BEFORE THE INDEPENDENT HEARINGS PANEL

UNDER	the Resource Management Act 1991 (RMA)
IN THE MATTER	Of the Far North Proposed District Plan - Hearing 15D: Rezoning Kerikeri-Waipapa

EVIDENCE IN CHIEF OF JOHAN PETRUS EHLERS FOR KIWI FRESH ORANGE COMPANY LIMITED

INFRASTRUCTURE

16 JUNE 2025

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WYNN WILLIAMS

INTRODUCTION

1 My full name is Johannes Petrus Ehlers.

2 I am a Director at Infīr Limited, a civil engineering consultancy specialising in land development civil design and construction monitoring as well as construction project management.

3 I hold a Bachelor's degree in Civil Engineering and an Honours degree in Construction Project Management from Pretoria University. I am an International Professional Engineer / APEC Engineer and Chartered Professional Engineer, specialising in civil engineering.

4 I have been in private practice since 2015, owning and managing Infīr. Infīr has successfully completed many residential and commercial developments. Prior to that I was employed by Napier City Council for twenty years, where I was engaged in a number of roles including design engineer, manager of the water supply system, and manager of the team that assessed applications for subdivision resource consents. I also led the team that applied for a wastewater discharge consent for Napier, and was responsible for the design and construction of the Awatoto wastewater treatment plant.

CODE OF CONDUCT

5 While the resource consent application is not before the Environment Court, I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023 and agree to comply with it.

6 I confirm that the topics and opinions addressed in this statement are within my area of expertise except where I state that I have relied on the evidence of other persons. I have not omitted to consider materials or facts known to me that might alter or detract from the opinions I have expressed.

SCOPE OF EVIDENCE

7 I have been engaged by Kiwi Fresh Orange Company Limited (**KFO**) to provide independent expert evidence in relation to KFO's submission on Hearing 15D: Rezoning Kerikeri-Waipapa on the Proposed Far North District Plan (**FNPDP**). KFO seeks a live urban zoning of its land between Kerikeri and Waipapa (**Site**), comprising a mix of general residential, mixed urban and natural open space (**Proposal**). KFO's Site is currently proposed to be zoned for Rural Production.

8 The purpose of this evidence is to summarise the Servicing Report (**SR**) that I prepared dated 14 October 2022, which outlines options for servicing a residential development on the Site and to explain the work completed since its drafting.

9 My evidence also responds to the new information contained in Beca's Technical Memorandum (**TM**) dated 6 February 2025 (describing the three waters planning inputs to Te Pātukurea, the Kerikeri Waipapa Spatial Plan and Hybrid Scenario appraisal) and Beca's Kerikeri-Waipapa 3-Waters Capacity and Modelling Assessment (**CMA**) dated 18 October 2024.

Wastewater servicing

10 The SR and CMA both identify wastewater treatment and discharge of treated effluent as key issues for development of the Site (and providing for housing growth in Kerikeri and Waipapa generally).

11 The SR considered integration with the public Kerikeri / Waipapa wastewater system and noted that extensions would be required to the municipal system to service the Site. Table 6 in the SR identified trigger points for a staged development of a wastewater system for the development. In summary:

(a) On-site treatment and disposal with 50% reserve area for the disposal field can be provided up to and including "Time 4" as defined in the SR. This level of development consists of 840 dwellings and 5 hectares of commercial development serviced by an on-site treatment plant and a 22-hectare disposal field and 11-

hectare reserve area to enlarge the disposal field size if necessary. Wastewater can be treated to a standard where the hydraulic load controls the size of the disposal field. The soil classification is predominantly clay, with basalt 4m to 6m deep. Table 35 from GD06 (which generally corresponds with other design standards) limits land application methods in clays to subsurface and surface irrigation, with some capacity for beds and trenches in light non-swelling clays. An application rate of 3mm per day has been used to calculate the level of development that can be serviced by a 22-hectare disposal field.

(b) A discharge consent will be required for a disposal field. Provided that the disposal field complied with design standards, consenting is not expected to be problematic because there are large areas of land on site that are distant from water bodies and neighbouring properties.

(c) Wastewater disposal could be switched over from on-site treatment and disposal to an off-site option when the public system is ready.

12 The CMA identifies options to upgrade the wastewater system capacity including the capacity of wastewater treatment plants. The CMA used 'Blue Sky' growth scenario figures of 4,690 additional dwellings by 2053. It identified various upgrades that would be required to the wastewater network, generally in the medium term (2040s). No fatal flaws were identified with providing the required capacity in the future. This capacity will be available for any development that can discharge to the treatment plant. I agree with Beca's assessment.

13 The Site can be connected to the proposed upgraded system through the development's northern entrance at Waipapa Road. Until such time as this connection becomes available, on-site treatment and disposal can be utilised, up to the SR 'Time 4' level of development.

14 The public system will convey wastewater some distance to the treatment plant(s). Long retention times in sewers can be a problem because it is challenging to manage septicity and the associated corrosion caused by the hydrogen sulphide that is released under anaerobic conditions. An advantage of connecting an established development to long trunk mains

is that septicity issues are minimised. It is typically smaller volumes of wastewater that take longer to be transferred through the system that create such problems.

15 The proposed solution for this development area, to initially utilise on-site treatment and disposal and switch to off-site treatment and disposal, offers a distinct level of flexibility. When the switch-over occurs, on-site treatment could be removed, or the standard of treatment could be scaled back to condition the wastewater for conveyance to the main treatment plant(s). The timeline for upgrading wastewater treatment capacity does not appear to be set. This development area offers a distinct advantage in being able to accommodate a reasonable level of development before on-site disposal becomes a requirement.

16 In my opinion, given the infrastructure planning undertaken by Beca for the Council, it is clear that there will be adequate wastewater servicing available for growth in the Kerikeri and Waipapa area (including the Site). It may be that public capacity is available at the outset of development on the Site. However, the site is capable of being developed with appropriate on-site wastewater servicing, and then switched-over to the public network.

Water supply

17 The SR and CMA both recognise capacity constraints in the existing public water supply system, that Puketotara stream is fully allocated and that additional water would be sourced from dams owned by Kerikeri Irrigation Company Limited. All upgrade options include conveyance and treatment elements. In other words, wherever new growth is going, water supply will be a constraint.

18 The CMA concludes that the groundwater source could only be used as a supplementary source and it is insufficient to meet growth in demand. I agree with this assessment.

19 Improvements to Kerikeri's bulk conveyance and treatment infrastructure are required regardless of the exact location of development – as confirmed by the CMA.

20 In terms of connection point to the public network, the Site can be connected to the trunk main at the proposed northern entrance on Waipapa Road.

21 Water supply to this development fits in well with the overall water supply system upgrades put forward in the CMA, given the location of existing infrastructure and the upgrades assessed by Beca, because the point of connection is at the northern entrance.

Stormwater drainage

22 The evidence by Laddie Kuta shows how the existing floodway can be modified without significant adverse effects on other properties. Discharge of stormwater from the proposed development area will primarily be to the floodway and potentially also to Puketotara Stream.

23 The quality of stormwater discharged from the Site must be at a standard suitable for the receiving environment, and the rate of discharge must be limited to pre-development values.

24 Stormwater treatment and attenuation systems must be provided on the development prior to discharge, including discharges to the floodway and Puketotara Stream.

25 The SR states that stormwater attenuation and treatment devices will occupy approximately 15% of the land area that will be developed. I still consider this to be the case. These facilities, which include swales, rain gardens and attenuation basins, can be integrated with the landscape to improve open spaces and amenity. There is sufficient space on the Site to develop stormwater treatment and attenuation systems, as well as providing for stormwater treatment.

26 By managing stormwater runoff from residential and commercial areas as described above, I have high confidence that adverse effects from stormwater runoff on other properties will be less than minor. Given flood risk will be managed by the floodway, I consider that the appropriate stormwater treatment and attenuation required for this Site can be achieved through adherence to good practice and relevant engineering standards.

