Before an Independent Hearings Panel
Appointed by Waimakariri District Council

under: the Resource Management Act 1991

in the matter of: Submissions and further submissions on the Proposed Waimakariri District Plan

and: Hearing Stream 12: Rezoning requests (larger scale)

and: **Carter Group Property Limited**
(Submitter 237)

and: **Rolleston Industrial Developments Limited**
(Submitter 160)

Statement of evidence of Tim McLeod (Infrastructure) on behalf of Carter Group Limited and Rolleston Industrial Developments Limited

Dated: 5 March 2024

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STATEMENT OF EVIDENCE OF TIM MCLEOD ON BEHALF OF CARTER GROUP LIMITED AND ROLLESTON INDUSTRIAL DEVELOPMENTS LIMITED

INTRODUCTION

1 My full name is Timothy Douglas McLeod. I am a Senior Civil Engineer at Inovo Projects Limited.

2 My qualifications include a Bachelor of Natural Resources Engineering from Canterbury University (BE[NatRes]), and I am a Chartered Member of Engineering New Zealand (CMEngNZ) and Chartered Professional Engineer (CPEng).

3 I have over twenty-eight years' experience as a Civil Engineer working on a range of infrastructure and land development projects.

4 I am familiar with the Submitters' request to rezone land bound by Mill Road, Whites Road, Bradleys Road (the *Site*).

5 I was involved in private plan change 31 (*PC31*) to rezone this land under the operative District Plan.

CODE OF CONDUCT

6 Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the Code of Conduct for Expert Witnesses contained in Part 9 of the Environment Court Practice Note 2023. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

7 My evidence provides an assessment of the infrastructure requirements for the rezoning request.

8 In preparing my evidence, I have reviewed:

8.1 The Outline Development Plan (*ODP*);

8.2 Statement of Evidence (stormwater / wastewater) prepared by **Mr Eoghan O'Neill** of Pattle Delamore Partners Ltd;

8.3 Statement of Evidence (Water Supply) prepared by **Mr Carl Steffens** of Pattle Delamore Partners Ltd;

8.4 Statement of Evidence (Flooding) prepared by **Mr Ben Throssell** of Pattle Delamore Partners Ltd;

8.5 Further submissions relevant to my expertise relating to the rezoning of the Site; and

8.6 The relevant documents from PC31.

9 I have visited the Site and have been involved in the planning and observation of various stages of Site investigation work carried out to date so, I am familiar with the Site characteristics.

SUMMARY OF EVIDENCE

10 My evidence demonstrates that:

10.1 A new wastewater reticulation system can be constructed to collect wastewater from within the development and convey to a centralised pump station, with a dedicated rising main required to convey the full development flow to the Rangiora wastewater treatment plant.

10.2 New water supply bores can be developed within the Site to provide sufficient potable water for the needs of the future residential properties. This can be supported with the transfer of existing water-take consents to Council or potentially a new community water supply take.

10.3 The Site can be provided with adequate "on-demand" potable water by development of a new water supply headworks for treatment, storage and pumping. This could be integrated with the existing Ōhoka water supply network.

10.4 Stormwater treatment and attenuation can be provided on-site to mitigate the effects of residential development on stormwater quality and attenuate run-off to pre-development levels.

10.5 Flood conveyance across the Site can be managed to ensure there is less than minor effect on neighbouring properties and proposed development areas.

10.6 Power and telecommunication network can be extended or upgraded to supply the proposed development.

REZONING REQUEST SUMMARY

11 The majority of the Site is located at 535 Mill Road, and is roughly trapezoidal in shape bounded for the most part by Whites, Mill and Bradleys roads, Ōhoka. The Site is typically gently sloping (1:180) to flat, sloping from west to east towards Whites Road. The current land use of the Site is a dairy farm and cattle breeding with the farmhouse and farm buildings in a cluster towards the western corner and an additional cluster of farm buildings near the boundary of 531 Mill Road. Open paddocks predominate, but the Site comprises a variety

of mature trees and shelterbelts. A relatively high-water table extends over the Site and several waterways, including Ōhoka Stream and the Ōhoka South Branch, flow in an easterly direction across the Site. There are multiple land drains within the Site that drain existing springs or seeps or straighten natural overland flow paths across the Site, and part of the WDC water race network (R3J-4 branch) passes along the southwest boundary. There are Transpower 66kV overhead transmission lines crossing the western part of the Site.

