

**UNDER** the the Resource Management Act 1991 ("RMA")  
**IN THE MATTER** of Proposed Waikato District Plan (Stage 1) Hearing 25 –  
Zone Extents

**STATEMENT OF EVIDENCE OF PETER ALDERTON ON BEHALF OF 2SEN  
LTD AND TUAKAU ESTATES LIMITED**

**[Submission 299]**

**INFRASTRUCTURE**

**1. INTRODUCTION**

1.1 My full name is Peter Alderton. I am a director of ACH Consulting Limited (“**ACH**”), a structural, civil and environmental engineering and design consultancy which undertakes and provides input into a broad range of residential, commercial and infrastructure projects.

**Experience**

1.2 I obtained a Bachelor of Engineering degree from Auckland University in 1982. I am a Chartered Professional member of Engineering NZ. I have been providing professional engineering services as a consultant, based in Auckland, for over 30 years. Prior to that I worked as a consulting engineer in Great Britain. I also have experience working for a local authority.

**Involvement in the Proposal**

1.3 I have been commissioned by 2Sen Ltd and Tuakau Estates Ltd (“**the Submitters**”) to prepare this statement of evidence to address matters raised by the Submitters’ submission on the proposed Waikato District Plan (Stage 1) (“**PDP**”) seeking the rezoning of the balance of their properties at 48 and 52 Dominion Road, Tuakau to the General Residential Zone (“**Properties**” and “**Rezoning Request**”). In particular, I have been asked to provide evidence in relation to the ability to appropriately service any future development of the Properties enabled by the Rezoning Request with necessary infrastructure.

- 1.4 I visited the properties on 29 September 2020 and carried out a walkover inspection.
- 1.5 I supervised the preparation of an Infrastructure Capacity & Flood Risk Assessment Report by ACH Consulting Limited, dated 11 February 2021 (“ACH Report”), which is attached as **Appendix A**. The ACH Report forms the basis of this statement of evidence.

### **Code of Conduct**

- 1.6 I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court’s Practice Note 2014. I have complied with the Code of Conduct in preparing this evidence and agree to comply with it while giving evidence. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

### **Scope of Evidence**

- 1.7 The purpose of my evidence is to confirm that development which would be enabled as a result of the Rezoning Request can be serviced by existing and planned infrastructure networks, and to provide an overview of the modelling and analysis undertaken to support the Rezoning Request.
- 1.8 Specifically, my evidence will address the following:
  - (a) Stormwater treatment and volume mitigation requirements of the PDP, as well as the recommended approach for stormwater disposal (Section 4);
  - (b) Flooding, including identification of overland flow paths crossing the property, potential flooding risks and the potential effects of climate change (Section 5);
  - (c) Reticulated wastewater capacity (Section 6);
  - (d) Water supply requirements (Section 7); and
  - (e) The Council’s Framework Report (Section 8).

## 2. EXECUTIVE SUMMARY

2.1 Under the notified PDP approximately half of each of the Properties are proposed to be zoned General Residential, with the remainder being zoned Rural. The Rezoning Request seeks to rezone the balance of the Properties to General Residential.

2.2 In order to establish that any future development of the Properties enabled by the Rezoning Request can be serviced with the necessary infrastructure, we prepared the ACH Report. The ACH Report has assessed a theoretical development proposal for the Properties which would be enabled by the Rezoning Request, and conservatively assumes that the maximum development potential of the site is utilised. The subdivision concept assessed is as follows:

- (a) 48 Dominion Road - 59 residential lots with a large reserve area located adjacent to the Kairoa Stream;
- (b) 52 Dominion Rd - 160 new residential lots.

2.3 I have concluded that it will be possible to service any future development of the Properties enabled by the Rezoning Request with necessary infrastructure, and that it is feasible to develop any required engineering responses in accordance with the applicable rules and guidelines. In that regard:

- (a) Stormwater quality and quantity mitigation has been evaluated in accordance with the recommendations of the Draft Catchment Management Plan for the Tuakau Structure Plan Area ("**Draft Tuakau CMP**"), and the principles of water sensitive design. If the treatment train approach recommended is adopted to mitigate and treat all post development stormwater flows, this would retain existing hydrology and enable the water quality and erosion control requirements of the Draft Tuakau CMP met, as well as the requirements of PDP and Regional Infrastructure Technical Specifications ("**RITS**"). The recommended approach involves the use of onsite retention tanks at each property, rain gardens and wetlands.
- (b) As the property is situated adjacent to the Kairoa Stream, flood risks associated with the potential development of the property

have also been considered in terms of the Draft Tuakau CMP. It is possible to mitigate flooding of the new development to the required 1% AEP storm event via purpose-built wetlands.

- (c) Assessment of reticulated wastewater capacities confirms that capacity of wastewater services would not be exceeded by the peak wet weather flow (“**PWWF**”) when the development enabled by the Rezoning Request is connected to the existing public system.
- (d) Assessment of water supply capacities confirms that water supply will be adequate to service the new development and provide water for fire services at the required pressure and flow rate.

### **3. BACKGROUND**

#### ***Site Description***

- 3.1 48 Dominion Road has an area of 5.0769 ha and 52 Dominion Road has an area of 14.0890 ha. The Properties are zoned rural residential under the Waikato District Council Operative Plan (“**WDOP**”). Under the PDP approximately half of each property is proposed to be zoned Residential, with the remainder staying Rural.
- 3.2 The Properties can be described as gently sloping rural residential blocks. Ground cover is predominantly pasture, with a concentration of scrub and trees on the southern border, along the Kairoa Stream riparian margin.
- 3.3 Dominion Road abuts the northern boundary of the Properties, with the Kairoa Stream forming the southern property boundary. The Kairoa Stream is one of two main watercourses flowing through the Tuakau Township. The Kairoa Stream drains the eastern portion of the Tuakau catchment. The upper reach of the Kairoa Stream drains mainly agricultural lands and has a well-developed flood plain contained within a deeply incised gully. The Kairoa Stream discharges into the Waikato River south of Tuakau.
- 3.4 The property adjoins a residential development to the west containing 50 lots ranging in size from 500 m<sup>2</sup> to 800 m<sup>2</sup>. Larger lifestyle blocks adjoin the eastern property boundary.



### ***The Rezoning Request***

- 3.5 The Rezoning Request will allow the future development of residential housing. Approximately 14 ha is proposed to be developed for residential use with the remainder of each lot used for stormwater and amenity purposes. A subdivision concept for the Properties has been developed in order to provide an upper estimate of potential subdivision yield under the provisions of the PDP. This subdivision concept provides for 59 residential lots and 160 new residential lots respectively on the two properties.
- 3.6 On both 48 and 52 Dominion Road, in order to manage potential incompatibility with industrial activities at Bollard Road, it is proposed to provide an amenity yard setback within which dwellings would require specific assessment as a restricted discretionary activity. While parts of this land might otherwise be developable, much of this land is marginal for development purposes and/or comprises the obvious location for stormwater attenuation and storage. At least a portion of this southernmost land on either or both of the Properties (depending on whether they are developed comprehensively or separated) is likely to be vested for that purpose at subdivision stage. The development plan upon which the assessment has been based is included in **Appendix B**, and the proposed amenity yard is illustrated in **Appendix C**.

### ***Relevant Planning Context***

- 3.7 A summary of the relevant standards and rules that were considered in assessing the Rezoning Request in terms of stormwater, flooding, wastewater and water supply is included at **Appendix D**, and our assessment of how these can be achieved is summarised in **Appendix E**. The relevant standards and rules include:
- (a) The PDP;
  - (b) RITS;
  - (c) New Zealand Building Code (“**NZBC**”);
  - (d) New Zealand Firefighting Water Supplies Code of Practice SNZ PAS 4509:2008.

#### 4. STORMWATER TREATMENT, MITIGATION AND DISPOSAL

4.1 WDC (PDP 14.11.1.1 and RITS Section 4) and the Draft Tuakau CMP recommends:

- (a) Stormwater quantity management.
- (b) Stormwater quantity management.
- (c) Aquatic resource and erosion protection.
- (d) Flood hazard management.

4.2 The following subparagraphs summarise the requirements of the PDP with respect to Stormwater (set out at **Appendix D**) and the design response proposed. This is followed by a detailed overview of the recommended stormwater design at paragraph 4.3:

- (a) Detention of stormwater runoff from all impervious surfaces during a 10% Annual Exceedance Probability (“**AEP**”) storm event to maintain the rate of stormwater discharge at or below pre-development rate.

**Comment:** Stormwater runoff from the 10% AEP storm event can comfortably be managed so as to not exceed the predevelopment flows. All excess stormwater can be mitigated via the use of rain gardens, detention/non-potable reuse tanks and constructed wetlands (for example).

- (b) Flows exceeding the 10% AEP must be collected to a system or overland flow path with a capacity to convey stormwater up to and including the 1% AEP.

**Comment:** Similar to the neighbouring downstream property, existing overland flows exceeding the 10% AEP can continue to be conveyed in the existing overland flow path, which depending on the concept pursued at subdivision stage might also act as a road. Such roadways can be designed to have the capacity to convey stormwater up to and including the 1% AEP without exceeding depths or velocities which might impede traffic movement.

- (c) Systems must be designed with site specific rainfall data including an adjustment for 2.1°C increase for climate change.

**Comment:** When determining predevelopment flows, the effects of climate change have not been considered; however, when sizing mitigation devices climate change adjusted flows will be used to include an increase in temperature of 2.1° C. This is consistent with the requirements of RITS which requires that:

- Current rainfall (i.e. not climate change) adjusted) shall be used to determine pre-development stormwater runoff flows and volumes.
- Climate change adjusted rainfall shall be used to determine post development flows and volumes to determine stormwater mitigation, treatment and infrastructure

- (d) Retention of stormwater runoff for non-potable reuse.

**Comment:** Onsite retention tanks are recommended at all dwellings within the subdivision to provide non-potable water for reuse.

- (e) Treatment, detention and gradual release to Kairoa Stream.

**Comment:** Constructed wetlands are recommended to mitigate the effects of stormwater flows by providing mitigation for erosion, water quality treatment, extended detention of the Water Quality Storm (34.5 mm), and to ensure that stormwater release into the Kairoa Stream mimics predevelopment flows and natural systems. This approach also meets the requirements of Section 4 of RITS which specifies:

- That where discharge is into a natural stream or modified channel, predevelopment runoff volumes shall be maintained or mitigation of erosive effects must be provided in the receiving environment.

- Water quality treatment where discharge is into a natural watercourse.
- Extended detention of the Water Quality Storm (34.5 mm) where discharge is into a natural watercourse.

Section 4 of RITS also requires that stormwater flows must be attenuated to maintain 2 and 10 year rainfall events to predevelopment levels. Rain gardens and reuse tanks can assist to maintain the 2 and 10 year predevelopment runoff levels.

- 4.3 In terms of stormwater management measures for the Properties, adopting the treatment train approach to stormwater management will provide the best outcome to the higher density development being proposed. There is a steep gully located adjacent to the southern property boundary which will act as an ecological buffer, providing amenity value as well as a stormwater management area. I note this area is also proposed to be identified as an “amenity yard” setback, in order to manage potential incompatibility with neighbouring industrial land uses, meaning this land is likely to be available for stormwater purposes in any event.
- 4.4 Each individual lot can provide mitigation through non-potable reuse and detention storage for all rainfall events up to and including the 10% AEP. For every 100 m<sup>2</sup> of roof area, approximately 2000 litres of detention storage including 500 litres of non-potable reuse can be provided. Detention storage of the first 35 mm of rainfall as well as treatment for every 100 m<sup>2</sup> of driveway and parking can be provided with 4 m<sup>2</sup> raingardens (designed in accordance with Auckland Council GD01).
- 4.5 Treatment for the 6 ha of roading can be provided with vegetated or grassed swales along the roadside draining to wetlands. Wetlands are consistent with a treatment train approach of low impact design. The wetlands will provide final treatment of all stormwater runoff within the site as well as supplemental detention for the runoff volumes and flows from individual residential lots.
- 4.6 Wetlands will protect the stream banks from erosion providing hydraulic neutrality and flood storage for rainfall events up-to and including the 1%

(1 in 100 year) rainfall event. Wetlands will also provide additional habitat for native flora and fauna as well as amenity value to the community.

- 4.7 Stormwater runoff will be discharged from the wetlands to a GD01 complaint outfall which will serve to provide energy dissipation as well as an ecological linkage to the riparian margins of the Kairoa Stream.

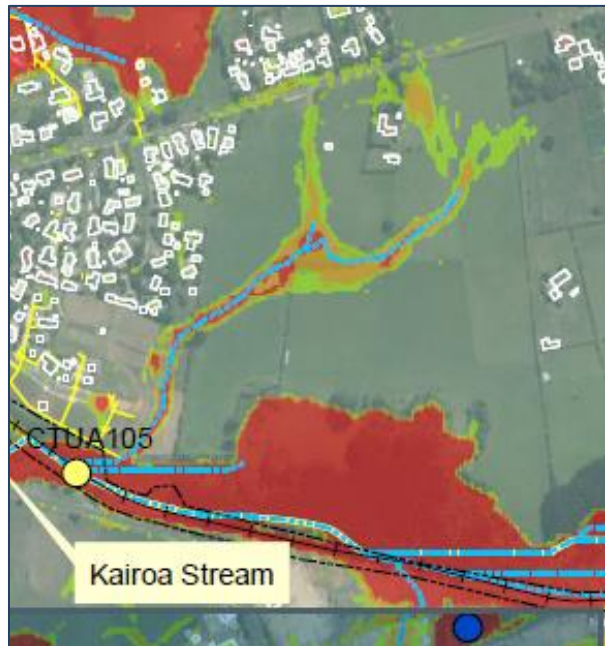
### ***Conclusion (Stormwater)***

- 4.8 In summary, it is possible to design stormwater management measures for development enabled by the Rezoning Request which meet requirements of the PDP and RITS. Accordingly, in my opinion, there are no stormwater effects-related constraints on the rezoning of the Properties for residential purposes as sought by the Submitters.

