Whenuapai Wastewater Servicing Scheme Phase 1 – Alternatives Assessment

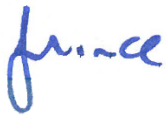
Prepared for Watercare Services Ltd
Prepared by Beca Limited

28 October 2022

Revision History

Revision Nº	Prepared By	Description	Date
1	Rachael Clark	Working draft	
2	Sarah MacCormick	First Review – working draft for Watercare review	22/02/2022
3	Jenny Vince	First Review – working draft for Watercare review	23/02/2022
4	Rachael Clark / Sarah MacCormick	Second draft for Watercare and Legal review	11/03/2022
5	Sarah MacCormick	Third draft for Watercare review	19/09/2022
6	Rachael Clark	Final for lodgement	26/10/2022

Document Acceptance

Action	Name	Signed	Date
Prepared by	Rachael Clark and Sarah MacCormick		28/10/2022
Reviewed and Approved by	Jenny Vince		28/10/2022
on behalf of	Beca Limited		

Contents

Appendices

1 Introduction

1.1 The Project

This report summarises the alternatives assessment process for the Whenuapai Redhills: Package 1 Project (the Project) which includes the following elements (listed below and shown on Figure 2):

1. A **Pump Station** at a point where the Whenuapai and Redhills Catchments meet at 23-27 Brigham Creek Road, with an emergency overflow outfall to the Sinton Stream.
2. A **Gravity Main Pipeline** (approximately 700m long and 375 – 475 mm in diameter) between the existing Whenuapai Village Pump Station on Tamiro Road and the Pump Station
3. A **Rising Main** (approximately 1.5km long and 500 mm in diameter) between the Pump Station and a proposed new break pressure chamber on Mamari Road.
4. A **Culvert** (approximately 63 m long including wing wall and rip rap) to provide access for the rising main across Sinton Stream.
5. A **Break Pressure Chamber** located on corner of Mamari and Spedding Roads..

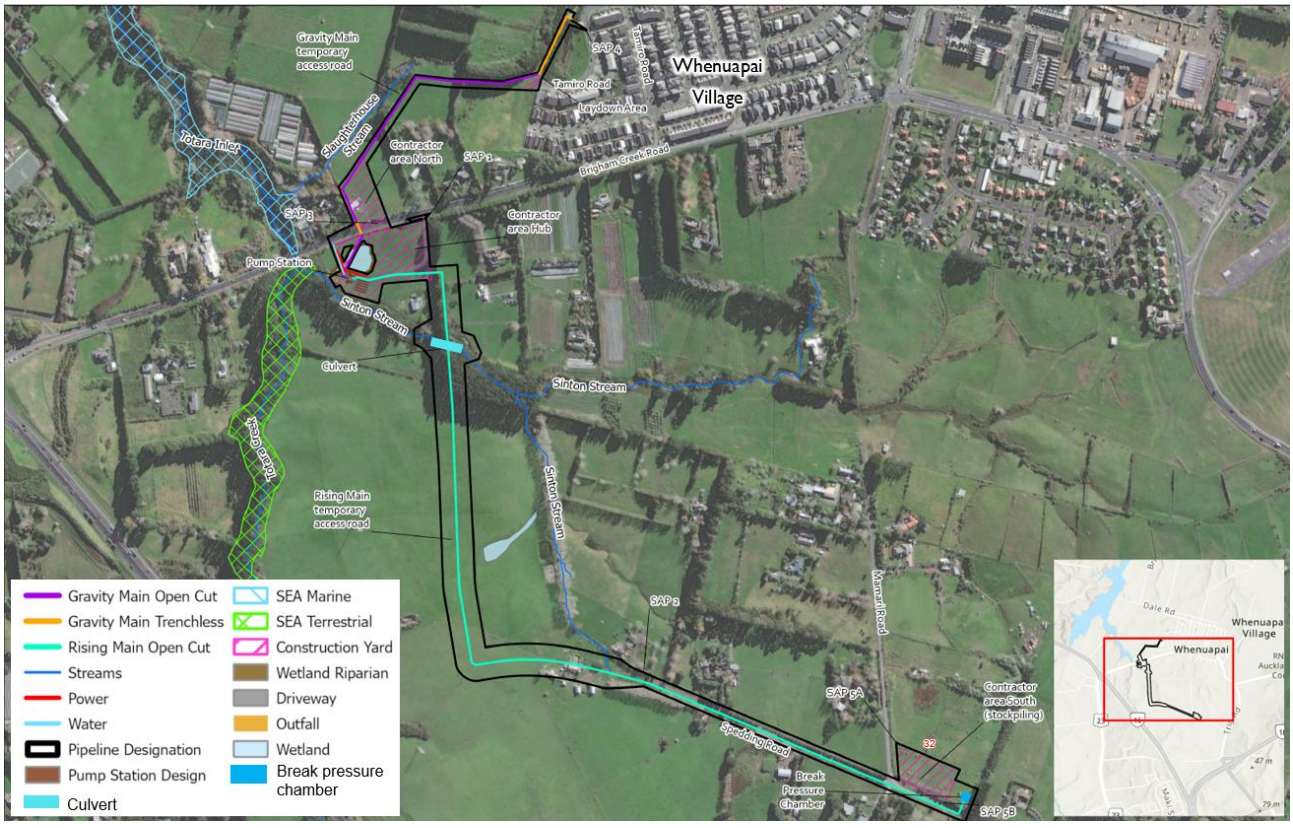


Figure 1. Project overview

The purpose of this report is to summarise the process that has been undertaken by Watercare and GHD (the designers) in relation to assessing alternative sites, routes, or methods of undertaking the work.

1.2 Purpose

171(1)(b) of the RMA requires a territorial authority (in this case Auckland Council), when making a recommendation on a Notice of Requirement and any submissions received, to have particular regard to

whether adequate consideration has been given to alternative sites, routes, or methods of undertaking the work if a) the requiring authority does not have an interest in the land sufficient for undertaking the work; or b) it is likely the work will have a significant adverse effect on the environment.

Watercare owns the underlying land for the existing Tamiro Road pump station, proposed pump station[1] and break pressure chamber[2]. Watercare also has an agreement in principle with Oyster Capital, and a lease agreement with the owner of 32 Mamari Road, to utilise 23-27 Brigham Creek Road and 32 Mamari Road respectively for construction areas for the duration of the Project works.

Watercare does not have an interest in other parts of the alignment sufficient for undertaking the work, which includes private properties at:

1. 20-22 Brigham Creek Road
2. 26 Brigham Creek Road
3. 28 Brigham Creek Road
4. 31 Brigham Creek Road,
5. 23-27 Brigham Creek Road; and
6. 15-19 Spedding Road

Therefore, a consideration of alternative sites, routes and methods of undertaking the work needs to be undertaken for the Project, as per s171(b) RMA.

1.3 Assessment of Alternatives Process Summary

The general process for undertaking the assessment of alternatives for the Project is set out in Figure 2.

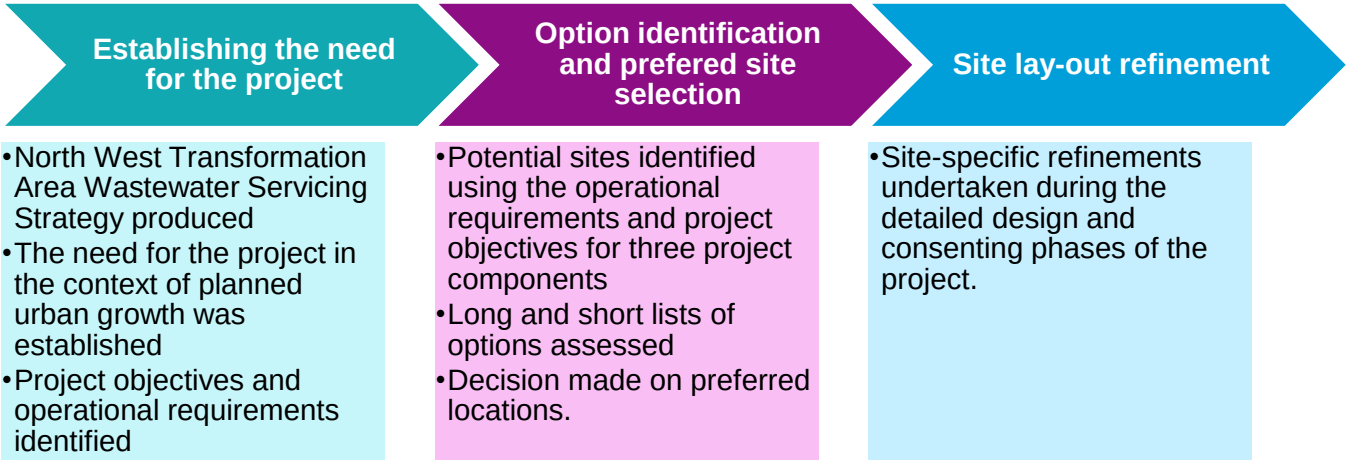


Figure 2. Package 1 Assessment of Alternatives process

[1] Legal description: Section 1 SO 569103

[2] Legal description: SECT 1 SO 582220

2 Need for the Project

2.1 Overview

Since 2000, a number of strategic documents and landuse policies have identified the North West for planned growth and the associated need for additional wastewater capacity to service this growth. A summary of this is shown in Figure 3.

Figure 3. Strategic plans relevant to planning for the North West wastewater network

2.2 Current and future growth in the North West

The North West region of Auckland is experiencing significant urban growth, with an additional 44,000 new houses anticipated to be built over the next 30 years. Development is expected to occur across a number of topographically based catchments, including catchments in Whenuapai, Redhills, Kumeū, Riverhead and Huapai.

Future urban areas in the North West have been identified in the Auckland Unitary Plan and Future Urban Land Supply Strategy (FULSS)[3], shown in Figure 4 below. The majority of future urban land in the North West has a 'development ready' timeframe between 2028-2032. Structure planning is expected to begin in 2025 with Council-led plan changes occurring after that.

[3] The primary purpose of the FULSS is to identify the sequencing and timing of future urban land for development readiness over 30 years.

Significant development is already occurring or is planned to occur in the Whenuapai and Redhills catchments, including development of Whenuapai Village and the Redhills area (both were originally Special Housing Areas and were 'live zoned' when the Auckland Unitary Plan was notified in 2016).

Whenuapai Stage 1 (shown in Figure 4 as orange) is anticipated to be development ready between 2018-2022 and is currently subject to a plan change to live zone for residential and light industrial use (Plan Change 5). The remainder of the Whenuapai Stage 2 area is sequenced to be live zoned between 2028 and 2032.

An out-of-sequence private plan change was lodged by Oyster Capital in 2020 to rezone ~52 ha of future urban zoned land south of Brigham Creek Road for light industrial use (see Figure 4 below).

