emissions is minimised.

Sizing of PV arrays can be optimised to maximise economic return; this is a complex interplay between tariff structure, load profile, and diurnal and seasonal generation variance. Based on this, modelling for an optimised solution was also undertaken with the results showing that the optimum array size based on these factors was 281.2kW$_p$, close to twice the size of the base solution.

The optimised array returns an NPV of $257,887 and an IRR of 8.6%.

Both solutions offer significant annual savings (except for year 12 where inverters are replaced) in offset electricity costs; $32,298 for the Powersmart solution and $60,398 for the optimised solution.

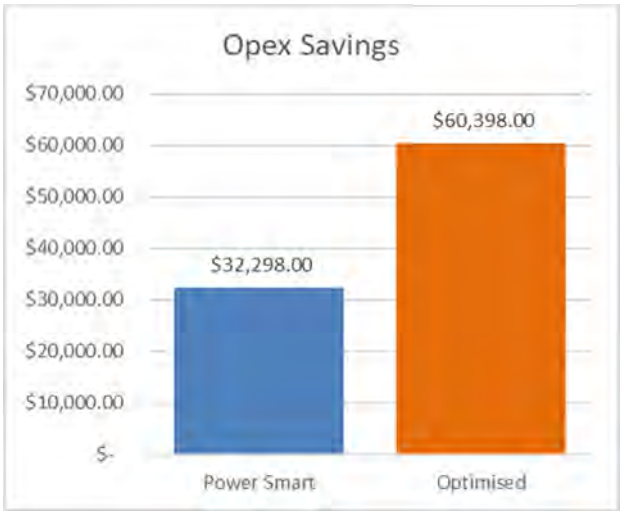

Figure 1 Comparison of savings between Powersmart and optimised solutions

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4 Confirmation of Business Requirements

4.1 Business need to be addressed

The business need is to reduce electricity consumption at the Rangiora WWTP site in order to realise operational cost savings. It should be noted that there is also the potential of incorporating battery storage in the future which would greatly improve operational resilience. Although probably not economically viable at present, battery costs are reducing significantly on an annual basis and it may be possible to incorporate this technology at a later date.

4.2 Strategic Case

The strategic case focuses on alignment with strategic objectives and fit with the external environment. Although investment in solar generation is not specifically considered in the "*Long Term Plan 2018 – 2028*", this business case is closely aligned to key outcome areas including:

- Services, core utility services are provided in a timely and sustainable manner, "Renewable energy technologies and their efficient use is encouraged"
- There is a healthy and sustainable environment for all, "Harm to the environment from the impacts of land use, use of water resources and air emissions is minimised"

There is also alignment with the Financial Strategy including:

- Restricting operating expenditure movements to the rate of Local Government Cost Inflation.
- Maintain the current prudent financial management while still providing high quality levels of service to both current and future generations.

In the strategic context of electricity supply and demand in New Zealand, the council has an opportunity to benefit from PV panel costs that are now at historical lows as well as increasing demand for electricity. The combination of low hardware costs and increasing demand pressure means that solar generation can only become more attractive over the next 25 years (the operational life of the core assets).

5 Modelling Approach

Modelling was based on annual half hourly load data (17,520 readings) available from the smart revenue meter. As the site has only operated at design capacity since mid-May, synthesised data based on other months were used to construct load profiles for February, March, April and May 2018. This was considered a reasonable approach given that the load profile for waste water treatment plants is generally flat and this plant follows that pattern.

Solar irradiance data published by NIWA (https://solarview.niwa.co.nz) was used as the basis for calculating generation. NIWA data is based on measured irradiance and accounts for the topographical features of the site that may impact on shading.

The tariff structure was based on twelve months of power accounts from February 2018 through to January 2019. An overall tariff based on the total of all variable charges was used, including energy charges, variable network charges and variable line charges. Fixed charges were not taken into account.

Benefits were calculated based on offset energy costs and direct revenue from injection of surplus generation to the grid. A conservative approach was taken to revenue attributable to surplus generation which was calculated at $0.04/kWh. It is worth noting that most retailers would offer buy back at spot for a large commercial site of this size so improvements may be possible to this rate by negotiation. Naturally this would improve the economic outcome of the project.

The modelling was based on a project life of 25 years which is a reasonable expectation for the life of the PV panels. Allowance was made for the replacement of inverters at Year 12, which is a conservative approach. These could possibly last through to the end of the project life.

A discount rate of 4.5% was used for the NPV calculation. Inflation hasn't been allowed for in this calculation; naturally any increase in future power costs would enhance the proposal.

6 Summary of Modelling Results

The Powersmart proposed option was modelled along with an additional solution that maximised NPV.

The opportunity to maximise NPV through optimisation of array size is based on the following. For solutions that are economically viable, self-consumption increases with generating capacity resulting in a coincident increase in NPV due to offset electricity costs. However, a point is reached where some of this generation is returned to the grid at a feed in tariff lower than the benefits of offsetting electricity cost. As more and more of this energy is returned to the grid the marginal benefits from each incremental increase in generating capacity reduce. At the point where they reach zero, NPV is maximised and the array size is optimised. Installing anything larger will see the NPV begin to reduce. The optimised solution presented in this business case is based on this.

The optimised solution utilises a panel tilt of 30° as opposed to the 25° specified by Powersmart. This maximises winter solar harvest at a slight expense to the summer solar harvest but provides a better result overall. The array configurations are presented in *Table 1* below.

Item	Powersmart Solution	Optimised Solution
Array orientation	North (0°)	North (0°)
Tilt angle	25°	30°
No of PV panels (370W_p)	396	760
kW_p Rating of the Array	146.52kW_p	281.2kW_p

Table 1 System configuration, Powersmart proposal and optimised solution

Based on these configurations, a project life of 25 years and discount rate of 4.5%, the economic performance of each system is presented *Table 2* below.

Factor	Powersmart Solution	Optimised Solution
Capital cost*	$307,838	$590,801
Annual savings in operating costs	$32,298	$60,398
Savings over project life	$771,312	$1,449,963
Maintenance costs (cleaning etc)	$246 pa	$473 pa
Simple Payback	10 years	10 years
Discounted payback	14 years	15 years
NPV	$143,339	$257,887
IRR	8.85%	8.60%
Project life	25 Years	25 Years
Discount rate	4.5%	4.5%

Table 2 System performance, Powersmart proposal and optimised solution

* A 10% contingency has been allowed for to provide for grid connection

The savings shown are nett and account for maintenance costs. Maintenance costs are calculated based on a life time cost of 2% of the capital value of the project, evenly distributed over the 25-year project life. Maintenance is not complex, it usually involves an annual washdown of the panels and check of connections. A 30° tilt angle provides good wash down from rain.

An indicative breakdown of the estimated capital costs is presented in *Table 3* below. This breakdown is based on projects of a similar nature.

aa

Item	Power Smart Solution	Optimised Solution
PV Modules	$125,000	$240,000
Mounting System	$50,000	$96,500
Installation	$48,000	$92,000
Balance of system (inverters, marshalling boxes etc)	$49,000	$93,400
Fencing	$7,800	$15,000
Grid Connection	$28,038	$53,901

Table 3 Breakdown of capital costs

System performance is detailed in *Table 4* below:

Factor	Powersmart Solution	Optimised Solution
Yearly Consumption	1,242,679kWh	1,242,679kWh
Grid Consumption	1,055,399kWh (85% of total)	893,257kWh, (71% of total)
PV Consumption	187,280kWh (15% of total)	349,423kWh (29% of total)
Sold to grid	1,355kWh (0.7% of PV gen)	14,053 kWh (3.8% of PV gen.)
PV Harvest	188,635kWh	363,475kWh
Self-consumption	99.28%	96.13%

Table 4 System performance and parameters

Although self-consumption as a percentage is less for the optimised solution, the increased self-consumption in winter offsets the decreased self-consumption in summer.

The load profile for this plant is very flat resulting in significant consumption at night time that can't be offset by PV generation. A load profile more in line with the PV generation profile would result in a much higher percentage of total consumption being serviced by the PV array.

7 Conclusions

The Powersmart solution presents an economically viable solution providing a positive NPV over the life of the project. This could be further enhanced by optimising the array size to maximise NPV and increase annual savings in energy costs even further.

Future benefits could be enhanced with the addition of battery storage when this technology becomes more affordable. These benefits could include:

- Peak demand management
- Provision of paid ancillary service to the distribution network operator such as voltage and frequency support
- Resilience, ability to ride through short term power outages and to enable a controlled shutdown of the process

8 Recommendations

- This project is consistent with stated outcomes in the "Long Term Plan 2018 – 2028" and presents an economically viable solution. Based on this it is recommended that a more detailed fixed price proposal is obtained.
- The optimised solution should be given due consideration and a fixed price proposal be requested based on this solution.
- Investigate opportunities to more closely align the load profile with the PV generation profile. This will improve self-consumption and the overall economics of the project. This will involve load monitoring and a process review to identify opportunities.

9 Appendices

9.1 Appendix 1, Powersmart Proposal

From: Sam Vivian
To: Gavin Hutchison
Subject: Waimakariri DC (Marsh Road WWTP) - PowerSmart indicative proposal
Date: Tuesday, 15 January 2019 2:11:26 PM
Attachments: image005.png
image006.png
image007.png
image008.png
image012.png
06560-1A - PV Proposed Layout.pdf

Hi Gavin,

Happy new year, I hope it was a great Christmas break.

Further to our discussions last month, our design team have come back with an indicative ground mounted solar layout (attached) and
generation simulation.

The proposed solar PV system will produce electricity that will be fed directly into the WWTP, reducing imported electricity consumption
and its associated costs. The system generates a clean energy source that emits no greenhouse gases, no pollution and uses no fossil
fuels. Over time, while utility electricity costs are likely to continue to inflate, the price of the electricity produced by the solar power
system will not, resulting in long term savings for you. Our simple ROI calculation **does not consider** any marketing and sustainability
benefits provided by a system, nor future carbon taxes or increases to retail power prices.

Please note that our proposed ground mounted system only uses some of the available land area. We have analysed your daytime power
consumption and sized the system so that export of excess generated power back to the grid is minimised as this reduces the return on
your investment.

I have summarised the important information below. The system price provided is an initial estimation, ground conditions as a minimum
would need to be assessed (via a geotechnical survey) to confirm the method of installing the panel mounting structure. Alternatively we
could look at a roof top installation if the structure is appropriate as this is typically cheaper.

Our systems are scalable to any size or to meet a specific budget. If you are interested in receiving a formal proposal please let me know.

PowerSmart is New Zealand's leading and most experienced full service solar integrator. Since 2012 we have installed more than $80m of
solar projects throughout New Zealand, Australia and the Pacific Islands.

Waimakiri District Council (Rangiora WWTP) – Indicative Solar PV Proposal
146.52 kWp Grid Tied PV System

Solar Power system Size: 146.52 kWp (396 x JA Solar 370W Solar Panels)
Orientation and Tilt North Orientation, 250 tilt
System, design, installation cost (ex GST): $280,000*

Est. Year 1 PV System production (kWh): 196,600 kWh
Est. Year 1 System production ($): $31,900 (Based on 90% usage @17.25 cents / kWh average internal use and
10% export to the grid @ 7 cents / kWh)
Est. offset of grid electricity consumption (8am-4pm) 47%
Est. total offset of grid electricity consumption 16%
Simple ROI 11.4% (NOTE, does not include p/a increases in electricity rates, increases in internal consumption or depreciation**. This would give you a better ROI)
Estimated payback period 8.7 years
Marketing value Further opportunity to increase ROI
** Note this price includes Geotechnical surveys up to $3,500 and assumes ground mounted framing can be piledriven given suitable*
ground conditions + we do not have to deal with any hazardous/toxic substances at site – any applicable exclusions will be detailed in
our formal proposal.
***Electricity Inflation is estimated at 2.7% p/a*
Depreciation: System can be depreciated over 10.5years

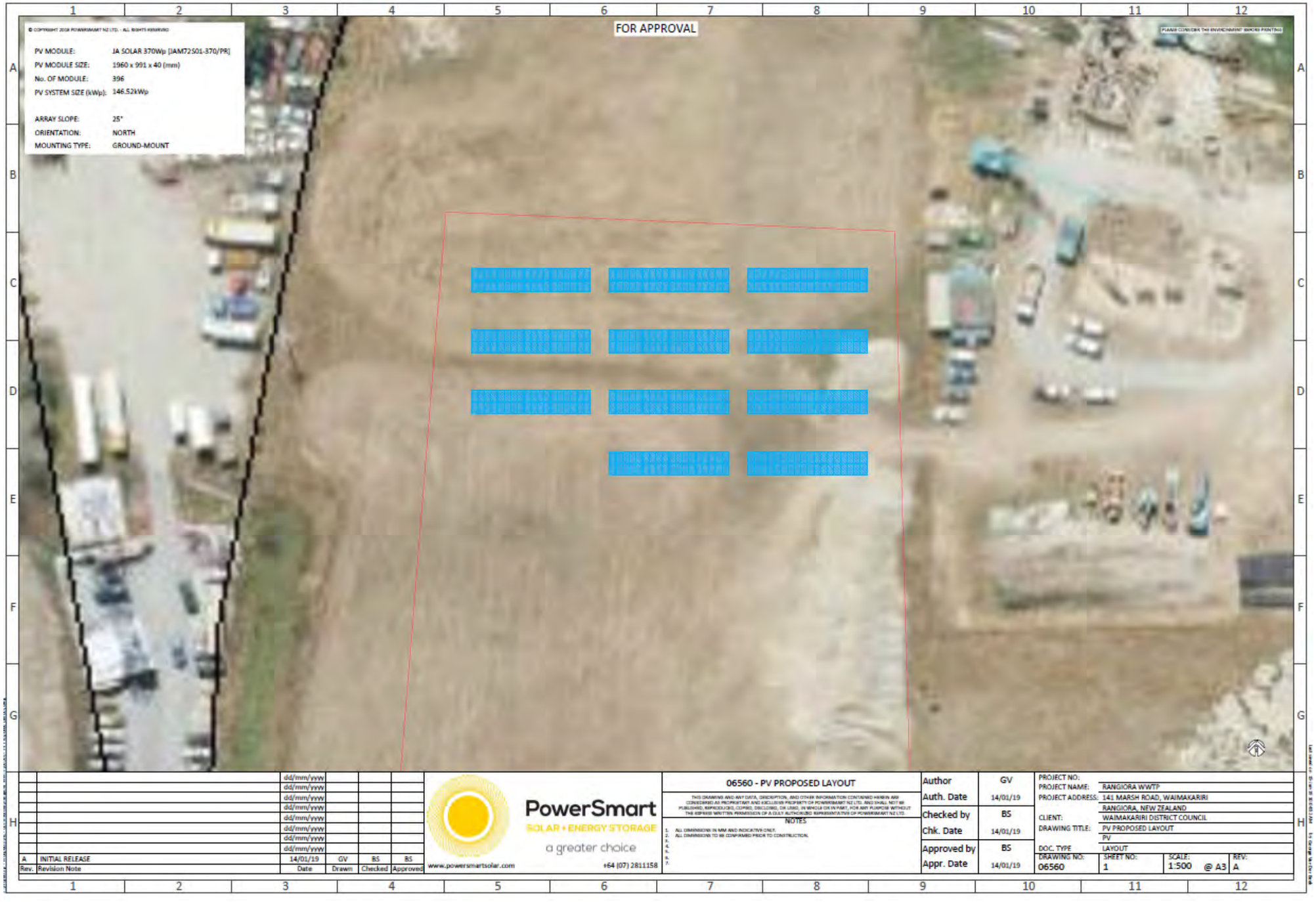


Figure 2 Proposed Powersmart layout

9.2 Appendix 2, NIWA Sun Path Diagrams

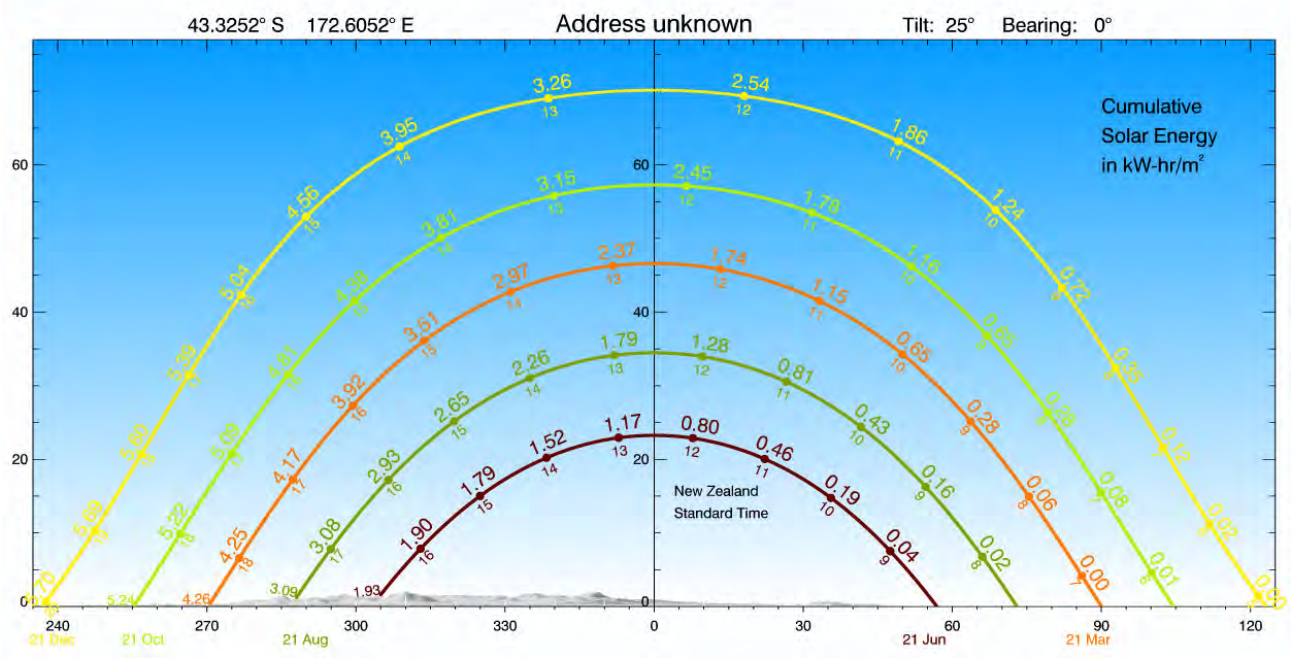


Figure 3 Sun path diagram for Powersmart proposal

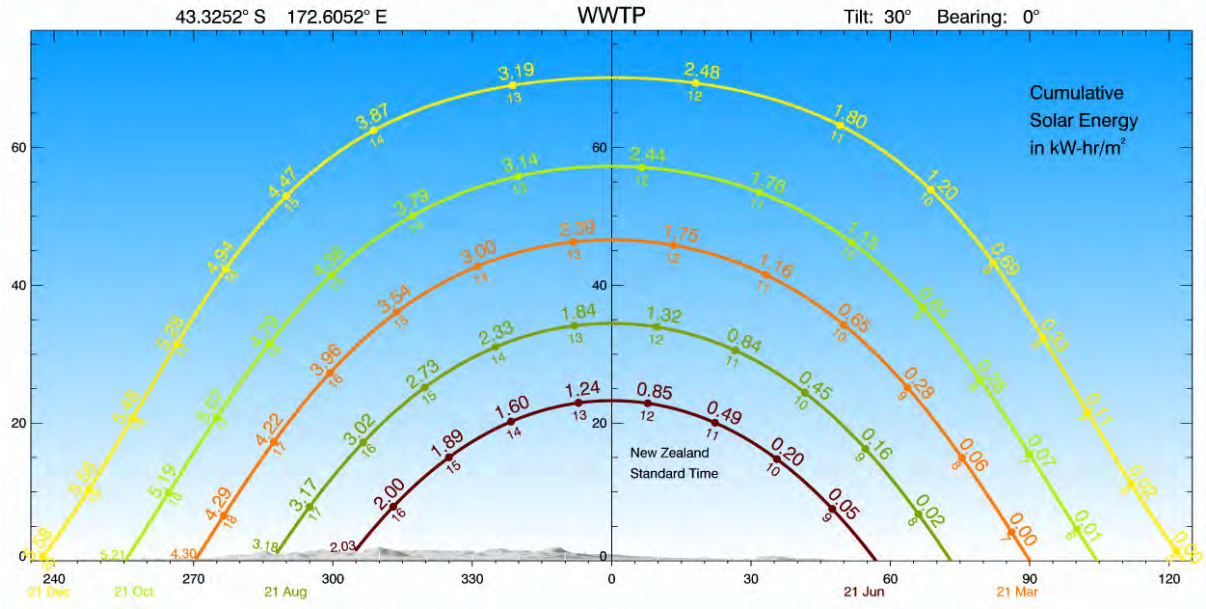


Figure 4 Sun path diagram for optimised solution

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	SEW-03-18-01/191206172005
REPORT TO:	Utilities and Roading Committee
DATE OF MEETING:	19 December 2019
FROM:	Sophie Allen – Water Environment Advisor Gerard Cleary – Manager Utilities and Roading
SUBJECT:	Sea foam sampling update - December 2019
SIGNED BY: **(for Reports to Council, Committees or Boards)**	Department Manager / Chief Executive

1. SUMMARY

1.1 This report provides an update on the Waimakariri District Council sampling programme for sea foam.

1.2 A revised sea foam notification and sampling technique was implemented in July 2019, with the aim of improving the notification process, to thereby obtain more samples. A flyer was developed with details for the public of how to notify the Council (Attachment 1). Sample collection is from four locations, and is restricted by factors such as laboratory hours, and volume of foam that is required to be present to obtain a sufficient sample volume.

1.3 Targeted publicity was shared with a range of beach users, rangers who visit the beach, and local community. Sea foam notifications from the public were re-organised to be directed to Customer Services, to then pass to the Water Unit staff to respond. The previous process was for direct notifications and response by the Water Environment Advisor.

1.4 One notification of sea foam was received by the public from the targeted publicity. However this did not result in sample collection, as it was too late in the day to respond.

1.5 No further samples have been obtained since December 2018. Three more rounds of sampling are intended to be undertaken over the summer of 2019-20.