12 The proposed residential development will comprise of up to 850 residential units, a potential primary school and a potential retirement village. If a school is not developed, approximately 42 additional residential units could be developed. The new commercial area (Local Centre Zone) will provide for approximately 2,700 m² of commercial floor space as well as car parking.

13 The majority of the Site is currently covered in a variety of dry land and irrigated pasture and has predominantly been used for dairy farming for the last 30 years, and prior to that a mixture of dairy, livestock and arable farming. There are 2 existing houses on the 152.5 ha main block along with milking sheds and ancillary farm sheds. Vegetation and landcover across the Site is predominantly open grass paddocks, with shelter belts and vegetation alongside fences, land drains and watercourses or surrounding existing buildings. It is understood there are five small properties each with a dwelling and potentially ancillary sheds on the remaining lots within the proposed Site.

WASTEWATER

14 Ōhoka village is currently serviced by the Mandeville Area Wastewater Scheme which is included as part of the wider Waimakariri District Council (*WDC*) Eastern Districts Wastewater Scheme (*EDS*). The Mandeville Area scheme principally consists of the Bradleys Road Pump Station and a Ø200mm uPVC rising main which conveys wastewater from the Mandeville and Ōhoka catchments to the Rangiora Wastewater Treatment Plant (*WWTP*). Existing dwellings in the Mandeville catchment area to the south are serviced by Septic Tank Effluent Pumping (*STEP*) systems which pump wastewater to the Bradleys Road pump station. Existing dwellings in the Ōhoka area north of the Site are typically serviced by individual low-pressure sewer pump stations which discharge directly into the Mandeville-Ōhoka rising main or via a low-pressure sub-main connection in Bradleys Road. The Mandeville-Ōhoka rising main runs some 11.2km to the Rangiora WWTP to the southeast of Rangiora.

15 The Rangiora WWTP is part of EDS where incoming wastewater from Rangiora and the surrounding district is treated and then pumped to the Kaiapoi WWTP for tertiary treatment before discharge via ocean outfall. The Rangiora WWTP has a capacity of approximately 24,000 Equivalent Persons (*EP*) and currently services a population of approximately 23,000 EP. Planned upgrades to the inlet headworks

will increase the WWTP capacity to approximately 33,000 EP. The Rangiora WWTP has capacity to accept additional flows from the proposed Site (approximately 7% of the Rangiora WWTP treatment capacity). Further extension of the WWTP has been identified and funded as described in the WDC Wastewater Activity Management Plan, with design and consenting works programmed for the forthcoming years to allow for anticipated population growth within the district. This would further ensure the Rangiora WWTP can accommodate demands arising from this requested rezoning.

16 Wastewater collection and conveyance within the Site could be provided by construction of a new conventional gravity network or low-pressure sewer network, or a combination of both. Waimakariri District Council wastewater policy states gravity sewer reticulation is preferred for residential development, but that low-pressure sewer is considered suitable for lower housing density areas or where ground conditions such as high groundwater or liquefaction risks make conventional gravity systems unfavourable.

17 A low-pressure sewer system (*LPS*) with individual pump stations at each dwelling connected to a common rising main in each street is a feasible option for part or all of the proposed development. A LPS system would convey wastewater to a centralised pump station before pumping to the Rangiora WWTP. The potential for infiltration and inundation of LPS networks during high rainfall events or high groundwater levels is significantly reduced when compared to conventional gravity networks as the system is a sealed pressure pipe network. Additionally, there are no surface entry points except for gully traps at dwellings, effectively removing the peak wet weather inflow from the system. This reduces overloading of downstream infrastructure such as pump stations and the WWTP.