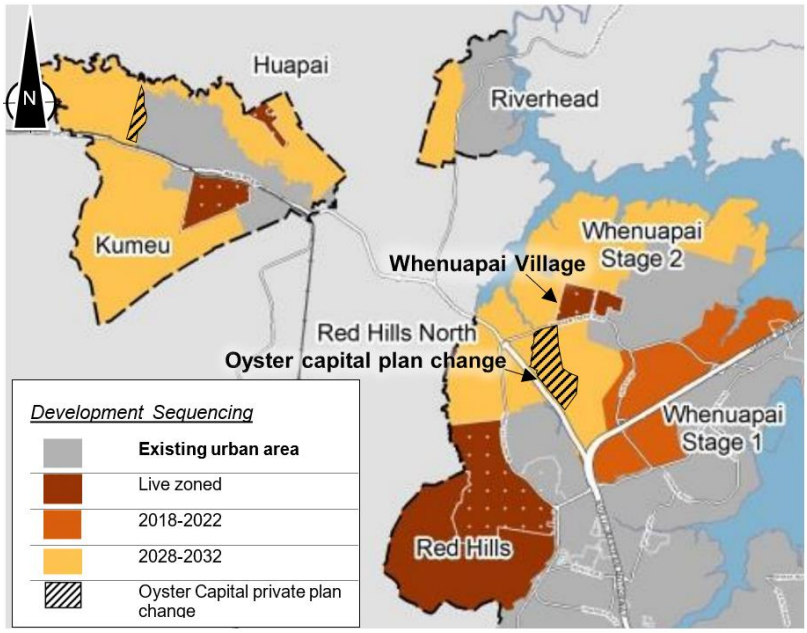


Figure 4. Planned development sequencing for Kumeū-Huapai, Riverhead, Whenuapai, and Redhills (Source: Future Urban Land Supply Strategy)

The growth projections for the number of dwellings and related wastewater wet weather flows in Whenuapai and Redhills between 2021 and 2046 (as calculated in 2018) are shown in Table 1. The existing Riverhead rising main has limited capacity available to service existing and planned wastewater flows from the Whenuapai catchment. Continued development and increased wastewater flows into the network risks causing future overflows at the Riverhead Pump Station. Further development of the catchment is therefore constrained, and additional capacity in the Whenuapai catchment is needed to unlock the development potential of the land in the wider area and prevent adverse effects on the environment.

Table 1. Whenuapai and Redhills – Dwelling Projections and Related Flows (2018)[4]

	2021	2026	2031	2036	2041	2046
Whenuapai	2,400*	4,300	6,300	8,300	10,200	12,000
Redhills	230	3,000	6,000	9,000	11,500	14,000
Total	2,630	7,300	12,300	17,300	21,700	26,000
Peak Wet Weather Flow (L/s)**	81	230	386	542	677	813

* Includes dwellings that are currently on septic tank.

** Flows are based on 3 people per dwelling

[4] Housing Infrastructure Fund Wastewater Servicing Detailed Business Case, 2018

Wastewater flows from the recently developed Whenuapai Village are currently pumped into an existing Riverhead rising main, which then runs from Whenuapai Village to the Upper Harbour Motorway, via a pipeline along Trig Road (see Figure 5).

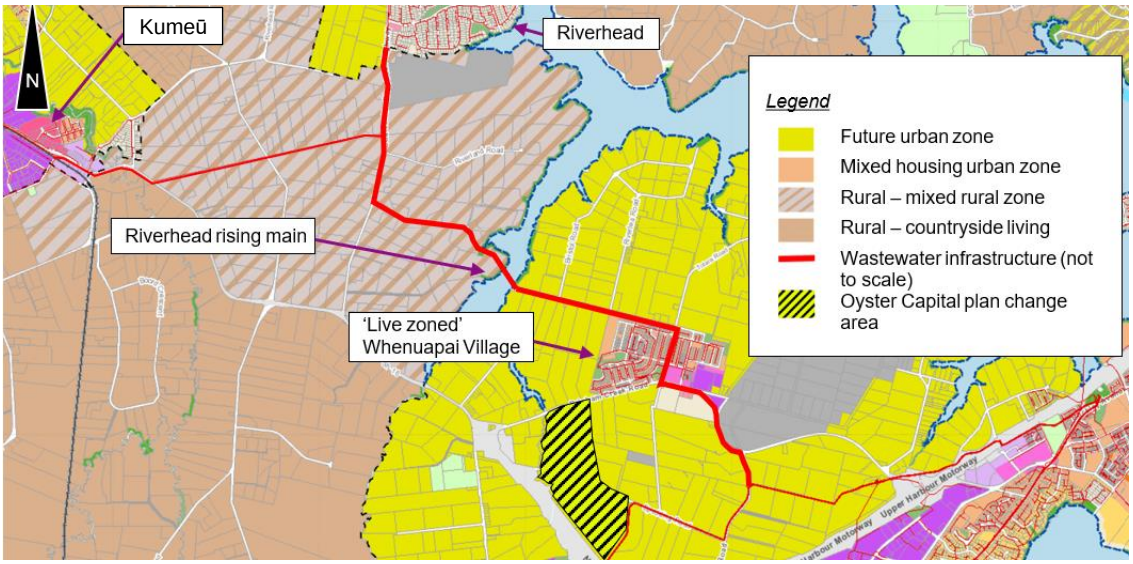


Figure 5. Existing wastewater infrastructure for Whenuapai catchment (red lines). Oyster Capital plan change area shown as hashed black area.

The existing Riverhead rising main has limited capacity available to service existing and planned wastewater flows from the Whenuapai catchment. Continued development and increased wastewater flows into the network risks causing future overflows at the Riverhead Pump Station. Further development of the catchment is therefore constrained, and additional capacity in the Whenuapai catchment is needed to unlock the development potential of the land in the wider area and prevent adverse effects on the environment.

2.3 North West Transformation Area Service Strategy 2015

In response to land use changes and development timing in the North West from Auckland Council planning documents, the North West Transformation Area Wastewater Servicing Strategy (North West WSS) was released in 2015 by Watercare. In the context of s171(1)(b) the consideration of alternatives started with this document and has been continually refined and built on since then.

The North West WSS provides an overarching 'road map' so that appropriately sized infrastructure would be established to service the progressive growth in the North West catchments. This helps to inform decisions on funding timing in Watercare's Asset Management Plan and Auckland Council's Long Term Plan.

The strategy includes development of a network of interconnecting pipelines and smaller pump stations within each catchment in the North West (refer to Figure 6). Each catchment would then deliver flows to a larger central pump station, with combined flows from across the area then delivered to the Northern Interceptor Phase 2 pipeline (NI).

Two key considerations were identified:

- The Whenuapai catchment is relatively flat with a number of individual fingers of land sloping in a westerly direction toward the harbour.

- The location and type of infrastructure is largely dictated by the need to deliver wastewater flows to the Northern Interceptor Phase 2 pipeline[5] (NI) and on to the Rosedale Wastewater Treatment Plant.

The North West WSS recommended a pump station be located near Brigham Creek Road at a point where multiple catchments meet. This would enable the pump station to efficiently connect the Whenuapai and Redhills catchments (as well as the Kumeū, Huapai and Riverhead catchments to the north west), and connect to the NI through a rising main. The report identified a potential site for this at 14-16 Brigham Creek Road, but also recommended that an options assessment for the location of this pump station be undertaken.

Building on the assessments in the North West WSS, more detailed work has been undertaken to identify the staging (and funding) of these improvements (see Section 2.4 and 2.5 below) and various options assessments have been undertaken to determine preferred locations (see Section 4 onwards below).

2.4 The Whenuapai – Redhills Wastewater Servicing Scheme - Detailed Business Case

In 2018 Watercare developed a Detailed Business Case (DBC) to request funding from the NZ Government Housing Infrastructure Fund. The DBC identified certain wastewater infrastructure investments to service Whenuapai and Redhills for the next 10 to 15 years by providing capacity in the order of 13,000 dwellings or 39,000 people. The purpose of the DBC was to seek funding and there was no detailed design undertaken at the time. In the context of s171(1)(b), this was an important 'step' in the assessment of alternatives, however more work was done after this to refine sites, routes and methods.

The 'Whenuapai-Redhills Wastewater Servicing Scheme' (the Scheme) is shown in purple on Figure 6 below.

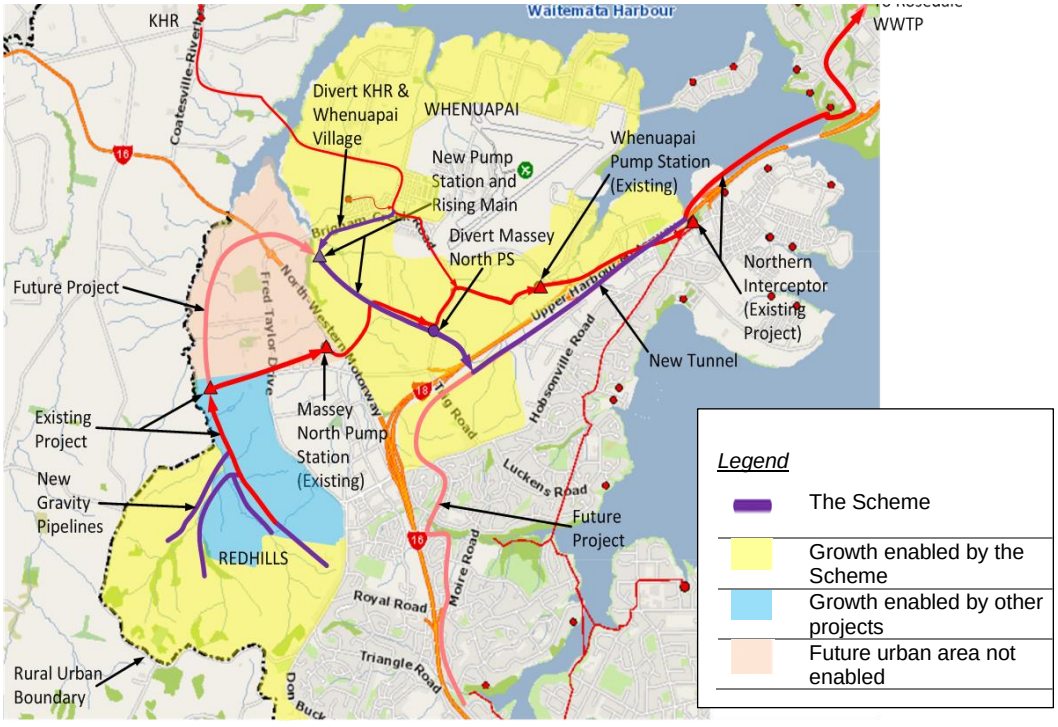


Figure 6. Whenuapai and Redhills Wastewater Servicing Scheme (the Scheme) (Source: Watercare)

[5] The Northern Interceptor Phase 2 comprises a tunnel that runs parallel with SH18 from Westgate to the Hobsonville pump station, then a rising main that traverses under the Harbour, via Wainoni Park, Schnapper Rock to the Rosedale Wastewater Treatment Plant.

2.5 The Whenuapai – Redhills Wastewater Servicing Scheme – Package 1

After the DBC, Watercare decided how the works will be staged. The infrastructure identified in the Scheme has since been split into three packages to stage infrastructure delivery (see Figure 7 below):

- Package 1 – Pump Station with gravity main and rising main.
- Package 2 –Connecting gravity sewer from Package 1 to the Northern Interceptor Phase 2 tunnel.
- Package 3 – Four gravity pipelines services the Southern Redhills area.

Staging the scheme in this way will enable immediate capacity to be addressed in the Whenuapai catchment and aligns with current known development timeframes.

Package 1 (the subject of this notice of requirement to which this alternatives assessment report relates and the associated application for resource consents), is sized to provide wastewater servicing capacity for approximately 10,240 dwellings, or 30,720 people, in the Whenuapai catchment growth projected to occur by 2041 (as shown in Table 1 above). Package 1 includes the following components (shown on Figure 8 below):

1. A new pump station with the ability to pump 320 L/s at a point where the Whenuapai and Redhills Catchments meet.
2. An approximately 700 m gravity main pipeline (375 – 475 mm diameter) between Whenuapai Village Pump Station on Tamiro Road and the pump station.
3. An approximately 1.5 km rising main (500 mm diameter) between the pump station and a proposed break pressure chamber on Mamari Road.

Package 2 will be the subject of a separate consent application (Northern Interceptor Phase 2 tunnel is already designated). Package 3 delivery is dependent on developer commitment to build in the area.