1.6 A community member has raised that there were sufficient volumes of sea foam to sample on the 6 October 2019. Unfortunately, no notifications were received by the Waimakariri District Council on that date.

1.7 Faecal Source Tracking (FST) can give an indication of the source (i.e. avian, bovine, canine, and human) of bacteria present tor absent in a sample. However, after obtaining further information from ESR, WDC staff no longer recommend to carry out faecal source tracking (FST) analysis on sea foam samples, due to inability to distinguish proportions of faecal sources, and the difficulty of obtaining a large enough sample to undertake the analysis.

1.8 The Eastern Districts Sewage Scheme ocean outfall met consent conditions for 2018-19 with respect to water quality at point of discharge.

Attachments:

i. Sea foam sampling flyer (TRIM 190703093973)
ii. Sea Foam Testing- Update on Summer 2018 Results (TRIM 190605078713)
iii. Ocean Outfall 2018 to 2019 Compliance Review (TRIM 190827119588[v1])

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 191206172005.

(b) **Notes** the new process for sea foam notification and sampling instigated in July 2019. This process, however, has not resulted in any further samples obtained.

(c) **Notes** the limitations of Faecal Source Tracking (FST) to show proportions of each source, such as between bovine, human and avian.

(d) **Approves** the removal of the additional expenditure of $36,000 for Faecal Source Tracking analysis from the allocated budget and work programme for sea foam sampling, due to the limitation to show relative proportions of faecal sources, and the difficulty of obtaining sea foam samples of the recommended four litres.

(e) **Notes** that the Eastern Districts Sewage Scheme ocean outfall continues to meet its consent conditions, as summarised in the 2018-19 Ocean Outfall Compliance Review, with respect to water quality at point of discharge.

(f) **Circulates** this report to the Ngāi Tūāhuriri Rūnanga executive, Kaiapoi - Tuahiwi Community Board and Woodend - Sefton Community Board.

3. BACKGROUND

3.1 Over the summer of 2015/16 there was a complaint from a member of the public that a build-up of foam on the beach along Pegasus Bay was caused by the ocean outfall discharge. A subsequent report to the Utilities and Roading Committee (TRIM 160608053630) sought funding to carry out an investigation into the issue. The Committee resolved to allocate $75,000 to the investigation.

3.2 A report (SEW 01-05 / 180301021693) by former Wastewater Asset Manager Chris Parton was presented to the Utilities and Roading Committee on 20 March 2018 regarding sea foam testing. The report set out the results of a sample of sea foam collected and tested on 15 January 2018. The sample was collected as part of the 5 days a week staff beach visits regime that ran from 8 January to mid-April 2018. The 15 January 2018 sample was sent to ESR for analysis. Results of this analysis showed that there were slightly elevated levels of *enterococci* and *E. coli* in the seawater tested and elevated levels of *enterococci* and *E. coli* in the Waimakariri River water tested.

3.3 The March 2018 report noted that the levels of both *enterococci* and *E. coli* in both the sea and river water were still well below action or alert levels as defined by the Ministry for the Environment, and that Council staff would continue to engage members of the public that frequent the beach to alert us to the presence of sea foam.

3.4 In August 2018 meeting, the sea foam testing methodology was reviewed and a memo (TRIM 181009117118) provided to the Water Unit outlining the protocols for a second programme of sampling and testing of sea foam. Samples were to be tested for

enterococci and *E. coli* levels, as an indicative assessment of any potential human health risk from the sea foam.

3.5 Sea foam was reported on 3 December 2018 by beach walkers to WDC staff, which was sampled and sent off to Hill Laboratories for testing. The wind was a strong (20-30km/h). ENE wind at the time of sampling. The bottles did not reach the lab chilled to below 8 degrees Celsius, the recommended temperature to prevent multiplication of bacteria, despite the frozen slicker pads in the Styrofoam sample box to chill the samples.

3.6 The results show significantly higher levels of *E. coli* and *enterococc*i than the earlier January 2018 results (see Attachment ii).

4. ISSUES AND OPTIONS

Microbiological sampling

4.1. Further sampling and testing of *E.coli* and *enterococci* continues to be recommended by WDC staff, to confirm if the 3 December 2018 sample was an aberration caused by high temperature in the samples post-collection. Samples of seawater at the collection sites will be taken at the same time. Some scientific articles have suggested that sea foam can have significantly higher levels of bacteria such as *enterococci* than the associated sand and water. Natural consolidation of bacteria within sea water into sea foam occurs by a process known as 'bubble scavenging'. Multiplication of *E.coli* and *enterococc*i, when provided with a warm, stable, nutrient-rich environment similar to the intestine environment of their host (such as the sea foam in summertime), has been indicated ESR scientists to also be a possibility. Further sampling may identified whether 'bubble scavenging' or multiplication of bacteria appears to be occurring in the sea foam.

Beach Visits

4.2. Staff will re-instigate regular visits to the beach over summer, carried out by the Water Unit and Water Environment Advisor, due to the difficulty of obtaining notifications from the public. These will particularly be carried out during an easterly or north-easterly wind direction, which is thought to be when sea foam is present in larger volumes.

Faecal Source Tracking

4.3. Faecal Source Tracking (FST) can give an indication of the source (i.e. avian, bovine, canine, and human) of bacteria present in a sample. However, after obtaining further information from ESR, WDC staff do not recommended to carry out faecal source tracking (FST) analysis on sea foam samples. Further information provided by the Institute of Environmental Science and Research (ESR) on this analysis has clarified that it would not provide an indication on the relative proportion of each source (i.e. percentage of ruminant, human or avian) within a sample. It is likely that results would show all faecal sources present in samples, which without knowing proportions would not further WDC investigations.

4.4. An additional sampling difficulty is the large volume of sample (four litres of bubbled-down sea foam liquid is recommended by ESR), would need to be collected for each site for Faecal Source Tracking. This volume would be very difficult, as sea foam volumes collected would need to be 40 litres or more, as shown by the difficulty to collect 100ml of bubbled-down liquid for the *E.coli* and *enterococci* sampling.

4.5. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. Groups and Organisations

5.1.1. The primary concern regarding human health risk from sea foam comes from a concerned community member. The results of the December 2018 samples have been reported to the community member in a meeting in January 2019. The community member has raised additional concerns over the lack of sampling, despite sea foam being present since the last sample was taken on the 3 December 2018.

5.1.2. When the issue was first raised in 2016, the Kaiapoi-Tuahiwi Community Board showed some desire to carry out further testing.

5.2. Wider Community

5.2.1. There have been reports of an active discussion thread regarding the posting of the WDC request for sea foam notifications on the Pines Kairaki Beaches Association Facebook page. However, it is unknown what themes were discussed in relation to sea foam.

6. IMPLICATIONS AND RISKS

6.1. Financial Implications

6.1.1. An original approved expenditure of $75,000 was approved, with a further $41,000 approved for Faecal Source Tracking in July 2019 by the Utilities and Roading Committee. To date $55,000 has been spent.

6.1.2. The estimated cost from ESR to run a suite of tests at the four locations, for both sea water and sea foam is $36,000. WDC staff recommend that this is no longer carried out, as detailed in this report.

6.1.3. Cost savings from not carrying out the Faecal Source Tracking beach monitoring budget will reduce an overspend in the beach monitoring budget of $32, 870.

6.2. Community Implication

6.2.1. The community implication from the recommendations is a reduced cost on the ratepayer to pay for the sea foam sampling and analysis, with no expenditure for Faecal Source Tracking that is unlikely to further investigations due to limitations of the method.

6.3. Risk Management

6.3.1. There are no significant risks that would result from the recommendations in this report.

6.4. Health and Safety

6.4.1. There are no new health and safety issues arising from this additional testing not already covered by existing testing procedure protocols and the ‘Safe Working in the Field’ manual.

7. CONTEXT

7.1. Policy

7.1.1. This matter is not a matter of significance in terms of the Council’s Significance and Engagement Policy.

7.2. **Legislation**

7.2.1. The legislation relevant to this decision are the ocean outfall consent conditions, which are set under the Resource Management Act (1991). Sea foam monitoring is a voluntary initiative, in addition to compliance conditions required in the consent.

7.3. **Community Outcomes**

7.3.1. Relevant Community outcomes are

7.3.1.1. The Council takes account of the views across the community including mana whenua.

7.3.1.2. Harm to the environment from the impacts of land use, use of water resources and air emissions is minimised

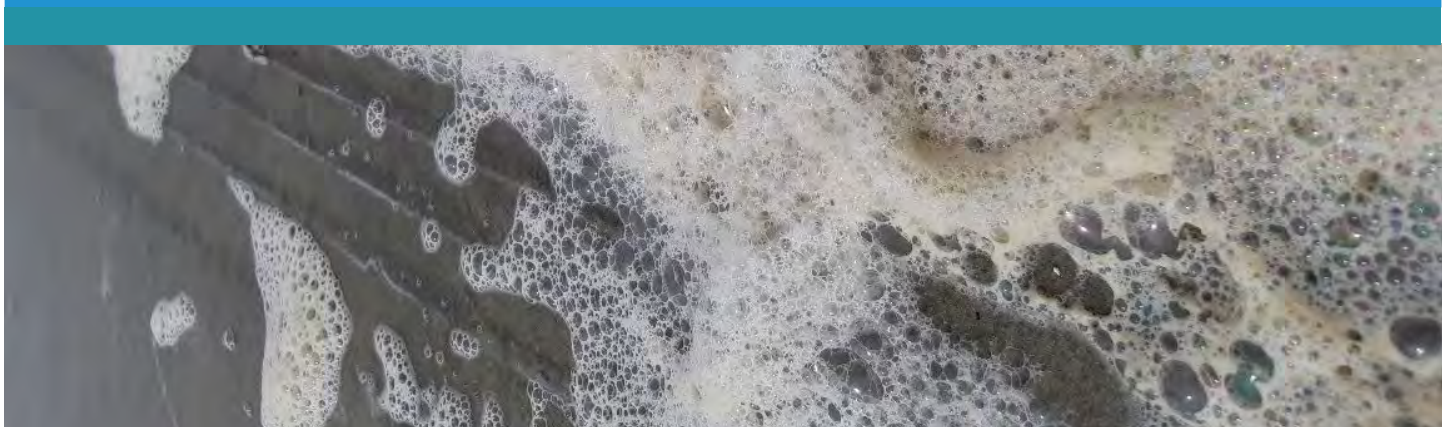
7.3.1.3. Harm to the environment from the spread of contaminants into ground water and surface water is minimised

7.3.1.4. People enjoy clean water at our beaches, rivers and lakes.

7.4. **Delegations**

7.4.1. The Committee has the authority to authorise a reduction in allocated expenditure, within an overspent budget.

Sea Foam Sampling
Can you help us?



The Council is currently sampling sea foam in the areas between Kairaki and Woodend Beach.

Do you visit the beach regularly?

As sea foam occurrence is a natural phenomenon that is only occasional, we're looking for notifications and photos from members of the public if they come across sea foam.

Contact us on 0800 965 468 if you see sea foam that is:

- Within the Waimakariri District (particularly between Kairaki and Woodend Beach)
- On the sand (not sea foam on the top of waves - see photo above)
- Sufficient in quantity to fill a 1 litre sample container

The Council is examining the levels of *E.coli* and enterococci in the sea foam (bacteria that are used to indicate if there is faecal contamination) as part of an ongoing investigation due to public interest.

Notifications can be received at any time. However, after hours or during the weekend may not be responded to until the next day or tide cycle, due to staff availability and/or laboratory availability.

Contact our Customer Services Team on 0800 965 468 to report sea foam

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR A DECISION

FILE NO and TRIM NO:	SEW-03-18-01 /190605078713
REPORT TO:	Utilities & Roading Committee
DATE OF MEETING:	18 June 2019
FROM:	Simon Collin – Infrastructure Strategy Manager Sophie Allen – Water Environment Advisor
SUBJECT:	Sea Foam Testing- Update on Summer 2018 Results
SIGNED BY: **(for Reports to Council, Committees or Boards)**	Department Manager / Chief Executive

1. SUMMARY

1.1 This report provides the committee with an update regarding the test results for sea foam from December 2018.

1.2 On 3 December 2018 conditions creating sea foam were reported by beach walkers to Council. WDC staff were able to collect samples for testing at four locations; at the ocean outfall, to the north of the outfall, south of the outfall, and at the mouth of the Waimakariri River.

1.3 The results of the 3 December 2018 samples were considerably higher for both *E. coli* and *Enterococci* than found for the previous sample from 15 January 2018. However, the laboratory noted that the results should be treated with caution as the temperature of the samples upon arrival at the laboratory was higher than the required 8 degrees Celsius.

1.4 Three further rounds of sea foam sampling were anticipated to be made in the second round of sampling in the summer 2018/19. Further sea foam sampling was hoped to clarify whether lack of chilling of samples had been a factor in the high *E. coli* and *Enterococci* results obtained. However, no further sampling alerts were received from the regular beach walkers, despite reminders that sampling was still desired. The Water Unit also not able to obtain any sea foam samples when undertaking weekly water sampling for the ocean outfall compliance monitoring.

1.5 Ongoing sampling and testing is therefore proposed, in an effort to gain sufficient data to establish if the sea foam does contain sufficient bacteria to be a cause for concern, and if so what is the source of contamination.

1.6 Approval is therefore sought to increase the originally approved amount of $75,000 for this work by a further $41,000.

1.7 Notwithstanding the proposed ongoing sampling and testing, the Eastern Districts Sewage Scheme ocean outfall has met consent conditions to-date for 2018-19 with respect to water quality at point of discharge.

Attachments:

i. Sea foam update report (TRIM SEW-03-18-01/190605078752)

ii. Memo outfall sea foam testing protocol October 2018 (TRIM 181009117118)
iii. Request for budget for Ocean Outfall and Beach Testing report (TRIM 160608053630)

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 190605078713.

(b) **Approves** an additional expenditure of $41,000 over and above the original $75,000, to allow ongoing sampling and testing of sea foam to be carried out.

(c) **Approves** funding coming from the beach monitoring budget of the Eastern Districts Sewer Scheme, which has $32,870 available.

(d) **Notes** that the faecal source tracking test will only be carried out if the *E.coli* and *Enterococci* counts are sufficiently high for the detection level of this test.

(e) **Notes** that it is not certain that the proposed sampling and testing programme will provide a definitive result of whether there is a source of contamination from the ocean outfall in the sea foam.

(f) **Notes** that the Eastern Districts Sewage Scheme ocean outfall continues to meet its consent conditions, with respect to water quality at point of discharge.

(g) **Circulates** a copy of this report to the Kaiapoi –Tuahiwi and Woodend-Sefton Community Boards

(h) **Circulates** a copy of this report to the Rūnanga Liaison Committee

3. BACKGROUND

3.1 Over the summer of 2015/16 there was a complaint from a member of the public that a build-up of foam on the beach along Pegasus Bay was caused by the ocean outfall discharge. A subsequent report to the Utilities and Roading Committee (TRIM 160608053630) sought funding to carry out an investigation into the issue. The Committee resolved to allocate $75,000 to the investigation.

3.2 A report (SEW 01-05 / 180301021693) by former Wastewater Asset Manager Chris Parton was presented to the Utilities and Roading Committee on 20 March 2018 regarding sea foam testing. The report set out the results of a sample of sea foam collected and tested on 15 January 2018. The sample was collected as part of the 5 days a week staff beach visits regime that ran from 8 January to mid-April 2018.

3.3 The 15 January 2018 sample was sent to ESR (Institute of Environmental Science and Research) for analysis.

3.4 Results of this analysis showed that there were slightly elevated levels of *Enterococci* and *E. coli* in the seawater tested and elevated levels of *Enterococci* and *E. coli* in the Waimakariri River water tested. The test results as presented in the 20 March 2018 report are shown in Table 1.

Table 1 – Test Results from Sea Foam Analysis

Sample Number	Sample Location	E. Coli	Action Level*	Enterococci	Action Level*
1	500m south of Ocean Outfall	13.3	550	62.5	280
2	1 km north of ocean outfall	10.7	550	42	280
3	1 km south fo ocean outfall	13.3	550	55	280
4	Waimakariri River, upstream of Kaiapoi WWTP	194.3	550	213	280

* As established by Ministry for the Environment.

3.5 The March 2018 report noted that the levels of both *Enterococci* and *E. coli* in both the sea and river water were still well below action or alert levels as defined by the Ministry for the Environment, and that Council staff would continue to engage members of the public that frequent the beach to alert us to the presence of sea foam.

3.6 A report to the Utilities and Roading Committee from Sophie Allen and Rob Frizzell on 21 August 2018 regarding avian botulism annual summary 2017-18, combined with a deputation from Mr Bate resulted in a request from the Committee to renew attempts by staff to collect and test sea foam samples from the vicinity of the ocean outfall.

3.7 Following the August 2018 meeting, the sea foam testing methodology was subsequently reviewed and a memo (TRIM 181009117118) provided to the Water Unit outlining the protocols for a second programme of sampling and testing of sea foam. Samples were to be tested for *Enterococci* and *E. coli* levels, as an indicative assessment of any potential human health risk from the sea foam.

3.8 Sea foam was reported on 3 December 2018 by beach walkers to WDC staff, which was sampled and sent off to Hill Laboratories for testing. The wind was a strong (20-30km/h) ENE wind at the time of sampling.

3.9 The sampling process was not ideal as there was only a limited amount of sea foam, which caused sampling difficulties. In addition the bottles did not reach the lab chilled to below 8 degrees Celsius, the recommended temperature to prevent multiplication of bacteria, notwithstanding the frozen slicker pads in the Styrofoam sample box to chill the samples.

3.10 The results show significantly higher levels of *E. coli* and *Enterococci* than the earlier January 2018 results, as shown in the table below. The laboratory report noted that the results should be viewed with caution, due to the samples not being below 8 degrees on arrival at the laboratory.

Sample Number	**Sample Location**	***E. coli***	**Action Level***	***Enterococci***	**Action Level***
1	1 km south of Ocean Outfall	845	550	24200	280
2	1 km north of Ocean Outfall	537	550	2100	280
3	Adjacent to Ocean Outfall	534	550	4110	280
4	Waimakariri River mouth	3650	550	5480	280

* Action level for from the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (MfE, 2003)

4. ISSUES AND OPTIONS

4.1. The most recent results indicate that further sampling and testing should be carried out so as to confirm if that sample was an aberration caused by high temperature in the samples or not. Samples of seawater at the collection sites should be taken at the same time. This

is because some scientific articles have suggested that sea foam can have significantly higher levels of bacteria such as *Enterococci* than the associated sand and water. Natural consolidation of bacteria within sea water into sea foam occurs by a process known as 'bubble scavenging'.

4.2. If further sampling replicates the high levels shown in the December samples, it should be possible to utilise the faecal source tracking testing offered by ESR. This may provide a clear indication of what the sources of contamination are. With previous samples the counts of *E. coli* and *Enterococci* have been too low for this technique to be used. The faecal source tracking tests, although expensive, should be able to determine if the contamination sources are from animals or humans. Note that this technology is not perfect and a definitive result may not be the result, even if *E.coli* and *Enterococci* counts in the samples are high.

4.3. ESR developed the faecal source tracking techniques, and there are no alternative suppliers at this point in time.

4.4. For the most recent sampling, the Waimakariri River results for *E. coli* are 4.3 times greater than the results from the beach, and 4.4 times greater for *Enterococci*. This aligns with the previous sampling results where the *E.coli* results were a minimum of 14.6 times higher than the beach samples and the *Enterococci* results a minimum of 3.4 times higher. The river is a possible source for animal effluent contamination, and therefore needs further investigation, especially when the relative flows are considered.

4.5. Comparing a typical low flow from the river at 55 m3 per second, with the maximum recorded flow in 17/18 from the outfall at 0.62 m3 per second, and factoring in the minimum ratio of *E. coli* between the river and beach sites, shows that the river is delivering an absolute minimum of 380 times more *E. coli* into the sea than the ocean outfall (300 for *Enterococci*).

4.6. The alternative option of not carrying out any further sampling is not recommended. Notwithstanding that the Council is still meeting its discharge consent conditions with respect to water quality at point of discharge, the most recent sea foam testing results are a cause for concern and warrant further testing.

4.7. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. Groups and Organisations

5.1.1. The primary concern regarding human health risk from sea foam comes from a concerned community member. The results of the December 2018 samples and testing have been reported verbally to the community member in a meeting in January. When the issue was first raised in 2016, the Kaiapoi-Tuahiwi Community Board also showed some desire to carry out further testing.

5.2. Wider Community

5.2.1. There has been no concern expressed from the wider community about this issue.

6. IMPLICATIONS AND RISKS

6.1. Financial Implications

6.1.1. On the basis of the June 2016 report (TRIM 160608053630) $75,000 has been approved for investigation of this issue. To date $55,000 has been spent.

6.1.2. Based on the previous quote provided by ESR for their faecal source tracking testing, the estimated cost to run a suite of tests at the four locations previously used, for both sea water and sea foam is $36,000. This figure is based on the assumption that 3 samples of sea foam would be sampled over the summer months, while noting that the practicality of obtaining sea foam samples in the past has proved problematic. The estimate also includes an interpretive report. Note that the faecal source tracking would only be carried out if the *E.coli* and *Enterococci* results were sufficiently high.

6.1.3. In addition, if it proves necessary to reinstate the daily staff beach visits for 5 days a week in order to locate the sea foam, an additional $25,000 would be required. This amounts to a total estimate of $61,000.

6.1.4. Approval is therefore sought to spend up to an additional $41,000, above the original approved expenditure of $75,000.

6.1.5. It is proposed that the funds would come from the beach monitoring budget of $32,870. If approved it would mean this budget would be overspent.

6.2. **Community Implications**

6.2.1. The community implication from the recommendations is the additional cost on the ratepayer to pay for the sea foam sampling and analysis.

6.3. **Risk Management**

6.3.1. There are no significant risks that would result from the recommendations in this report

6.4. **Health and Safety**

6.4.1. There are no new health and safety issues arising from this additional testing not already covered by existing testing procedure protocols and the ‘Safe Working in the Field’ manual.

7. CONTEXT

7.1. **Policy**

This matter is not a matter of significance in terms of the Council’s Significance and Engagement Policy.