18 Due to the relatively flat site topography and high groundwater levels across the Site, conventional gravity sewer drainage would require multiple pump stations or lift stations to convey wastewater to an end-point pump station before pumping to the Rangiora WWTP. Each lift station and vented manhole presents opportunity for stormwater to enter the wastewater system in the event of localised flooding. Conventional gravity systems with an end-point pump station and rising main discharge require additional storage and oversized infrastructure due to the larger volume of wastewater in the system resulting from inflow and infiltration during storm events.

19 Regardless of the type of system utilised, there are viable solutions for providing a reticulated wastewater network to the Site. The type of system and details such as wet weather storage volume is typically determined at the detailed design stage in consultation with Council who will ultimately take over ownership and operation of the network.

20 A new dedicated rising main from Ōhoka to the Rangiora WWTP is proposed to service the full development within the Site. The new rising main could follow a similar alignment to the existing Mandeville-

Ōhoka rising main along Mill Road, Threlkelds Road and Flaxton Road, and then through Council owned land to the Rangiora WWTP, a distance of approximately 7.1km. For the majority of the route the pipeline can be installed by conventional trenching within the road berm or, if necessary, within the road carriageway where existing buried services within the berm area are congested. The main physical obstacles to overcome for construction of the new rising main are crossings under Lineside Road, Main North Rail Line, Flaxton Road, Fernside Road roundabout, Cust Main Drain, and Mill Road. Conventional construction methods such as directional drilling, pipe ramming or pipe jacking, can be used for the installation of pipelines below existing obstacles with minimal disruption or environmental impact.

21 There is some spare capacity in the existing Mandeville-Ōhoka rising main that could be utilised in the short-term until such time as a dedicated rising main for the Site is constructed. In the early stages of development, low wastewater flows generated by only a few occupied houses results in long residence time for wastewater held at pump stations and in rising mains, potentially leading to septicity and issues with foul odours. There would be benefits to utilising any spare capacity in the existing Mandeville-Ōhoka rising main until such time that switch-over to the dedicated rising main can occur when sufficient flows are generated. Utilisation of this spare capacity would be subject to agreement with WDC on the number of lots and timing of when the new rising main would need to be commissioned.

22 Foul odours, mainly attributed to the release of Hydrogen sulphide (H_2S) gas and other volatile organic compounds, can be encountered in gravity reticulation systems with poor ventilation, at pump station wet wells, at locations where pressure mains discharge into gravity networks, and at air-release valves on pressure mains. Odour issues in urban wastewater systems are typically managed using biofilter units, bio-scrubbers (bio-trickling filters), activated-carbon filtration units, and wet-air or chemical scrubbers. The sizing of odour control units is normally completed during the detailed design stage, taking into consideration the size of each upstream catchment, expected wastewater residence time, air displacement or extraction rates, and the septicity of the discharge. Passive activated-carbon filters could be utilised to manage potential odour nuisance at air-release valves on the rising main if required.

STORMWATER

23 The Site has limited existing stormwater infrastructure. Runoff from the Site generally flows via sheet flow to various land drains and natural streams crossing the Site including the Ōhoka Stream, Ōhoka South Branch, and South Drain. A land drain along the west side of Whites Road links the various land drains crossing the Site and culverts passing under Whites Road. These culverts discharge into Open Public Drains downstream of Whites Road as shown on the WDC Ōhoka Rural Drainage Scheme attached as **Appendix 1**.

24 Based on evidence gathered to date the groundwater across the Site is typically shallow and subject to seasonal fluctuations. Groundwater at the Site is estimated, using the record from bore M35/0596, to be an average of 0.64 m below ground level (*bgl*) with the highest recorded groundwater level at 0.14 m bgl (June 2018). Seasonal fluctuations in this bore are relatively small, commonly being 0.5 – 0.8 m. As expected, groundwater levels are generally highest in winter/spring and lowest in summer/autumn. It is noted that bore M35/0596 is close to spring M35/7485 (mapped location is 20 m away), and so may be in an area of the Site that has particularly high groundwater levels.

25 As noted in the evidence of **Mr O'Neill**, the extensive test pitting undertaken by Tetra Coffey Ltd at the Site in May 2021 encountered a range of groundwater depths. The shallowest groundwater level recorded during this testing was 1.15m bgl close to Spring M35/7485, the deepest groundwater was encountered at 1.85m bgl at the Mill Road end of the Site. The recorded water depth at monitoring bore M35/0596 at the time of these investigations was approximately 0.9m bgl.