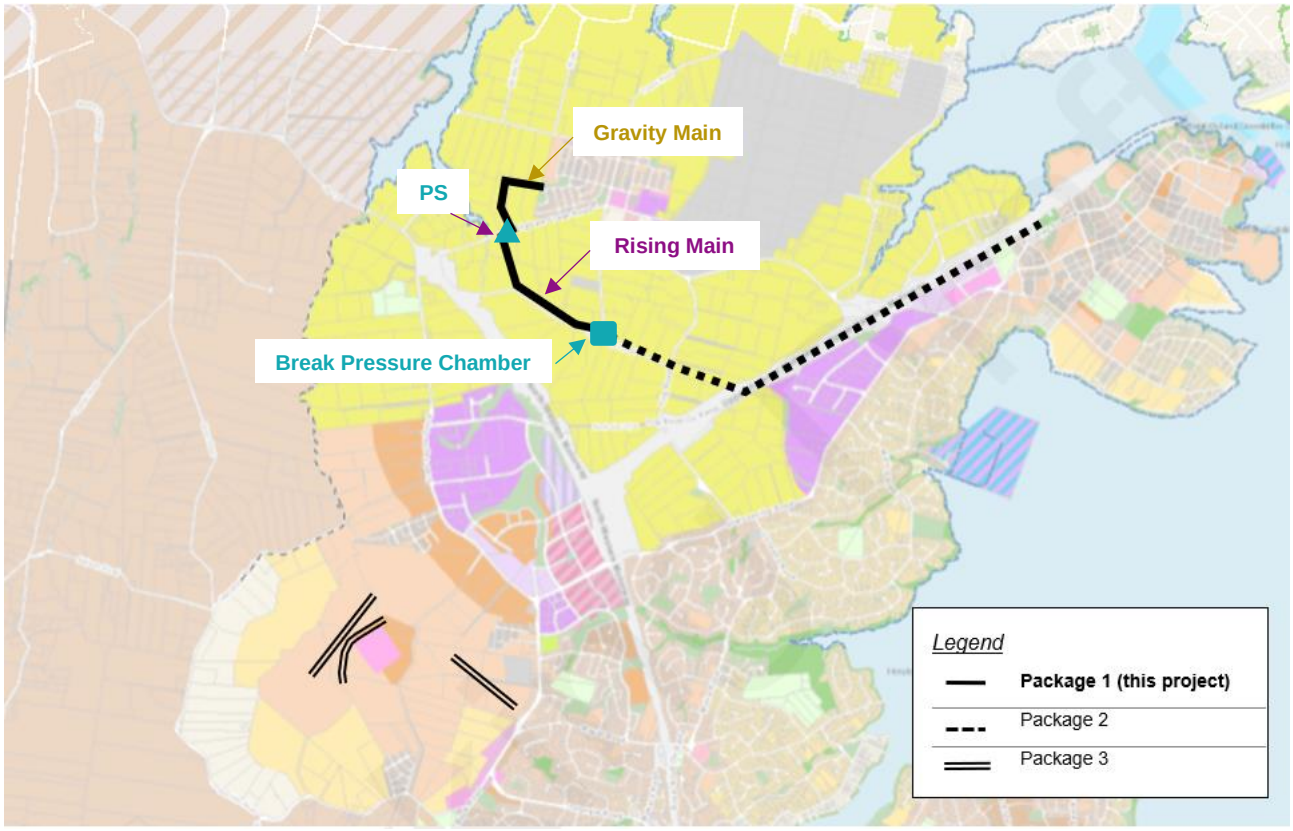


Figure 7. Schematic diagram of Whenuapai-Redhills Wastewater Servicing Scheme packages

3 Project Objectives

The Project is part of the larger Whenuapai-Redhills Wastewater Servicing Scheme, required to deliver the necessary wastewater infrastructure network in Whenuapai (and nearby Redhills) to respond to the significant growth anticipated over the next 20 years.

The following Project Objectives have been developed for the Package 1 works:

1. To provide additional capacity in the wastewater network for growth and development of the Whenuapai-Redhills catchment in a manner that:
    a. Protects public health;
    b. Optimises investment decisions, including being efficient, effective and financially responsible;
    c. Minimises private property development disruption
    d. Coordinates with existing and known planned development; and
    e. Integrates with the existing Watercare wastewater network.
2. To provide statutory protection for Package 1 of the Whenuapai and Redhills project to enable its construction, operation, and maintenance.

4 Pump Station Alternatives Assessment

This section summarises the process undertaken by Watercare and GHD (the designers) in identifying the location of the pump station, required to service the Project.

4.1 Early site selection

The North West WSS[6] recommended wastewater flows from across the North West region be delivered to a centralised pump station then travel through a central trunk to the Rosedale Wastewater Treatment Plant.

Whilst initially the pump station was only required to facilitate up to 320L/s from the Whenuapai Catchment, as development increases across the North West, it may enable additional catchments to be serviced. To integrate with the wider planned network, the pump station is required to be located at a point where multiple catchments intersect.

It was fundamental for the decision on the pump station location to be made prior to the location of other connecting pipes and supporting infrastructure. The location needed to enable efficient movement of wastewater between catchments in the Brigham Creek Road area.

The North West WSS identified that a number of catchments intersected at 14-16 Brigham Creek Road, and subsequently recommended 14-16 Brigham Creek Road to be an appropriate location for the Central Pump Station for the overall scheme but also recommended that an options assessment for the location of this pump station be undertaken.

Some constraints were identified with this site, and as such, an options assessment process was initiated in June 2020 to assess the original site against other feasible site options in the area. The sites were identified considering:

- The Project objectives
- The overall network strategy
- The requirement to locate the pump station at a point of catchment convergence near Brigham Creek Road, and
- Topographical requirements for operating a gravity wastewater network
- Known future development in the area including Proposed Private Plan Change 69 (Spedding Block) by Oyster Capital

4.2 Longlist assessment

Watercare identified a long-list of six options for potential alternative sites for the pump station. These are shown as Options A, B, C, D, E and F on Figure 8.

The ‘do nothing’ option was also considered and discounted. This option provides no additional wastewater conveyance for the Whenuapai catchment and therefore does not meet the Project objectives and was not considered further.

[6] North-West Transformation Area (NWTA) Wastewater Servicing Strategy, November 2015.

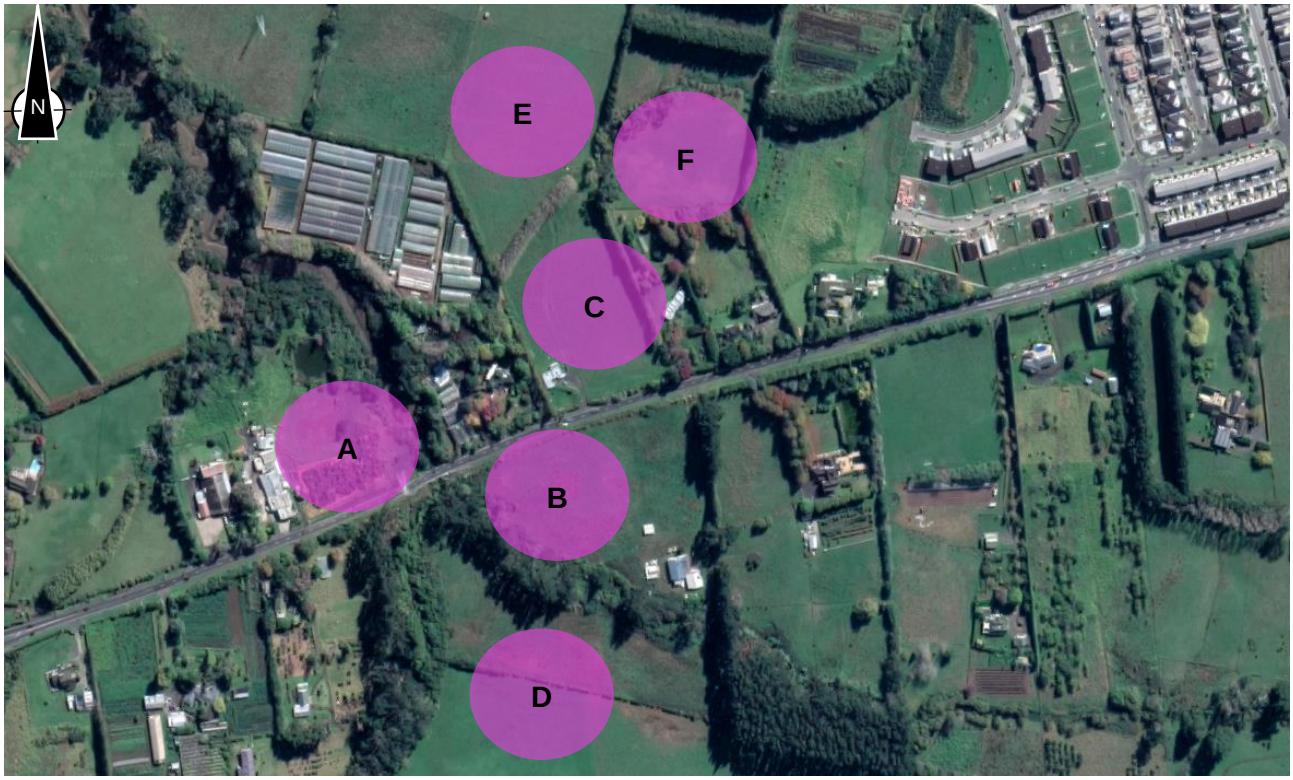


Figure 8. Pump station long list options

The long-listed sites were analysed against engineering, environmental and financial matters. A summary of the outcome of this process is provided in Table 2 below (and outlined in more detail in Appendix A).

Table 2. Longlist assessment summary

Long-List option	Assessment
Option A:14-16 Brigham Creek Road	Taken forward to short-list assessment. This option: • Is located in a central location, at the intersection of the Redhills and Whenuapai catchments • Land owned by Watercare
Option B: 23-27 Brigham Creek Road	Taken forward to short-list assessment. This option: • Is located in a central location, at the intersection of the Redhills and Whenuapai catchments • Avoids multiple stream crossings • Provides good access from Brigham Creek Road; and coordinates with the proposed new Spedding Road extension (as part of the Oyster Capital Plan Change)
Option C: 20-22 Brigham Creek Road	Taken forward to short-list assessment. This option: • Avoids multiple stream crossings
Option D: 23-27 Brigham Creek Road	Discounted. This option: • Requires two stream crossings for gravity and rising mains (and a pipe bridge for the gravity main) in locations that do not coordinate with Oyster Capital planned development • Will result in an increase in gravity main and pump station depth and resulting significant increase in cost • No clear operational access to site
Option E: 20-22 Brigham Creek Road	Discounted. This option:

	• Requires multiple stream crossings resulting in potential adverse effects on these areas • Requires a significant new road access from Brigham Creek Road • Will result in an increase in rising main length and cost due to distance from Northern Interceptor
Option F: 26 Brigham Creek Road	Discounted. This option: • Requires a deeper pump station wetwell (governed by operational requirements of Oyster Capital gravity sewer to flow at a downhill gradient) resulting in increased cost, and additional construction timeframes • Requires a significant new road access from Brigham Creek Road similar to Option E • Will result in an increase in rising main length and cost due to distance from Northern Interceptor

4.3 Shortlist assessment

The short-listed sites (Option A, B and C) were then qualitatively assessed against criteria related to the Project objectives, including current and future network integration and function, environmental and social constraints, cost, and constructability (refer to Appendix A). This assessment, undertaken by Watercare and GHD, is summarised in Table 3 below:

Table 3. Shortlist assessment summary

Short-list option	Assessment
Option A:14-16 Brigham Creek Road	This option was discounted for the following reasons: - Requires two stream crossings (significant / costly pipe bridges over Totara Creek, for gravity and rising main), in locations that do not co-ordinate with planned development, compared to one stream crossing required for Option B and C. - Mana Whenua raised concerns about this location where the pump station emergency discharge would be located within the Coastal Marine Area and required the proposed pipe to cross Totara Creek twice. - Potential further constraints in useable space on the site due to uncertainty of land requirement from Supporting Growth Programme - Working around (or likely relocation of) Transpower transmission pylons - Poor ground conditions - Wetland identified
Option B: 23-27 Brigham Creek Road	Preferred option. This option: - Requires one stream crossing (culvert over Sinton Stream, for rising main), in a location that coordinates with planned development (which reduces costs). - Avoids Transpower transmission pylon and lines - Will result in a shorter gravity main compared to Option A - Will result in shorter rising main and therefore lower operational (pumping) costs compared to Option C. - Greater integration with the existing and future planned network than Option C, strategically placed to connect to other catchments if required in the future
Option C: 20-22 Brigham Creek Road	This option was discounted for the following reasons:

	- Requires one stream crossing (culvert over Sinton Stream, for rising main), in a location that coordinates with planned development (which reduces costs) - Results in a longer rising main and therefore higher operational (pumping) costs compared to Option B. - The presence of a flood plain in the site may require purchase of larger portion of land, compared to Option B. - Lesser integration with existing and future planned network, as whilst suitable to connect to two other catchments in short term, and would require further considerations to planned trunk connections, or longer network diversions, in long term. - Requires construction of long dedicated access road to provide ongoing access.

