



# Huia WTP Replacement

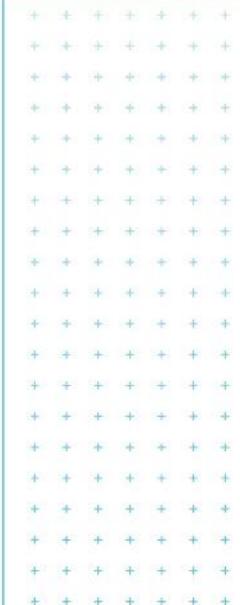
## Report on Longlist Options

Prepared for  
Watercare Services Ltd

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Tonkin & Taylor Ltd

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## Executive summary

Watercare Services Limited (Watercare) is investigating options to construct a new Water Treatment Plant (WTP) to replace the aging Huia WTP and to accommodate future growth in Auckland. A Multi-Criteria Assessment (MCA) approach has been chosen by Watercare as the basis for comparing and assessing the site options. This report sets out the results of the long list development and scheme evaluation for a new WTP.

The initial identification of potential sites involved using GIS tools to identify potentially suitable locations that aligned with key site principles regarding location and 'technical feasibility'. Combined with a manual screening assessment, this resulted in a preliminary long list of 21 sites. These sites have been grouped into eight schemes as shown in Figure 1.1, with a three-dimensional (3D) summary view of the eight schemes shown in Figure 1.2 below.

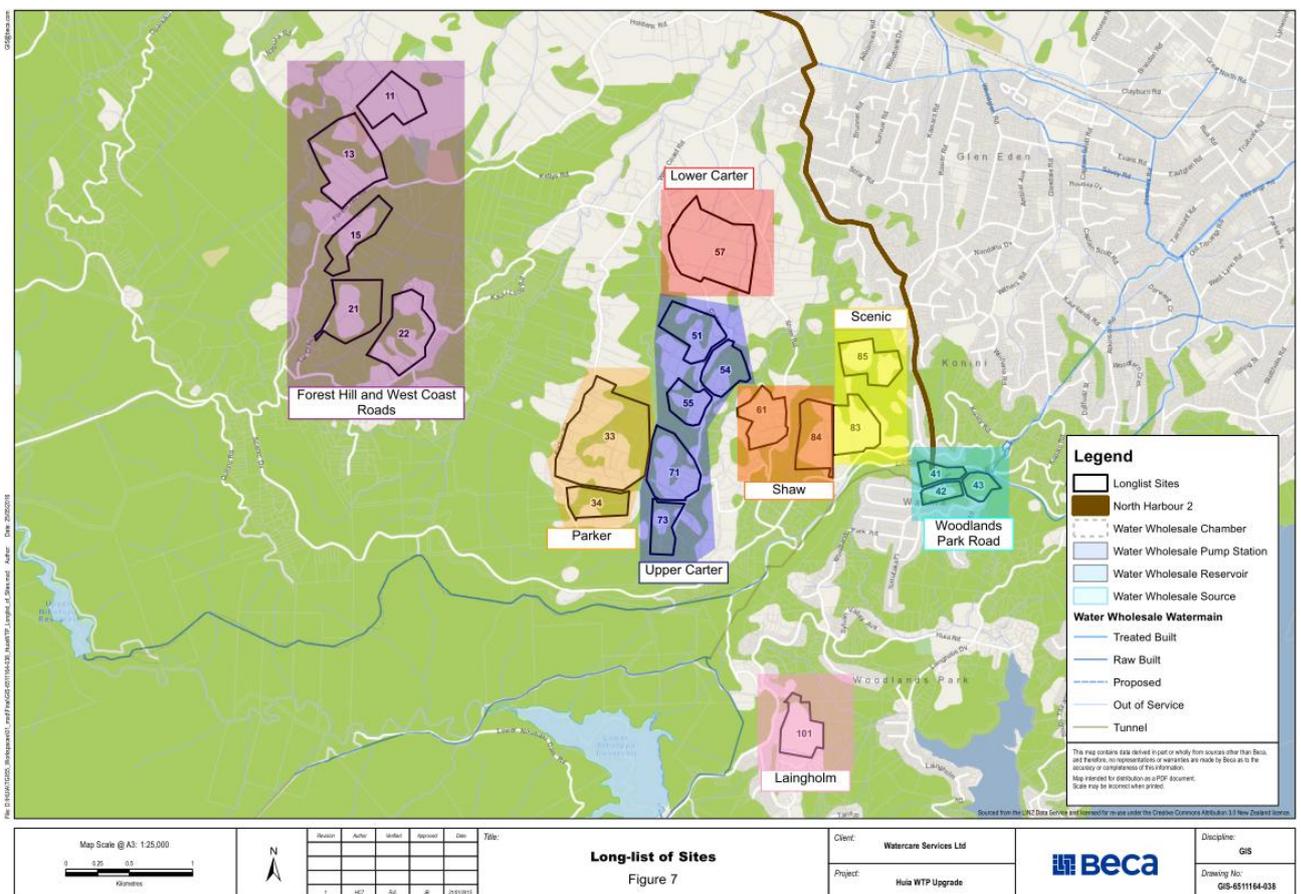


Figure 1.1: Map showing long listed schemes and corresponding sites (Source: Beca Limited, drawing no. GIS-6511164-038).

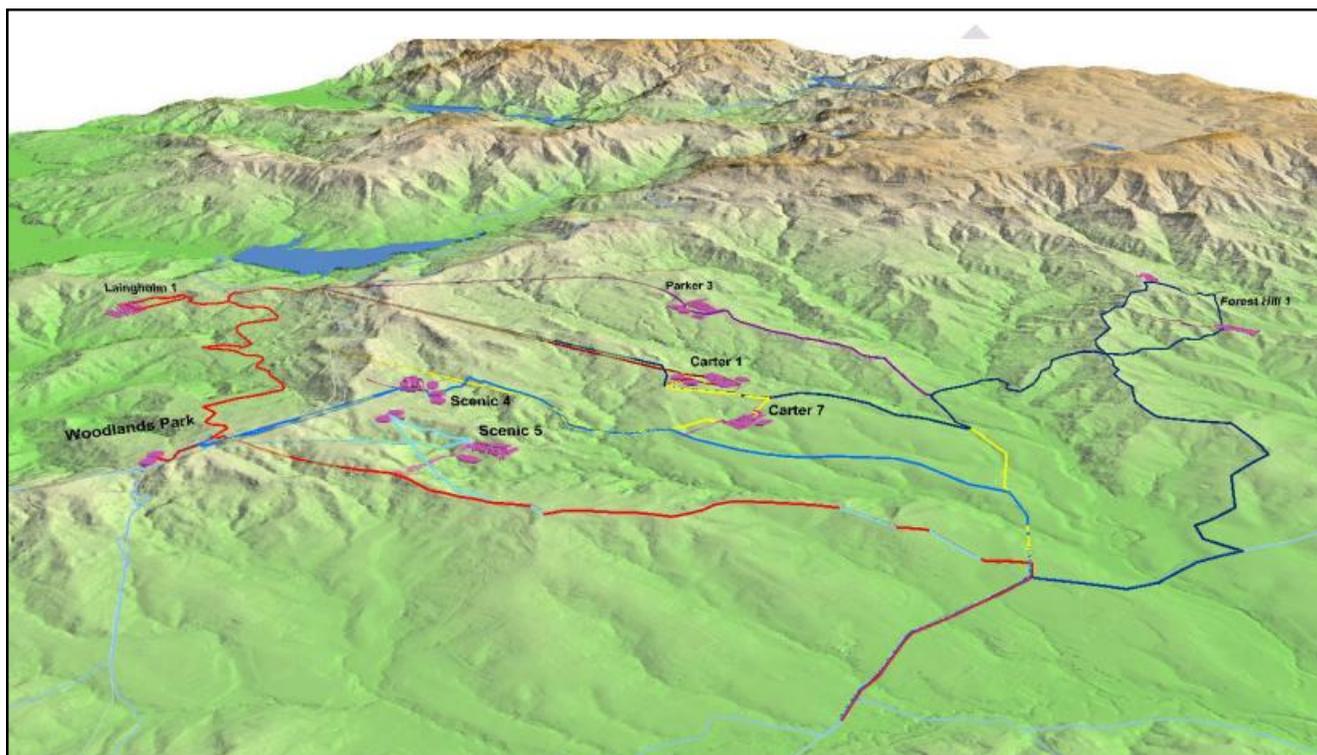


Figure 1.2: 3D summary view of the eight long listed schemes (Source: CH2M Beca Limited, February 2016)

An MCA has been undertaken on the eight long listed schemes, with the best site for each scheme assessed based on a generic site layout, along with the ancillary structures required (pump stations, tunnels and pipelines). The design for each scheme has not been optimised at this stage of the site selection process. Scoring was undertaken on the basis of engineering, cultural, environmental, social and consenting risk criteria. Costing has also been undertaken for each of the schemes. The overall results of the scheme assessment are shown in Table 1.1 below

Table 1.1: Overall results of scheme assessment (no weighting applied)

Scheme	WTP & Reservoirs score	Ancillary Structures score	Total score (out of a possible 85)	Rank	50 year NPV costs (\$ million)
Parker Road	50	17	67	1	\$293
Woodlands Park Road	42	19	61	2	\$297
Laingholm	42	18	60	3	\$336
Shaw Road	44	15	59	4	\$301
Lower Carter	44	14	58	5	\$322
Forest Hill	47	10	57	6	\$363
Scenic Drive	43	12	55	7	\$300
Upper Carter	39	14	53	8	\$309

The Parker Road scheme consistently ranks as the highest scoring scheme. The site is large, with two alternative WTP locations within the site, and located at a very good elevation. The scheme scores well across all engineering-related criteria as well as non-engineering/environmental related criteria. No significant hurdles or particular limitations have been identified in terms of the environmental, social and cultural criteria at this stage of the evaluation process, although we note a new WTP at this location is likely to cause disruption to the local community. In terms of the engineering-related criteria, the requirement for a long curved section of tunnel will require further scrutiny in the shortlisting process.

Woodlands Park Road is generally the 2<sup>nd</sup> ranked scheme. The site is owned by Watercare and designated for water supply purposes and is located immediately adjacent to the existing Huia WTP which forms part of the existing environment in terms of effects on the surrounding community. Woodlands Park Road scores poorly in terms of environmental considerations, but reasonably well on engineering-related matters. The presence of a Significant Ecological Area across most of the WTP and reservoir sites constitutes a significant hurdle from a consenting perspective and also means the social impacts are potentially high. Additionally, there will be a requirement for biodiversity off-set mitigation associated with vegetation removal which has not been assessed or costed at this stage. This is of particular relevance to the Woodlands Park Road site but will also apply more broadly to the removal of indigenous vegetation at any of the sites.

The Laingholm and Shaw Road schemes consistently rank in the top half of the table and the MCA does not clearly differentiate which is the better of these two options. Laingholm ranks well from an operational perspective as it is a large site with good access. It also offers a short raw water connection to the existing network at Mackies Rest. However the low elevation of the site means the reservoirs need to be located remotely (in the same location as the Woodlands Park Road scheme) and a significant treated water lift (pumping) is required. It is also the worst ranking site from a landscape perspective and is likely to have relatively high social impacts and high consenting risk being located on or near community facilities (sportsgrounds and pony club) and within a residential area. Shaw Road by comparison scores better from an environmental and social perspective but carries significant constraints from an engineering perspective. This is particularly due to access which would require widening of Shaw Road and a bridge from Shaw Road to the site through an established area of vegetation. Topography also has the potential to pose a significant challenge at the Shaw Road site.

The Scenic Drive, Upper Carter and Forest Hill schemes do not rank in the top half of the sites even with multiple different weightings applied. The Lower Carter scheme generally ranks in the middle relative to other schemes, but has significant operational issues due to being located at a low elevation, with treated water needing to be pumped to a higher elevation. This means the reservoirs need to be located off-site in the same location as the visually prominent Upper Carter scheme reservoirs. Therefore, these four schemes are not recommended to proceed to the shortlisting evaluation process.

On the basis of the investigations and assessment completed to date, Watercare has determined that it will take the top two schemes through into the detailed shortlisting stage, being Parker Road and Woodlands Park Road. The design and site layout for both schemes will be reviewed and optimised through the shortlisting process. As well as providing for the engineering related requirements and operability considerations, this will include measures to minimise and/or mitigate effects on the environment through site design and layout.

In relation to the Woodlands Park Road scheme, we understand that Watercare will also further investigate the option of rebuilding on the existing Huia WTP site. This includes identifying other works in the wider network that would be required to facilitate taking the WTP out of service for an extended period, and determining whether this option is feasible from a water supply and network resilience perspective.

## 1 Introduction

### 1.1 Huia WTP replacement

The Huia Water Treatment Plant (Huia WTP) is the third most significant water treatment plant in Auckland and is a crucial component of Auckland's water supply network. The Huia WTP was constructed in 1929 and upgraded in the 1940s and is now nearing the end of its operational life unless extensive upgrades are undertaken. Watercare Services Limited (Watercare) has therefore been looking at options to construct a new Water Treatment Plant (new WTP) to replace the aging Huia WTP and to accommodate future growth in Auckland.

Although previous work on the siting of a new WTP has focused on the existing designated site or the Manuka Road site (also designated) immediately adjacent to the existing site, Watercare has determined that it is necessary to adopt a first principles approach to investigate and provide adequate consideration to alternative sites. This is driven by the requirements of the Resource Management Act 1991 (RMA), particularly section 171(1)(b) and also Clause 6 of Schedule 4 which will require any future applications for a new plant to be supported by a robust assessment of alternative options. This approach is also supported by Watercare's desire to ensure that the proposed new plant is considered strategically in terms of selecting the best option for the operation and future development of Auckland's water treatment and drinking water supply network.

A Multi-Criteria Assessment (MCA) approach has been chosen by Watercare as the basis for comparing and assessing the site options for a new WTP. Assessment criteria have been developed based on the site principles along with key opportunities, effects and areas of potential risk to the project. An MCA approach is commonly applied to large-scale infrastructure projects of this type, and is particularly useful where there are several sites to choose between and where there are numerous complex considerations involved. The purpose of the MCA is to rank sites in a robust and transparent manner so that the process of finding a preferred option can be clearly demonstrated.

### 1.2 Background and work to date

The overall methodology for considering and evaluating alternatives is set out in the *Site alternatives assessment: Evaluation methodology, prepared by Tonkin + Taylor Ltd, December 2015 (updated February 2016)* ('Evaluation Methodology Report'). To date this process has comprised:

#### 1 A review of the project justification including a gap analysis

This initial work involved a review and gap analysis of existing documentation to assess the justification for replacing the Huia WTP. The results of the review and gap analysis is set out in the *Huia WTP Replacement: Project Justification Report (Nov. 2015)* ('Project Justification Report') and the *Justification Gap Analysis Report (Nov. 2015)* ('Gap Analysis Report') both prepared by GHD.

These reports concluded that a new WTP is required for a number of reasons, including:<sup>1</sup>

- a The Waitakere Ranges water sources and the Huia WTP are important ongoing elements of the Auckland region's water supply system and contribute to its resilience, especially as Auckland continues to grow.
- b The existing Huia WTP is not ideally suited to manage a series of key water quality risks and the process capacity of several components does not currently achieve the plant's nameplate capacity of 126 MLD.
- c The existing ageing Huia WTP asset base represents a high risk when looking at a 20 to 50 year master planning horizon, and therefore new assets are required to meet Watercare's service standards.

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<sup>1</sup> Project Justification Report, Pg. 10.

However these reports also identified the following areas where further investigation may be required:<sup>2</sup>

- a Whether it is feasible to upgrade the existing Huia WTP to 140MLD and to a high safety and environmental standard.
- b Whether it is feasible to utilise the existing Huia WTP at around 65 MLD in conjunction with establishing a new 75MLD plant at another site (or some other optimum combination of sizing between the existing Huia WTP and a new WTP).
- c Whether other system augmentation options present a more favourable solution than options for upgrading the Huia WTP.

## 2 The development of site principles

The site principles inform the initial site identification and overall evaluation of sites, particularly in terms of their technical feasibility and connection to the existing water supply network. These site principles and the rationale for them are set out in the *Huia WTP Site Selection Site Principles report prepared by CH2M Beca Ltd (Dec. 2015)* ('Site Principles Report'). Their application to the site identification and evaluation process is set out in the Evaluation Methodology Report.

## 3 Initial site identification and evaluation

The initial identification of potential sites involved using GIS tools to identify potentially suitable locations that aligned with the principles. The principles applied in this initial GIS screening approach focused on the 'technical feasibility' based principles e.g. locations outside of the Watercare dam catchments, elevation, proximity (distance of each parcel from the existing WTP and to the North Harbour 2 Watermain (WMNH2)) and slope to ensure a broad approach to the initial identification of sites. These key technical requirements were then overlaid to identify "more suitable" and "less suitable" sites on the basis of how well each site aligned with each of the principles.

A manual screening assessment, including fatal flaws analysis, was then undertaken in a workshop to determine whether or not sites should be included on a preliminary long list of sites that would be subject to further evaluation. This manual screening process took into account site size, shape and topography, level and type of development in the vicinity of the site. The presence of Significant Ecological Area (SEA) and/or Outstanding Natural Landscape (ONL) features on a site was also considered.

Sites that were not taken forward onto the long list, along with the reason(s) for this, are documented in the *Site Identification and Evaluation Report, CH2M Beca Limited (Dec. 2015)* ('Site Identification and Evaluation Report').

### 1.3 Scope of this report

This report builds on previous reporting and sets out the results of the long listing assessment as follows:

- Section 1: This introduction
- Section 2: Naming convention for sites and schemes
- Section 3: Scheme development
- Section 4: Description of schemes
- Section 5: Scheme evaluation
- Section 6: Discussion and key conclusions

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<sup>2</sup> Gap Analysis Report, Pg. 5.