26 Detailed knowledge of maximum ground levels across the Site will be crucial to inform the design depth and location of stormwater detention ponds at the Site. The stormwater concept design by PDP has conservatively assumed that stormwater detention basins will be constructed with minimal excavation (less than 0.2m below existing ground level) to avoid interception of groundwater. Detailed groundwater monitoring at multiple locations across the Site will be commissioned prior to consenting stage to inform the detailed design of these detention basins and ensure no interception of groundwater occurs.

27 Conceptual design of the stormwater management areas has been provided by Pattle Delamore Partners Ltd (*PDP*) as described in the evidence of **Mr O'Neill** and summarised below:

27.1 Attenuation and flood storage up to the 2% AEP (50-yr ARI) can be managed within the Site by the use of basins, compensatory storage, and rainwater tanks. Stormwater detention basins will be designed to be constructed along the fall of the Site with minimal excavation to ensure storage can be provided without intercepting highest groundwater at the Site. Instead of creating ponding volume by excavation, low bunding can be formed making use of the fall across the Site to create ponding volume to retain floodwaters.

27.2 Water quality treatment from residential areas and the retirement village/school area can be predominantly treated by means of filtration via high-infiltration rate raingardens or swales and bioscapes which will be designed to treat 90% of rainfall runoff from the Site. Raingardens and bioscapes, being approximately 1m deep, will likely be constructed into seasonal

groundwater. They will be fully lined so as to avoid any active drainage of groundwater that may be intercepted at their base.

27.3 Large lot residential stormwater runoff to be treated by means of swales, high-infiltration raingardens and bioscapes.

27.4 Stormwater runoff from commercial area to be treated by means of rain gardens or proprietary filtration devices.

27.5 All stormwater treatment infrastructure will be designed to limit potential groundwater take to within permitted activity status under requirements of the LRWP.

28 Primary stormwater runoff from the development areas will be collected via swales and an underground pipework into a series of raingardens, bioscapes and proprietary treatment devices. Once treated, stormwater will be conveyed via underground pipework into storage basins and ultimately into streams/drains.

29 Stormwater conveyance and treatment will be managed within internal catchments between the various drainage channels and natural streams crossing the Site. Stormwater flows from upstream of the Site to downstream of the Site will be provided by way of the three main formalised flow path corridors through the proposed development.

30 Controlled outlets on stormwater basins will be utilised to ensure peak discharge rates from the development are equal to or less than the peak pre-development flow rate. The remaining volume can be detained within SMAs and released over an extended period of time.

GROUNDWATER INTERCEPTION

31 In-ground infrastructure such as wastewater and stormwater pipe trenches, swales, raingardens/bioscapes, and road pavements have the potential to intercept seasonal high groundwater in parts of the Site. This has the potential to divert or drain shallow groundwater which could cause localised wet areas or ponding, saturate stormwater management infrastructure, or divert water away from natural springs.

32 The potential for inadvertently intercepting and diverting shallow groundwater can be mitigated by using low permeability backfill material or water stops in trenches, maintaining minimum buffer distances to springs, and using stabilised pavement construction techniques.

33 Detailed groundwater investigations will be conducted to understand seasonal variation in groundwater levels across the Site so that the detailed designed of in-ground infrastructure can be developed to account for this.

UNDERDRAINAGE

34 Underdrainage for road construction and service trenches is currently a potential consenting issue faced by all land developers and local councils in Canterbury. Underdrainage refers to subsoil drains installed at, or slightly below, subgrade level to lower the groundwater table locally and ensure the road subgrade and pavement materials are in a drained condition.

35 Underdrainage is not always required where subgrade materials consist of sandy gravels which are not drastically affected by moisture content or high groundwater levels. Alternative pavement construction techniques such as increased gravel thickness, use of geotextiles, cement stabilisation, or rigid pavement construction (concrete) can be used if required to avoid the potential consenting issue for underdrainage (related to consumptive takes of groundwater).