4.4 Design refinement of Option B

Option B was selected as the preferred site for the pump station. In refining the final location of the pump station, three key considerations were evaluated:

- The location of a wetland to the north-west of the site.
- Land-owner negotiations with Oyster Capital, including negotiation of available land parcels and the need to not fragment land that would later be difficult to utilise.
- The operational requirement to be located in proximity to the stream to enable provision of an emergency overflow from the pump station.

Taking this into consideration, the preferred location of the pump station is shown on Figure 9 below.

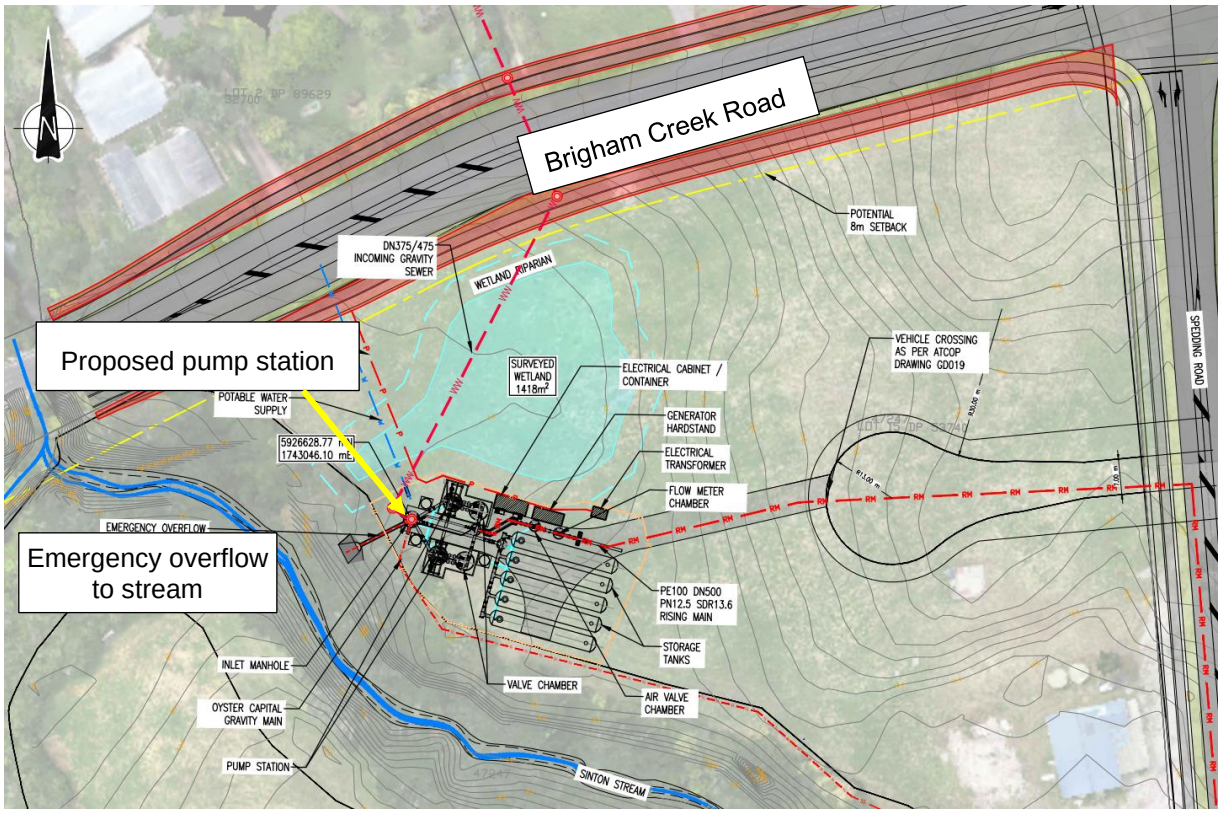


Figure 9. Proposed pump station location at 23-27 Brigham Creek Road

This location:

- Protects public health by contributing to overall objective of reducing wet weather overflows in the catchment
- Avoids permanent reclamation or dewatering of the wetland.
- Is adjacent to Sinton Stream to enable emergency overflow
- Enables Watercare to purchase only the minimum amount of land required for the pump station, without need to purchase other portions of land which are planned for future development by Oyster Capital.
- Co-ordinate with known and planned development as part of the proposed Oyster Captial plan change

The section of the site to be used for the pump station has subsequently been purchased by Watercare.

5 Gravity Main Options

Having established the location of the pump station, Watercare and GHD went through a process of establishing the alignment for both the gravity main and the rising main (discussed further in Section 6). This section sets out the options considered for the alignment of the gravity main.

5.1 Alignment considerations

When developing a short list of options for the gravity wastewater pipeline between Whenuapai Village pump station and the pump station at 23-27 Brigham Creek Road the following was considered:

- The project objectives
- The existing location and depth of gravity pipes flowing to the Whenuapai Village pump station, which is the starting point of the alignment.
- The planned location of the pump station at 23-27 Brigham Creek Road, which is the end point of the alignment.
- The operational requirement that gravity pipes need to flow downgradient from a high point to a low point.
- The streams and floodplains between the Whenuapai Village pump station and the pump station at 23-27 Brigham Creek Road.
- A topographical raised crest of a hill located around 30, 31 and 33 Brigham Creek Road.
- Whether the option could be trenched or trenchless (a trench construction method is preferred due to cost, timeframes and risks) including impacts of this on the Southern Cross internet cable and Brigham Creek Road.

5.2 Shortlist assessment

Watercare considered two potential alignment options at the northern end of the pipeline, and six potential alignment options at the southern end of the pipeline (see Figure 10)

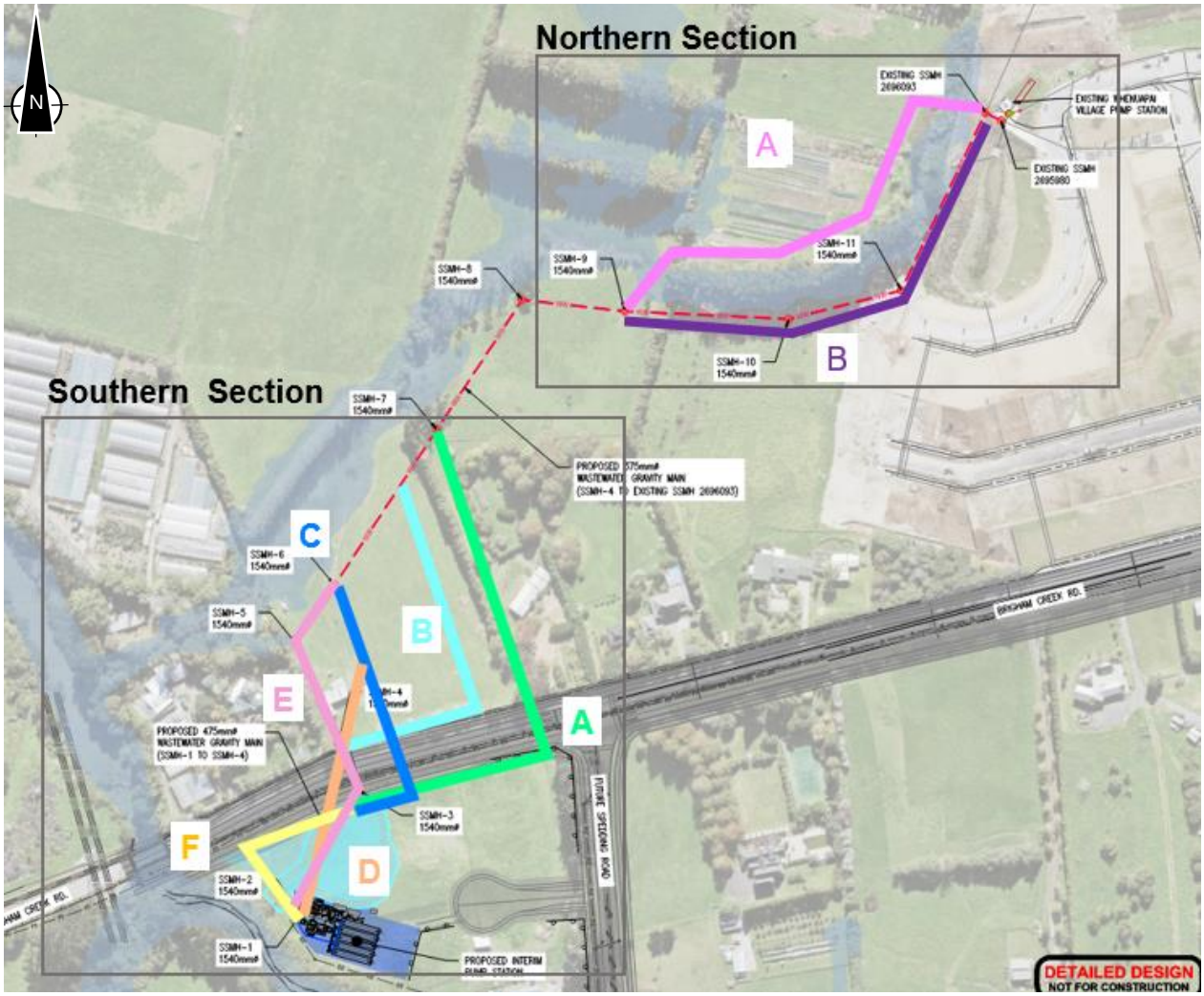


Figure 10 Alignment options (A-F) considered for gravity pipeline.

Each option was assessed against criteria, including considerations of construction risk, cost, future land developability, and environment effects (see Table 4, and

Table 5).

Table 4. Summary of northern section options assessment

Northern Section Short-list option	Assessment
Option A:	This option was discounted for the following reasons: • Stream is incised and steep. • This alignment would require two deep trenchless constructed crossings of the stream, or two pipe bridges. • If deep trenchless crossings are required/preferred, then the entire gravity alignment and pump station at 23-27 Brigham Creek Road would be forced deeper at significant cost.
Option B:	Preferred. This option: • Does not require stream crossings and can be achieved through trenched or trenchless construction.