## 2 Naming convention for schemes and sites

Through the process set out in Section 1.2 above, an initial preliminary long list of 21 sites has been identified for further consideration and evaluation in the MCA process. This long list has then been further refined into eight schemes, which take into account the ancillary structures required to service the new WTP and reservoirs (e.g. pipelines, tunnels, pumping stations).

All sites generated by the initial GIS screening were numbered sequentially. Following the manual screening process and formation of the preliminary long list, sites were named according to the nearest road. To further differentiate between the individual sites and schemes (which include ancillary structures), schemes have also been named as set out in Table 2.1 below.

Table 2.1: Naming of schemes and preliminary long list sites

Scheme name	Preliminary long list	
	Site name	Site number
Woodlands Park Road	Woodlands Park 1	41
	Woodlands Park 2 (existing Huia WTP)	42
	Woodlands Park 3 ('Manuka Road')	43
Laingholm	Laingholm 1	101
Scenic Drive	Scenic 3	83
	Scenic 5	85
Shaw Road	Shaw 1	61
	Scenic 4	84
Upper Carter	Carter 1	51
	Carter 4	54
	Carter 5	55
	Cochran 1	71
	Cochran 3	73
Lower Carter	Carter 7	57
Parker Road	Parker 3	33
	Parker 4	34
Forest Hill	Forest Hill 1	11
	Forest Hill 3	13
	Forest Hill 5	15
	West Coast 1	21
	West Coast 2	22

### 3 Scheme development

#### 3.1 Preliminary long list sites

Through the process set out in Section 1.2 above and further documented in the Site Identification and Evaluation Report, a preliminary longlist of 21 sites was identified for further consideration and evaluation in the MCA process. These are shown in Figure 3.1 below (grouped by scheme) with the numbers corresponding to the sites identified in Section 2.

As a result of an initial assessment two of the sites were identified as being fatally flawed (refer Section 3.3). Cochran 3 (Site 73) is considered to be fatally flawed due to unsuitable access, and West Coast 1 (Site 21) would require major tunnelling and also has unsuitable access.

#### 3.2 Scheme identification

As set out in the Evaluation Methodology Report, following the identification of a preliminary long list of site options for a new WTP, the options have been refined into eight schemes which encompass the remaining 19 sites, based on similar geographical locations, hydraulic characteristics, and pipeline routes.

The eight schemes and the corresponding sites are shown in Figure 3.1 below and identified in Table 3.1 along with key scheme characteristics. Scheme development is more fully described in the *Huia Water Treatment Plant Site Selection: Long-list Option Development report prepared by CH2M Beca Limited (25 May 2016)* (Long-List Option Development Report).

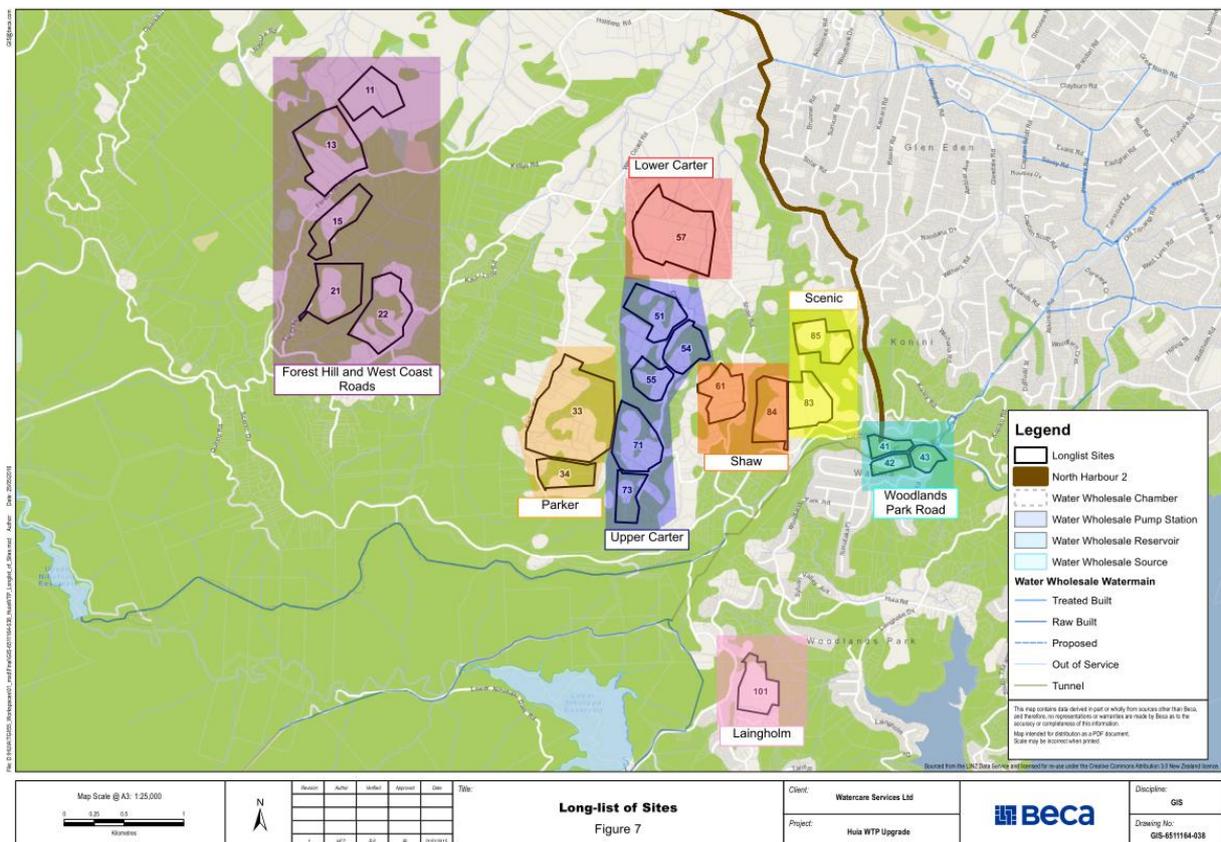


Figure 3.1: Map showing long listed schemes and corresponding sites (Source: Beca Limited, drawing no. GIS-6511164-038).

Table 3.1: Schemes and corresponding sites

Scheme	Site(s) the scheme applies to	Key scheme characteristics
Woodlands Park Road	Woodlands Park 1, 2 and 3	<ul style="list-style-type: none"> <li>• Connection to the end of the raw water aqueduct</li> <li>• Direct supply to Titirangi Reservoirs</li> <li>• Supply to the current WMNH2 route via treated water tunnel</li> </ul>
Laingholm	Laingholm 1	<ul style="list-style-type: none"> <li>• Raw water connection at Mackie's Rest</li> <li>• Treated watermain along Huia and Woodlands Park Roads to a reservoir close to the current site</li> </ul>
Scenic Drive	Scenic 3 and 5	<ul style="list-style-type: none"> <li>• Connection to the end of the raw water aqueduct</li> <li>• Raw water tunnel from Woodlands Park Road</li> <li>• Minor diversion to WMNH2 route</li> </ul>
Shaw Road	Scenic 4 and Shaw 1	<ul style="list-style-type: none"> <li>• Raw water pump station at existing plant or Exhibition Drive/Shaw Road junction</li> <li>• Treated watermain in Shaw Road</li> </ul>
Upper Carter	Cochran 1 and 4, and Carter 1, 4 and 5	<ul style="list-style-type: none"> <li>• Raw water tunnel to Carter Road from Mackie's Rest</li> <li>• Raw and treated watermains in Carter Road</li> <li>• Connection to treated water network on West Coast Road</li> </ul>
Lower Carter	Carter 7	<ul style="list-style-type: none"> <li>• Raw water tunnel from Shaw-Exhibition intersection</li> <li>• Raw watermain in Shaw Road</li> <li>• Treated water reservoir at an elevated site on Carter Road</li> </ul>
Parker Road	Parker 3 and 4	<ul style="list-style-type: none"> <li>• Raw water tunnel from Mackie's Rest</li> <li>• Treated watermain down Parker Road</li> <li>• Connection to treated water network on West Coast Road</li> </ul>
Forest Hill	Forest Hill 1, 3 and 5 and West Coast 1 and 2	<ul style="list-style-type: none"> <li>• Raw watermain to the end of Shaw Road and then back uphill to Forrest Hill Road or along West Coast Road</li> <li>• These sites fall away from the road and require a second tunnelled section under high points close to the site or a pipeline route across private property</li> </ul>

### 3.3 Ranking of preliminary long list

The process for evaluating and ranking sites on the preliminary long list to determine the preferred site for each of the eight schemes is set out in the Evaluation Methodology Report. Key components of the methodology included:

- 1 The development of information relating to each site, including planning maps, indicative site layouts and consideration of pipeline routes and connections;
- 2 A site visit to obtain a broad general view of the locality and site access options. Attendees at the site visit included the Watercare project team, Beca and GHD engineers and T+T planners (minutes attached as Appendix A);
- 3 Project team members (above) then completed an assessment of each site against a set of agreed criteria and using a standardised scoring framework. The MCA at this stage of the

process was based on a desktop assessment of the sites using existing information including aerial photography, Archview information and planning maps. Scores were inputted into the MCA spreadsheet to enable a high level MCA scoring and initial ranking of all preliminary longlisted sites;

- 4 A workshop was then conducted to review the output of the MCA and confirm the ranking of the preliminary long listed site options.

The results of the high level MCA on the preliminary long list are set out in Figure 3.2 below which shows the overall MCA score and ranking of the sites grouped by the eight schemes.

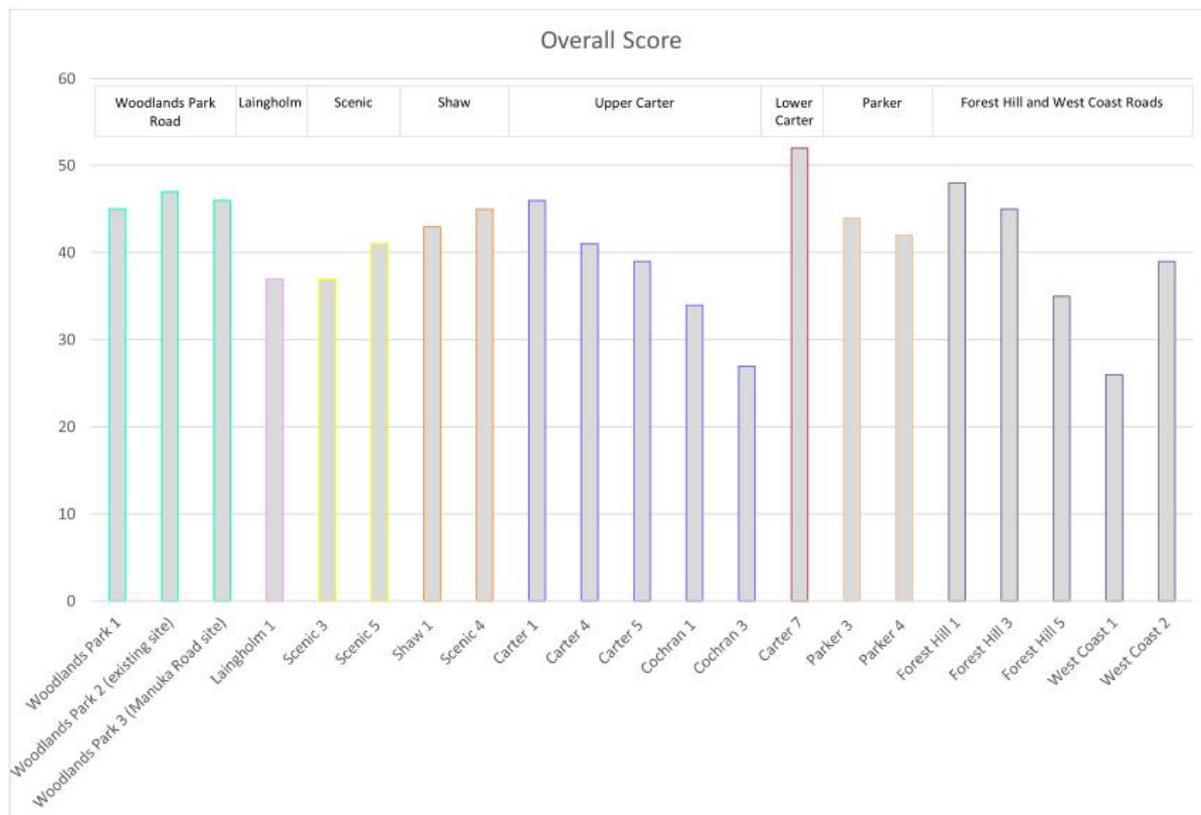


Figure 3.2: Overall MCA scores for long listed sites by scheme

On the basis of the high-level MCA, the Carter 7 and Forest Hill 1 sites were the top ranked sites overall as they are relatively flat rural sites with limited development and no particular landscape, ecological or cultural values identified in the relevant planning maps. The existing Huia WTP site (Woodlands Park 2) also scored well as the site is relatively clear of vegetation, particularly when compared to the other Woodlands Park sites. Also there is a baseline established by the existing WTP particularly in relation to amenity and social impacts, and it is well connected in relation to the existing raw water and treated water network.

The site which scored the best for each scheme on the basis of the preliminary long list assessment and ranking has been taken through for further analysis in the scheme longlist assessment. This approach provides for a comprehensive analysis of the schemes as a whole i.e. the new WTP site and reservoirs as well as raw and treated water connections and supporting infrastructure including pump stations, tunnels and pipelines. The preferred sites for each of the eight schemes are identified in Table 3.2 and shown in Figure 3.3 and Figure 3.4 below.

Table 3.2: Preferred site for each scheme

Scheme	Site(s) the scheme applies to	Preferred site from MCA on preliminary long list
Woodlands Park Road	Woodlands Park 1, 2 and 3	Woodlands Park 3
Laingholm	Laingholm 1	Laingholm 1
Scenic Drive	Scenic 3 and 5	Scenic 5
Shaw Road	Scenic 4 and Shaw 1	Scenic 4
Upper Carter	Cochran 1 and 4, and Carter 1, 4 and 5	Carter 1
Lower Carter	Carter 7	Carter 7
Parker Road	Parker 3 and 4	Parker 3
Forest Hill	Forest Hill 1, 3 and 5 and West Coast 1 and 2	Forest Hill 3

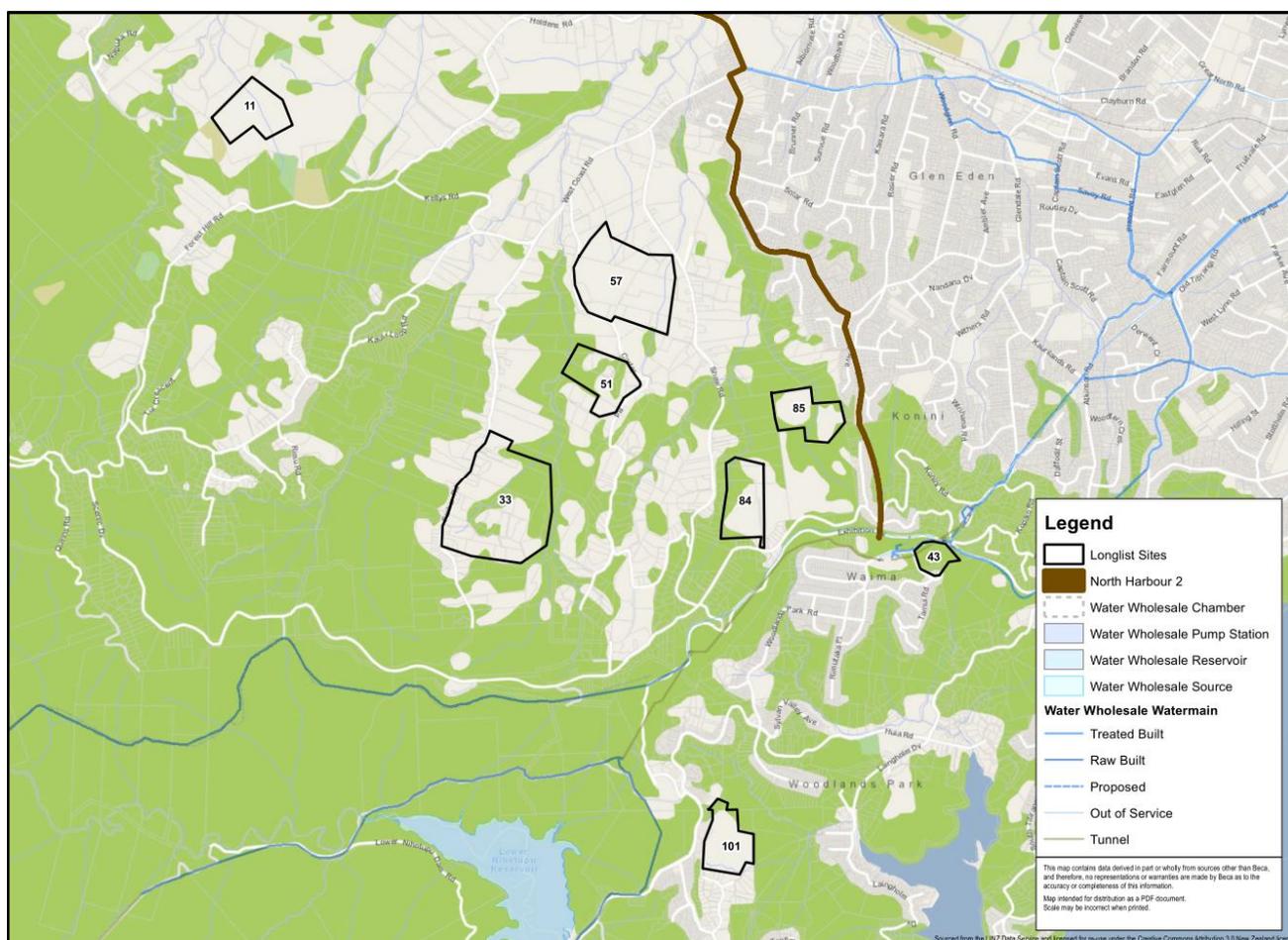


Figure 3.3: Huia WTP Long list Preferred Schemes (Source: Beca Limited, Drawing No: GIS-6511164-040, DRAFT March 2016)

