Kaipara District Council

Mangawhai Water and Fire Supply Options Feasibility and Cost Analysis

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Date: 29-04-2016
Reference: 1-13548.01
Status: Draft 2

Document History

Revision	Issued	Prepared by	Reviewed by	Approved by	Issue Description/Status
Draft 1	20/01/2016	E. Foschieri	-Neil Daykin	-	Draft report for Mangawhai Water
Draft 2	29/04/2016	E. Foschieri		-	Draft report for client to comment

Contents

Executive Summary

Opus International Consultants have been engaged by Kaipara District Council (KDC) to:

1. Assess the current capacity of the small public water supply network in Mangawhai and to investigate options to provide water supply for firefighting and offer it to more households. Records provided by KDC show that approx. 9,000m3/yr of water would be available from the source to supply an additional 24 households. However, due to the relatively small diameter of the network supply pipes, unknown capability of the existing pumps and borehole, and a highly variable water usage (especially in summer), further assessment will be required to confirm the feasibility of any additional connections. The fireflow analysis shows the estimated budget to upgrade the existing small network to NZFS Code is $842,910.

2. Prepare a concept layout to convey untreated water from Maungaturoto Dam and provide an indicative plan for a water supply network covering the same area as the Mangawhai drainage district (i.e. area of benefit as the current wastewater network). Indicative cost for the 3 different options to construct and commission a Council fully reticulated water supply have been identified in :

	Option 3a – Mangawhai Village Full Reticulation	**Option 3b – Mangawhai Heads Full Reticulation**	**Option 3c – Mangawhai Heads & Village Full Reticulation**
Indicative Costs	**$ 7,480,000**	**$ 20,510,000**	**$ 24,031,000**

3. Evaluate available options for water supply for new and existing residential and commercial buildings. the assessment of the following 2 options has also been undertaken, and indicative costs for each option provided:

   1 - Do nothing; cost **$0**.

   2 - Options for communal firefighting water supplies in the key Mangawhai subdivision areas of Northcoast, KSR Farms, Vista Verrano, Parklands and Jack Boyd Drive.

Subdivision	Indicative Costs		
	Option 2a - Underground Water Tank	**Option 2b - Aboveground Water Tank**	**Option 2c - Water Limited Reticulation**
Northcoast	$ 240,000	$ 110,000	$ 470,000
KSR Farms	$ 80,000	$36,000	$ 145,000
Vista Verrano	$ 120,000	$ 54,000	$ 290,000
Parklands	$ 40,000	$ 18,000	$ 125,000
Jack Boyd Drive	$ 370,000	$ 166,000	$ 935,000
	$ 850,000	**$ 384,000**	**$ 1,965,000**

3 - Installation of communal water storage for firefighting for Mangawhai based on the Gisborne communities covered by the firefighting agreement is estimated to be **$60,000-$80,000.**

1 Introduction

Mangawhai, which includes Mangawhai Village and Mangawhai Heads currently has no water reticulation network except a small section from a bore that supplies the camping ground, retirement village and nearby facilities. The remainder of properties are on tank supply. KDC have a resource consent for the bore that supplies the water network. Conditions of the consent are to extract no more than:

Summer (between 1st Dec. – 31st March):
- 110m³/day;
- an average daily take of 75m³/day;
- 9,075m³ in this period.

Winter (between 1st April – 30th Nov.):
- 70m³/day;
- an average daily take of 45m³/day;
- 10,980m³ in this period.

Annually (between 1st April – 31st March): 20,055m³ in this period

This report outlines a high level assessment of different firefighting and water supply options for Mangawhai including Mangawhai Village and Mangawhai Heads and provides indicative costs and layout plans for each of them.

2 Extent and Capacity of Current Water Supply Network

2.1 Existing Water Supply

Mangawhai has a small water supply scheme with 18 connections. The scheme primarily provides potable water source to the Mangawhai Heads Camp Ground, Wood Street shops, public toilets and retirement housing.

Mangawhai's water is drawn from a bore and pumped to a single reservoir where simple chlorination is undertaken by the addition of chlorine tablets prior to reticulation to the various customers. An overview of the Mangawhai Water Supply system is shown in Figure 1.

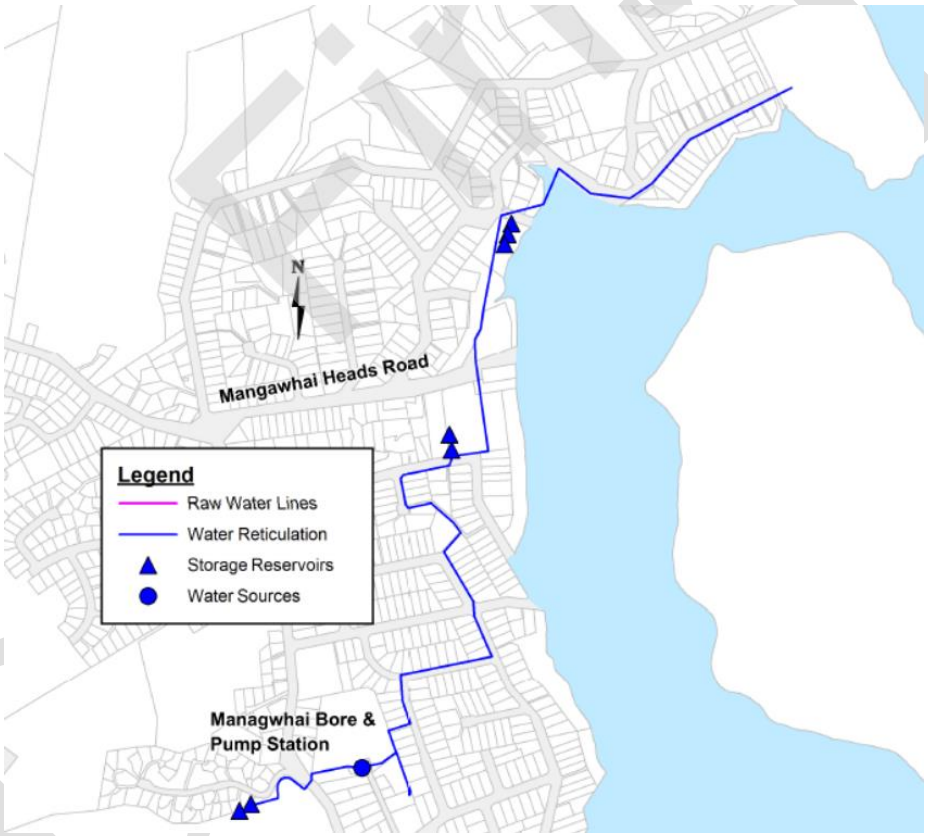


Figure 1- Mangawhai Asset Map (Source KDC AMP 2014)

Headworks

- A single groundwater bore is located near Fagan Place.

Treatment

- Chlorine tablet disinfection at two timber reservoirs with total storage of 135m³ located near Greenview Drive.

Storage & distribution

- Two concrete reservoirs with total storage of 20m³ located at the South Mangawhai Campground.
- Three reservoirs (one concrete and two plastic) with total storage of 73m³ located at the North Mangawhai Campground.
- Reticulation pump at the Mangawhai Campground
- Approximately 2.9km of pipeline

2.2 Existing Water Supply Capacity Analysis

Available meter reading data at the water bore provided by KDC covers a 15 month period from 01/04/2014 to 31/07/2015. Table 1 shows a high level analysis of the water usage for the summer and winter season:

Table 1 – Water Bore Meter Reading Data versus bore consent conditions

Season	Average Flow (m³/day)	Max Average Flow permitted (m³/day)	Unused Average Flow (m³/day)	Max Flow (m³/day)	Max Flow permitted (m³/day)	Unused Max Flow (m³/day)	Total Volume (m³)	Total Volume permitted (m³)	Unused Volume (m³)
Summer	43.8	75	31.2	109	110	1	5,163	9,075	3,912
Winter	27.7	45	17.3	65	70	5	6,709	10,980	4,271

The network reaches its daily take limit of 110m³/day during the summer season. The recorded data reflects the typical seasonal pattern characteristic of tourist areas with high summer water demand during the summer season from October to April and particularly during the weekends.

Further assessment was undertaken comparing the maximum flow that the existing network can physically deliver through the pipes (considering a maximum allowable velocity of 2m/s) and the metered water demand (Table 2).

Table 2 - Pipe Capacity

Existing Pipe Diameter	Allowable Velocity	Max Capacity	Max Hourly Demand	Spare Capacity
mm	m/s	l/s	l/s	l/s
50	2	3.9	6.31	None – demand higher than pipe capacity
75	2	8.8	6.31	2.5

Where:

- Allowable Velocity: value from NZS 4404:2010, Paragraph 6.3 for pipe design;
- Max Capacity: maximum deliverable flow for the selected diameter and velocity;
- Max Hourly Demand: calculated from multiplying the maximum daily flow of 109m³/day by a coefficient of 5, as specified in NZS 4404:2010, Paragraph 6.3.5 to produce the max hourly demand;
- Spare Capacity: flow capacity of the pipe minus metered demand/usage.

Table 2 indicates that the 50mm pipe does not provide the capacity to deliver the current peak hourly demand, having an hourly demand flow almost double of the allowable flow. Actual peak hourly demand may be less than the calculated peak hourly demand due to the conservativism in the conversion of recorded max daily flow using the coefficient. The figures also assume that the peak demand is across the whole network which is unlikely due to the buffering provided by the storage tanks (campground has five storage tanks for peak summer demand buffering).

On the other hand, the calculated metered hourly flow is the output of the borehole, not the actual demand in the network. Peak demand could equally be higher than that could be supplied. There is the possibility that the borehole was shut down when it reached the consent limit and the demand on that day was actually higher.

Although the maximum daily take at the bore is reached, in terms of average daily take, the bore still has a significant volume capacity left, in particular:

- Summer – 3,912m³ out of 9,075m³ (43%) over 4 months period
- Winter – 4,271m³ out of 10,980m³ (39%) over 8 months period

This surplus can be converted to the number of Household Unit Equivalents, i.e. the number of additional households (Table 3).

Table 3 - Calculation of Additional Households

Period	Consent Max Take (m³)	Used (m³)	Surplus (m³) (Consent Max – Used)	Surplus % (Surplus / Consent Max)	Surplus (m³/day)	Surplus as Additional Households*
Summer	9,075	5,163	3,912	43%	38	50
Winter	10,980	6,709	4,271	39%	18	24

** surplus divided by 1 Household Unit Equivalent (HUE) of 0.75m³/day*

The unused capacity volume could be used to supply approximately 24 additional households given that the winter surplus per day is the lowest. However further assessment will be required to take into account the following:

- The small size of the current pipes and the lack of any internal loops/bypasses that will restrict additional flow being drawn for any new connections, especially during the summer. An option could be to locate the new connections all in the same area and supply via a storage tank connected to the water main. In this way the storage will compensate the peak fluctuation on the water main (as stated above, during the peak time the maximum daily intake is reached). Another option would be to review the consenting, allowing for a higher daily intake;
- Capacity of the existing pump to meet this additional demand;
- Capacity of the bore to meet this additional demand;
- Impact to KDC's level of service requirements for emergency storage (firefighting & reserves).

2.3 Fireflow Analysis

Opus have previously been engaged to assess the current condition of the small public water supply network and what is needed to bring it up to standard (Draft Report , "Servicing Strategy for small communities, Mangawhai" prepared by Michael Dunstone – January 2016).

As part of the abovementioned report, a fireflow analysis of the network was undertaken.

The fireflow level of service/compliance was assessed using SNZ PAS 4509:2008; New Zealand Fire Service Firefighting Water Supplies Code of Practice. The majority of the properties in the area are residential properties, which have a firewater classification of FW2 and require a fireflow of 25l/s with a residual pressure of 10m at the hydrant. The campground and shops/businesses on Fagan Place have a higher rating of FW3, requiring a fireflow of 50l/s.