Road access

27 Several concept options have been developed to provide road access to the development area. These are:
Access A: Western access at State Highway 10 / Puketotara Road
Access B: Eastern access at Aranga Road (alternative to Access C)
Access C: Eastern access at Golf View Road (alternative to Access B)
Access D: Northern access at Waitotara Drive

28 Access A consists of a minor realignment of SH10 to suit geometry requirements for a new 19m diameter four leg roundabout. An access road into the development will provide linkage with the northern and eastern access points. A concept design of the roundabout is in **Appendix B**.

29 Access B consists of a bridge across Puketotara Stream. The 150m long crossing will require a 60m central span to avoid piers in the stream channel. To position the bridge above flood levels, ground level at the eastern approach would be raised by up to 6m. Due to vertical geometry constraints, the cut depth on the western side of the Stream will be up to 6m deep. Construction of the eastern approach will require an extension of Aranga Road through the Aranga Backpackers grounds. Construction of the western approach will require a road to be constructed through the southern part of the golf course. Concept earthworks volumes for this road are 20,000m^3 net cut and 40,000m^3 net fill. A concept design of the bridge is in **Appendix C**.

30 Access C consists of replacing the existing single lane bridge across Puketotara Stream at Golf View Road with a two-lane bridge and pedestrian facilities at a level two metres higher than the existing bridge. The vertical geometry of the eastern approach will require adjustment to suit.

31 The road on the golf course property will be reconstructed to be above flood level along its full length. Its alignment will follow the existing golf course access road for approximately 200m west of the bridge where a tee intersection will be constructed to provide access to the clubhouse. The road will be extended from the tee intersection through the northern three holes of the golf course onto the subject land. A 5m deep cut will

be constructed at the northern boundary of the golf course to facilitate an overpass pedestrian bridge.

32 The total length of the new road from the Puketotara Stream bridge to the northern boundary of the golf course is 550m. Concept earthworks volumes to construct this road are 2,800m^3 net cut and 3,700m^3 net fill. A concept plan showing this bridge is in **Appendix D**.[1]

33 Access D is at the northern end of the Site and consists of a bridge across Waipekakoura River. The 70m long crossing will span the 30m wide river channel and extend a further 40m to cross the native bush. To position the bridge above flood levels, the northern approach will be 4m above ground level. Concept earthworks volumes for this road are 24,000m^3 net fill. A concept plan showing this bridge is in **Appendix E**.

34 I have considered all of the access points from an engineering perspective and conclude that each can be feasibly constructed. The transportation effects of the access points are considered by Mr Brown's evidence.

CONCLUSION

35 The 3-waters assessment prepared by Beca infrastructure demonstrates that the public water supply and wastewater systems can be upgraded to support residential and commercial development on the Site . Timing issues for the wastewater upgrades can be overcome by providing an interim on-site wastewater treatment and land-disposal system. The upgrades to the water supply system will be required regardless of the location of development in Kerikeri. The timeline to implement upgrades to the public water supply system can only be extended if development in the district is delayed, which is unlikely to be an acceptable outcome.

36 Once the floodway is in place, stormwater management on the subject Site will consist of the standard measures to control stormwater quality and peak discharge rates.

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[1] Please note that the golf holes in this image shown are not indicative of the proposed redesign of holes at the Kerikeri / BOI Golf Club. Please refer to the concept redesigned golf holes KFO commissioned from Brett Thompson.

37 The concept designs for the access roads show that it is feasible to provide access from the west, north and east.

38 Accordingly, I consider that the Site can be adequately serviced from a 3-waters and transport perspective.

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Johan Ehlers

16 June 2025

APPENDIX A – SERVICING REPORT

1828 & 1878 SH10, WAIPAPA SERVICING REPORT J16102/2

Report prepared by Johan Ehlers

14 October 2022

NO.	DATE	DESCRIPTION
Memo	17/09/2022	First draft
J16102/2	14/10/2022	For planning submission

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1 Scope

This report describes servicing options for a proposed residential development on 1828 & 1878 State Highway 10, Waipapa. The site is approximately 200 hectares in size. The servicing assessment has been based on a development will comprising:

- 1,500 to 2,000 dwellings. Approximately 30% retirement housing and 70% households
- One hectare retail
- One hectare office/commercial
- Three hectares other business

The development area is shown on Figure 1.

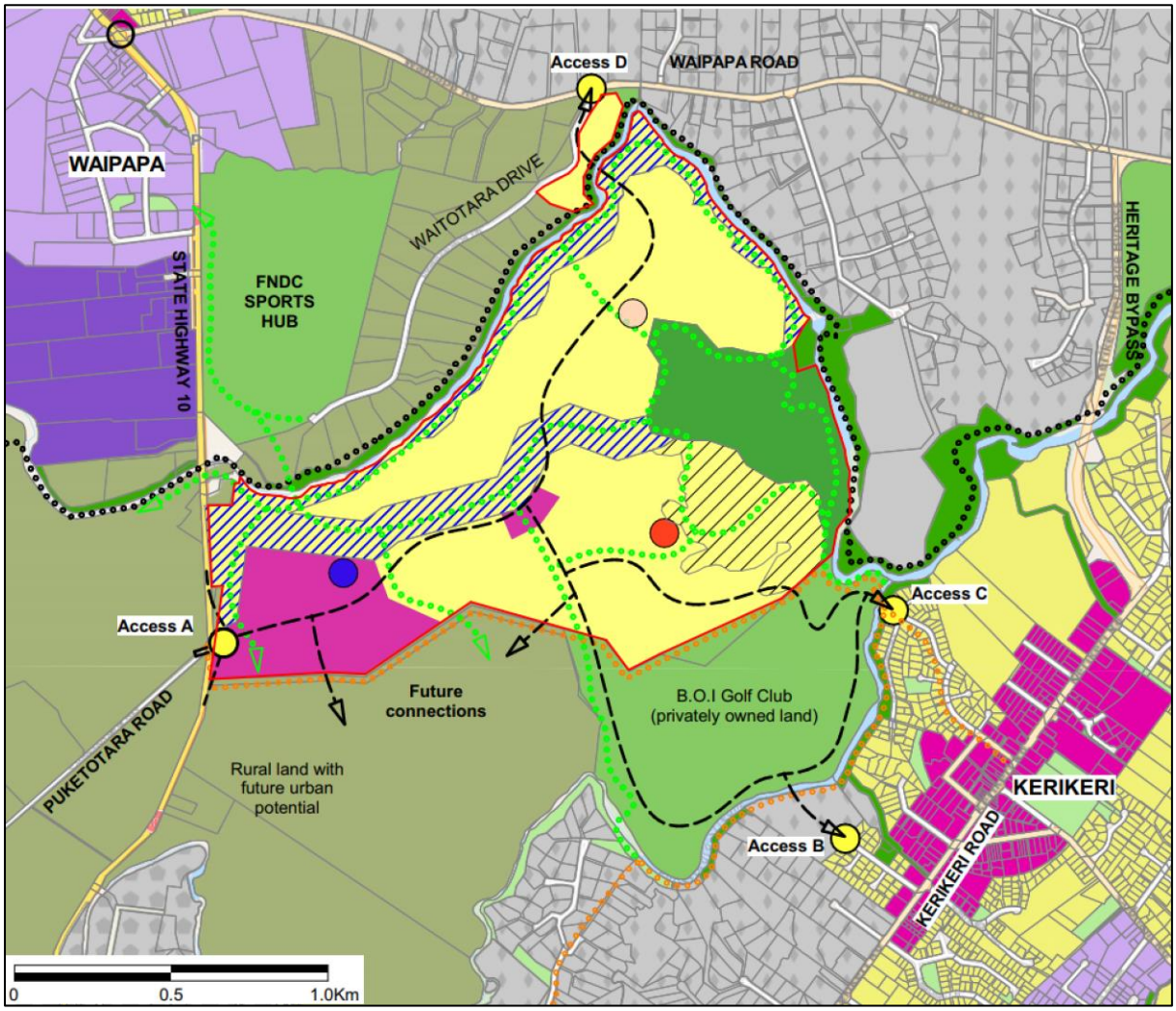


Figure 1 – Submission area

Development will occur incrementally over time. Trigger points must be identified for on-site and off-site servicing solutions.

2 Basis for assessment

The cumulative level of development that has been used for the assessment is shown on Table 1. Note that the timeline is only intended to show the level of demand for services that will be created at various levels of development.