7.2. **Legislation**

7.2.1. The legislation relevant to this decision are the ocean outfall consent conditions which are set under the Resource Management Act (1991).

7.3. **Community Outcomes**

7.3.1. Relevant Community outcomes are

- The Council takes account of the views across the community including mana whenua.
- Harm to the environment from the impacts of land use, use of water resources and air emissions is minimised
- Harm to the environment from the spread of contaminants into ground water and surface water is minimised
- People enjoy clean water at our beaches, rivers and lakes.

7.4. **Delegations**

7.4.1. The Committee has the delegation to authorise proposed over expenditure of up to 20% in any line of activity provided that the source of funding for the proposed over-expenditure is identified.

Attachment i

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
101C Waterloo Road
Hornby
Christchurch 8042 New Zealand

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	Waimakariri District Council	**Lab No:**	2090911	SPv1
Contact:	Sophie Allen	**Date Received:**	04-Dec-2018	
	C/- Waimakariri District Council	**Date Reported:**	05-Dec-2018	
	Private Bag 1005	**Quote No:**	94491	
	Rangiora 7440	**Order No:**	P0015017	
		Client Reference:		
		Submitted By:	Sophie Allen	

Sample Type: Saline

Sample Name:		North 03-Dec-2018 10:20 am	Outfall 03-Dec-2018 10:00 am	South 03-Dec-2018 10:40 am	River Mouth 03-Dec-2018 11:00 am	
Lab Number:		2090911.1	2090911.2	2090911.3	2090911.4	
Escherichia coli	MPN / 100mL	537 #1	534 #1	845 #1	3,650 #1	-
Enterococci	MPN / 100mL	2,100 #1	4,110 #1	24,200 #1	5,480 #1	-

Analyst's Comments

#1 Please interpret this result with caution as the sample was > 8 °C on receipt at the lab. The sample temperature is recommended by APHA to be less than 8 °C on receipt at the laboratory (but not frozen). However, it is acknowledged that samples that are transported quickly to the laboratory after sampling, may not have been cooled to this temperature.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Saline

Test	Method Description	Default Detection Limit	Sample No
Escherichia coli	MPN count using Colilert 18 (Incubated at 35°C for 18 hours), Analysed at Hill Laboratories - Microbiology; 101c Waterloo Road, Hornby, Christchurch. APHA 9223 B, 22nd ed. 2012.	10 MPN / 100mL	1-4
Enterococci	MPN count using Enterolert, Incubated at 41°C for 24 hours. Analysed at Hill Laboratories - Microbiology; 101c Waterloo Road, Hornby, Christchurch. MIMM 12.4, APHA 9230D.	10 MPN / 100mL	1-4

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Yu (Dominique) Gao BASc
Laboratory Technician - Microbiology

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

WAIMAKARIRI DISTRICT COUNCIL

MEMO

FILE NO AND TRIM NO:	SEW 03-18-01 / 181009117118
DATE	9 October 2018
MEMO TO:	Sean de Roo Water Unit
FROM:	Sophie Allen
Cc:	Kalley Simpson Simon Colin Rob Frizzell Gavin Hutchinson
SUBJECT:	Parameters for Testing of Sea Foam Around Ocean Outfall

Following Chris Parton work with Louise Weaver of ESR regarding the testing of sea foam in the vicinity of the WDC Ocean Outfall, and my subsequent discussion with Hill Laboratories, the following items outline the protocols for the second programme of sampling and testing of sea foam. Samples will be tested for *Enterococci* and *E. coli* levels, as an indicative assessment of human health risk of the sea foam.

What to Sample

Foam that is to be tested should be of a "bluish-greenish-brownish" hue. However, Michael Bate has requested that any foam (even if it is e.g. white / light-brown) should also be tested if it not foamy, but instead 'oily' or 'slimy' in appearance.

Where to Sample

When foam that fits the above description is found, samples should be taken at 4 different locations. Those are:

- 1 km north of where the ocean outfall enters the ocean,
- 1 km south of where the ocean outfall enters the ocean,
- At the point where the ocean outfall enters the ocean,
- At the mouth of the Waimakariri River

The attached map (Map 1) shows these locations in more detail.

Best Time for Sampling

There is no best time of day to find and sample sea foam. The presence of foam should not be influenced by whether or not the tide is either incoming or outgoing. If sea foam is present, then it should remain for several hours, maybe even a full tidal cycle, after initial detection.

How to Sample

When the appropriate sea foam is detected, the following methodology should be followed for collecting the sample:

- Sample bottles should be kept out of sunlight to avoid degradation of the sample.
- Hill Laboratories have supplied the bottles for the appropriate tests. Labelling is required after the sample is taken.
- A minimum 100ml sample of foam (and associated seawater) should be collected if and when foam is found. The sea foam should bubbled down to a liquid that can be filtered for the *Enterococci* and *E. coli* tests.

Map 1: The four sampling locations

WAIMAKARIRI DISTRICT COUNCIL

REPORT

FILE NO and TRIM NO: SEW-03-18-01-01 / 160608053630

REPORT TO: Utilities and Roading Committee

DATE OF MEETING: 21st June 2016

FROM: Ric Barber, Wastewater Asset Manager

SUBJECT: Request for budget for Ocean Outfall and Beach Testing

SIGNED BY:
(for Reports to Council or Committees)

Department Manager

Chief Executive

1. SUMMARY

1.1. The purpose of this report is to seek approval to for a new budget of $100,000 for the 2016/17 financial year for further testing of the beach and Ocean Outfall discharge.

1.2. This further testing has eventuated from concern from the community, Kaiapoi Community Board, Runanga and Councillors regarding a foam build-up on the beach near to the Ocean Outfall.

1.3. ESR have undertaken testing of this sea foam which determined that there was the presence of marine diatoms consistent with those found in naturally occurring sea foam.

1.4. Council staff provided a report of this analysis to the Utilities and Roading Committee and to the Kaiapoi Community Board with the results of the sea foam analysis and were requested to undertake further testing to confirm the presence of any faecal indicator bacteria.

1.5. Council staff and ESR developed a testing programme to determine whether there are any of the same faecal indicator bacteria present in the Ocean Outfall discharge to those is present in the sea foam.

1.6. The cost to carry out this further testing is expected to be approximately $100,000, which would mean an increase of the Eastern District Sewer Scheme rate of 1.6% which equates to a one-off increase of $8.45.

1.7. There is an option to do nothing as Environment Canterbury have closed their investigation into the sea foam in Pegasus Bay and the Ocean Outfall is operating fully within the resource consent conditions therefore there is no regulatory driver to carry out any further work.

Attachments

1 – Proposal from ESR for faecal source tracking testing work

2. RECOMMENDATION

THAT the Utilities and Roading Committee recommends:

THAT the Council:

(a) **Receives** report No. 160608053630

(b) **Approves** a new operational budget of $100,000 for faecal source tracking testing of the Ocean Outfall and beach samples.

(c) **Approves** the award of the testing and analysis work to ESR through a sole source proposal.

(d) **Notes** that this has an effect of a 1.6% increase on the Eastern District Sewer Rate in the 2017/18 financial year.

(e) **Circulates** a copy of this report to all Boards for their information.

(f) **Circulates** a copy of this report to the Water Zone Committee for their information.

3. ISSUES AND OPTIONS

3.1. The purpose of this report is to seek approval to for a new budget of $100,000 for the 2016/17 financial year for further testing of the beach and Ocean Outfall discharge.

3.2. Background

3.3. Over the summer of 2015/16 there was a complaint from a member of the public that a build-up of foam on the beach along Pegasus Bay was attributed to the Ocean Outfall discharge.

3.4. A foam on the tide line was present at times on the beach at various places over the summer. This is shown in Figure 1.

Figure 1: Sea Foam near The Pines Beach

3.5. At this time Council staff sought further advice from Lesley Bolton-Ritchie who is a Senior Coastal Water Quality Scientist at Environment Canterbury (ECan). Her advice was “based on samples collected at beaches in Pegasus Bay that we [ECan] have submitted to Cawthron in the past, there can be blooms of surf diatoms notably Attheya armatus. These blooms produce scummy brown foam which discolours the waves and

leaves scum lines on the beach. The surf diatom is a non-toxic species. The blooms are patchy, i.e. there can be a hundred metres or so of 'brown foam on the waves' then hundreds of metres of white foam on the waves, and then another patch of brown foam. I have seen bloom patches at South Brighton, North Beach, Waimairi Beach, out from Bottle Lake Forest, on the west coast of the south island and the west coast of the North Island."

3.6. As part of the summer monitoring of the swimming beaches that is undertaken by Environment Canterbury the samplers look for signs of surf diatom and any other blooms including discoloured water and waves, foam lines on the beach and anything else unusual. Such observations have been carried out for a number of years.

3.7. Council staff sampled some of the sea foam to test for marine diatoms, which is what Lesley Bolton-Ritchie believed the sea foam to be based on photographs. These samples are shown in Figure 2.

Figure 2: Samples of Sea Foam taken in March 2016

3.8. ESR carried out analysis of these samples and determined that there was a presence of marine diatoms and dinoflagellates that are "naturally occurring members of aquatic systems. Diatoms and dinoflagellates are both important members of the marine phytoplankton, and play an important role in the carbon cycle by fixing atmospheric carbon, turning it into complex sugars which they release into the water column. Consequently they are often associated with the development of sea foams which results from the wind and wave driven churning of organic rich waters. The results of this preliminary study have shown the presence of these protozoa with sea foam". If the Council wishes to investigate further, a more detailed analysis would be required to determine the relationship of the protozoa with the sea foam, and to ascertain the role, if any, the wastewater ocean outfall effluent play in creation of sea foam.

3.9. Environment Canterbury were satisfied with this analysis of the sea foam and have closed their investigation into the cause of this.

3.10. Throughout this time, the Ocean Outfall discharge has consistently met all of the resource consent conditions and operated as normal.

3.11. Council staff provided a report of this analysis to the Utilities and Roading Committee and to the Kaiapoi Community Board with the results of the sea foam analysis and were requested to undertake further testing to confirm the presence of any faecal indicator bacteria.

3.12. Council staff and ESR developed a testing programme to determine whether there are any of the same faecal indicator bacteria present in the Ocean Outfall discharge to what is present in the sea foam.

3.13. This is carried out by faecal source tracking testing which provides a “fingerprint” of the faecal indicator bacteria so different samples can be compared to determine if their origin is the same.

3.14. Further to this, the ten year review of the Ocean Outfall consent has shown that the testing carried out at Woodend Beach and at The Pines Beach shows an increase in faecal indicator bacteria over the ten years. This is converse to a decrease in levels of faecal indicator bacteria in the Ocean Outfall discharge over the same period. This would make it very unlikely that the Ocean Outfall discharge is contributing to the increase in faecal indicator bacteria at the beach sites.

3.15. Options

3.16. Option 1 – Do Nothing

Environment Canterbury have closed their investigation into the sea foam in Pegasus Bay and the Ocean Outfall is operating fully within the resource consent conditions therefore there is no regulatory driver to carry out any further work. However there is still some concern among Councillors and the Kaiapoi Community Board regarding the quality of effluent discharge from the Ocean Outfall.

3.17. Option 2 – Wait and see if there is another sea foam occurrence

As marine diatoms are photosynthetic organisms, they congregate more in the summer months, therefore the sea foam was present in the summer months, but is not on the beach at present. There is a possibility that there will not be another occurrence for a number of years. There is an option to not plan any further work until there is another sea foam occurrence at which point a further report, proposal and testing could be considered. This approach is not recommended as it does not provide the flexibility to sample the sea foam if there is another occurrence over a short time period.

3.18. Option 3 – Engage ESR to undertake the Ocean Outfall and Beach testing

Council staff and ESR scientists have determined a testing regime that will provide certainty whether the Ocean Outfall discharge is contributing to the sea foam occurrence within Pegasus Bay. This should provide Councillors and the Community Boards with sufficient information to determine whether there is any detriment to the environment being caused by the Ocean Outfall discharge and whether any further treatment to the discharge is required.

3.19. Staff believe that ESR provide fair value for their work. This specialist scientific analysis can only be carried out by a handful of laboratories in the country and the Christchurch ESR lab provides the service which includes taking the samples, analysing them and providing expert advice that would be more difficult from a remote location.

3.20. Recommendation

3.21. The recommended approach is option 3, to undertake the testing as per the ESR proposal. However it is noted that there is also a strong option to do nothing further as there is no regulatory requirement or specific scientific evidence showing any correlation between the Ocean Outfall discharge and the sea foam.

3.22. The Management Team has reviewed this report and supports the recommendations.

4. COMMUNITY VIEWS

4.1. The Kaiapoi Community Board have been consulted on this matter twice and have shown some desire to carry out further testing to categorically determine if there is any link between the sea foam and the Ocean Outfall discharge.

4.2. The Water Zone Committee, ECan and Runanga have also been consulted and are being kept updated on the progress of this work.

5. FINANCIAL IMPLICATIONS AND RISKS

5.1. The estimated total cost of this project is $100,000, with $72,000 for the ESR testing and reporting plus a $28,000 contingency for any further testing or analysis required.

5.2. This new operational budget would lead to an increase in the Eastern District Sewer Scheme rate of 1.6%. This increase in rates would take place in 2017/18 and equates to a one off increase of $8.45 per ratepayer.

5.3. There is a risk that this further testing indicates that there is a correlation between the sea foam and the Ocean Outfall discharge at which point this would generate further work in determining the level of increased treatment required to ensure the Ocean Outfall discharge is having no detrimental effect to the marine environment it discharges into.

6. CONTEXT

6.1. Policy

This matter is not a matter of significance in terms of the Council's Significance Policy.

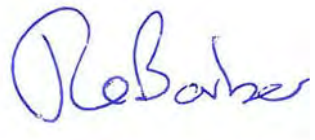
6.2. Legislation

This project is not covered by specific legislation.

6.3. Community Outcomes

This project is consistent with the following community outcome of:

- Core utility services are provided in a timely, sustainable, and affordable manner.



Ric Barber
Wastewater Asset Manager

ATTACHMENT 1 - Proposal from ESR for faecal source tracking testing work

Sea foam proposal

Preliminary studies undertaken by ESR for Waimakariri District Council identified presence of protozoan species in the sea foam found on the beach in close proximity to the ocean outfall (Pantos & Weaver, 2016). Diatoms, dinoflagellates and ciliates were found in the samples taken but no inference to the implications of their presence was made. Diatoms and dinoflagellates are both important members of the marine phytoplankton, and play an important role in the carbon cycle by fixing atmospheric carbon, turning it into complex sugars which they release into the water column. Consequently they are often associated with the development of sea foams which results from the wind and wave driven churning of organic rich waters. The results of this preliminary study have shown the presence of these protozoa with sea foam. A more detailed analysis is required to determine the relationship of the protozoa with the sea foam, and to ascertain the role, if any, the wastewater ocean outfall effluent play in creation of sea foam.

Further study is proposed after consultation with Ric Barber to identify whether the sea foam is related to the wastewater discharge from the ocean outfall.

Aim for this research: Compare the profile of sea foam and beach sea water samples with effluent leaving the wastewater treatment works (Woodend and Kaiapoi) as it enters the ocean outfall. The profiles generated using faecal source tracking (FST) and identification of protozoa present will enable identification of the role of wastewater discharge on production of sea foam, if any.

A study is proposed to identify at each site:

A. protozoan community composition (diatoms, dinoflagellates and ciliate),
B. faecal indicator organisms (enterococci and *E. coli*),
C. faecal source tracking (FST) markers (sterols),
D. faecal source tracking (FST) (microbial diversity), and,
E. inorganic nutrient analysis.

Note: D. is proposed to enable comparison of the difference in the microbial composition of the wastewater compared to the sea foam, beach sand and seawater samples. If the wastewater is not impacting on the area surrounding the outfall it would be assumed that the community composition will be distinct.

Samples will be taken of:

1. Wastewater effluent before it enters the ocean outfall,
2. Foam/scum on the edge of the wastewater ponds at Kaiapoi if present,

3. Sea foam from Kaiapoi beach around the ocean outfall and other sites (e.g. New Brighton beach) around the Canterbury region,
4. Beach sand (sediment),
5. Seawater samples on the beach around the ocean outfall and,
6. Seawater samples on the beach further afield (>1 km away from the ocean outfall site).

The study is proposed to be conducted on **6 occasions** in total: 3 when sea foam is present at the outfall site and 3 when it is not present (as a baseline).

From this further study, the impact of the ocean outfall on the presence of sea foam will be determined. FST markers provide a method for identifying the source of faecal contamination, being human or animal source. The similarity or difference in protozoan communities present in the wastewater and sea foam coupled with presence or absence of FST markers will enable us to determine if the sea foam is composed of material from the wastewater discharging through the ocean outfall.

Price estimate:

Analysis proposed	*Cost per sample ($, excl GST)*	*Total Number of samples*	*Total cost ($, excl GST)*
A. Protozoa ID	$315	36	$11,340
B. Faecal indicator organisms	$35	36	$1,260
C. Faecal source tracking (sterols)	$450	36	$16,200
D. Faecal source tracking (microbial diversity)	$300	36	$10,800
E. Inorganic analysis	$200 (Hill Labs)	36	$7,200
Sampling			$11,520
Reporting			$13,200
		Total cost (excl GST)	**$71,520**

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR INFORMATION

FILE NO and TRIM NO:	SEW-12 /190827119588
REPORT TO:	Utilities and Roading Committee
DATE OF MEETING:	24th September 2019
FROM:	Gavin Hutchison, Wastewater Asset Manager
SUBJECT:	Ocean Outfall 2018 to 2019 Compliance Review

SIGNED BY: (for Reports to Council, Committees or Boards)	Department Manager	Chief Executive

1. SUMMARY

1.1 The purpose of this report is to update the Utilities and Roading Committee on the operation of the Ocean Outfall for the 2018-2019 reporting year. The Eastern District Sewer Scheme Ocean Outfall operates under resource consent CRC041162.2. Consent compliance for monitoring data of this nature is determined on two levels:

- Has the frequency of monitoring met the consent requirements
- Does the monitoring data comply with any numerical limits specified in the consent conditions

1.2 Compliance was achieved for all consent conditions during the 2018 -2019 monitoring period.

1.3 For the total nitrogen and total phosphorus monthly samples there were two samples that the laboratory failed to undertake the correct testing. A review of the incident identified the laboratory were requested to undertake the monthly sampling but failed to do so. This was reported to the Canterbury Regional Council by email on the 25th March 2019 with an explanation from the laboratory manager. Additional sampling was undertaken to ensure sufficient representative samples were collected for the monitoring period to meet compliance.

1.4 The five day biochemical oxygen demand (BOD_5) results have shown an improvement in the 2018/19 monitoring period. The median for this period was 14 g/m^3 compared to 27 g/m^3 in the previous monitoring period. This reduction is attributed to the new aeration basin at the Rangiora WWTP.

1.5 Ammonical-N concentrations compliance was met as required by Condition 11 of the consent. Concentrations were within the permitted exceedance limits with only 9 of an allowable 16 reading above 27 g/m^3 in each 26-week period during the 2018/19 monitoring period.

1.6 Ammoniacal-N (NH_4) has shown decrease particular between January and April. The median for this period was 8.6 g/m^3 compared to 10.65 g/m^3 in the previous monitoring period. This reduction is attributed to the new aeration basin at the Rangiora WWTP.

1.7 Metals and metalloids are required to be sampled six-monthly. The samples were taken for the 2018/19 period were comparable to results from previous years. There is no consent limit for trace metals and metalloids.

1.8 There were no exceedances of the consent limits for faecal coliforms over the 2018/19 monitoring period.

1.9 Compliance for enterococci limits was achieved as required by Condition 12. Enterococci values exceeded (1,500 cfu/100 mL) on two occasions, a sample on the 29th January 2019 (1,000 cfu/100mL) exceeded the standard value, and one sample collected on the 5th February 2019 (2,420 cfu/100 mL) exceeded the high limit (1,500 cfu/100 mL). This is permitted under Condition 12, which allows for two out of eight consecutive samples to exceed the high limit.

1.10 All organochlorine pesticide, PCB and PAH results were below their respective method detection limits.

Attachments:

i. Eastern Districts Sewer Scheme – Annual Compliance Monitoring Report 2018-2019 (Trim 190822117285)

2. RECOMMENDATION

THAT the Utilities and Roading Committee:

(a) **Receives** report No. 190827119588.

(b) **Notes** that the Ocean Outfall discharge consent was compliant with all consent conditions for the year 2018-2019.

(c) **Circulates** this report to Council for their information.

(d) **Circulates** this report to all Community Boards for information.

3. BACKGROUND

3.1. The purpose of this report is to update the Utilities and Roading Committee on the operation of the Ocean Outfall for the 2018-2019 monitoring year (the year). The treatment facilities at the Rangiora, Kaiapoi, Woodend and Waikuku Beach wastewater treatment plants (WWTP's) discharge into a pipeline, the Ocean Outfall line, that discharges into Pegasus Bay between Pines/Karaiki Beach and Woodend Beach. These treatment plants and the Ocean Outfall line comprise the Eastern Districts Sewer Scheme (EDSS). Figure 1 below is a schematic of the scheme. A schematic diagram of the EDSS is included on the following page. The EDSS operates under a number of resource consents from Canterbury Regional Council. The focus of this report is CRC041162.2, the consent that authorises the discharge of treated effluent into the coastal marine environment from the Ocean Outfall.

