



memorandum



TO Bruce Van Duyn FROM Nic Love and Carl Steffens
Carter Group Limited DATE 10 September 2026
RE Water Supply – Beca Questions

1.0 Introduction

This memorandum has been prepared to provide comment on various issues relating to the community drinking-water supply for the proposed Carter Group residential subdivision development at 531 and 535 Mill Road, Ōhoka. A meeting was held between Carter Group, Inovo, Pattle Delamore Partners (PDP) and Beca (assisting Waimakariri District Council (WDC)) on 14 August 2026, where a number of questions posed by Beca relevant to the proposed water supply were discussed. Our comments under the sections below address the specific matters raised by Beca at that meeting. This memo should be read in conjunction with the PDP Groundwater Assessment of Environmental Effects (AEE) Report, dated 25 May 2026 that was originally submitted with the Fast Track application.¹

We also note there has been a slight change to the number of proposed lots for the subdivision. Section 5.1.1 of the PDP Groundwater AEE set out the proposed demand for the subdivision development. Since that time there has been a reduction in residential lots from 875 previously to 856. This slightly changes the demand values from those provided in Tables 2, 3 and 6 of the PDP Groundwater report. The updated values are provided in the following tables. The updated residential peak demand is given in Table 1 (an update to Table 2 in the Groundwater AEE), where the demand reduces from 2,474 m³/day to 2,425 m³/day.

Table 1: Peak Water Supply Demand Summary – Residences

Lots/Units	No. of Lots/Units	Peak Daily Demand per Connection/Unit (L/con/day)	Peak Demand (m ³ /day)
Small Lots (Res 2 Zone)	734	2,500	1,835
Large Lots (Res 4a Zone)	122	3,810	465
Retirement Village Units (Res 8 Zone)	250	500	125
Total Peak Demand (m³/day)			2,425

¹ Pattle Delamore Partners, May 2026. Fast Track Application – 531 & 535 Mill Road, repla – Groundwater Assessment of Environmental Effects Report.

The updated average residential demand is provided in Table 2 (an update to Table 3 in the Groundwater AEE) where the demand decreases from 1,102 m³/day to 1,080 m³/day.

Table 2: Average Water Supply Demand Summary – Residences

Lots/Units	No. of Lots/Units	Average Demand per Connection/Unit (L/con/day)	Average Demand (m ³ /day)
Small Lots	734	1,000	734
Large Lots	122	1,165	142
Retirement Village Units	250	250	63
Total Average Demand (m³/day)			939
Total Average Demand (+ 15% allowance) (m³/day)			1,080

Based on these changes and noting there is no change to the proposed commercial and irrigation requirements, the total subdivision demand is amended to the values set out in Table 3.

Table 3: Total Water Supply Demand Requirements

Water Use	Peak Flow Rate (L/s)	Peak Daily Volume (m ³)	Annual Volume (m ³)
Residential	33.7	2,425	395,280
Commercial	2	86	13,416
Irrigation (Polo Field)	2.94	254	36,288
Irrigation (SMA areas)	4.17	360	21,600
Total Use	42.81	3,125	466,584

Given the amendments represent very small reductions in demand they won't make a significant change to the environmental assessments that are set out in the Groundwater AEE, noting the changes would result in slight reductions in drawdown interference and stream depletion effects compared to the assessments provided.

2.0 Indicative bore locations and Community Drinking-water Protection Zone around first new supply bore.

Figure 1 sourced from Inovo shows indicative locations for proposed water supply bores at Ōhoka. The proposed lot size for the new bores is approximately 100 m². This area provides enough space for the bores to be established and allow access and maintenance in the future. The first proposed bore is intended to be installed in the north within the Stage 2 area (but is planned to be drilled and established as part of the Stage 1 works) of the subdivision adjacent to Bradleys Road in close proximity to the existing Ōhoka township Water Treatment Plant (WTP) and WDC emergency backup bore M35/5609. In the PDP Groundwater AEE it was recommended that new deep drinking-water bores should be situated at least 100 m from the subdivision boundary so that the required Community Drinking-water Protection Zone (CDWPZ) around each bore would fall within the site and not extend onto neighbouring land.

A Community Drinking-water Protection Zone (CDWPZ) is a mapped area around the drinking-water source where land use activities that pose potential contamination risks are regulated. Schedule 1 of the Land and Water Regional Plan (LWRP)² sets out considerations for determining the dimensions of a CDWPZ. LWRP Table S1A provides default provisional CDWPZ dimensions based on bore depth and the type of aquifer.

The protection zone around WDC deep supply bore BW24/0262 (screened from 78 to 84 m below ground level (bgl)) is a circular area with a 100 m radius extending from the bore. Bore BW24/0262 would meet the LWRP Table S1A criteria for a bore with a screen deeper than 70 m bgl within a semi-confined aquifer. Based on this criteria Table S1A gives the same default dimensions as the actual CDWPZ around the bore and new onsite bores are expected to have the same size provisional CDWPZ. In contrast, the top of the well screen in WDC shallow emergency backup supply bore M35/5609 is only 16.8 m bgl. This bore would fit into the Table S1A category for a screen interval between 10 and 30 m bgl drawing water from an unconfined aquifer. We note the existing CDWPZ around this bore matches the Table S1A default dimensions for this type of bore with a zone that extends 200 m down gradient of the bore and 1000 m in an up gradient direction.

Various land use and discharge activities are restricted via rules within the LWRP where these activities occur within a CDWPZ. Where a proposed activity is normally permitted, if it occurs within a CDWPZ then rules in the LWRP may require that resource consent is gained or the activity may be subject to stricter conditions than if it were occurring outside a CDWPZ.