Table 1 - Levels of development used to determine trigger points

Land use		Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8	Time 9	Time 10
Residential units	N.O.	150	300	450	600	750	900	1050	1200	1350	1500
Retirement village units	N.O.	60	120	180	240	300	360	420	480	540	600
Total number of households	**N.O.**	**210**	**420**	**630**	**840**	**1050**	**1260**	**1470**	**1680**	**1890**	**2100**
Retail (ha)	Hectare	1	1	1	1	1	1	1	1	1	1
Office/commercial (ha)	Hectare	1	1	1	1	1	1	1	1	1	1
Other business (ha)	Hectare	3	3	3	3	3	3	3	3	3	3

Soil characteristics assessments have been based on LDE report 149114 dated 17 June 2022 – Specific reference to appendices A, B and C.

E2 Environmental undertook a flood assessment of the wider area and formulated a stormwater drainage framework for the development to enable development to be undertaken without adversely affecting other properties.

Demand for services have been based on the unit rates shown on Table 2

Table 2 - Demand for services

Land use		Potable water demand	Wastewater discharge
Residential units	L/hh/day	1200	800
Retirement village units	L per retirement unit per day	600	400
Retail	L/50m^2 retail per day	65	65
Office/commercial	L/15m^2 offices per day	65	65
Other business	L/50m^2 other business per day	65	65

Peak stormwater discharge rates must be limited to pre-development peak discharge rates and stormwater must be treated prior to discharge to the floodway and the river, to a level appropriate for the receiving environment. These matters are best addressed when resource consent applications for subdivisions are considered.

3 Existing servicing environment

3.1 Stormwater

Hydrology for the wider catchment has been addressed by E2 Environmental. This work produced a formalised floodway option (Figure 6 dated 5 July 2022), which is the preferred option. It primarily consists of a 100m wide channel and minor reshaping of the existing landscape.

It is noted that the impact of any earthworks inside flow paths, including roading embankments at the Waipapa Road / Waitotara Drive intersection, at river crossing points and floodway crossing points must be carefully assessed to ensure there are no adverse impacts on other properties. It is a reasonable assumption that earthworks and structures in flow paths and water bodies can be designed such that adverse effects on other properties can be avoided or mitigated. Such designs may require adjustment of other design elements.

The design concept developed by E2 Environmental will create an environment into which stormwater from the proposed development can be discharged. These discharges must be equivalent to the existing runoff from the area that is to be developed. The environment that will be created by E2 Environmental's concept does not allow for increases in the maximum rate at which stormwater is discharged from the site, but it does allow for the length of time at which stormwater is discharged at the current maximum flow rates to be extended.

Development will result in an increase in impermeable areas, and therefore an increase in runoff. The effect of development on stormwater runoff is twofold and should be mitigated as follows:

Effect	Runoff rate	Runoff volume	Quality
Description of effect	Increased peak runoff rate.	Increased runoff volume.	Potential for contamination.
Mitigation measure	Attenuation storage.	Discharge runoff for a longer length of time.	Treatment through a suite of industry standard measures including swales, rain gardens, filter strips and separators.
Result of mitigation	Reduce peak runoff rate to pre-development rate. This will avoid increased flood levels.	No change in flood levels, but water levels will stay at elevated levels for slightly longer lengths of time.	Stormwater discharge compliant with Regional Council rules.

It is expected that stormwater attenuation and treatment devices will occupy approximately 15% of the land area that will be developed.

3.2 Wastewater

The extent of the municipal wastewater network is shown on a map appended to this report. Northland Regional Council has provided funding in their 10-year capital plan for a significant wastewater network and wastewater treatment plant upgrade, including the Waipapa area. Planning work for the upgrades is in an early stage and no definitive upgrade options have been released. FNDC officers have indicated that the existing network and treatment plant do not have spare capacity, and that upgrade options at the existing treatment plant at Okura Drive (located 5km from the Structure Plan area as the crow flies and 8.5km via Waipapa Road and Twin Coast Discovery Highway) are constrained by the topography.

Treated wastewater discharges must be to land and not into water.

The approach to wastewater treatment and disposal for the proposed structure plan area must be twofold:

1. Integrate the wastewater system for the structure plan area with the Kerikeri / Waipapa system. It is noted that Waipapa is not currently reticulated, but that Council's 10-year capital plan provides for a system to be developed for the Waipapa area. The development of new wastewater treatment and disposal systems are notoriously difficult and time consuming. Whilst the developer should work closely with FNDC to develop an integrated wastewater treatment and disposal solution, and meet the proportional implementation cost, the time required for optioneering, consultation, consenting, land acquisition (if needed) and construction is much longer than the timeframe within which commencement of development of the structure plan area is envisaged to occur. Development of the structure plan area is driven by social and commercial factors. Development of a municipal wastewater system must be cognisant of a myriad of other factors which are beyond the control of any single entity.
2. Develop a standalone wastewater disposal system. This system will consist of a treatment plant, sludge processing facility and areas of land for disposal of treated wastewater. It is possible that land areas outside the structure plan area may become available for land disposal but for the purposes of this memorandum it has been assumed that the disposal areas will be inside the structure plan area. The standalone wastewater disposal system must be developed such that the following options are left open:
    a. To redirect raw wastewater to a future wastewater treatment plant outside the structure plan area,
    b. To redirect treated wastewater to a future disposal area outside the structure plana area.
    c. A combination of the two options.

The geotechnical report shows that most of the land inside the structure plan area are cohesive and mostly clay. The rate at which treated wastewater can be applied to land is limited by hydraulic load and nutrient load. It will be possible to treat wastewater to a standard where the application rate will not be limited by nutrient load, so that the application rate will be constrained by the volume of wastewater. In other words, the area of land that is required for wastewater disposal will be determined by the volume of wastewater.

The volume for which the land disposal area must be designed for can be calculated by applying design standards. Far North District Council's draft engineering standards 2022 (FNDC ES22) requires:

Table 3 - Wastewater discharge units

Wastewater source	Units	Value
Domestic	Persons per household	4
Domestic	Litres wastewater per person per day	200
Domestic	Litres per household per day (average dry weather)	800
Retirement home	Litres wastewater per resident per day	220
Retirement home	Litres wastewater per day staff member per day	50
Hotels/Motels	Litres per guest and resident staff per day	200

FNDC ES22 requires a peak factor of five to be applied to the average dry weather flow rates shown above.

FNDC ES22 does not provide specific discharge rates for commercial activities. Auckland City Council uses the following rates:

- Retail, warehouses: 65 litres per 50m^2 per day
- Offices, restaurants: 65 litres per 15m^2 per day

The soil classification is predominantly clay, with basalt rock 4m to 6m deep. Table 35 from GD06 (which generally corresponds with other design standards) limits land application methods in clays to subsurface and surface irrigation, with some capacity for beds and trenches in light non-swelling clays. An application rate of 3mm per day has been adopted because it is likely to be achievable. However, to provide design margin it is recommended to provide reserve disposal area of 50% of the estimated area that will be required. The need for the reserve disposal area should be assessed at the defined trigger point to determine whether it is actually required. If the estimated area functions well, the reserve area could be utilised to support more development. The requirement for on-site disposal will cease when a wider Council wastewater system becomes available.