Table 5. Summary of southern section options assessment

Southern Section Short-list option	Assessment
Option A:	This option was discounted for the following reasons: • There is a topographical raised crest of the hill around 30, 31, 33, Brigham Creek Road (25mRL). The proposed pipe would become too deep for trenched construction if this alignment were chosen. A trenchless or tunnelled construction would be at a significant cost increase. • Construction would require significant works along Brigham Creek Road, which adds construction risk due to high trafficked road and service strikes of critical buried infrastructure along the road.
Option B:	This option was discounted for the following reasons: • There is a topographical raised crest of the hill around 30, 31, 33, Brigham Creek Road (25mRL). The proposed pipe would become too deep for trenched construction if this alignment were chosen. A trenchless or tunnelled construction would be at a significant cost increase. • Construction would require significant works along Brigham Creek Road, which adds construction risk due to high trafficked road and service strikes of critical buried infrastructure along the road.
Option C:	This option was discounted for the following reasons: • There is a topographical raised crest of the hill around 30, 31, 33, Brigham Creek Road (25mRL). The proposed pipe would become too deep for trenched construction if this alignment were chosen. A trenchless or tunnelled construction would be at a significant cost increase. • Construction would require significant works along Brigham Creek Road, which adds construction risk due to high trafficked road and service strikes of critical buried infrastructure along the road. • This crosses in the middle of potentially developable land.
Option D:	This option was discounted for the following reasons: • Long trenchless construction across Brigham Creek Road. • Construction risks associated with ground conditions, including evidence of organic material which increases risk of failure when using trenchless construction methods across Brigham Creek Road. • Crosses in the middle of potentially developable land.
Option E:	Preferred. This option: • Can be achieved through trenched construction., • Minimises construction works along Brigham Creek Road. • Minimises the length of the trenchless construction under Brigham Creek Road • Minimises crossing through potentially developable land as far as practicable (to enable connection with the pump station).
Option F:	This option was discounted for the following reasons: • Construction would require significant works along Brigham Creek Road, which adds construction risk due to high trafficked road and service strikes of critical buried infrastructure along the road, including potential to strike and damage the nationally significant Southern Cross Cable providing internet services to New Zealand.

5.3 Design refinement of preferred gravity main option

Option B of the Northern Section of the pipeline, and Option E at the Southern Section, were subsequently confirmed as the preferred options for the gravity main alignment.

This alignment:

- At the Northern Section was determined by the location of the flood plain and existing stormwater drain.
- At the Southern Section was determined by avoidance of trees and aligning through relative low areas to minimise the depth (and cost) of the pipeline and pump station. This alignment also reduces works in Brigham Creek Road and potential impacts on nationally significant Southern Cross Cable.
- Protects public health by contributing to overall objective of reducing wet weather overflows in the catchment.
- Is sized to service projected demand within the next 10 to 15 years.
- Connects to the proposed pump station.

The final alignment is shown on Figure 11 below.

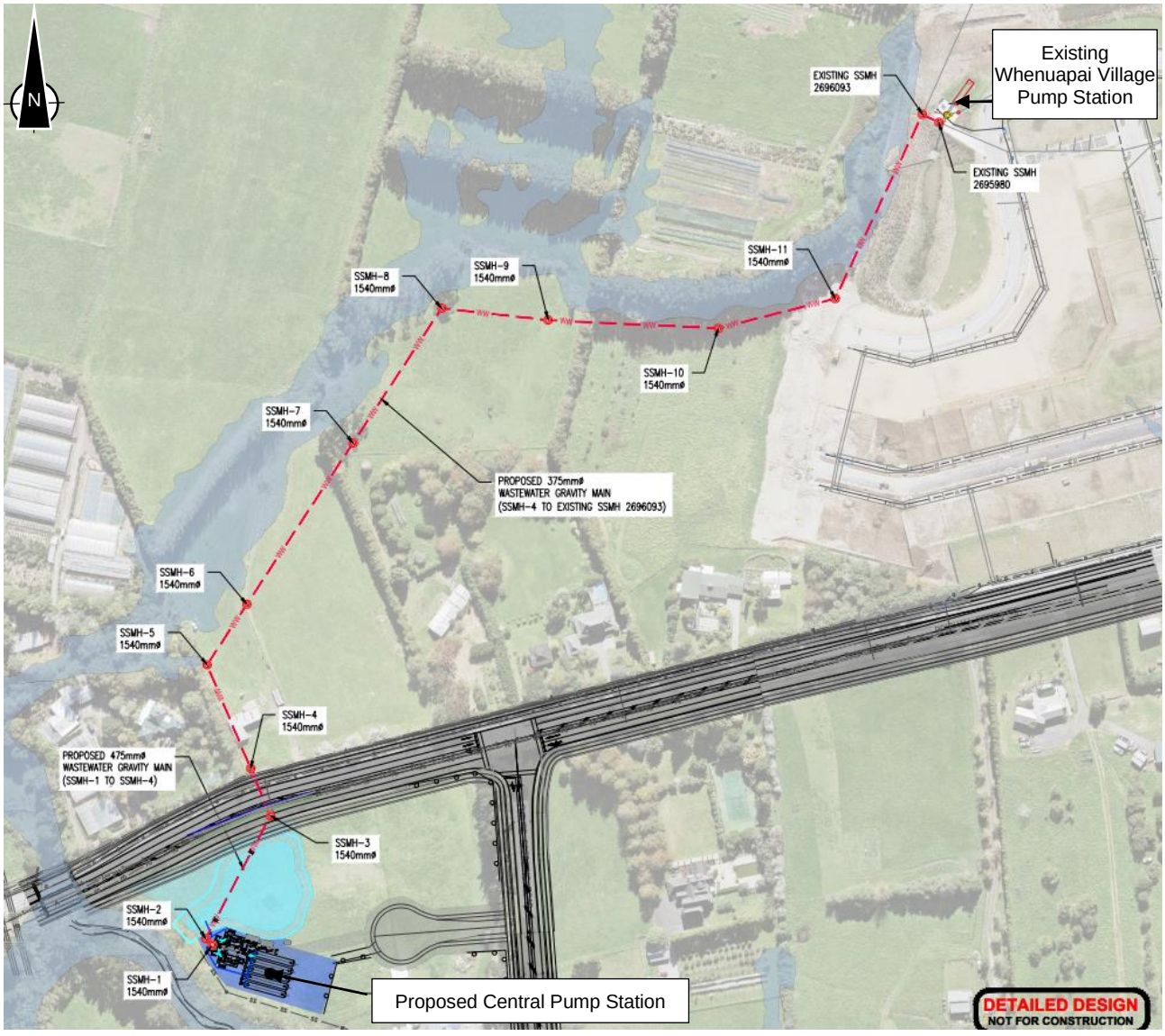


Figure 11. Final alignment of gravity main.

6 Rising Main Options

This section sets out the options considered for the rising main.

6.1 Alignment considerations

When developing a short list of options for the rising main wastewater pipeline between the pump station at 23-27 Brigham Creek Road and Trig Road the following was considered:

- The planned starting point of the alignment from the pump station at 23-27 Brigham Creek Road.
- Future Spedding Road alignment and levels (coordination was undertaken with the design team for the Oyster Capital Plan Change).
- Existing Spedding Road alignment, levels, and overhead cable locations.
- The planned location of the break pressure chamber, which is the discharge point of the rising main, at 32 Mamari Road (which is being designated as part of Package 1, and consented as part of Package 2).
- Optimising the length of the pipeline alignment where possible to avoid unnecessary costs.
- Optimising the vertical grade of the pipeline to avoid an undulating alignment, and therefore minimising the requirement for operational valves and chambers.

6.2 Shortlisted options

Two potential options were considered at both the northern and southern ends of the pipeline in relation to the alignment of the rising main (see Figure 12)[7].

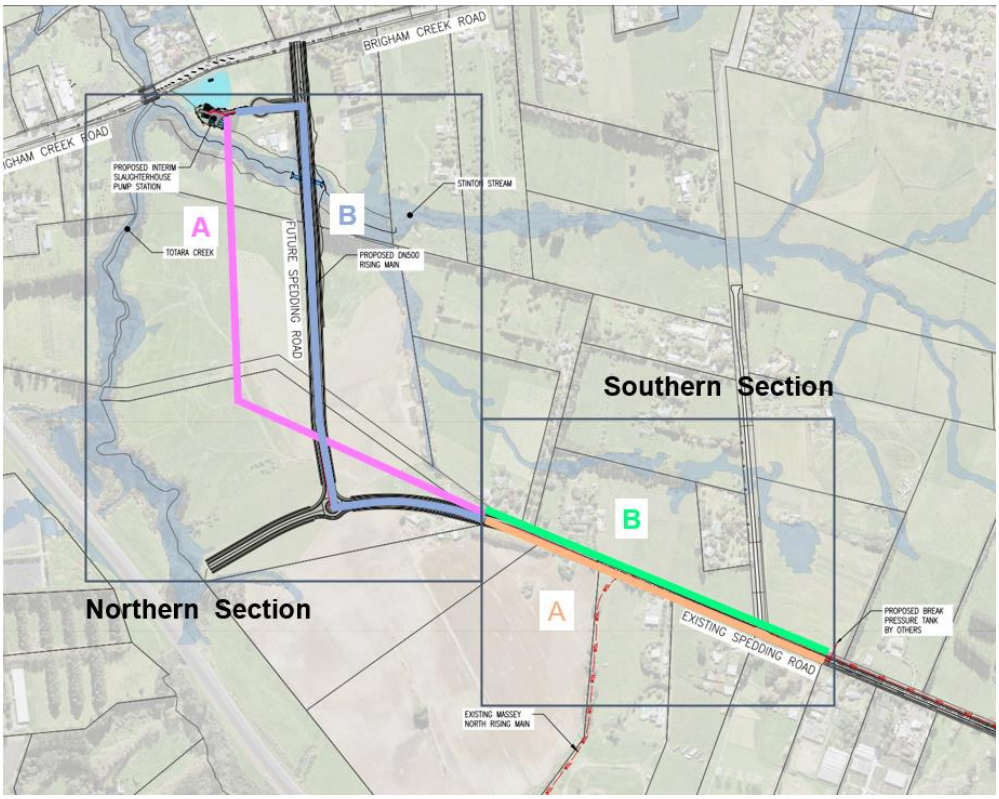


Figure 12. Alignment options considered for rising main pipeline.

[7] During the design and options assessment process the alignment of Spedding Road was extended southwards to incorporate a roundabout. As Option B was based around following the Future Spedding Road corridor, the amended alignment is considered to remain the same 'Option B'.

Options were assessed against the project objectives, the ability to coordinate with existing and known planned development including the Oyster Capital Plan Change, and enablement of the future construction, operation, maintenance and extension of the WWSS, (see Table 6 and Table 7).

Table 6. Northern Section options assessment

Northern Section Short-list option	Assessment
Option A:	This option was discounted for the following reasons: - Require a purpose-built pipe bridge to cross Sinton Stream - Would also cross the middle of potentially developable land. - This route would avoid some tree removal; however the trees are to be removed regardless as part of the Future Spedding Road construction works.
Option B:	Preferred. This option: - Follows the Future Spedding Road and can integrate with future development - Would provide accessibility for future maintenance and further development in future, including duplication of the rising main to form a dual rising main in a future stage of the WWSS.

Table 7. Southern Section options assessment

Southern Section Short-list option	Assessment
Option A: Southern lane of Spedding Road	Preferred - Minimises the length of construction under the overhead power lines as a safety consideration. Electrical overhead power cables run along Spedding Road. From the Trig Road intersection, the overhead cables are on the southern side of the road, and at the Mamari Road intersection the cables move to the north side of the road.
Option B: Northern lane of Spedding Road	Discounted - Greater length of construction under overhead power lines as a safety construction.