Given it has been proposed that a new bore within the Stage 2 area could be drilled in proximity to the existing WDC WTP and emergency backup bore M35/5609, the new CDWPZ would extend slightly across the subdivision boundary onto land to the west of Bradleys Road. However, the new CDWPZ would fall within the extents of the much larger existing CDWPZ for M35/5609. Since M35/5609 could be expected to be decommissioned by WDC once additional deep bores are available for the Ōhoka supply, the existing CDWPZ around that bore would no longer be required under that scenario. Therefore, even though a new CDWPZ around the proposed Stage 2 deep bore may extend slightly beyond the subdivision boundary, there will be a significant overall reduction in the size of any CDWPZ area that currently extends onto the neighbouring properties west of Bradleys Road.

3.0 Bore Construction Details

It is not possible to confirm construction details for any of the proposed community drinking water bores at this stage because their depths and screen zones are likely to vary depending on the strata that is encountered during drilling. However, the applicant intends to adopt industry best practise methodologies for the drilling and construction of the bores.

The New Zealand Standard environmental standard for drilling of soil and rock (NZS 4411)³ is currently being updated and is in public consultation draft format at present. This document (DZ 4411) is intended to align the minimum national environmental requirements for drilling of soil and rock with updated national and international best practice. The proposed drilling and construction of new water supply bores onsite will be consistent with the updated DZ 4411 document.

²<https://www.ecan.govt.nz/your-region/plans-strategies-and-bylaws/canterbury-land-and-water-regional-plan>

³<https://consultations.standards.govt.nz/draft-standards/nzs-4411-environmental-standard-for-drilling-of-so/>

DZ 4411 includes minimum requirements for bore construction including the following:

- ✧ Drilling methodology
- ✧ Bore casing materials
- ✧ Bore screen materials and design
- ✧ Bore sealing, including sanitary seal requirements for water supply bores
- ✧ Bore/aquifer development
- ✧ Headworks design

In addition to this document, it is proposed that drilling and bore construction will be consistent with relevant sections of the WDC Engineering Code of Practice⁴. Part 7 of that document relates to water supply.

The applicant is willing to accept consent conditions that require drilling and bore construction for water supply bores is consistent with DZ 4411 and the WDC Engineering Code or Practice.

While it is not possible to confirm the construction details for any new bores at this stage, it is proposed that all new water supply bores will be screened at depths greater than 70 m below ground and this requirement can also be adopted as a consent condition. The diameter of bores cannot be confirmed at this stage, however it is expected they will be between 200 to 300 mm in diameter.

4.0 Bore Acceptance Criteria and Bore Testing Requirements

The following acceptance criteria and testing requirements are proposed and can be incorporated into consent conditions.

4.1 Minimum Sustainable Yield

The sustainable yield for WDC bore BW24/0262 is 13 L/s. A similar sustainable yield is assumed for future supply bores. A minimum sustainable yield threshold of 8 L/s (although higher yields are expected) has been adopted for new bores. Where any new bore does not meet this threshold, the bore will be abandoned and a new bore will be drilled in a different location, some distance from where the unsuccessful bore was drilled.

4.2 Turbidity

Raw bore water turbidity will be required to be less than 5.0 NTU, consistent with the Taumata Arowai Aesthetic Values for Drinking Water Notice 2022⁵. However, it will be the intention through best practise drilling, construction and development methodologies for raw bore water turbidity to be considerably less than this value. If required, additional filtration treatment will be carried out to ensure effective UV treatment where NTU will need to be less than 1.0 NTU.

⁴ https://www.waimakariri.govt.nz/consents-and-licences/engineering-code-of-practice?result_113831_result_page=2

⁵ <https://gazette.govt.nz/notice/id/2022-sl2379?stageDraft>

4.3 Raw Water Quality

A water quality sample will be collected from new supply bores following drilling and construction. Given the depth of the proposed bores and existing water quality results from BW24/0262, water quality issues are not expected. Similar water quality to that obtained from BW24/0262 is expected in any of the new water supply bores.

Treatment of the raw water will occur via chlorine disinfection and UV.

4.4 Run to Waste/Sour

Provision will be made in the supply to meet run to waste/scour requirements.

4.5 Bore Testing Requirements

4.5.1 Step-drawdown Testing

A step-drawdown test will be carried out in all new water supply bores to confirm the drawdown versus yield relationship in each bore.

The testing should consist of four separate 1 hour long pumping steps with an immediate increase in pumping rate prior to the next pumping step. The first pumping step should be carried out at approximately half the rate of the final pumping step and there should be a consistent increase in rate between each of the pumping steps.

Groundwater levels in the pumped bore should be monitored and recorded at 1-minute intervals with a pressure transducer for at least 24 hours prior to the testing and for an additional 24 hours following the cessation of pumping. A barometric transducer located at the site should record barometric fluctuations at 1-minute intervals over the testing period and the data used to compensate the submerged transducer data. Manual depth to groundwater measurements should be made with a contact meter in the pumped bore at regular intervals over the testing period.

The pumping rate should be measured with an electronic flow meter and recorded with a data logger at 1-minute intervals over the testing period.

The water abstracted during the testing should be disposed of to the nearest flowing surface water body.

On completion of testing, the test data should be analysed by a suitably qualified hydrogeologist to confirm the sustainable yield of each new supply bore.

4.5.2 Constant Rate Testing

A constant rate pumping test should be carried out in at least one of the new supply bores following drilling and development. The testing should be carried out at the highest constant flow rate possible as determined via the analysis of the previous step-drawdown test in the bore. The constant rate pumping duration should continue for at least 72 hours.

At least one observation bore screened in the same aquifer as the pumped bore should be monitored (groundwater level monitoring) during the test. The observation bore should be located within 500 m of the pumped bore.