Table 4 - GD06 - Soil categories

Table 35: Soil categories and recommended maximum design loading rate (DLR) or design irrigation rate (DIR) for treated wastewater land application

Soil category [Note 9]	Soil texture	Soil structure	Indicative permeability K_{sat} (m/d)	Recommended maximum design loading rate (DLR) or design irrigation rate (DIR) – mm/day								
				Trenches [Note 7]		Beds [Note 8]		ETS beds and trenches	Subsurface and surface irrigation (e.g. PCDI)	LPED irrigation	Mounds	Bottomless sand filter
				Primary treated effluent	Secondary treated effluent	Primary treated effluent	Secondary treated effluent					
1	Gravels and sands	Structureless (massive)	>3	20 [Note 1]	25 [Note 1]	16 [Note 1]	20 [Note 1]	Not advised	5 [Note 4]	Not advised	24	70
2	Sandy loams	Weakly structured	>3	20 [Note 1]	25 [Note 1]	16 [Note 1]	20 [Note 1]	Not advised	4 [Note 4]	4	24	Not advised
		Massive	1.4 – 3	15	30	12	24		4 [Note 4]	3.5	16	
3	Loams	High/moderate structured	1.5 – 3	15	30	12	24	15	4 [Note 3]	3.5	16	
		Weakly structured or massive	0.5 – 1.5	10	30	8	24	12	4 [Note 3]	3.5	16	
4	Clay loam	High/moderate structured	0.5 – 1.5	10	30	Not advised	15	12	3.5 [Note 3]	3	Not advised Note 2	
		Weakly structured	0.12 – 0.5	6	20		Not advised	8		3		
		Massive	0.06 – 0.12	4	10		Not advised	5		3		
5	Light clays (non-swelling)	Strongly structured	0.12 – 0.5	5 [Note 2]	12 [Note 2]	Not advised	Not advised	8	3 [Note 3]	2.5 [Note 5]		
		Moderately structured	0.06 – 0.12	Not advised	10 [Note 2]			5		2.5 [Note 5]		
		Weakly structured or massive	<0.06		8 [Notes 2 & 6]			5 [Note 6]		2.5 [Note 5]		
6	Medium to heavy clays. Swelling clays.	Strongly structured	0.06 – 0.5	Not advised	Not advised	Not advised	Not advised	Not advised	2 [Note 4]	Not advised		
		Moderately structured	<0.06									
		Weakly structured or massive	<0.06									

(Adapted from: AS/NZS 1547:2012)

The estimated land area that will be required for on-site wastewater disposal is shown below.

Table 5 – Treated wastewater discharge to land

Land use	Units	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8	Time 9	Time 10
Retail	m^3/day	13	13	13	13	13	13	13	13	13	13
Office/ commercial	m^3/day	13	13	13	13	13	13	13	13	13	13
Other business	m^3/day	39	39	39	39	39	39	39	39	39	39
Retirement village units	m^3/day	24	48	72	96	120	144	168	192	216	240
Residential units	m^3/day	120	240	360	480	600	720	840	960	1080	1200

Land use	Units	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8	Time 9	Time 10
Total	m^3/day	209	353	497	641	785	929	1073	1217	1361	1505
Land application rate	mm/day	3	3	3	3	3	3	3	3	3	3
Land application area	hectare	7.0	12	17	21	26	31	36	41	45	50
Reserve land application area (50%)	hectare	3.5	5.9	8.3	10.7	13.1	15.5	17.9	20.3	22.7	25.1
Total area reserved for land application	hectare	10.5	17.7	24.9	32.1	39.3	46.5	53.7	60.9	68.1	75.3

A nominal area of two hectares will also be required for a wastewater treatment plant and for biosolids processing facilities.

Based on a 30-hectare area being set aside for on-site disposal the trigger points for wastewater disposal are as follows:

Table 6 - Wastewater system trigger points

Trigger point	Time step	Action
Commencement of development	Prior to Time 1	Obtain discharge consents
On site disposal with 50% reserve area	Development during Time 1 to Time 4	Monitor and report on performance of disposal field, to determine whether the 50% reserve area is required
On site disposal without reserve disposal area, if it is found that the estimated land application area performed well	Development during Time 5 and Time 6	No further development than shown for Time 6 without off-site disposal
Off-site disposal	All time steps	When off-site disposal becomes available, wastewater stops being a constraint and areas set aside for wastewater disposal can be used for other purposes.

3.3 Water supply

The Kerikeri Water Supply Strategy prepared by Jacobs in June 2021 describes the existing water supply and water source.

70% of Kerikeri's water supply is sourced from the Kerikeri Irrigation Company (KIC). The remaining 30% is sourced from Puketotara stream near the golf course. Puketotara stream is fully allocated.

Far North District Council's draft engineering standards 2022 (FNDC ES22) requires:

Table 7 - Potable water demand units

Water demand source	Units	Value
Domestic	Persons per household	4
Domestic	Litres water per person per day	300
Domestic	Litres per household per day (average dry weather)	1,200

Auckland City Council's demand figures were adopted for other uses. These are:

- Dry retail: 1.3L/m^2/day
- Wet retail: 4.3L/m^2/day

Estimated daily demand is shown on Table 8.

Table 8 - Estimated potable water demand

Land use	Units	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8	Time 9	Time 10
Retail	m^3/day	13	13	13	13	13	13	13	13	13	13
Office/ commercial	m^3/day	43	43	43	43	43	43	43	43	43	43
Other business	m^3/day	39	39	39	39	39	39	39	39	39	39
Retirement village units	m^3/day	36	72	108	144	180	216	252	288	324	360
Residential units	m^3/day	180	360	540	720	900	1080	1260	1440	1620	1800
Total	m^3/day	311	527	743	959	1175	1391	1607	1823	2039	2255
Source flow rate to replenish in 20-hour timeframe	L/s	4.3	7.3	10.3	13.3	16.3	19.3	22.3	25.3	28.3	31.3
Minimum source flow rate that must be available to overcome algal bloom issues	L/s	1.4	2.4	3.4	4.4	5.4	6.4	7.4	8.4	9.4	10.4

The water strategy shows that the existing system does not have spare capacity.

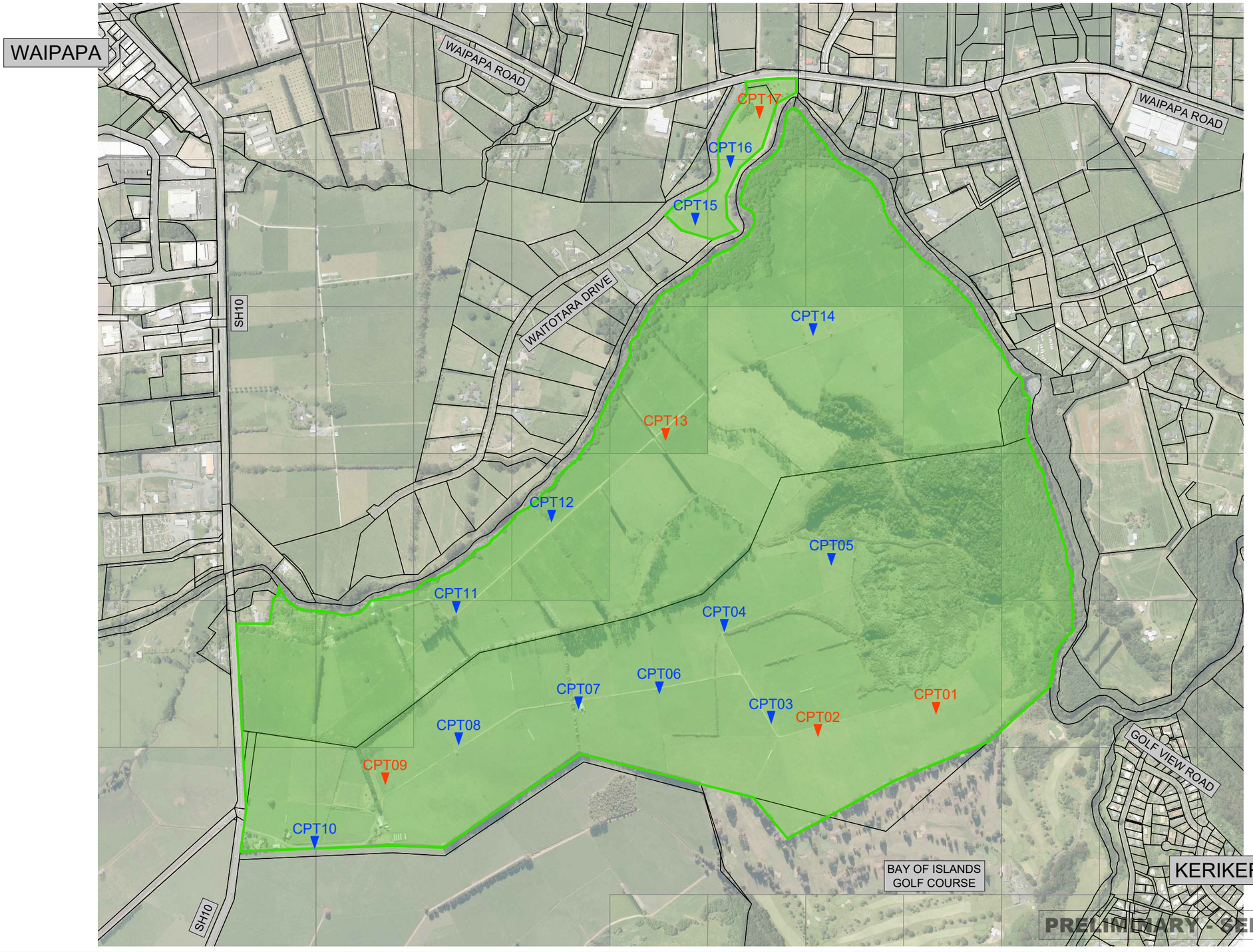
The Long Term Plan includes provision for a treatment plant and source water upgrade for Kerikeri. The timeframe for this work will not necessarily be compatible with commencement