## **5. FLOODING**

- 5.1 Flood modelling and analysis has also been undertaken to understand the flood risk associated with the Rezoning Request. As set out in **Appendix D**, flood risk has been assessed in accordance with the relevant aspects of RITS and the NZBC.
- 5.2 As noted above, the Kairoa Stream forms the southern boundary of the Properties. Flood modelling of the Kairoa Stream was undertaken in 2014 as part of a draft Tuakau Catchment Management Plan. The model results indicate that a culvert running under the North Island Main Trunk Line results in flooding along the banks of the Kairoa Stream upstream of the culvert. Within the subject property, flooding is contained entirely within the incised gully, which is within the area currently proposed to be identified as “amenity yard”.
- 5.3 The flood modelling shows two areas of flooding within the Properties (refer Fig 1 below). However, the Properties can be developed irrespective of the modelled depth and extent of flooding. Similar to the neighbouring development, immediately to the west, the proposed roads can be designed as blue-green infrastructure, allowing overland flows to pass unhindered to their current discharge point along the Kairoa Stream. The flood plain associated with the northern bank of the Kairoa Stream would also logically be used as recreational open space serving the development and the surrounding community, given it will be more difficult

to develop given its status as an “amenity yard” in order to manage potential incompatibility with nearby industrial uses..



*Figure 1 Flood map of the subject property from the Draft Tuakau CMP*

- 5.4 As discussed in section 4 above, stormwater discharge into the Kairoa Stream can be maintained at current levels using onsite stormwater mitigation and purpose-built wetlands, which provide treatment as well as peak flow mitigation for rainfall events up to and including the 1% AEP. Flood model maps have been included in Appendix D to the ACH Report.
- 5.5 Detention is proposed to be provided by the wetlands discussed in the previous section. These wetlands will limit the post development 1% AEP rainfall event flow rates to 80% of the pre-development 1% AEP rainfall event flow rates.
- 5.6 The subdivision can be laid out in such a way as to confine flooding resulting from the 1% AEP rainfall to reserve and road areas.

**Conclusion (Flooding)**

- 5.7 In summary, it is possible to design a subdivision layout for the Properties in a manner which, alongside the stormwater management measures described in section 4 above, negates the flooding risk to an acceptable level.

## 6. WASTEWATER CAPACITY

- 6.1 As identified in **Appendix D**, the PDP requires new development or subdivision to have a wastewater system that is connected to public, reticulated wastewater network.
- 6.2 As such, an assessment of wastewater capacity has been undertaken to confirm that there is an ability to connect to the wastewater network, and sufficient capacity within that network to accommodate development enabled by the Rezoning Request.
- 6.3 In that regard:
- (a) The local wastewater system is a gravity main which flows to the pump station located on Kowhai Street approximately 1.5 km downstream. From the pump station wastewater is discharged via a 355 mm diameter HDPE rising main for approximately 1.2 km, to convey wastewater over a 10 m rise, in the vicinity of the Tuakau Primary School. From the upper end of the rising main, wastewater enters a 375 uPVC gravity main that discharges to the Watercare Treatment Plant located at the end of Friedlander Road.
  - (b) There is a connection point to an existing 200 mm diameter uPVC wastewater line at the end of Moira Drive, on the western property boundary. This wastewater line currently serves 33 houses within the neighbouring subdivision immediately to the west.
  - (c) Wastewater capacity has been calculated in accordance with section 5.2.3 of the RITS for the fully developed scenario of the catchment (Catchment Design for high density residential development)<sup>1</sup>. The PWWF is calculated to be 22.7 l/s for the service area.
  - (d) There are two available connections to a reticulated wastewater network with sufficient capacity (without surcharge) to cater for the

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<sup>1</sup> Section 5.2.3, RITS, PWWF (litres/sec) = ((infiltration allowance x catchment area) + (surface water ingress x catchment area) + (peaking factor x water consumption x population equivalent)) ÷ 86400

PWWF = ((2,250 litres/day x 21.6 ha) + (16,500 litres/day x 21.6 ha) + (3 x 200 litres/day x 120 people x 21.6 ha)) ÷ 86400 = 22.7 litres/sec.

PWWF for development associated with the Rezoning Request. The preferred connection point is at a 200 mm diameter line located near the southwest property boundary adjacent to no. 34 Moira Drive. All downstream pipes have a gradient greater than 0.9%, comfortably exceeding the minimum 0.55% gradient required by the RITS.

- (e) Further pipe capacity flow calculations indicate that the existing downstream piped system has capacity for a development of up to 50 ha which is over twice the subdivided area of 19.1 ha (only 14 ha which is proposed to be developed).<sup>2</sup> This confirms that there is sufficient capacity for development enabled by the Requested Rezoning.

### ***Conclusion (Wastewater)***

- 6.4 In summary, development enabled by the Requested Rezoning would be able to connect to the wastewater network, and there is sufficient capacity within that network to accommodate the development which would be enabled by the Rezoning Request.

## **7. WATER SUPPLY REQUIREMENTS**

- 7.1 An assessment of water supply capacity has been undertaken to confirm that there is sufficient water supply and associated infrastructure to accommodate development enabled by the Rezoning Request. Water supply assessment has been done in accordance with the requirements of RITS and New Zealand Firefighting Water Supplies Code of Practice (as outlined in **Appendix D**).
- 7.2 The local residential area is serviced by a reticulated potable water supply. A 150 mm diameter water main is located in the road berm adjacent to the northern property boundary on Dominion Road and a 63 mm diameter rider main is located within Moira Drive adjacent to the western property boundary. New water supply pipes will be required, connecting to both the 150 mm main in Dominion Road, and the 63 mm

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<sup>2</sup> Pipe capacity calculations results are shown in Figure 4 in the ACH Report and the calculations have been included in Appendix E of the ACH Report.



rider main in Moira Drive, to provide all domestic and firefighting water supplies.

**Firefighting Water Supply**

- 7.3 Water supply for residential areas must have sufficient capacity to comply with FW2 water supply classification. FW2 water supply requires 750 litres/min within 135 m distance with an additional 750 litres/min within 270 m distance.
- 7.4 There are two available fire hydrants to service the area,<sup>3</sup> with each one exceeding FW2 = 750 l/min. Both hydrants draw from a 100 mm line. Nova Flow Tec Ltd conducted flow testing on these two hydrants simultaneously on Friday the 2<sup>nd</sup> of October. Test results are presented in Table 1 below and included in the ACH Report at Appendix E.

*Table 1 Fire Fighting Water Supply Flow Testing Test:*

Fire Hydrant	Flow (litres/min)	Pressure (kPa)
Dominion Road	870	200
Moira Drive	846	200
<b><i>TOTAL</i></b>	<b><i>1716</i></b>	

- 7.5 Flow testing established that the existing reticulated water supply has sufficient capacity to provide FW2 firefighting water supply to the Properties, in terms of pressure and flow for residential development. Additional fire hydrants will be required, as part of any future residential development, to achieve compliance with the maximum distance of 135 m from any dwelling.

**Domestic Water Supply**

Waikato District Council requires that water supplies for new residential subdivisions have a water supply of 260 litres/day with a peaking factor of 5 or 1300 litres/day. Based on the flow testing results presented in table 2, there is sufficient water supply for 1900 people. Given a maximum probable development of 219 new residential lots and an average

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<sup>3</sup> The nearest fire hydrants are located on the corner of Brian Cowley place and Moira Drive, and near the north-western corner of 48 Dominion Road.

occupancy rate of 2.7 persons per household, at maximum probable development an additional 592 people will be connected to the reticulated water supply. Hence the existing supply is adequate to service the development.

### ***Conclusion (Water Supply)***

- 7.6 In summary, there is sufficient water supply to accommodate any new residential subdivision enabled by the Requested Rezoning. New water supply pipes will be required, connecting to both the 150 mm main in Dominion Road, and the 63 mm rider main in Moria Drive, to provide all domestic and firefighting water supplies. Provision of additional fire hydrants will need be part of any future development so as to allow for hydrants to be within 135 m distance of each house, and have an additional 750 L/min within 270 m distance.

## **8. COMMENTS ON THE COUNCIL'S FRAMEWORK REPORT**

- 8.1 The following comments within the Framework Report relating to provision of infrastructure are relevant to the Rezoning Request:
- (a) Paragraph 7(q) - that additional zoning for urban land uses (both employment and residential activities) in and around existing towns can be serviced by existing and planned infrastructure networks. If short-term infrastructure capacity is not available, for example due to a disconnect between infrastructure delivery and developer readiness, the Framework Report notes that this will be addressed with the developer at the time of subdivision or land use consent.
  - (b) Paragraph 7(s) – Recognition of Tuakau as an area that has existing infrastructure networks (including waters) which either have existing capacity or, with investment, are scalable to support growth. In the case of waters infrastructure, trunk mains and/or headworks already exist in these areas.
  - (c) Paragraphs 291 and 296 – Rezoning requests should not result in development that will necessitate the construction of a private wastewater system, and should propose to connect to a Council owned water and wastewater system.

- (d) Appendix 5 - Servicing of the Dominion Rd growth cell (an area within which the Properties are located) is programmed for 2023-2030. In terms of Water Supply, it notes that Watercare are to extend the water supply network towards Dominion Rd. In terms of Wastewater it notes that the network is to be extended to further support growth cell

8.2 In my view, the Rezoning Request is consistent with the Framework Report from an infrastructure perspective because it will enable development which can be serviced, and which can be designed in accordance with the requirements of the PDP and other relevant documents.

## **9. CONCLUSION**

9.1 **Appendix E** provides a summary of how each of the requirements of the PDP and other relevant standards and rules can be met.

9.2 The evaluation of the relevant rules regarding residential zoned property indicates that the Rezoning Request is appropriate because:

- (a) Stormwater quality and quantity mitigation can be provided in accordance with the PDP and the recommendations of the Draft CMP for the Tuakau Structure Plan Area.
- (b) Flood risks associated with the Kairoa Stream in relation to the potential development are minimal and can be effectively managed.
- (c) The available reticulated wastewater and water supply meet the RITS. Capacity of wastewater services will not be exceeded when the new development is connected to the existing public system. Water supply will be adequate to service the new development and provide water for fire services.

**Peter Alderton**

**17 February 2020**


**Appendix A**

**Infrastructure Capacity & Flood Risk Assessment Report by ACH  
Consulting Limited**

# **Infrastructure Capacity & Flood Risk Assessment**

## **Proposal to Rezone Rural Land**

Pacific Engineering Projects  
48-52 Dominion Road  
Tuakau



200560  
16 February 2021

## Pacific Engineering Projects


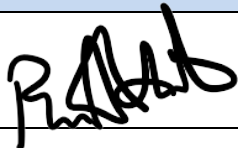
Infrastructure Capacity & Flood Risk Assessment

Proposal to Rezone Rural Land

48-52 Dominion Road

Tuakau

### Document Status

Rev #	Author		Reviewer	
	Name	Signature	Name	Signature
D	Linda Norman BS, MSc, MEngNZ		Peter Alderton BE, CPEngNZ	

ACH CONSULTING LTD

3 Kawakawa Place, Westgate

PO Box 84-287, Westgate 0657

T: 09 839 7050 E: info@achconsulting.co.nz

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## Appendix A

Waikato District Council GIS Plans

## Appendix B

Development Concept Plans

## Appendix C

MPD Stormwater Calculations

## Appendix D

Flood Model Map for Kairoa Stream

## Appendix E

Wastewater Pipe Capacity Calculations

Water Supply Flow testing

## 1. Introduction

ACH Consulting Ltd has been engaged to assess the capacity of the existing infrastructure, as part of a submission on the Proposed Waikato District Plan, seeking a rezoning of land at 48 & 52 Dominion Rd, Tuakau. The properties are zoned rural residential under the Waikato District Council Operative Plan (WDOP); however, under the Waikato District Proposed District Plan (WDPP) approximately half of each property is proposed to be zoned residential, with the remainder staying rural. A plan change is sought to allow for greater residential development of the property on a similar scale to that of the property directly to the west. The relevant rules regarding residential zoned property have been evaluated to determine the suitability of rezoning.

The reticulated wastewater and water supply capacities have been assessed in accordance with the Regional Infrastructure Technical Specifications (RITS). Stormwater quality and quantity mitigation has been evaluated in accordance with the recommendations of the Draft Catchment Management Plan for the Tuakau Structure Plan Area, and the principles of water sensitive design. As the property is situated adjacent to the Kairoa Stream, flood risks associated with the potential development of the property have also been considered, in terms of the Draft Catchment Management Plan.

## 2. Scope

This report provides an assessment of:

- Stormwater treatment and volume mitigation requirements of the WDPP.
- Proposed stormwater disposal from the subject property.
- Overland flow paths crossing the property.
- Potential flooding risks.
- Potential effects of climate change.
- Reticulated wastewater capacity.
- Water supply requirements.

## 3. Waikato Council Requirements

Any proposed rezoning, for the purpose of future residential development, must adhere to the relevant standards and rules presented in Table 1 below.