There are currently two fire hydrants in Mangawhai, one adjacent to the bore and another on Molesworth Drive.

An uncalibrated hydraulic model was built in order to calculate the fireflow availability at each of the locations. The model was built using the GIS data provided by KDC and the nodes were levelled to contour data. The model was verified against the hydrant flush that was performed by KDC staff at the hydrant adjacent to the bore.

This analysis showed that no part of the network can supply the fireflow required. This is due to the small diameter of pipework that the majority of the network is comprised of.

In order to supply fireflow, the network will require:

- Upgrade of the main pipes to 100-150mm diameters ,
- A new fireflow pump at the northern Campground site to supply the downstream customers,
- Installation of at least 19 fire hydrants along the main pipe. This is based on a maximum distance between hydrants of 135m along the 2,500m long main pipe. This would only cover those properties adjacent to the main pipe.

Indicative costs for these network upgrades have been estimated at **$842,910**.

The extent of works to provide protection to the whole of Mangawhai Heads was not considered, as this would require a significant expansion of the current network.

3 Reticulated Water Supply - Option Assessment

In this section Opus have developed:

- An indicative concept layout to convey untreated water from Maungaturoto Dam (Appendix C).
- A potential site for a new water treatment plant near Mangawhai.
- An indicative plan for a water supply network covering the same area as the Mangawhai drainage district (i.e. area of benefit as the current wastewater network).

3.1 Reticulated Options

Opus has developed a concept design layout (shown in Appendix B) for each of the three different options mentioned below:

3.1.1 Option 3a - Mangawhai Heads only

The water source for Mangawhai Heads was identified by KDC as being the Maungaturoto dam. A 125mm PE trunk main (approx. 2 km) would connect the dam to the Water treatment Plant (WTP) located next to Brown Rd. The elevation difference between the 2 sites would allow the water to flow by gravity. From the WTP the water would be pumped via a 125mm diameter PE pipe (approx. 6km) into a storage tank (1,200m^3) located at the top of the hill where Old Waipu Road ends.

The tank location, 80m above MSL, is deemed to be sufficient to gravity feed all of Mangawhai Heads (further assessment will be required to confirm water losses and house connection elevations).

3.1.2 Option 3b - Mangawhai Village only

The water source for Mangawhai Village was identified by KDC as being the Maungaturoto dam. A 200mm PE trunk main (approx. 2 km) would connect the dam to the WTP located next to Brown Rd. The elevation difference between the 2 sites would allow the water to flow by gravity. From the WTP the water is pumped via a 315mm diameter PE pipe (approx. 6km) into a storage tank (3,300m^3) located at the top of the hill where Old Waipu Road ends.

The tank location, 80m above MSL, is deemed to be sufficient to gravity feed all of Mangawhai Village (further assessment will be required to confirm water losses and house connection elevations).

3.1.3 Option 3c - Mangawhai Heads and Village

The water source for Mangawhai Village and Mangawhai Heads was identified by KDC as being the Maungaturoto dam. A 200mm PE trunk main (approx. 2 km) would connect the dam to the WTP located next to Brown Rd. The elevation difference between the 2 sites would allow the water to flow by gravity. From the WTP the water is pumped via a 350mm diameter PE pipe (approx. 6km) into a storage tank (4,800m^3) located at the top of the hill where Old Waipu Road ends.

From the tank, the water would be conveyed via a 350mm PE potable water main to Molesworth Drive, at which point it would split to supply Mangawhai Heads and Village.

The tank elevation, 80m above MSL, is deemed to be sufficient to gravity feed all of Mangawhai Heads and Village (further assessment will be required to confirm water losses and house connection elevations).

3.1.4 Design Assumptions

This section describes the main assumptions used for the three water reticulation options.

- Water Demand

The proposed water reticulation will cover the same area as the Mangawhai Drainage District. The District includes 1617 connections[1] divided between:

» 1,187 for Mangawhai Heads
» 430 for Mangawhai Village

Each connection corresponds to 1 Household Unit Equivalent (HUE) of 0.75m³/day. Water demand for the water treatment plant was based on the maximum daily flow:

» Mangawhai Heads: 890 m³/day
» Mangawhai Village: 323 m³/day
» Combine Demand: 1213 m³/day

Where the hourly peak flow was required, a multiplier of 5 has been used as per NZS 4404:2010, Paragraph 6.3.5. The existing water network and water supply from the bore has been assumed to operate in addition to the proposed reticulation.

- Water Treatment Facility

The Water Treatment Plan (WTP) will have the same treatment processes as the nearby Maungaturoto WTP given that the water is drawn from the same source. The water treatment provided will be:

» Clarifier
» Rapid Sand Pressure Filters
» Chemical Dosing: Polyelectrolyte, Chlorine, pH correction
» UV disinfection

- Water Source

The water source (Maungaturoto Dam) has been assumed to be capable of supplying water for all three options.

- No volume, quality or water availability assessment has been undertaken for this report.

3.1.5 Water Treatment Plant, Potable Storage Tank and Pipe Route Locations

Opus have identified some KDC land located on Brown Road (north to Hakaru) for siting the new water treatment plant. This location minimizes cost of land purchase for this component and represents an optimal location in term of:

- Accessibility from the street for maintenance and service operation.
- Elevation and vicinity to the water source.

Opus have identified a site located at the top of the hill where Old Waipu Road ends for storage of the treated water. This site is 80m above MSL, relatively high in respect to Mangawhai Heads and

[1] Data from KDC Wastewater AMP page 53 (June 2015)

Village, allowing the water to be supplied by gravity without the use of additional booster pumps (further assessment will be require to confirm house elevation, in particular for the connections located northeast of Mangawhai Heads).

Siting of the WTP and storage tank allows the new connecting trunk main pipe to run along the easement of the existing wastewater main.

3.1.6 Indicative Costs

Error! Reference source not found. shows the indicative costs for each option. A detailed breakdown is provided in Appendix D.

Table 4 - Council Reticulated Water Supply Option Costs

	Option 3a – Mangawhai Village Full Reticulation	Option 3b – Mangawhai Heads Full Reticulation	Option 3c – Mangawhai Heads & Village Full Reticulation
Indicative Costs	$ 7,480,000	$ 20,510,000	$ 24,031,000

3.2 Firefighting system and water supply network under the New Zealand Fire Service Code of Practice

The code of practice SNZ PAS 4509:2008 sets out what constitutes a sufficient minimum supply of water pressure and volume for firefighting in structures in urban fire districts. Section 1.3 of the code shows the Legislative requirements of territorial local authorities under the LGA 2002, Fire Service Act 1975, Building Act 2004 and RMA 1991.

Below is an extract of the NZFS code:

"..Under the Local Government Act 1974, territorial authorities are required to install fire hydrants, and to keep them charged. The requirement to install fire hydrants is contained in section 647 of the Local Government Act 1974, which requires territorial authorities to provide fire hydrants on all reticulation water mains in such convenient places as it determines for extinguishing any fire, or in any fire district under section 26 of the Fire Service Act, as the New Zealand Fire Service Commission approves. The requirement to keep pipes charged on which hydrants are fixed is contained in section 648 of the Local Government Act 1974..."

Therefore, should KDC provide a new water supply in Mangawhai, the Council will be required to provide hydrants installations on the network. Requirements in terms of pressure, flow and storage are described in Appendix A.

4 Communal Firefighting

Mangawhai Village and Mangawhai Heads currently have no water reticulation network except a small section from a bore that supplies the camping ground, retirement village and nearby facilities. As mentioned in the above section (2.3-Fireflow Analysis) in order to supply fireflow, the network will require to be upgraded. The extent of works to provide protection to the whole of Mangawhai Heads would require a significant expansion of the current network, not considering the area of Mangawhai Village.

In term of firefighting water supply requirements the Kaipara District Plan (Rules 12.10.26, 13.10.26, 14.10.26 and 15.10.25 and 12.15.4, 13.14.2 and 14.13.4) require resource consent if water supply is not provided for a new building in accordance with the NZFS Code of Practice. The Code of Practice requires 45,000 litres for domestic supply, and higher for commercial supply, separate from potable supply for firefighting purposes, or a pond or lake within 90 metres of the building with approved access. In the Mangawhai area however, the majority of developments cannot comply with this requirement.

The arrangement since the District Plan was made Operative in 2013 is for developers to apply for resource consent for an alternative supply approved by NZFS. Generally this has been 10,000 litres set aside in a separate tank or within a larger tank with a cut off valve. This has generated a large number of resource consents when otherwise a building may not require consent at all. Alternative supplies have been also consented to support subdivisions so supplies do not have to be provided on individual lots, but there are many existing subdivisions with no communal supply available.

Application of the rules has resulted in a proliferation of tanks in subdivisions with no alternative supply to hand, difficulties developing smaller lots and general dissatisfaction among the developer community about the additional compliance costs and delays to obtaining code compliance while waiting for their resource consent

In an attempt to address the dissatisfaction among the community and following the NZFS's opposition to the 2014 Plan Change, the Council has entered into negotiations with the NZFS for an alternative solution to the current resource consent arrangements. This would comprise a Memorandum of Understanding (MOU) between the parties agreeing that the process will be moved to the building consent, with developers submitting NZFS approval as part of their building consent application. Developers will still be required to provide an alternative supply, but would no longer have to pay and wait for a resource consent. The negotiations have not been finalized and the solution does not address the problem of tank proliferation, the cost of extra tanks and difficulties with accommodating tanks on smaller lots.

4.1 Option Assessments

Under this section a detail assessment for a communal firefighting have been undertaken. The assessment was conducted following the SNZ PAS 4509:2008.

The following two options have been investigated and a table with indicative costs for each provided:

1. Do nothing;
2. Options for a communal firefighting water supplies in the key Mangawhai subdivision areas of Northcoast, KSR Farms, Vista Verrano, Parklands and Jack Boyd Drive including:
   a) Underground tanks;
   b) Above ground tanks;
   c) Reticulated network and localized water supply
3. Options base on a potential agreement between NZFS and KDC

4.1.1 Option 1: Do Nothing

In Mangawhai which includes Mangawhai Heads and Mangawhai Village, there is currently no communal fire system. However, KDC have prepared and are proposing a Fire District Plan (2014) via a plan change. Accordingly, Mangawhai Heads and Village will need to adapt to this new plan change if adopted.

The proposed Plan Change 2 - Fire Safety Rules (Dec. 2014) included in the Kaipara District Plan outlines the new requirement for:

"*...Any building is permitted if:*

It does not impede the movement of fire service vehicles or equipment or generally restrict access for firefighting purposes; and

Water supply for firefighting and access to this supply complies with the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice SNZ PAS 4509:2008, except that where a reticulated water supply is not available:

(bi) in relation to a site containing a dwelling (including any building accessory to a dwelling), the minimum water storage volume (separate to any domestic (potable) supply) shall be 10m³; and

The building is located at least 20m away from naturally occurring or deliberately planted area of scrub or shrub land, woodlot or forest; and

Any water tank for firefighting purposes that is constructed of combustible material shall be situated no less than 6m from any building on the site.

Note 1: For fire safety, the New Zealand Fire Service advises that buildings should be at least 20m from the dripline of any tree and that these setbacks are also appropriate from scrubland and other similar vegetated areas.

Note 2: Table 2 in SNZ PAS 4509:2008, in situations where there is not a reticulated water supply, requires a water storage volume of 45m³ for dwellings. For (bi) above allows that this may be reduced to a 10m³ minimum storage volume at all times to be retained for firefighting purposes for dwellings and associated accessory buildings...."

The requirements above will likely lead to an increase in specifications for any new building such as tanks, concrete driveways, space for fire brigade access etc. This can add significant additional cost to a new development. This only deals with new builds.