FLOOD RISK

36 The Site has the potential to be flooded from internal stormwater runoff or overland flow from the northwest of the Site due to stormwater runoff from rural land or groundwater resurgence.

37 The potential flooding from internal stormwater runoff can be addressed with the proposed stormwater management systems including attenuation and depression storage within the development area. The proposed roads will be designed to also act as overland flow paths for events exceeding the capacity of the stormwater system.

38 The potential for flooding from overland flow from upstream and the impact of the proposed development on neighbouring properties has been assessed as described in the evidence of **Mr Throssell** of PDP. In his evidence **Mr Throssell** describes the flood modelling and validation process, and the impact of the development predicted by the model results. In his conclusion he notes that the flood modelling shows:

38.1 that conveyance of floodwaters through the Site is the main issue that needs to be solved from a flood effects lens. The most effective mitigation is to ensure development is minimised in areas where the existing conveyance of floodwaters is significant;

38.2 that the PDP flood model demonstrates that there is a viable subdivision layout which minimises development in areas of existing flood conveyance. This layout ensures the effects of the proposed subdivision on flood levels will not exceed 20 mm for any habitable building footprint;

38.3 that Ōhoka is prone to low hazard flood events, similar to those experienced in June 2014, July 2022 and July 2023. The

stormwater solution within the Site will provide mitigation of any additional stormwater generated by the Site for events of these magnitudes; and

38.4 for more significant events, modelling of the 200-year event shows the flood hazard is still low for areas south of Mill Road/downstream of Whites Road and moderate for areas north of Mill Road. The PDP flood model predicts limited increases greater than 10mm for areas north of Mill Road and no increase greater than 20mm for habitable dwellings elsewhere within the PDP model.

39 I agree with the conclusions of **Mr Throssell** and am of the view that appropriate flow conveyance through the Site can be incorporated into the Site layout design. Further detailed flood modelling including integration of primary and secondary (overland) flood models would be undertaken at the detail design stage to confirm the impacts of flooding are less than minor and that appropriate freeboard requirements for new development areas can be provided. Recent advances in flood modelling software and computing power make this process a normal prerequisite at subdivision detail design stage.

POTABLE WATER

40 The Site is not currently serviced by reticulated water supply, and a new potable water source (or sources) and reticulation network will be required for the proposed development area. An on-demand reticulated water scheme is proposed for the Settlement Zone, with supply to the Large Lot Residential Zone restricted to 2m³/day in line with WDC's current policies regarding water servicing. Assuming around 700 residential connections with average daily demand of 1m³/day/connection (on-demand) and 140 large lot residential lots with average daily demand of 2m³/day/connection (restricted), the estimated daily water demand is 980m³/day. Therefore, the estimated annual water take for the development is 980 m³/day × 365 days/year × 1.15 = 412,000 m³/year (including a 15% allowance for growth, deviation from average water use, and leakage).

41 The Site has a number of existing wells that are currently consented for irrigation use, including consent CRC991022 (which permits a total take of 4,968m³/day or 1.81 million m³/yr) and CRC991827 (which permits a total take of 3,612m³/day subject to flow in the Ōhoka Stream). It is proposed that consent CRC991022 is transferred to WDC for reallocation for use as a community drinking water supply.

42 In his evidence, **Mr Steffens** of PDP describes the expected bore and aquifer performance, well interference on neighbouring bores and stream depletion effects, and consenting pathways for development of new community supply bores within the Site. I concur with the conclusion of **Mr Steffens** evidence that:

42.1 the available information indicates it is viable to establish a deep community supply at the Site, with an estimated total of four new bores providing adequate redundancy, assuming that the performance of any new bores is similar to that of existing community supply bore BW24/0262;

42.2 the preliminary assessment suggests that well interference and stream depletion effects are estimated to be less than minor and it is reasonable to assume that effects of a deep supply source in the majority of neighbouring bores in the area (mostly shallow) will be less than that which currently occurs via abstraction from the onsite shallow irrigation bores. Therefore, potential interference effects, are not likely to prevent consenting of new public water supply bores;

42.3 at the resource consenting stage Site specific pumping tests and an assessment of environmental effects will be required to support the resource consent application which is typical for all groundwater take applications; and

42.4 over-allocation of groundwater in the area is ultimately not a significant concern because there is a pathway in the Canterbury Land and Water Regional Plan for consenting of groundwater for community supply even when allocation volumes are exceeded.