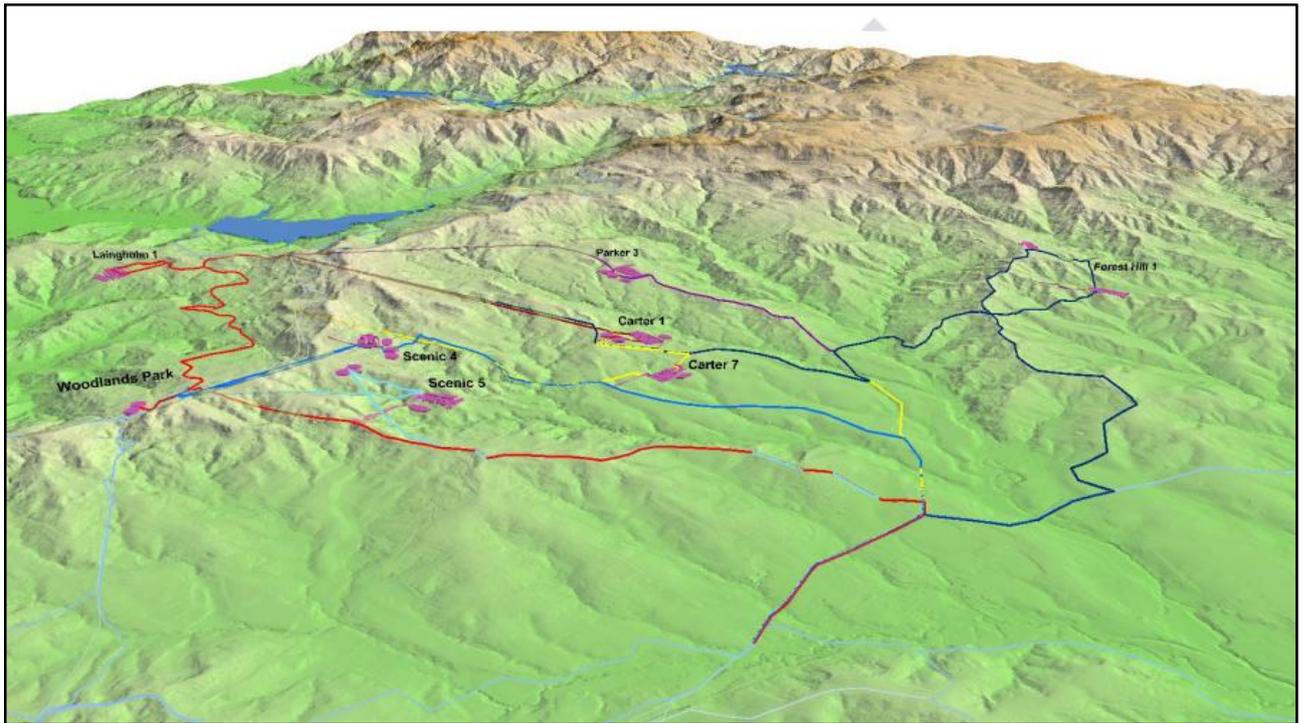


Figure 3.4: 3D summary view of the eight long listed schemes (Source: CH2M Beca Limited, February 2016)

## 4 Description of schemes

The eight longlisted schemes are described in the sections that follow. The layouts shown are conceptual only, and are essentially ‘cookie cutter’ shapes laid over site aerials in approximate locations. Those sites taken through to the shortlist stage will be subject to further development and design.

### 4.1 Woodlands Park Road

The scheme at Woodlands Park Road would utilise two existing parcels of land which adjoin the existing Huia WTP, conceptually shown in Figure 4.1 below. In the current concept layout the WTP would be located at the “Woodlands Park 3”<sup>3</sup>, with the reservoir site located on the northern side of Woodlands Park Road at “Woodlands Park 1”. We note that, in parallel to this MCA analysis, additional investigation is underway in order to confirm whether full or partial replacement of the WTP at the existing site is possible.

Scheme characteristics include:

- Connection to the end of the raw water aqueduct.
- Direct supply to the Titirangi Reservoirs.
- Supply to the current North Harbour No. 2 Watermain (WMNH2) route via treated water tunnel.

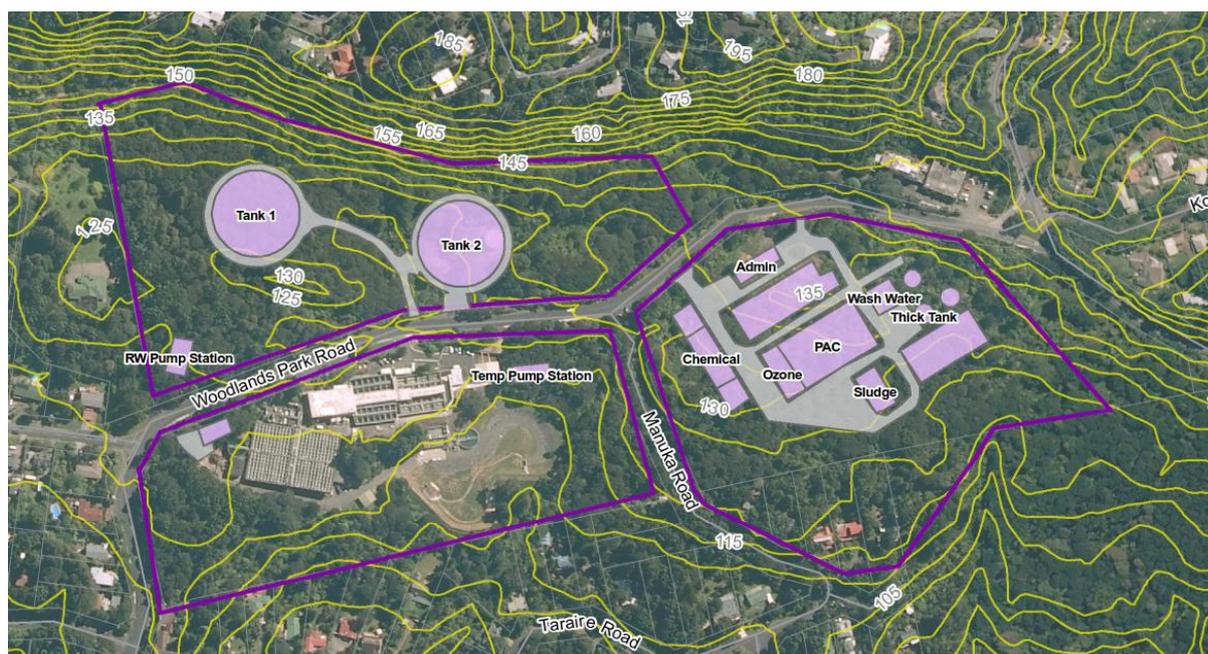


Figure 4.1: Woodlands Park Road scheme concept layout, captured from GHD Drawing “Figure 1, Huia WTP Site Selection Study Preliminary Site Layouts, Site: 44 – Woodlands Park 1, 2, 3”, Job Number 51-33575, Revision 0, dated 08 Mar 2016.

<sup>3</sup> This is referred to in previous documents relating to the Huia WTP as the “Manuka Road site” due to its location on the corner of Woodlands Park and Manuka Roads.

## 4.2 Laingholm

The Laingholm option would be located on the pony club area and below the sports fields at 436B Huia Road and is conceptually shown in Figure 4.2 below. Reservoirs for this scheme would be located in the same location as for the Woodlands Park 3 site (see Figure 4.1 above). Scheme characteristics include:

- Raw water connection at Mackie's Rest.
- Treated watermain along Huia and Woodlands Park Roads to a reservoirs at Woodlands Park Road.

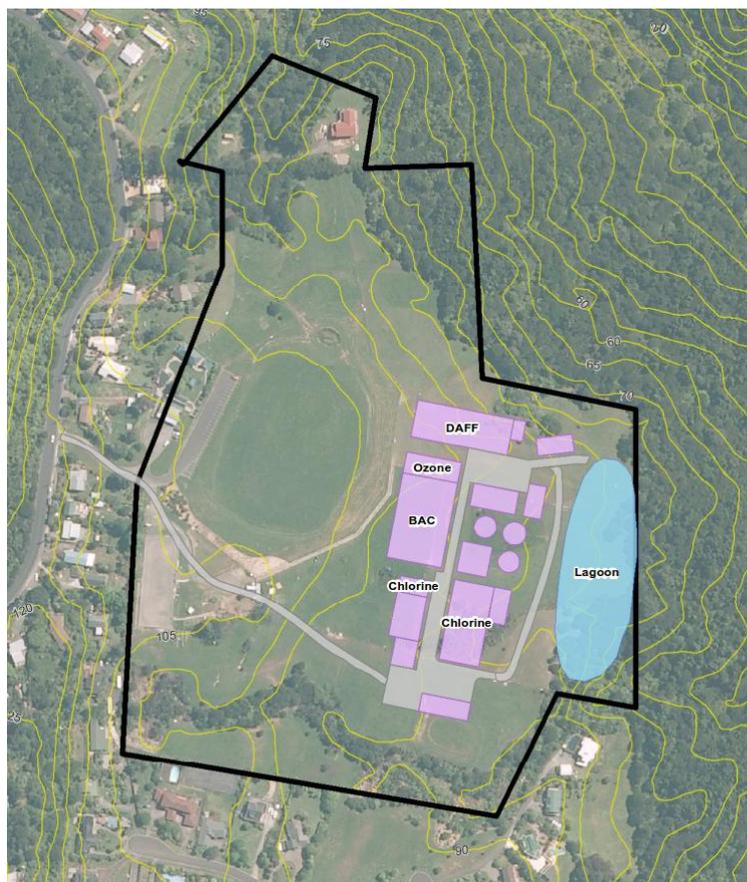


Figure 4.2: Laingholm scheme concept layout, captured from GHD Drawing "Figure 1, Huia WTP Site Selection Study Preliminary Site Layouts, Site: 101 – Laingholm 1", Job Number 51-33575, Revision 0, dated 14 December 2015

## 4.3 Scenic Drive

The Scenic Drive option would be located off Scenic Drive with the main access of Shetland Street, Glen Eden (see Figure 4.3 below). Reservoirs for this scheme would be located at the Shaw Road site (see Figure 4.4 below). Scheme characteristics include:

- Connection to the end of the raw water aqueduct.
- Raw water tunnel from Woodlands Park Road.
- Minor diversion to WMNH2 route.

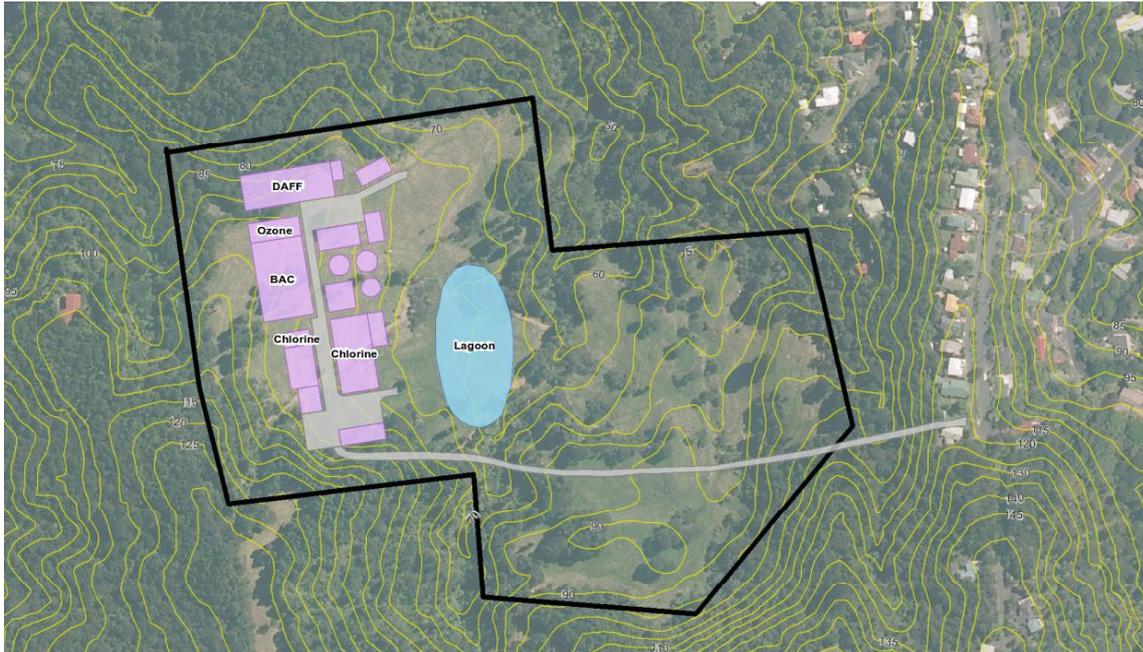


Figure 4.3: Scenic Drive scheme concept layout, captured from GHD Drawing "Figure 1, Huia WTP Site Selection Study Preliminary Site Layouts, Site: 85 – Scenic 5", Job Number 51-33575, Revision 0, dated 14 December 2015

#### 4.4 Shaw Road

The Shaw Road scheme would be located off Scenic Drive near Shaw Road. Light vehicle access could be located off Scenic Road while the main operational and construction access would be from Shaw Road (Figure 4.4). The site is large enough and high enough to accommodate the WTP and reservoirs on the same site. Scheme characteristics include:

- Raw water pump station at existing plant or at the Exhibition Drive/Shaw Road junction.
- Treated water main in Shaw Road.

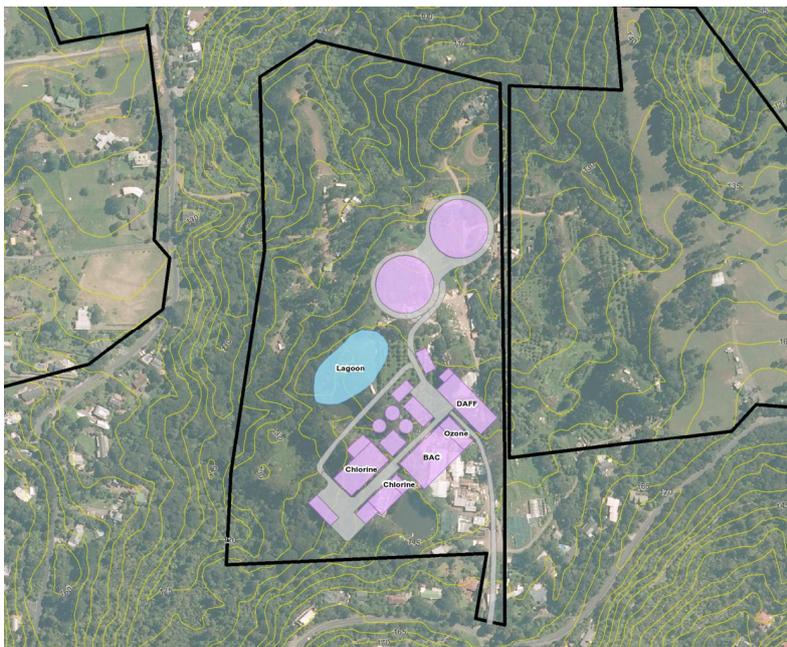


Figure 4.4: Shaw Road scheme concept layout, captured from GHD Drawing "Figure 1, Huia WTP Site Selection Study Preliminary Site Layouts, Site: 84 – Scenic 4", Job Number 51-33575, Revision 0, dated 14 December 2015

## 4.5 Upper Carter

The Upper Carter scheme would be located at Parkin Road. The main construction access is located off Carter Road (see Figure 4.5). The site is large enough and high enough to accommodate the WTP and reservoirs on the same site. Scheme characteristics include:

- Raw water tunnel to Carter Road from Mackie's Rest.
- Raw and treated watermains in Carter Road.
- Connection to treated water network on West Coast Rd.