However, without a communal fire system and any adequate planning for fire, the consequences of fire increase substantially. For example, a firefighting truck can only transport a maximum of 6m^3 of water to a fire, therefore, without adequate emergency water storage, it is feasible that access to a burning house and saving of life may be limited. Not only does this present a significant risk to the lives and safety of residents but it also has significant commercial impacts.

Property insurance premiums may increase along with decreased coverage of fire damage (if covered at all).

4.1.2 Option 2: Communal firefighting system in key areas

Established subdivisions in Mangawhai (Northcoast, KSR Farms, Vista Verrano, Parklands and Jack Boyd Drive) are not provided with any water supply reticulation system, including for firefighting purposes.

KDC requested Opus to identify and evaluate feasible options for a SNZ PAS 4509:2008 compliant communal firefighting water supply system for these established subdivisions.

Opus liaised with the Fire Brigade Service during the assessment and option development phase to identify limitations and requirement for each of the proposed systems.

The main constraint identified was the relative short distance (maximum of 90m) required between a building to be protected and the water supply, whether it be a tank, pond or hydrant. Further concern highlighted by the Fire Brigade Officer was the poor water quality (algae, debris and other material) often found in ponds that reduces the standard of firefighting operations.

Three options as follows, have been considered for a Class FW2 Fire Water Supply, specific for housing including dwellings, multi-unit dwellings, but excluding multi storey apartment blocks. Should KDC wish to consider a higher fire category such as Class FW3 for small industrial/commercial developments, then further assessment will be required.

4.1.2.1 Option 2a – Underground Tanks

Option 2a consists of 25,000l underground tanks (Figure 2) being strategically located around the subdivisions. To satisfy the requirement set out in SNZ PAS 4509:2008, at least 2 tanks will be located at a max distance of 90m from each property to be protected (i.e. to cover the minimum 45,000l storage requirement within 90m).

The tanks would ideally be located within the road corridor, preferably between the property boundary and the footpath. This would provide safe access for the fire brigade whilst minimizing reinstatement costs during installation (Figure 3). This option has the advantage to remove any aesthetic issue of having an above ground tank and very low associated maintenance costs.

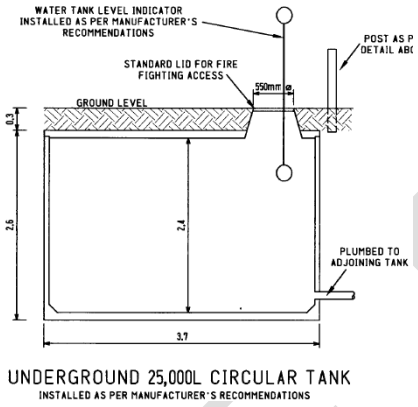


Figure 2 -Underground tank typical layout

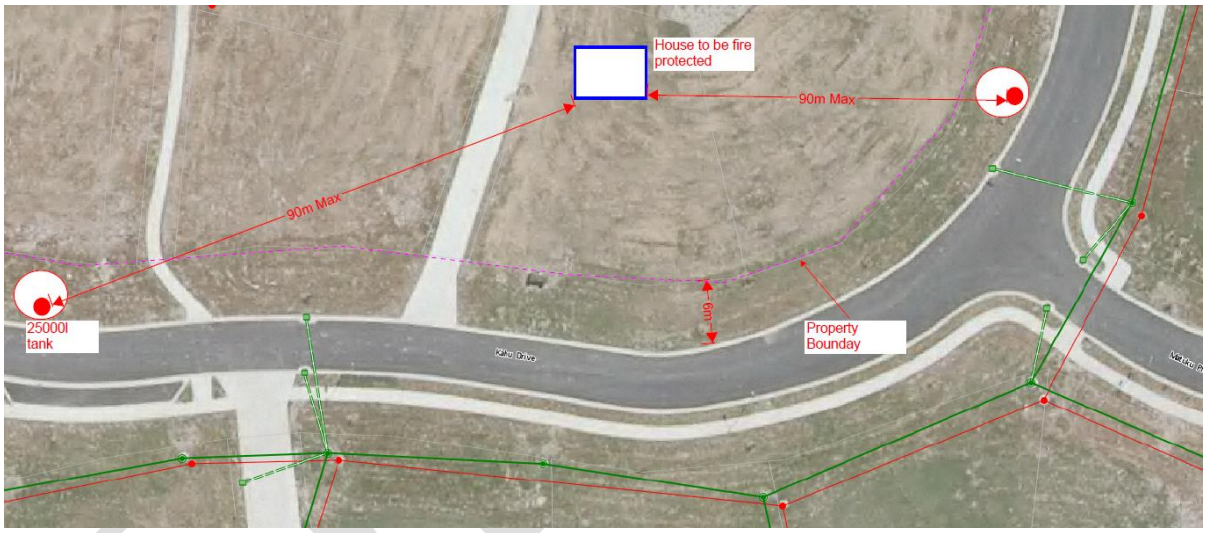


Figure 3 -Distance requirement and tank location

4.1.2.2 Option 2b – Aboveground Tanks

Option 2b consists of 25,000l aboveground tanks being strategically located around the subdivisions. To satisfy the requirement set out in SNZ PAS 4509:2008, at least 2 tanks will be located at a max distance of 90m from each property to be protected (i.e. to cover the minimum 45,000l storage requirement within 90m).

As before, the tanks would ideally be located within the road corridor, preferably between the property boundary and the footpath. This option is the cheapest option, however, it creates a significant visual impact and may be subject to vandalism, vehicle, environmental or other damage which have associated costs.

4.1.3 Option 2c –Limited Reticulated network and localized water supply

Option 2c consists of ponds or adequate water sources strategically located around Mangawhai. It is reasonable to assume that due to the morphology of the area and property constraints, ponds cannot be located at the required distance of 90m from each property. Therefore, a reticulated water network will be required in addition to the ponds, including:

- Reliable pump system (preferably a diesel pump)
- Pipe network able to deliver the required flow (indicatively via a 100mm PE pipe)

4.1.4 Options Summary

Table 5 below provides indicative costs for each option.

Table 5 - Option Comparison

Option	Advantage	Disadvantage	Indicative Costs*
2a Underground tanks	- No visual impact - Simple and reliable solution - Low/nil maintenance costs	- Requires excavations	$10,000 per tank
2b Aboveground tanks	- Low/nil maintenance costs - Simple and reliable solution - Economic solution	- High Visual impact - vulnerability to damage, vandalism etc.	$4,500 per tank
2c Limited Reticulation	- Depending on the pond size and location, large areas can be serviced / supplied	- Water reticulation required - Solution requiring specific design -High costs associated with water reticulation and maintenance	- $15,000 for a diesel pump - $300/m for PE 100mm dia pipe installation - $3,500 for each hydrant - Pond installation, maintenance and stormwater system costs to be evaluated for each case

** Note that indicative costs include average costs for installation (material delivery, excavation, backfilling, reinstatement etc.) and materials. Design and MSQA, Geotechnical Investigation, Archaeological Monitoring, Risk associated with design variations and construction price market variation are not included in the cost.*

The drawings in Appendix B detail the concept design layout for each subdivision and option.

4.1.5 Indicative Option Costs

Table 6 shows the indicative costs.

Table 6 - Indicative Option Costs

Subdivision	Indicative Costs*		
	Option 2a Underground tanks	**Option 2b** Aboveground tanks	**Option 2c** Limited Reticulation
Northcoast	$ 240,000	$ 110,000	$ 470,000
KSR Farms	$ 80,000	$36,000	$ 145,000
Vista Verrano	$ 120,000	$ 54,000	$ 290,000
Parklands	$ 40,000	$ 18,000	$ 125,000
Jack Boyd Drive	$ 370,000	$ 166,000	$ 935,000
	$850,000	**$384,000**	**$1,965,000**

** Note as above*

4.1.6 Potential arrangement between NZFS and KDC

This section outlines a potential arrangements between NZFS and Kaipara District Council to provide an alternative communal firefighting system that can be reached for the whole area of Mangawhai Heads and Mangawhai Village.

The arrangement is based on the agreement adopted between the NZFS Service Commission and Gisborne District Council (GDC) in relation to the provision and installation of communal water tanks (Appendix E). All staff involved in its preparation are no longer at GDC and therefore no information is available regarding the technical basis of their agreement or any assumptions. Based on the agreement, GDC installed 3x30,000l water tanks for the Okitu and Wainui Community.

The community is located along a narrow but long (4.5km) strip of coast, just to the northeast of Gisborne. The population is approx. 1,680 people (2006 Census) with no water supply network. It had no Council firefighting storage in place for the mostly residential community.

In case of a fire, a tanker carrying about 5,500l of water is available from the Wainui Fire Station. The 3x30,000l water tanks are deemed to be an additional water source in case the water on the tanker is not sufficient to extinguish any fire. Other water tankers are also available from the surrounding communities and the nearby city of Gisborne (approx. 20-30 minutes travel time).

A similar solution has been adopted for Tolaga Bay (Gisborne), having 800 residents and an installed water capacity of 60,000 litres.

Table 7 below shows the pro-rata water storage based on the population in the Gisborne communities covered by the firefighting agreement:

Table 7 - Pro-Rata Water Capacity for Wainui, Okitu and Tolaga

	Water Capacity (litres)	Population	Pro-rata Capacity (l/pp)
Wainui and Okitu Community	90,000	1,680	54
Tolaga Bay	60,000	800	75

A similar agreement could be achieved between KDC and NZFS to provide a communal fire system for the whole area of Mangawhai Village and Heads. This option have the potential advantage of:

- Eliminate the current resource consent requirements for new residential buildings;
- Avoid future negotiation to move the fire supply requirements on the building consents process;
- Provide a fire system for future, but most important existing buildings;
- Reduce the tank proliferation, the cost of extra tanks and difficulties with accommodating tanks on smaller lots.

Table 8 below shows the required water capacity based on the current population[2] and indicative cost for Mangawhai based on the Gisborne communities covered by the firefighting agreement:

Table 8 - Water Capacity and Indicative Cost for Mangawhai Heads and Village

	Population[1]	Pro-rata Capacity (l/pp)	Water Capacity (litres)	Indicative Cost[3]
Mangawhai Heads and Village	2,682	54-75	145,000-200,000	$60,000-$80,000

The approach based on pro-rata water capacity offers an indicative capacity only. Further assessment related to location, access and size of the tanks should be part of the arrangement process between NZFS and KDC.

[2] Data from Mangawhai Town Plan – Growth and development outlook (2016)

[3] Indicative cost based on a 25,000l above ground water tank costing $10,000 including supply and installation.

5 Conclusion

In this report several aspects related to Mangawhai water supply network and firefighting requirements have been assessed.

The first part of the report was focused on the assessment of the current capacity of the public water supply network in Mangawhai and the investigation of feasible options to provide water supply for firefighting and offer it to more households.

Records provided by KDC show that approx. 9,000m3/yr of water would be available from the source to supply an additional 24 households. However, due to the relatively small diameter of the network supply pipes, unknown capability of the existing pumps and borehole, and a highly variable water usage (especially in summer), further assessment will be required to confirm the feasibility of any additional connections.

The fireflow analysis shows the estimated budget to upgrade the existing small network to NZFS Code is $842,910 (upgrade involving only a limited area of Mangawhai Heads)

In the second part 3 different concept layouts have been provided for a full water reticulation.

The concepts included the network to convey untreated water from Maungaturoto Dam, water treatment plan and reservoir location and dimension and water supply reticulation. Indicative cost for the 3 different options to construct and commission a Council fully reticulated water supply have been identified in :

	Option 3a – Mangawhai Village Full Reticulation	**Option 3b – Mangawhai Heads Full Reticulation**	**Option 3c – Mangawhai Heads & Village Full Reticulation**
Indicative Costs	**$ 7,480,000**	**$ 20,510,000**	**$ 24,031,000**

Finally, the last part of the report evaluated different firefighting system options for new and existing residential and commercial buildings in the Mangawhai area:

Option 1 - Do nothing; cost **$0**.