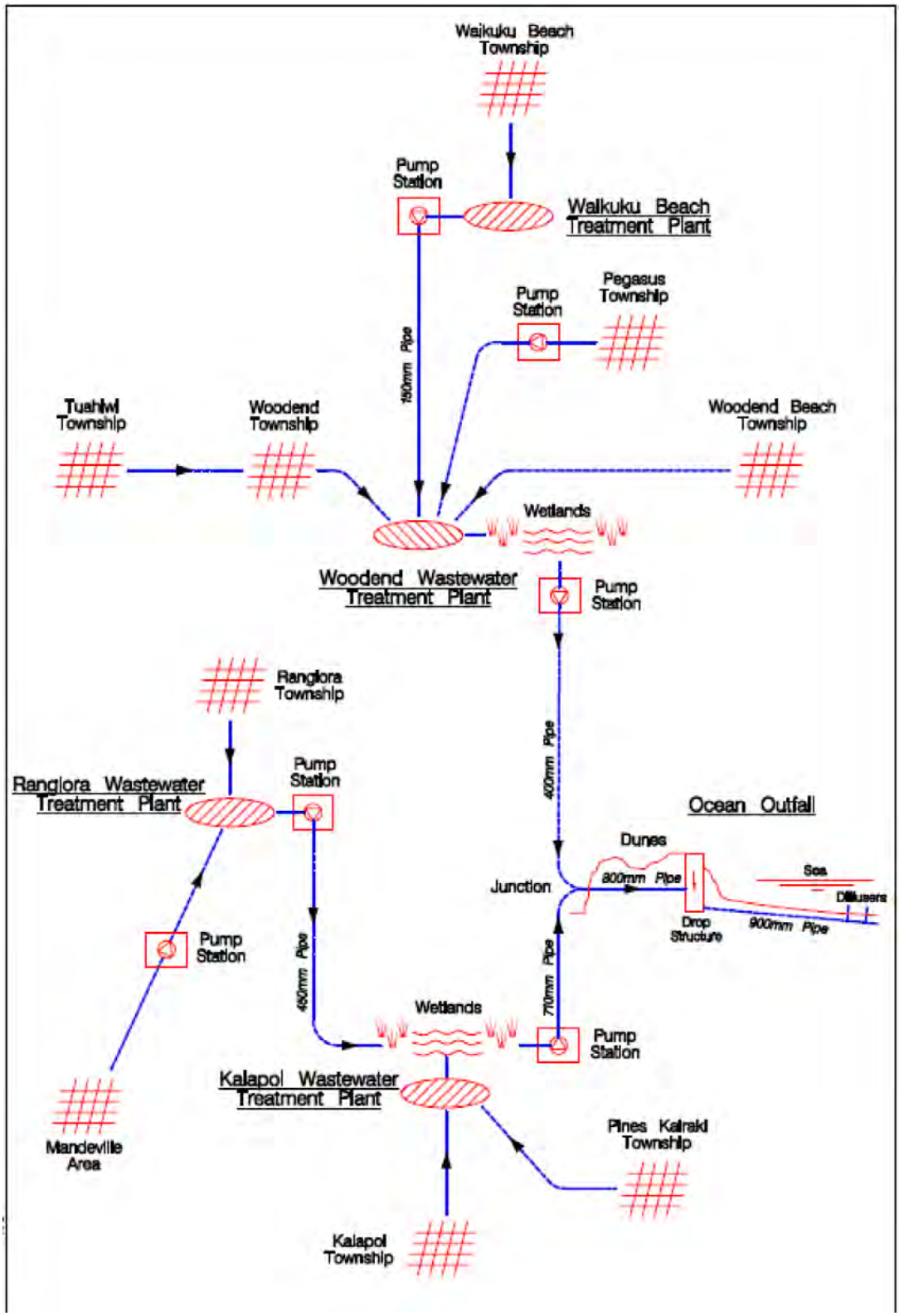


Figure 1: Eastern District Sewer Scheme Schematic

Condition 2 – Discharge Volume and Rate

3.2. Discharge volumes and instantaneous discharge rate to the Ocean Outfall are recorded by a supervisory control and data acquisition (SCADA) system. Figures 2 & 3 in the Annual report depict the annual measures of these metrics. There were no exceedances of either the discharge volume limit or the instantaneous discharge volume for the year.

Ocean Outfall Pipeline Effluent Water Quality

3.3. Six areas describing the quality of wastewater effluent from the Ocean Outfall are sampled and tested based on the schedule for each area as specified in the consent. Those areas are:

- Physiochemical
- Five-day biochemical oxygen demand (BOD_5)
- Nutrients
- Microbiological quality
- Metals and metalloids
- Human pathogens
- Pesticides, PCBs, and PAHs

3.4. Testing results for each area are described in more detail in the following sections.

3.4.1. Physiochemical

pH

Laboratory measured pH in 2018/19 were comparable with that seen in the previous monitoring period. There is no consent limit for pH.

Dissolved Oxygen

Dissolved Oxygen (DO) concentrations were reasonably consistent through the year. There were a few occasions where DO levels were low (<1g/3), and on average the levels were marginally lower than previous monitoring years.

Refer to Figure 5 of the Annual Compliance Monitoring Report. There is no consent limit for DO.

Temperature

Temperature data showed typical seasonal variation (Refer to Figure 6 Annual Compliance Monitoring Report). During the 2018/19 monitoring period, the lowest temperature (5.7 °C) was recorded in July 2019, while the highest temperature (20.3 °C) was recorded in December 2018. The temperature was sampled weekly at the Ocean Outfall structure as required under Condition 9. There is no consent limit for temperature.

Total Suspended Solids

There was no exceedance of the consent limit for TSS (200g/m3) for the 2018/19 monitoring period. Refer to Figure 7 of the Annual Compliance Monitoring Report.

3.4.2. Biochemical Oxygen Demand

Five day biochemical oxygen demand (BOD_5) results have shown an improvement in the 2018/19 monitoring period. The median for this period was 14 g/m^3 compared to 27 g/m^3 in the previous monitoring period. This reduction is attributed to the new aeration basin at the Rangiora WWTP.

Consistent with previous monitoring periods, soluble BOD_5 comprised between 10% and 20 % (interquartile range) of the total BOD_5 during the 2018/19 monitoring period. None of the soluble

BOD_5 results was above the consent limit of 25 g O_2/m^3 (Figure 9, Annual Report). Therefore full compliance was met.

3.4.3. Nutrients

Condition 9 requires dissolved inorganic nitrogen (DIN), ammoniacal-N and dissolved reactive phosphorus (DRP) to be measured weekly. Total nitrogen (TN) and total phosphorus (TP) are required to be measured monthly. The frequency of monitoring prescribed by Condition 9 was met in full for the parameters sampled weekly. For the TN and TP monthly samples there were two samples that the Laboratory failed to undertake the correct testing. This was reported to the regional Council (email 25/3/2019) with an explanation from the laboratory manager. Additional sampling was undertaken to ensure sufficient representative samples were collected for the monitoring period to meet compliance.

Ammoniacal-N (NH_4) has shown decreased particularly between January and April. This is most likely due to the nitrification that was occurring in the new aeration basin at the Rangiora WWTP. The NH_4 levels leaving the Rangiora plant dropped to <1g/m^3 during this period. There were 9 occasions in September and October when concentrations exceeded 25g/m^3. However, this exceedance did not result in a breach of Condition 11, which allows up to 16 exceedances in each 26-week period of the current monitoring period.

Figures 10-14 in the Annual Compliance Monitoring Report show the annual data for ammoniacal-N, nitrogen and phosphorus.

3.4.4. Metals and Metalloids

Full compliance achieved. Metals and metalloids are required to be sampled six-monthly. The samples were taken for the 2018/19 period were comparable to results from previous years. The exception was arsenic which all though in low concentration was slightly elevated. There is no consent limit for trace metals and metalloids.

3.4.5. Microbiological Quality

Faecal Coliforms

Faecal coliform numbers were below relevant seasonal consent limits over the entire 2018/19 monitoring period; therefore, full compliance with Condition 12 was achieved. Figure 16 in the Annual Report shows the annual data for faecal coliforms.

Enterococci

Enterococci values exceeded (1,500 cfu/100 mL) on two occasions, 29th January 2019 (1,000 cfu/100mL) exceeded the standard value, and one sample collected on the 5th February 2019 (2,420 cfu/100 mL) exceeded the high limit (1,500 cfu/100 mL) (Figure 17 in the Annual Compliance Monitoring Report). The resource consent allows for six out of eight consecutive samples to exceed the standard limit, and two out of eight consecutive samples to exceed the high limit. Therefore, full compliance with Condition 12 was achieved for enterococci.

Escherichia coli (E. coli)

There is no consent limit for E. coli. There were two occasions when results showed elevated levels of E.coli. Figure 18 in the Annual Compliance Monitoring Report shows annual data for E. coli.

3.4.6. Human Pathogens

The human pathogen sampling requirements of Condition 9(d) were met in full. Human enterovirus and adenovirus were below their respective minimum detection limit during the 2018/19 monitoring period.

4. COMMUNITY VIEWS

4.1. The community have not been specifically consulted as part of this monitoring.

5. IMPLICATIONS AND RISKS

5.1. Financial Implications

5.1.1. There are financial implications and risks should consent compliance is not achieved. Non-compliance of any consent parameter can result in increased monitoring costs and action being taken against the Council (i.e. abatement notice). Such instances can result in loss of confidence from the public and is a reputational risk.

5.2. Community Implications

There are no community implications.

5.3. Risk Management

This project is consistent with the following community outcome of:

- There is a safe environment for all, and
- Core utility services are provided in a timely, sustainable, and affordable manner.

5.4. Health and Safety

Sampling is undertaken by trained staff working to a standard operating procedure.

6. CONTEXT

6.1. Policy

This matter is not a matter of significance in terms of the Council's Significance and Engagement Policy.

6.2. Legislation

This project is not covered by specific legislation.

6.3. Community Outcomes

This project is consistent with the following community outcome of:

- There is a safe environment for all, and
- Core utility services are provided in a timely, sustainable, and affordable manner.

6.4. Delegations

Not applicable.

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	IRU-17-15 / RDG-32-16 / 190827119584
REPORT TO:	Kaiapoi-Tuahiwi Community Board
DATE OF MEETING:	18 November 2019
FROM:	Kieran Straw – Civil Project Team Leader (PDU) Joanne McBride – Roading & Transportation Manager
SUBJECT:	Pines Beach Roundabout
SIGNED BY: **(for Reports to Council, Committees or Boards)**	Department Manager / Chief Executive

1. SUMMARY

1.1 The purpose of this report is to:

a. Provide the Kaiapoi Tuahiwi Community Board with an outline of concerns raised regarding the operation of the existing roundabout that was installed at the intersection of Featherstone Ave, Dunns Ave, and Beach Road in 2015.

b. Provide a background to the design followed for the existing roundabout.

c. Seek feedback from the Community Board as to whether staff should include further works to improve the operation of the roundabout within future years of the forward works programme.

1.2 The intersection at Beach Road / Dunns Ave, and Featherstone Ave was reconstructed in 2015 as part of the Infrastructure Recovery project following the Canterbury Earthquakes.

1.3 Since the intersection was reconstructed, the Council has received a number of complaints about the intersection as well as a petition from local residents.

1.4 A review of the intersection has been carried out to consider options for improvement.

Attachments:

i. Aerial Photograph showing the existing intersection layout, with tracking curve (TRIM 190828120365)
ii. Scheme Plan of remedial option to relocate the central island (TRIM 190828120367)
iii. Petition from local residents. (TRIM 190611082059)

2. RECOMMENDATION

THAT the Kaiapoi-Tuahiwi Committee Board:

(a) **Receives** report No. 190827119584;

AND

RECOMMENDS THAT the Utilities & Roading Committee:

(b) **Adopts** "Option One" which retains the existing intersection layout, with no further action required;

OR

Adopts "Option Two" which involves including remedial work at the roundabout to improve the intersection layout in a future programme of works;

(c) **Notes** that there is no funding currently available to undertake this project, and that staff would need to include this project in the future minor safety programme which will be brought to the Board in April 2020;

(d) **Notes** that Option Two has an estimated cost of $90,000.00

(e) **Circulates** this report to the Utilities and Roading Committee for their information.

3. BACKGROUND

3.1 Following the earthquakes of 2010 and 2011, the roading network of Pines Beach and Kairaki Beach suffered extensive damage. As part of the Infrastructure Recovery Programme, the intersection was reconstructed along with roading repairs being carried out in the wider Pines Beach area.

3.2 The intersection previously operated as a "T" junction, however to help improve safety at the intersection and reduce speeds, the intersection was upgraded to a roundabout.

3.3 Since the completion of the intersection reconstruction, Council has received ongoing complaints regarding the usability of the roundabout, particularly for larger vehicles, or those towing trailers.

3.4 The roundabout was designed to be fully mountable. This means that the intention was always that larger vehicles would need to partially drive over the mountable island while negotiating the roundabout to travel through to Featherstone Ave, from Beach Road.

3.5 The design brief called for the roundabout to support a low-speed 30km/hr speed environment. To achieve this, the designer has chosen to off-set the roundabout to the north. In doing so, the consequence of this is that it is harder for larger or towing vehicles to make the manoeuvre through the intersection. The off-set of the roundabout to the north has also resulted in severe deflection for Kairaki-bound traffic, while there is a very small amount of deflection for Kaiapoi-bound traffic coming from Featherstone Ave. The "deflection" is required to control entry speeds into a roundabout.

3.6 Due to the design, there is two separate issues:

a. The off-set of the roundabout has resulted in some drivers choosing to travel on the incorrect side of the roundabout to enter Featherstone Ave. Some drivers of larger vehicles go further and suggest that they cannot negotiate the roundabout island in its current location however staff have monitored the intersection and have witnessed large vehicles using the roundabout successfully.

b. Deflection is used to control vehicle speeds on entry to the intersection. The difference in deflection between entering the roundabout from the east versus the west results in a variation of speed that vehicles enter the intersection. Due to the lower deflection, vehicles entering the intersection from Featherstone Ave are not required to slow

down very much in order to negotiate the roundabout, whereas those entering from Beach Road have to slow significantly.

3.7 Observations carried out by staff on site indicate that approximately 40% of drivers travelling from Beach Road into Featherstone Avenue are electing to drive on the incorrect side of the roundabout. This is regardless of whether or not they are driving a larger vehicle, or a towing vehicle.

3.8 The design of the roundabout went through three independent safety audits. One at the Scheme Design stage, one at the Detailed Design stage, and one Post Construction.

The issue of the roundabout geometry was raised at the Scheme Design stage, with the following comment:

"The audit team notes that there is very little deflection at the proposed roundabout for traffic from Kairaki towards Kaiapoi. Conversely vehicles approaching the roundabout from Pines Beach or Kaiapoi will be required to slow considerably in order to negotiate the roundabout."

The audit team focused on the vehicle speeds entering the intersection, suggesting that the speed hump on the Kairaki approach should be shifted closer to the roundabout. There was no mention in the audit of larger vehicles turning curves.

During the Detailed Design safety audit the audit team made the following comment:

"There is minimal deflection at the roundabout for vehicles turning left from Dunns Avenue and Featherstone Avenue approaches. Both of these approaches have extensive visibility which could result in high entry speeds to the intersection, the major cause of roundabout crashes."

In response, the designer noted that "All entry arms have either close, or relatively close road humps for speed control".

As part of the Post Construction Safety Audit there was a recommendation included which suggested that consideration be given to realigning the intersection to address the deflection issue, however the decision was made that changes could not be justified on the basis of the cost outweighing the benefit given that the intersection was located in a low-speed environment.

3.9 It is noted that the intersection layout as it currently exists is not considered to be dangerous. The Post Construction safety audit rated the risk as "Minor" with accident frequency rated as "Occasional", and death or serious injury accidents as "Unlikely".

3.10 Reponses to complainants at the time included an assurance that Council would monitor the on-going performance of the intersection.

3.11 Although there have been no recorded crashes, driver behaviour continues to be poor.

3.12 A petition has been submitted to Council calling for the intersection design to change. This petition is included as attachment iii.

4. ISSUES AND OPTIONS

4.1. Staff have investigated several options including the following:

- Do nothing

- Remove the central island, and reinstate the intersection as Give-Way controlled intersection, with priority to Beach Road and Featherstone Ave traffic.
- Reconstruct the full intersection, including all approach kerb and channels, and reinstating the roundabout in the correct location.
- Remove the existing central roundabout island, and replace with a smaller central roundabout to reduce the deflection for vehicle entering the intersection from Beach Road.
- Remove the existing central roundabout island, and replace with a new central roundabout of the same size approximately 5m south of the current location. This option would also require pavement widening south of the roundabout, and an extension to the existing traffic splitter island on Dunns Ave, but would not require full intersection reconstruction.

4.2. The above options have been assessed by the Project Delivery Unit, and two options are considered viable. These options are discussed below:

4.2.1 Option One: Do Nothing

Accept the intersection in its current state.

With this option it is acknowledged that some drivers will continue to choose to drive on the incorrect side of the roundabout island. This may be due to the type of vehicle that is being driven (i.e. the vehicle being a large truck or bus).

Observations on site indicate that drivers do use their own lane when there is on-coming traffic. Non-compliance increased when there was no other traffic present. In the case where a driver is unable to negotiate the roundabout, the driver will wait at the give-way limit line until the on-coming lane is clear and then proceed. Therefore the issue is not considered to be a high crash-risk, rather one where the design does not promote good driver behaviour.

Discussions has been held with Police and they have indicated that drivers will not be ticketed when negotiating the roundabout provided that the driver has made a genuine effort to keep left while negotiating the roundabout. Therefore car drivers that currently choose to drive on the incorrect side of the roundabout island will continue to be ticketed.

4.2.2 Option Two: Remove the central roundabout island, and reinstate 5m south

This option retains as much of the intersection kerbing and alignment as possible, but relocates the central roundabout island 5m south of its current location. The intention with this option is to keep costs as low as possible, while ensuring that the final roundabout alignment is fully functional for all road users, and encourages correct driver behaviour.

Relocation of the central roundabout island will reduce the deflection required for drivers entering the intersection from Beach Road, and increase deflection for those entering the intersection from Featherstone Ave. This will help balance the approach speeds so that there is a consistent speed across all approach legs of the intersection, and would allow large and towing vehicles to more easily negotiate the roundabout.

The existing Dunns Avenue splitter island would need to be extended, and an additional splitter island installed on the Featherstone Avenue approach to help balance the intersection. Further road marking will help delineate the roundabout area as the existing kerb lines are retained for this option.

4.3. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. Groups and Organisations

The Kairaki Beach Motorcamp have expressed their concerns regarding the roundabout design back in 2015 following the completion of the roundabout. Many residents and customers of the camping ground tow trailers with boats or caravans. These people currently have issues negating the roundabout, and cause delays when needing to block the road.

5.2. **Wider Community**

Council have six recorded service requests regarding the design of the roundabout, excluding the petition that was supplied to Council staff in June 2019. There is no record of phone calls that have also been received since the roundabouts construction in 2015.

A petition was submitted to the Civil Project Team Leader by residents of Featherstone Ave in June 2019. This petition was conducted by way of a pole on social media. At the time of presenting the petition to Council, the pole had 237 votes, or which 92% were in agreement that the roundabout either needed to be removed, or fixed. It is not clear to what extent this pole was circulated on social media and who has responded.

This petition is included as attachment iii. of this report.

6. IMPLICATIONS AND RISKS

6.1. **Financial Implications**

6.2. There is no current funding available to carry out further works at this intersection. Should the Community Board choose Option Two then the work would be carried out under the Minor Safety Programme and would need to be put into a future works program.

6.3. The Scheme Design Estimate for Option Two is $90,000.

6.4. **Community Implications**

6.5. Local residents that use the intersection have lobbied to have the design of the roundabout changed since its completion.

6.6. **Risk Management**

6.7. Council responses to concerns raised to date have been a commitment to monitor the on-going performance of the intersection and make changes if necessary.

6.8. There is a small risk that changes made at the intersection may not address the driver behaviour issues and as such drivers may still “choose” to knowingly drive down the wrong side of the road. This risk is considered to be low.

6.9. **Health and Safety**

6.10. All construction contracts involve careful management of Health & Safety risks.

6.11. As part of any physical works contracts, the successful contractor will be required to submit a Health & Safety Plan for approval prior to contract commencement.

7. CONTEXT

7.1. **Policy**

This matter is not a matter of significance in terms of the Council’s Significance and Engagement Policy.

7.2. Legislation

The Land Transport act is relevant in this matter.

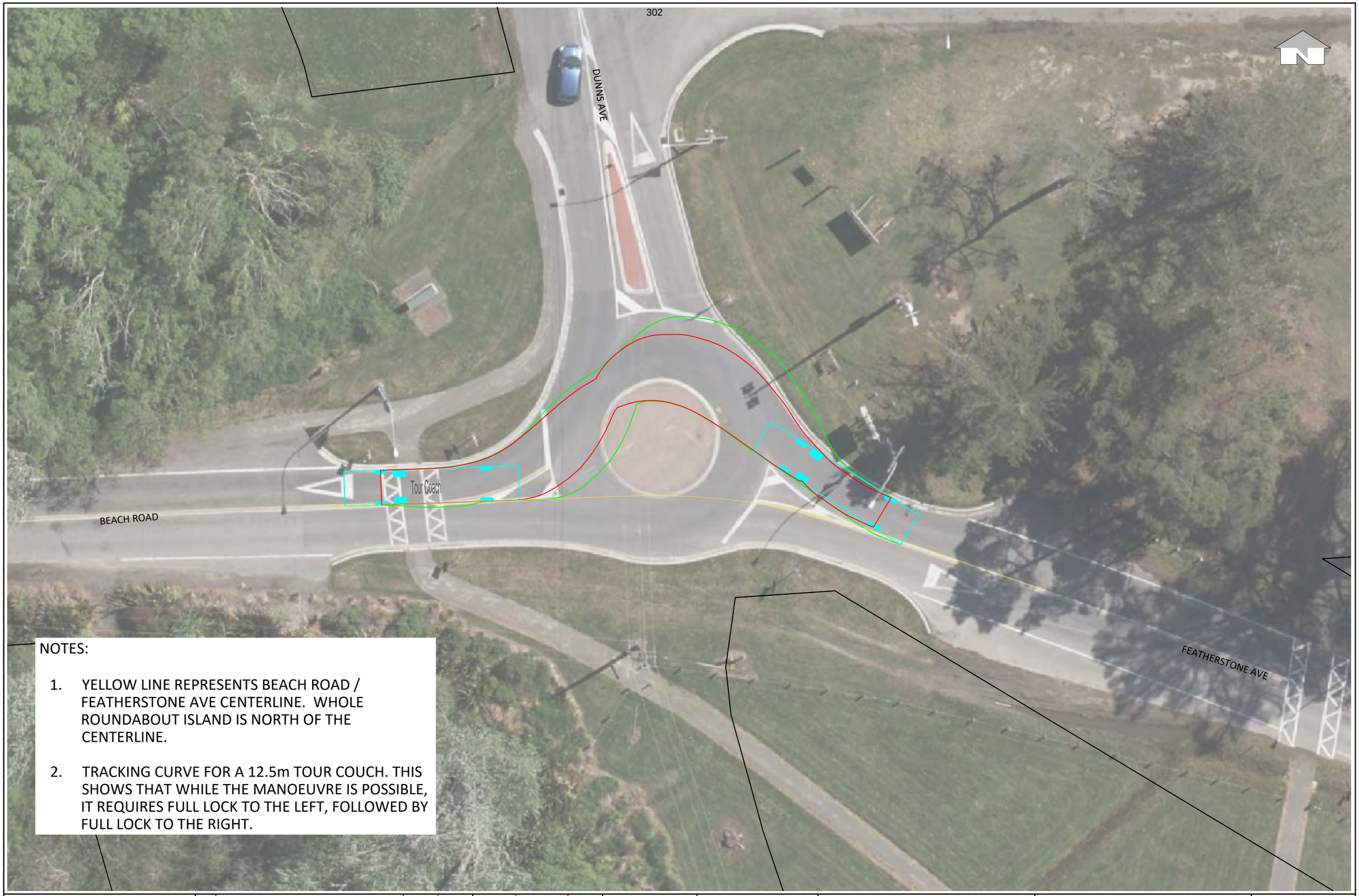
7.3. Community Outcomes

c. There is a safe environment for all

- Harm to people from natural and man-made hazards is minimised.
- Crime, injury and harm from road crashes, gambling, and alcohol abuse are minimised.