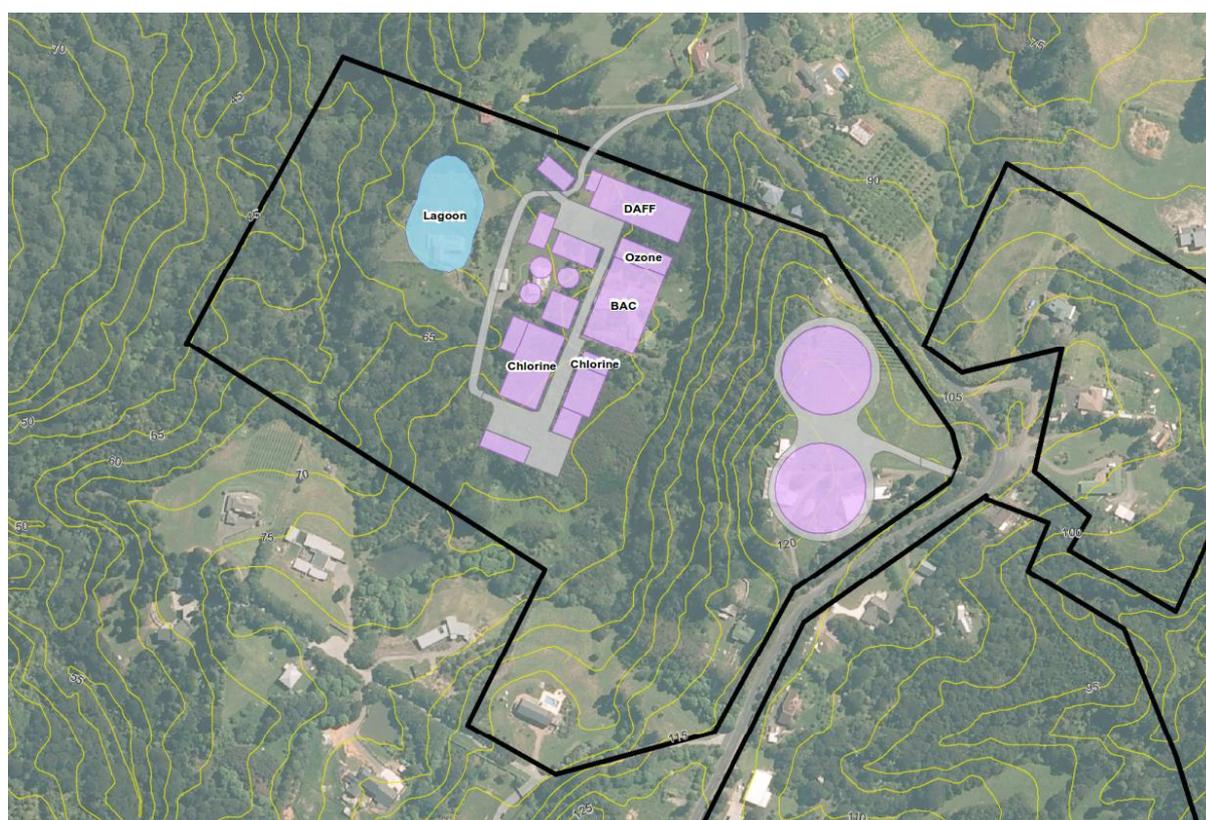


Figure 4.5: Upper Carter scheme concept layout, captured from GHD Drawing "Figure 1, Huia WTP Site Selection Study Preliminary Site Layouts, Site: 51 – Carter 1", Job Number 51-33575, Revision 0, dated 14 December 2015

## 4.6 Lower Carter

The Lower Carter scheme would be located on a large site which stretches between the northern end of Carter Road and Shaw Road. The Lower Carter site is located entirely below the ideal elevation band identified in the Site Principles Report. It was only included as an option on the basis that the site and surrounding area is largely rural with some rural-residential development, is mainly devoid of vegetation or any identified overlays, and the topography is more favourable (less steep) than sites at a higher elevation. The rationale for including the Lower Carter scheme is further described in the Site Identification and Evaluation Report.

The main construction access for the Lower Carter Scheme is located off Carter Road (see Figure 4.6). The current concept plan shows the WTP located in the south-eastern corner of the site with access off Shaw Road. As the site is located well below the ideal elevation, the reservoirs would need to be located at the Upper Carter site (see Figure 4.5 above). Scheme characteristics include:

- Raw water tunnel from Shaw-Exhibition intersection.

- Raw watermain in Shaw Road.
- Treated water reservoir at an elevated site on Carter Road.

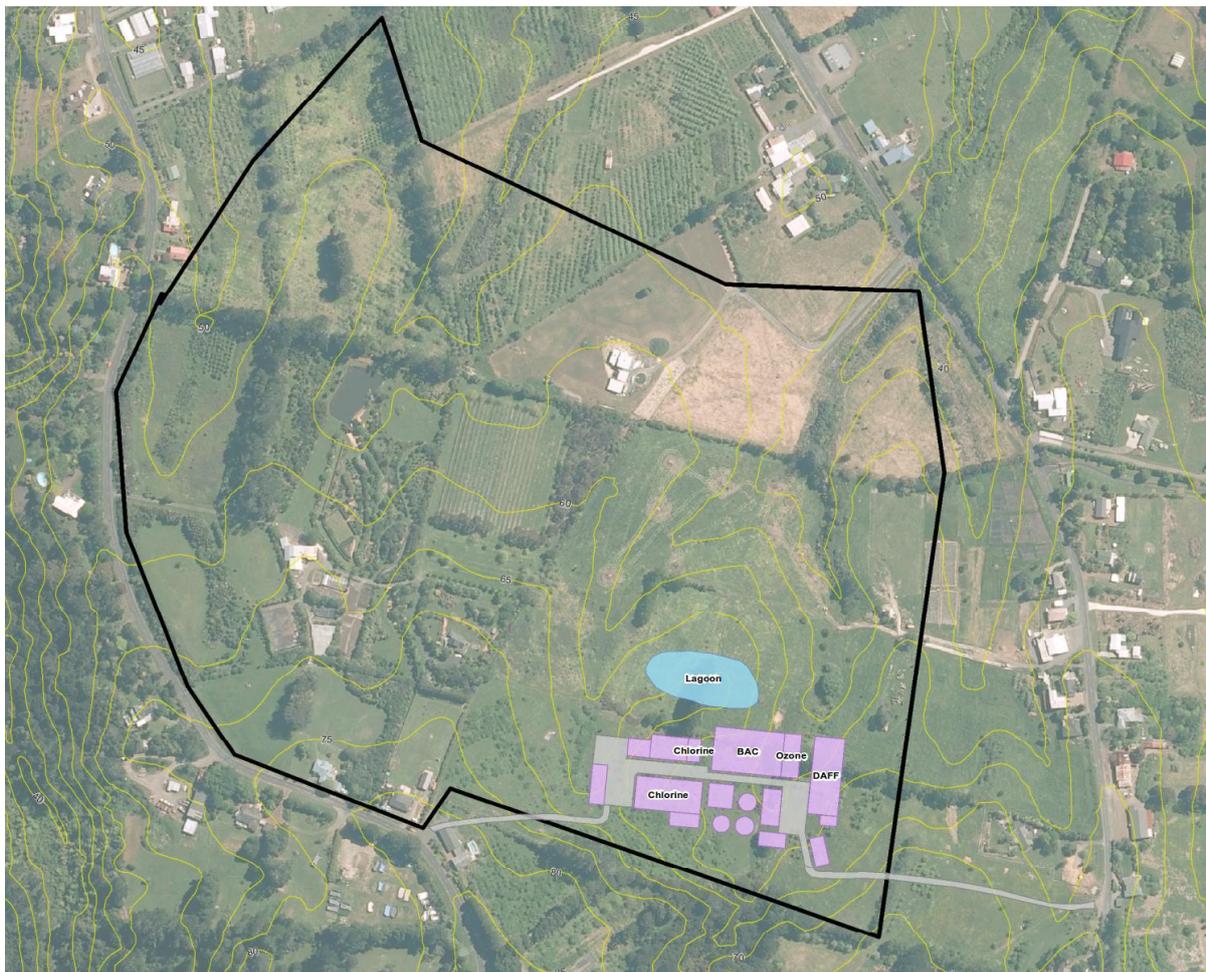


Figure 4.6: Lower Carter scheme concept layout, captured from GHD Drawing "Figure 1, Huia WTP Site Selection Study Preliminary Site Layouts, Site: 57 – Carter 7", Job Number 51-33575, Revision 0, dated 14 December 2015

#### 4.7 Parker Road

The Parker Road scheme would be located along and accessed from Parker Road (see Figure 4.7). The site is high enough and large enough to accommodate the WTP and the reservoirs on the same site, with two potential layouts show in Figure 4.7 below. Scheme characteristics include:

- Raw water tunnel from Mackie's Rest.
- Treated watermain down Parker Road.
- Connection to treated water network on West Coast Road.

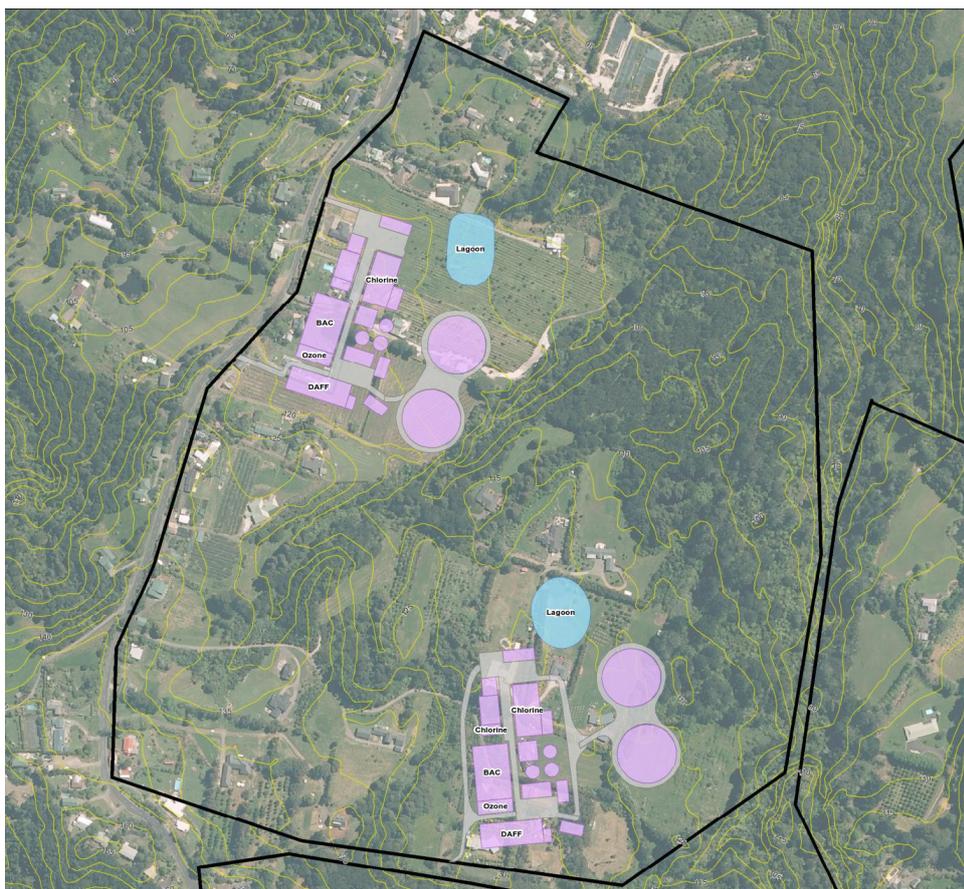


Figure 4.7: Parker Road scheme concept layout, captured from GHD Drawing "Figure 1, Huia WTP Site Selection Study Preliminary Site Layouts, Site: 33 – Parker 3", Job Number 51-33575, Revision 0, dated 14 December 2015

#### 4.8 Forest Hill

The Forest Hill scheme is located some distance north of the existing plant off Forest Hill Road (see Figure 4.8). The site would be accessed over private property from Forest Hill Road. The main site is not high enough to accommodate the reservoirs on the same site. Instead these would be located further west at or about 259 Forest Hill Road (see Figure 4.9 below). Scheme characteristics include:

- Raw watermain to the end of Shaw Road and then back uphill to Forest Hill Road or along West Coast Road.
- The site falls away from the road and requires a second tunnelled section under high points close to the site or a pipeline route across private property.



Figure 4.8: Forest Hill Road scheme concept layout, captured from GHD Drawing "Figure 1, Huia WTP Site Selection Study Preliminary Site Layouts, Site: 11 – Forest Hill 1", Job Number 51-33575, Revision 0, dated 14 December 2015

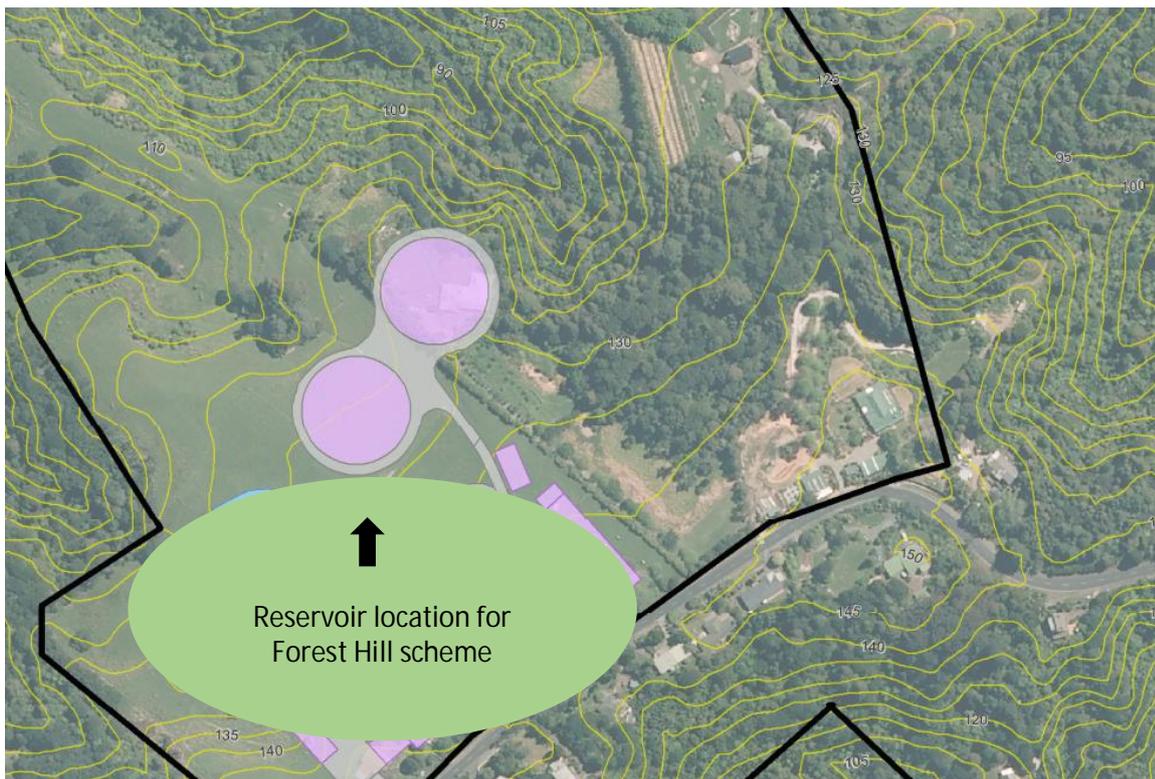


Figure 4.9: Forest Hill Road Site 3 showing reservoir location, captured from GHD Drawing "Figure 1, Huia WTP Site Selection Study Preliminary Site Layouts, Site: 13 – Forest Hill 3", Job Number 51-33575, Revision 0, dated 14 December 2015

## 5 Scheme evaluation

### 5.1 Introduction and methodology

The eight longlisted schemes have been subject to further assessment as part of the MCA process. The approach to evaluating the schemes is set out in detail in the Evaluation Methodology Report. In summary:

- A subject matter expert briefing was held on 15 March 2016 including specialists in engineering, operations, landscape architecture, ecology, acoustics and planning (refer Appendix B for briefing material). Subject matter experts subsequently developed assessment measures specific to their field of expertise, including a 'finer-grained' template to determine the overall score for the criteria they were evaluating that aligned with the scale of 1-5 set out in the broad scoring template. A robust rationale for each of the scores was also reported on (refer Appendix C).
- The subject matter experts then prepared an initial score for the relevant criteria (i.e. within their field of expertise only) and a rationale for this for presentation at a challenge workshop with the project team and broader Watercare stakeholders held on 7 April 2016. The expert score was then used as a guide with scoring debated and confirmed through this workshop.
- Costings were completed by Beca (refer the Long-List Option Development Report).
- Scores were then fed into the MCA spreadsheet and an overall score generated for each scheme to enable a ranking and comparison of schemes. Weighting was undertaken to further analyse and test the sensitivity of the process and inform the overall decision making (i.e. rather than to arrive at a final decision on the basis of a particular weighting system).
- The main WTP and reservoir site were assessed and scored across all criteria for each of the eight schemes. However, testing of the assessment criteria on the broader scheme components i.e. the pipeline route, tunnels, pump stations etc termed 'ancillary structures' in the MCA, revealed that not all criteria were relevant to the ancillary structures and/or useful in differentiating between the schemes. Therefore only some criteria have been scored for the ancillary structures as set out in Appendix D.

### 5.2 Key considerations for each scheme

The following tables identify and summarise the key considerations for each of the eight schemes based on the relevant subject matter expert assessment for the MCA criteria. The full assessment, including the results of the multi-criteria scoring, is contained in Appendix D.