This option doesn't address the current issues related to the lack of a communal fire system. Under this scenario the consequences of fire can increase substantially; not only does this present a significant risk to the lives and safety of residents but it also has significant commercial impacts.

Option2 - Options for communal firefighting water supplies in the key Mangawhai subdivision areas of Northcoast, KSR Farms, Vista Verrano, Parklands and Jack Boyd Drive.

Subdivision	Indicative Costs		
	Option 2a - Underground Water Tank	**Option 2b - Aboveground Water Tank**	**Option 2c - Water Limited Reticulation**
Northcoast	$ 240,000	$ 110,000	$ 470,000
KSR Farms	$ 80,000	$36,000	$ 145,000
Vista Verrano	$ 120,000	$ 54,000	$ 290,000
Parklands	$ 40,000	$ 18,000	$ 125,000
Jack Boyd Drive	$ 370,000	$ 166,000	$ 935,000
	$ 850,000	**$ 384,000**	**$ 1,965,000**

This option offers different solutions to address the current lack of a fire communal systems in 5 keys areas. This approach can be considered optimal for the considered areas, but it is unlikely that the same approach could be extended to the entire area of Mangawhai Village and Heads. Due to the distance requirements (90m max between the storage and the building) sets out in the Fire Code of Practice a large number of tanks or ponds would be required.

Option 3 - Installation of communal water storage for firefighting for Mangawhai based on the Gisborne communities covered by the firefighting agreement is estimated to be **$60,000-$80,000.**

This option, if adopted, could lead to several potential advantages including:

- Eliminate any current resource consent requirements for new residential buildings;
- Provide a fire system for future, but most important existing buildings;
- Avoid future negotiation to move the fire supply requirements on the building consents process;
- Reduce the tank proliferation, the cost of extra tanks and difficulties with accommodating tanks on smaller lots.

Appendix A
Water Supply Classification

APPENDIX K – WATER SUPPLY SYSTEM CLASSIFICATION

Tables 1 and 2 are well suited for determining firefighting water requirements for individual fire risks. However, the flow rates and storage volumes that reticulated water supply systems should be designed for should be assessed on the range of fire risks that can be present in any one reticulation zone. The purpose of this appendix is to give guidance to water supply system designers in determining the design firefighting flow rates and storage volumes for reticulated water supplies.

It is important to note that firefighting water requirements are IN ADDITION to the domestic/commercial/industrial water supply needs and fire sprinkler demand. When water for firefighting is provided from hydrants it must be at a pressure of not less than 100 kPa.

K1 Water supply classifications

K1. 1 *Background*

Firefighting water supplies can be classified using the scale shown in table 2, taking into account factors such as the size (firecell area) of the average fire risk and the highest expected fire risks in the area, and anticipated future development. Provision is also made for FW7, for which flow rates and storage requirements can be determined on a case by case basis, using methods such as those outlined in Appendices H and J.

Table 1 shows the fire water supply classifications that are required to protect individual fire risks.

K1. 2 *General procedure for establishing classifications for water supply reticulations*

The capacity of existing water supplies to store and deliver water for firefighting can be measured by undertaking comprehensive flow testing or estimated through computer modelling. Water supply authorities should undertake this work in partnership with the Fire Service. If necessary the WSA can establish water classification zones after consultation with the Fire Service, so that the minimum storage and flow requirements in the zones are clearly defined. Due to the capital intensive nature of water reticulations long lead times may be required to make improvements. Strategies should therefore be put in place in consultation with the Fire Service that clearly describe how any known deficiencies in the water supply are managed and how they will be remedied. Any consultations with the Fire Service should occur at the Fire Region Manager level or their delegated authority.

To determine the firefighting capacity for new water supplies in greenfield areas the WSA should make an assessment of the developments that are likely to occur in that area, and design the water supply system for the average fire risk using tables 1 and 2 taking account of other factors such as future growth after consultation

with the Fire Service. Any new developments should be assessed against the capacity of the water supply system, to ensure that developers design within the reticulated supply capacity, and in cases where the required fire water exceeds the reticulation capacity, remedy the effects by providing additional on site storage or increasing the reticulated capacity.

K2 Storage

The volume of storage that is reserved for firefighting purposes must not be used for normal operational requirements, see figure K1. Additional storage must be provided to balance diurnal peak demand, seasonal peak demand and normal system failures, for instance power outages. The intent is that there are always sufficient volumes of water available for firefighting, except during civil defence emergencies or by prior arrangement with the Fire Region Manager.

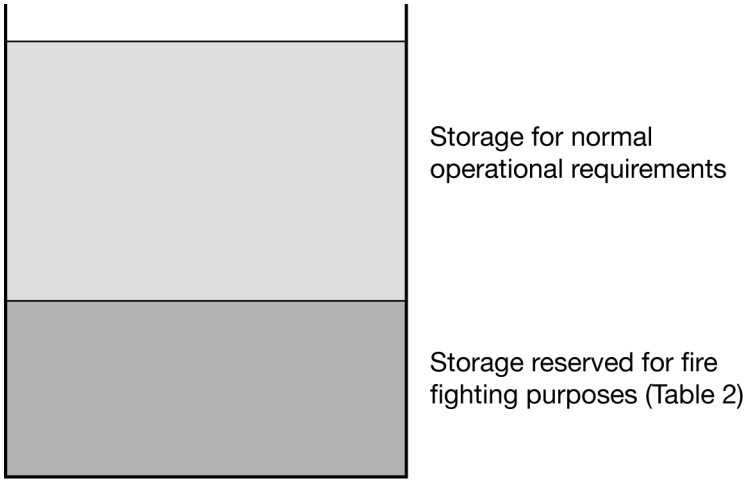


Figure K1 – Reservoir storage

K3 Flow

The flow rate that is available for firefighting from hydrants can be measured by undertaking comprehensive flow tests or be estimated through network modelling.

Comprehensive flow tests should be carried out at times of reasonably high consumer demand (domestic, industrial, and commercial water usage) so that the test results will reflect the effects of any reduced reticulation pressure at such times. The timing for such tests must be determined in consultation with the water supply authority to manage any discolouration and reduced pressures that may result.

When the available firefighting flow rates are estimated by running computer models, it is necessary to include background consumer demand concurrently with the fire water flows from hydrants. As a guide, two thirds of the annual peak consumer demand should be used consecutively with fire flows from hydrants, with resulting reticulation pressures not less than 100 kPa. The annual peak

demand varies from zone to zone, but as a guide in residential areas, can be estimated as follows:

Zones less than 1000 dwellings: $Q_{peak} = 0.596D^{0.632}$ L/s

Zones larger than 1000 dwellings: $Q_{peak} = 0.0467D$ L/s

where Q_{peak} = Peak annual demand (L/s)

D = Number of dwellings

Individual water suppliers may use different formulae particular to their suppliers, based on observed peak flow rates.

In most cases several modelling runs would be needed to assess the impact of different fire scenarios at different locations, but scenarios should allow for only one fire at a time.

Where structures are fitted with compliant fire sprinkler systems, the required water supply classification is no greater than FW2. NZS 4541 requires the fire sprinkler flows to be delivered concurrently with a flow of 1500 L/min (25 L/s) from the nearest fire hydrants at the pressure determined as part of the sprinkler system design and flow tests. By default a flow test should therefore be available that takes into account the effect of reduced pressure due to consumer demand.

Computer modelling can be used to verify that the level of consumer demand at the time the flow test was conducted was at least two thirds of peak annual demand. In cases where the modelled pressure is less than the observed pressure, further work should be carried out to determine the appropriate available reticulation pressure that the fire sprinkler system should be designed for.

K3. 1 *Example*
A water reticulation has to be designed for a proposed business park. Average lot size will be 2000 m^2. Working/business/storage activities with medium fire load such as manufacturing, processing, and bulk storage up to 3 metres will be permitted under the proposed district plan provisions.

Using tables 1 and 2, the water supply qualifications and firefighting water requirements in table K1 are possible.

Table K1 – Example of calculating flow

Options	Building sprinklered	Firecell size (m^2)	Fire water classification	Flow rate from hydrants L/min (L/s)	Storage in reservoir (m^3)
1	Yes	UNLIMITED	FW2	1500 (25)	45
2	No	0 – 199	FW3	3000 (50)	180
3	No	200 – 399	FW4	6000 (100)	540
4	No	400 – 799	FW5	9000 (150)	1080
5	No	800 – 1199	FW6	12 000 (200)	2160
6	No	>1199	FW7	Specific design	
NOTE – The 'storage in reservoir' column is to ensure that the specified firefighting water is a dedicated amount purposefully allowed for in a town water reticulation design IN ADDITION to the domestic, commercial, and/or industrial needs. It is obtained by multiplying the expected firefighting duration by the required fire flow rate from the hydrants.					

After consultation with the Fire Service and through the Resource Management process it is agreed to provide reticulated firefighting capacity for sprinklered buildings and for non-sprinklered buildings up to FW3. All buildings with firecells not greater than 199 m^2 can therefore be protected using water from the reticulated supply, but any proposal to construct a firecell larger than 199 m^2 will require a sprinkler system to be installed or on-site storage to be provided to make up the shortfall.

An example of the application of this is as follows:

If a non-sprinkler protected building whose largest firecell is 600 m^2 is to be built in this area it would have a FW classification of FW5. However the water reticulation network supplying this zone is only rated at FW3. Table K2 shows a comparison of the firefighting capacity of the water supply network with the firefighting water requirements for the fire risk.

Table K2 – Comparison of firefighting capacity of the water supply network with the firefighting water requirements

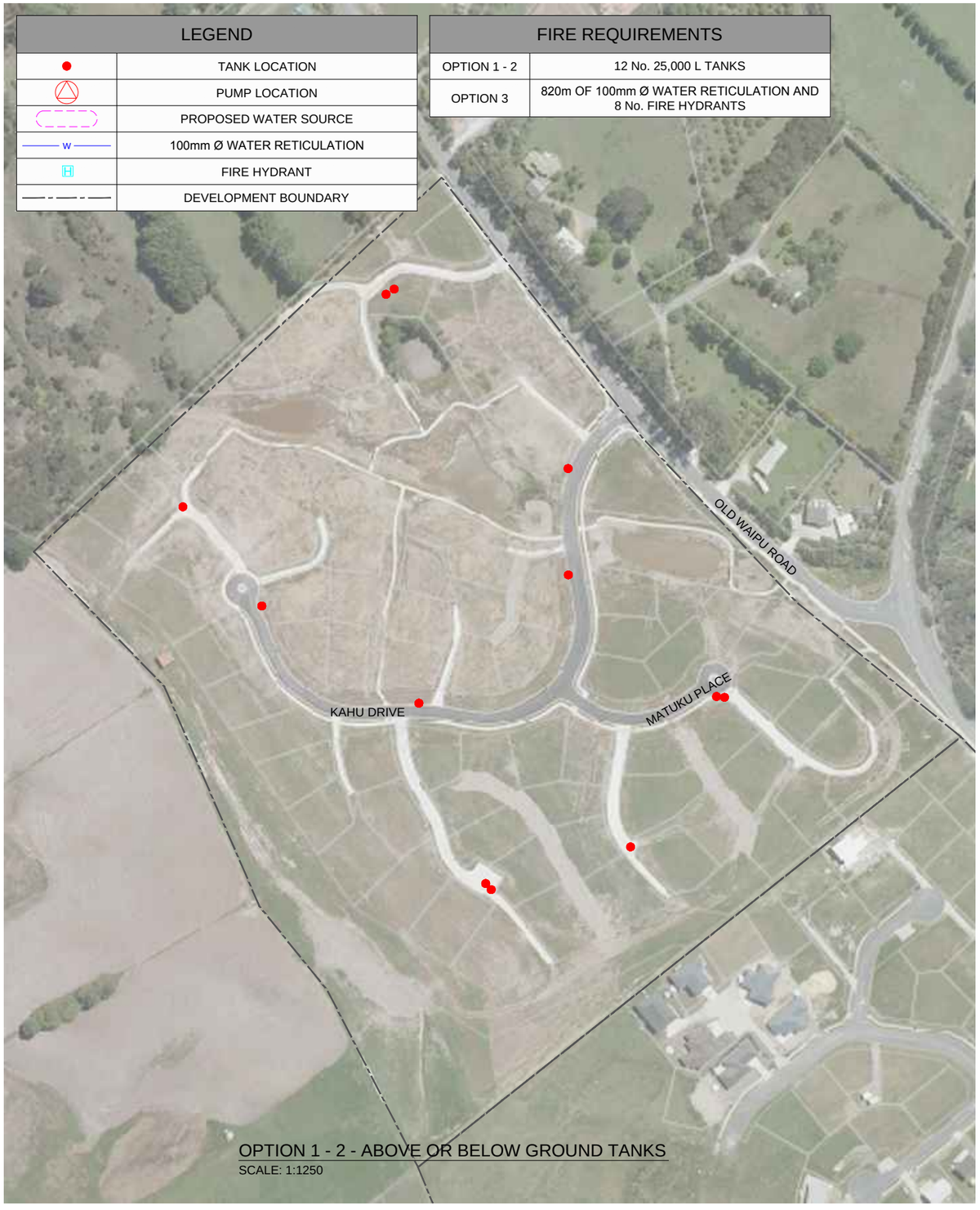
	Flow rate L/min (L/sec)	**Storage** (m^3)
Reticulation designed to meet FW3 requirements	3000 (50)	180
Fire risk FW5	9000 (150)	1080
Theoretical water supply system deficit	6000 (100)	900
Possible solutions to provide for flow and storage deficits	(a) Provide additional flow from on-site storage source (b) Check whether actual water reticulation capacity is higher than 50 L/s (c) Increase water reticulation capacity (d) Combination of the above	(a) Provide on-site storage (b) Check whether additional storage from the water supply reservoir can be dedicated for firefighting purposes (c) Increase water supply system storage volume (d) Combination of the above