7.4. Delegations

The Community Board is responsible for acting as an advocate for the interests of its community and has delegated authority to approve traffic control and constraint measures on streets, and provide a recommendation to Council on this matter.



NOTES:

1. YELLOW LINE REPRESENTS BEACH ROAD / FEATHERSTONE AVE CENTERLINE. WHOLE ROUNDABOUT ISLAND IS NORTH OF THE CENTERLINE.

2. TRACKING CURVE FOR A 12.5m TOUR COUCH. THIS SHOWS THAT WHILE THE MANOEUVRE IS POSSIBLE, IT REQUIRES FULL LOCK TO THE LEFT, FOLLOWED BY FULL LOCK TO THE RIGHT.

WAIMAKARIRI DISTRICT COUNCIL

ISSUE	AMENDMENT	APPD.	DATE
A			

	NAME	DATE
SURVEYED	-	-
DESIGNED	-	-
DRAWN	-	-
CHECKED	-	-
RECOMMENDED	-	-

ORIGIN OF LEVELS: LYTTELTON 1937 MSL

ORIGIN OF COORDINATES: NZTM

SCALES 1:250 @A3

PLAN	-
DETAILS	-
LONG SECT hor.	-
LONG SECT vert.	-
REFERENCE	FB: - LB: -

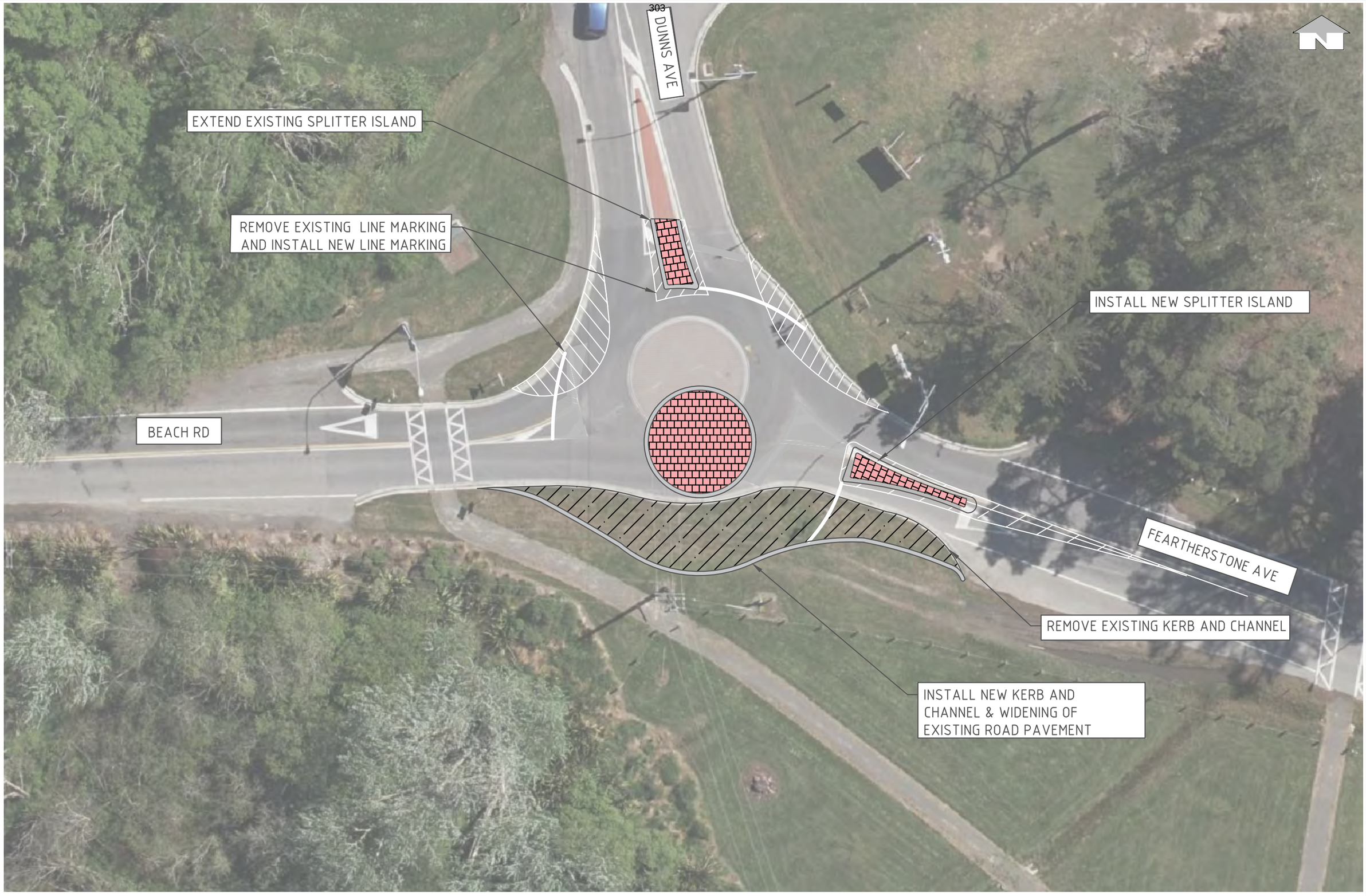
PROJECT TITLE: PINES BEACH ROUNDABOUT

SHEET TITLE: REPORT ATTACHMENT i

PROJECT No.	PD000353
FILE No.	RDG-32-16
SHEET No.	01
PLAN No.	4037
ISSUE	A B C D E F

A3

PLOT DATE: 28/08/2019 FILE: S:\PDU\PDU JOBS\PD000300-399\PD000353 - STRUCTURAL & CORRIDOR MAINTENANCE - PROFESSIONAL FEES\PINES BEACH ROUNADBOUT\OLD FILES\TRACKING CURVES PINES BEACH - COPY.DWG



WAIMAKARIRI DISTRICT COUNCIL

ISSUE	AMENDMENT	APPD.	DATE
A			

	NAME	DATE
SURVEYED		
DESIGNED	NR	29/08/19
DRAWN	NR	29/08/19
CHECKED	KS	29/08/19
RECOMMENDED		

ORIGIN OF LEVELS: LYTTELTON 1937 MSL

ORIGIN OF COORDINATES: NZTM

SCALES 1:250 @A3

PLAN	1:250
DETAILS	1:250
LONG SECT hor.	-
LONG SECT vert.	-
REFERENCE	FB: - LB: -

PROJECT TITLE: PINES BEACH ROUNDABOUT

SHEET TITLE: ROUNDABOUT RELOCATION AND ISLAND EXTENSION

PROJECT No.	PD000353
FILE No.	RDG-32-16
SHEET No.	02
PLAN No.	4037
ISSUE	(A) B C D E F

A3

PLOT DATE: 29/08/2019 FILE: S:\PDU\PDU JOBS\PD000300-399\PD000353 - STRUCTURAL & CORRIDOR MAINTENANCE - PROFESSIONAL FEES\PINES BEACH ROUNADBOUT\PINES BEACH ROUNDABOUT - RELOCATE ROUNDABOUT AND NEW KERB - VEHICLE TRACKING - CENTRED.DWG

Adam R B Reeve created a poll.
7 June at 17:11 ·

So, after 4 years or so the Police have started fining people for driving through to Kairaki Beach on the wrong side of this roundabout. It was criticized whilst still in the very early stages as being offset. That is, the centre is to one side so that people driving to Kairaki Beach have a lot further to go around the Roundabout than for those returning to Kaiapoi. Majority of Kairaki Beach traffic and all cars with trailers and all buses and trucks took the route marked blue in the photo because they couldn't safely get right around the Roundabout. And it's very high and poorly designed for driving over.

There is a motor camp at Kairaki Beach which sees a lot of larger traffic, and the Yacht Club and river also see lots of boat trailers.

I have an older bus which is totally impossible for me to get around the Roundabout the right way. So I will have to break the law to enter Kairaki Beach. My father also has a bus, and his is too low slung to mount the centre of the Roundabout and drive over. Trucks wanting to leave Pines Beach often have to drive to Kairaki Beach to turn around first. The school bus mounts the centre of the roundabout on one side... risking tossing the children about.

Do you think the current design is good or not? What do you think should be done for a safer entrance to Kairaki Beach? Please share your thoughts... I want to take this to the Waimakariri District Council because they refuse to take the locals seriously

https://youtu.be/7EYTwigaS4Y

8% The Roundabout is great

92% Remove or fix Roundabout

Undo Vote

237 Votes

You and 3 others

9 comments 12 shares

Like Comment Share

Adam R B Reeve

Simon Reeve
7 June at 18:30 ·

Can you all vote on this and share it on please, as it's important for everyone. Because until that roundabout is either fixed or removed, we, like a lot of other friends, neighbour's, locals and countrymen, we cannot get our big vehicles back into Kairaki Beach legally.
Even the local school bus, (which is quite high up off the road,) can't get around it without leaving some rubber off it's tires behind on the centre of the roundabout.
So our big bus (which is in that video trying to get around it,) is stuck at home until the local Council step forward and fix their mistake.
And we desperately want to go on holiday, but are afraid to take it out in case we are unable to get it home again legally.
Especially since there is now a Police picket watching the roundabout just about every day now!

Adam R B Reeve

Like · Reply · 2d

Adam R B Reeve

Like · Reply · 2d

Paul Diack Looks pretty shit really. Needs a decent dozer to shift the stupid blimmin thing

Like · Reply · 2d · 1

Mark Spencer The round about was a fukup from the design stage same as some of the roads in Kaiapoi with there very dangerous narrow sections
Cause you to turn in front of on coming traffic
And now the revenue collecting has started
And we'll Wat about the non Olympic size swimming pool
Well done the wdc ccc
The rebuild
Lol

Pool

Like · Reply · 2d · 1

Sue McIntosh Agreed. I do not go there anymore when I visit chch

Paul Diack Looks pretty shit really. Needs a decent dozer to shift the stupid blimmin thing

Like · Reply · 2d · 1

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And now the revenue collecting has started
And we'll Wat about the non Olympic size swimming pool
Well done the wdc ccc
The rebuild
Lol

Pool

Like · Reply · 2d · 1

Sue McIntosh Agreed. I do not go there anymore when I visit chch, it is too dangerous in my opinion and my 8m Camper van wouldnt fit either.

Like · Reply · 2d · 2

Lyn Brixton So many people just ignore it and drive wherever they want to even on the wrong side go figure

Like · Reply · 2d · 1

Michael Sturt I find a lot of junctions in new Zealand are "improved" only to make them worse. Spend thousands doing new junction to make it safer but then put a hump in the road, so visibility it worse than it was before the "improvement". Several junctions near me been done like that.

Like · Reply · 2d · 2

Anthony Joyce Where's the health and safety officer patrolling this ??

Like · Reply · 2d · 1

Robyn Ford What a waste of money for nothing but a big f..k up.

Like · Reply · 1d

Write a comment

20 – The Roundabout is great 217 - Remove or fix Roundabout

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	RDG-32-71 / 191118160249
REPORT TO:	Rangiora-Ashley Community Board
DATE OF MEETING:	11 December 2019
FROM:	Glenn Kempton, Project Engineer Joanne McBride, Roading & Transport Manager
SUBJECT:	Cone Street Improvement - Project Update and Requesting Support to Upgrade Cone Street Retaining Two-Way Traffic.
SIGNED BY: **(for Reports to Council or Committees)**	Department Manager / Chief Executive

1. SUMMARY

1.1. The purpose of this report is to update the Rangiora-Ashley Community Board on progress with the Cone Street improvements, the proposed layout option for the street and request support to proceed with the proposed layout.

1.2. Cone Street does not have a pedestrian linkage along its full length between High Street and Collins Street. As there is no footpath south of 9 Cone Street pedestrians will be required to use the carriageway. This has been identified as a safety risk in the area.

1.3. A new footpath was installed from High Street past the entrance of the new development at no. 9 Cone Street. This work was completed October 2019.

1.4. Options for the street were first workshopped with the Community Board in February 2019. At the workshop staff presented four layout options for discussion. The Board asked that staff carry out additional investigation to confirm the impacts of Option Four (One Way).

1.5. Consultation with affected businesses and property owners has been carried out in three phases which included an initial information notice seeking feedback on the proposed options, a workshop held on the 18 September 2019 to talk through initial options and a second follow up workshop held on the 13 November 2019 to seek feedback on a further developed option.

1.6. The workshops have been well attended and have shown a clear preference from business and property owners to retain two way traffic along Cone Street, and there was general acceptance with parking at the northern end of the street being removed to accommodate the preferred layout.

1.7. Eight carparks will need to be removed along Cone Street (between High Street and Collins Street) to allow for the installation of a new footpath and to maintain two way traffic.

Attachments:

i. Proposed Two Way Layout for Cone Street (Trim No. 191118160433)

ii Complete Report to Rangiora-Ashley Community Board requesting support to upgrade Cone Street including a northbound one-way system with attachments (Trim No. 190731106893[v2])

2. RECOMMENDATION

THAT the Rangiora-Ashley Community Board:

(a) **Receives** report Nº 191118160249;

(b) **Notes** that the installation of the footpath on Cone Street from High Street to the new development at No. 9 Cone Street has been completed. All further construction works will continue from the development at No. 9 Cone Street towards Collins Street once the development has been completed;

(c) **Notes** that eight carparks will need to be removed along Cone Street between High Street and Collins Street to allow for the installation of a new footpath and to maintain two way traffic;

(d) **Notes** that consultation and workshops have been carried out with stakeholders from the area to ensure key issues have been identified and addressed.

And:

RECOMMENDS that the Utilities and Roading Committee:

(e) **Approves** the proposed scheme design which retains two-way traffic in Cone Street noted as option (a).

(f) **Approves** the removal of eight carparks along Cone Street (between High Street and Collins Street) to allow adequate room for a footpath and two lanes of traffic;

(g) **Notes** that four of the eight carpark spaces should, according to our Code of Practice, be marked as no-stopping within the current road layout due to either the existing road width, or proximity to the intersection of High Street.

(h) **Notes** that the proposed scheme design, including the removal of eight carparks, is the preferred option of the stakeholders.

(i) **Notes** that physical works are likely to be carried out within the 2020/2021 financial year

3. BACKGROUND

3.1. There is currently no continuous footpath linkage on Cone Street, between High Street and Collins Street.

3.2. Stage one of the Cone Street Improvement project saw the construction of a footpath being undertaken between High Street and the southern boundary of 9 Cone Street.

3.3. As there is no footpath south of 9 Cone Street pedestrians will be required to use the carriageway. This has been identified as a safety risk in the area.

3.4. Cone Street is primarily a commercial area with commercial vehicles servicing businesses frequently. Future and planned developments within the area are likely to increase pedestrian and vehicle numbers.

3.5. Cone Street has a narrow road reserve which varies from 9.5m at the northern end to 13m at the southern end. This does not allow adequate space for two lanes of traffic, a footpath and on street parking for its entirety.

3.6. Four possible layout options were identified during the investigation process. These were presented to the Community Board for discussion during a workshop in February 2019. These options were as follows:

a. Two way, 7 formalised car parks with no property purchase and 1.5m footpath

b. Two way, no formalised carparks with no property purchase and 2.0m footpath

c. Two way, 8 formalised carparks with property purchase and 1.5 - 2.0m footpath

d. One way option northbound, 22 formalised carparks and 1.5 – 2.0m footpath.

3.7. The Board asked that staff carry out additional work to further consider the effects of a one-way system (option d as noted above).

3.8. Abley Consultants were engaged to carry out modelling work and provide further advice on options and the effectiveness of a one-way system.

3.9. Public consultation and workshops were held with the immediate stakeholders and property owners. This included a “Let’s Talk” information notice being prepared and hand delivered or posted to all properties within the immediate area and two subsequent workshops.

3.10. The options were presented to a total of 40 business and residential properties, including properties that fronted onto High Street.

3.11. Following the initial consultation, option (c) was ruled out due to land purchase requirements. The cost associated with this option also outweighed the benefits.

3.12. The feedback from the initial consultation process was mixed and did not provide Council staff with a clear guidance on a preferred option. Due to the mixed feedback, two follow up workshops with stakeholders from the area were held in order to further discuss the options and ensure key issues were identified and addressed.

3.13. The first workshop was held on 18 September 2019. Staff presented options a, b and d noted in Section 3.5. Feedback from this workshop was very constructive with the stakeholders showing a clear preference for staff to further develop option (a).

3.14. The second workshop was held on 13 November 2019. Staff presented a revised design of option a, which addressed the key concerns which were raised at the first workshop. The feedback from this workshop was positive with no suggested alterations. The updated option (a) proposed layout is included as attachment (i) of this report.

3.15. Other issues / concerns raised by business / property owners included;

- Vehicles parking in Cone Street and Collins Street all day limit customer turnover and resident parking.
- Reducing speed as currently Collins Street and Cone Street are used as a way to avoid the High Street traffic signals.
- The intersection of Collins Street and Ivory Street can already be difficult to negotiate.

4. ISSUES AND OPTIONS

4.1. Option One: Retain Status Quo

This option would defer all further work along Cone Street.

This option is not recommended due to the safety risk that already exists due to the lack of footpath.

This option is therefore not recommended.

4.2. Option Two: Construct Option B – Two Way Traffic with No On-street Parking.

Proceed with removal of all existing on street parking, retain two way traffic flow and construct a 2.0m wide footpath from no. 9 Cone Street to Collins Street.

This option has an estimated cost of $140,000 excluding GST.

Feedback from stakeholders were not in favour of this option as it removed all parking along the street and parking is of high demand in some areas. Further options can be implemented in order to maintain on street parking and provide two way traffic flow.

This option is therefore not recommended.

4.3. Option Three: Construct Option D – One Way Northbound with 22 Formalised On-street Carparks.

Proceed with the construction of a one way system with traffic flow northbound and a 1.5-2.0 wide footpath from the entrance at no. 9 Cone Street to Collins Street.

This option has an estimated cost of $200,000 excluding GST. The estimated cost for option d is slightly higher than the two way option due to the construction of a cul-de-sac head at the Collins Street / Cones Street intersection to provide turning space for vehicles.

Feedback from stakeholders were not in favour of this option and believed it would cause logistical issues for clients and customers.

This option is therefore not recommended.

4.4. Option Four – Construct Option A – Two Way Traffic with 7 Formalised On-street Carparks

Proceed with removal of eight carparks, retain two way traffic movements and a construct a 1.5m wide footpath from no. 9 Cone Street to Collins Street.

This option has an estimated cost of $140,000 excluding GST.

Feedback from stakeholders was strongly in favour of this option as it provided both two way traffic and on-street carparks for clients and customers, however the footpath width is less than desirable for a town centre. It is expected that the alternative footpath on High Street and Ivory Street are wide and will provide primary access.

To maintain two way traffic and allow the footpath to be installed, eight car parks will need to be removed along Cone Street between High Street and Collins Street.

This is the recommended option.

4.5. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. Groups and Organisations

5.2. As detailed under the “Background” section, staff have carried out three rounds of consultation with the stakeholders in the immediate area including affected businesses,

residents and property owners. This consisted of visits by staff, delivery of the information notice and two subsequent workshops.

5.3. **Wider Community**

5.4. No specific consultation has been carried out with the wider community, and it is not considered necessary to do so.

6. IMPLICATIONS AND RISK

6.1. **Financial Implications**

6.2. Stage one of the Cone Street Improvements consisted of installation of a footpath and kerb & channel from High Street to south of the entrance to no. 9 Cone Street. This was funded from the Subdivision Contribution budget and had a budget of $45,000.

6.3. As part of the development at no. 39 High Street and no. 9 Cone Street, a financial contribution of $17,745.00 excluding GST has been taken towards the upgrade of the Cone Street frontage (full length of the new development).

6.4. As the timing of the next stage of development is not yet known, it is recommended that the physical works be held and carried out in conjunction with the development. It is anticipated that this would be in the 2020/21 year.

6.5. The physical works are estimated to cost $140,000 and would be funded from the Council performed works budget which has an allocation of $524,938 in the 2020/21 year. This budget is for work associated with development.

6.6. **Community Implications**

6.7. This project will be of significant interest to the community being within the town centre.

6.8. This project will have positive implications to the community, it will provide safe pedestrian linkages between High Street, Collins Street and Cone Street.

6.9. **Risk Management**

6.10. There is risk of new development being completed prior to the construction of the works which may cause finished level issues or damage to newly constructed infrastructure.

6.11. This risk can be mitigated by ensuring communication with the developers is clear and concise and the work is completed within the same timeframe as the new development.

6.12. **Health and Safety**

6.13. Standard construction Health and Safety risks are associated with the project.

6.14. These risks will be mitigated by carrying out a Safety in Design review, requiring contractor prequalification, carrying out a Health and Safety assessment at tender approval time and requiring the implementation of a Site Specific Safety Plan.