#### 5.2.1 Woodlands Park Road

Table 5.1: Woodlands Park Road

Criteria	Key considerations
Engineering criteria: <ul style="list-style-type: none"> <li>• Key site characteristics</li> <li>• Engineering feasibility and constructability</li> <li>• Access</li> <li>• Operability</li> </ul>	<ul style="list-style-type: none"> <li>• Elevation of site may require two-stage pumping.</li> <li>• Close to existing raw water, treated water and overflow infrastructure. Other services also available and known, including connections to local potable water system and sanitary sewer.</li> <li>• Site can be approached from two directions. Access for deliveries etc. is reasonable.</li> <li>• This option means retaining the aqueduct. Will need to maintain or replace this in the future.</li> </ul>

Criteria	Key considerations
Cultural criteria: <ul style="list-style-type: none"> <li>Heritage and archaeology</li> <li>Mana Whenua values</li> </ul>	<ul style="list-style-type: none"> <li>Existing Huia WTP and Nihotupu Filter Station are listed heritage features.</li> </ul>
Environmental criteria: <ul style="list-style-type: none"> <li>Terrestrial Ecology</li> <li>Freshwater ecology</li> <li>Landscape and visual effects</li> </ul>	<ul style="list-style-type: none"> <li>Site is c. 95% Significant Ecological Area (SEA) under the Proposed Auckland Unitary Plan (PAUP) including mature/high value vegetation Scored a 1 for terrestrial ecology (“Very significant impact, including widespread impacts on sensitive environments. On-site mitigation is not achievable”).</li> <li>Warituna Stream headwaters – very challenging site for freshwater ecology.</li> <li>No landscape overlays. Site is visually well buffered.</li> </ul>
Social criteria: <ul style="list-style-type: none"> <li>Social and community impacts - construction</li> <li>Social and community impacts – operation</li> <li>Property risk</li> </ul>	<ul style="list-style-type: none"> <li>Social impact likely centred on removal of significant vegetation in this location.</li> <li>Meeting night-time noise limits may be an issue for ongoing operation of the plant.</li> <li>Property risk is very low as sites are already owned by Watercare.</li> </ul>
Consenting risk	<ul style="list-style-type: none"> <li>Both sites are designated for Water Supply purposes.</li> <li>Existing WTP provides a baseline / existing environment for establishment and operation of a new WTP.</li> <li>However, high planning risk due to consent required for vegetation clearance and associated ecological, landscape and social effects.</li> </ul>
Additional information (costs / opportunities) <sup>4</sup>	<ul style="list-style-type: none"> <li>No land acquisition costs / Watercare owns land.</li> <li>Confined nature of the site means that there is likely to be an increased construction time for the plant (with associated costs).</li> <li>Lower price uncertainty for this site compared to other sites.</li> <li>Low pumping cost and associated opex.</li> <li>Retention of raw water aqueduct retains the cost associated with the maintenance and improvement of this existing infrastructure.</li> </ul>

## 5.2.2 Laingholm

Table 5.2: Laingholm

Criteria	Key considerations
Engineering criteria: <ul style="list-style-type: none"> <li>Key site characteristics</li> <li>Engineering feasibility and constructability</li> <li>Access</li> </ul>	<ul style="list-style-type: none"> <li>Low elevation. Needs separate site for reservoirs a long way from treatment plant. Treated water pumping required / significant treated water lift.</li> <li>Good proximity to sludge disposal.</li> <li>Short raw water connection at Mackies Rest but otherwise generally poor linkage to existing water supply infrastructure.</li> <li>Large flat site includes buffer area with relatively limited earthworks required.</li> </ul>

<sup>4</sup> The additional cost / opportunities information for Woodlands Park and for all other subsequent sites is taken from the Long List Evaluation Cost Estimate Summary, prepared by CH2M Beca Limited, 27 May 2016, attached as Appendix C to the Long-List Option Development Report.

Criteria	Key considerations
<ul style="list-style-type: none"> <li>Operability</li> </ul>	<ul style="list-style-type: none"> <li>Site likely to contain some fill – not a closed landfill site registered on Auckland Council’s database.</li> <li>Access along very windy roads and long distance. Traffic considerations/constraints.</li> <li>Replaces raw water aqueduct.</li> </ul>
Cultural criteria: <ul style="list-style-type: none"> <li>Heritage and archaeology</li> <li>Mana Whenua values</li> </ul>	<ul style="list-style-type: none"> <li>One recorded site R11/1993 “Homestead; no standing remains apparent. An historic midden (with pottery fragments) has been noted here eroding out of the slope on the southern side of the Pony club area.”</li> </ul>
Environmental criteria: <ul style="list-style-type: none"> <li>Terrestrial Ecology</li> <li>Freshwater ecology</li> <li>Landscape and visual effects</li> </ul>	<ul style="list-style-type: none"> <li>Development footprint currently shown partly over an SEA and partly over wetland vegetation in tributary of Woodlands Stream but site large enough that this can likely be avoided.</li> <li>Reservoirs would be located on Woodlands Park 3 site</li> <li>From a landscape perspective, this is the worst site. Entirely open, with high viewing audiences and high amenity values due to public reserve.</li> </ul>
Social criteria: <ul style="list-style-type: none"> <li>Social and community impacts - construction</li> <li>Social and community impacts – operation</li> <li>Property risk</li> </ul>	<ul style="list-style-type: none"> <li>Auckland Council owned site. Zoned and used for public open space/ recreational purposes. Important community facility and the location of a WTP here would have a high social impact.</li> <li>Potentially high construction impacts (noise, traffic, visual effects).</li> </ul>
Consenting risk	<ul style="list-style-type: none"> <li>High due to value placed on public open space and visual impacts.</li> </ul>
Additional information (costs / opportunities)	<ul style="list-style-type: none"> <li>Requires long length of treated water pipeline along a relatively busy road (Huia Road)</li> <li>Close to the coastal marine area. Low cost associated with the overflow and attenuation pipeline.</li> <li>Costs associated with disposing contaminated material to landfill if the site is found to be an unregistered fill site.</li> <li>Means raw water aqueduct can be abandoned, avoiding requirement for future maintenance and upgrades works.</li> <li>High pumping cost and associated opex.</li> </ul>

### 5.2.3 Scenic Drive

Table 5.3: Scenic Drive

Criteria	Key considerations
Engineering criteria: <ul style="list-style-type: none"> <li>Key site characteristics</li> <li>Engineering feasibility and constructability</li> <li>Access</li> <li>Operability</li> </ul>	<ul style="list-style-type: none"> <li>Site below ideal elevation band, with reservoirs located at a separate location. Treated water pumping required.</li> <li>Poor linkages to existing infrastructure.</li> <li>Adequate area includes buffer.</li> <li>Topography is challenging, including for ancillary structures.</li> <li>Very poor/challenging site access. No secondary site access.</li> </ul>

Criteria	Key considerations
Cultural criteria: <ul style="list-style-type: none"> <li>Heritage and archaeology</li> <li>Mana Whenua values</li> </ul>	<ul style="list-style-type: none"> <li>No recorded sites.</li> </ul>
Environmental criteria: <ul style="list-style-type: none"> <li>Terrestrial Ecology</li> <li>Freshwater ecology</li> <li>Landscape and visual effects</li> </ul>	<ul style="list-style-type: none"> <li>Footprint currently encroaches into SEA but may be able to largely avoid through careful design. But development would result in the loss of several individual indigenous trees/ stands of trees within grassland area.</li> <li>Pipeline route intersects regenerating kauri - podocarp forest, and route crosses Kaurimu Stream tributary.</li> <li>Site contains a main tributary of Kaurimu Stream, and numerous flow paths/ minor tributaries, some of which are likely to be affected; some opportunities for onsite mitigation.</li> <li>Catchment for new WTP extends to north toward urban area, location in valley. Potential visibility from Glengarry/ Oratia Drive / Philip Ave / Foothills Lane residential area to north – potential to screen. Lesser visual catchment for reservoirs but possible visibility from Tawini Road ridgeline/houses.</li> </ul>
Social criteria: <ul style="list-style-type: none"> <li>Social and community impacts - construction</li> <li>Social and community impacts – operation</li> <li>Property risk</li> </ul>	<ul style="list-style-type: none"> <li>Up to 57 dwellings affected / within construction noise contour. To comply with operational night-time limit of 40dB LAeq would require non-conventional noise mitigation and would therefore be costly. 2 Lots inside 50dB LAeq contour may require acoustic treatment</li> <li>Social and community impacts around traffic, particularly construction traffic which would pass through built up residential area.</li> <li>Site is made up of two privately owned lots.</li> </ul>
Consenting risk	<ul style="list-style-type: none"> <li>Generally low risk with the possible exception of traffic issues, and provided that impacts on native vegetation and visual impacts can be managed.</li> </ul>
Additional information (costs / opportunities)	<ul style="list-style-type: none"> <li>High costs associated with site access.</li> <li>Tunnel length is reasonably short.</li> <li>Treated water reservoirs located separately - increases treated water pipeline costs.</li> <li>Site topography and associated earthworks and geotechnical uncertainties increases the risk associated with this site.</li> <li>Phillip Avenue will require road widening and potentially construction of a bridge into the site.</li> <li>Alignment and geotechnical risks associated with the raw water tunnel.</li> <li>High pumping cost and associated opex.</li> <li>Retention of the raw water aqueduct also retains the cost associated with the maintenance and improvements of the existing infrastructure.</li> </ul>

#### 5.2.4 Shaw Road

Table 5.4: Shaw Road

Criteria	Key considerations
Engineering criteria: <ul style="list-style-type: none"> <li>Key site characteristics</li> </ul>	<ul style="list-style-type: none"> <li>Generally meets the key site characteristics, as from a high level perspective, site elevation and slope are reasonable, and proximity to existing water supply infrastructure and site size are good. A pumped raw watermain</li> </ul>

Criteria	Key considerations
<ul style="list-style-type: none"> <li>• Engineering feasibility and constructability</li> <li>• Access</li> <li>• Operability</li> </ul>	<p>presents challenges around maintaining a gravity supply from the Upper Nihotupu Dam.</p> <ul style="list-style-type: none"> <li>• Preferred raw water connection Woodland Park Road. This is the only site where raw water would be pumped. Treated water would be gravity feed through plant to reservoirs</li> <li>• Relatively tight site with some steep grades and significant earthworks required. Site contours would make site set out complex. Trenched pipeline leaving site is challenging due to gully.</li> <li>• Very poor/challenging site access. Bylaw prevents heavy traffic along section of Scenic Drive so access would be via a bridge to Shaw Road.</li> <li>• Complex arrangement for ancillary structures, with no connection to Titirangi Reservoirs or supply to the city. Treated water pumping.</li> </ul>
<p>Cultural criteria:</p> <ul style="list-style-type: none"> <li>• Heritage and archaeology</li> <li>• Mana Whenua values</li> </ul>	<ul style="list-style-type: none"> <li>• No recorded sites.</li> </ul>
<p>Environmental criteria:</p> <ul style="list-style-type: none"> <li>• Terrestrial Ecology</li> <li>• Freshwater ecology</li> <li>• Landscape and visual effects</li> </ul>	<ul style="list-style-type: none"> <li>• Indicative footprint encroaches into SEA which comprises c. 65 year old kanuka forest, but scoring assumes this is largely avoidable, with opportunity for on-site mitigation. Access from Shaw Road (likely bridge through bush) may reduce this.</li> <li>• Site encompasses main stem and tributaries of Kaurimu Stream, and numerous flow paths/ minor tributaries, along with two ponds. Fairly limited opportunities for on-site mitigation.</li> <li>• Relatively good from a landscape perspective as plant can likely be contained within the site however access would need to be further assessed and would likely mean a reduced score (this scheme is currently scored as a 4 for landscape and visual impacts).</li> </ul>
<p>Social criteria:</p> <ul style="list-style-type: none"> <li>• Social and community impacts - construction</li> <li>• Social and community impacts – operation</li> <li>• Property risk</li> </ul>	<ul style="list-style-type: none"> <li>• Social and community impacts around traffic, particularly construction traffic which would pass through built up residential area, and operational noise.</li> <li>• Site is made up of six parcels on predominantly large rural blocks.</li> </ul>
<p>Consenting risk</p>	<ul style="list-style-type: none"> <li>• Generally moderate risk with the possible exception of traffic issues, and provided that impacts on native vegetation and visual impacts can be managed.</li> </ul>
<p>Additional information (costs / opportunities)</p>	<ul style="list-style-type: none"> <li>• High costs associated with site access.</li> <li>• Tunnel length is reasonably short.</li> <li>• Raw water pump station located separately to the treatment plant.</li> <li>• Shaw Road will need to be upgraded/widened and a bridge constructed to cross a gully into the site.</li> <li>• Alignment and geotechnical risks associated with the raw water tunnel. This may need to be curved to minimise land purchase and vegetation removal.</li> <li>• Retention of the raw water aqueduct retains cost associated with the maintenance and improvements of the existing infrastructure.</li> </ul>

## 5.2.5 Upper Carter

Table 5.5: Upper Carter

Criteria	Key considerations
Engineering criteria: <ul style="list-style-type: none"> <li>• Key site characteristics</li> <li>• Engineering feasibility and constructability</li> <li>• Access</li> <li>• Operability</li> </ul>	<ul style="list-style-type: none"> <li>• The majority of the site is below the ideal elevation range– treated water pumping to reservoirs. The area at a suitable elevation for reservoirs is limited and the land between the WTP and the reservoirs is steep.</li> <li>• Loss of system hydraulic efficiency due to need to gravitate to below hydraulic grade line and then pump.</li> <li>• Site can be approached from two directions. Good proximity to existing water supply infrastructure.</li> <li>• Raw water connection to aqueduct at Mackie's Rest - good access. Raw water connection to Upper Nihotupu via bush.</li> </ul>
Cultural criteria: <ul style="list-style-type: none"> <li>• Heritage and archaeology</li> <li>• Mana Whenua values</li> </ul>	<ul style="list-style-type: none"> <li>• No recorded sites.</li> </ul>
Environmental criteria: <ul style="list-style-type: none"> <li>• Terrestrial Ecology</li> <li>• Freshwater ecology</li> <li>• Landscape and visual effects</li> </ul>	<ul style="list-style-type: none"> <li>• Footprint as currently shown encroaches into SEA margins comprising an area of c. 60-70 yr old scrub, and a stand of kauri - podocarp - kanuka forest; limited opportunity to wholly avoid bush due to site constraints; some opportunities for protecting/ revegetating surrounds.</li> <li>• Pipeline route intersects stand of regenerating kauri - podocarp - kanuka forest (SEA) within the site envelope</li> <li>• The site encompasses flowpaths/ minor tributaries of Cochrane Stream, some of which are likely to be affected; fairly limited opportunities for onsite mitigation.</li> <li>• Reservoirs very prominent / would have a significant visual impact.</li> </ul>
Social criteria: <ul style="list-style-type: none"> <li>• Social and community impacts - construction</li> <li>• Social and community impacts – operation</li> <li>• Property risk</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to manage noise and vibration is good, however impacts on nearby school will need to be managed (particularly traffic).</li> <li>• Visual impacts of reservoirs would create additional social impacts.</li> <li>• 10 affected land owners - predominantly lifestyle / developed properties</li> </ul>
Consenting risk	<ul style="list-style-type: none"> <li>• Visual impact of reservoirs likely to be a consenting issue, as they are not able to be moved or screened.</li> </ul>
Additional information (costs / opportunities)	<ul style="list-style-type: none"> <li>• Land acquisition costs and length of raw water tunnel are key cost differentials for this site.</li> <li>• Risk associated with the low elevation (just above the minimum elevation requirement) and restricted footprint at this elevation for the reservoir site.</li> <li>• Limited space on site for overflow attenuation if needed.</li> <li>• Site topography increases earthworks requirements.</li> <li>• High pumping cost and associated opex.</li> <li>• Raw water aqueduct can be abandoned, meaning that future maintenance and upgrades would not be required.</li> </ul>

## 5.2.6 Lower Carter

Table 5.6: Lower Carter

Criteria	Key considerations
<p>Engineering criteria:</p> <ul style="list-style-type: none"> <li>• Key site characteristics</li> <li>• Engineering feasibility and constructability</li> <li>• Access</li> <li>• Operability</li> </ul>	<ul style="list-style-type: none"> <li>• All of site below ideal elevation range.</li> <li>• Loss of system efficiency due to need to gravitate to below hydraulic grade line and then pump. Requires large pumping station (60m lift).</li> <li>• Shaft needed at Shaw-Exhibition for raw water connection to aqueduct</li> <li>• Reservoirs located at an alternative site which is limited in size and only just at a high enough elevation (at Upper Carter). Reservoir construction challenging due to limited site footprint and dual pipelines in Carter Road.</li> <li>• Likely to be contaminated from previous horticultural use.</li> <li>• Adequate access. Site can be approached from two directions.</li> </ul>
<p>Cultural criteria:</p> <ul style="list-style-type: none"> <li>• Heritage and archaeology</li> <li>• Mana Whenua values</li> </ul>	<ul style="list-style-type: none"> <li>• No recorded sites</li> </ul>
<p>Environmental criteria:</p> <ul style="list-style-type: none"> <li>• Terrestrial Ecology</li> <li>• Freshwater ecology</li> <li>• Landscape and visual effects</li> </ul>	<ul style="list-style-type: none"> <li>• No SEA overlay on the WTP site.</li> <li>• No landscape overlays on the WTP site however, reservoirs are in the same location as Upper Carter and would have the same visual impacts.</li> </ul>
<p>Social criteria:</p> <ul style="list-style-type: none"> <li>• Social and community impacts - construction</li> <li>• Social and community impacts – operation</li> <li>• Property risk</li> </ul>	<ul style="list-style-type: none"> <li>• School located in reasonably close proximity (corner West Coast Road and Shaw Road). Potential health and safety concerns particularly around construction traffic.</li> <li>• Reservoirs likely to be associated with additional social impacts (visual amenity).</li> <li>• 3 affected land owners of mainly large rural land holdings</li> </ul>
Consenting risk	<ul style="list-style-type: none"> <li>• Generally moderate risk however impacts on sensitive receivers e.g. Oratia School and kindergarten would need to be managed carefully. Visual impact of reservoirs also likely to be an issue.</li> </ul>
Additional information (costs / opportunities)	<ul style="list-style-type: none"> <li>• Land acquisition costs and length of the raw water tunnel are key cost differentials for this site.</li> <li>• Risk associated with the low elevation (just above the minimum elevation requirement) and restricted footprint at this elevation for the reservoir site.</li> <li>• Alignment and geotechnical risks associated with the raw water tunnel.</li> <li>• Other key risks include connection to raw water aqueduct at Shaw-Exhibition Drive intersection, and two treated water pipelines in Carter Road between the treatment plant and the treated water reservoirs.</li> <li>• High pumping cost and associated opex.</li> <li>• Means that approximately half of the raw water aqueduct can be abandoned, reducing future maintenance and upgrade requirements.</li> </ul>