Appendix B

Options for communal firefighting in key areas

LEGEND	
●	TANK LOCATION
△	PUMP LOCATION
⬭	PROPOSED WATER SOURCE
W	100mm Ø WATER RETICULATION
H	FIRE HYDRANT
— - — — - —	DEVELOPMENT BOUNDARY

FIRE REQUIREMENTS	
OPTION 1 - 2	12 No. 25,000 L TANKS
OPTION 3	820m OF 100mm Ø WATER RETICULATION AND 8 No. FIRE HYDRANTS



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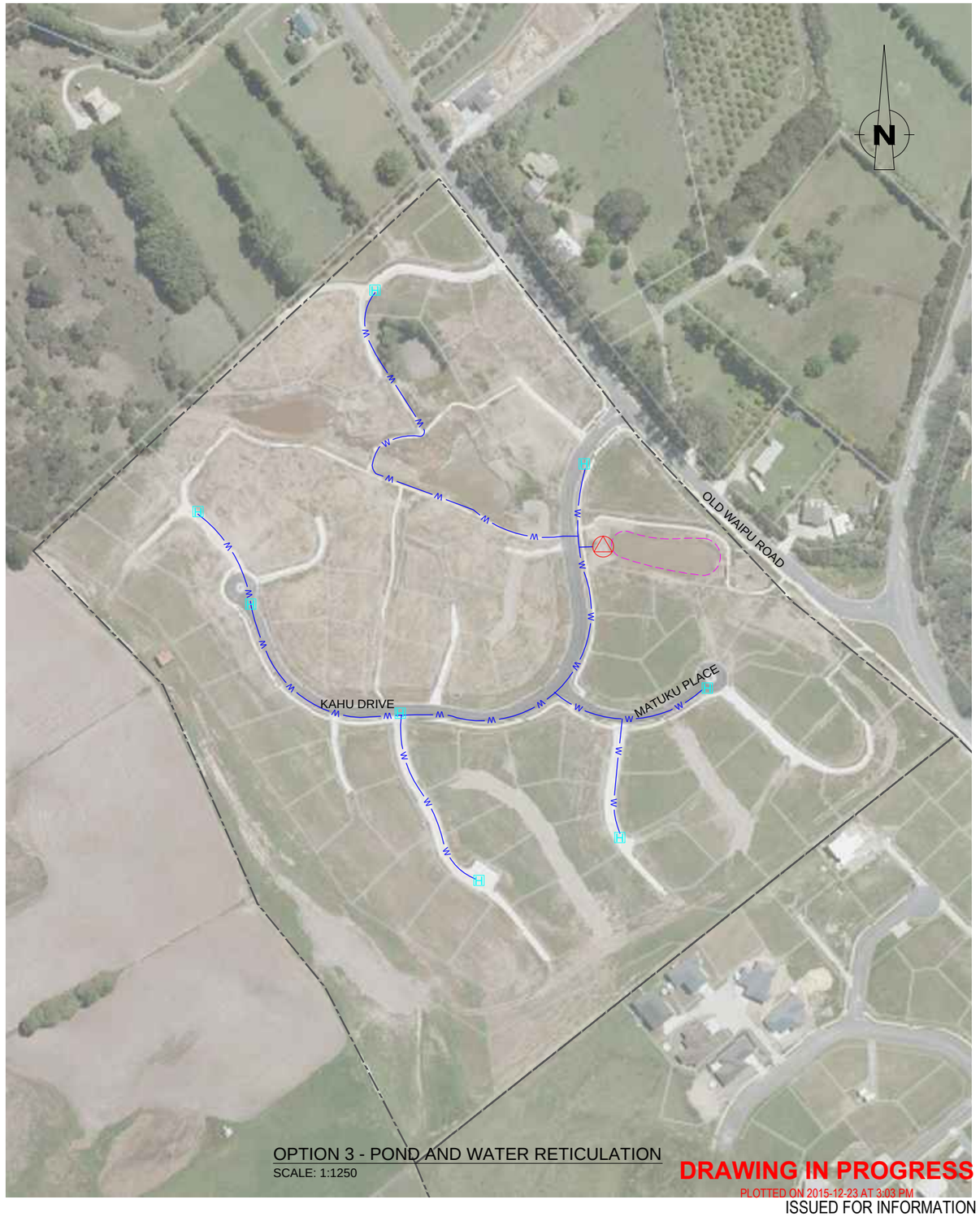

OPTION 3 - POND AND WATER RETICULATION
SCALE: 1:1250

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NOTE:

1. PROPOSED WATER SOURCE SHALL BE ASSESSED FOR COMPLIANCE WITH THE CURRENT FIRE FIGHTING REQUIREMENTS.

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Drawn	Scales
R. CRAWFORD	1:1250 AT A1

Project
KAIPARA DISTRICT COUNCIL
MANGAWHAI WATER SUPPLY OPTIONS
FEASIBILITY AND COST ANALYSIS

Sheet
VISTA VERRANO DEVELOPMENT

Project No.	Sheet. No.	Revision
1-13548.01	C01	A

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Drawing	-	-	
Design	-	-	
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Date			

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Drawing	-	-
Design	-	-
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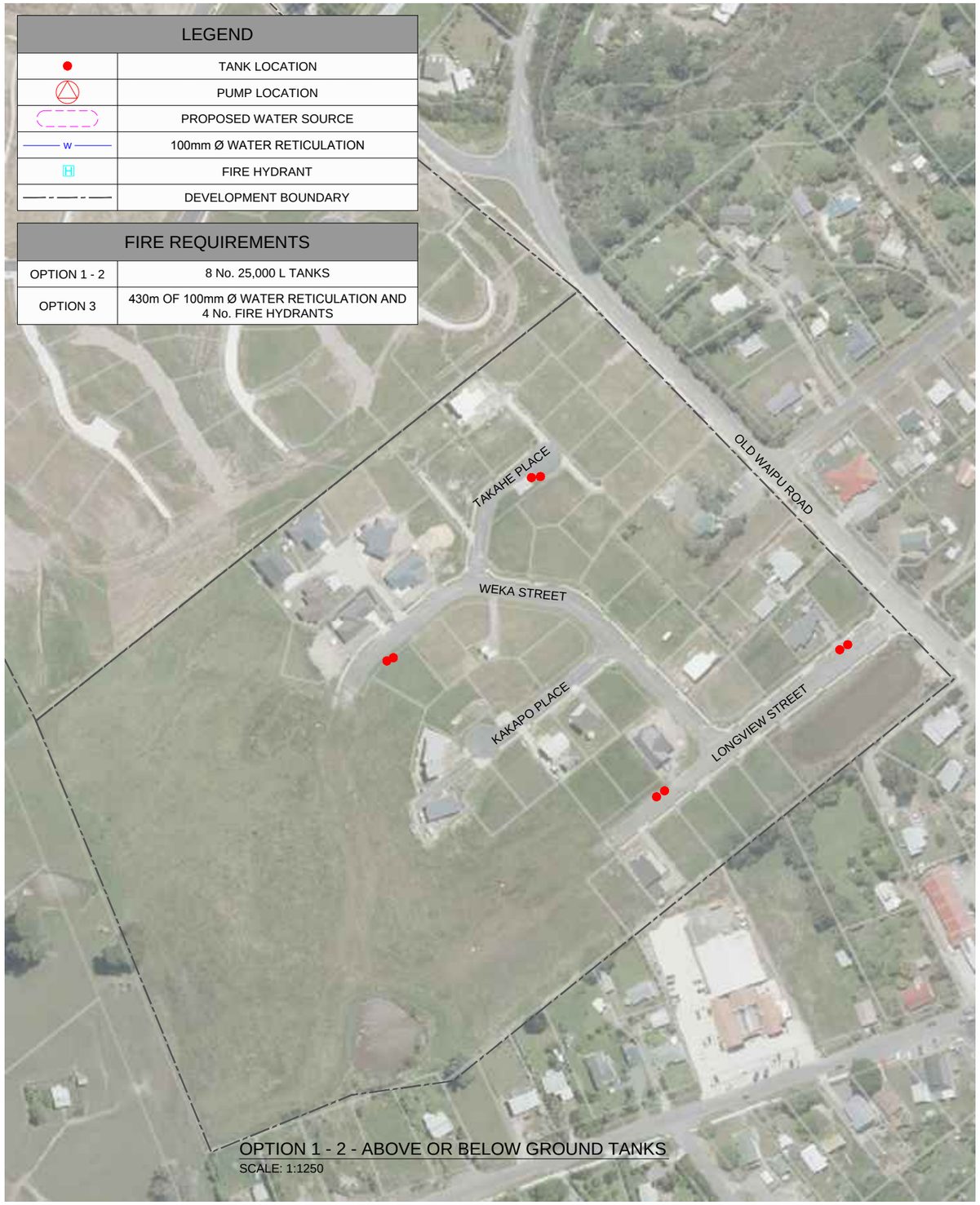
LEGEND

●	TANK LOCATION
△	PUMP LOCATION
▭	PROPOSED WATER SOURCE
W	100mm Ø WATER RETICULATION
H	FIRE HYDRANT
— - — - —	DEVELOPMENT BOUNDARY

FIRE REQUIREMENTS

OPTION 1 - 2	8 No. 25,000 L TANKS
OPTION 3	430m OF 100mm Ø WATER RETICULATION AND 4 No. FIRE HYDRANTS



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OPTION 3 - POND AND WATER RETICULATION
SCALE: 1:1250

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NOTE:

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MANGAWHAI WATER SUPPLY OPTIONS
FEASIBILITY AND COST ANALYSIS

Sheet
KSR FARM DEVELOPMENT

Project No.	Sheet. No.	Revision
1-13548.01	C02	A

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Design	-	-
Checked	Date	

LEGEND	
	TANK LOCATION
	PUMP LOCATION
	PROPOSED WATER SOURCE
W	100mm Ø WATER RETICULATION
H	FIRE HYDRANT
	DEVELOPMENT BOUNDARY