6.3 Options for crossing Sinton Creek

Works to construct the rising main may precede Oyster Capital works. Given this may be the case, Watercare has investigated options to provide access for the rising main across Sinton Stream prior to the Oyster Capital works (including the culvert) being constructed. The options Watercare considered included:

- Constructing a temporary pipe bridge across Sinton Stream, then removing the pipe bridge and routing the pipe across the culvert once constructed by Oyster Capital; and
- Temporarily routing the rising main to the west of the proposed alignment, then realigning the rising main to be underneath Spedding Road, and over the culvert, once the culvert and Spedding Road are constructed by Oyster Capital.

These options were considered to not be practicable for engineering and cost efficiency reasons. In addition, such works would require multiple episodes of stream bank disturbance, with concomitant ecological effects. In the context of the future plans for the area, it was therefore considered that Watercare constructing the proposed culvert as part of the proposed works was the only practicable option for the proposal, and that it was not practicable to avoid the loss of the stream extent.

The culvert has been designed in accordance with the regulations of the National Policy Statement for Freshwater to provide for fish passage and protect the habitat values of the stream, and a length of 479 m of stream will be restored to mitigate the loss.

6.4 Design refinement of preferred rising main option

Option B at the northern section of the pipeline, and Option A at the southern section of the pipeline, were confirmed as the preferred options for the alignment. This alignment:

- Protects public health by contributing to overall objective of reducing wet weather overflows in the catchment.
- Results in an efficient length of pipeline alignment where possible to avoid unnecessary costs.
- Optimises the vertical grade of the pipeline to avoid an undulating alignment, and therefore minimising the requirement for operational valves and chambers.
- Follows the Oyster Capital proposed Spedding Road extension (to co-ordinate with known and planned development), and the existing Spedding Road.
- Will allow for a future connection into the NI.
- Is sized to service projected demand within the next 10 to 15 years.

The final alignment is shown on Figure 13 below.

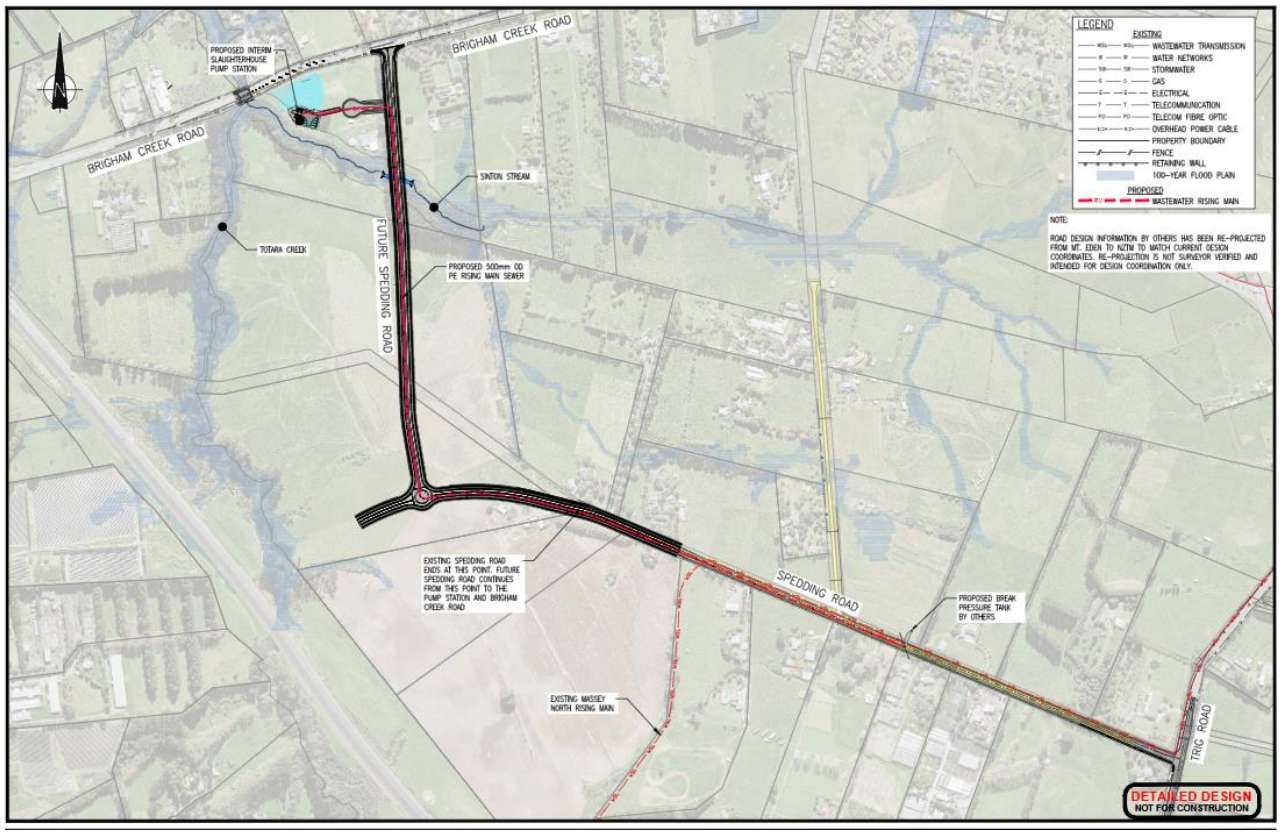


Figure 13. Final alignment of rising main.

7 Construction Yard Options

This section sets out the options considered for the construction yards.

The Whenuapai Package 1 Project requires three construction yards, including:

4. A 5,000m^2 contractor yard north (to the north of Brigham Creek Road) to service the proposed gravity pipeline with stockpiling, materials storage, light vehicle parking and amenities, for close access to the proposed gravity pipeline alignment.
5. A 10,000m^2 contractor area hub located close to service the proposed pump station with site access, site office, workshop, light vehicle parking, materials storage, truck turning, crane operating area, stockpile
6. A 5,000m^2 contractor yard south to service the proposed rising main near the existing Spedding Road to provide for stockpiling, materials run off, small break room and light vehicle parking.

One feasible option was considered for the Contractor Area Hub (as shown on Figure 10), as it is located at the proposed pump station site. This was and sized to avoid temporary effects on the wetland as much as practical whilst providing sufficient space for a construction hub, truck ingress and ingress, equipment and laydown, and material stockpiling.

Alternative locations were considered for both the Northern Area yard and Southern Area yard (see Figure 14 below). The preferred locations in blue and the secondary sites in ochre. The key activities for both yards will be for stockpiling of topsoil and buffering earthworks spoil for disposal off site and for deliveries of pipeline materials and aggregate onto site, as well as amenities and light vehicle parking for site personnel.

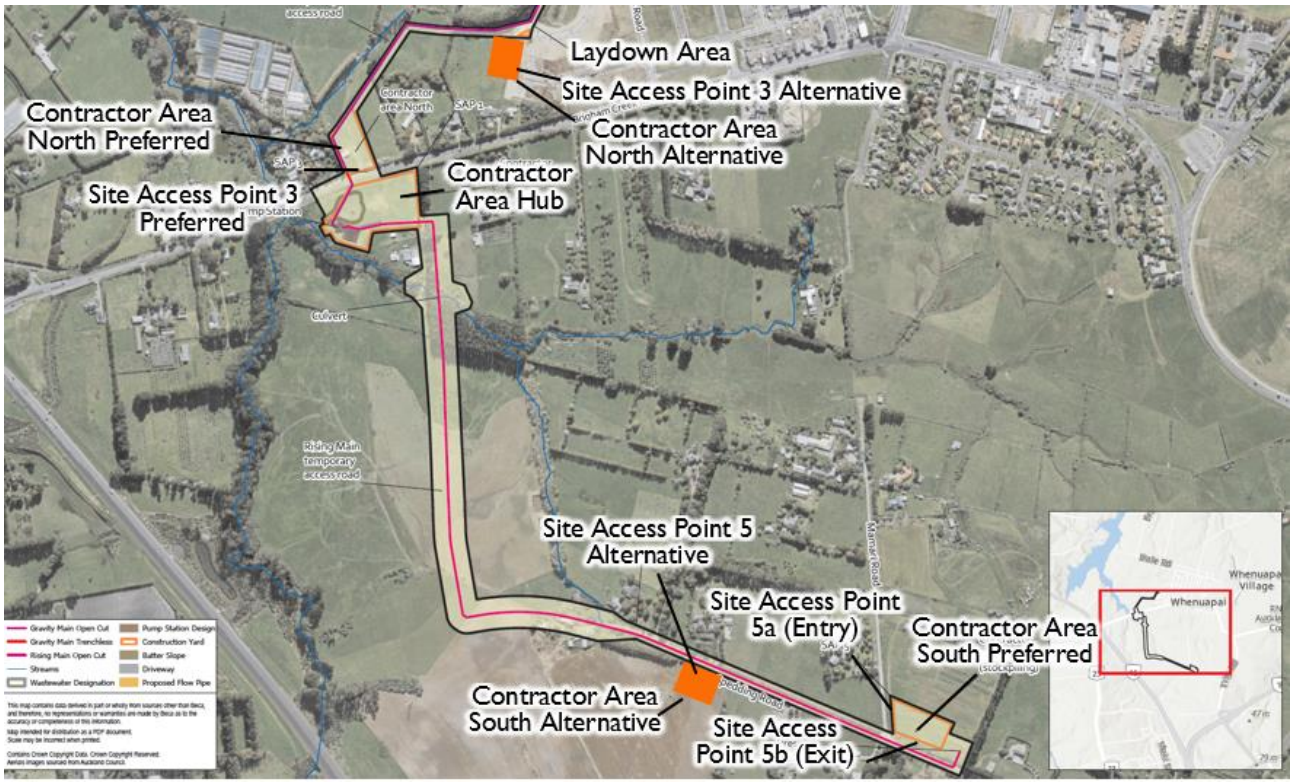


Figure 14. Proposed construction yards for the Whenuapai Package 1 project.

For the Northern Area yard, the site (shown in blue) was selected as the preferred site because of its proximity to both the pump station and gravity main sites, it enables heavy traffic to access the site directly

from Brigham Creek Road, rather than accessing the site through smaller residential streets in Whenuapai Village (which would have noise effects and safety risks).

The Southern Area yard preferred location is also shown in the Figure above (blue). The proposed yard location was selected to sit alongside the proposed break pressure chamber site, so the yard area offers some flexibility of use for both the Package 1 and 2 projects. The Mamari Road site selected also provides two access crossing locations, SAP5a and SAP5b, which enable a one way circuit to be set up on site, making for a safer site access for the Moxy dump trucks and the truck and trailer units that will be accessing the site for earthworks spoil removal and for aggregate deliveries.

One feasible option was considered for the laydown area to support the trenchless construction works at Tamiro Road Stormwater Embankment (as shown on Figure 14), immediately adjacent to the works area. The laydown area is sized to provide sufficient space for the equipment necessary to undertake the works, a muck bin and materials storage area, and a site container.

8 Conclusion

Package 1 is sized to provide wastewater servicing capacity for approximately 10,240 dwellings, or 30,720 people, in the Whenuapai catchment. This growth is projected to occur by 2041. Package 1 includes the following components:

1. A pump station at a point where the Whenuapai and Redhills Catchments meet
2. An approximately 700 m gravity main pipeline (375 – 475 mm diameter) between Whenuapai Village Pump Station on Tamiro Road and the pump station.
3. An approximately 1.5 km rising main (500 mm diameter) between the pump station and a proposed break pressure chamber on Mamari Road.

An assessment of the potential alternatives for the location of the above components has been undertaken by Watercare and GHD (designers) in accordance with s 171(1)(b) of the RMA.