Groundwater levels in the pumped bore and observation bore should be monitored and recorded at 1-minute intervals with a pressure transducer for at least 24 hours prior to the testing and for an additional 72 hours following the cessation of pumping. A barometric transducer should record barometric fluctuations at 1-minute intervals over the testing period and the data used to compensate the submerged transducer data. Manual depth to groundwater measurements should be made with a contact meter in the observation bore at regular intervals over the testing period.

The pumping rate should be measured with an electronic flow meter and recorded with a data logger at 1-minute intervals over the testing period.

The water abstracted during the testing should be disposed of to the nearest flowing surface water body.

The testing data should be analysed by a suitably qualified hydrogeologist to estimate aquifer parameters. The estimated aquifer parameters should be used to update the drawdown interference and stream depletion assessments provided in the PDP groundwater AEE report.

In addition to the requirements set out above, step-drawdown and constant rate pump testing should be carried out in general accordance with Schedule 11 and Rule 5.109 of the LWRP.

4.6 Drawdown Interference Between Supply Bores

PDP prepared the consent application to take and use groundwater from WDC bore BW24/0262 in 2016⁶. This included analysis of step-drawdown and constant rate pump testing data from the bore. The constant rate test analysis enabled estimation of aquifer parameters which were used to assess the drawdown interference and stream depletion effects of that application. The constant rate pump testing included monitoring of two bores screened at similar depths to BW24/0262. These bores are M35/8381 (88 m deep and screened from 86.5 to 88 m bgl), located approximately 730 m east of BW24/0262 and M35/7701 (86 m deep and screened from 84 to 86 m bgl) located around 900 m south-east from BW24/0262. The drawdown response measured in both of these bores during the testing was significant and therefore there is high confidence in the aquifer parameter estimates from the analysis of the data from each bore.

PDP used the aquifer parameter data from the testing in BW24/0262 to assess the drawdown interference effects of the water supply for the proposed subdivision. This is considered reasonable given the high quality testing results and we note that for the first proposed bore within the Stage 2 subdivision area we expect this is likely to be an approach that ECan would typically accept for a new consent application. ECan's Aquifer Test Exemptions Fact Sheet⁷ notes that one of the principles for exemption (no test required) is if:

"an aquifer test with observation wells has been carried out in the same aquifer, within 500 m of the proposed abstraction location, the results of which are considered by Environment Canterbury to be reliable."

We consider the existing testing of BW24/0262 meets this exemption criteria for the first proposed supply bore within Stage 2 of the subdivision (as it is approximately 175 m from BW24/0262). We consider this data is also appropriate for more distant bores within the subdivision. This is because as the observation bores used for the testing in BW24/0262 were located significantly further than 500 m from the WDC pumped bore and the results obtained from an aquifer test using observation bores are not specific to the location that the drawdown measurements are made. Instead, the results at an observation bore are influenced by the properties of all the strata between the pumping bore and the observation bore.

Section 6.2.3 of the PDP groundwater AEE report provides an assessment of drawdown interference effects in neighbouring bores. This assessment is considered very conservative because the effects have been assessed based on multiple (five) individual assessments (from various locations at the boundaries of the subdivision), where in each case the assessment assumes the full subdivision demand is taken from a single point/bore. We also note that the Groundwater AEE demand assessment locations are shown in

⁶ Pattle Delamore Partners Limited, January 2016. Application for Resource Consent to Abstract Groundwater from Bore BW24/0262 (Ohoka Public Supply Bore): Assessment of Environmental Effects.

⁷ <https://www.ecan.govt.nz/do-it-online/resource-consents/applying-for-resource-consent/preparing-your-application/tools-and-resources>

Figure 9 of the PDP groundwater AEE and that figure is attached as Figure 2 to this memo. It can be seen in Figure 2 that assessment location 3 is close to the proposed location for the new Stage 2 area supply bore.

The location 3 assessment provided in the AEE is only 110 m distant from BW24/0262, which is actually 50 m closer to the WDC bore than the proposed Stage 2 bore location. We note the results of the AEE location 3 assessment predict 6.8 m of drawdown in BW24/0262 as a result of continuous groundwater abstraction at location 3 for 150 days, whereby 70 % of the proposed subdivision demand would be abstracted over this period. This is a significantly conservative assessment because in reality if 70 % of the annual volume is abstracted over this period there is a high chance there would not be enough remaining allocation to supply the subdivision for the additional 215 days of the year. Furthermore, it assumes all of the demand will be taken from location 3 when in reality the majority of the water will be supplied from other bores located at much greater distances from BW24/0262 (while also noting the slight reduction in demand discussed in Section 1 that is not included in the assessments).

Despite the overly conservative nature of the assessment described above, the results show the predicted effects on BW24/0262 are well within ECan's LWRP Schedule 12 assessment criteria. The assessment shows the remaining available drawdown in BW24/0262 is 67 m and the results of the 2016 step-drawdown testing in the WDC bore indicate that 50 m of drawdown is required for that bore to achieve its maximum yield of 13 L/s (based on continuous abstraction from the bore for 7 days).

Based on our previous assessments described above, drawdown interference effects in BW24/0262 from the operation of the proposed subdivision bores are not expected to impact on the ability of the WDC bore to achieve its yield requirements. As described, the assessment carried out has used appropriate aquifer parameters and significantly overestimates the yield that will be abstracted in close proximity to BW24/0262. The majority of the subdivision demand will be abstracted from bores at much greater distances from BW24/0262 and therefore the actual drawdown effects in the WDC bore can be expected to be considerably less than the assessment provided with the application.