FIRE REQUIREMENTS	
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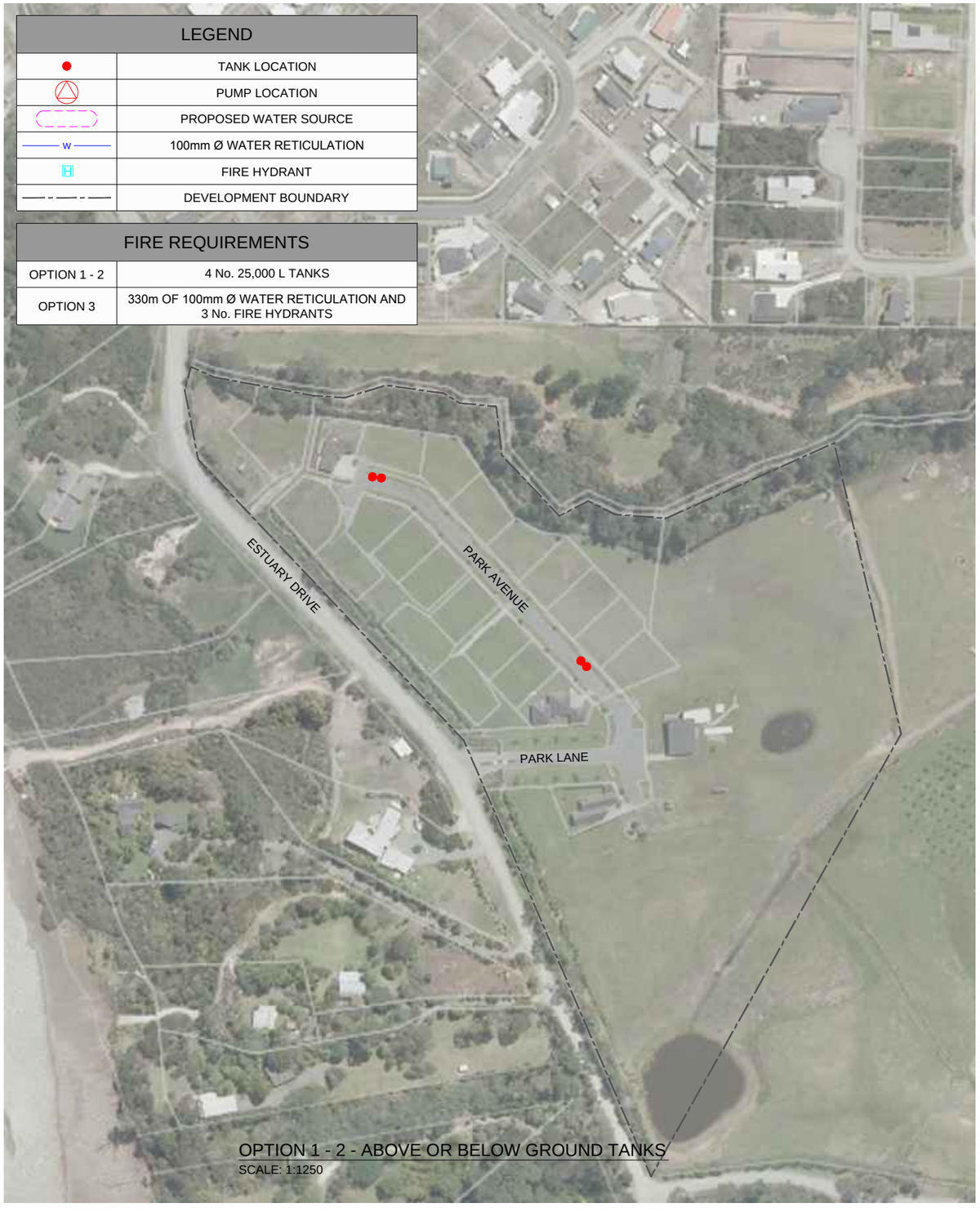
OPTION 3	330m OF 100mm Ø WATER RETICULATION AND 3 No. FIRE HYDRANTS



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OPTION 3 - POND AND WATER RETICULATION
SCALE: 1:1250

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R. CRAWFORD	1:1000 AT A1	

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FEASIBILITY AND COST ANALYSIS

Sheet
PARKLAND DEVELOPMENT

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1-13548.01	C03	A

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△	PUMP LOCATION
⬭	PROPOSED WATER SOURCE
W	100mm Ø WATER RETICULATION
H	FIRE HYDRANT
— · — · —	DEVELOPMENT BOUNDARY

FIRE REQUIREMENTS	
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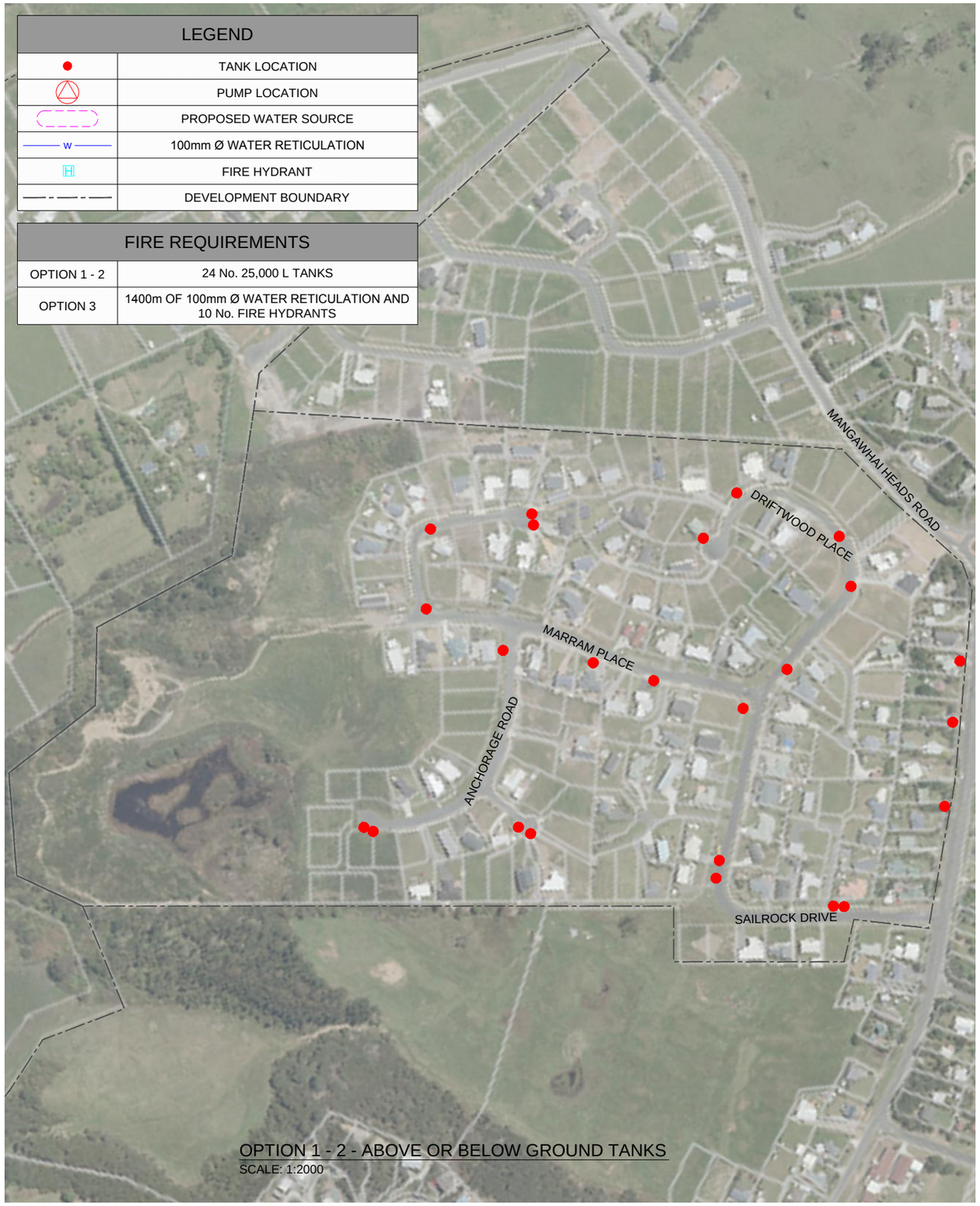
OPTION 3	1400m OF 100mm Ø WATER RETICULATION AND 10 No. FIRE HYDRANTS



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OPTION 3 - POND AND WATER RETICULATION
SCALE: 1:2000

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NOTE:
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MANGAWHAI WATER SUPPLY OPTIONS
FEASIBILITY AND COST ANALYSIS

Sheet
NORTHCOAST DEVELOPMENT

Project No.	Sheet. No.	Revision
1-13548.01	C04	A

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Drawing	-	-
Design	-	-
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Date		

LEGEND	
●	TANK LOCATION
△	PUMP LOCATION
▭	PROPOSED WATER SOURCE
w	100mm Ø WATER RETICULATION
H	FIRE HYDRANT
— - — - —	DEVELOPMENT BOUNDARY

FIRE REQUIREMENTS	
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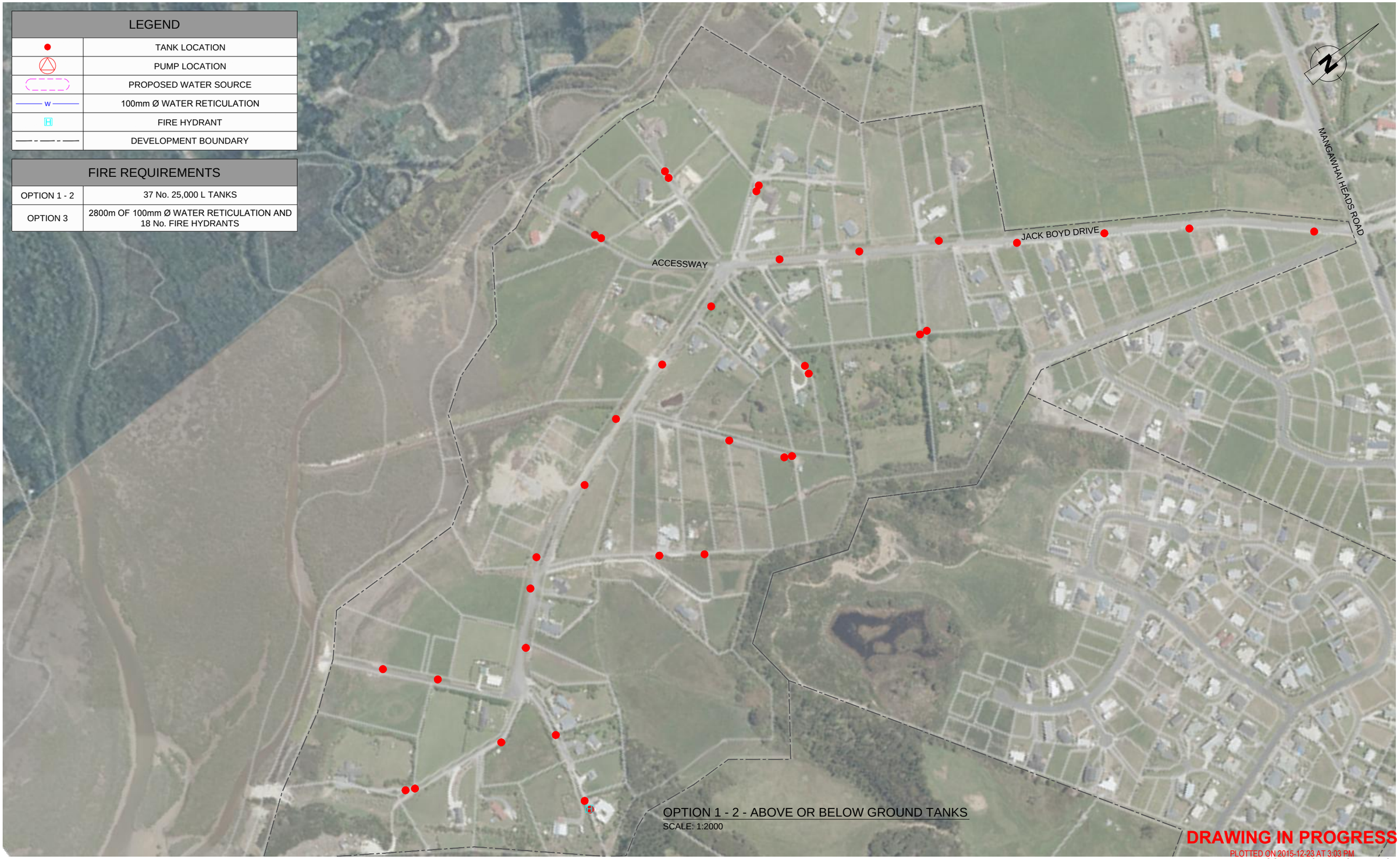
OPTION 3	2800m OF 100mm Ø WATER RETICULATION AND 18 No. FIRE HYDRANTS