*Table 1 Property Rules 48- 52 Dominion Road.*

Rule or Standard	Requirements
<b>STORMWATER</b>	
<b>WDPP -14.11.1.1 Stormwater systems for new development or subdivision.</b>	Detain stormwater runoff from all impervious surfaces during a 10% Annual Exceedance Probability (AEP) storm event to maintain the rate of stormwater discharge at or below pre-development rate
	Flows exceeding the 10% AEP are collected to a system or overland flow path with a capacity to convey stormwater up to and including the 1% AEP.
	Systems must be designed with site specific rainfall data including an adjustment for 2.1°C increase for climate change
	Retention of stormwater runoff for non-potable reuse
	Treatment, detention and gradual release to a Kairoa Stream.



RITS Section 4	Design Rainfall : <ul style="list-style-type: none"> <li>• Current rainfall (i.e. not climate change) adjusted) shall be used to determine pre-development stormwater runoff flows and volumes.</li> <li>• Climate change adjusted rainfall shall be used to determine post development flows and volumes to determine stormwater mitigation, treatment and infrastructure</li> </ul>
	Stormwater flows must be attenuated to maintain 2 and 10 year rainfall events to predevelopment levels
	Where discharge is into a natural stream or modified channel predevelopment runoff volumes shall be maintained or mitigation of erosive effects must be provided in the receiving environment.
	Water quality treatment where discharge is into a natural watercourse.
	Extended detention of the Water Quality Storm (34.5 mm) where discharge is into a natural watercourse.
<b>FLOODING</b>	
RITS Section 4	Where identified downstream flooding (or risk of) exists detention is required, limiting the post development 1% AEP rainfall event flow rates to 80% of the pre-development 1% AEP rainfall event flow rates.
Section 4.3.1 of E1/VM1 New Zealand Building Code: Clause E1 Surface Water	<ul style="list-style-type: none"> <li>• 500 mm of free board is required where surface water has a depth of 100 mm or more and extends from the building directly to a road or car park, other than a car park for a single dwelling</li> <li>• 150 mm for all other cases.</li> </ul>
<b>WASTEWATER</b>	
14.11.1.3 Wastewater Servicing for new Development or Subdivision	(i) Is connected to a reticulated wastewater network
RITS Section 5.2.4	Wastewater pipelines shall have sufficient capacity (without surcharge) to cater for the peak wet weather flows (PWWF) for the service area calculated as follows: $PWWF \text{ (litres/sec)} = ((\text{infiltration allowance} \times \text{catchment area}) + (\text{surface water ingress} \times \text{catchment area}) + (\text{peaking factor} \times \text{water consumption} \times \text{population equivalent})) \div 86400$
	On at least one occasion every day a minimum velocity for solids re-suspension (self-cleaning) is achieved.
	150 mm minimum pipe size
	0.55% Minimum Gradient
<b>WATER SUPPLY</b>	
RITS Section 6.1.3	The residual pressure and flow at point of supply to residential lots shall be a minimum of 200 kPa (20 m) and 25 L/min.
	The minimum fire supply service level shall be FW2 for residential areas
	No more than 150 residential Lots shall be serviced, at any point from a single ended 150 mm diameter watermain.
New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ PAS 4509:2008.	Water supply must be adequate for firefighting purposes FW2 (non sprinklered single family and multi-unit dwellings excluding multi storied apartment blocks)
	FW2 = 750 litres/min within 135 m distance with an additional 750 litres/min within 270 m distance

#### 4. Site Description

48 Dominion Road, legally described as is Lot 1 DP 485993, has an area of 5.0769 ha and 52 Dominion Road (Lot 2 DP 371796) has an area of 14.0890 ha.

The subject properties can be described as gently sloping rural residential blocks. Ground cover is predominantly pasture, with a concentration of scrub and trees on the southern border, along the Kairoa Stream riparian margin.

The Kairoa Stream forms the southern property boundary, while Dominion Road abuts the northern boundary. The property adjoins a residential development to the west containing 50 lots ranging in size from 500 m<sup>2</sup> to 800 m<sup>2</sup>. Larger lifestyle blocks adjoin the eastern property boundary. The WDPP maps show a proposed transmission gas line running north - south through Lot 2. Council GIS maps have been included in Appendix A.



*Figure 1 Aerial Photograph of the subject property from Waikato District Council Maps.*

#### 5. Proposed Re-Zoning



The proposed rezoning will allow the future development of residential housing. Approximately 14 ha of the two lots is conducive to residential development with the remainder of each lot providing reserve areas. Figure 2 below shows a concept subdivision concept for 48 Dominion Road, having 59 residential lots with a large reserve area located adjacent to the Kairoa Stream. At the same relative density, there is potential to create 160 new residential lots on 52 Dominion Rd. Moira Drive currently terminates at the western boundary of 48 Dominion Rd, and it is clearly intended to extend into the subject properties as shown in figure 2. A development plan has been included in Appendix B.



*Figure 2 Concept of new subdivision showing residential sites at 48 and 52 Dominion Road.*

## 6. Stormwater

WDC and the Draft Catchment management Plan for Tuakau recommends:

- Stormwater quantity management.
- Stormwater quantity management.
- Aquatic resource and erosion protection.
- Flood hazard management.

The requirements for peak flow attenuation in the 50% AEP (1 in 2 year) and 10% (1 in 10 year) AEP storm events and the requirement to store and release (via extended detention) of the first 34.5 mm of

rain are considered standard practice and will be adopted for the stormwater design. All designs must account for a 2.1°C climate change.

A treatment train approach to stormwater management will provide the best outcome to the higher density development being proposed. There is a steep gully located adjacent to the southern property boundary which will act as an ecological buffer, providing amenity value as well as a stormwater management area.

Each individual lot can provide mitigation through non-potable reuse and detention storage for all rainfall events up to and including the 10% AEP. For every 100 m<sup>2</sup> of roof area approximately 2000 litre of detention storage including 500 litres of non-potable reuse can be provided. Detention storage of the first 35 mm of rainfall as well as treatment for every 100 m<sup>2</sup> of driveway and parking can be provided with 4 m<sup>2</sup> raingardens (designed in accordance with Auckland Council GD01).

Treatment for the 6 ha of roading can be provided with vegetated or grassed swales along the roadside draining to wetlands. Wetlands are consistent with a treatment train approach of low impact design. The wetlands will provide final treatment of all stormwater runoff within the site as well as supplemental detention for the runoff volumes and flows from individual residential lots.

Wetlands will protect the stream banks from erosion providing hydraulic neutrality and flood storage for rainfall events up-to and including the 1% (1 in 100 year) rainfall event. Wetlands will also provide additional habitat for native flora and fauna as well as amenity value to the community.

Stormwater runoff will be discharged from the wetlands to a GD01 complaint outfall which will serve to provide energy dissipation as well as an ecological linkage to the riparian margins of the Kairoa Stream.

## 7. Flooding

The Kairoa Stream is one of two main watercourses flowing through the Tuakau Township. The Kairoa Stream drains the eastern portion of the Tuakau catchment. The upper reach of the Kairoa Stream drains mainly agricultural lands and has a well-developed flood plain contained within a deeply incised gully. The Kairoa Stream discharges into the Waikato River south of Tuakau.

A draft Catchment Management Plan report, completed in 2014, includes modelling of the potential flooding of the Kairoa Stream. The model results indicate that a culvert running under the North Island Main Trunk Line results in flooding along the banks of the Kairoa Stream upstream of the culvert. Within the subject property, flooding is contained entirely within the incised gully, which will be designated as open space.

The flood modelling shows two areas of flooding within the subject properties. The property can be developed respective of the modelled depth and extent of flooding. Similar to the neighbouring development, immediately to the west, the proposed roads will be designed as blue-green infrastructure, allowing overland flows to pass unhindered to their current discharge point along the Kairoa Stream. The flood plain associated with the northern bank of the Kairoa Stream will be designated as recreational open space serving the development and the surrounding community.

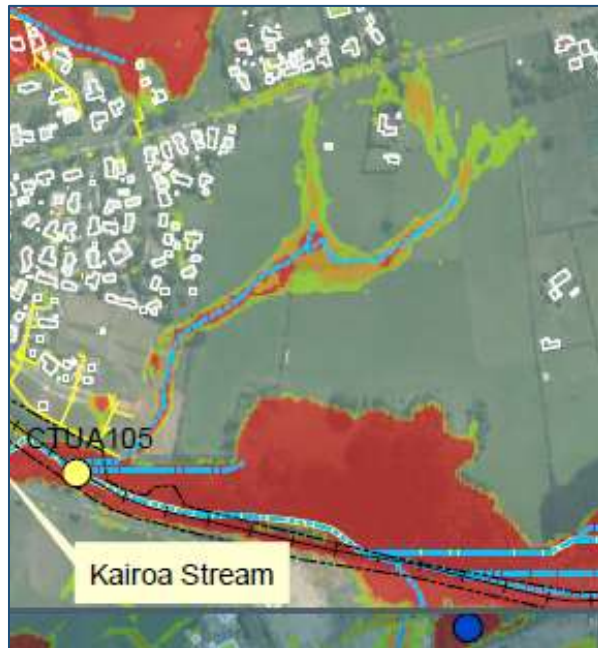


Figure 3 Flood map of the subject property form the Draft Tuakau Catchment management Plan

As discussed in the proceeding section, stormwater discharge into the Kairoa Stream will be maintained at current levels using onsite stormwater mitigation and purpose-built wetlands, which provide treatment as well as peak flow mitigation for rainfall events up to and including the 1% AEP. Flood model maps have been included in Appendix D.

## 8. Wastewater

The local wastewater system is a gravity main which flows to the pump station located on Kowhai Street approximately 1.5 km downstream. From the pump station wastewater is discharged via a 355 mm diameter HDPE rising main for approximately 1.2 km, to convey wastewater over a 10 m rise, in the vicinity of the Tuakau Primary School. From the upper end of the rising main, wastewater enters a 375 uPVC gravity main that discharges to the Watercare Treatment Plant located at the end of Friedlander Road.

There is a connection point to an existing 200 mm diameter uPVC wastewater line at the end of Moira Drive, on the western property boundary. This wastewater line currently serves 33 houses within the neighbouring subdivision immediately to the west.

Wastewater capacity has been calculated in accordance with section 5.2.3 of the RITS for the fully developed scenario of the catchment - Catchment Design for high density residential development:

$PWWF \text{ (litres/sec)} = ((\text{infiltration allowance} \times \text{catchment area}) + (\text{surface water ingress} \times \text{catchment area}) + (\text{peaking factor} \times \text{water consumption} \times \text{population equivalent})) \div 86400$

$PWWF = ((2,250 \text{ litres/day} \times 21.6 \text{ ha}) + (16,500 \text{ litres/day} \times 21.6 \text{ ha}) + (3 \times 200 \text{ litres/day} \times 120 \text{ people} \times 21.6 \text{ ha})) \div 86400 = 22.7 \text{ litres/sec.}$

Pipe capacity flow calculations indicate that the existing downstream piped system has capacity for a development of up to 50 ha. Pipe capacity calculations results are shown in Figure 4 and the calculations have been included in Appendix E.



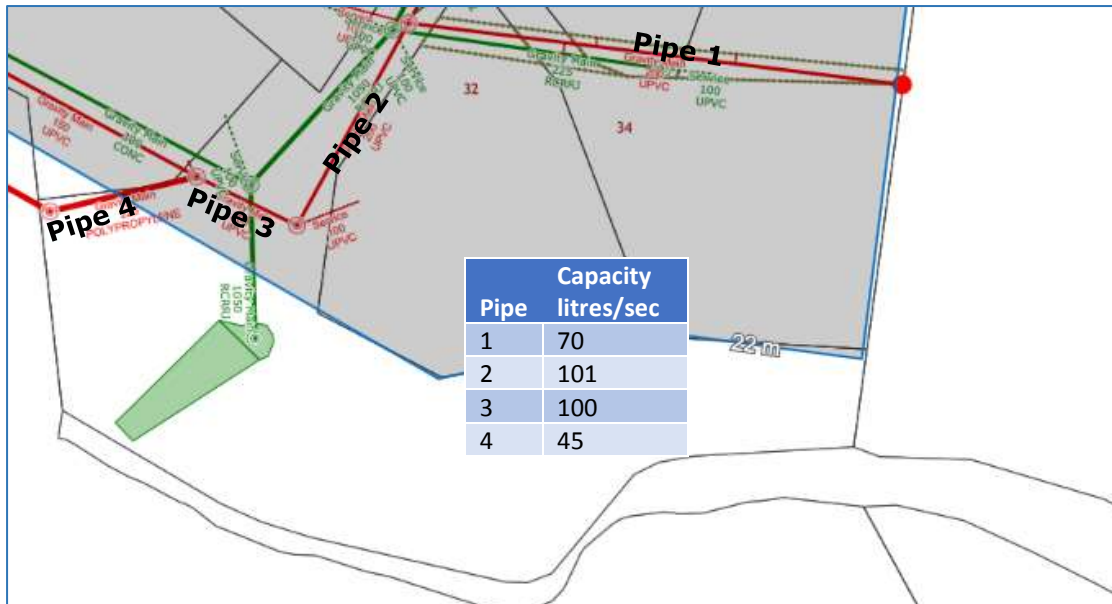


Figure 4 Wastewater pipes.

## 9. Water Supply

The local residential area is serviced by a reticulated potable water supply. A 150 mm diameter water main is located in the road berm adjacent to the northern property boundary and a 63 mm diameter rider main is located within Moira Drive adjacent to the western property boundary. New water supply pipes will be required, connecting to both the 150 mm main in Dominion Road, and the 63 mm rider main in Moria Drive, to provide all domestic and firefighting water supplies. An extension of the 150 mm main in Dominion Road may also be required to upgrade the line from 50 mm further to the east along the northern property boundary of # 52 Dominion Road.