## 5.2.7 Parker Road

Table 5.7: Parker Road

Criteria	Key considerations
<p>Engineering criteria:</p> <ul style="list-style-type: none"> <li>• Key site characteristics</li> <li>• Engineering feasibility and constructability</li> <li>• Access</li> <li>• Operability</li> </ul>	<ul style="list-style-type: none"> <li>• Very good elevation.</li> <li>• Site located some distance from existing infrastructure, especially raw water.</li> <li>• 2.5km of curved tunnelled section, approximately 7.5km in total pipeline length.</li> <li>• Large area with lots of flexibility for WTP configuration and buffer area.</li> <li>• Flat site so little earthworks required.</li> <li>• Adequate for traffic/access.</li> <li>• Integrates logically into hydraulic grade line and maximises use of gravity.</li> <li>• Replaces aqueducts. Will need additional works in the Transmission network to provide redundancy to Titirangi Reservoirs "</li> </ul>
<p>Cultural criteria:</p> <ul style="list-style-type: none"> <li>• Heritage and archaeology</li> <li>• Mana Whenua values</li> </ul>	<ul style="list-style-type: none"> <li>• One scheduled heritage site but potentially will be able to avoid in detailed design.</li> </ul>
<p>Environmental criteria:</p> <ul style="list-style-type: none"> <li>• Terrestrial Ecology</li> <li>• Freshwater ecology</li> <li>• Landscape and visual effects</li> </ul>	<ul style="list-style-type: none"> <li>• Site encompasses SEA comprising mature kanuka - broadleaved forest with scattered kauri and podocarps, however this can likely be avoided. Potential lizard habitat outside of SEA.</li> <li>• Pipeline route intersects area of low kanuka scrub surrounding a stream tributary (not SEA). Scope for on-site mitigation.</li> <li>• Can avoid nearest ONL. Rural residential and horticulture, houses generally orientated out from ridge so screening potential.</li> </ul>
<p>Social criteria:</p> <ul style="list-style-type: none"> <li>• Social and community impacts - construction</li> <li>• Social and community impacts – operation</li> <li>• Property risk</li> </ul>	<ul style="list-style-type: none"> <li>• This site is best from a noise perspective.</li> <li>• Low visual amenity impacts if site can be screened.</li> <li>• Approximately 12 affected land owners for each of the Parker site locations.</li> </ul>
Consenting risk	<ul style="list-style-type: none"> <li>• No significant consenting issues identified, providing that significant vegetation can be avoided and site can be screened.</li> </ul>
Additional information (costs / opportunities)	<ul style="list-style-type: none"> <li>• Land acquisition costs and length of raw water tunnel are key cost differentials.</li> <li>• There are alignment and geotechnical risks associated with raw water tunnel, which is the longest tunnel out of all options. It would either need to be curved to follow the topography or an intermediate shaft would be required.</li> <li>• Low pumping cost and associated opex.</li> <li>• Raw water aqueduct can be abandoned, meaning that future maintenance and upgrades would not be required.</li> </ul>

## 5.2.8 Forest Hill

Table 5.8: Forest Hill

Criteria	Key considerations
<p>Engineering criteria:</p> <ul style="list-style-type: none"> <li>• Key site characteristics</li> <li>• Engineering feasibility and constructability</li> <li>• Access</li> <li>• Operability</li> </ul>	<ul style="list-style-type: none"> <li>• Site below ideal elevation range. Separate site needed for reservoirs.</li> <li>• While site affords opportunities for further development and optimal site layout, this area is remote from existing infrastructure.</li> <li>• Complex raw and treated water setup. Raw water connection to aqueduct at Mackie's Rest - good access. Raw water connection to Upper Nihotupu would be a pipeline route via bush.</li> <li>• Long length of tunnel. Trenched pipeline would be through narrow windy roads with geotechnical concerns, long distance.</li> <li>• Will make connections to the transmission system complete. Replaces aqueduct.</li> </ul>
<p>Cultural criteria:</p> <ul style="list-style-type: none"> <li>• Heritage and archaeology</li> <li>• Mana Whenua values</li> </ul>	<ul style="list-style-type: none"> <li>• No recorded sites.</li> </ul>
<p>Environmental criteria:</p> <ul style="list-style-type: none"> <li>• Terrestrial Ecology</li> <li>• Freshwater ecology</li> <li>• Landscape and visual effects</li> </ul>	<ul style="list-style-type: none"> <li>• No SEA overlay. No significant woody vegetation cover.</li> <li>• Route intersects sections of riparian mixed podocarp-broadleaved forest surrounding Anamata Stream, Norman Glen and McLeod Stream tributary.</li> <li>• Site just clips ONL in west corner can be avoided. Entirely open rural - low intactness. Visual catchment for WTP limited to local area, low level residential in surrounds. Valley with potential ability to screen viewing audiences. Low context/quality.</li> </ul>
<p>Social criteria:</p> <ul style="list-style-type: none"> <li>• Social and community impacts - construction</li> <li>• Social and community impacts – operation</li> <li>• Property risk</li> </ul>	<ul style="list-style-type: none"> <li>• No significant issues identified in terms of visual amenity, noise and vibration, traffic, health and safety.</li> <li>• 5 affected land owners, predominantly lifestyle / developed properties</li> </ul>
Consenting risk	<ul style="list-style-type: none"> <li>• Relatively straightforward from a consenting perspective in terms of effects however likely to be challenged on rationale for location given remoteness of site and relationship with existing structure.</li> </ul>
Additional information (costs / opportunities)	<ul style="list-style-type: none"> <li>• Land acquisition costs, length of raw water tunnel and treated water pipelines key cost differentials, along with the costs associated with locating reservoirs on a separate site.</li> <li>• Risks include route of raw water and treated water pipelines which pass over the high point on Forest Hill. The raw water pipeline would either require additional land purchase or tunnelling.</li> <li>• Ground conditions across the site are known to be poor.</li> <li>• High pumping costs and associated opex.</li> <li>• High cost associated with the treatment plant.</li> <li>• Raw water aqueduct can be abandoned, meaning that future maintenance and upgrades would not be required.</li> </ul>

### 5.3 Overall MCA scores

The overall MCA scores are detailed in Table 5.9 below and take into account scoring for both the main WTP and reservoirs sites as well as the ancillary structures. No weighting has been applied to these scores. It is important to note that in all instances a high score is 'good' (i.e. relatively better / more preferred) and a low score is 'bad' (i.e. relatively worse / less preferred) in terms of the criteria being considered.

Table 5.9: Overall scores

Scheme	WTP & Reservoirs score	Ancillary Structures score	Total score (out of a possible 85)	Rank	50 year NPV costs (\$ million)
Parker Road	50	17	67	1	\$293
Woodlands Park Road	42	19	61	2	\$297
Laingholm	42	18	60	3	\$336
Shaw Road	44	15	59	4	\$301
Lower Carter	44	14	58	5	\$322
Forest Hill	47	10	57	6	\$363
Scenic Drive	43	12	55	7	\$300
Upper Carter	39	14	53	8	\$309

These scores are also shown diagrammatically in Figure 5.1 below along with the 50 year NPV costs. The score for the WTP and reservoir site and the score for the ancillary structures are shown separately to demonstrate the contribution of each of these components to the overall score (noting the ancillary structures were scored for criteria considered to be of particular relevance to these structures only).

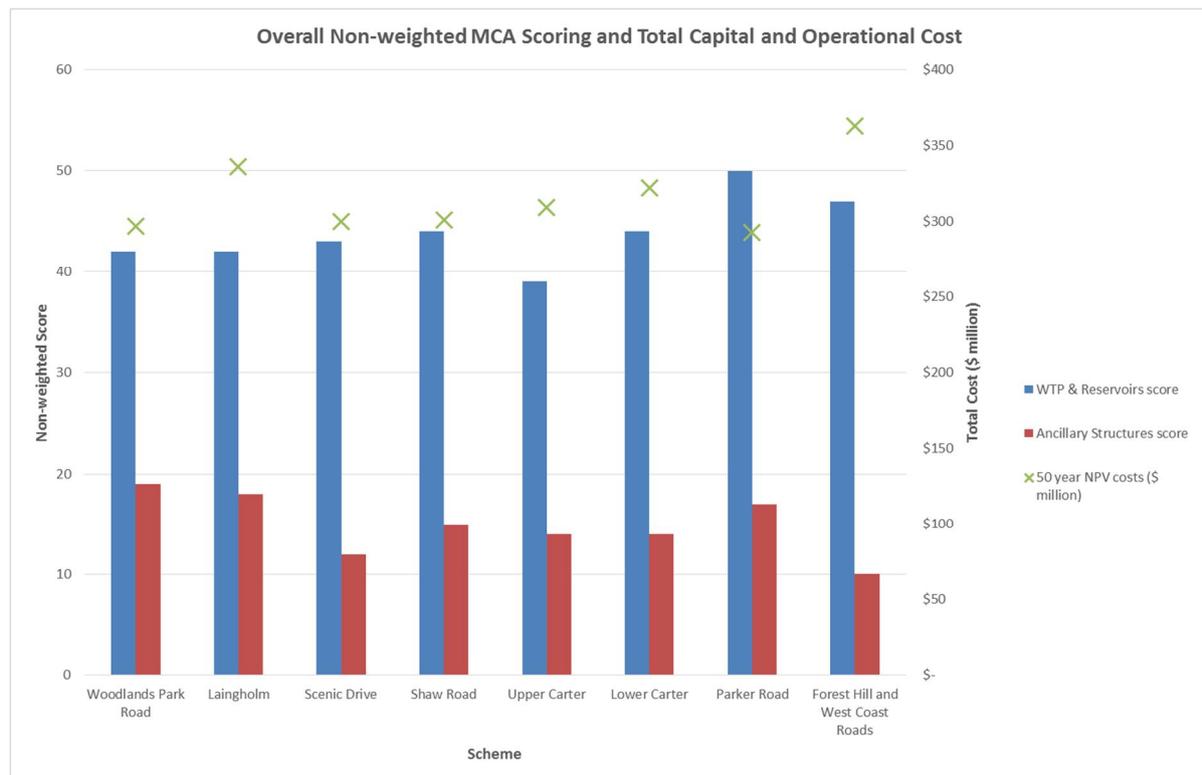


Figure 5.1: Overall MCA scores, showing scoring for WTP and reservoirs (blue) and ancillary structures (red) separately. 50 year NPV costs are indicated for each scheme by the green crosses.

Overall, the top two schemes are Parker Road and Woodlands Park Road. Forest Hill, Scenic Drive and Upper Carter are the bottom ranked schemes. Shaw Road, Laingholm and Lower Carter make up the middle of the group and score very similarly (59, 60 and 58 respectively). Table 5.2 shows the 50 year NPV costs are reasonably similar across all the schemes with the exception of Forest Hill where it is notably higher. This is due to the length of pipeline that would be required to service this site, and is also reflected in the poor score this scheme gets for ancillary structures. The NPV for Laingholm, and to a lesser extent Lower Carter, are also a little higher than the other schemes. For the Laingholm Scheme this reflects the long length of pipeline and pumping required for treated water transmission. For the Lower Carter Scheme this reflects the long length of the raw water tunnel and associated pumping requirements.

## 5.4 Analysis of schemes by criteria

### 5.4.1 Engineering-related criteria

The technical engineering-related criteria included in the MCA are:

- Key site characteristics;
- Engineering feasibility and constructability;
- Access; and
- Operability.

The score for the engineering-related criteria for each of the schemes is presented in Figure 5.2 below.

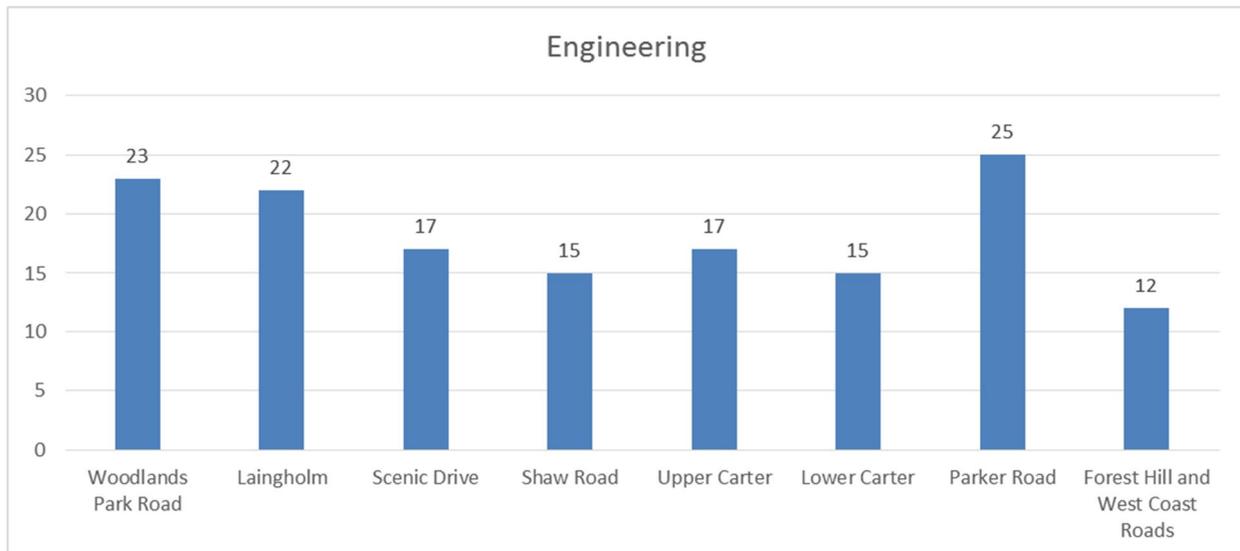


Figure 5.2: Engineering scores for both WTP & reservoir sites and ancillary structures.

Figure 5.2 indicates that there are three clearly preferred schemes from an engineering perspective, being Parker Road, Woodlands Park Road and Laingholm. All these sites provide reasonably good connectivity with existing water supply infrastructure, access is manageable and all score well in terms of operability. The Laingholm and Parker Road Schemes would have the additional benefit of making the existing treated water aqueduct redundant. As well as improving system resilience, disposing of this old asset avoids the need to undertake significant maintenance or replacement works in the future and the associated costs and environmental effects such works would entail. Both Parker Road and Woodlands Park Road Schemes are located at good elevations with the reservoirs being located immediately adjacent or in close proximity to the WTP. Laingholm is unusual in that it provides a large undeveloped site albeit at a lower elevation than the other two sites. Reservoirs for the Laingholm scheme would be located off-site at Woodlands Park Road.

The Scenic Drive, Shaw Road, Lower and Upper Carter and Forest Hill schemes all have reasonably significant engineering issues. These issues include:

- Significant access as well as topographical constraints for Shaw Road and Scenic Drive;
- Inefficient elevation for all sites, which increases pumping requirements and associated costs;
- Locational constraints for the reservoirs for the Carter schemes, which would be confined to a small area at Upper Carter at the required elevation. The Lower Carter site would require dual pipes to be laid within Carter Road up to the reservoir site and then back down again. These pipes have a likely diameter of approximately 1.2m meaning they would take up most of the road space and cause significant disruption during their installation.
- Forest Hill is remote from existing infrastructure, with shallow instability requiring additional foundation works.

#### 5.4.2 Cultural-related criteria

The cultural-related criteria included in the MCA are:

- Heritage and archaeology;
- Mana Whenua Values.

Three sites (Woodlands Park Road, Laingholm and Parker) have recorded heritage/archaeological sites in the vicinity. These are the existing Huia WTP and Nihotupu Filter Station for Huia, an old homestead at Laingholm (no standing remains are apparent), and Theets Cottage at 132 Parker

Road. The records for these sites indicate that they are confined to a particular area and therefore it is likely that works associated with a WTP could avoid these sites (subject to an archaeological investigation at the shortlist stage).

Mana Whenua representatives have indicated that their preference is to be directly involved at the shortlist stage (see minutes attached in Appendix E). No Sites of Significance or Sites of Value to Mana Whenua are indicated on the relevant planning maps for any of the eight sites and therefore all sites have scored 5 for this criteria.

As heritage and archaeology and Mana Whenua values are not a differentiator at this stage, the MCA scores for the relevant criteria are not presented separately.

### 5.4.3 Environmental-related criteria

The environmental-related criteria included in the MCA are:

- Terrestrial ecology;
- Freshwater ecology; and
- Landscape and visual effects.

The score for the environmental criteria for each of the schemes is presented in Figure 5.3 below.

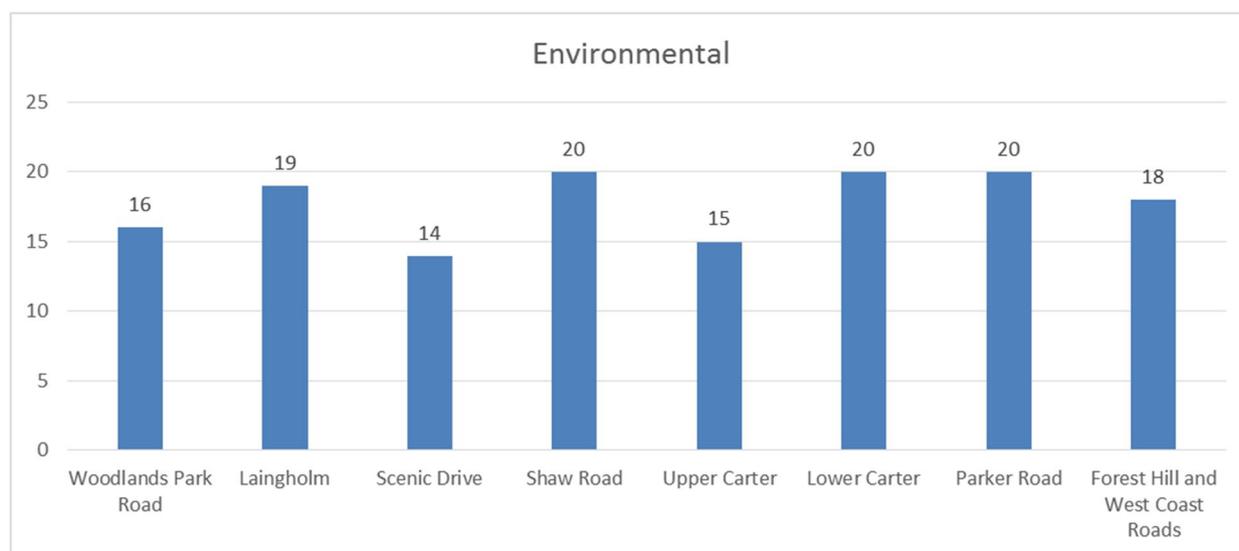


Figure 5.3: Environmental scores for both WTP & reservoir sites and ancillary structures.