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KAIPARA DISTRICT COUNCIL
MANGAWHAI WATER SUPPLY OPTIONS
FEASIBILITY AND COST ANALYSIS

Sheet
JACK BOYD DEVELOPMENT
OPTION 1 - 2

Project No.	Sheet. No.	Revision
1-13548.01	C05	A

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△	PUMP LOCATION
- - -	PROPOSED WATER SOURCE
W	100mm Ø WATER RETICULATION
H	FIRE HYDRANT
— · — · —	DEVELOPMENT BOUNDARY

FIRE REQUIREMENTS	
OPTION 1 - 2	37 No. 25,000 L TANKS
OPTION 3	2800m OF 100mm Ø WATER RETICULATION AND 18 No. FIRE HYDRANTS

OPTION 3 - POND AND WATER RETICULATION

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MANGAWHAI WATER SUPPLY OPTIONS
FEASIBILITY AND COST ANALYSIS

Sheet: JACK BOYD DEVELOPMENT
OPTION 3

Project No.	Sheet No.	Revision
1-13548.01	C06	A

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Design	-	-	
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Appendix C

Council Reticulated Water Supply Options – Drawing Plan

Survey	-	-	
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Design	-	-	
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	PROPOSED WATER RETICULATION
w	PROPOSED RAW WATER MAIN
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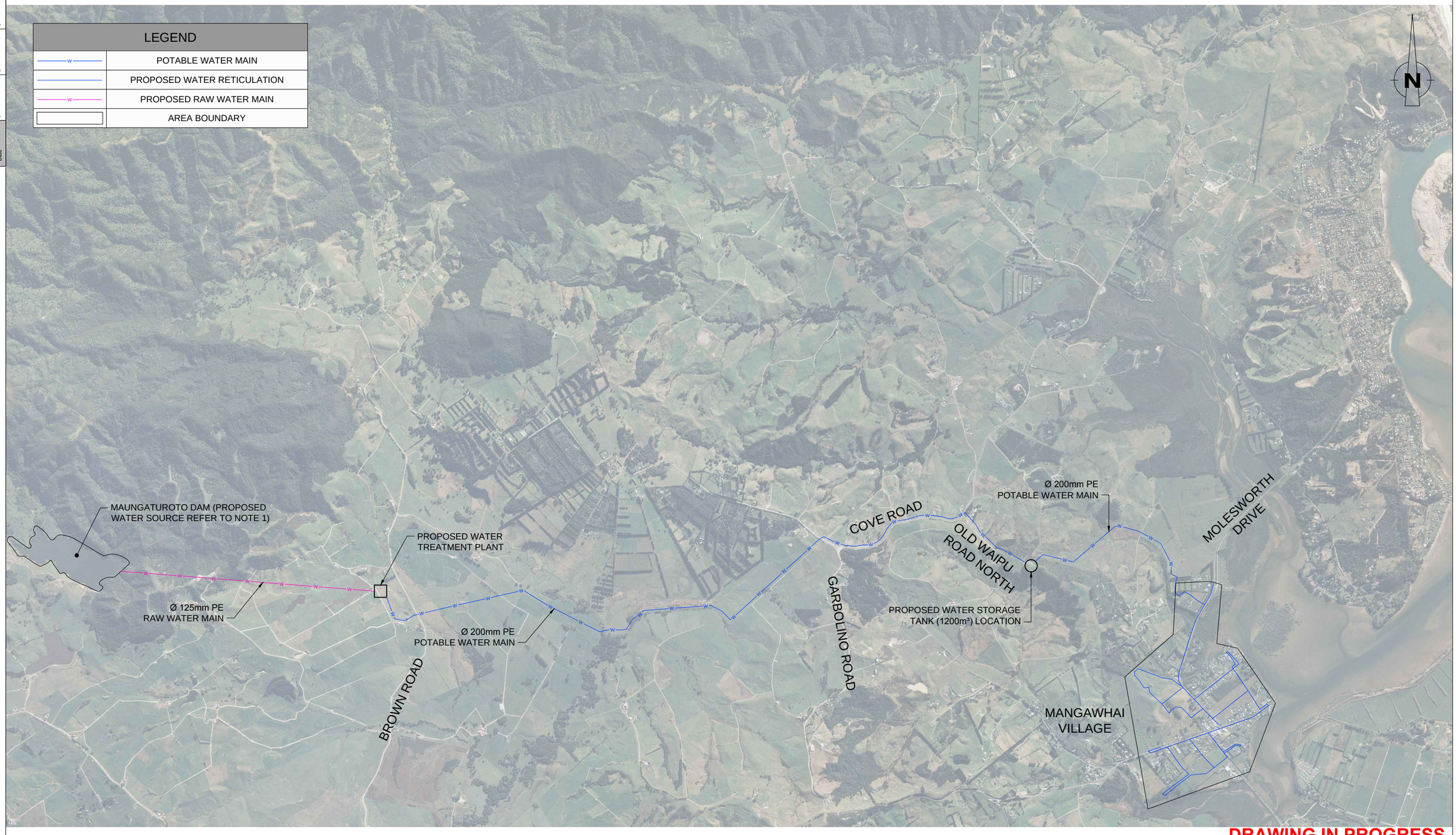

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DRAFT - NOT FOR CONSTRUCTION

NOTE:

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Revision	Amendment	Approved	Revision Date

KAIPARA DISTRICT
Kaipara ki Oruawharo • Two Oceans Two Harbours

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Designed	Approved	Approved Date
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Drawn	Scales	
L. TATTERSALL	1:15000 AT A1	

Project
KAIPARA DISTRICT COUNCIL
MANGAWHAI WATER SUPPLY OPTIONS
FEASIBILITY AND COST ANALYSIS

Sheet
PROPOSED WATER RETICULATION OPTION 1
MANGAWHAI VILLAGE

Project No.	Sheet. No.	Revision
1-13548.01 (02)	C01	A

Survey	-	-
Drawing	-	-
Design	-	-
Checked	Date	

LEGEND	
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	PROPOSED WATER RETICULATION
w	PROPOSED RAW WATER MAIN
w	EXISTING WATER MAIN RETICULATION
	AREA BOUNDARY

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DRAWING IN PROGRESS

PLOTTED ON 2015-12-24 AT 9:40 a.m.

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NOTE:

1. WATER SOURCE HAS NOT BEEN ASSESSED FOR VOLUME AND WATER QUALITY AVAILABILITY.

1:15 @ A1
1:30 @ A3
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 km

Revision	Amendment	Approved	Revision Date

KAIPARA DISTRICT
Kaipara te Oranganui - Two Oceans Two Harbours

OPUS
Whangarei Office
+64 9 430 1700
Private Bag 9017
Whangarei 0148
New Zealand

Designed	Approved	Approved Date
E. FOSCHIERI	-	-
Drawn	Scales	
L. TATTERSALL	1:15000 AT A1	

Project
KAIPARA DISTRICT COUNCIL
MANGAWHAI WATER SUPPLY OPTIONS
FEASIBILITY AND COST ANALYSIS

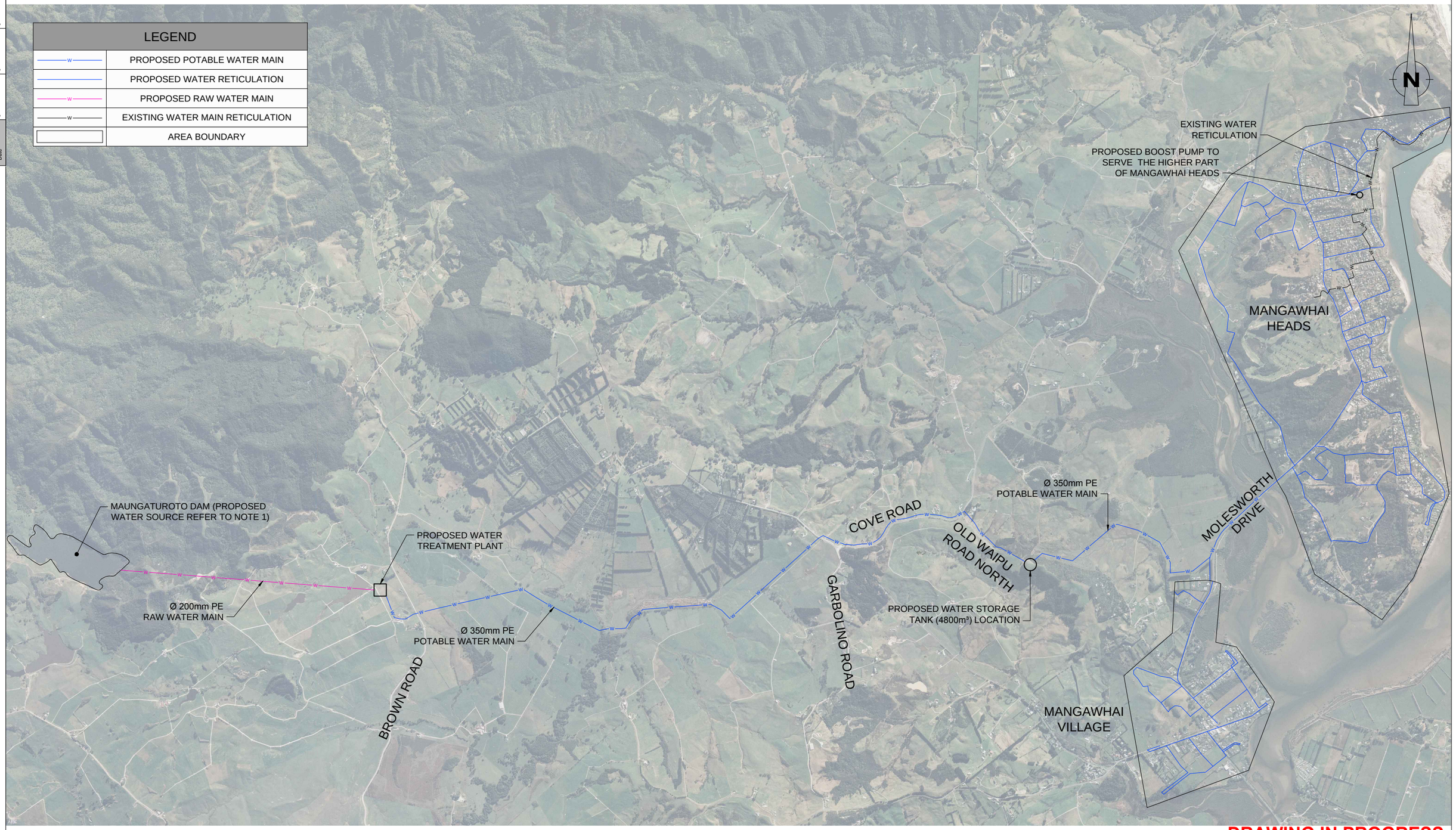
Sheet
PROPOSED WATER RETICULATION OPTION 2
MANGAWHAI HEADS

Project No.	Sheet. No.	Revision
1-13548.01 (02)	C02	A

Original Sheet Size A1 [841x594] Plot Date 2015-12-24 at 9:40:42 a.m. Path G:\01 Clients\Kaipara DC\1-13548.01 Mangawhai Water Supply Options Feasibility and Cost Analysis\300 Technical\210 Drawings\(C)Civil+AutoCAD\1-13548.01 (02).dwg C02

Survey	-	-	
Drawing	-	-	
Design	-	-	
Checked			
Date			

LEGEND	
w	PROPOSED POTABLE WATER MAIN
	PROPOSED WATER RETICULATION
w	PROPOSED RAW WATER MAIN
w	EXISTING WATER MAIN RETICULATION
	AREA BOUNDARY



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DRAWING IN PROGRESS

PLOTTED ON 2015-12-24 AT 9:40 a.m.