### 9.1 Firefighting Water Supply

Water supply for residential areas must have sufficient capacity to comply with FW2 water supply classification. FW2 water supply requires 750 litres/min within 135 m distance with an additional 750 litres/min within 270 m distance. The nearest fire hydrants are located on the corner of Brian Cowley place and Moira Drive, and near the north-western corner of 48 Dominion Road. Both hydrants draw from a 100 mm line. Nova Flow Tec Ltd conducted flow testing on these two hydrants simultaneously on Friday the 2<sup>nd</sup> of October. Test results are presented in Table 2 and included in Appendix E.

Table 2 Fire Fighting Water Supply Flow Testing Test:

Fire Hydrant	Flow (litres/min)	Pressure (kPa)
Dominion Road	870	200
Moria Drive	846	200
<b>TOTAL</b>	<b>1716</b>	

Flow testing established that the existing reticulated water supply has sufficient capacity to provide FW2 firefighting water supply to the subject property, in terms of pressure and flow for residential development. Additional fire hydrants will be required, as part of any future residential development, to achieve compliance with the maximum distance of 135 m from any dwelling.

## 9.2 Domestic Water Supply

Waikato District Council requires that water supplies for new residential subdivisions have a water supply of 260 litres/day with a peaking factor of 5 or 1300 litres/day. Based on the flow testing results presented in table 2, there is sufficient water supply for 1900 people. Given a maximum probable development of 219 new residential lots and an average occupancy rate of 2.7 persons per household, at maximum probable development an additional 592 people will be connected to the reticulated water supply. Hence the existing is adequate to service the development.

## 10. Conclusions

The evaluation of the relevant rules regarding residential zoned property indicates that the rezoning of rural properties at 48 & 52 Dominion Rd, Tuakau, for greater residential development of the property, is appropriate.

The available reticulated wastewater and water supply meet the RITS. Stormwater quality and quantity mitigation can be provided in accordance with the WDPP, and the recommendations of the Draft Catchment Management Plan for the Tuakau Structure Plan Area. Flood risks associated with the Kairoa Stream in relation to the potential development are minimal and can be effectively managed.

*Table 3 Property Rules 48- 52 Dominion Road.*

Rules & Standards	Comments
<p><b>STORMWATER</b>  <b>WDPP -</b>  <b>14.11.1.1</b>  <b>Stormwater</b>  <b>systems for</b>  <b>new</b>  <b>development or</b>  <b>subdivision.</b>  <b>&amp;</b>  <b>RITS Section 4</b></p>	<ul style="list-style-type: none"> <li>• Detention of stormwater runoff from all impervious surfaces during a 10% Annual Exceedance Probability (AEP) storm event to maintain the rate of stormwater discharge at or below pre-development rate will be provided by a combination of rain gardens, detention/non-potable reuse tanks and constructed wetlands.</li> <li>• Similar to the neighbouring property existing overland flows exceeding the 10% AEP will continue to be conveyed in the existing overland flow path which will also act as a road. The roadway will have the capacity to convey stormwater up to and including the 1% AEP without exceeding depths or velocities which might impede traffic movement.</li> <li>• Both green and grey stormwater infrastructure will be sized (for volume, treatment and flows) to allow for the predevelopment flows to be determined without climate change and the post development flows to include 2.1°C increase for climate change.</li> <li>• All homes within the subdivision will include retention tanks to provide non-potable reuse of stormwater runoff from roof areas. The non-potable reuse will include laundry, toilet and gardening.</li> <li>• Residential reuse tanks and raingardens will help maintain runoff volume to predevelopment levels to attenuate rainfall events so as to maintain 2 and 10 year predevelopment levels.</li> <li>• The discharge is into the Kairoa Stream will be via wetlands which will provide:             <ul style="list-style-type: none"> <li>▪ Mitigation of the erosive effects of stormwater discharge.</li> <li>▪ Water quality treatment.</li> <li>▪ Extended detention of the Water Quality Storm (34.5 mm).</li> <li>▪ Ensure a release of stormwater flows to the Kairoa Stream that mimics natural systems and does not exacerbate erosion within the stream or the riparian margins.</li> </ul> </li> </ul>

<p><b>FLOODING &amp; SURFACE WATER</b></p> <p>RITS Section 4. &amp; Section 4.3.1 of E1/VM1 New Zealand Building Code: Clause E1 Surface Water</p>	<p>The Kairoa Stream is subject to downstream and upstream flooding. As such, the wetlands will provide detention, limiting the post development 1% AEP rainfall event flow rates to 80% of the pre-development 1% AEP rainfall event flow rates.</p> <p>The subdivision will be laid out in such a way as to confine flooding resulting from the 1% AEP rainfall to reserve and road areas.</p>
<p><b>WASTEWATER</b></p> <p>14.11.1.3 Wastewater Servicing for new Development or Subdivision &amp; RITS Section 5.2.4</p>	<p>There are 2 available connections to a reticulated wastewater network with sufficient capacity (without surcharge) to cater for the PWWF of 22.7 litres/sec calculated for the service area.</p> <p>The preferred connection point is at a 20 mm diameter line located near the southwest property boundary adjacent to #34 Moira Drive.</p> <p>All downstream pipes have a gradient greater than .9%</p>
<p><b>WATER SUPPLY</b></p> <p>RITS Section 6.1.3 &amp; New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ PAS 4509:2008.</p>	<p>There is a 150 mm diameter watermain located adjacent to the northern property boundary which can service up to 150 residential lots from a single connection point. An extension of the 150 mm water supply line may be necessary under the scheme plan presented herein.</p> <p>Flow testing has demonstrated that the residual pressure and flow at the point of supply to the proposed rezoning area minimum pressure of 200 kPa and flow rate of at least 846 litres/min.</p> <p>The flow rate from the two available fire hydrants meet FW2 = 750 litres/min.</p> <p>Additional fire hydrants will need to be part of any development plan so as to allow for hydrants to be within 135 m distance and have an additional 750 litres/min within 270 m distance.</p>

## 11. Limitations

This report has been prepared for the sole benefit of Pacific Engineering Projects Ltd to provide evidence for a proposed plan change and subsequent development of 48 & 52 Dominion Road. It is not to be relied upon or used out of context by any other person without reference to ACH Consulting.



# Appendix A

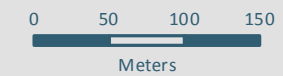
## Waikato District Council GIS Plans





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### 48 & 52 Dominion Road, Tuakau

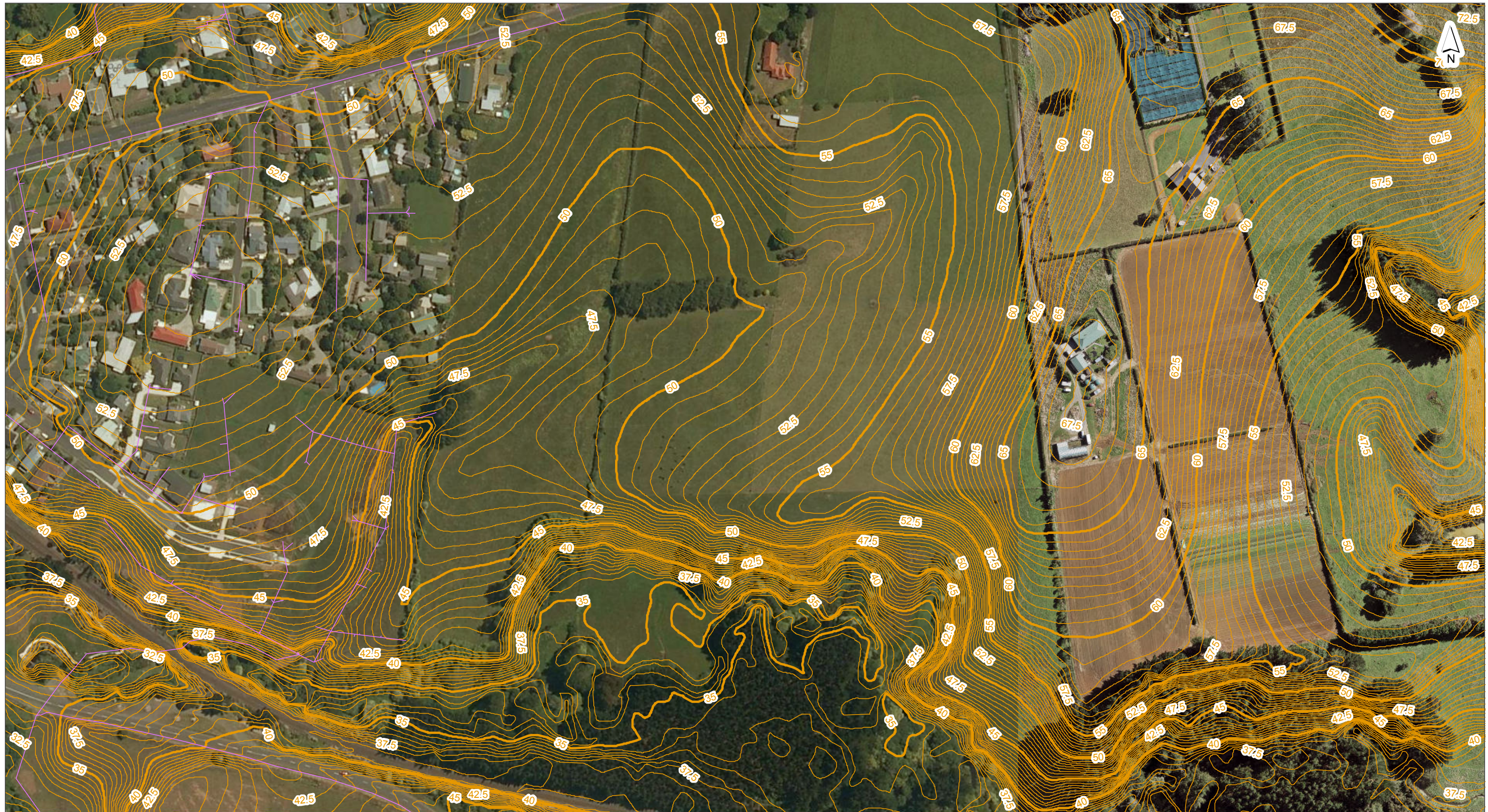


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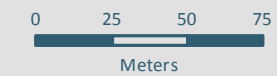






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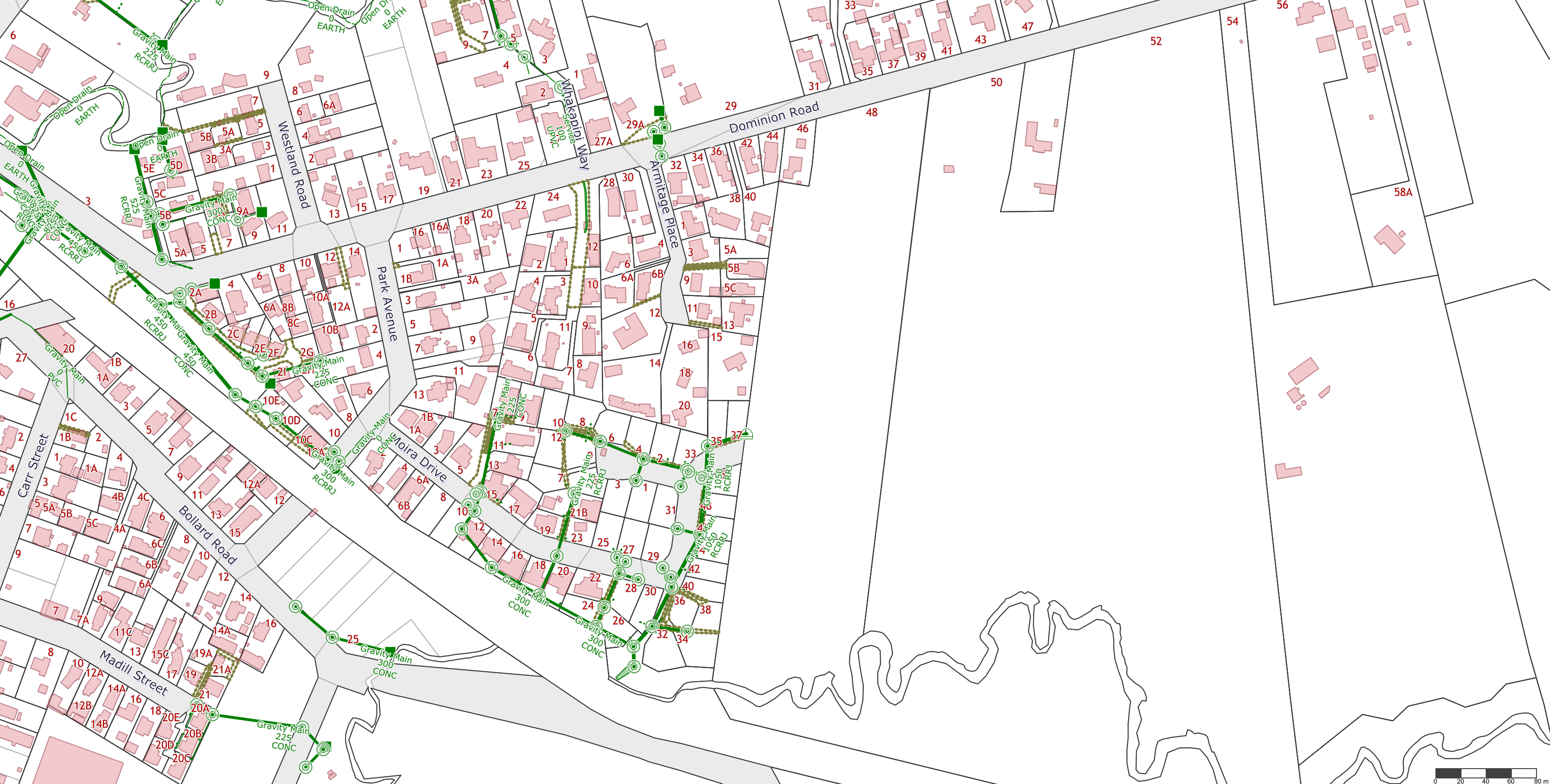