of development. An approach similar to the approach for wastewater is therefore proposed: Work as closely as possible with FNDC to develop and integrated system but be prepared to construct a dedicated bulk supply system if required, and ensure that it can be integrated with the wider municipal system at a later date, when that system becomes available.

KIC has indicated that they can supply raw water from their northern dam. The point of supply is approximately three kilometres from the structure plan area. A bulk water main extension, treatment plant with a buffer tank, treated water storage facility and distribution pump station will be required to reticulate the structure plan area. A nominal one-hectare area should be set aside for water treatment and water storage. The treatment plant should not be in a residential area, but its location is not as sensitive as a wastewater treatment plant.

The treatment process must be designed to be able to cope with algal blooms that occur in KIC's storage dams. The blooms are toxic and difficult to treat. Ideally an alternative water source will be developed, similar to the 30% of supply that Kerikeri sources from Puketotara stream. The only source that has been identified is groundwater, which is limited. It is understood that bore capacities in the Kerikeri area is limited and that a good bore produces 3 L/s. Field work should be undertaken prior to the hearing to confirm availability of groundwater.

Appendix A Maps



N

0m 250m 500m

ORIGINAL SCALE (A3) = 1 : 10,000

GEOLOGY MARKERS

CPT99 Sand / Silt

CPT99 Clay

REV	DESCRIPTION TO REVISION	REV BY	DATE
0	PRELIMINARY CONCEPT – ISSUED FOR SERVICING REPORT ONLY	JB	20.09.2022

CLIENT: BROWNLIE BROTHERS LTD

PROJECT: 1878 SH 10 KERIKERI

INFRASTRUCTURE SOLUTIONS ‖ PROJECT MANAGEMENT
PO Box 7335, Taradale 4141
Phone : 06 650 5565 Email : admin@infir.nz

DRAWING TITLE: PRELIMINARY CONCEPT GEOTECHNICAL INFORMATION

PROPOSAL CHECKED : -	CAD CHECKED : -	PROPOSAL APPROVED : -	CLIENT APPROVED : -	ENGINEER APPROVED : -
DRAWN BY : JB	A3 DWG SCALE : 1:10,000	PROJ / DWG / SHEET : J16102 / SK100		REV : 0

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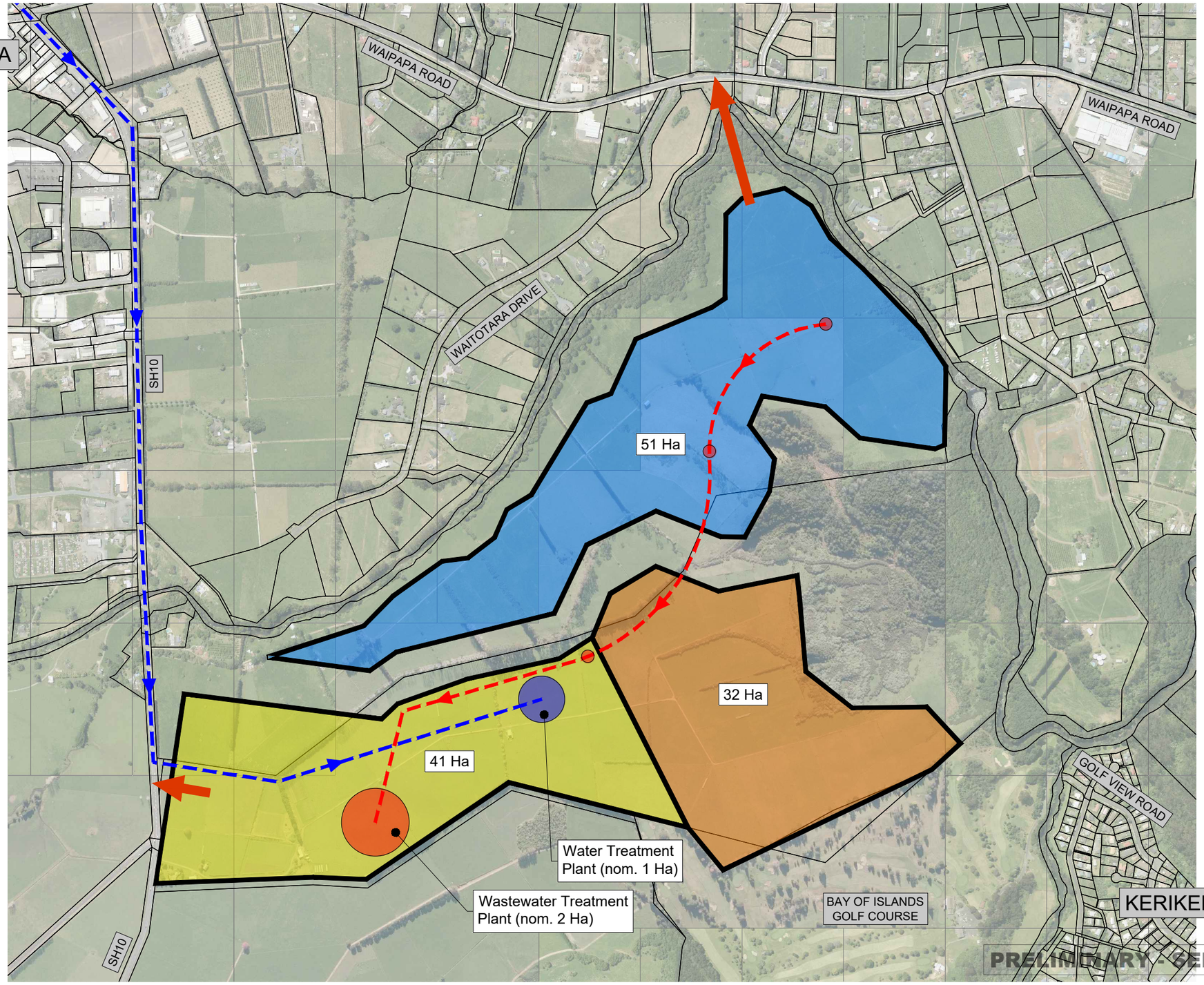

N

0m 250m 500m

ORIGINAL SCALE (A3) = 1 : 10,000

LEGEND

- Residential / Community
- Wastewater disposal
- Undefined usage
- Wastewater treatment plant
- Potable water treatment plant
- Wastewater pump station
- Wastewater principal main
- Raw water from Kerikeri Irrigation Company
- Future off-site wastewater disposal

REV	DESCRIPTION TO REVISION	REV BY	DATE
0	PRELIMINARY CONCEPT – ISSUED FOR SERVICING REPORT ONLY	JB	20.09.2022

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DRAWING TITLE: PRELIMINARY CONCEPT
WATER & WASTEWATER ZONING PLAN

PROPOSAL CHECKED : -	CAD CHECKED : -	PROPOSAL APPROVED : -	CLIENT APPROVED : -	ENGINEER APPROVED : -
DRAWN BY : JB	A3 DWG SCALE : 1:10,000	PROJ / DWG / SHEET : J16102 / SK101	REV : 0	