43 Assuming water is drawn from a similar depth as the existing Ōhoka No. 2 well (approximately 77 m), then the only water treatment required will be ultra-violet (UV) disinfection, chlorination and pH correction to meet Drinking Water Standards. Extra filtration or treatment to remove iron or manganese is unlikely to be required at this location. A reservoir will be required at the headworks site to meet storage requirements including emergency storage in case of outages. A schematic of the principal water sources, treatment and storage is presented in **Appendix 2**.

44 The two existing Council-owned sites at 336 Bradleys Road (235 m²) and 566 Bradleys Road (corner of Bradleys Road-Mill Road intersection, 287 m²) do not have sufficient land area available for the headworks required to supply water to the Site such as reservoir, pump station and treatment plant. A new site of approximately 1,000 m² in area would be required within or near the Site for the water supply headworks, plus up to 4 separate sites throughout the Site for the development of deep bores for community water supply.

45 The new water supply scheme could be standalone or integrated with the existing Ōhoka water supply scheme, and additional work to understand which option would provide the most resilient and cost-effective solution is required. This design work is typically carried-out at subdivision design stage in consultation with Council's engineers. A schematic diagram outlining how the existing Ōhoka network might

be incorporated into the new scheme for the Site is shown on the schematic included as **Appendix 2**.

46 The details of the reticulation design and hydrant locations to accommodate peak demand including fire-fighting demand will be designed in accordance with the WDC ECoP and SNZ/PAS 4509:2008 and can be addressed at the engineering approval stage through the resource consent process.

EARTHWORKS

47 Bulk earthworks design will be determined by providing overland flow paths along roads and existing watercourses, and achieving 1:500 (absolute minimum) grade across residential sections towards road frontage. To avoid carting material off-site earthworks will be designed to achieve a cut/fill balance across the Site where possible.

48 All earthworks on residential lots and roads will be carried out in accordance with principles outlined on the Environment Canterbury's Erosion Sediment Control Toolbox to minimising the adverse effects of erosion, sedimentation and dust-to-air emissions during construction.

POWER AND TELECOMMUNICATIONS

49 Mainpower (electricity supplier) have confirmed that there is sufficient capacity within their high voltage network to supply the proposed development. Network upgrades to existing zone substations at Swannanoa or Kaiapoi and the associated high voltage distribution network to service the Site can be completed in time to meet the expected increase in load from the proposed development.

50 The existing trunk fibre network in Tram Road can be extended to service the Site. Broadband fibre for telecommunications would be provided to all new allotments to industry standard.

CONCLUSION

51 In summary, already planned infrastructure upgrades or new infrastructure constructed as part of the development of the Site can provide for the infrastructure needs, including Three Waters infrastructure, for the proposed rezoning request. The required infrastructure upgrades will be practicable to develop the Site in accordance with the proposed zoning.