Parker Road, Shaw Road and Lower Carter are the top ranking schemes from an environmental perspective, followed by Laingholm and Forest Hill. The Parker Road, Shaw Road and Lower Carter schemes are located in areas that are rural or rural-residential in character, and are large enough that the WTP could be sited outside of areas of significant vegetation or ecological value, and/or screened from view. The landscape and visual effects (and potentially ecology) scoring for the Shaw Road scheme is likely to be over-stated as this did not factor in the works necessary to provide access via Shaw Road. This would likely involve a bridge crossing requiring removal of an area of established vegetation.

While Laingholm scores very poorly ('1') from a landscape perspective, it scores reasonably highly overall for environmental criteria. This is due to its location on sportsfields, largely outside of Significant Ecological Areas, along with limited environmental impacts associated with ancillary structures.

Similarly, Lower Carter scores poorly ('2') from a landscape perspective due to the off-site location of the reservoirs at the Upper Carter site, which are in a prominent site immediately adjacent to Carter Road. The reservoirs are substantial structures (approximately 8m high and 60m in diameter) which are unlikely to be able to be moved or screened effectively due to the limited area at the required elevation on which to site this infrastructure. This is a change from the initial long list, when the site scored well based on a broad-brush assessment due to the lack of landscape overlays or distinguishing visual features. However this initial assessment was based on the Lower Carter site itself - the location of the reservoirs had not been factored in at this stage.

The Woodlands Park Road scheme scores poorly for environmental criteria largely due to the impacts of the new WTP and reservoirs on terrestrial ecology in particular, and also on freshwater ecology values. There would be a requirement for off-set mitigation associated with the removal of vegetation at this site if it was developed, as on-site mitigation options appear to be limited to covenanting and weed control.

#### 5.4.4 Social-related criteria

The social -related criteria included in the MCA are:

- Social and community impacts, including noise and amenity effects, associated with construction
- Social and community impacts, including noise and amenity effects, associated with operation
- Property impacts.

The score for the social criteria for each of the schemes is presented in Figure 5.4 below.

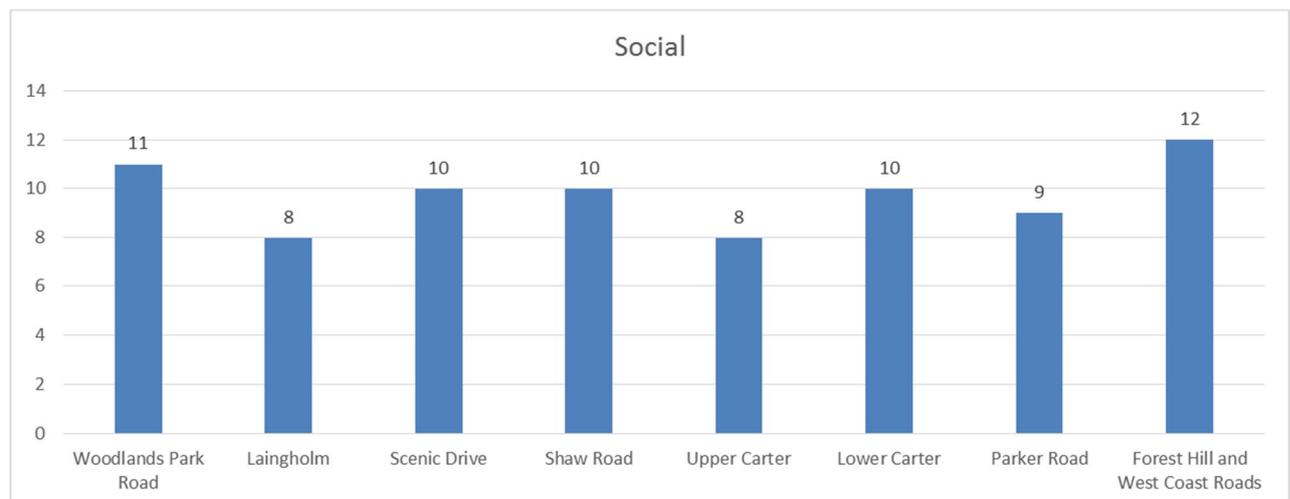


Figure 5.4: Social scores for both WTP & reservoir sites and ancillary structures.

Forest Hill scores well for the social impact criteria as there are no significant issues identified in terms of visual amenity, noise and vibration, traffic effects or health and safety. Five affected land owners have been identified, with the predominant land use being lifestyle properties.

Woodlands Park scores well for this criteria largely because Watercare already owns the sites that the WTP and reservoirs are located on, and therefore the property risk is low (the site scores a '5' for this criteria). In addition, this scheme is located on an existing site which is designated for 'Water Supply Purposes' and is immediately adjacent to the existing Huia WTP which has been in operation since the 1920s. This was factored into the scoring where there was considered to be an established baseline in terms of the siting of a new WTP and operations into the future. Notwithstanding this, the social and community impacts for this site could still be reasonably high due to the clearance of

significant vegetation for the WTP and reservoirs. The score for social and community impacts of construction was not agreed at the challenge workshop, with the majority scoring being '3' and the minority scoring being '2' with reference to the value the community placed on the existing mature vegetation.

The score for social and community impacts for Laingholm was also not agreed at the challenge workshop, with the majority scoring being '2' and the minority scoring being '1' for both construction and operational impacts. From a visual amenity perspective, this is the worst site and works on open space were considered to have a particular impact.

Overall Parker Road scored relatively well for social and community impacts due to the large site area and the ability to manage noise and vibration, visual amenity and traffic impacts. However, the site scores poorly ('1') from a property perspective due to the number of properties likely to be directly impacted by the siting of a new WTP at this location.

#### 5.4.5 Consenting risk

For each scheme, the level of consenting risk has been scored taking into account at the longlisting stage zoning and any major consenting impediments (e.g. scheduled trees, SEA, ONL, property hurdles). The score for the consenting risk for each of the schemes is presented in Figure 5.5. It is important to reiterate here that a high score is 'good' (i.e. relatively better / more preferred) in terms of consenting risk and a low score is 'bad' in that it represents a lower consenting feasibility.

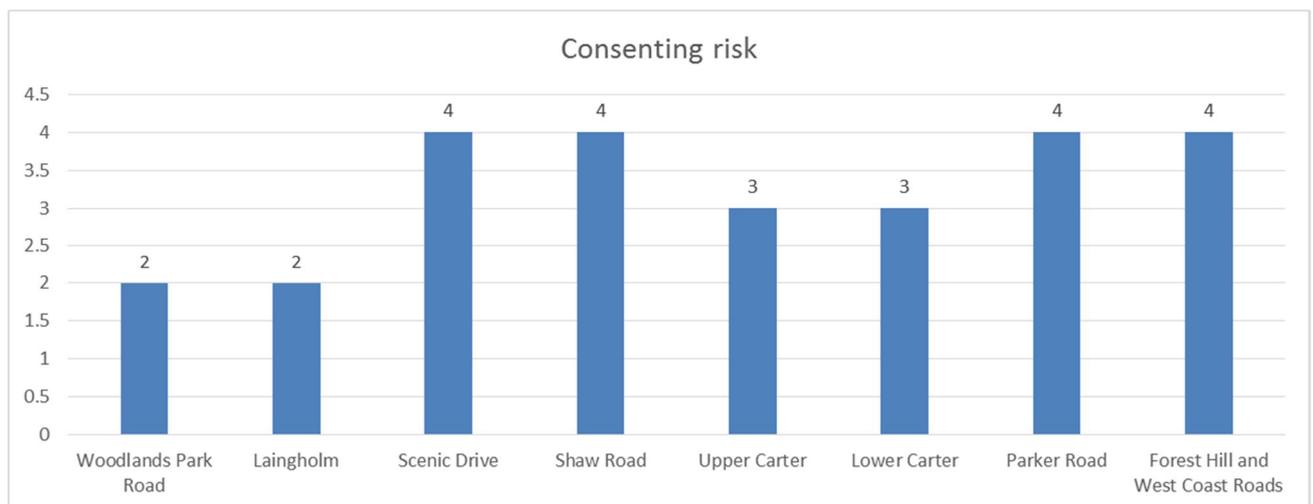


Figure 5.5: Consenting risk scores for both WTP & reservoir sites and ancillary structures.

No schemes score a 5 or a 1 i.e. none are considered completely unconsentable at this stage. However, no schemes are considered straightforward to consent and some face significant hurdles.

Access to the Shaw Road Scheme is likely to impact on intact vegetation on the western side of this site. Therefore, while Shaw Road has scored reasonably well at this long list stage, with further detailed assessment this score could reduce given potential impacts on ecological and landscape values. This would mean that all sites except Woodlands Park and Laingholm would score '3' i.e. moderate planning risk.

Woodlands Park Road is scored '2'. This site is owned by Watercare and is designated, but is considered a high planning risk due to the requirement to obtain resource consent to clear a significant area of vegetation and the ecological, landscape and social impacts associated with this.

Laingholm also scores '2'. The establishment of a new WTP at this site is likely to be very contentious due to the visible nature of the site, its use for public recreation, along with nearby sensitive land uses (kindergarten).

## 5.5 Cost analysis

Watercare's obligations to deliver water and wastewater services for Auckland are set out in Section 57(1) of the Local Government (Auckland Council) Act 2009 (LG (AC) Act which stipulates that an Auckland water organisation:

*Must manage its operations efficiently with a view to keeping the overall costs of water supply and wastewater services to its customers (collectively) at the minimum levels consistent with the effective conduct of its undertakings and the maintenance of the long-term integrity of its assets;*

The construction and operational cost of each option is therefore a key factor when considering alternative sites.

Cost information has been prepared by Beca (refer Appendix C of the Long-list Option Development Report). Along with capital expenditure, the 50 year Net Present Value (NPV) has been calculated for each scheme to capture ongoing operational expenditure and benefits, including replacement of or significant maintenance of the existing treated water aqueduct in the future.

Figure 5.6 below shows costs and 50 year NPV for each scheme. It is relevant to note that the capital cost for Laingholm incorporates a risk allowance for 50% of excavated fill to be disposed of to landfill, as it is uncertain what type of fill is present at the site. If this assumption is relaxed to 20% of fill disposed of to landfill, the construction costs drop by approximately \$30 million.

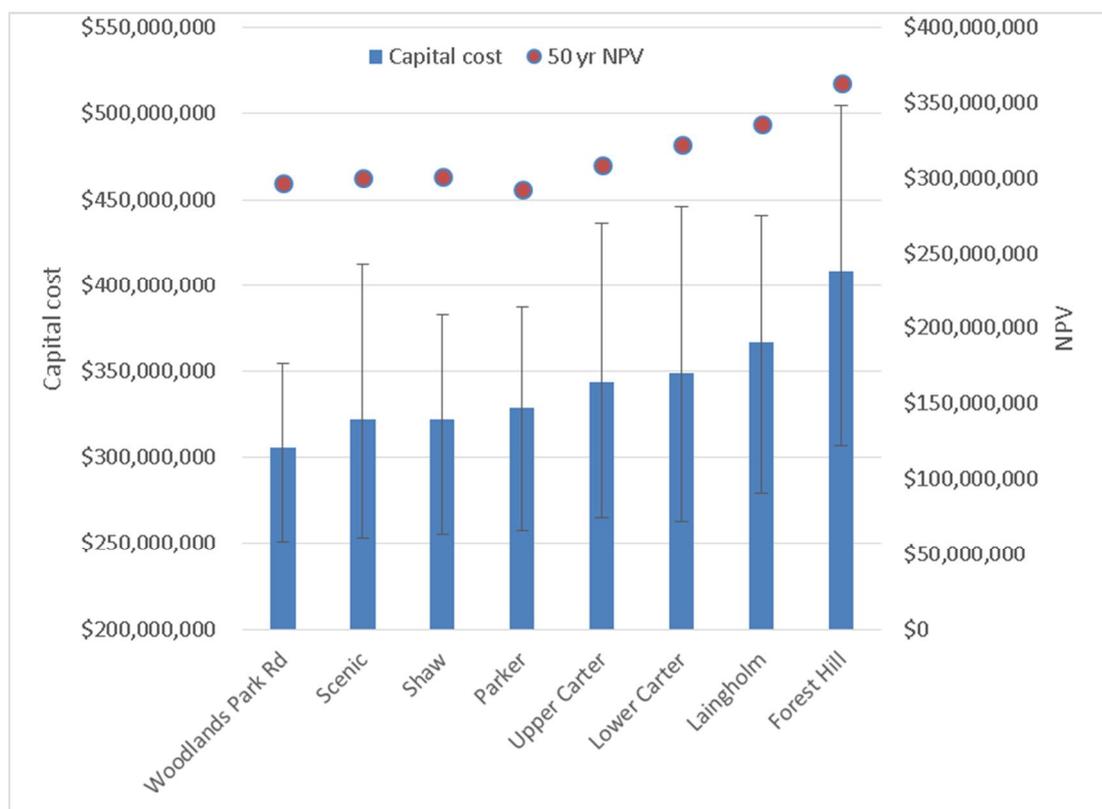


Figure 5.6: Scheme capital cost estimate and 50 year NPV comparison, from Figure 1, refer Appendix C of the Long-list Option Development Report. Note the brackets indicate the price range between the lower and upper capital cost estimates, with the blue bars showing the expected capital costs.

## 5.6 Weighting and sensitivity analysis

Sensitivity analysis of the above outcomes has been undertaken by applying weightings that bias scoring in predetermined areas. This includes weightings based on:

- Watercare project team '1000Minds' weighting: output from decision-making software which assists prioritisation and group decisions making. See Appendix F for full output details;
- Section 6 of the Resource Management Act 1991: weighting based on Section 6 Matters of National Importance. For this MCA analysis, criteria relevant to s6 RMA have been weighted at twice the importance of all other criteria. These include heritage and archaeology, Mana Whenua values, terrestrial ecology, freshwater ecology and landscape and visual impacts;
- Local Government Act: weighting based on s57 of the LG (AC) Act 2009 which outlines the obligations of the Auckland water organisation (i.e. Watercare) to "*manage its operations efficiently with a view to keeping the overall costs of water supply and waste-water services to its customers (collectively) at the minimum levels consistent with the effective conduct of its undertakings and the maintenance of the long-term integrity of its assets*" and to "*have regard for public safety (for example, the safety of children in urban areas) in relation to its structures*". For this MCA analysis, criteria relevant to s57 of the LG (AC) Act 2009 have been weighted at twice the importance of all other criteria. These include all engineering criteria (which have direct cost and efficiency implications).

Table 5.10 compares each weighting with the original non-weighted ranking.

Table 5.10: Weighting comparison (changes from non-weighted ranking in bold)

Scheme	Non-weighted ranking	1000 Minds weighting	RMA s6 weighting	LGA weighting
Woodlands Park Road	2	2	5	2
Laingholm	3	3	3	3
Scenic Drive	7	7	7	6
Shaw Road	4	4	2	4
Upper Carter	8	8	8	7
Lower Carter	5	5	3	5
Parker Road	1	1	1	1
Forest Hill	6	6	6	7

The 1000 Minds weighting and LGA weighting do not change the ranking significantly, with some movement in the bottom half of the table.

When the s6 RMA weighting is applied, Woodlands Park Road drops to 5<sup>th</sup> and Lower Carter (Carter 7) rises to 3<sup>rd</sup> equal. This is likely due to the terrestrial and freshwater ecology issues at Woodlands Park Road, and the relative absence of these at Lower Carter. It is noted that if the landscape and consenting risk scores for Shaw Road are reduced to take into account likely impacts associated with access to this site, its RMA ranking drops to 4<sup>th</sup> with Woodlands Park Road, with Parker Road remaining in 1<sup>st</sup> place, and Laingholm and Lower Carter ranked 2<sup>nd</sup> equal.

In addition, in order to compare the MCA scores with the costs, we have divided the cost by both the non-weighted and weighted scores, and compared ranking of schemes as shown in Table 5.11 below. In general, the rankings have stayed reasonably similar to the ranking generated by the non-weighted MCA scores.

Table 5.11: Scores compared to cost

Scheme	Non-weighted ranking	Cost/ non-weighted score	Cost / weighted score (1000 Minds)	Cost / weighted score (s6 RMA)	Cost / weighted score (LGA)
Woodlands Park Road	2	2	2	3	2
Laingholm	3	7	7	7	5
Scenic Drive	7	4	4	5	4
Shaw Road	4	3	3	2	3
Upper Carter	8	6	6	6	7
Lower Carter	5	5	5	4	6
Parker Road	1	1	1	1	1
Forest Hill and West Coast Roads	6	8	8	8	8

## 6 Discussion and key conclusions

### 6.1 Parker Road Scheme

Having reviewed the ranking of the schemes based on non-weighted scores, weighted scores and taking cost into consideration, the Parker Road Scheme consistently ranks as the highest scoring scheme at this stage and should be taken through to the short listing stage for further investigation and analysis.

The site is large, with two alternative WTP locations within the site, and it is located at a very good elevation. The scheme scores well across all engineering-related criteria as well as non-engineering/environmental related criteria. No significant hurdles or particular limitations have been identified in terms of the environmental, social and cultural criteria at this stage of the evaluation process, although we note a new WTP at this location is likely to cause disruption to the local community. In terms of the engineering-related criteria, the requirement for a long curved section of tunnel will require further scrutiny in the shortlisting process.

The design and site layout(s) of a new WTP within the broader Parker Road scheme will also be reviewed and optimised through the shortlisting process. As well as providing for the engineering related requirements and operability considerations, this will include measures to minimise and/or mitigate effects on the environment through site design and layout.

### 6.2 Woodlands Park Road Scheme

Woodlands Park Road is generally the 2<sup>nd</sup> ranked scheme.