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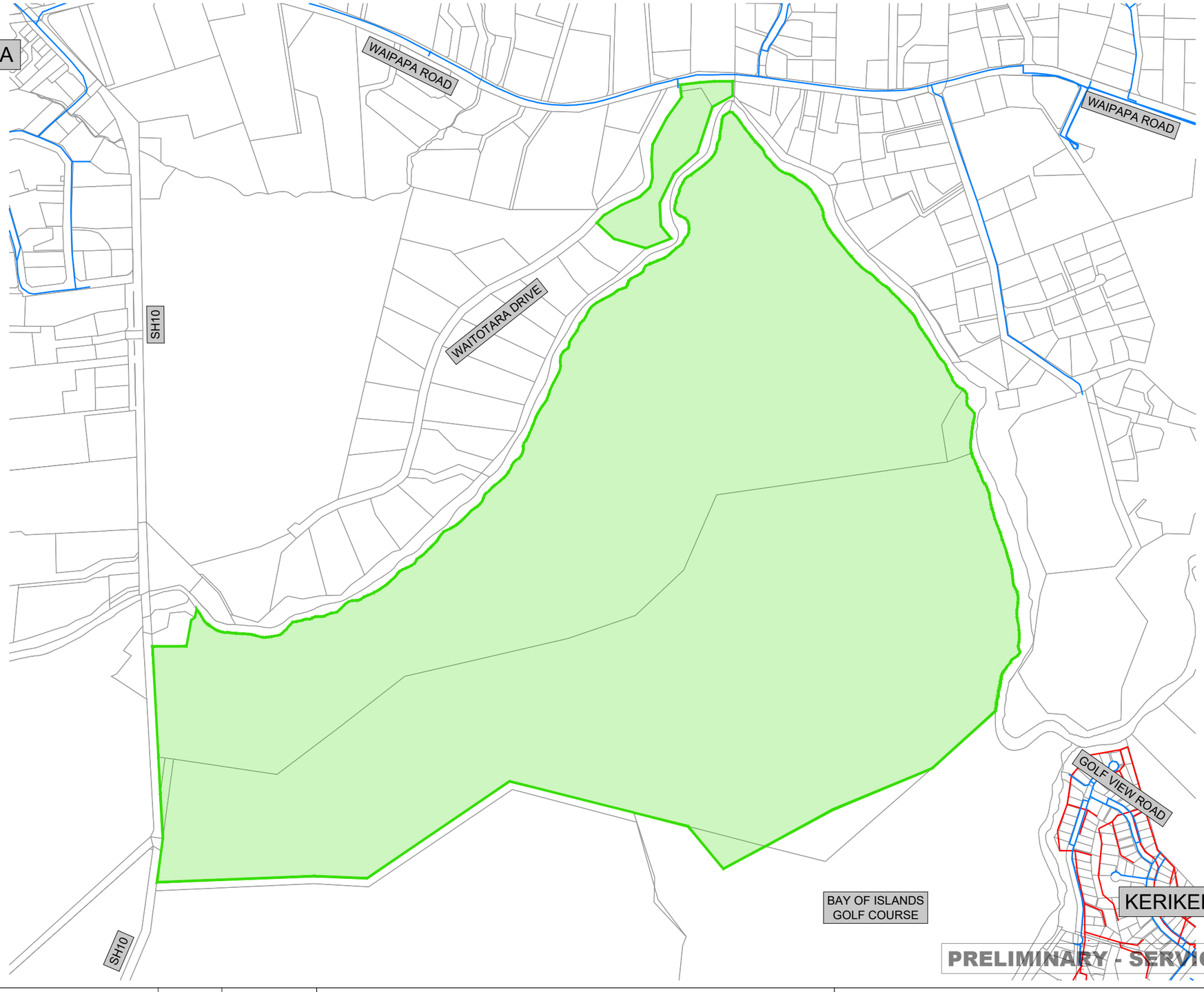

PRELIMINARY - SERVICING CONCEPT ONLY

REV	DESCRIPTION TO REVISION	REV BY	DATE
0	PRELIMINARY CONCEPT – ISSUED FOR SERVICING REPORT ONLY	JB	20.09.2022

CLIENT: BROWNLIE BROTHERS LTD

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Phone : 06 650 5565 Email : admin@infir.nz

DRAWING TITLE: PRELIMINARY CONCEPT
EXISTING FNDC INFRASTRUCTURE

PROPOSAL CHECKED :	-	CAD CHECKED :	-	PROPOSAL APPROVED :	-	CLIENT APPROVED :	-	ENGINEER APPROVED :	-
DRAWN BY :	JB	A3 DWG SCALE :	1:10,000	PROJ / DWG / SHEET :	J16102 / SK102			REV :	0

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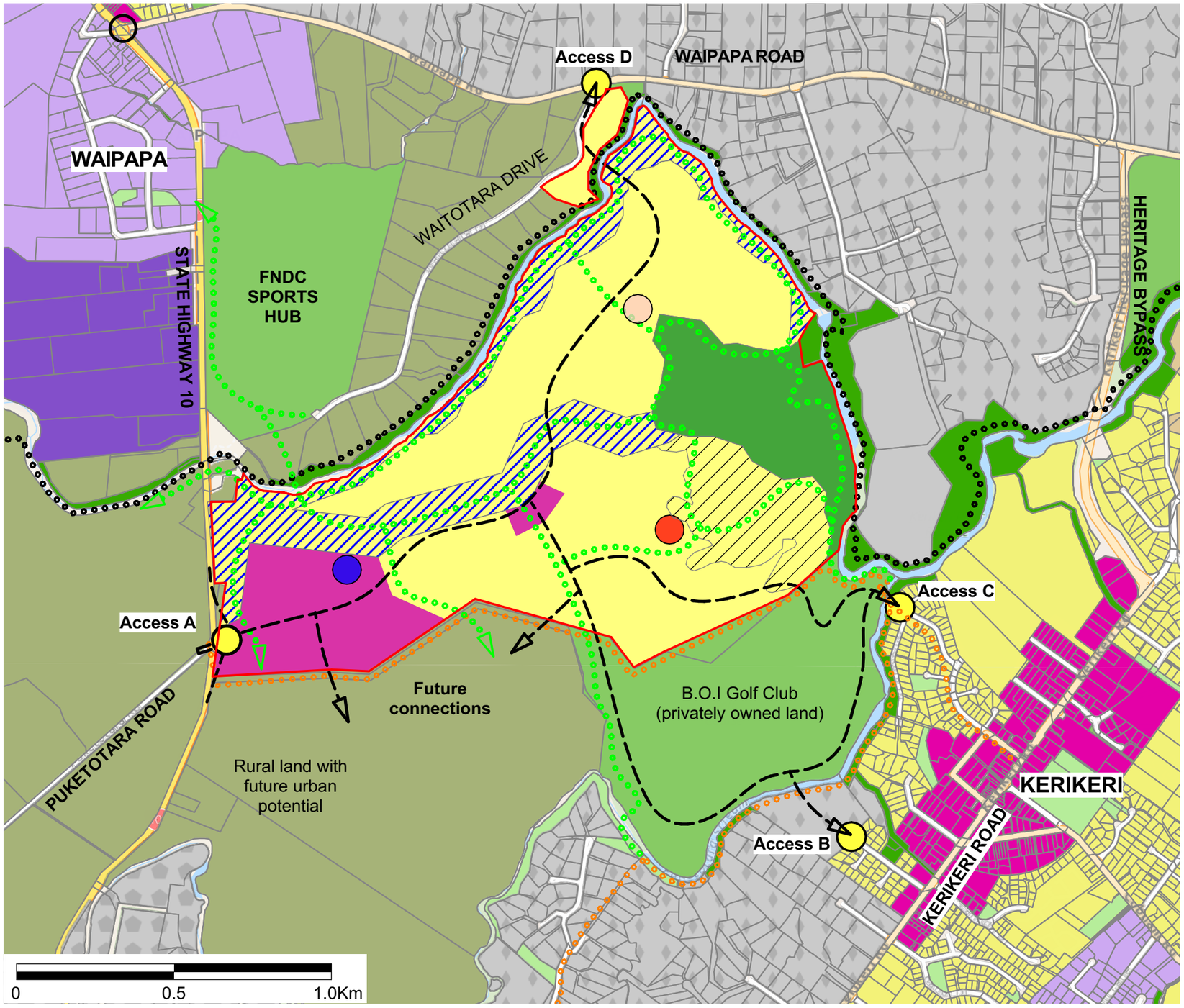