DRAFT - NOT FOR CONSTRUCTION

NOTE:

1. WATER SOURCE HAS NOT BEEN ASSESSED FOR VOLUME AND WATER QUALITY AVAILABILITY.

1:15 @ A1
1:30 @ A3
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 km

Revision	Amendment	Approved	Revision Date

KAIPARA DISTRICT
Kaipara te Oranganui - Two Oceans Two Harbours

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Designed	Approved	Approved Date
E. FOSCHIERI	-	-
Drawn	Scales	
L. TATTERSALL	1:15000 AT A1	

Project
KAIPARA DISTRICT COUNCIL
MANGAWHAI WATER SUPPLY OPTIONS
FEASIBILITY AND COST ANALYSIS

Sheet
PROPOSED WATER RETICULATION OPTION 3
MANGAWHAI HEADS AND VILLAGE

Project No.	Sheet. No.	Revision
1-13548.01 (02)	C03	A

Appendix D

Council Reticulated Water Supply Options – Indicative Costs

Kaipara District Council
Maungawhai Heads Water Supply
Indicative Budget Cost (January 2016)

				Maungawhai Heads Water Supply	
Item	**Comment**	**Unit**	**Quantity**	**Rate**	**Amount**
Water Treatment Plant	-	L.S.	1		**$ 335,000**
Water Storage Tank	1200m3	L.S.	1		**$ 780,000**
Pump Station From WTP to Reservoir	-	L.S.	1		**$ 33,000**
Water Main Installation				**PE110 SDR11 PE100 PN16**	
in carriageway - open cut	50%	m	3603	$ 120	$ 432,360
in berms/minor road - open cut	50%	m	3603	$ 100	$ 360,300
Pipe Supply					
Not included above		m	7206	$ 100	$ 720,600
	Total Length:	m	*7206*		**$ 1,510,000**
Water Main Installation				**PE125 SDR11 PE80 PN16**	
in carriageway - open cut	40%	m	3200	$ 120	$ 384,000
in berms/minor road - open cut	60%	m	4800	$ 100	$ 480,000
Pipe Supply					
Not included above		m	8000	$ 150	$ 1,200,000
	Total Length:	m	*8000*		**$ 2,060,000**
Water Main Installation				**PE200 SDR11 PE80 PN12,5**	
in carriageway - open cut	30%	m	1050	$ 150	$ 157,500
in berms/minor road - open cut	70%	m	2450	$ 120	$ 294,000
Pipe Supply					
Not included above		m	3500	$ 310	$ 1,085,000
	Total Length:	m	*3500*		**$ 1,540,000**
	Subtotal				**$ 6,258,000**
Contingency (10%)					$ 626,000
Design (as per IPENZ 7.0%)					$ 440,000
Construction MSQA (as per IPENZ CM3, 2.5%)					$ 160,000
	Subtotal				**$ 1,226,000**
			Project Total		**$ 7,480,000**

Assumptions
Estimate for pipe supply from Humes Trade PriceBook (Nov.2015)
Estimate for water main installation from QvCost Builder
Water Main installation assumed to be in light, sand or clay soil

Costs do not include:
- Rider mains and house connections
- Valves, fittings and eventual hydrants (for pipe distribution)
- Resource Consent
- Land Purchuase and easement costs
- Geotechnicnal Investigation
- Archeological Monitoring
- Risk associated with design variations, construction price market variation

Kaipara District Council
Maungawhai Village Water Supply
Indicative Budget Cost (January 2016)

Item	Comment	Unit	Quantity	Maungawhai Village Water Supply Rate	Maungawhai Village Water Supply Amount
Water Treatment Plant	-	L.S.	1		**$ 770,000**
Water Storage Tank	3300m3	L.S.	1		**$ 1,600,000**
Pump Station From WTP to Reservoir	-	L.S.	1		**$ 37,000**
Water Main Installation				**PE110 SDR11 PE100 PN16**	
in carriageway - open cut	50%	m	8171	$ 120	$ 980,520
in berms/minor road - open cut	50%	m	8171	$ 100	$ 817,100
Pipe Supply					
Not included above		m	16342	$ 100	$ 1,634,200
	Total Length:	m	*16342*		**$ 3,430,000**
Water Main Installation				**PE200 SDR11 PE80 PN12,5**	
in carriageway - open cut	40%	m	4480	$ 150	$ 672,000
in berms/minor road - open cut	60%	m	6720	$ 120	$ 806,400
Pipe Supply					
Not included above		m	11200	$ 310	$ 3,472,000
	Total Length:	m	*11200*		**$ 4,950,000**
Water Main Installation				**PE315 SDR11 PE80 PN12,5**	
in carriageway - open cut	30%	m	1980	$ 180	$ 356,400
in berms/minor road - open cut	70%	m	4620	$ 160	$ 739,200
Pipe Supply					
Not included above		m	6600	$ 800	$ 5,280,000
	Total Length:	m	*6600*		**$ 6,380,000**
	Subtotal				**$ 17,167,000**
Contingency (10%)					$ 1,717,000
Design (as per IPENZ 7.0%)					$ 1,200,000
Construction MSQA (as per IPENZ CM3, 2.5%)					$ 430,000
	Subtotal				**$ 3,347,000**
			Project Total		**$ 20,510,000**

Assumptions
Estimate for pipe supply from Humes Trade PriceBook (Nov.2015)
Estimate for water main installation from QvCost Builder
Water Main installation assumed to be in light, sand or clay soil

Costs do not include:
- Rider mains and house connections
- Valves, fittings and eventual hydrants (for pipe distribution)
- Resource Consent
- Land Purchuase and easement costs
- Geotechnicnal Investigation
- Archeological Monitoring
- Risk associated with design variations, construction price market variation

Kaipara District Council
Maungawhai Heads and Village Water Supply
Indicative Budget Cost (January 2016)

				Maungawhai Heads and Village Water Supply	
Item	**Comment**	**Unit**	**Quantity**	**Rate**	**Amount**
Water Treatment Plant	-	L.S.	1		**$ 1,050,000**
Water Storage Tank	4800m3	L.S.	1		**$ 2,000,000**
Pump Station From WTP to Reservoir	-	L.S.	1		**$ 40,000**
Water Main Installation				**PE110 SDR11 PE100 PN16**	
in carriageway - open cut	50%	m	11774	$ 120	$ 1,412,880
in berms/minor road - open cut	50%	m	11774	$ 100	$ 1,177,400
Pipe Supply					
Not included above		m	23548	$ 100	$ 2,354,800
	Total Length:	m	*23548*		**$ 4,950,000**
Water Main Installation				**PE200 SDR11 PE80 PN12,5**	
in carriageway - open cut	30%	m	3840	$ 150	$ 576,000
in berms/minor road - open cut	70%	m	8960	$ 120	$ 1,075,200
Pipe Supply					
Not included above		m	12800	$ 310	$ 3,968,000
	Total Length:	m	*12800*		**$ 5,620,000**
Water Main Installation				**PE315 SDR11 PE80 PN12,5**	
in carriageway - open cut	30%	m	1410	$ 180	$ 253,800
in berms/minor road - open cut	70%	m	3290	$ 160	$ 526,400
Pipe Supply					
Not included above		m	4700	$ 800	$ 3,760,000
	Total Length:	m	*4700*		**$ 4,540,000**
Water Main Installation				**PE355 SDR11 PE80 PN16**	
in carriageway - open cut	30%	m	570	$ 180	$ 102,600
in berms/minor road - open cut	70%	m	1330	$ 160	$ 212,800
Pipe Supply					
Not included above		m	1900	$ 840	$ 1,596,000
	Total Length:	m	*1900*		**$ 1,910,000**
	Subtotal				**$ 20,110,000**
Contingency (10%)					$ 2,011,000
Design (as per IPENZ 7.0%)					$ 1,410,000
Construction MSQA (as per IPENZ CM3, 2.5%)					$ 500,000
	Subtotal				**$ 3,921,000**
			Project Total		**$ 24,031,000**

Assumptions
Estimate for pipe supply from Humes Trade PriceBook (Nov.2015)
Estimate for water main installation from QvCost Builder
Water Main installation assumed to be in light, sand or clay soil

Costs do not include:
- Rider mains and house connections
- Valves, fittings and eventual hydrants (for pipe distribution)
- Resource Consent
- Land Purchuase and easement costs
- Geotechnicnal Investigation
- Archeological Monitoring
- Risk associated with design variations, construction price market variation

Appendix E

NZFS-GDC Agreement

Opus International Consultants Ltd
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w: www.opus.co.nz

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50-64 Customhouse Quay
PO Box 2791
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New Zealand
DX SP20002 WGTN
Tel +64 4 472 6289
Fax +64 4 472 7429
www.dlapf.com

Agreement between New Zealand Fire Service Commission and Gisborne District Council for provision of firefighting water supplies in the Gisborne District

GRW-003269-711-14-V2:JB

Parties

New Zealand Fire Service Commission, a crown entity constituted by section 4(1) of the Fire Service Act 1975 (**Commission**)

Gisborne District Council, a unitary authority constituted under Local Government (Gisborne Region) Reorganisation Order 1989 (**Council**)

1 Background

1.1 This agreement confirms the matters agreed by the Commission and the Council between 28 August 2014 and 24 October 2014 in relation to the provision and installation of community water tanks.

1.2 The context of this agreement was to enable the Commission's Environment Court appeal relating to the Council's plan change 56 to be resolved before a hearing was necessary. A consent order to resolve that appeal will be filed with the Environment Court. This agreement covers those matters that are outside the scope of plan change 56 provisions.

2 Community water tanks

2.1 Council will provide and install, at its own cost, three 30,000 litre capacity water tanks in the vicinity of the Wainui and Okitu Community :

2.2 All tanks will be installed before 1 July 2015.

2.3 The exact location of the tanks will be first agreed between the parties.

2.4 Council is solely responsible for, and will maintain, at its own cost, the tanks provided under this Agreement in accordance with the Code.

2.5 Council is responsible for obtaining any consents or approvals required for installation of any tanks under this Agreement, at its own cost.

2.6 Council will commit to progressively fitting firefighting connections to water storage tanks in rural communities across the district.

2.7 Council will annually provide the Commission with an update on the progress of its commitment under clause 2.6.

Execution and date

Executed as an agreement.

Date: 14 January 2015

Signed on behalf of the **Commission** by:

.....

Signature of authorised person

ROBERT JOHN POPE

.....

Name of authorised person (print)

Director: Office of the Chief Executive

.....

Office held

Signed for and on behalf of the **Council** by:

.....

Signature of authorised person

PETER HIGGS

.....

Name of authorised person (print)

DEP. CE

.....

Office held