5.0 Compliance Pathway

Treated water will be provided that complies with the Water Services (Drinking Water Standards for New Zealand) Regulations 2022⁸. The water supply will meet the compliance requirements of the Taumata Arowai Drinking Water Quality Assurance Rules⁹. The relevant drinking water category under the rules is a large (>500 people) networked supply. Bacterial and protozoal compliance will be provided via UV treatment.

6.0 Use of Non-potable Water for Polo Field and SMA Irrigation

Beca has asked whether non-potable water could be used to irrigate the polo field and the SMA areas. In theory this would be possible, however we don't consider it is the most practical or efficient option for both the applicant and ultimately WDC. A non-potable irrigation source could be provided via the following options:

1. An irrigation source from the new deep water supply bores, whereby the irrigation water would bypass the WTP.
2. A source via one or more of the existing onsite shallow irrigation bores.

⁸ <https://www.legislation.govt.nz/secondary-legislation/pco-drafted/2022/168/en/latest/#LMS698021>

⁹ <https://www.taumataarowai.govt.nz/drinking-water-suppliers-and-operators/for-drinking-water-suppliers/ways-to-comply/drinking-water-quality-assurance-rules>

3. A source via new shallow bores within the SMA areas.

However, we consider there are significant disadvantages for all of the potential options above. Options 1 and 2 would need additional separate reticulation systems around the majority of the subdivision area, while Option 3 will require a very large number of new shallow irrigation bores (likely 10 or more) to provide a source to all the SMA areas and the polo field. All options will significantly increase the infrastructure requirements and place additional maintenance and operational demands on WDC in the future.

The irrigation demand for the polo field and SMAs is a relatively small proportion of the subdivision demand (12 % of the total volume demand) and therefore only a small percentage of the treated water would be used for irrigation. Therefore, we don't consider a separate irrigation supply is an efficient option, taking into account the substantial additional infrastructure and maintenance requirements.

The use of a shallow supply for irrigation purposes will also offset some (albeit a small amount) of the drawdown interference and stream depletion environmental benefits of replacing a large shallow irrigation take onsite with a deep community supply take.

7.0 Potential to Source Groundwater Supply from the Existing Supplies for Rangiora and Kaiapoi.

The Carter Group proposal is to drill new deep bores on the site of the proposed subdivision at Ōhoka to provide for community drinking-water supply purposes. The total demand is up to 43.5 L/s and 474,636 m³/year for the subdivision, as per Table 6 of the PDP Groundwater AEE report. This demand is intended to provide n + 1 redundancy for the subdivision and the existing township, and it is expected that up to five water supply bores may be required to provide this demand.

The assumption that up to five new bores will be required is based on the existing performance of deep WDC Ōhoka supply bore BW24/0262. We consider this is a reasonable assumption given the close proximity of this bore to the site but also note the presence of two additional nearby bores (approximately 300 m north or north-east of the proposed subdivision) of similar depth to BW24/0262. These two bores are the same bores discussed in Section 4.6 and which were used as water level observation bores during the 2016 constant rate pump testing in BW24/0262. ECan's database has specific capacity information for these bores, where specific capacity is a bore's reported yield divided by the measured drawdown in the bore at that yield and provides a general indication of bore performance, where higher values of specific capacity represent higher bore performance.

The reported specific capacities for M35/8381 and M35/7701 are 0.9 and 0.68 L/s/m respectively. This compares to 0.41 L/s/m for WDC bore BW24/0262. Following drilling and construction, if any of the new onsite bores have a specific capacity similar to the values for M35/8381 or M35/7701, then a considerably higher yield than 13 L/s may be possible from an individual bore and a lower number of onsite bores may be feasible. For example, a specific yield of 0.9 L/s (as per M35/8381) may theoretically allow for a yield from a single bore of over two times that in BW24/0262. If that could be achieved, then it is possible that less than five bores may be required to provide the required demand.

While we consider a deep groundwater supply for the subdivision is the best option, Beca asked whether obtaining the Ōhoka supply from the existing WDC Rangiora or Kaiapoi community supply schemes may be feasible. While the intended approach is an onsite deep supply, we have carried out some investigation into the Beca query where the results are summarised in the following sections.

The assessments below use the growth forecasts and capacity information reported in the WDC Water Supply Activity Management Plan (AMP)¹⁰. Table 20 of the AMP provides projected average daily and peak daily flows for Rangiora and Kaiapoi for 2024 (when the report was produced), along with projections for 2033, 2043, 2053 and 2073. Our summary of this information is a high-level availability assessment only, to assess whether there could feasibly be available capacity within one or both of the schemes to accommodate the required yield at Ōhoka.

7.1 Rangiora Water Supply

The Rangiora water supply is sourced from six deep artesian bores (between 154.8 and 155.8 m deep) located at Smith Street in Kaiapoi. The water is then piped to Rangiora along Lineside Road. The groundwater take is authorised by resource consent CRC252680 with the following combined limits:

- ✧ Maximum instantaneous rate of 425 L/s;
- ✧ Maximum daily volume of 36,720 m³/day; and
- ✧ Maximum annual volume of 6,328,400 m³/year.

Table 4 below compares the current and projected source capacity against the existing and projected average and peak daily demand derived from the AMP, along with the additional demand sought for the Ōhoka development. The projected daily flow demands from Table 20 of the AMP have been used (converted to daily volumes).