7. CONTEXT

7.1. **Policy**

This is not a matter of significance in terms of the Council's Significance Policy.

7.2. **Legislation**

There is no relevant legislation in this matter.

7.3. **Community Outcomes.**

The following community outcomes are relevant in this matter:

- There is a safe environment for all;
- Public spaces and facilities are plentiful, accessible and high quality.
- Transport is accessible, convenient, reliable and sustainable
- Businesses in the District are diverse, adaptable and growing.

7.4. **Delegations**

7.4.1. The Board, under delegation S-DM 1041, has specific jurisdiction for:

"To advise the Council and Standing Committees on local implications of such policies, projects and plans, which have district-wide impacts and are referred to the Board for comment."

REV	REVISION DETAILS	DRN	CHK	APP	DATE
A	FIRST ISSUE	GK			

SURVEYED	GK	11/04/2019	PROJECT No	PD001307
DRAWN	GK	25/08/2019	CON No	CON2019xx
DRAWING CHKD	KS		SCALE (A3)	1:750
DESIGNED	GK	23/09/2019		
DESIGNED CHKD	KS		DATE ISSUED	25/08/2019
APPROVED				

WAIMAKARIRI DISTRICT COUNCIL

PROJECT

CONE STREET IMPROVEMENTS

SHEET TITLE

OVERVIEW

FOR CONSTRUCTION

DRAWING	
	3884
SHEET	REVISION
01	A

REV	REVISION DETAILS	DRN	CHK	APP	DATE

SURVEYED	GK	11/04/2019	PROJECT No	PD001307
DRAWN	GK	05/07/2018	CON No	CON2018--
DRAWING CHKD	KS	--/--/2018	SCALE (A3)	1:350
DESIGNED	GK	--/--/2018		
DESIGNED CHKD	KS	--/--/2018	DATE ISSUED	05/07/2019
APPROVED	JM	--/--/2018		

WAIMAKARIRI DISTRICT COUNCIL

PROJECT

CONE STREET UPGRADE

SHEET TITLE

OVERVIEW

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWING 3884

SHEET	REVISION
02	01

REV	REVISION DETAILS	DRN	CHK	APP	DATE

SURVEYED	GK	11/04/2019	PROJECT No	PD001307
DRAWN	GK	05/07/2018	CON No	CON2018--
DRAWING CHKD	KS	--/--/2018	SCALE (A3)	1:350
DESIGNED	GK	--/--/2018		
DESIGNED CHKD	KS	--/--/2018	DATE ISSUED	05/07/2019
APPROVED	JM	--/--/2018		

WAIMAKARIRI DISTRICT COUNCIL

PROJECT

CONE STREET UPGRADE

SHEET TITLE

OVERVIEW

PRELIMINARY

NOT FOR CONSTRUCTION

DRAWING 3884

SHEET 03

REVISION 01

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	RDG-32-71 / 190731106893
REPORT TO:	Rangiora-Ashley Community Board
DATE OF MEETING:	13 August 2019
FROM:	Glenn Kempton, Project Engineer Joanne McBride, Roading & Transport Manager
SUBJECT:	Cone Street Project Update
SIGNED BY: **(for Reports to Council or Committees)**	Department Manager / Chief Executive

1. SUMMARY

1.1. The purpose of this report is to update the Rangiora-Ashley Community Board on progress with the Cone Street Upgrade and layout options for the street.

1.2. Cone Street currently has no footpath which requires pedestrians to use the carriageway and there is informal parking along the street. This has been identified as a growing safety risk and this will increase as further development occurs in the area.

1.3. A workshop was held with the Community Board on 13 February 2019. At the workshop staff presented four options for discussion as follows:

- Option One – On-street Parking western side only
- Option Two – No On-street Parking
- Option Three – On-street Parking with property Purchase
- Option Four – One Way retaining all parking

1.4. The Board asked that staff carry out additional investigation to confirm the impacts of Option four (One Way).

1.5. The first stage of public consultation has been carried out with immediately adjacent businesses and property owners. Feedback from this process has been mixed.

1.6. Abley Consultants were engaged to determine the feasibility of changing Cone Street to a one-way street. The option they recommended was to reconfigure Cone Street to a northbound one-way system with Collins Street remaining as two-way with a Cul-de-sac turning head at the end. A footpath is required along the western side of Cones Street to south of the entrance to the development at no. 9 Cone Street irrespective of the final layout of the street. Work to install this path will be carried out in conjunction with the development.

1.7. To allow the footpath to be installed five car parks will need to be removed along the western side of Cone Street between High Street and the entrance to the new development. Two carparks will also need to be removed opposite the new development entrance to allow for vehicle manoeuvring in and out of the entrance.

1.8. It is proposed that the next step would be to hold workshop(s) with stakeholders from the area to allow an opportunity to talk through any issues / concerns which they may have and to be able to further progress the options.

Attachments:

i. Proposed Layout (Trim No. 190806109525)

ii. Traffic Flow Options Assessment (Trim No. 190404049892)

iii. Cone Street – Consultation "Let's Talk" Information Notice (Trim No. 190415055960)

iv. Cone Street Upgrade – Summary of Submission Responses (Trim No. 190806109563)

2. RECOMMENDATION

THAT the Rangiora-Ashley Community Board:

(a) **Receives** report N^{o} 190731106893,

(b) **Notes** that the installation of the footpath on Cone Street from High Street the new development at No. 9 Cone Street is required irrespective of the preferred layout and that work will proceed on the installation of this path;

(c) **Notes** that five carparks will need to be removed on the western side of Cone Street between High Street and the new development to allow for the installation of a new footpath and two on the eastern side of the road opposite the new development entrance to allow for manoeuvring;

(d) **Notes** that further workshop(s) and consultation will be carried out with stakeholders from the area to ensure key issues are identified and addressed before the options are further progressed;

(e) **Notes** that further information will be brought to the Board for consideration;

And:

RECOMMENDS that the Utilities and Roading Committee:

(f) **Approves** the removal of five carparks on the western side of Cone Street between High Street and the new development to allow for the installation of a new footpath and two on the eastern side of the road opposite the new development entrance to allow for manoeuvring;

(g) **Notes** that four of these spaces should, according to our Code of Practice, be marked as no-stopping within the current road layout due to either the existing road width, or proximity to the intersection of High Street.

3. BACKGROUND

3.1. There is currently no footpath in Cone Street and as such pedestrians who walk down Cone Street use the existing carriageway and property frontages while trying to access the various commercial and residential properties. As there is no separation between vehicles and pedestrians this raises safety concerns in a busy town centre location.

3.2. Cone Street is primarily a commercial area with commercial vehicles servicing businesses frequently.

3.3. Future and planned developments within the area will increase pedestrian and vehicle numbers within this area.

3.4. Cone Street has a narrow road reserve which varies from 9.5m at the northern end to 13m at the southern end. This does not allow adequate space for two lanes of traffic, a footpath and on street parking.

3.5. Irrespective of the future configuration of Cone Street, a footpath is required along the western side from High Street to south of the entrance at the development of no. 9 Cone Street. Work to install this path needs to be carried out in conjunction with the development.

3.6. To allow the footpath to be installed five car parks will need to be removed along the western side of Cone Street between High Street and the entrance to the new development.

4. ISSUES AND OPTIONS

4.1. A number of layout options have been identified during the investigation process. These were presented to the Community Board for discussion during a workshop in February 2019.

4.2. The Board asked that staff carry out some additional work to further consider the effects of a one-way system. Abley Consultants were engaged to carry out modelling work and provide further advice on the effectiveness of a one-way system.

4.3. The options that Abley's considered are detailed in the table below.

Option	Advantages	Disadvantages	Recommendation
Option 1 Two Way (No change to traffic flow but requires removal of on street parking).	• Footpath is not located next to parking therefore pedestrians are protected from opening car doors. • Traffic Movement remains as is.	• Removal of on street parking to make way for the footpath may not be accepted by adjacent businesses. • Rat-running continues.	Not recommended
Option 2 One way Northbound including Collins Street	• Avoids right turn que clashes at High Street intersection although right turn into Cone St is low. • Allows vehicles parked on west side to exit passenger side of car. • Cone St/Collins St approaches will be narrower at the intersections, which shortens pedestrian crossing distance & removes pedestrian/vehicle conflict points. • Retain all on street parking • Reduces left turning conflict with through cyclists.	• Traffic flow adjustments (potential increase in traffic on Collins St as motorists will not be able to enter and exit Cone St). • Less network permeability for cyclists, southbound cyclist would need to go through Ivory St/High St signalised intersection or ride on footpath. • Traffic calming required because the traffic lane would be too wide for one-way.	Recommended over option 1 and 3 however a hybrid option detailed below should be strongly considered.

Option 3 One-way Southbound	• Retains all on street parking • Narrows intersection as above	• Traffic flow adjustments (potential increase in traffic on Collins St as motorists will not be able to enter and exit Cone St). • Less network permeability for cyclists, southbound cyclist would need to go through Ivory St/High St signalised intersection or ride on footpath • Rat running continues	Not recommended
Option 4 Cone Street one-way northbound and Collins Street two-way.	• Reduces impacts on residential properties. • Avoids need for traffic calming on Collins Street. • The Cone St/Collins St interface could be designed as such it appears as a cul-de-sac in both directions which will deter any rat running traffic.	• The treatment at Collins St/Cone St interface would need to be suitably designed. • Potentially higher cost than other options	**This hybrid option with northbound traffic on Cone Street is our recommendation. This option will facilitate the desired outcomes whilst minimising traffic impacts**.

4.4. The first stage of public consultation has been carried out with immediately adjacent businesses and property owners. This included a “Let’s Talk” information notice being prepared and hand delivered or posted to all properties within the immediate area.

4.5. A total of 40 business and residential properties were consulted including properties that fronted onto High Street.

4.6. A number of the businesses and residents did not have a preferred option however were happy to see some safety improvements being made to their street.

4.7. Feedback from the face to face consultation was generally that the one way system would be beneficial however concerns were raised by one business stating that two way traffic was vital.

4.8. Some of the business owners and residents raised concerns for consideration. These included;

- Vehicles parking in Cone Street and Collins Street all day limit customer turnover and resident parking.
- Reducing the speed limit as currently Collins Street and Cone Street is currently used as a way to avoid the High Street traffic lights with some high speeds being witnessed.
- The intersection of Collins Street and Ivory Street can already be difficult to negotiate without the added turning traffic volume.

4.9. As the feedback from the consultation process was mixed it is considered appropriate to hold follow up workshop(s) with stakeholders from the area to further discuss the options and to ensure key issues are identified and addressed before the options are further progressed.

5. COMMUNITY VIEWS

5.1. Groups and Organisations

5.2. As detailed under the “Issues and Options” section, staff have carried out consultation with the stakeholders in the immediate area including affected businesses, residents and property owners. This consisted of visits by staff and delivery of the information notice.

5.3. Wider Community

5.4. No specific consultation has been carried out with the wider community.

6. IMPLICATIONS AND RISK

6.1. Financial Implications

6.2. Funding of $45,000 has been allowed for from the Subdivision Contribution Budget for the section of kerb & footpath from High Street to the new development at No. 9 Cone Street.

6.3. Development contributions have also been take as part of the resource consent process for the new development at No. 9 Cone Street.

6.4. Community Implications

6.5. This project will be of significant interest to the community being within the town centre.

6.6. This project will have positive implications to the community, it will ultimately provide safe pedestrian links between High Street, Collins Street and Cone Street.

6.7. Risk Management

6.8. There is a risk that the community may not support a particular option. This risk can be mitigated by working closely with the community and with affected businesses to identify key areas of concern and resolve any potential issues early in the process.

6.9. There is risk of new development being completed prior to the construction of the works which may cause finished level issues or damage to newly constructed surfaces. This risk can be mitigated by ensuring communication with the developers is clear and concise and the work is completed within the same timeframe as the new development.

6.10. Health and Safety

6.11. Standard construction Health and Safety risks are associated with the project. These risks will be mitigated by carrying out a Safety in Design review, requiring contractor prequalification, carrying out a Health and Safety assessment at tender approval time and requiring the implementation of a Site Specific Safety Plan.

7. CONTEXT

7.1. Policy

This is not a matter of significance in terms of the Council’s Significance Policy.

7.2. Legislation

There is no relevant legislation in this matter.

7.3. **Community Outcomes.**

The following community outcomes are relevant in this matter:

- There is a safe environment for all;
- Public spaces and facilities are plentiful, accessible and high quality.
- Transport is accessible, convenient, reliable and sustainable
- Businesses in the District are diverse, adaptable and growing.

7.4. **Delegations**

7.4.1. The Board, under delegation S-DM 1041, has specific jurisdiction for:

"To advise the Council and Standing Committees on local implications of such policies, projects and plans, which have district-wide impacts and are referred to the Board for comment."

REV	REVISION DETAILS	DRN	CHK	APP	DATE
A	FIRST ISSUE	GK			5.7.19

SURVEYED	GK	11/04/2019	PROJECT No	PD001307
DRAWN	GK	05/07/2018	CON No	CON2018--
DRAWING CHKD	KS	--/--/2018	SCALE (A3)	1:750
DESIGNED	GK	--/--/2018		
DESIGNED CHKD	KS	--/--/2018	DATE ISSUED	05/07/2019
APPROVED	JM	--/--/2018		

WAIMAKARIRI DISTRICT COUNCIL

PROJECT

CONE STREET UPGRADE

SHEET TITLE

OVERVIEW

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWING 3884

SHEET 01

REVISION 01

Insightful solutions. Empowering advice.

Cone Street/ Collins Street Traffic Flow Options

Prepared for:	Waimakariri District Council
Job Number:	WMKDC-J077
Revision:	A
Issue Date:	3 April 2019
Prepared by:	Wendy Wee, Senior Transportation Engineer
	Jay Baththana, Senior Transportation Engineer
Reviewed by:	Jeanette Ward, Technical Director

1. Introduction

Waimakariri District Council (WMK) commissioned Abley Limited to investigate opportunities to convert Cone Street and Collin Street, Rangiora into a one-way street. The changes are driven by the need to provide a footpath on Cone Street whilst potentially maintaining on-street parking.

The Rangiora Paramics Microsimulation model has been utilised to assess the likely network effects of Cone Street options. This technical note summarises the traffic modelling component of the study and outlines the pros and cons of each of the following options;

- Cone Street/ Collin Street being two-way (existing)
- Cone Street/ Collin Street one-way for northbound traffic
- Cone Street/ Collin Street one-way for southbound traffic

The alignment of Cone Street/ Collin Street is shown in **Figure 1.1**.

Figure 1.1 Cone Street/ Collin Street Alignment

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E admin@abley.com

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Level 8, 57 Fort Street
PO Box 911336
Auckland 1142
New Zealand

Christchurch
Level 1, 137 Victoria Street
PO Box 25350
Christchurch 8144
New Zealand

www.abley.com

2. Data collection

Abley undertook traffic turning movement surveys on Thursday,14 March 2019 for the morning and evening peak periods (7am to 9am and 4pm to 6pm) at the following intersections:

- High Street/ Cone Street
- High Street/ Albert Street
- Ivory Street/ Collins Street

The surveys shows that the morning peak hour is 8am to 9am and the evening peak hour is between 4:15pm and 5:15pm. The turning movements at the Ivory/ High/ Ashley signalised intersection were obtained from SCATS data on the same survey day. The morning and evening peak hour turning movements at the intersections are shown in **Figure 2.1** and **Figure 2.2** respectively. The SCATS data is recorded in 30 minute intervals and the turning volumes at the Ivory/ High/ Ashley signalised intersection peaked at 4:30pm to 5:30pm as shown in **Figure 2.2**.

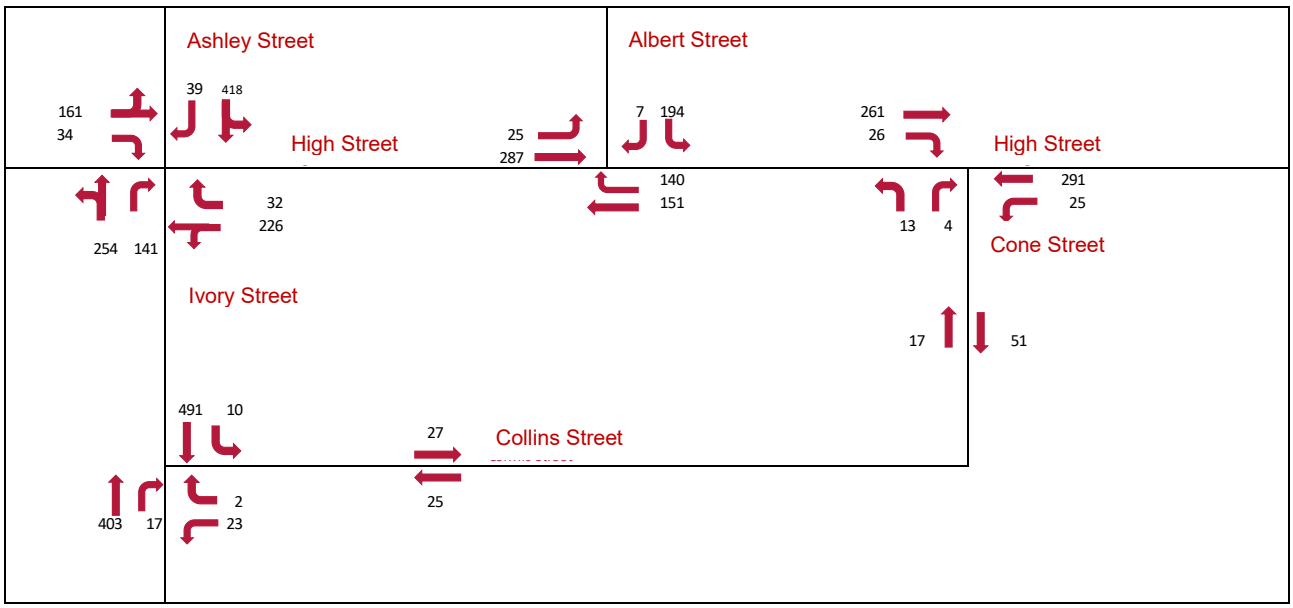

Figure 2.1 Existing morning peak hour traffic volumes (8am - 9am)

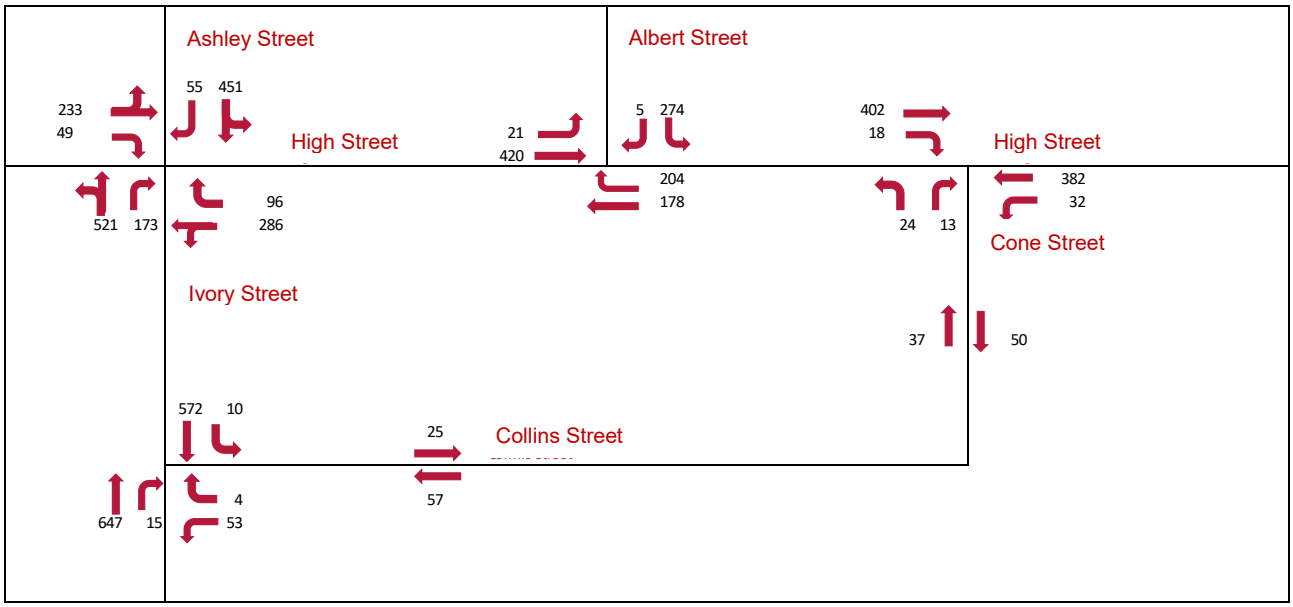

Figure 2.2 Existing evening peak hour traffic volumes (4:15pm - 5:15pm)

Figure 2.1 and **Figure 2.2** show that the road network is busier in the evening peak hour when compared to the morning peak hour. The morning peak hour two-way traffic volume on Cone Street and Collins Street is between 52 vehicles per hour (vph) and 68vph and increases to between 82vph and 87vph during the evening peak hour.

Number plates of southbound vehicles on Cone Street and westbound vehicles on Collins Street were recorded to assess the quantity of through traffic ("rat-running") between High Street and Ivory Street. The results show that there were 20 vehicles travelling through Cone Street and Collins Street to avoid the Ivory/High signals during the morning peak period (7am-9am) and 15 of these occurred during the morning peak hour of 8am-9am. The number of through vehicles doubled in the evening peak period (4pm-6pm) to 40 vehicles and 23 of these occurred during the evening peak hour of 4:15pm-5.15pm.

3. Model Calibration

Tthe traffic count locations with modelled flows in the 2017 Rangiora Paramics model and the difference from the observed count for the morning and evening peak hours are included in **Figure 3.1** and **Figure 3.2** respectively.