The preferred locations are summarised below:

Pump Station

Option B is preferred. This option:

- Requires one stream crossing (culvert over Sinton Stream, for rising main), in a location that coordinates with planned development (which reduces costs).
- Will result in shorter rising main and therefore lower operational (pumping) costs compared to Site C.
- Greater integration with the existing and future planned network than Site C, this option is strategically placed to connect to other catchments if required in the future
- Is located adjacent to Sinton Stream to enable emergency overflow

Gravity Main

Option B in the North is preferred. This option:

- Does not require stream crossings and can be achieved through trenched or trenchless construction compared with Option A.

Option E in the South is preferred. This option:

- Can be achieved through trenched construction.
- Minimises construction works along Brigham Creek Road and is therefore preferred over Options A, B and F.
- Minimises the length of the trenchless construction under Brigham Creek Road compared to all other options.
- Avoids crossing through potentially developable land, therefore preferred over Options A and B.

Rising Main

Option B in the north is preferred. This option:

- Follows the Future Spedding Road and can integrate with future development.
- Would provide accessibility for future maintenance and further development in future, including duplication of the rising main to form a dual rising main in a future stage of the WWSS.
- Follows the Oyster Capital proposed Spedding Road extension (to co-ordinate with known and planned development), and the existing Spedding Road.
- Will allow for a future connection into the NI.

Option A in the south is preferred. This option:

- Minimises the length of construction under the overhead power lines run along Spedding Road and therefore is a safer option compared to Option B.

Construction Yards

The Northern Area yard, preferred site was selected because it enables heavy traffic to access the site from Brigham Creek Road, rather than accessing the site through smaller residential streets in Whenuapai Village, which would present a risk of complaints and safety risks.

The Southern Area yard preferred location was selected to sit alongside the proposed break pressure chamber site, so the yard area offers some flexibility of use for both the Package 1 and 2 projects.

A

Appendix A – Whenuapai – Slaughterhouse Pump Station Alternative Location Assessment

Interim Pump Station Alternative Location Assessment – Version 2

To: Reginald Barry (WSL Project Manager)

From: Simon Wang (PM), Lourie Geldenhuys (DM)

1. Background

Watercare have previously purchased a parcel of land at 16 Brigham Creek Road to be used for siting the interim and ultimate Slaughterhouse Pump Station (PS).

To service the area from the 16 Brigham Creek Road site would require a significant pipe bridge structure to be built to cross Totara Creek. Fletchers provided a cost estimate of $1.6M construction value of the pipe bridge.

During the value engineering project phase, the project team have identified two alternative parcels of land which Watercare could purchase for the interim pump station. These parcels would negate the requirement to construct an expensive pipe bridge during this phase. Watercare have since committed to the strategy of purchasing of an alternative interim PS site.

This assessment considers the ultimate pump station to be located at Site A. The figure below shows Site A (Original site at 16 Brigham Creek Road), Site B (alternative site owned by Oyster Capital Development), and Site C (alternative site owned by private property owner).

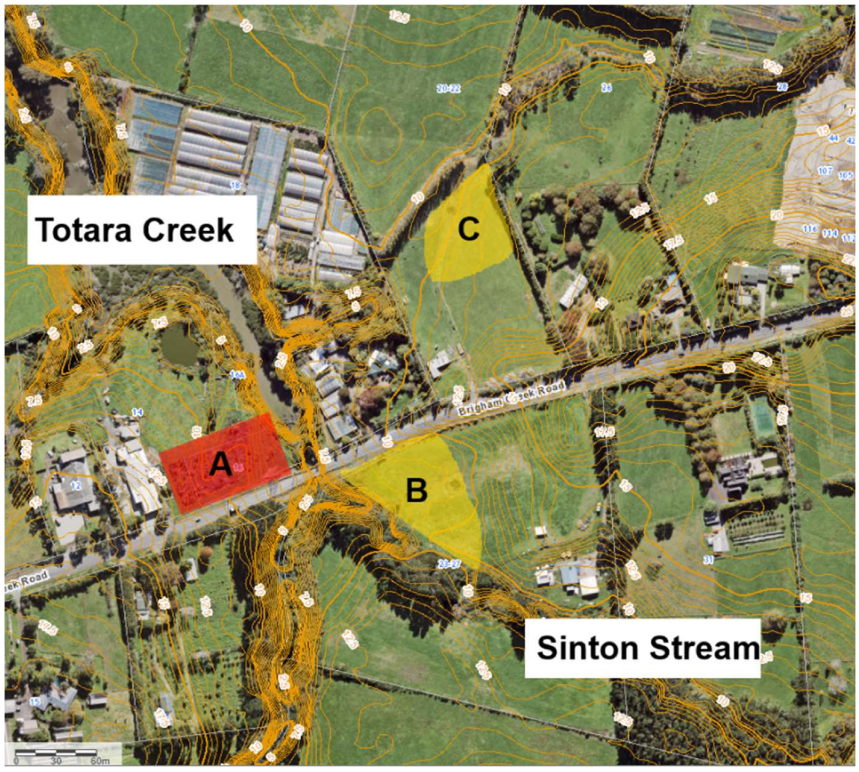


Figure 1: Interim PS location options (A/B/C)

Other Sites (D, E, F) within the general vicinity with similar topographic features were also considered, however were ruled out due to fatal flaws.

These are presented in the figure below.

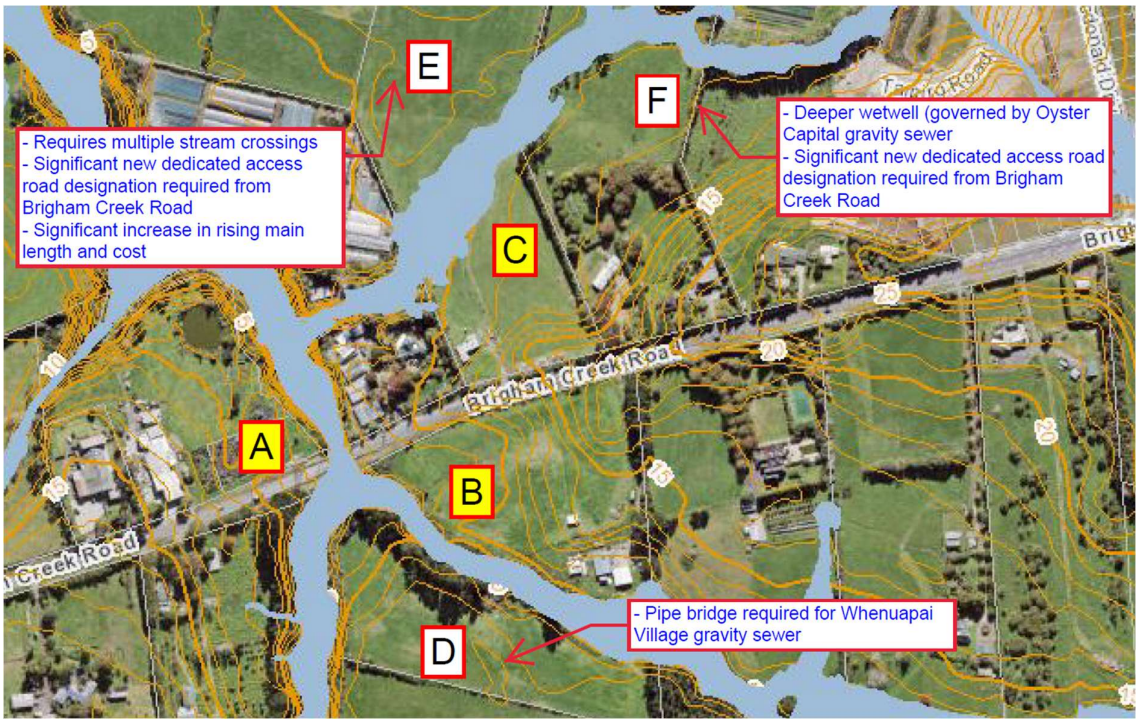


Figure 2: Other alternative sites considered with fatal flaws

2. Purpose

This memo seeks to assess the two alternative PS sites (B and C) and make a clear engineering recommendation for a preferred site to be purchased.

3. Site Descriptions:

3.1. Alternative Site B

The general location investigated for alternative site B is located on Lot 15 DP 53740 and is owned by Oyster Capital and located directly south of Brigham Road with Sinton stream as its western border. Specifically the location is between the 10.5 m / 10.0 m contour and Sinton stream (shown in yellow below). The site area required for the proposed interim pump station is approximately 1,500 m² (shown in red below for indicative scale). The PS site is to be situated within the yellow area at later design stage. Oyster Capital has indicated preliminary planned land use for the area and adjacent sites to be Light Industrial. Zoned as Future Urban Area (2028-2032) on the Auckland Council GEOMAPS site.

Proposed access to the site will be via an access road off the new extension of Spedding Road, which is to be developed by Oyster Capital. Proposed rising main(s) will be in

same corridor as the dedicated access road and then following Spedding Road as per the original business case.

Figure 3: Proposed Site B

The proposed area falls outside of identified Flood Plains as per Auckland Council GEOMAPS – refer to Figure 3 below.

Figure 4: Flood Plain - Site B

The Unitary Plan does not provide detail on the wetland however the Oyster Capital ecological report prepared for Plan Change has identified "Wetland C" is within the proposed area of 338 m².

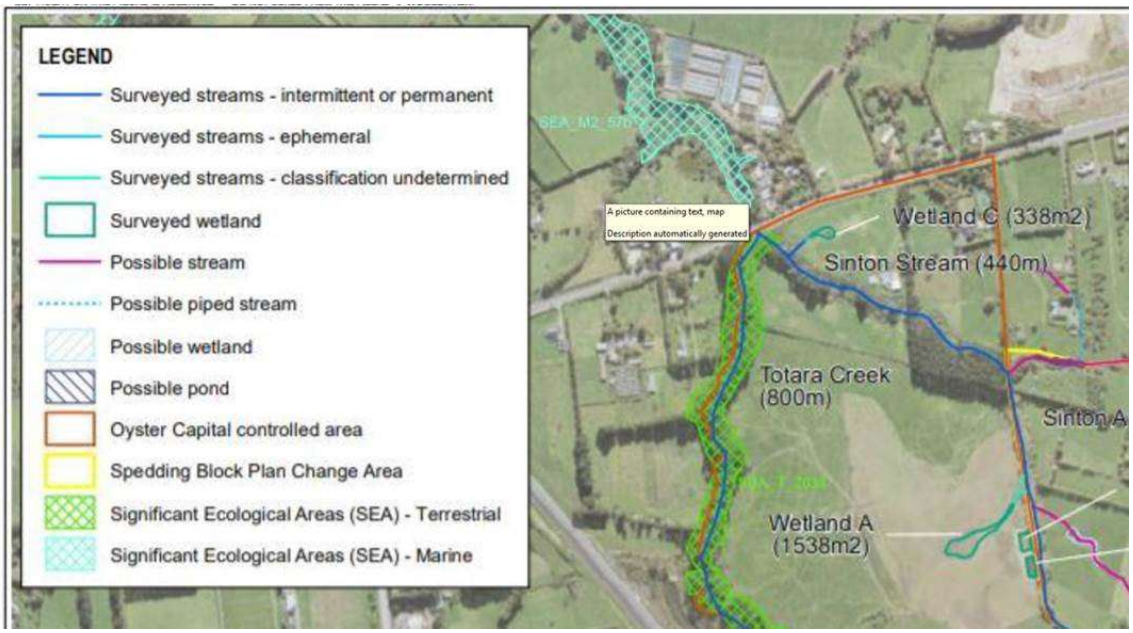


Figure 5: Wetland C indicated in Area B

The intention is, however, to stay outside of the identified wetland area by positioning the interim PS to the southern side of the area (indicated in orange in Figure 3 above). Should the identified area not be available from Oyster Capital and the PS and the wetland area be affected, relevant ecological mitigation / enhancement will be required.

The PS will require an emergency discharge point. Site B will require consent for this discharge.