Table 4: Rangiora Water Supply Headroom

Assessment basis	2024	2033	2043	2053	2073	Ōhoka Development
Available primary source capacity	340 L/s (29,376 m ³ /day)	340 L/s (29,376 m ³ /day)	340 L/s (29,376 m ³ /day)	410 L/s (35,424 m ³ /day)	480 L/s (41,472 m ³ /day)	43.51 L/s
Projected average daily flow	7,171 (22,205 headroom)	9,245 (20,131 headroom)	11,059 (18,317 headroom)	12,355 (23,069 headroom)	15,206 (26,266 headroom)	1,300 m³/day
Projected peak daily flow	17,971 m ³ /day (11,405 m ³ /day headroom)	23,069 m ³ /day (6,307 m ³ /day headroom)	27,734 m ³ /day (1,642 m ³ /day headroom)	30,758 m ³ /day (4,666 m ³ /day headroom)	38,016 m ³ /day (3,456 m ³ /day headroom)	3,174 m³/day

Notes:

Green = Capacity to accommodate Ōhoka requirements.

Red = No capacity to accommodate Ōhoka requirements.

Available primary capacity includes the Table 21 Rangiora upgrades of 70 L/s in 2024, 2050 and 2060, added cumulatively to the stated 270 L/s (assuming n+1 redundancy) available primary capacity.

Ōhoka average daily flow assumed to be the annual volume requirement divided by 365 days.

As shown in Table 4, there is more than sufficient primary capacity within the supply for all projected years to meet the projected average demand for Rangiora, while maintaining sufficient additional capacity to meet the average demand for the Ōhoka development. This is demonstrated in Table 1 by the remaining headroom noted in the table, which represents the source capacity less the projected Rangiora demand.

¹⁰ Waimakariri District Council. (2024). Activity Management Plan 2024, Water Supply

In all cases the headroom can accommodate the average demand for Ōhoka given in the last column of the table.

Under peak daily demand conditions, there is expected to be sufficient additional headroom within the available source capacity to meet the projected Rangiora peak demand and the peak Ōhoka demand for most projected years. However, the exception to this is the 2043 projection (highlighted in red), where the source capacity at that time of 29,376 m³/day less the projected peak demand for Rangiora of 27,734 m³/day means the remaining capacity is only 1,624 m³/day. That is not sufficient to accommodate all of the peak Ōhoka demand of 3,174 m³/day at that time. However, by 2053 it appears the primary capacity will be upgraded (additional 70 L/s planned for 2050) and there is sufficient capacity thereafter up to at least 2073.

Further to the above, we note Table 4 indicates that the primary capacity and the peak demand will exceed the consented capacity by 2073 and therefore additional allocation for Rangiora will be required prior to this time. It is also noted that the current annual volume on the Rangiora water supply consent equates to an average daily volume of around 17,388 m³/day. Based on the information in Table 4, this annual volume would still be sufficient in 2072 to accommodate the projected average daily flow from both the existing scheme and the Ōhoka development.

Overall, based on Table 4 there appears to be capacity in the existing Rangiora supply to accommodate average and peak Rangiora demand, in addition to the Ōhoka average and peak demand for most projections. The lack of capacity to accommodate the Ōhoka peak demand at the 2043 projection could be addressed via an earlier upgrade to the source capacity. As per the notes accompanying Table 4, an upgrade between the 2043 and 2053 projections looks to be scheduled for 2050, however the results of this assessment indicate an upgrade prior to 2043 would be required to also meet the demand for Ōhoka.

7.2 Kaiapoi Water Supply

Kaiapoi is supplied by six deep artesian bores located throughout the township operating under multiple consents, with a combined maximum abstraction rate of 472 L/s and combined maximum daily take of 30,788 m³/day¹¹. Four of the consents for Kaiapoi only have instantaneous rate and maximum daily volume restrictions (i.e. no annual volume limit). Therefore, the annual consented capacity has not been factored into the assessment below because it is unknown, but theoretically higher than the required source capacity.

Table 5 summarises the relevant information from the WDC AMP to assesses the capacity of the Kaiapoi scheme to meet projected demand for Kaiapoi and confirm whether there may be remaining capacity to provide for the proposed Ōhoka supply.

¹¹ Waimakariri District Council. (2024). Activity Management Plan 2024, Water Supply

Table 5: Kaiapoi Water Supply Headroom

Assessment basis	Current	2033	2043	2053	2073	Ōhoka Development
Available primary source capacity	325 L/s (28,080 m ³ /day)	325 L/s (28,080 m ³ /day)	395 L/s (34,128 m ³ /day)	395 L/s (34,128 m ³ /day)	395 L/s (34,128 m ³ /day)	43.51 L/s
Projected average daily flow	4,406 (23,674 headroom)	5,875 (22,205 headroom)	6,307 (27,821 headroom)	6,998 (27,130 headroom)	7,949 (21,179 headroom)	1,300 m³/day
Projected peak daily flow	10,973 m ³ /day (17,107 m ³ /day headroom)	14,774 m ³ /day (13,306 m ³ /day headroom)	15,811 m ³ /day (18,317 m ³ /day headroom)	17,366 m ³ /day (16,762 m ³ /day headroom)	19,786 m ³ /day (14,342 m ³ /day headroom)	3,174 m³/day

Notes:

Green = Capacity to accommodate Ōhoka requirements.

Red = No capacity to accommodate Ōhoka requirements.

Available primary capacity includes the Table 21 Kaiapoi upgrades of 70 L/s in 2024 and 2035, added cumulatively to the stated 255 L/s (assuming n+1 redundancy) available primary capacity.

Ōhoka average daily flow assumed to be the annual volume requirement divided by 365 days.

As illustrated in Table 5 above, there is sufficient primary source capacity within the Kaiapoi supply to meet the average daily demand values for Kaiapoi and also accommodate the proposed average demand for the Ōhoka development up to the 2073 projection.

Under peak daily flows, there is also sufficient primary source capacity to accommodate the peak demand requirements for Kaiapoi and the Ōhoka development through to the 2073 projection.