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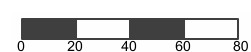
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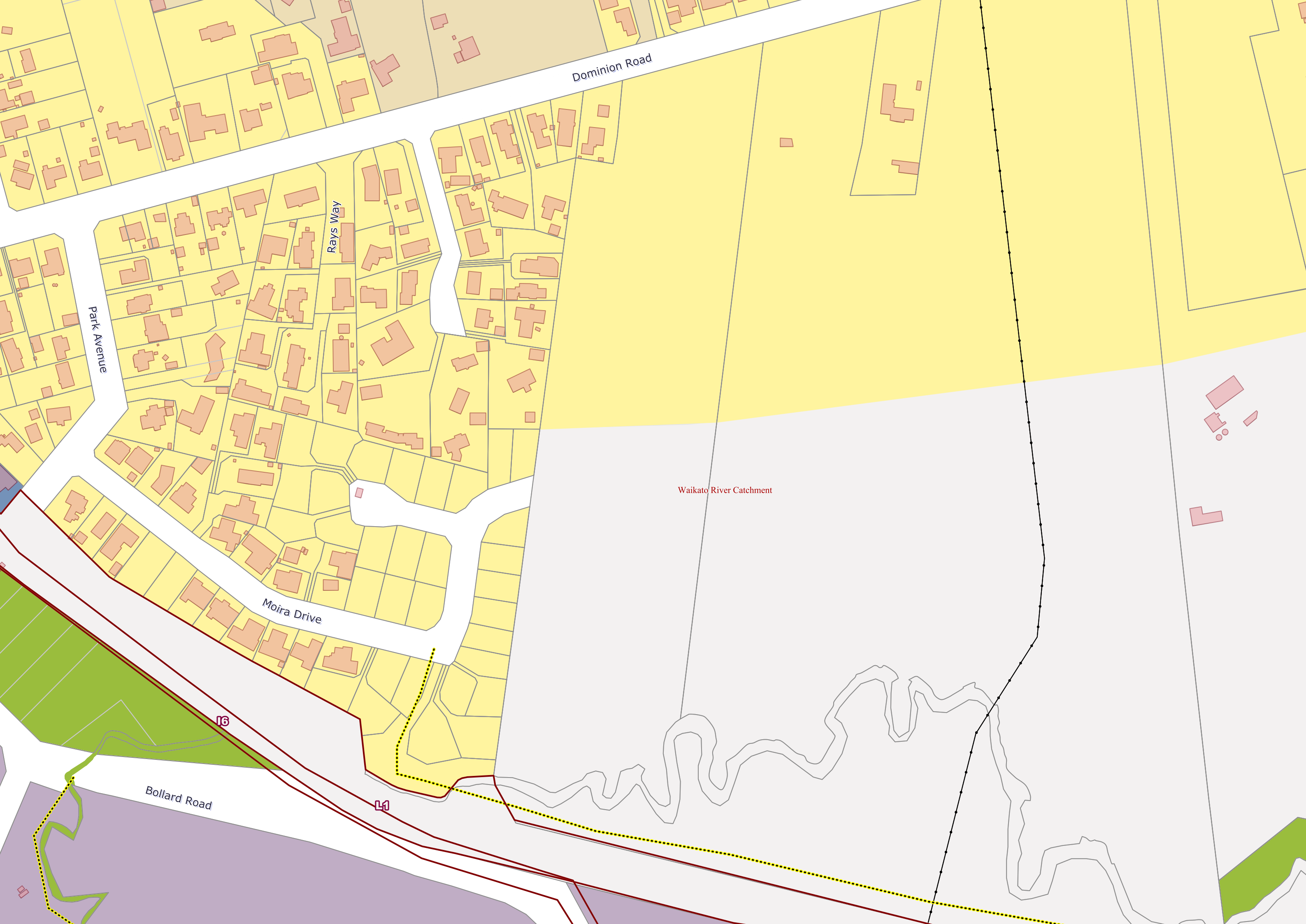
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Dominion Road

Rays Way

Park Avenue

Moira Drive

Bollard Road

Waikato River Catchment

16


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## Appendix B

### Development Concept Plans





 Proposed covenanted planted area

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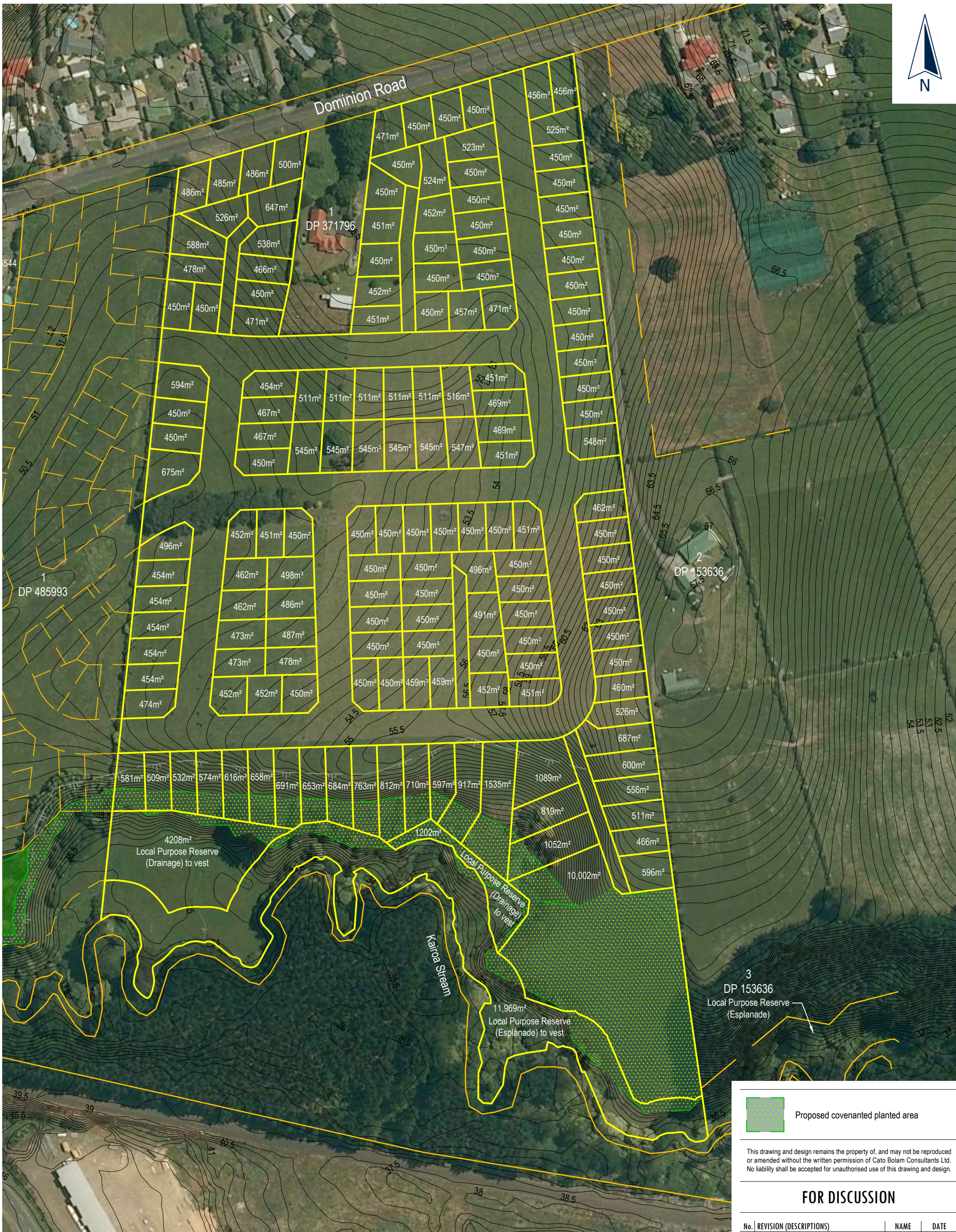
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
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DATE	ORIGINAL SCALE	ORIGINAL SIZE
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44924-DR-PLN-1200	A	





 Proposed covenanted planted area

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**FOR DISCUSSION**

No.	REVISION (DESCRIPTIONS)	NAME	DATE
A	Issued for discussion	CS	05/02/2021

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DRAWN	TM	26/01/2021
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## Appendix C

### MPD Stormwater Calculations

**Stormwater Runoff Calculation Worksheet - (Based on ARC TP 108)**

**Section 1 - Runoff Curve Number (CN) & Initial Abstraction (I<sub>a</sub>)**

Greenfield

Soil Name & Classification	Cover Type, treatment & Hydrologic Condition	Curve No. (CN)	Area (ha)	Product of CN x Area
<i>For Undeveloped Situation:</i>				
Pervious	Grass	74	19.0000	1406.00
Impervious	Existing Hardstand	98	0.0000	0.00
	Building	98	0.0000	0.00
			0.0000	0.00
<b>Undeveloped Total:</b>			<b>19.0000</b>	<b>1406.00</b>
<i>Developed Situation</i>				
Pervious	Grass	74	6.6500	492.10
Re-planting	Bush	70	0.0000	0.00
Impervious	Hardstand	98	8.7500	857.50
	Building	98	3.6000	352.80
<b>Developed Total:</b>			<b>19.0000</b>	<b>1702.40</b>

Time of Concentration (t <sub>c</sub> )	Undeveloped	Developed
Channelisation Factor (C)	0.6	0.8
Catchment Length (km)	0.670	0.670
Catchment Slope (S <sub>c</sub> ) (m/m)	0.04	0.04
Runoff Factor = CN/(200-CN)	0.59	0.81
<b>t<sub>c</sub> = 0.14 x C x L<sup>0.66</sup>(CN/200-CN)<sup>-0.55</sup> x S<sub>c</sub> (hrs)</b>	<b>0.231</b>	<b>0.257</b>
Time to Peak (t <sub>p</sub> ) = 2/3 t <sub>c</sub> (hrs)	0.154	0.172

CN <sub>(Weighted)</sub> = Total Product/ Total Area	74.00	89.60
Initial Abstraction I <sub>a(Weighted)</sub> = 5(Pervious Area/ Total Area)	5.00	1.75

**Section 2 - Graphical Peak Flow Rate**

Catchment Data	Undeveloped	Developed
Catchment Area (A) (km <sup>2</sup> )	0.190000	0.190000
Runoff Curve Number (CN)	74.00	89.60
Initial Abstraction I <sub>a(Weighted)</sub>	5.00	1.75
Time of Concentration (t <sub>c</sub> ) (hrs)	0.231	0.257
Depression Storage (S) = (1000/CN - 10) x 25.4 (mm)	89.24	29.48

Average Recurrence Interval (ARI) (yrs)	2yr		10yr		100yr		34.5 mm	
Situation	Undev	Dev	Undev	Dev	Undev	Dev	Undev	Dev
24 hour Rainfall Depth (P <sub>24</sub> ) (mm)	78	78	122	122	195	195	34.5	34.5
Runoff Index (c*) = P <sub>24</sub> -2I <sub>a</sub> / P <sub>24</sub> -2I <sub>a</sub> +2S	0.27	0.56	0.39	0.67	0.51	0.76	0.12	0.34
Estimate Specific Flow Rate q*	0.075	0.112	0.094	0.123	0.111	0.131	0.035	0.085
Peak Flow Rate (q <sub>p</sub> ) = q* x A x P <sub>24</sub> (m <sup>3</sup> /sec)	1.102	1.648	2.182	2.845	4.098	4.851	0.228	0.554
Runoff Depth D <sub>24</sub> = (P <sub>24</sub> -I <sub>a</sub> ) <sup>2</sup> /(P <sub>24</sub> -I <sub>a</sub> )+S (mm)	32	55	66	97	129	168	7	17
Runoff Volume V <sub>24</sub> = 1000 x D <sub>24</sub> x A (m <sup>3</sup> )	6174.5	10360.26	12611	18348.8	24562.81456	31857.35	1392.48	3274.62
<b>Δ runoff Volume (m<sup>3</sup>)</b>		<b>4185.73</b>		<b>5737.96</b>		<b>7294.54</b>		<b>1882.14</b>
Δ runoff rate (L/sec)		545.136		663.015		752.9145		325.70