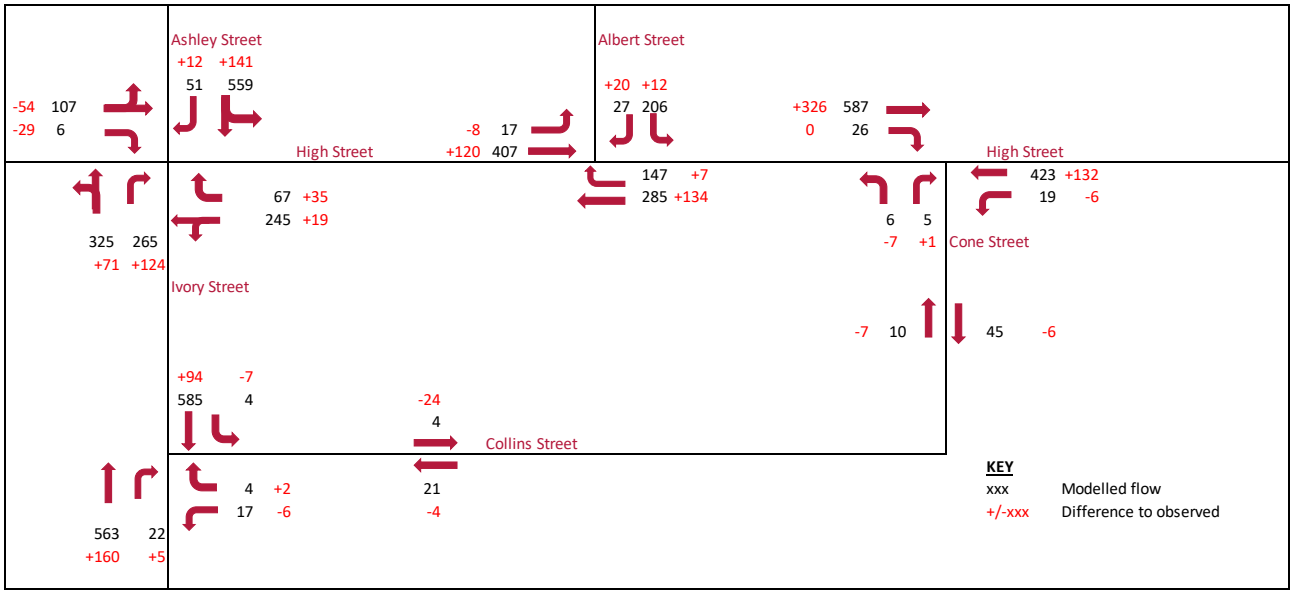

Figure 3.1 Paramics model validation - AM peak hour (8am-9am)

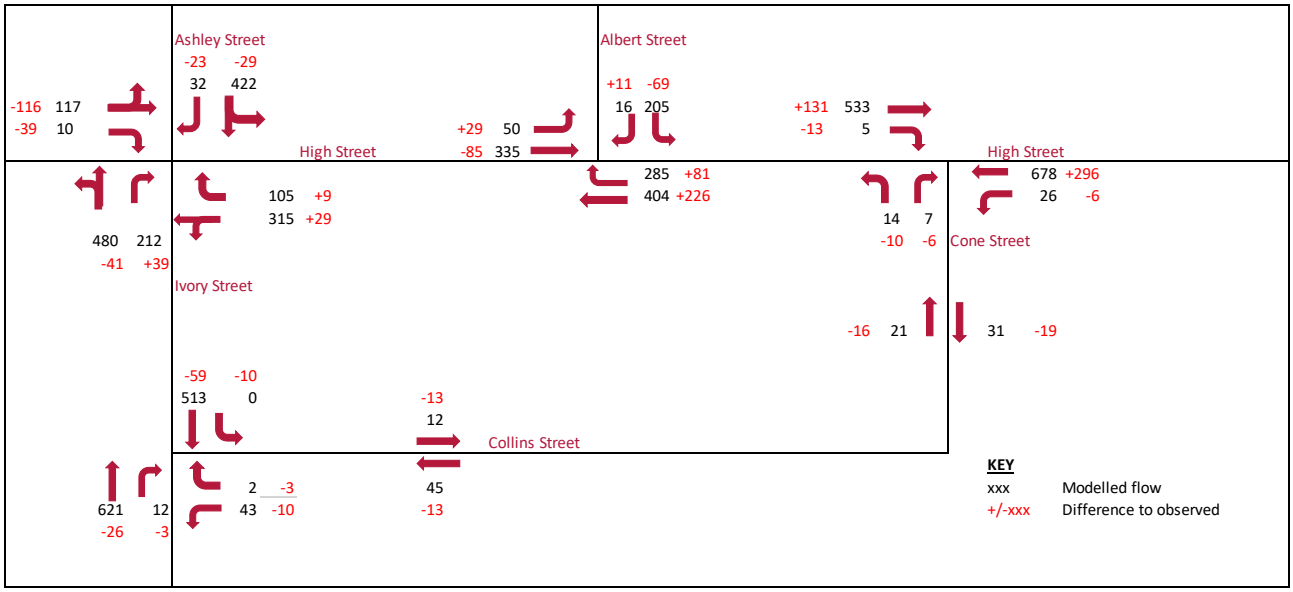

Figure 3.2 Paramics model validation - PM peak hour (4:15pm-5:15pm)

Figure 3.1 and Figure 3.2 show that the Paramics model generally validates well with the surveyed or observed traffic counts except for the through volumes on High Street at its intersection with Cone Street and Albert Street. The Paramics model is showing higher through volumes on High Street at the High Street/Albert Street and High Street/Cone Street intersections, however it is noted that the volumes on High Street (east of Ashley Street) validate well with the SCATS flows. As such there is some discrepancy between the SCATS and turning movement surveys on this corridor.

In light of the inconsistent survey data, no adjustments were made to the Rangiora Paramics model as part of the model calibration as it is considered that the model with higher volumes on High Street was suitable for providing a conservative assessment of the effects of the Cone Street/ Collins Street options.

4. Option testing

The Paramics base year (2017) model has been run for the morning and evening peak periods for the following three options:

1) Retain Cone Street and Collins Street as a two-way corridor (existing situation)
2) Cone Street and Collins Street one-way for northbound traffic
3) Cone Street and Collins Street one-way for southbound traffic

The modelling assessment has been based on the average of three consecutive model runs.

4.1 Comparison of modelling results

Modelled flows

The modelled flows on Cone Street and Collins Street under each option are as follows in the morning peak hour:

- Option 1 (existing) model has 56 vehicles (two way) on Cone Street and 47 vehicles (two way) on Collins Street
- Option 2 (northbound) model has 22 and 62 vehicles on Cone Street and Collins Street respectively
- Option 3 (southbound) model has 88 and 19 vehicles on Cone Street and Collins Street respectively

The modelled flows on Cone Street and Collins Street under each option are as follows in the evening peak hour:

- Option 1 (existing) model has 52 vehicles (two way) on Cone Street and 57 vehicles (two way) on Collins Street
- Option 2 (northbound) model has 55 and 20 vehicles on Cone Street and Collins Street respectively
- Option 3 (southbound) model has 30 and 58 vehicles on Cone Street and Collins Street respectively

The total change in vehicles flows on the network are very small approximately one vehicle per minute travelling along the Cone Street and Collins Street corridor.

Key intersection performance

A general description of level of service is shown in **Table 4.1**.

Table 4.1 Level of Service (LOS) general descriptions (Higway Capacity Manual 2000 Chapter 10)

Level of Service Band	General Traffic Flow Description
LOS A	Primarily free-flow operation
LOS B	Reasonably unimpeded operation
LOS C	Stable operation
LOS D	A less stable condition in which small increases in flow may cause substantial increases in delay and decreases in travel speed
LOS E	Characterised by unstable operation and significant delay
LOS F	Characterised by flow at extremely low speed. Congestion is likely occurring at the boundary intersections, as indicated by high delay

A comparison of intersection performance for the three modelling scenarios is shown in Attachment A, **Table 1** to **Table 4** for the morning peak hour and in Attachment A, **Table 5** to **Table 8** for the evening peak hour. Key points from the comparisons include:

- All intersections currently operate satisfactorily, during the morning and evening peak hours, with overall intersection performance operating at LOS C or better.

- The overall intersection performance (average delay and LOS) for all intersections remain similar or the same as the existing for both Option 2 and 3.
- The overall intersection traffic volume at the Ivory/High/Ashley signalised intersection is expected to increase by 40vph to 80vph during the peak hours in Option 2 and 3. The overall intersection traffic volume at the other three priority intersections is expected to remain similar to the existing with differences within 45vph.

Overall, converting Cone Street and Collins Street to a one-way street has minimal impact on intersection performance. This is predominantly due to the relatively low traffic volume on Cone Street and Collins Street that would be affected as a result of converting the two-way streets to one-way streets.

Queue observations

Modelled vehicle queues were observed to identify any operational issues such as queue propagation on intersection approaches affecting capacity and queue discharge at nearby intersections. Key observations are as follows:

- There are no queues on Cone Street and Collins Street approaches during both morning and evening peak hours.
- The right turn queue on High Street turning right into Albert Street at the High Street/Albert Street intersection reaches three to four vehicles at times but is generally no more than two vehicles during peak hours
- The queue on the Albert Street approach to High Street reaches up to four vehicles during the peak hours.
- The queue on the High Street approach to the Ivory/High/Ashley signalised intersection, extend beyond the High Street/Cone Street intersection at times during the both morning and evening peak hours but does not extend to the railway crossing on High Street.
- Queues on the Ivory Street approach to the Ivory/High/Ashley signalised intersection extend to Alfred Street intersection during the peak hours but does not extend to the Collins Street intersection.
- Vehicle queues were observed to be similar between the three model runs therefore converting Cone Street and Collins Street to one-way streets does not result in significant changes in vehicle queues on the adjacent road network.

5. Qualitative Option Assessment

Following the traffic modelling assessment, a qualitative assessment of each option was conducted. During this process a hybrid option of converting only Cone Street to one-way and maintaining Collins Street as two-way was identified. This alternative was considered as Collins Street is wider than Cone Street so making it one-way is problematic in terms of road space (may need narrowing). It was also considered as a way to reduce the impact on accessibility for Collins Street residents.

It is assumed that providing a footpath is required in any option. Considering the activity type, number of accesses and access widths on each side of Cone Street, it is recommended that the footpath is provided on the west side of Cone Street. This would align well with any future pedestrian connections to developments on Ivory Street. Pros and cons assessment of each option is summarised in **Table 5.1**. It is noted that an existing footpath is located on the east side of the street for approximately 50 metres north of Collins Street.

Table 5.1 Qualitative Option Assessment

Option	Advantages	Disadvantages	Recommendation
Option 1 - Two-way (no change to traffic flow but requires removal of parking on one side)	• Footpath is not located next to parking therefore pedestrians are protected from opening car doors • Traffic movement remains as is	• Removal of on street parking to make way for the footpath may not be accepted by adjacent businesses • Rat-running continues	Not recommended
Option 2 – One-way Northbound	• Avoids right turn queue clashes at High Street intersection (although right turn into Cones Street is low) • Allows vehicles parked on west side to exit passenger side of car. • The Cone Street/ Collins Street approaches will be narrower at the intersections, which shortens pedestrian crossing distance and removes pedestrian/ vehicle conflict points • Retain all on street parking • Reduces left turning conflict with through cyclists	• Traffic flow adjustments (potential increase in traffic on Collins Street as motorists will not be able to enter and exit using just Cone Street) • Less network permeability for cyclists, southbound cyclist would need to go through the Ivory Street/ High Street signalised intersection or ride on the footpath. • Traffic calming required because the traffic lane would be too wide for one-way.	Recommended over option 1 and 3 however the hybrid option detailed below should be strongly considered.
Option 3 – One-way Southbound	• Retains all on street parking • Narrows intersection as above	• Traffic flow adjustments (potential increase in traffic on Collins Street as motorists will not be able to enter and exit using just Cone Street) • Less network permeability for cyclists, southbound cyclist would need to go through the Ivory Street/ High Street signalised intersection or ride on the footpath. • Rat-running continues	Not recommended

Option	Advantages	Disadvantages	Recommendation
		• Traffic calming required because the traffic lane would be too wide for one-way (encouraging higher speeds).	
Option 4 - Cones Street One-way northbound and Collins Street two-way (Hybrid Option)	• Reduces impact on residential properties • Avoids need for traffic calming because the traffic lane would be too wide for one-way. • The Cone Street/ Collins Street interface could be designed as such it appears as a cul-de-sac in both directions which will deter any rat running traffic.	• The treatment at Collins Street/ Cone Street interface will need to be suitably designed • Potentially higher cost than other options	**This hybrid option with northbound traffic on Cone Street is our recommendation. This option will facilitate the desired outcomes whilst minimising traffic impacts.** **An indictive layout of this option is shown in Figure 5.1.**

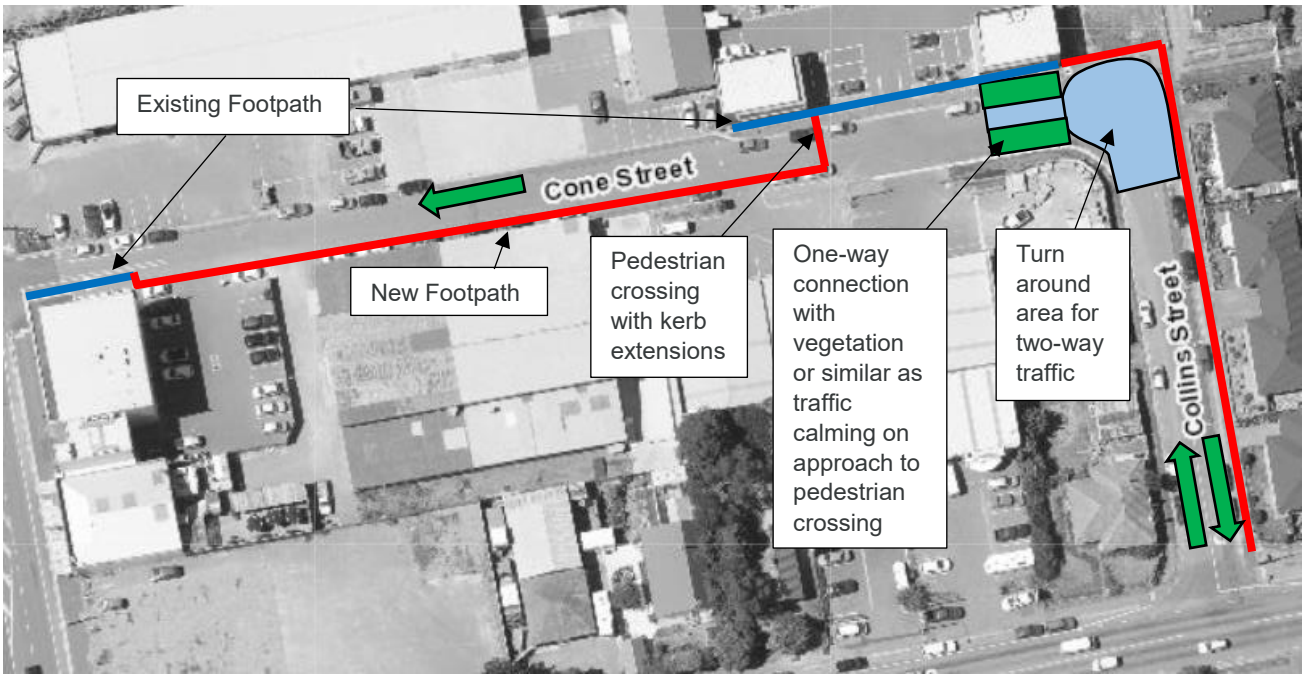

Figure 5.1 Hybrid Option Layout

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Attachment A

Table 1 High Street/ Cone Street intersection performance - AM peak hour (8am-9am)

Approach	Movement	Option 1 - Existing			Option 2 – Northbound			Option 3 – Southbound		
		Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS
East	Left	19	7	A	-	-	-	21	8	A
East	Through	423	8	A	429	8	A	416	9	A
South	Left	6	9	A	18	9	A	-	-	-
South	Right	5	7	A	4	8	A	-	-	-
West	Through	587	7	A	586	7	A	581	7	A
West	Right	26	8	A	-	-	-	47	8	A
Intersection		1066	9	A	1036	8	A	1065	9	A

Table 2 High Street/ Albert Street intersection performance - AM peak hour (8am-9am)

Approach	Movement	Option 1 - Existing			Option 2 – Northbound			Option 3 – Southbound		
		Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS
North	Left	206	9	A	172	9	A	178	11	B
North	Right	27	33	D	28	38	E	31	31	D
West	Left	17	6	A	20	7	A	17	7	A
West	Through	407	7	A	414	7	A	449	7	A
East	Through	285	30	D	304	31	D	309	30	D
East	Right	147	11	B	142	11	B	109	12	B
Intersection		1089	24	C	1081	24	C	1093	25	D

Table 3 Ivory Street/ Collins Street intersection performance - AM peak hour (8am-9am)

Approach	Movement	Option 1 - Existing			Option 2 – Northbound			Option 3 – Southbound		
		Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS
North	Left	4	6	A	32	6	A	-	-	-
North	Through	585	6	A	610	6	A	616	6	A
South	Through	563	7	A	541	7	A	558	7	A
South	Right	22	8	A	30	8	A	-	-	-
West	Left	17	8	A	-	-	-	17	7	A
West	Right	4	7	A	-	-	-	12	7	A
Intersection		1195	7	A	1213	7	A	1204	7	A

Table 4 Ivory/High/Ashley intersection performance - AM peak hour (8am-9am)

Approach	Movement	Option 1 - Existing			Option 2 – Northbound			Option 3 – Southbound		
		Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS
North	Left	63	18	B	58	21	C	75	19	B
North	Thru	497	21	C	514	19	B	510	20	B
North	Right	51	12	B	60	12	B	51	12	B
West	Left	11	27	C	14	29	C	12	31	C
West	Thru	96	28	C	100	29	C	107	30	C
West	Right	6	33	C	10	39	D	6	27	C
South	Left	8	16	B	4	15	B	5	14	B
South	Thru	317	17	B	299	18	B	316	18	B
South	Right	265	21	C	276	19	B	284	21	C
East	Left	159	29	C	197	29	C	181	28	C
East	Thru	86	28	C	76	30	C	77	30	C
East	Right	67	32	C	59	37	D	82	32	C
Intersection		1625	22	C	1667	22	C	1706	22	C

Table 5 High Street/ Cone Street intersection performance - PM peak hour (4:15pm-5:15pm)

Approach	Movement	Option 1 - Existing			Option 2 – Northbound Only			Option 3 – Southbound Only		
		Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS
East	Left	26	7	A	-	-	-	18	6	A
East	Through	678	10	A	692	10	B	675	10	B
South	Left	14	10	A	42	11	B	-	-	-
South	Right	7	8	A	13	8	A	-	-	-
West	Through	533	7	A	537	7	A	546	7	A
West	Right	5	10	B	-	-	-	12	7	A
Intersection		1263	10	A	1284	10	A	1251	10	A

Table 6 High Street/ Albert Street intersection performance - PM peak hour (4:15pm-5:15pm)

Approach	Movement	Option 1 - Existing			Option 2 – Northbound			Option 3 – Southbound		
		Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS
North	Left	205	9	A	186	10	A	199	9	A
North	Right	16	35	D	18	39	E	13	28	D
West	Left	50	7	A	58	7	A	61	7	A
West	Through	335	7	A	350	7	A	359	7	A
East	Through	404	33	D	430	33	D	402	33	D
East	Right	285	12	B	297	13	B	266	12	B
Intersection		1295	24	C	1339	25	C	1300	25	C

Table 7 Ivory/Collins intersection performance - PM peak hour (4:15pm-5:15pm)

Approach	Movement	Option 1 – Existing			Option 2 – Northbound			Option 3 – Southbound		
		Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS
North	Left	0	0	A	8	6	A	-	-	-
North	Through	513	6	A	543	6	A	498	6	A
South	Through	621	7	A	648	7	A	651	7	A
South	Right	12	8	A	12	9	A	-	-	-
West	Left	43	7	A	-	-	-	34	7	A
West	Right	2	8	A	-	-	-	24	7	A
Intersection		1192	7	A	1211	7	A	1207	7	A

Table 8 Ivory/High/Ashley intersection performance - PM peak hour (4:15pm-5:15pm)

Approach	Movement	Option 1 – Existing			Option 2 – Northbound			Option 3 – Southbound		
		Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS	Vol. (vph)	Ave. Delay (s)	LOS
North	Left	81	20	B	75	20	B	75	19	B
North	Thru	341	20	C	336	19	B	327	20	B
North	Right	32	14	B	36	15	B	42	15	B
West	Left	26	25	C	25	30	C	28	26	C
West	Thru	92	30	C	107	30	C	109	30	C
West	Right	10	37	D	13	32	C	10	34	C
South	Left	7	19	B	14	16	B	13	20	B
South	Thru	473	19	B	474	19	B	488	18	B
South	Right	212	17	B	226	18	B	236	17	B
East	Left	210	31	C	238	31	C	204	30	C
East	Thru	105	31	C	118	31	C	118	31	C
East	Right	105	32	C	94	34	C	94	35	D
Intersection		1695	23	C	1757	23	C	1745	22	C

LET'S TALK ABOUT CONE STREET IMPROVEMENTS

337

The Council is proposing to construct a new footpath along Cone Street. This is to provide a safe option for pedestrians accessing the new development on the corner of High Street and Ivory Street, and to address pedestrian safety through Cone Street.

Included in the new development is a Burger King with a drive through. With additional traffic accessing this area, the Council is aware that pedestrian safety needs to be addressed.

Investigation work has been carried out to identify possible options for the new footpath. There are some constraints in the area, particularly with the narrow road width between High Street and Collins Street. On-street parking also needs to be formalised as currently it is not clearly defined.

Other constraints include:

- The area is primarily commercial activity with heavy vehicles using Cone Street to undertake deliveries
- A dish-drain runs along the eastern side of the road, reducing the road width and provides limited stormwater runoff options
- There is a 'pinch-point' outside number five and nine Cone Street due to the existing footpath creating a limited road width to work with.

Proposals

Four options have been developed for consideration and we would like your feedback.

Option one: On-street parking with no property purchase

- This option allows for a 1.5m footpath
- Allows for two 3.0m road lane widths with a 2.1m parking bay on the western side
- Allows for on-street parking and pedestrian access
- Existing road lanes move east removing 15 carparks. Seven are retained on the western side.
- Footpath widths are not desirable for the retail area, however the alternative footpath on High Street and Ivory Street are wide and will provide primary access.