It is noted that while the current daily consented limit of 30,788 m³/day is expected to be sufficient for accommodating peak daily flows for Kaiapoi and the Ōhoka development through to the maximum projected period of 2073, we note the peak source capacity will exceed the consented daily volume limit from 2035 onwards (although this isn't necessarily an issue if the demand does not exceed the current consented limits).

7.3 Overall Assessment of Availability

The information presented above indicates that both the Rangiora and Kaiapoi water supply schemes could mostly supply the expected water demand for their own townships and the Ōhoka development over the long term. However, an earlier than currently scheduled source capacity upgrade may be required for the Rangiora scheme to also accommodate the peak demand for Ōhoka for a period prior to the 2043 projection.

Despite this, a deep groundwater source is the preferred option for the subdivision as the distance from the site to both schemes is many kilometres as confirmed in the following sections. In addition, there are likely to be considerable additional upgrade works required to utilise these supplies at Ōhoka.

8.0 Proximity to Existing Potable Water Supplies

In order to consider where the Ōhoka development could theoretically connect into the existing Rangiora or Kaiapoi potable water supplies, the site location has been plotted against the WDC OpenMaps water-pipe layer¹², which shows the locations of the Council's registered water supply pipes. This indicates that the nearest potable reticulations to the Ōhoka development are:

- ✧ A connection to the 500 mm diameter Rangiora supply main along Lineside Road; or
- ✧ An extension to the Kaiapoi network, most logically via the western side of Kaiapoi (multiple options).

The above options are illustrated in Figure 3, attached. The comparison below is high level based on the mapped alignment of the existing networks and assuming that piping alignment would generally follow existing roads. This assessment has not included detailed engineering assessments around how a connection could be enabled.

8.1 Rangiora Supply - Lineside Road Connection

The Rangiora supply main follows Lineside Road between the Kaiapoi bores where the groundwater is sourced, and Rangiora. From the Ōhoka site, the nearest practical connection appears to be towards the north-east toward Lineside Road where the 500 mm diameter water main is present.

The Lineside Road main location in comparison to the site is shown in Figure 3. As shown, a potential route from the development would be down Mill Road, then heading north-east along Threlkelds Road, then north to Lineside Road via Mulcocks Road. This is around 6.1 km from the development (corner of Bradleys and Mill Roads) not accounting for the existing water supply network within Ōhoka.

8.2 Kaiapoi Network Connection

A connection to the Kaiapoi scheme would require a new main from the site eastward to the existing network in or near Kaiapoi. The mapped Kaiapoi reticulation is more extensive than the Lineside Road main which is a single main, so there may be more flexibility around connection options within this area of Kaiapoi. A route into Kaiapoi would likely involve a similar length main to the Lineside Road option.

The Kaiapoi water supply network location in comparison to the site is shown in Figure 3. As shown, a potential route from the development would be towards the south-east down Mill Road, to the development on the western side of Kaiapoi. Depending on where the final connection would be, this is likely to be at least 6 km from the development (corner of Bradleys and Mill Roads) not accounting for the existing water supply network within Ōhoka.

9.0 Conclusion

Overall, the proposed onsite deep groundwater supply remains the preferred approach for servicing the community drinking-water requirements of the Ōhoka development, including the irrigation of SMA areas and the polo field. New deep bores can be designed, constructed and tested in accordance with best practice and recognised standards and consent conditions can be formulated to ensure this.

The CDWPZ associated with WDC bore M35/5609 currently extends over a large area of neighbouring properties on the western side of Bradleys Road. Once the subdivision is developed only a very small area

¹² https://openmaps-waimakariri.hub.arcgis.com/datasets/5f4aea9450c345d5b22ce13603215772_17/explore?location=-43.363935%2C172.597168%2C14.00

of this land will continue to be within a CDWPZ (provided WDC decide to decommission the shallow backup bore M35/5609).

A minimum sustainable yield of 8 L/s is proposed for any new supply bore within the proposed development site, however higher yields are anticipated for individual bores. Water quality of the proposed deep source is expected to be high and similar to existing WDC bore BW24/0262. Pump testing will be carried out in the bores following construction to confirm the sustainable yield for each bore and estimate aquifer parameters for confirming the drawdown interference and stream depletion assessments set out in the application.

The proposed supply will meet the requirements of the Drinking Water Quality Assurance Rules and the supply will provide water that complies with the Drinking Water Standards for New Zealand.

While supplying Ōhoka from the existing Rangiora or Kaiapoi potable water schemes may be technically possible, those options would require substantial new infrastructure over long connection distances and may require timing changes to future source upgrades. On that basis, an onsite deep groundwater supply is expected to provide a more practical, efficient and resilient long-term water supply solution for the development.

10.0 Limitations

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Carter Group Limited and others (not directly contracted by PDP for the work), including Inovo, Environment Canterbury and Waimakariri District Council. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