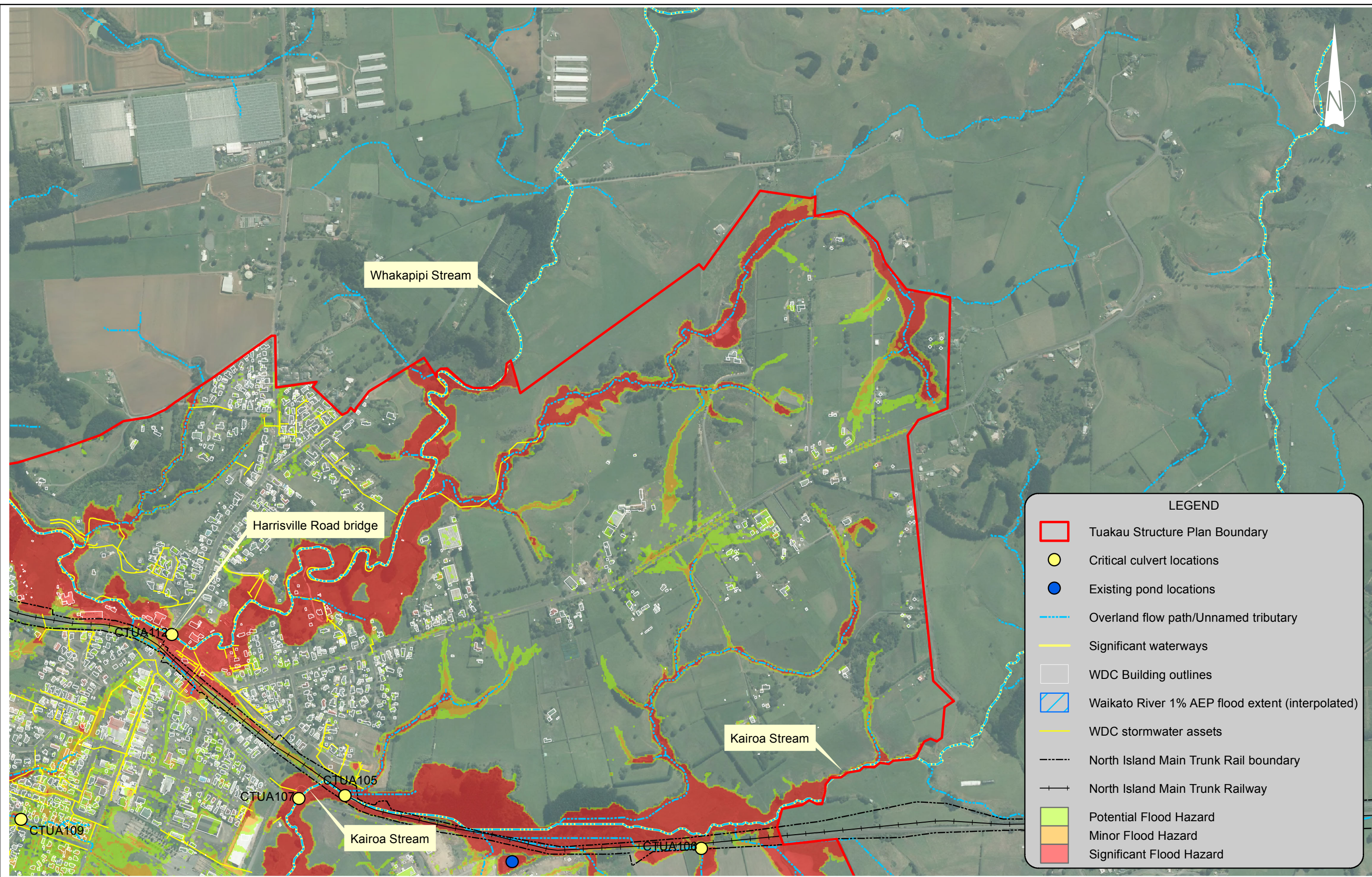
Water Quality Volume		
Average Recurrence Interval (ARI) (yrs)	1/3 of the 2yr	
Situation	Undev	Dev
24 hour Rainfall Depth (P <sub>24</sub> ) (mm)	25	25
Runoff Index (c*) = P <sub>24</sub> -2I <sub>a</sub> / P <sub>24</sub> -2I <sub>a</sub> +2S	0.08	0.27
Estimate Specific Flow Rate q*	0.0200	0.071
Peak Flow Rate (q <sub>p</sub> ) = q* x A x P <sub>24</sub> (m <sup>3</sup> /sec)	0.095	0.336
Runoff Depth D <sub>24</sub> = (P <sub>24</sub> -I <sub>a</sub> ) <sup>2</sup> /(P <sub>24</sub> -I <sub>a</sub> )+S (mm)	4	10
Runoff Volume V <sub>24</sub> = 1000 x D <sub>24</sub> x A (m <sup>3</sup> )	695.7	1947.709

NIWA HIRDS V.4 Rainfall depths (mm) :  
 RCP8.5 for the period 2081-2100 which predicts between 3.2°C and 5.4°C increase in global average temperatures over the next 100 years.

## Appendix D

### Flood Model Map for Kairoa Stream



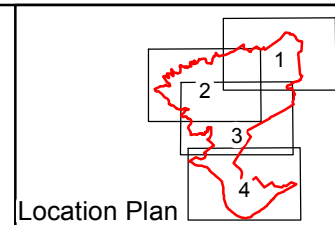
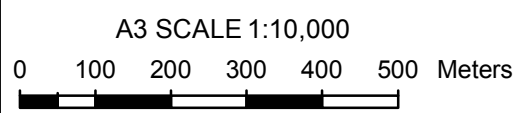


**LEGEND**

- Tuakau Structure Plan Boundary
- Critical culvert locations
- Existing pond locations
- Overland flow path/Unnamed tributary
- Significant waterways
- WDC Building outlines
- Waikato River 1% AEP flood extent (interpolated)
- WDC stormwater assets
- North Island Main Trunk Rail boundary
- North Island Main Trunk Railway
- Potential Flood Hazard
- Minor Flood Hazard
- Significant Flood Hazard

Path: P:\61814\61814\_0000\WorkingMaterial\GIS\61814\_000-F102\_F105.mxd Date: 16/07/2014 Time: 9:15:49 a.m.

Notes: Aerial photograph supplied by Waikato District Council.



**Tonkin & Taylor**  
Environmental and Engineering Consultants  
Level 1, 9 Clifton Road, Hamilton  
www.tonkin.co.nz

DRAWN	DWM	Jul, 14
CHECKED	BND	7/14
APPROVED	PRC	7/14
ARCFILE 61814.000-F102_F105.mxd		
SCALE (AT A3 SIZE) 1:10,000		
PROJECT No.	61814.000	

**WAIKATO DISTRICT COUNCIL  
CATCHMENT MANAGEMENT PLAN  
TUAKAU STRUCTURE PLAN AREA  
Flooding Map - Sheet 1 of 4**

FIGURE No. Figure 102

Rev. 0



## Appendix E

Wastewater Pipe Capacity Calculations

Water Supply Flow testing

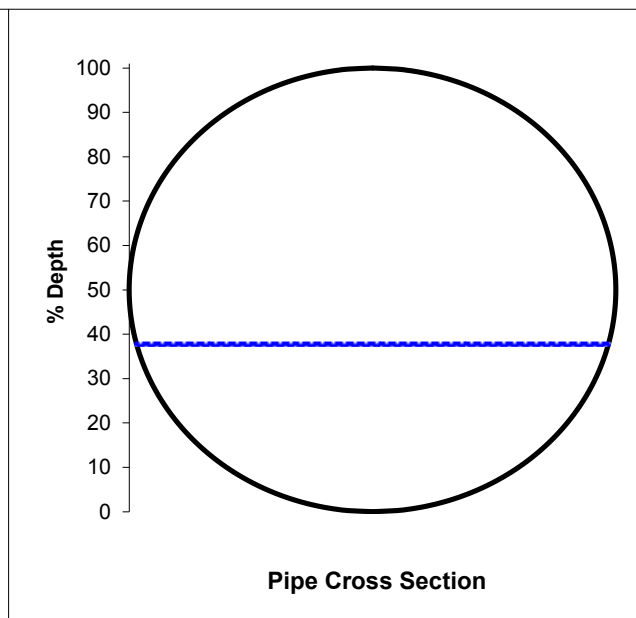
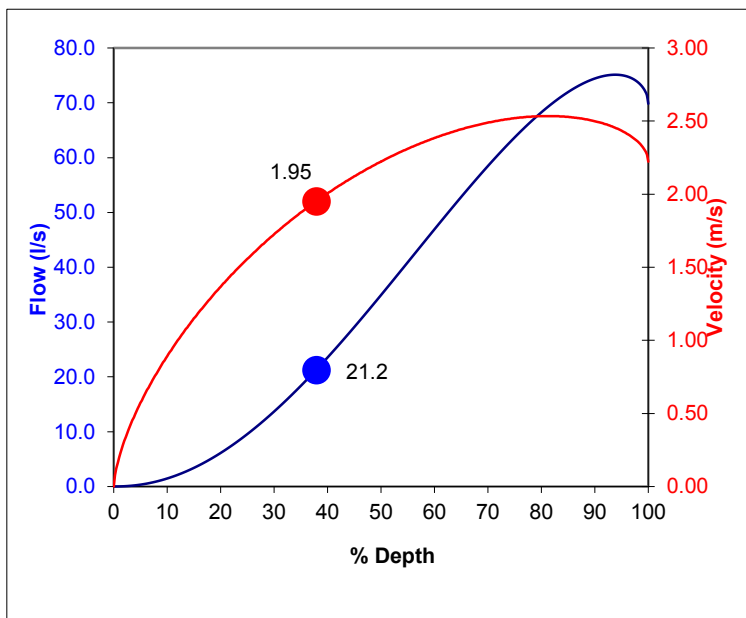
**PIPE FLOW CAPACITY - MANNING'S FORMULA**

**CAPACITY LINE 1**

Flow Rate	21.5 l/s	Upstream I.L.	42.17 m
Pipe Material:	AC Pipe	Downstream I.L.	39.83 m
Pipe Internal Diameter:	200 mm	Pipe Length	51.6 m
Pipe Slope:	4.53 % or 122.1		
Colebrooke-White 'k':	1.5 mm		
Mannings "n":	0.013 approx.		

**HYDRAULIC OUTPUT**

Flow Rate	21.5 l/s	Wetted Perimeter	0.265 m
Velocity	1.95 m/s	Flow Area	0.011 m <sup>2</sup>
Flow Depth	76 mm	Specific Energy	270 mm
Flow Depth / Pipe Dia.	38 %	<b>Froude Number</b>	<b>2.63</b>
<b>Pipe Flow at 100% Dpth</b>	<b>70 l/s</b>	<b>OK</b>	Flow Type
			Supercritical



Velocity = Q/A  
0.68 m/sec

Mannings Formula

$$V = \frac{1}{n} R^{2/3} S^{1/2}$$



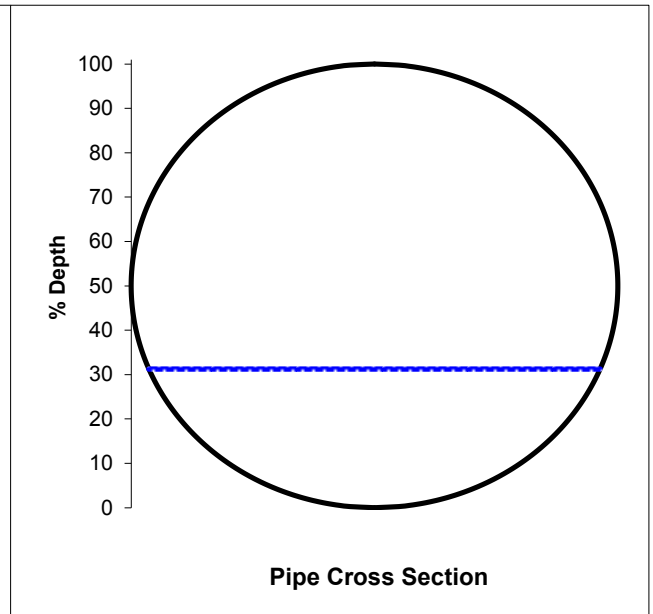
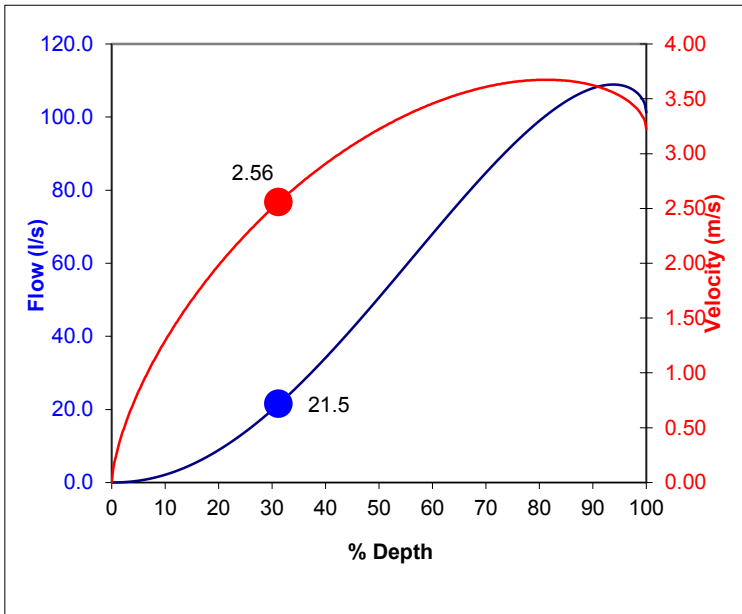
**PIPE FLOW CAPACITY - MANNING'S FORMULA**

**CAPACITY LINE 2**

Flow Rate	21.5 l/s	Upstream I.L.	39.83 m
Pipe Material:	AC Pipe	Downstream I.L.	37.54 m
Pipe Internal Diameter:	200 mm	Pipe Length	24.03 m
Pipe Slope:	9.53 % or 1 in 10.5		
Colebrooke-White 'k':	1.5 mm		
Mannings "n":	0.013 approx.		