52 Overall, I am of the view that the proposed rezoning request can be supported from an infrastructure perspective.

Dated: 5 March 2024

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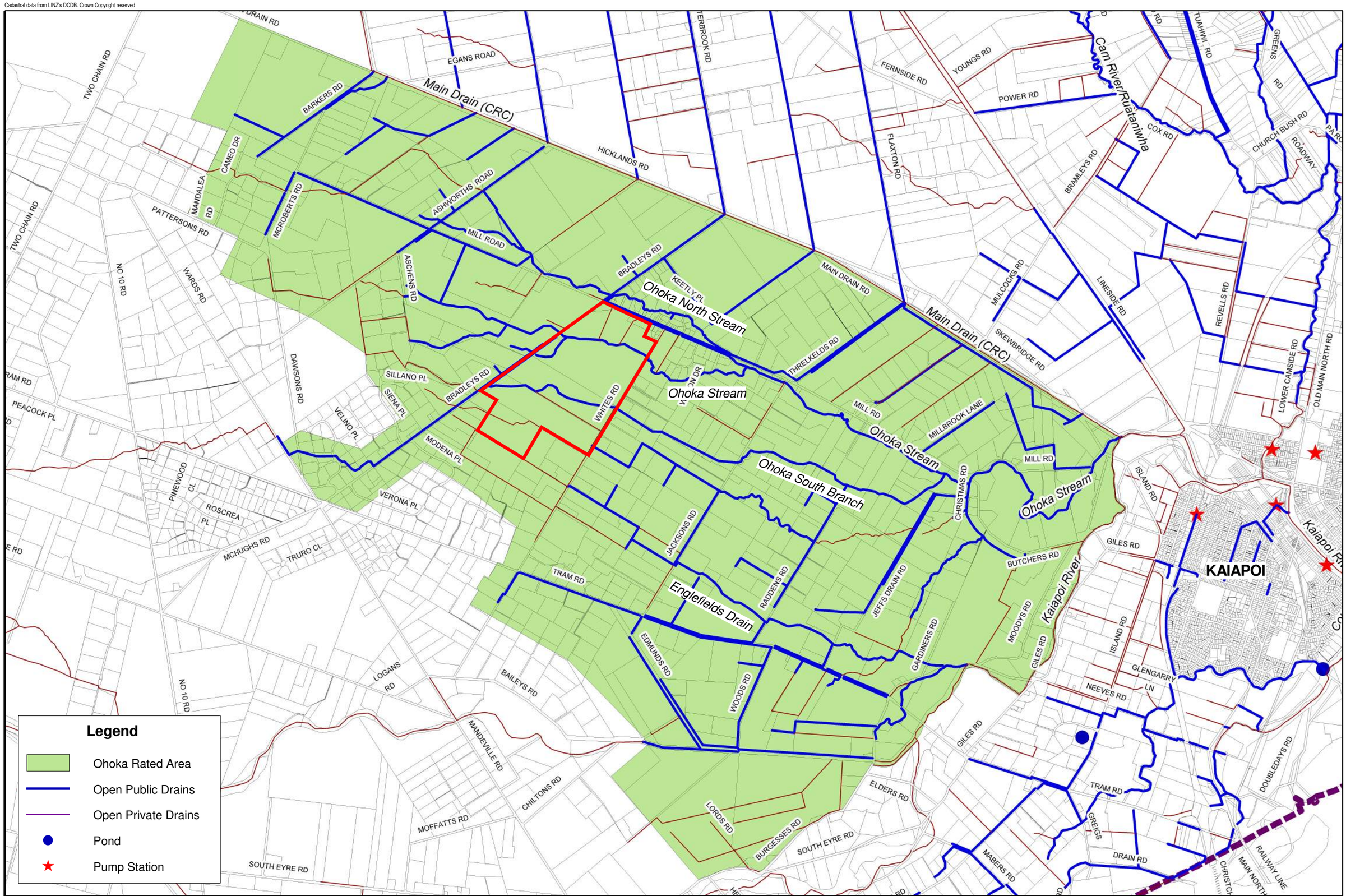
Tim McLeod

APPENDIX 1 – WDC ŌHOKA RURAL DRAINAGE SCHEME



	ISSUE	AMENDMENT	DRAWN	CHKD	APPD	DATE	(A3) SCALE 1:35,000	SHEET TITLE	PROJECT TITLE	PLAN No
WAIMAKARIRI DISTRICT COUNCIL technical services	A	FIRST ISSUE	HMF	SAS	MB	NOV-08	NORTH	OHOKA RURAL	RATED DRAINAGE AREA BOUNDARY	2938