Legend

- Submission area
- State Highways
- Local roads
- Waterways

Zones

- General Residential
- Heavy Industrial
- Light Industrial
- Mixed Use
- Natural Open Space
- Open Space
- Sport And Active Recreation
- Rural Lifestyle
- Rural Production

Special Purpose Zones

- Airport
- Carrington Estate; Kauri Cliffs; Kororāreka Russell Township; Moturoa Island; Orongo Bay; Quail Ridge
- Horticulture
- Horticulture Processing Facilities
- Rural Residential

Features

- Significant Natural Area
- Proposed area of large lot residential
- Key transport connections to existing roads
- Proposed local centre
- Potential school site with connection to FNDC sports hub
- Potential hotel facility with connection to existing golf course
- Proposed local roads with cycle ways
- Potential future connections beyond submission area
- Te Araroa Trail
- Planned pathways (FNDC District Plan)
- Proposed greenway pathways

N

Map notations (including zone boundaries, greenways etc) are indicative only and will be refined through later (more detailed) processes such as Plan Changes or Notices of Requirement.

Title

Brownlie Land - Proposed Structure Plan: Land Use

PACIFIC ENVIRONMENTS ARCHITECTS

P.O. Box 8807 Symonds St, Auckland, NZ
Ph (09)308-0070 Email:info@penzl.co.nz

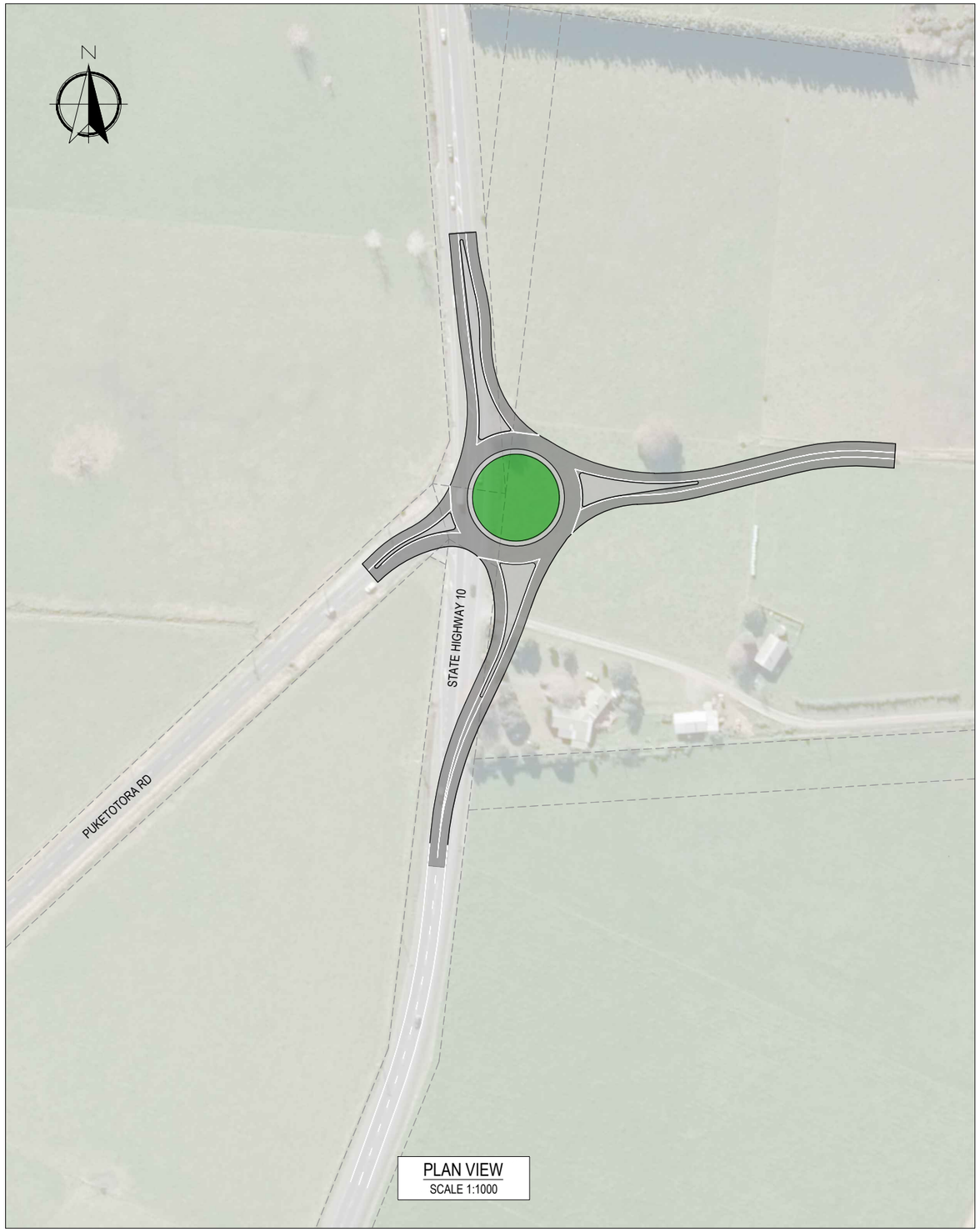
Submission on FNDC District Plan

1828 & 1878 State Highway 10, Waipapa

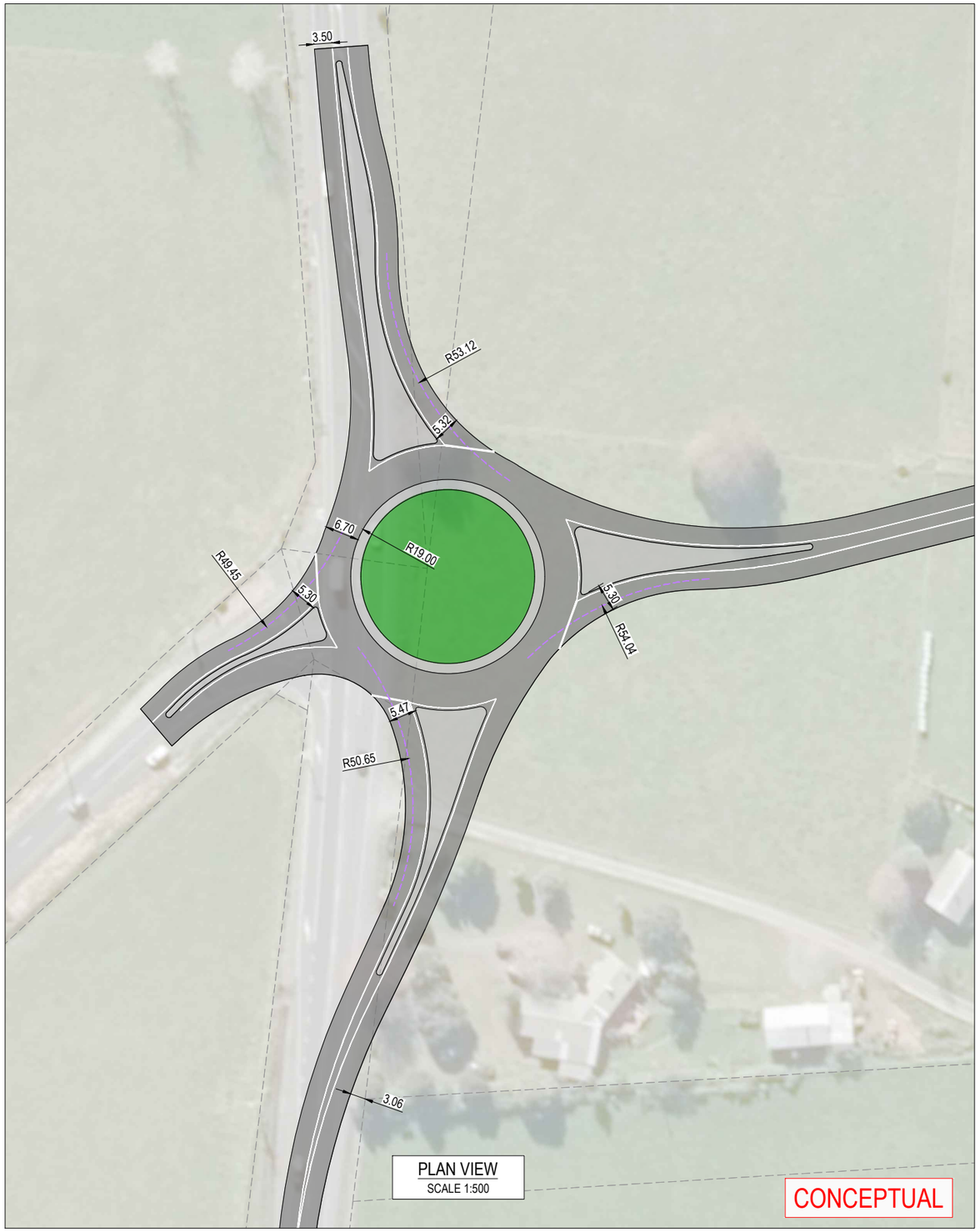
ref no. 22030

Date	Scale	Client	sheet no.	revision