Other environmental considerations for the area (not specific to Site B, but to the area – therefore including Sites A and C) have been identified in the Oyster Capital reports:

- Ecology: The site is in the Wild West Link, providing green havens from Waitakiri to Hauraki. Most likely skinks, wading birds, native fish and known to have native bats. Bat survey proposed if any trees are to be removed;
- Archaeology: further assessment required based on areas and alignment, and to seek Archaeological Authority;
- Cultural: expectation of any works around streams / overland flow paths to be managed by enhancing and protecting;
- Contamination: asbestos and pesticides. Will need to undertake specific testing and identify likely management.

3.2. Alternative Site C

The general location investigated for alternative site C is located on private property (Lot 1 DP 51941) north of Brigham Creek Road with the Slaughterhouse Stream as its north western border and located in the centre of Property 20-22 (as shown in yellow below). The site area required for the proposed interim pump station is approximately 1,500 m² (shown in red below for indicative scale). The PS site is to be situated within the yellow area at later design stage.

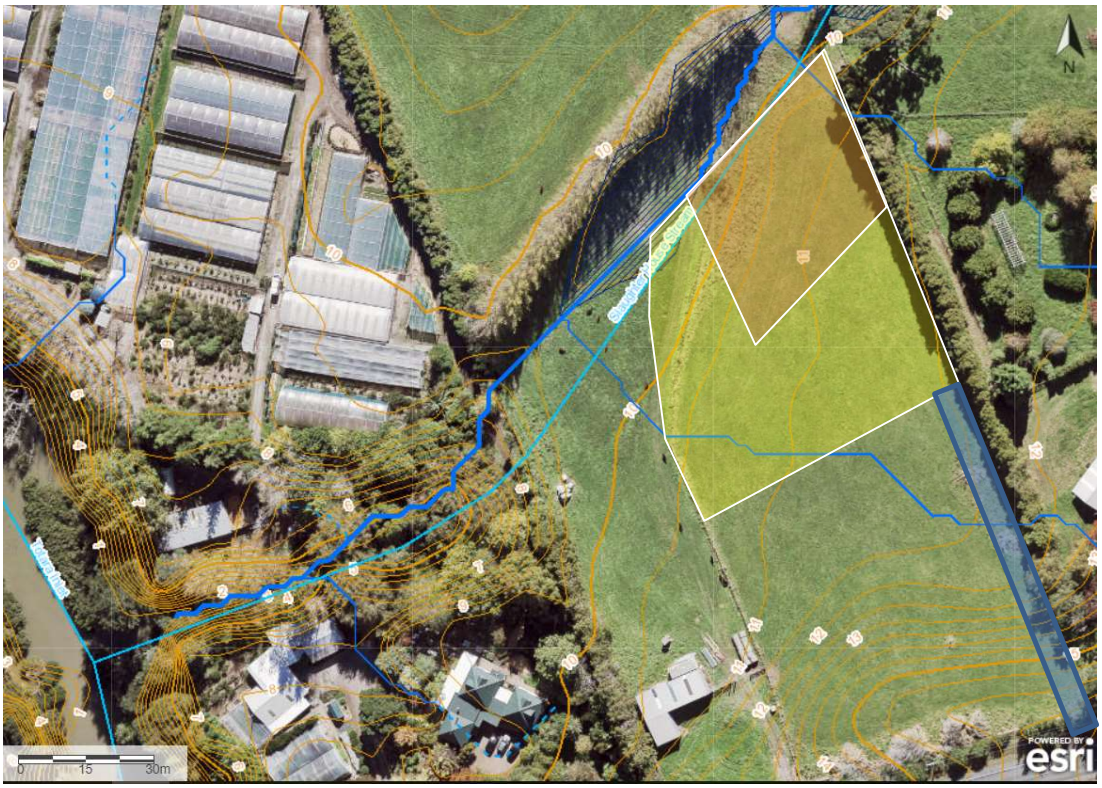


Figure 6: Proposed Site C

Current land use is agricultural / small holdings and with future land use indicated as Future Urban Area (2028-2032) on the Auckland Council GEOMAPS site.

Proposed dedicated access to the site will be via Brigham Creek Road. Proposed rising main(s) will be in same corridor as the access road up to Brigham Creek Road, and after crossing Brigham Road following Spedding Road as per the original Business Case. There is an initial ridge at the proposed Brigham Road crossing with RL ± 18 m.

A part of the currently proposed area falls in an identified Flood Plain as per Auckland Council GEOMAPS as per Figure 5 below. It will therefore be required to increase the identified area to make provision for the required area outside of the flood plain.

(purchasing land identified in floodplain will be easier. Consents will be required, increased design cost to ensure electrics outside of floodplain?)

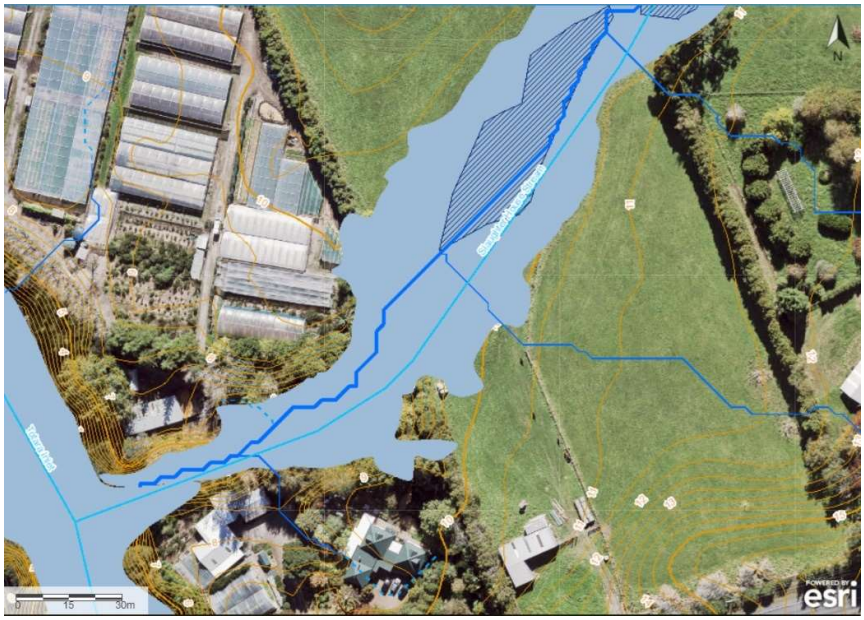


Figure 7: Flood Plain - Site C

The PS will require an emergency discharge point. Site C will require consent for this discharge.

Refer to general environmental considerations for the area (not specific to Site C, but to the area) included under Section 3.1 above, e.g. Ecology, Archaeology, Cultural and Contamination.

4. Assessment

We have compared identified constraint elements in the Table below.

Constraint Element	Site B	Site C	Comment
Interim PS depth	4.5m deep (governed by Whenuapai Village gravity sewer).	4.8m deep (governed by Oyster Capital Sewer).	±0.3m difference in PS depths.
Whenuapai Village Gravity main length	± 720m	± 450m	± 270m difference of single DN300 gravity sewer.
Oyster Capital Gravity main length	0m (considered this location as a baseline)	± 350m	± 350m difference of single DN375 gravity sewer.
Rising main length	± 1,910m	± 2,070m	± 160m difference of dual 400 / 450mm dia or single 500mm dia rising main(s), which also includes Brigham Creek Road crossing. Increased OPEX related to increased pumping distance.

Constraint Element	Site B	Site C	Comment
Futureproofing – connection of other catchments to Interim PS	Suitable for Catchments 1,2,6,7	Best suited for 6 and 7.	Site B at high level appears to favour connections of other catchment developments.
Futureproofing – connection to Ultimate PS	If ultimate PS will be at Site B then the Redhills tunnel would be a ± 200m longer. If ultimate PS will be at Site A then the interim PS would need to be diverted to Site A. Diversion length ± 200m. Cost of Oyster capital diversion would be borne by Watercare.	If ultimate PS will be at Site C then the Redhills tunnel route will require further considerations. If ultimate PS will be at Site A then the interim PS would need to be diverted to Site A. Diversion length ± 400m.	Diversion of Interim PS to Ultimate PS at Site A is ± 200m difference.
Access restrictions	Unlimited access via new Spedding Road in conjunction with Oyster Capital.	Potential limited access via Brigham Road. Would require WSL to build long dedicated access road.	Potential limited access for heavy vehicles close to current / future Brigham Rd / Totara Creek Bridge.
Ground conditions	Some risks with instability or stream bed deposits.	No risks identified.	Assessment based on desktop information only.
Overflow	± 30m to 40m distance to Sinton Stream for overflow.	± 30m to 40m distance to Slaughterhouse Stream for overflow.	No difference in overflow distances, however higher flow expected for Sinton Stream vs Slaughterhouse Stream. Both sites will require consent for this discharge.
Water supply	± 100m from existing WSL main.	± 130m from existing WSL main.	± 30m length difference between sites.
Flooding	PS area outside of identified flood plain.	Part of PS area inside identified flood plain.	Area of land required for Site C likely to be larger than Site B due to increased area require to move outside of flood plain.
Future Zonal Description	Future Urban Area (2028-2032).	Future Urban Area (2028-2032).	No difference.
Construction disturbance	Limited – current site undeveloped, except for existing single dwelling ± 70m from site. Could run concurrent with proposed Oyster Capital construction activities.	Limited – current site undeveloped, except for two existing dwellings ± 80m from site.	Could limit construction disturbance if Site B is developed in conjunction with Oyster Capital Development.

Constraint Element	Site B	Site C	Comment
Neighbouring land-use: • Noise • Vibration • Odour • Architecture • Security	Limited – Site adjacent to planned Light Industrial site (as per initial Oyster Capital layout).	Unknown – Future Urban Area (after 2028). Significant if developed in future to Residential Property.	Unknown.
Purchase cost	Early consultation with Oyster Capital estimated at $ 550/m^2.	Unknown – uncertainty if site is available.	Unknown - Propose for WSL to obtain provisional valuation as part of the decision process.
Environmental Considerations	Small wetlands area identified in area – will however be dealt with under proposed Oyster Capital development consenting processes.	Adjacent / portion of site extending onto wetland area.	Area of land required for Site C likely to be larger than Site B due to increased area require to move outside of wetlands. Propose for WSL Planning to address Ecology, Archaeology, Cultural and Contamination assessments associated with both Sites (Refer to Section 3.1 above for environmental considerations identified for the General Area and not specifically related to Sites B and C).

5. Input received from Fletchers

Version 1 of this Interim Pump Station Alternative Location Assessment Memorandum was forwarded to Fletchers (EM Construction Part) on 27 August 2020. Comments received from Fletchers on 28 August have been included below:

We've reviewed memo and from a constructability perspective and we don't see a large difference between Options B and C, assuming similar geotechnical conditions, and offer the following comments:

- *Terrain at PS sites and access are similar but access to site B is likely to be a bit shorter from Brigham Creek Road and there is potential to coordinate with Oyster Capital on access;*
- *Site B provides advantage on overall piping length. Site C will require gravity connection from Oyster Capital across Brigham Creek Road, duplicating route of rising main from Site C to Spedding Road extension;*
- *Depending on rising man and gravity alignments, Site C may require two drill shots under Brigham Creek Road as opposed to potential for only one drill shot for Site B;*

Site C rising main may require an additional Air Valve at Brigham Creek Road, again depending on vertical alignment.

We agree with the recommendation in the memo that Site B is the preferred location.

6. Recommendation

GHD-WSP issued Version 1 of this Memorandum to Watercare and Fletchers and August 2020.

Taking comments received from the Programme First Team, it is recommended for Watercare to proceed with Site B which has fewer constraints and will most likely have associated cost savings.