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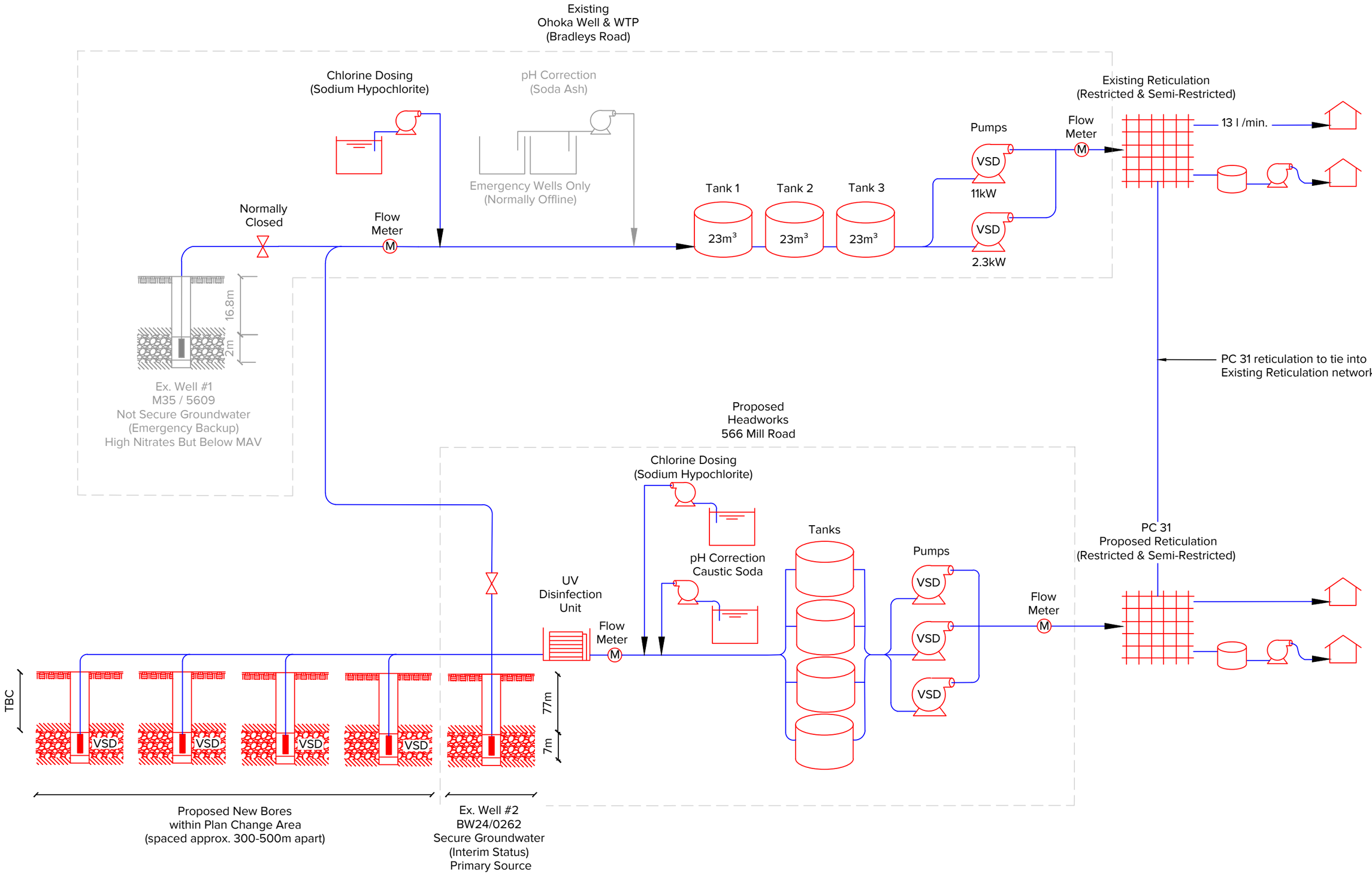
APPENDIX 2 – WATER SUPPLY SCHEMATIC



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A	PRELIMINARY ISSUE	MHS	15.06.23

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Approved: TMcL
Date: 15.06.23

Client: **ROLLESTON INDUSTRIAL DEVELOPMENTS LTD.**

Project: **PLAN CHANGE 31 MILL ROAD, OHOKA**

Drawing Title: **PROPOSED WATER SUPPLY SCHEMATIC**

Status: **FOR INFORMATION**

Drawing No.: **14895-M-650**

Rev: **A**

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