12/10/2022	As shown	Kiwi Fresh Orange Company Ltd	A007	04

APPENDIX B – SH10 ROUNDABOUT



PLAN VIEW
SCALE 1:1000



PLAN VIEW
SCALE 1:500

CONCEPTUAL

NOT FOR CONSTRUCTION

REV	REVISION DESCRIPTION	DRAWN	CHECKED	APPROVED	DATE
B	ROUNDABOUT REVISED TO MINIMISE LAND TAKE	JO			29.06.22
A	ISSUED FOR DISCUSSION	JO	JE		17.06.22

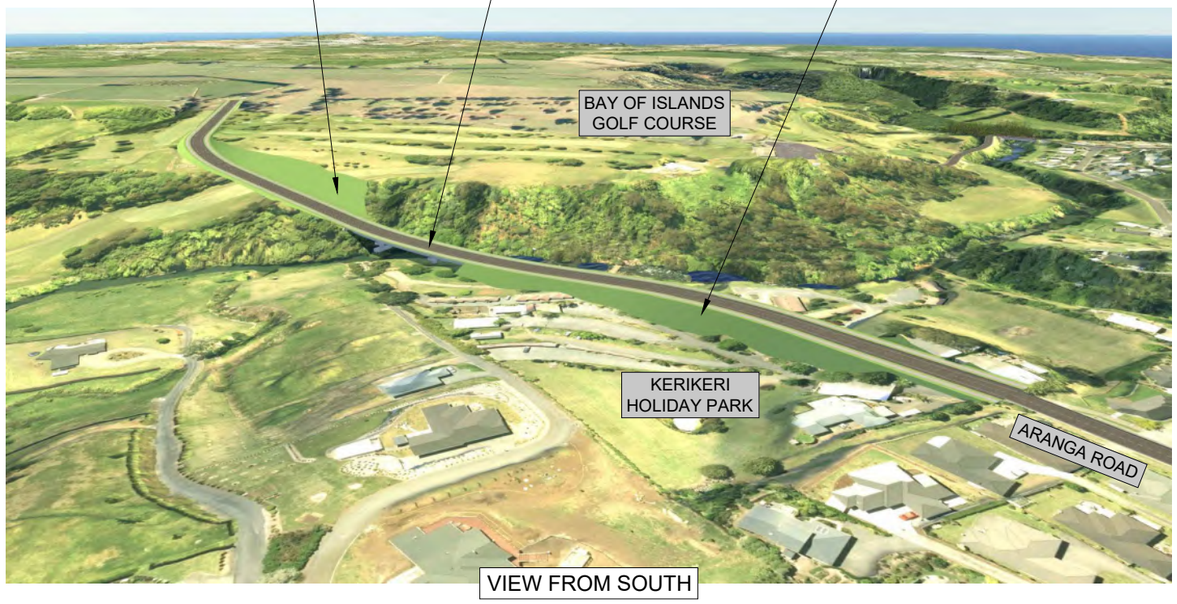
	NAME
DESIGNED	J. ORRINGE
DRAWN	J. ORRINGE
REVIEWED	
APPROVED	

CTD CIVIL & TRANSPORTATION DESIGN
CIVIL & TRANSPORTATION DESIGN LIMITED
josh@ctdesign.co.nz
027 641 6653

INFIR LIMITED
STATE HIGHWAY 10 / PUKETOTORA ROAD ROUNDABOUT
OVERALL LAYOUT PLAN

DRAWING STATUS: WORKING PLOT
PLOT DATE: 29.06.2022
SCALE AT A1: AS SHOWN
DRAWING NO. 22-005-SK001
REV B

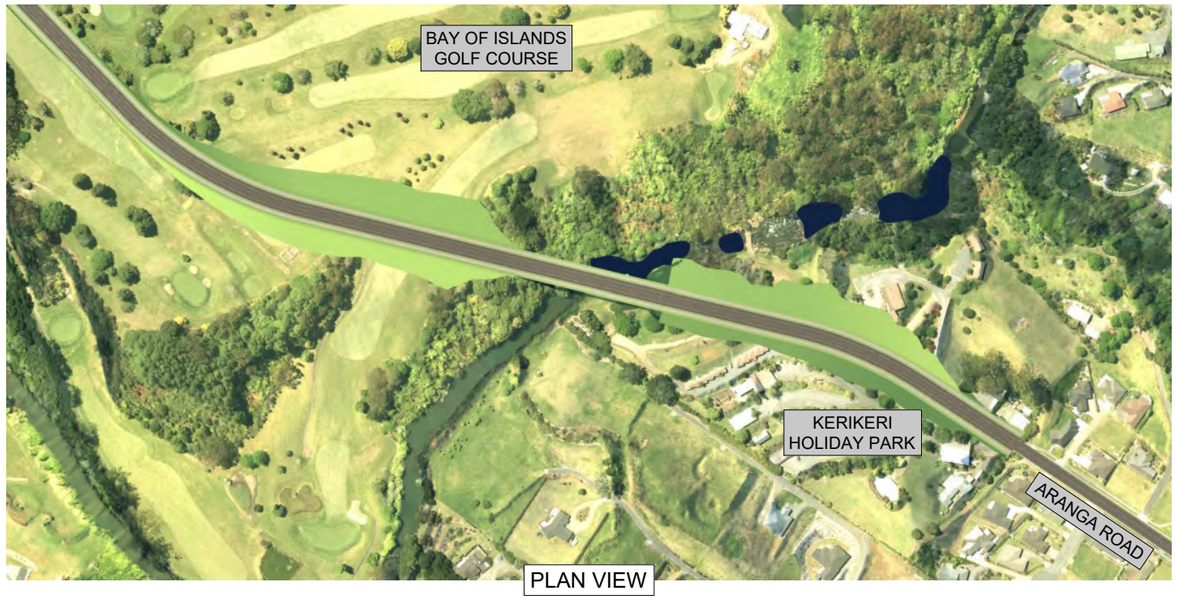
APPENDIX C – ARANGA ROAD ACCESS



VIEW FROM SOUTH

VIEW FROM NORTH

VIEW FROM EAST



PLAN VIEW

PRELIMINARY - FOR DISCUSSION

REV	DESCRIPTION TO REVISION	REV BY	DATE
0	PRELIMINARY CONCEPT – ISSUED FOR DISCUSSION ONLY	JB	07.07.2022

CLIENT: BROWNLIE BROTHERS LTD

PROJECT: 1878 SH 10 KERIKERI

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DRAWING TITLE: PRELIMINARY CONCEPT
ARANGA ROAD - BRIDGE OPTION (2/3)

PROPOSAL CHECKED : -	CAD CHECKED : -	PROPOSAL APPROVED : -	CLIENT APPROVED : -	ENGINEER APPROVED : -
DRAWN BY : JB	A3 DWG SCALE : NTS	PROJ / DWG / SHEET : J16102 / SK02	REV : 0	

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APPENDIX D – GOLF VIEW ROAD ACCESS

APPENDIX E – NORTHERN ACCESS ROAD