Option two: No on-street parking

- This option allows for pedestrian access with a 2m footpath
- No on-street parking is allowed for
- Allows for two 3.4m road lane widths
- Removes 22 carparks.

Please turn over

Option three: On-street parking with property purchase

- Footpath varies from 1.5m to 2m
- Allows for two 3m road lane widths and a 2.1m parking bay on the western side
- On-street parking and pedestrian access is allowed for
- Removes 14 carparks and retains eight on the western side
- Property purchase relieves the 'pinch point' outside numbers five and nine Cone Street.

Option four: Cone Street one-way

- Footpath varies from 1.5m to 2m
- Allows for two 3.2m road lane widths and two 2.1m parking bays
- Allows for on-street parking
- No carparks are removed. 22 carparks remain
- One-way access could potentially be less convenient for businesses and residents.

Timing of works

Following feedback, the detailed design of the street improvements will be finalised. Construction of the project will be carried out during mid-late 2019. Construction of the footpath on High Street near Burger King may take place earlier.

Tell us what you think

Your feedback is important to us and we want to hear what you think of the proposed options. You can provide your feedback online at waimakariri.govt.nz/letstalk, or fill out the form provided and return it to us FreePost.

To view detailed drawings of the options, or for more information about the proposals, contact glenn.kempton@wmk.govt.nz or phone 0800 965 468.

Let us know your thoughts by 5pm, Friday 10 May 2019.

190415055960

LET'S TALK

ABOUT CONE STREET IMPROVEMENTS

339

Feedback Form

Name: _____

Organisation: *(if applicable)* _____

Address: _____

_____ Postcode: _____

Email: _____ Phone: _____

1. Please tick your preferred option:

- ☐ Option one: on-street parking with no property purchase
- ☐ Option two: no on-street parking
- ☐ Option three: on-street parking with property purchase
- ☐ Option four: Cone Street one-way.

2. Your feedback is important to us. Please provide any comments, suggestions or feedback you have about the proposals:

WAIMAKARIRI DISTRICT COUNCIL

Freepost Authority Number 1667

Free

Cone Street Improvements Submissions
Waimakariri District Council
Private Bag 1005
Rangiora 7440

Fold along line

Please seal on all side

Fold along line

If you have any comments or questions regarding Cone Street Improvements please contact:

Glen Kempton
Engineering Technician

Waimakariri District Council
Phone: 0800 965 468
Email: records@wmk.govt.nz

Or return this feedback form (no stamp required) back to us by 5pm, Friday 10 May 2019.

190415055960

Address	Owner / Tenant	Preferred Option	Comments
76 Ivory Street	Owner	Option Two	Submission on five properties. No on-street parking. Congestion on Ivory Street. Access for heavy vehicles.
1 Cone Street	Owner	Option Two	Submission on five properties. No on-street parking. Congestion on Ivory Street. Access for heavy vehicles.
3 Cone Street	Owner	Option Two	Submission on five properties. No on-street parking. Congestion on Ivory Street. Access for heavy vehicles.
5a Cone Street	Owner	Option Two	Submission on five properties. No on-street parking. Congestion on Ivory Street. Access for heavy vehicles.
5b Cone Street	Owner	Option Two	Submission on five properties. No on-street parking. Congestion on Ivory Street. Access for heavy vehicles.
5b Cone Street	Tenant	Option Four	Retain all on streert parking. Prefers narrower footpath on eastern side of the road
2 Collins Street	Owner	Option Four	One way from High St. Left only out of BK into Ivory Street. No parking on right hand side of road. Lefth hand side only Collins St and Cones St.
8 Collins Street	Owner	Option Two	One way would disadvantage our living. Would not be able to come off Ivory St. Footpath would be appreciated as it is dangerous walking on the road.
6/6 Cone Street	Owner	Option Four	Leads to the best parking outcome. Parking should be for businesses and therefore P60 / P75 / P120 or similar.
6 Cone Street	Tenant	Option Four	To lose 22 parks is not practical to our business. Being one way is not an issue to us.
5a Cone Street	Tenant	Option Two	Wants footpath on the eastern side of the road. Two way traffic is vital for our business.
6/1 Cone Street	Tenant	Option Four	Please don't take the carparks away.
6/1 Cone Street	Tenant	Option Four	
19 High Street	Tenant	Option One	Maintain two way for businesses. Footpaths only need to be minimal as it is not a high volume pedestrian area (people donlt shop by foot in this area). Less carparking. More yellow lines to make it safer. Entrance at Collins St needs consideration.
6/2 Cone Street	Owner	Option One	Definitely not one way for Cone Street
Access Group		Not stated	High volume of pedestrians along High Street. Removing parking improves visibility for both pedestrians and drives. I would recommend parks closest to High Street are removed. Install tactile indicators for visually impaired.
Cnr High / Cone Street	Tenant	Option Four	Limited all day parking in the area. Concerned about where BK workers will park. Likes one way with footpath. Prefers painted carparks to guide parking.
Survey Monkey		Option One	If you don't have car parks then people will not stop.
Survey Monkey		Option Three	Actually a mixture of option 3 & 4 would be best. I live on Cone Street and am aware of the issues. My concern is which way the one way goes (north or south). The road in/out to BK needs to be addressed. Similar to drive through at KFC. Same issues as Ivory St. Maybe timed parking and 30 km/h speed limit could be looked at.
Survey Monkey		Option Four	Leaves parking for businesses and wide enough for comfortable driving space and safer room for pedestrians.
Cone Street		Option Four	Modified to be north to south as this is better for businesses. Parking is at a premium.

Preferred Option:	One	3
	Two	7
	Three	1
	Four	9
	Not stated	1

WAIMAKARIRI DISTRICT COUNCIL

REPORT FOR DECISION

FILE NO and TRIM NO:	RDG-32-77-03 /191128167500
REPORT TO:	Rangiora Ashley Community Board
DATE OF MEETING:	11th December 2019
FROM:	Don Young, Senior Engineering Advisor
SUBJECT:	Park and Ride facility locations
SIGNED BY: (for Reports to Council, Committees or Boards)	Department Manager / Chief Executive

1. SUMMARY

1.1 This report is to seek a recommendation from the Board to Utilities and Roading Committee on the location of Park and Ride facilities in Rangiora

Attachments:

i. 190904123648 – Park and Ride – South Rangiora Locations
ii. 190910126418 – South Rangiora Short Term Park and Ride - site location MCA
iii. 190910126416 – South Rangiora Long Term Park and Ride - site location MCA
iv. 191202169360 – Southbrook Park Option 1
v. 191202169361 – Southbrook Park Option 2A
vi. 191202169364 – Southbrook Park Option 2B
vii. 191202169365 – Southbrook Park Option 2C
viii. 191202169366 – Southbrook Park Option 2D

2. RECOMMENDATION

THAT Rangiora Ashley Community Board:

(a) **Receives** report No. 191128167500.

(b) **Recommends** that the Utilities and Roading Committee adopt the following Park and Ride facilities for Rangiora

i. River Road – extension of the existing dog park carpark

ii. White St – existing Park and Ride site

iii. Southbrook Park – the exact option and detail to be worked out by staff to optimise benefits, minimise costs, and mitigate effects.

(c) **Notes** that an additional long term option for South Rangiora will be considered if/when Southbrook Park approaches capacity.

3. BACKGROUND

3.1 The Council has budgeted to implement a programme to assist with Travel Demand Management. This includes establishing Park and Ride facilities in time for the opening of

the new Northern Motorway, and the High Occupancy Vehicle lanes on the Waimakariri Bridge.

3.2 At its meeting on 24th September, the Utilities and Roading Committee adopted a phased implementation plan. This mandated the general approach of progressing short term options to be ready for June 2020, while also considering the longer term needs.

3.3 In particular, the Implementation Plan included three Rangiora sites – North, Central and South.

3.4 Since then staff have considered which sites could be developed in the short timeframe. North Rangiora and central Rangiora are relatively straightforward as existing formal or informal sites already exist at River Road and White st respectively, and therefore these sites have been chosen for practicality.

3.5 For South Rangiora there were more options, each with advantages and disadvantages. A brief Multi Criteria Analysis was therefore carried out (as attached). This identified Southbrook Park as the preferred short term site.

3.6 However it was also noted that Southbrook Park had other long term disadvantages, and so a Long term assessment was also carried out for South Rangiora (see attached).

3.7 The Council is currently considering its options for a long term site and this will be advised on separately.

4. ISSUES AND OPTIONS

4.1. The three recommended sites are commented on in more detail.

4.2. North Rangiora

4.3. The initial plan was to extend the current shoulder widening of River Road in the neighbourhood of the Croquet Club. It was decided that while this is practical, it does not optimise the situation. More recently, discussions have been held with Community and Recreation staff about the possibility of extending the existing Dog Park carpark. This is currently the preferred approach, as it offers a number of advantages

4.3.1. The Park and Ride users will be safer off road

4.3.2. The dog park users will get use of extra parking during low usage times

4.3.3. The Croquet club get to keep the current informal use of the road side

4.3.4. The off road carpark offers more opportunity for improvement if the demand warrants it.

4.4. Therefore, if the River Road option is supported, staff will progress the extension of the Dog park carpark for park and ride. Plans as to the exact layout will be prepared at that time.

4.5. Central Rangiora

4.6. There is currently a Park and Ride facility on White St. Given the existing usage, it is most efficient to continue with this facility. Other sites may or may not provide advantages but it would be difficult to identify them and develop them in the remaining timeframe. If an alternative is requested by the community, it can be relatively easily considered in the future.

4.7. South Rangiora

4.8. As noted above, Southbrook Park is identified as the preferred short term facility. It is noted that at times the Southbrook Park parking is already overloaded, and therefore to ensure that any Park and Ride use does not worsen the situation, the Council would need to ensure that it provided additional carparking over and above that existing, to match the expected demand.

4.9. There are two areas around the park that have been identified that would provide additional parking

4.9.1. Widening the South Belt road frontage to allow diagonal parking

4.9.2. Extending the front carpark into the Ellis Road verge

4.10. To assist with this discussion, indicative plans have been drawn up which allow for this

4.10.1. Option 1 – Extend the carpark into Ellis Rd

4.10.2. Option 2 - Provide a new access to Southbrook Park on the verge of Ellis Rd

4.11. This latter option has the further additional advantage of removing an existing traffic hazard where the current access passes the existing (unused) changing rooms which would be very beneficial if/when the changing rooms were r-developed.

4.12. Due to the complexity of this option, four sub-options have been developed for consideration (Options 2A – 2D). It is likely that other options may emerge as discussions continue.

4.13. Initial meetings have been held with the users and the neighbours, and these have generally been positive. Further meetings are planned for the week preceding the Community Board meeting to discuss this more detailed assessment, and a verbal update will be provided at the meeting.

4.14. The Management Team have reviewed this report and support the recommendations.

5. COMMUNITY VIEWS

5.1. Groups and Organisations

5.1.1. There have been discussions with the Croquet Club, the Saracens Rugby Club, Southbrook Cricket Club, the Southbrook Touch Rugby Club, and the Country Lane Residents. Final feedback will be provided as a verbal update at the meeting.

5.1.2. In addition the other organisations involved in Greater Christchurch are supportive of the Council providing suitable Park and Ride facilities.

Wider Community

5.2. Consultation has begun on the Express Bus Services and the Park and Ride facilities. The outcome of this process will not be known until the consultation closes on 8th December. A verbal update on the analysis to date will be given at the meeting.

6. IMPLICATIONS AND RISKS

6.1. Financial Implications

6.1.1. The Council has budgeted a total of $100,000 in 2019/20 and a further $4.00mill in 2020/21, for implementing Park and Ride facilities. The timing of this expenditure may be altered as part of Annual Plan discussions. It is expected that NZTA will fund any works in advance, and the Council will re-fund NZTA in the following year.

6.1.2. The costs of carrying out all of the works are still being developed, but they will fit within the above budget.

6.2. Community Implications

6.2.1. The community has an expectation that Park and Ride facilities will be provided in time for the opening of the High Occupancy Vehicle lanes, and that long term facilities will be provided as appropriate to meet the demand.

6.3. Risk Management

6.3.1. There is a risk that other suitable sites could be better as a Park and Ride facility. This is mitigated by the fact that the staff have carried out a robust evaluation of sites, and concluded that these are the best sites

6.3.2. There is a risk that the popularity of Park and Ride will not be great enough to warrant the expenditure in these sites. This is partially mitigated by the planned phased approach to development which will ensure development only occurs as demand increases, partially mitigated by the long timeframe over which Park and Ride initiatives should be assessed, and partially mitigated by the alternative uses available for any improvements.

6.4. Health and Safety

6.4.1. Health and safety issues relating to the construction and operation of the site will be considered as part of the transport engineering report.

7. CONTEXT

7.1. **Policy**

7.1 This matter is not a matter of significance in terms of the Council's Significance and Engagement Policy.

Legislation

7.2 The works are already budgeted, and are authorised under the Local Government Act.

Community Outcomes

7.3 ***Transport is accessible, convenient, reliable and sustainable***

- The standard of our District's roads is keeping pace with increasing traffic numbers.
- Communities in our District are well linked with each other and Christchurch is readily accessible by a range of transport modes.
- Public transport serves our District effectively.
- Opportunities to increase the occupancy of commuter vehicles is actively encouraged.

Delegations

7.4 The RACB does not have delegated authority to make this decision, but can recommend to the Utilities and Roading Committee, which does have authority to progress budgeted works.

WAIMAKARIRI DISTRICT COUNCIL

Rangiora Park And Ride
Long Term Option Assessment

SCALE (A4) 1:13,000

DATE 11/09/2019

Document Path: J:\WDC Drawings\4001-6000\4049\4049-sht3-a - Rangiora Long Term.mxd

SOUTH RANGIORA - SHORT TERM PARK AND RIDE OPTIONS ANALYSIS

		Land ownership issues?		Ability to become the long term solution		Accessibility of site to main users		Linkage with Blue Line		Practicality of express bus route		Impact on planned usage of site		Benefit to Southbrook Rd congestion		Likely view of neighbours		Consenting / Environmental issues		Amount of physical work to implement		Total Score (HIGHER is better)	RANK
		Weight	*3*	*Weight*	*3*	*Weight*	*3*	*Weight*	*3*	*Weight*	*1*	*Weight*	*3*	*Weight*	*2*	*Weight*	*2*	*Weight*	*2*	*Weight*	*1*		
		Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score		
3	**Headworks land**	5	15	5	15	1	3	1	3	4	4	1	3	3	9	1	2	1	2	2	2	**49**	**3**
1	**Southbrook Park**	5	15	3	9	5	15	5	15	5	5	4	12	5	15	3	6	5	10	3	3	**90**	**1**
7	**RRC frontage**	5	15	5	15	3	9	3	9	5	5	4	12	1	3	4	8	4	8	3	3	**84**	**2**
	Grade																						
Key	1	Purchase req'd - V unlikely to sell		No possibility for long term solution		Back-tracking for majority		Unattractive site for Blue Line		Difficult and time consuming towards town		Significant disuption to planned usage		Does not assist Sthbrook congestion		Will be viewed negatively		Will be challenging to consent		Difficult construction			
	2	Purchase Req'd - No info on willingness																					
	3	Purchase Req'd - willing seller		Capacity could be found with some difficulty		On preferred route, but some negatives		Blue Line could be altered without major issue				Would require some re-arranging		May partially assist		Will require some discussions		Some consents but similar activitiy		Medium construction			
	4	Purchase req'd - govt agency																					
	5	Council owned		Sufficient land for all future purposes		On preferred route for the majority towards town		Already on Blue Line		Easy access to town		No planned usage		Directly assists Sthbrook congestion		No issues		No major consenting issues		Easy to construct			

SOUTH RANGIORA - LONG TERM PARK AND RIDE
OPTIONS ANALYSIS

		Land ownership issues?		Earthworks implications?		Access issues?		Accessibility of site to main users		Linkage with Blue Line		Practicality of express bus route		Benefit to existing road congestion		Consenting / Environmental / Contamination issues		Likely view of neighbours		Future access to rail?		Future access to motorway?		Compatible with future zoning		Land size allows long term development		Servicing issues (power, water)		Total Score (HIGHER is better)	RANK
		Weight	*3*	*Weight*	*1*	*Weight*	*2*	*Weight*	*2*	*Weight*	*2*	*Weight*	*3*	*Weight*	*2*	*Weight*	*2*	*Weight*	*2*	*Weight*	*1*	*Weight*	*2*	*Weight*	*1*	*Weight*	*2*	*Weight*	*1*		
		Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score	Grade	Score		
1	Southbrook Park	4	12	3	3	4	8	4	8	5	10	4	12	5	10	4	8	2	4	1	1	1	2	4	4	2	4	4	4	**90**	**2**
2	Summerset	3	9	3	3	3	6	3	6	3	6	4	12	5	10	3	6	3	6	1	1	1	2	1	1	5	10	4	4	**82**	**4**
3	Council headworks	5	15	3	3	4	8	2	4	1	2	4	12	4	8	2	4	1	2	1	1	1	2	2	2	5	10	4	4	**77**	**6**
5	Calder Stewart	2	6	3	3	3	6	2	4	1	2	2	6	1	2	5	10	3	6	1	1	1	2	5	5	5	10	3	3	**66**	**7**
6	Luisettis	3	9	3	3	4	8	3	6	5	10	5	15	1	2	5	10	4	8	4	4	1	2	5	5	5	10	4	4	**96**	**1**
7	RRC frontage	5	15	2	2	4	8	2	4	2	4	5	15	1	2	5	10	4	8	2	2	1	2	5	5	4	8	4	4	**89**	**3**
8	Sthbrk Svce Station	2	6	3	3	3	6	2	4	2	4	5	15	1	2	5	10	4	8	2	2	1	2	5	5	5	10	4	4	**81**	**5**
	Grade																														
Key	1	Purchase req'd - V unlikely to sell		Major earth-filling likely		Difficult site to connect		Backtrack / not attractive for majority of users		Unpractical for Blue Line		Convoluted time-consuming run to Chch		Does not assist		Major consenting issues		Very negative view		No access practical		No access practical		Will impact on future rezone		Very constrained size		Furtherest distance from reticulation			
	2	Purchase Req'd - No info on willingness																													
	3	Purchase Req'd - willing seller		Medium earth-filling		Easier site to connect		Some negatives to attractive location		Some changes required to Blue Line		Some impediments		May assist		Medium consenting issues		Neutral view		Medium		Medium		Medium		Some constraints		Medium distance from reticulation			
	4	Council owned - leased by others																													
	5	Council owned		Minor earth-filling only		Easy access		Preferred direction for majority of users		On existing Blue Line route		Clean fast run into and out of Chch		Direct assistance		Minor consenting issues		Positive view		Direct adjacent access		Direct adjacent access		Completely separate from future rezone		Adequate size for all future scenarios		Closest to reticulation			

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wsp
Christchurch Office
+64 3 363 5400
PO Box 1482
Christchurch 8140
New Zealand

Designed	Approved	Approved Date
T.GRANT	C.MORAHAN	11/19

Drawn	Scales
T.GRANT	1:500 (A1), 1:1000 (A3)

Project
WAIMAKARIRI DISTRICT COUNCIL
115B SOUTH BELT
SITE INVESTIGATIONS FOR RANGIORA PARK AND RIDE FACILITY

Sheet
CAR PARK LAYOUT
OPTION 1

Project No.	Sheet. No.	Revision
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Revision	Amendment	Approved	Revision Date
A	DRAFT	C.M.	11/19

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T.GRANT	C.MORAHAN	11/19

Drawn	Scales
T.GRANT	1:500 (A1), 1:1000 (A3)

Project
WAIMAKARIRI DISTRICT COUNCIL
115B SOUTH BELT
SITE INVESTIGATIONS FOR RANGIORA PARK AND RIDE FACILITY

Sheet
CAR PARK LAYOUT
OPTION 2A

Project No.	Sheet. No.	Revision
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Original Sheet Size A1 [841x594] Plot Date 2019-11-29 at 3:32:07 PM Path U:\ProjectsNZ\6d\6-DHLHG.00 Waimakariri Park and Ride Facility\Home\800 Drawings\Southbrook Park\6-DHLHG.00_OPTION_2A.dwg C02

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Revision	Amendment	Approved	Revision Date
A	DRAFT	C.M.	11/19

wsp
Christchurch Office
+64 3 363 5400
PO Box 1482
Christchurch 8140
New Zealand

Designed	Approved	Approved Date
T.GRANT	C.MORAHAN	11/19

Drawn	Scales
T.GRANT	1:500 (A1), 1:1000 (A3)

Project
WAIMAKARIRI DISTRICT COUNCIL
115B SOUTH BELT
SITE INVESTIGATIONS FOR RANGIORA PARK AND RIDE FACILITY

Sheet
CAR PARK LAYOUT
OPTION 2B

Project No.	Sheet. No.	Revision
6-DHLHG.00	C02	A

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Revision	Amendment	Approved	Revision Date
A	DRAFT	C.M.	11/19

wsp
Christchurch Office
+64 3 363 5400
PO Box 1482
Christchurch 8140
New Zealand

Designed	Approved	Approved Date
T.GRANT	C.MORAHAN	11/19
Drawn	**Scales**	
T.GRANT	1:500 (A1), 1:1000 (A3)	

Project
WAIMAKARIRI DISTRICT COUNCIL
115B SOUTH BELT
SITE INVESTIGATIONS FOR RANGIORA PARK AND RIDE FACILITY

Sheet
CAR PARK LAYOUT
OPTION 2C

Project No.	Sheet. No.	Revision
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1:1000 @ A3
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Revision	Amendment	Approved	Revision Date
A	DRAFT	C.M.	11/19

wsp
Christchurch Office
+64 3 363 5400
PO Box 1482
Christchurch 8140
New Zealand

Designed	Approved	Approved Date
T.GRANT	C.MORAHAN	11/19

Drawn	Scales
T.GRANT	1:500 (A1), 1:1000 (A3)

Project
WAIMAKARIRI DISTRICT COUNCIL
115B SOUTH BELT
SITE INVESTIGATIONS FOR RANGIORA PARK AND RIDE FACILITY

Sheet
CAR PARK LAYOUT
OPTION 2D

Project No.	Sheet. No.	Revision
6-DHLHG.00	C02	A

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