**HYDRAULIC OUTPUT**

Flow Rate	21.5 l/s	Wetted Perimeter	0.237 m
Velocity	2.56 m/s	Flow Area	0.008 m <sup>2</sup>
Flow Depth	63 mm	Specific Energy	396 mm
Flow Depth / Pipe Dia.	31 %	<b>Froude Number</b>	<b>3.84</b>
<b>Pipe Flow at 100% Dpth</b>	<b>101 l/s</b>	<b>OK</b>	Flow Type
			Supercritical



**Velocity = Q/A**  
**0.68 m/sec**

Mannings Formula

$$V = \frac{1}{n} R^{2/3} S^{1/2}$$

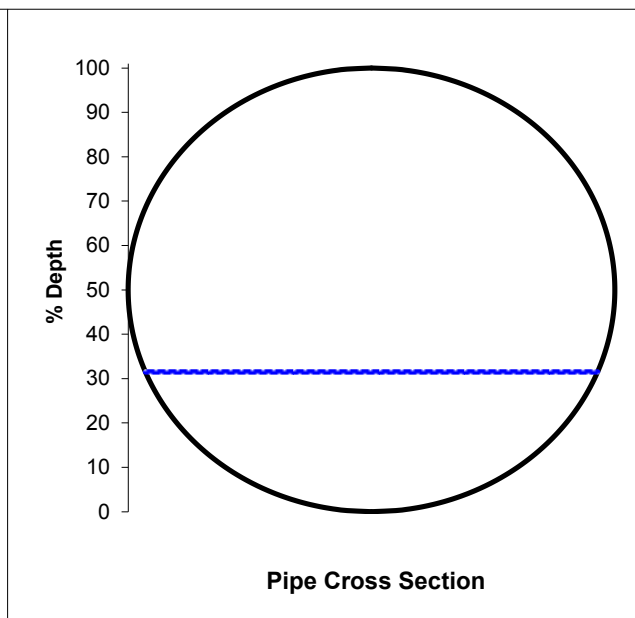
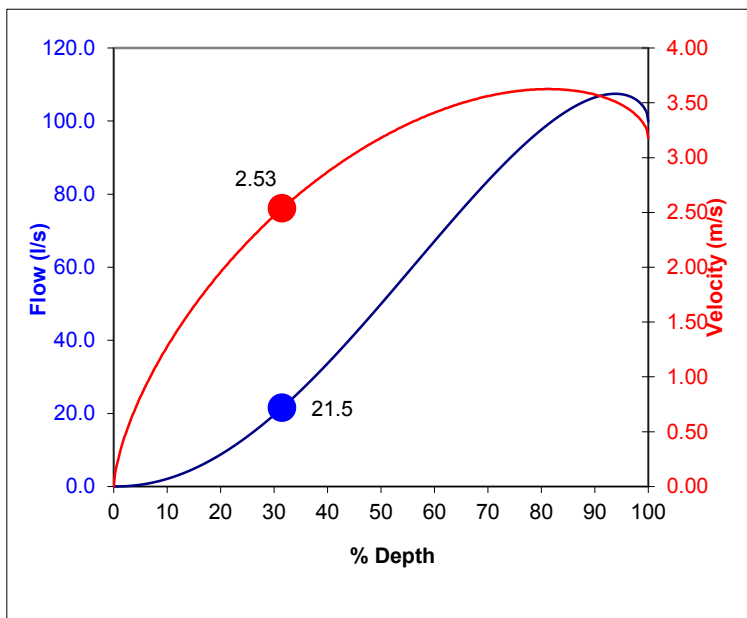
**PIPE FLOW CAPACITY - MANNING'S FORMULA**

**CAPACITY LINE 3**

Flow Rate	21.5 l/s	Upstream I.L.	37.54 m
Pipe Material:	AC Pipe	Downstream I.L.	36.51 m
Pipe Internal Diameter:	200 mm	Pipe Length	11.1 m
Pipe Slope:	9.28 % or 110.8		
Colebrooke-White 'k':	1.5 mm		
Mannings "n":	0.013 approx.		

**HYDRAULIC OUTPUT**

Flow Rate	21.5 l/s	Wetted Perimeter	0.238 m
Velocity	2.53 m/s	Flow Area	0.008 m <sup>2</sup>
Flow Depth	63 mm	Specific Energy	390 mm
Flow Depth / Pipe Dia.	32 %	<b>Froude Number</b>	<b>3.79</b>
<b>Pipe Flow at 100% Dpth</b>	<b>100 l/s</b>	<b>OK</b>	Flow Type
			Supercritical



Velocity = Q/A  
0.68 m/sec

Mannings Formula

$$V = \frac{1}{n} R^{2/3} S^{1/2}$$

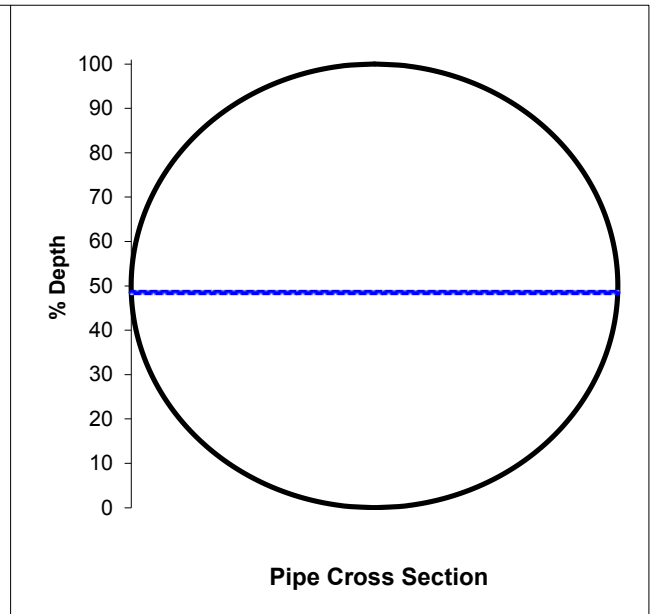
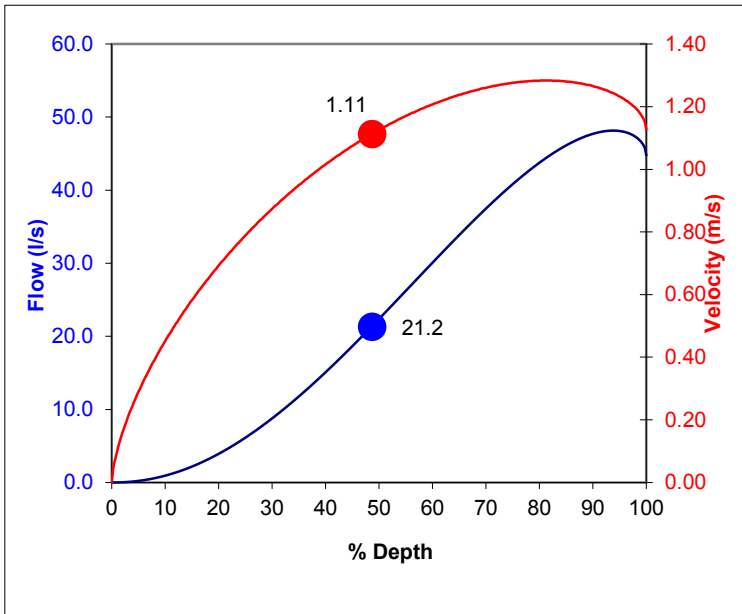
**PIPE FLOW CAPACITY - MANNING'S FORMULA**

**CAPACITY LINE 4**

Flow Rate	21.5 l/s	Upstream I.L.	36.25 m
Pipe Material:	AC Pipe	Downstream I.L.	36.09 m
Pipe Internal Diameter:	225 mm	Pipe Length	16.1 m
Pipe Slope:	0.99 % or 1 100.6		
Colebrooke-White 'k':	1.5 mm		
Mannings "n":	0.013 approx.		

**HYDRAULIC OUTPUT**

Flow Rate	21.5 l/s	Wetted Perimeter	0.347 m
Velocity	1.11 m/s	Flow Area	0.019 m <sup>2</sup>
Flow Depth	110 mm	Specific Energy	173 mm
Flow Depth / Pipe Dia.	49 %	<b>Froude Number</b>	<b>1.22</b>
<b>Pipe Flow at 100% Dpth</b>	<b>45 l/s</b>	<b>OK</b>	Flow Type
			Supercritical



Velocity = Q/A  
0.54 m/sec

Mannings Formula

$$V = \frac{1}{n} R^{2/3} S^{1/2}$$



NOVA FLOWTEC SERVICES LTD  
HYDRANT TESTING SPECIALISTS

E: info@novaflowtec.co.nz  
T: 09 444 8375  
PO Box 241, Albany, Auckland 0752  
www.novaflowtec.co.nz

2nd October 2020

ACH Consulting  
PO Box 84 287  
Westgate, Auckland

**RE: Firefighting Water Supply at 48-52 Dominion Road, Tuakau**

**Attention: Stefan Timmermans**

Dear Stefan

Nova Flowtec Services were engaged to conduct a FW2 hydrant flow test for the proposed development at the above address.

The testing was conducted on Friday 2<sup>nd</sup> October at 9.40am.

The object of the testing was to prove that there is sufficient water for firefighting purposes.

**Requirements:**

In order to meet the FW2 minimum requirements of PAS 4509: 2008, 12.5Lps is required within 135m and an additional 12.5Lps is required within 270m of the development.

This being a total of 25Lps at a minimum residual pressure of 100kPa.

**Results:**

During testing the minimum requirement was unable to be achieved as insufficient hydrants were available within the allowable distances of all areas of the development as described above.

However, the nearest two hydrants located on Dominion Road and Moira Drive were tested and a flow of 28.6Lps at 200kPa was recorded, proving the minimum FW2 requirement is available at the nearest street hydrants.

Additional hydrant(s) will need to be fitted within the site.

Please find the results table and the hydrant map on the following page.

Should you have any questions please do not hesitate to contact me.

Kind Regards

A handwritten signature in blue ink that reads 'MKeane'.

Melanie Keane  
Testing Manager

### FW2 Water Classification Test

	Hydrant One	Hydrant Two	Total Flow (Lps)	Pressure (kPa)
			0	455
Flow (Lps)	n/a		n/a	n/a
Flow (Lps)	14.5	14.1	28.6	200
Date & Time:	2nd October 2020 at 9.40am			
Site Address:	48-52 Dominion Road, Tuakau			
Full Flow Result:	28.6Lps at 200kPa			

### Hydrant Map



Figures aquired from, Reginal Infrastructure Technical Specification (RITS)

**RITS 6.2.3 System Design Criteria for New Residential Subdivision.**

260 litres/person/day with peak flow 5 times this amount for on demand supply.

**Nova Flow Tec Hydrant Results.**

28.6 Lps whilst flowing two hydrants simultaneously at 200kPa. Hydrants located on Dominion Rd and Moira Drive.

**Calculation**

One day= (24 hrs x 60 minutes x 60 seconds = 86,400 seconds per day)

Domestic demand 260 litres per person per day x 5 (peak flow) = 1300 Ltr per day

86,400 seconds x 28.6 Lps = 2,471,040 Ltrs per day available

2,471,040 Ltrs % 1300 Ltrs per day per person at peak flows = 1900.8 People, drawing at peak times

1900.8 people % 4 (average number of people per house) = 475.2 new houses.


Not taking into consideration water reticulation design or other hydrolic engineering considerations. Based only on figures provided by the RITS and Nova Flow Tec Ltd, there is sufficient water flow to supply domestic water to **475 new dwellings**

**Appendix B**

**Development Concept Plans**





 Proposed covenanted planted area

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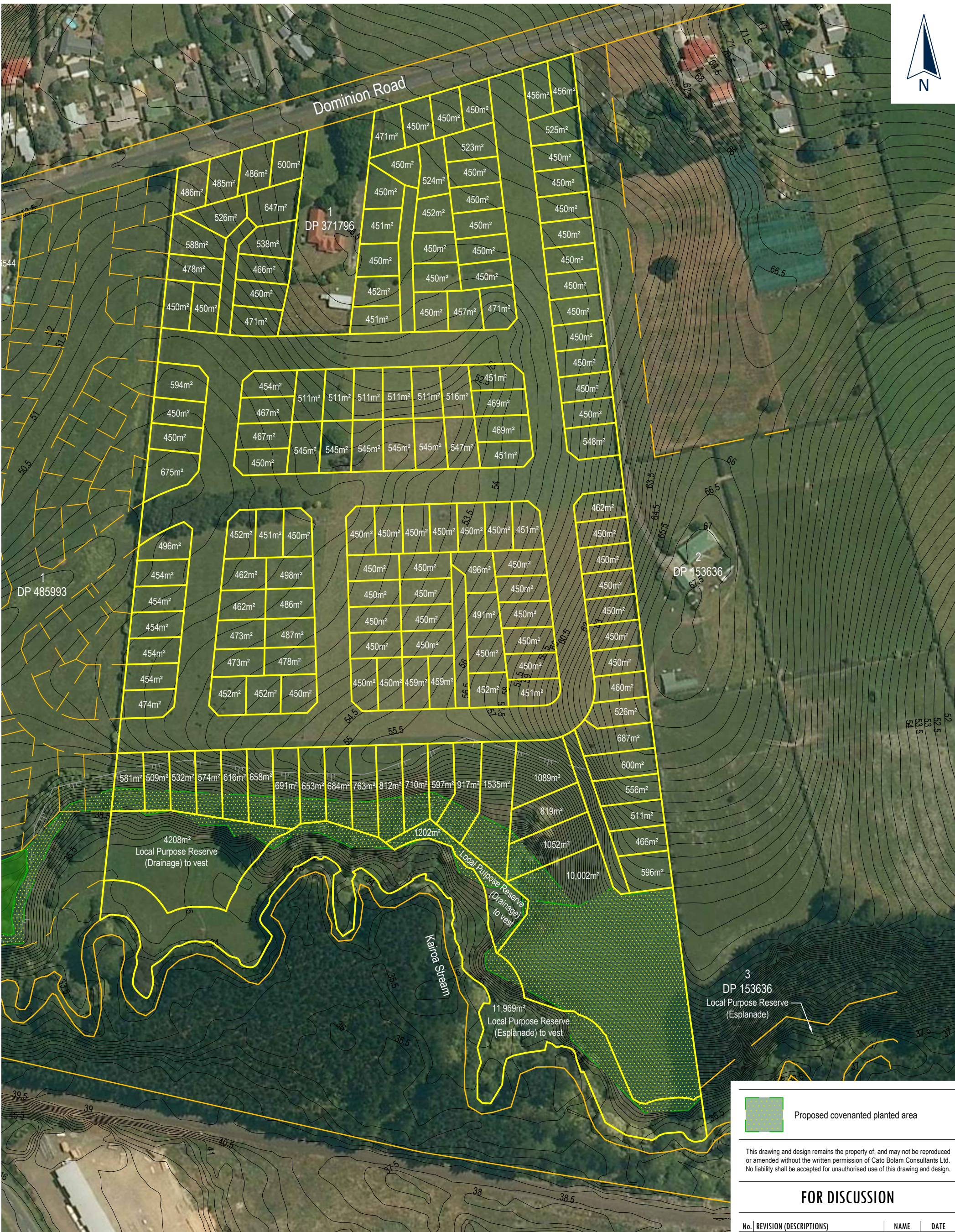
**FOR DISCUSSION**