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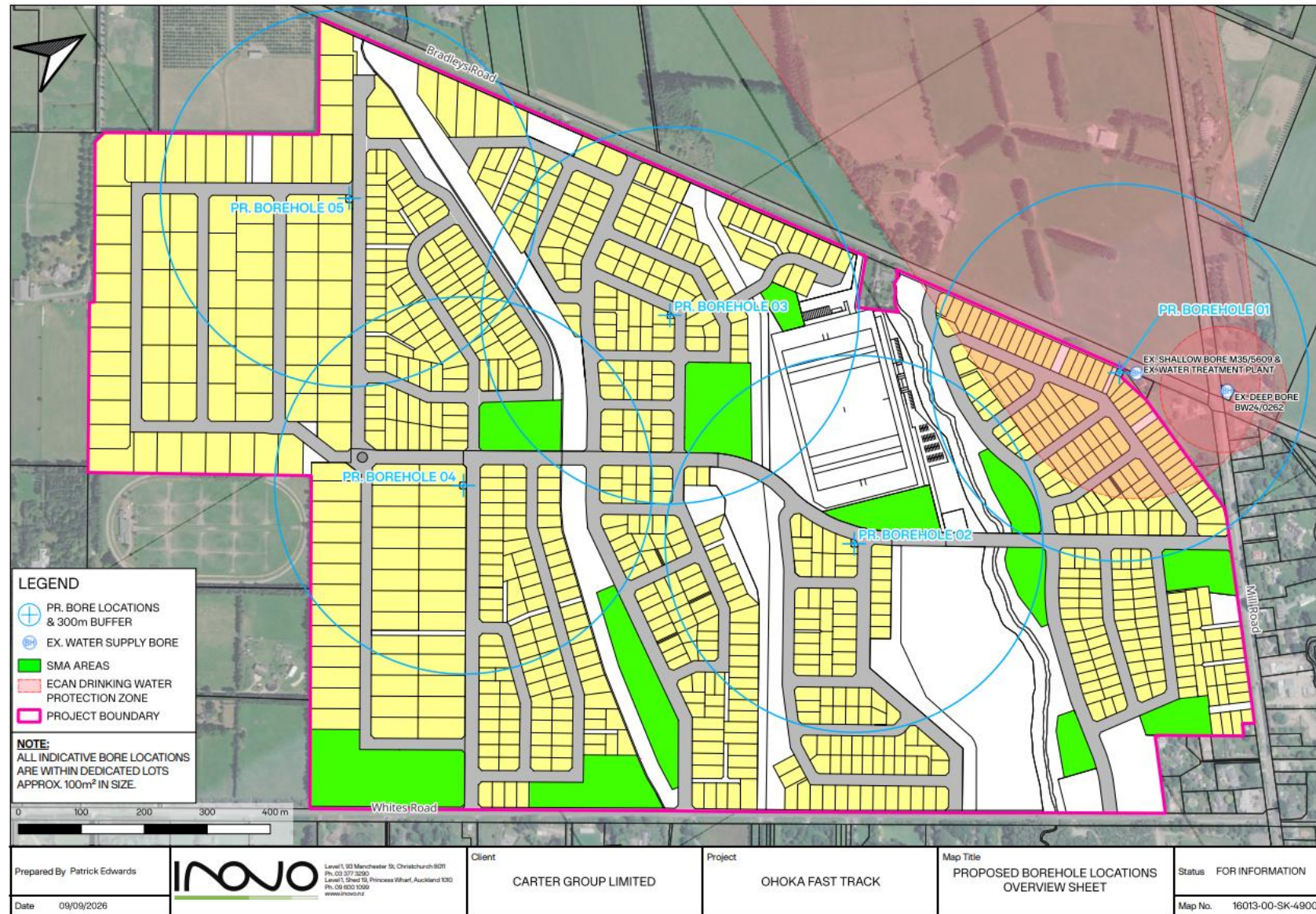


FIGURE 1: INDICATIVE LOCATIONS OF PROPOSED COMMUNITY SUPPLY BORES (SOURCED FROM INOVO)