No.	REVISION (DESCRIPTIONS)	NAME	DATE
A	Issued for discussion	CS	05/02/2021

SURVEYED		
DESIGNED	CS	26/01/2021
DRAWN	TM	26/01/2021
DATE	ORIGINAL SCALE	ORIGINAL SIZE
05/02/2021	1:2000	A3
DRAWING NO.		REVISION
44924-DR-PLN-1200		A





 Proposed covenanted planted area

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**FOR DISCUSSION**

No.	REVISION (DESCRIPTIONS)	NAME	DATE
A	Issued for discussion	CS	05/02/2021

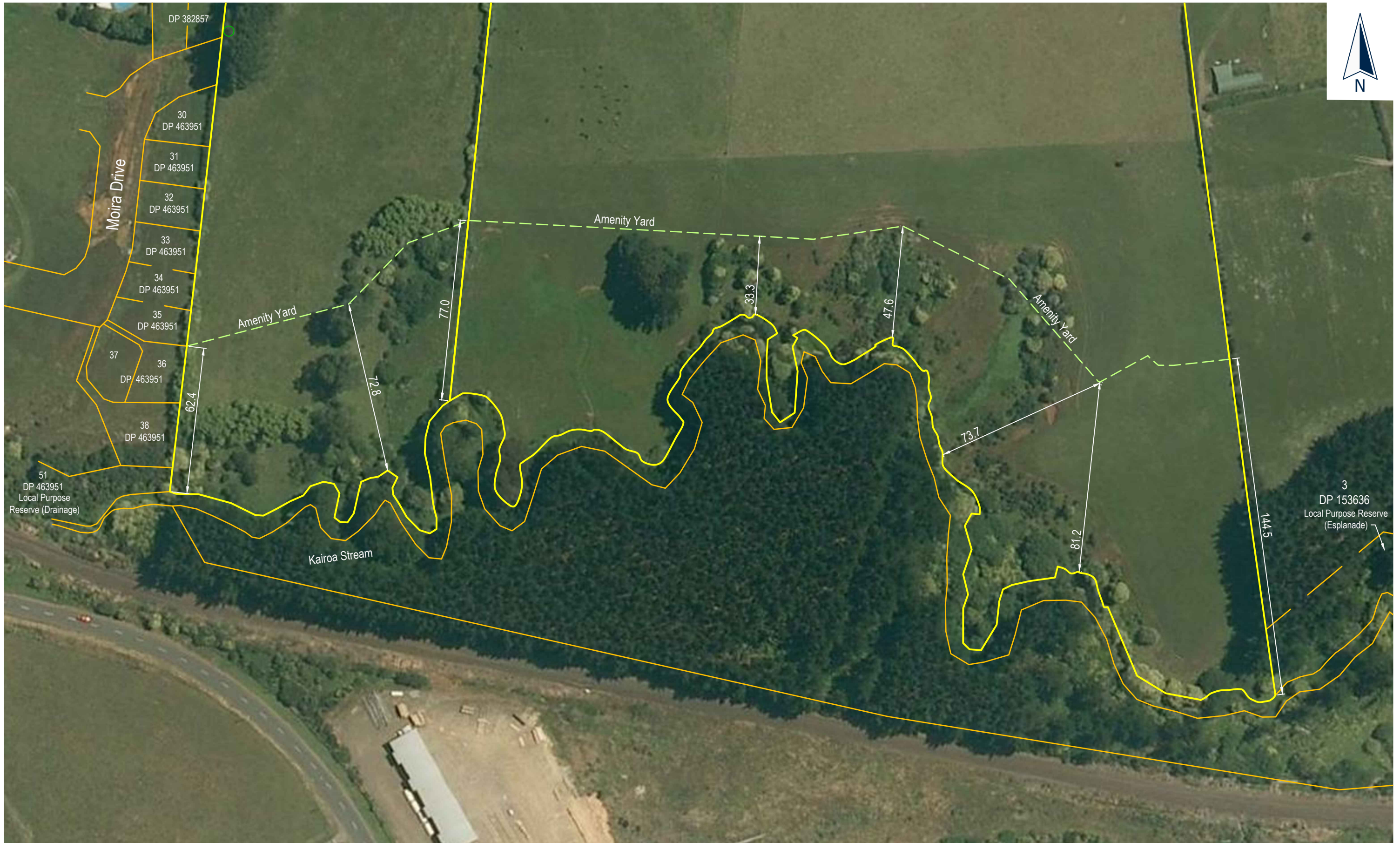
  

SURVEYED			
DESIGNED		CS	26/01/2021
DRAWN		TM	26/01/2021
DATE	05/02/2021	ORIGINAL SCALE	ORIGINAL SIZE
		1:2000	A3
DRAWING NO.		REVISION	
44924-DR-PLN-1210		A	



**Appendix C**

**Proposed "Amenity Yard"**



No.	REVISION (DESCRIPTIONS)	NAME	DATE
A	Issued for discussion	CS	11/02/2021
B	Hatching removed	CS	11/02/2021

FOR DISCUSSION

	NAME	DATE
SURVEYED		
DESIGNED	CS	11/02/2021
DRAWN	TM	11/02/2021
DATE	ORIGINAL SCALE	ORIGINAL SIZE
11/02/2021	1:1500	A3
DRAWING NO.	REVISION	
44924-DR-PLN-1300	B	



## Appendix D

### Relevant Rules

Table 1 Property Rules 48- 52 Dominion Road.

Rule or Standard	Requirements	
<b>STORMWATER</b>		
<b>WDPP -14.11.1.1</b> Stormwater systems for new development or subdivision.	Detain stormwater runoff from all impervious surfaces during a 10% Annual Exceedance Probability (AEP) storm event to maintain the rate of stormwater discharge at or below pre-development rate	
	Flows exceeding the 10% AEP are collected to a system or overland flow path with a capacity to convey stormwater up to and including the 1% AEP.	
	Systems must be designed with site specific rainfall data including an adjustment for 2.1°C increase for climate change	
	Retention of stormwater runoff for non-potable reuse	
	Treatment, detention and gradual release to a Kairoa Stream.	
<b>RITS Section 4</b>	Design Rainfall : <ul style="list-style-type: none"> <li>• Current rainfall (i.e. not climate change) adjusted) shall be used to determine pre-development stormwater runoff flows and volumes.</li> <li>• Climate change adjusted rainfall shall be used to determine post development flows and volumes to determine stormwater mitigation, treatment and infrastructure</li> </ul>	
	Stormwater flows must be attenuated to maintain 2 and 10 year rainfall events to predevelopment levels	
	Where discharge is into a natural stream or modified channel predevelopment runoff volumes shall be maintained or mitigation of erosive effects must be provided in the receiving environment.	
	Water quality treatment where discharge is into a natural watercourse.	
	Extended detention of the Water Quality Storm (34.5 mm) where discharge is into a natural watercourse.	
	<b>FLOODING</b>	
	<b>RITS Section 4</b>	Where identified downstream flooding (or risk of) exists detention is required, limiting the post development 1% AEP rainfall event flow rates to 80% of the pre-development 1% AEP rainfall event flow rates.
<b>Section 4.3.1 of E1/VM1 New Zealand Building Code: Clause E1 Surface Water</b>	<ul style="list-style-type: none"> <li>• 500 mm of free board is required where surface water has a depth of 100 mm or more and extends from the building directly to a road or car park, other than a car park for a single dwelling</li> <li>• 150 mm for all other cases.</li> </ul>	
<b>WASTEWATER</b>		

<p><b>14.11.1.3</b>  <b>Wastewater Servicing for new Development or Subdivision</b></p>	<p>(i) Is connected to a reticulated wastewater network</p>
<p><b>RITS Section 5.2.4</b></p>	<p>Wastewater pipelines shall have sufficient capacity (without surcharge) to cater for the peak wet weather flows (PWWF) for the service area calculated as follows:  PWWF (litres/sec) = ((infiltration allowance × catchment area) + (surface water ingress × catchment area) + (peaking factor × water consumption × population equivalent)) ÷ 86400</p> <p>On at least one occasion every day a minimum velocity for solids re-suspension (self-cleaning) is achieved.</p> <p>150 mm minimum pipe size</p> <p>0.55% Minimum Gradient</p>
<p><b>WATER SUPPLY</b></p>	
<p><b>RITS Section 6.1.3</b></p>	<p>The residual pressure and flow at point of supply to residential lots shall be a minimum of 200 kPa (20 m) and 25 L/min.</p> <p>The minimum fire supply service level shall be FW2 for residential areas</p> <p>No more than 150 residential Lots shall be serviced, at any point from a single ended 150 mm diameter watermain.</p>
<p><b>New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ PAS 4509:2008.</b></p>	<p>Water supply must be adequate for firefighting purposes FW2 (non sprinklered single family and multi-unit dwellings excluding multi storied apartment blocks</p> <p>FW2 = 750 litres/min within 135 m distance with an additional 750 litres/min within 270 m distance</p>

## Appendix E

### Summary of recommendations to meet requirements of relevant rules for development of 48- 52 Dominion Road.

Table 2 Recommendations to meet rule requirements in relation to development of 48-52 Dominion Road

Rules & Standards	Comments
<p><u>STORMWATER</u>                      WDPP -14.11.1.1                      Stormwater systems for new development or subdivision.                      &amp;                      RITS Section 4</p>	<ul style="list-style-type: none"> <li>• Detention of stormwater runoff from all impervious surfaces during a 10% Annual Exceedance Probability (AEP) storm event to maintain the rate of stormwater discharge at or below pre-development rate will be provided by a combination of rain gardens, detention/non-potable reuse tanks and constructed wetlands.</li> <li>• Similar to the neighbouring property existing overland flows exceeding the 10% AEP will continue to be conveyed in the existing overland flow path which will also act as a road. The roadway will have the capacity to convey stormwater up to and including the 1% AEP without exceeding depths or velocities which might impede traffic movement.</li> <li>• Both green and grey stormwater infrastructure will be sized (for volume, treatment and flows) to allow for the predevelopment flows to be determined without climate change and the post development flows to include 2.1°C increase for climate change.</li> <li>• All homes within the subdivision will include retention tanks to provide non-potable reuse of stormwater runoff from roof areas. The non-potable reuse will include laundry, toilet and gardening.</li> <li>• Residential reuse tanks and raingardens will help maintain runoff volume to predevelopment levels to attenuate rainfall events so as to maintain 2 and 10 year predevelopment levels.</li> <li>• The discharge is into the Kairoa Stream will be via wetlands which will provide:                             <ul style="list-style-type: none"> <li>▪ Mitigation of the erosive effects of stormwater discharge.</li> <li>▪ Water quality treatment.</li> <li>▪ Extended detention of the Water Quality Storm (34.5 mm).</li> <li>▪ Ensure a release of stormwater flows to the Kairoa Stream that mimics natural systems and does not exacerbate erosion within the stream or the riparian margins.</li> </ul> </li> </ul>
<p><u>FLOODING &amp; SURFACE WATER</u>                      RITS Section 4.                      &amp;                      Section 4.3.1 of E1/VM1 New Zealand Building Code: Clause E1 Surface Water</p>	<p>The Kairoa Stream is subject to downstream and upstream flooding. As such, the wetlands will provide detention, limiting the post development 1% AEP rainfall event flow rates to 80% of the pre-development 1% AEP rainfall event flow rates.</p> <p>The subdivision will be laid out in such a way as to confine flooding resulting from the 1% AEP rainfall to reserve and road areas.</p>

<p><b>WASTEWATER</b> 14.11.1.3 Wastewater Servicing for new Development or Subdivision &amp; RITS Section 5.2.4</p>	<p>There are 2 available connections to a reticulated wastewater network with sufficient capacity (without surcharge) to cater for the PWWF of 22.7 litres/sec calculated for the service area.</p> <p>The preferred connection point is at a 20 mm diameter line located near the southwest property boundary adjacent to #34 Moira Drive.</p> <p>All downstream pipes have a gradient greater than .9%</p>
<p><b>WATER SUPPLY</b> RITS Section 6.1.3 &amp; New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ PAS 4509:2008.</p>	<p>There is a 150 mm diameter watermain located adjacent to the northern property boundary which can service up to 150 residential lots from a single connection point.</p> <p>Flow testing has demonstrated that the residual pressure and flow at the point of supply to the proposed rezoning area minimum pressure of 200 kPa and flow rate of at least 846 L/min.</p> <p>The flow rate from the two available fire hydrants meet FW2 = 750 litres/min.</p> <p>Additional fire hydrants will need to be part of any development plan so as to allow for hydrants to be within 135 m distance and have an additional 750 litres/min within 270 m distance.</p>