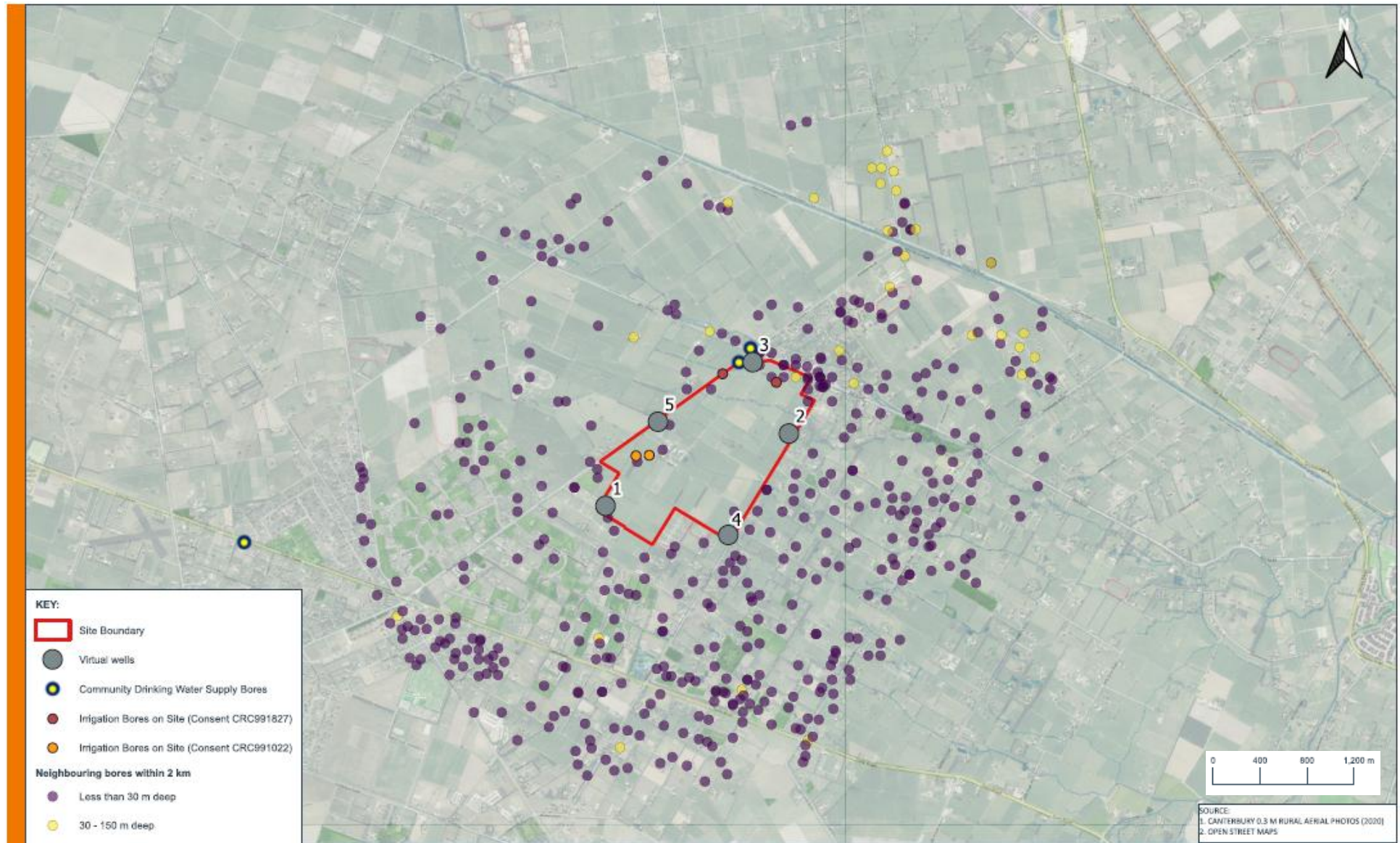
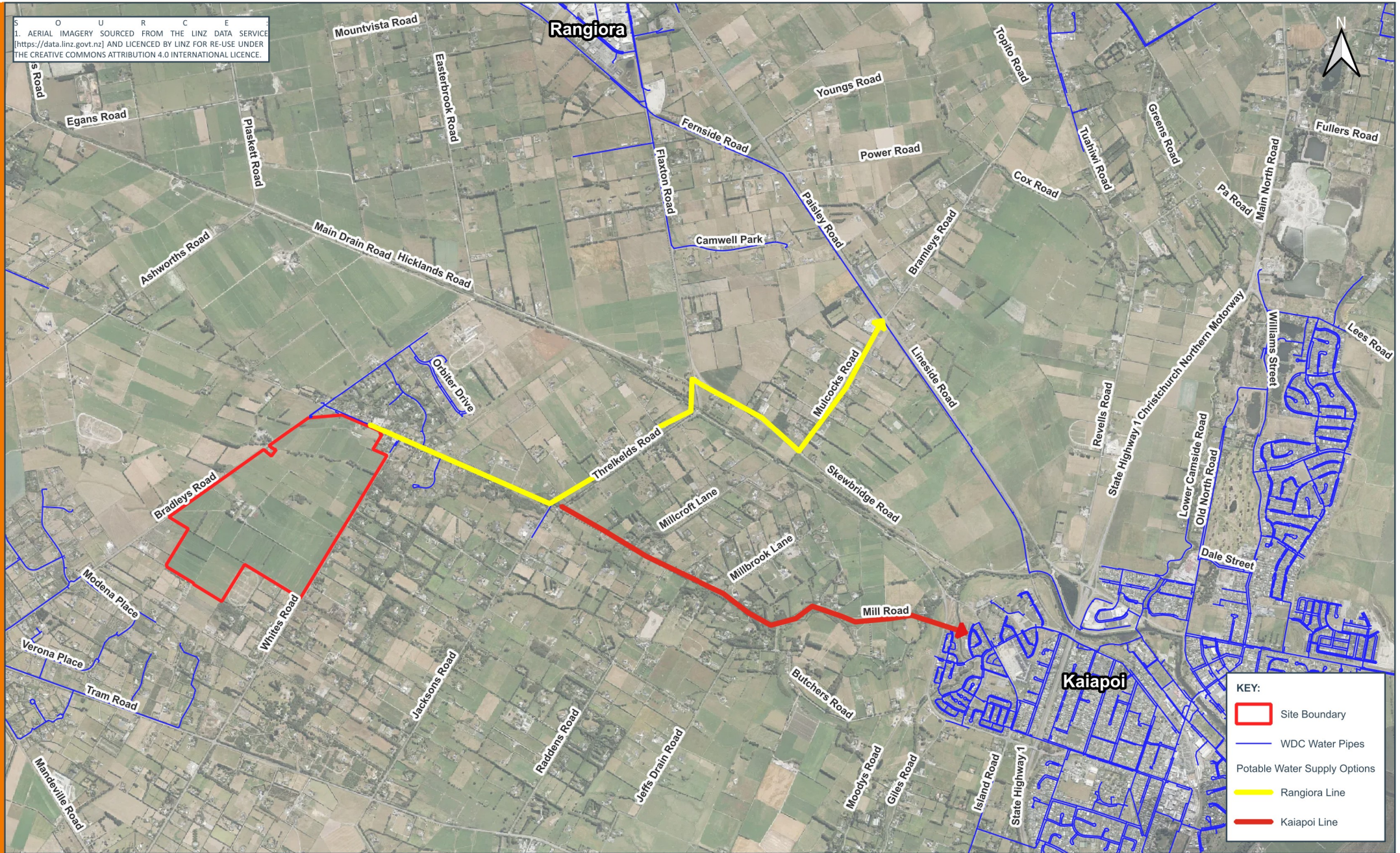


FIGURE 2: LOCATIONS OF FIVE DRAWDOWN INTERFERENCE ASSESSMENT SITES (ORIGINAL SOURCE IS FIGURE 9 OF PDP GROUNDWATER AEE)

S O U R C E
1. AERIAL IMAGERY SOURCED FROM THE LINZ DATA SERVICE
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METRES
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REV. A

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FIGURE

FIGURE 3: POTABLE WATER SUPPLY OPTIONS

PROJECT

OHOKA FAST TRACK