Woodlands Park Road scores poorly in terms of environmental considerations, but reasonably well on engineering-related matters. The presence of a Significant Ecological Area across most of the WTP and reservoir sites constitutes a significant hurdle from a consenting perspective and also means the social impacts are potentially high. Additionally, there will be a requirement for biodiversity off-set mitigation associated with vegetation removal which has not been assessed or costed at this stage. This is of particular relevance to the Woodlands Park Road site but will also apply more broadly to the removal of indigenous vegetation at any of the sites.

The site scores reasonably well from an engineering perspective as it is located at a good elevation and in close proximity to the existing Huia WTP, meaning there are good connections to the existing water supply network. Moreover, the site is owned by Watercare and designated for water supply purposes, and is located immediately adjacent to the existing Huia WTP which provides an established baseline in terms of the operation of a WTP at this location.

For these reasons, the Woodlands Park Road scheme scores well overall. On this basis it should be taken through to the short listing stage for further investigation and analysis. As for the Parker Road scheme, the design and site layout of a new WTP at this location will be reviewed and optimised through the shortlisting process. This will take into consideration operability and other engineering related requirements, along with measures to minimise and/or mitigate effects on the environment.

### 6.3 Laingholm and Shaw Road Schemes

The Laingholm and Shaw Road schemes consistently rank in the top half of the table and the MCA does not clearly differentiate which is the better of these two options.

Laingholm ranks well from an operational perspective as it is a large site with good access. It also offers a short raw water connection to the existing network at Mackies Rest. However the low elevation of the site means the reservoirs need to be located remotely (in the same location as the Woodlands Park Road scheme) and a significant treated water lift (pumping) is required. While the

site is not identified on Auckland Council's historical landfills database, the fact it is such a large flat area within the Waitakere Ranges suggests there is likely to be at least some fill on the site. It is also the worst ranking site from a landscape perspective and is likely to have relatively high social impacts and high consenting risk being located on and adjoining community facilities (pony club and sportsgrounds) and within a residential area.

Shaw Road by comparison scores better from an environmental and social perspective but carries significant constraints from an engineering perspective. This is particularly due to access which would require widening of Shaw Road and a bridge from Shaw Road to the site through an established area of vegetation. While this was not assessed in the non-cost attributes of the MCA (i.e. the environmental, cultural, social etc criteria), it was factored into the cost estimates. Topography also has the potential to pose a significant challenge at the Shaw Road site.

#### 6.4 Lower Carter Scheme

The Lower Carter scheme generally ranks in the middle relative to other schemes. It scores well for constructability, access and ecological criteria, being the reasons that it was included within the preliminary long-list in the first place. However, the scheme has significant operational issues associated with it due to its low elevation. In particular this means the reservoirs need to be located off-site in the same location as the visually prominent Upper Carter scheme. This would require dual pipes to be laid within Carter Road up to the reservoir site and then back down again. These pipes have a likely diameter of approximately 1.2m meaning they would take up most of the road space and cause significant disruption during their installation. The relatively long pipeline lengths, particularly the raw water connection, also mean greater capital cost and ongoing operational risk and cost (see the Long-list Option Development Report).

#### 6.5 Scenic Drive, Upper Carter and Forest Hill Schemes

The Scenic Drive scheme has very poor access. A bylaw restricts heavy traffic along the eastern part of Scenic Drive. While alternative access is potentially available, this access is along residential cul-de-sacs. Overall, the scheme consistently scores in the bottom half of the rankings.

The Upper Carter scheme is a constrained site and has a very limited area available at a high enough elevation to construct reservoirs (this area is restricted to the knoll immediately adjoining Parkin Road). The reservoirs will be visually prominent, located on a high point immediately adjacent to the road, and the footprint of the WTP encroaches into an SEA. As most of the site is at a low elevation, there is a loss of system hydraulic efficiency due to the need to gravitate to below the hydraulic grade line (HGL) and then pump back upslope. Overall, this scheme is consistently scoring in the bottom half of the rankings.

In terms of the site principles, the Forest Hill scheme is located on the edge of the 'proximity principle' but was initially thought to have some advantages due to its proximity to the Waitakere Dam. However, a more detailed costing has demonstrated that the Forest Hill scheme has no advantage over any other scheme in this respect. In addition, due to its remoteness from connecting infrastructure it would have significantly higher capital costs and high operational costs relative to all of the other schemes.

The Scenic Drive, Upper Carter and Forest Hill schemes do not rank in the top half of the sites even with multiple different weightings applied. Therefore, these three schemes are not recommended to proceed through to the shortlisting stage.

## 6.6 Watercare resolution

On the basis of the investigations and assessment completed to date, Watercare has determined that it will take the top two schemes through into the detailed shortlisting stage, being Parker Road and Woodlands Park Road.

Watercare will also further investigate the option of rebuilding on the existing Huia WTP site. This includes identifying other works in the wider network that would be required to facilitate taking the WTP out of service for an extended period, and determining whether in fact this is feasible from a water supply and network resilience perspective.

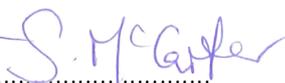
## 7 Applicability

This report has been prepared for the exclusive use of our client Watercare Services Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

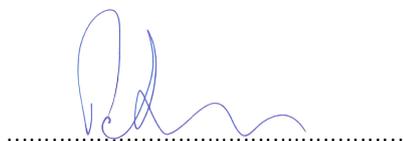
Tonkin & Taylor Ltd

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Peter Roan  
Project Director

SCM / KLB

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Appendix A: Minutes: Longlist site visit

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# Minutes

<b>Meeting:</b>	<b>Huia Water Treatment Plant and longlisted replacement sites</b>		
<b>Venue:</b>	<b>Waitakere Ranges and surrounds</b>	<b>Date:</b>	<b>15 December 2015</b>
<b>Job No:</b>	<b>30848</b>	<b>Time:</b>	<b>9am - 4pm</b>
<b>Present:</b>	<b>Watercare: Alastair Stewart, Tom Surrey, Carl Tucker, Tuan Hawke, Rob Fisher, Andy ?, Simon Greening; GHD: Mike Muntasov, Christian Gamst; Beca: John Wardle, Jack Brennan</b>		

The purpose of the site visit was to assess the longlisted sites for the Huia Water Treatment Plant (WTP) replacement in the context of the surrounding areas, to check if there were any fatal flaws and to rationalise the long list where possible prior to undertaken a multi-criteria assessment on each potential site. A potential pump station site on the corner of Exhibition and Shaw Road was also visited.

An information pack was compiled for the site visit containing high level information for each site, including:

- Preliminary overview of the locations and pipeline routes for a Huia WTP replacement;
- Proposed assessment criteria;
- Preliminary site layouts for each site;
- Indicative pipeline routes;
- Proposed Auckland Unitary Plan (PAUP) zoning and overlays for each site;
- Notes pages.

The information is preliminary only, and designed to give a high level picture of how the WTP and associated infrastructure could be situated on each site. Similarly, the PAUP is subject to change, and is provided for indicative planning purposes only.

The following tables summarise notes taken by the wider group for each longlisted site, including general notes, any fatal flaws associated with the site and with reference to the proposed multi-criteria assessment criteria. The sites are listed in the following order:

1. Pump station
2. Woodlands Park 1-3
3. Laingholm 1
4. Scenic Drive 3-5
5. Shaw Road 1
6. Carter Road 1, 4, 5, 7
7. Cochran Road 1, 3
8. Parker Road 3, 4
9. West Coast Road 1, 2
10. Forest Hill Road 1, 3, 5

1. Pump station	
General notes	This is located on the corner of Exhibition and Shaw Road (233 Shaw Road)
Fatal flaws?	
Site principles	N/A (pump station site)
Engineering feasibility and constructability	Could also be a construction site for shaft for tunnelling (most options have this requirement). The alternative is keeping the pump station on the existing site, but this particular location is ideal for most of the sites.
Operability	N/A
Cost considerations	N/A
Heritage and archaeology	"The Horse Paddock and McKenzie's Camp" (not scheduled) – cleared for paddock for draught horses associated with Exhibition Drive tramway, 1910s.
Mana Whenua values	Site R11/417 (Burial Cave) recorded on adjoining property – to west of site, above 163/165 Woodlands Park Road.
Terrestrial Ecology	Cleared grassed area.
Freshwater ecology	N/A
Landscape and visual effects	Views out over Laingholm 1 site – reasonably well buffered from residential dwellings.
Social and community impacts - construction	Well used track over aqueduct and appears to be well utilised seat looking over Laingholm in cleared area.
Social and community impacts - operation	Noise from pump station??
Consenting risk	Designated for Water Supply Purposes and Regional Park Outside RUB in notified PAUP Overlays: ONL, SEA Public Open Space – Conservation zone
Property risk	One lot, owned by Watercare. Therefore very low / no property risk.
	

2.	Woodlands Park 2 (existing site)	Woodlands Park 3 (Manuka Road site)	Woodlands Park 1
General notes	This is the existing site.	Cannot fit both the reservoirs and WTP on this site. Either reservoirs could be located on the north-eastern part of the site (as shown in the preliminary GHD plan) or the WTP could be located as per the MWH plans dated 2013, with the reservoirs located on Woodlands Park 3 site.	Across the road from the existing site. Site doesn't fit both reservoirs and WTP – either WTP located on this site and reservoirs on Woodlands Park 1, or vice versa. Existing backwash tank is located on the eastern side of the site.
Fatal flaws?			
Site principles	The current site would fail the principles for double pumping and maintaining supply	This is the Manuka Road site but would need a separate reservoir site	
Engineering feasibility and constructability	Connection at the end of the treated water aqueduct and then to the current WMNH2 route Unclear how you would decommission and replace the existing WTP while maintaining supply – would you need to increase the Waikato take prior to the upgrade?	Connection at the end of the treated water aqueduct and then to the current WMNH2 route Two accessways possible	Connection at the end of the treated water aqueduct and then to the current WMNH2 route
Operability		Two accessways possible	
Cost considerations			
Heritage and archaeology	Scheduled interior/filter station/tanks. No recorded archaeological sites on ArchSite.	No recorded sites in PAUP or ArchSite.	No recorded archaeological sites on ArchSite or scheduled heritage sites.
Mana Whenua values	No recorded Sites of Significance to Mana Whenua.	No recorded Sites of Significance to Mana Whenua.	No recorded Sites of Significance to Mana Whenua.
Terrestrial Ecology	Areas of established bush are covered by an SEA overlay (the existing WTP has been excluded from the overlay). T+T undertook terrestrial ecology study on this site, dated October 2012 – areas of established bush are of high ecological significance.	Scrubby area on central/northern side. Southern, steeper area of bush more established T+T undertook terrestrial ecology study on this site, dated October 2012 – southern part of the site has high ecological significance. The rest is not significant or low-medium significant.	Most of the site covered by an SEA overlay. Some flat scrubby area on the road side. T+T undertook terrestrial ecology study on this site, dated October 2012. The south-western corner and bush next to the backwash tank are of high ecological significance. These areas would be affected by the WTP and the reservoirs if located as per the preliminary plans.
Freshwater ecology	Overland flow path modified and used as discharge point.	Overland flow path in middle of site.	Overland flow path modified and used as discharge point.
Landscape and visual effects	Existing	Check viewshafts of houses on Tawini Road, which may overlook the site. Outstanding Natural Landscape (ONL) on south-eastern corner of site, Ridgeline Protection on eastern boundary	Check viewshafts – but neighbours on Tawini Road may be high enough that structures on the ground below would not affect them. Also could use 'existing environment' argument as look towards existing plant.
Social and community impacts - construction	Nearest dwellings not visible from site.	Houses reasonably nearby to the south, below brow of hill.	Nearest dwellings located above site on Tawini Road, not visible when standing on the site.
Social and community impacts - operation	Existing	Reservoirs/WTP likely to be located over the other side of ridge from nearest houses – check.	
Consenting risk	Within RUB in notified PAUP Overlays: Stormwater Management Area Flow (SMAF) 1, Significant Ecological Area (SEA), Designation 9322, Waitakere Ranges Heritage Area sub-precinct C, Heritage Site Public Open Space – Conservation zone Lowest consenting risk overall as redevelopment of existing site.	Within Rural Urban Boundary (RUB) in notified PAUP Overlays: Stormwater Management Area Flow (SMAF) 1, scheduled tree, Significant Ecological Area (SEA), Designation 9322, ONL, Ridgeline Protection, Waitakere Ranges Heritage Area sub-precinct C Public Open Space – Conservation zone	Within RUB in notified PAUP Overlays: Stormwater Management Area Flow (SMAF) 1, Significant Ecological Area (SEA), Designation 9324, Waitakere Ranges Heritage Area sub-precinct C, Ridgeline protection, Public Open Space – Conservation zone
Property risk	Owned by Watercare	Owned by Watercare	Owned by Watercare

3. Laingholm 1	
General notes	Owens Reserve. Large flat site. Soccer fields on upper tier drops off to flatish-rolling pasture on lower level. For visual reasons would likely seek to locate on this lower tier. Much more visible on upper tier – soccer fields.
Fatal flaws?	
Site principles	
Engineering feasibility and constructability	Very flat site. <i>Post meeting note: The site is not marked as a closed landfill. Further investigation of site required.</i>
Operability	Closer to dams but would need to pump up to Manuka Road
Cost considerations	
Heritage and archaeology	One recorded site R11/1993 “Homestead; no standing remains apparent. An historic midden (with pottery fragments) has been noted here eroding out of the slope on the southern side of the Pony club area.”
Mana Whenua values	No recorded sites.
Terrestrial Ecology	SEA overlay over small stream (intermittent?) and north-western corner.
Freshwater ecology	SEA overlay over small stream (intermittent?)
Landscape and visual effects	Western area is flat, with a drop off on the eastern part of the site. View out to the harbour looking east. Surrounded by residential housing with direct views on to the site (zoning is (“Large Lot”). Locating the WTP on the eastern end of the site may mean that it can’t be viewed looking west, but will still be visible to properties to south and possible up the ridge to the north. ONL on eastern half of site (where WTP located on preliminary plans).
Social and community impacts - construction	Residential dwellings reasonably nearby. Kindergarten located on western side next to carpark, Pony Club located at eastern end.
Social and community impacts - operation	Use of public land currently used for public recreation and sensitive land uses (kindergarten).
Consenting risk	Within the RUB. Overlays: ONL, SEA, SMAF 1 Public Open Space – Sport and Active Recreation zone.
Property risk	One parcel of land. Owned by Auckland Council. High.

4.	Scenic 3	Scenic 4	Scenic 5
General notes	Looked at site from 141 Scenic Drive. Generally large area of rolling pasture across all the Scenic sites. Could be appropriate to combine part of this site with Scenic 5 as the western lot of this site Pt Lot 1 DP 7428 is the same as Scenic 5.	Access at Gordon's Nursery driveway – did not fully enter site. Orchard area visible from long driveway. Generally large area of rolling pasture across all the Scenic sites.	Did not stop at site. Generally large area of rolling pasture across all the Scenic sites.  See note on Scenic 3 – located on Pt Lot 1 DP 7428 also crosses over into Scenic 3
Fatal flaws?			
Site principles	A bit high		
Engineering feasibility and constructability	Heavy vehicle traffic is not allowed along a section of Scenic Drive, between Woodlands Park Road and Shaw Road. This is because it's really windy and heavy vehicles get stuck. <i>Post meeting note:</i> <i>This restriction was in effect under the Waitakere CC Use of Roads and Parking Bylaw 2010. This has been revoked and replaced by the Auckland Transport Traffic Bylaw 2012, to the extent that it applied to any roads under the care, control or management of Auckland Transport. A high level review of the 2012 Bylaw has not revealed any specific restrictions in this area however, discussions with Auckland Transport would be prudent.</i>	Connection to either point on the raw water aqueduct via tunnels Same as Scenic 3	Connection to either point on the raw water aqueduct via tunnels Same as Scenic 3
Operability		Sightlines from access not great – chemical deliveries could be a health and safety issue.	
Cost considerations			
Heritage and archaeology	No recorded sites	No recorded sites.	No recorded sites.
Mana Whenua values	No recorded sites.	No recorded sites.	No recorded sites.
Terrestrial Ecology	SEA overlay over much of the larger site (Pt Lot 1 DP 7428)	SEA overlay western side of the site	SEA overlay over much of the site
Freshwater ecology	Natural Stream Management Area through eastern lot (Pt Lot 1 DP 7428)	Natural Stream Management Area through western side of the site.	Natural Stream Management Area
Landscape and visual effects	Ridge Protection overlay	Ridgeline protection on eastern side. Good buffer area. No ONL overlay.	Ridgeline protection
Social and community impacts - construction	Low density housing on road front	A number of small residential dwellings along roadside. Rural use behind these residential dwellings.	
Social and community impacts - operation			
Consenting risk	Outside RUB Overlays: Ridgeline Protection, Waitakere Ranges Heritage Area sub-precinct A, SEA, Natural Stream Management Area, Countryside Living zone Low (relative to other sites)	Outside RUB Overlays: Ridgeline Protection, Waitakere Ranges Heritage Area sub-precinct A, SEA, Natural Stream Management Area, Countryside Living zone Low (relative to other sites)	Outside RUB Overlays: Ridgeline Protection, Waitakere Ranges Heritage Area sub-precinct A, SEA, Natural Stream Management Area, Countryside Living zone Low (relative to other sites)
Property risk	Three lots, three private owners – some crossover between both Scenic 4 and Scenic 5 in terms of ownership. Larger lot is Pt Lot 1 DP 7428. Western part of site also part of Gordons. Watercare owns Lot 4 DP 156565 Low (relative to other sites)	Five parcels, two owners (potentially same Gordons orchard/nursery operation?) Low (relative to other sites)	One lot – same as Scenic 3 (Pt Lot 1 DP 7428) Watercare owns Lot 4 DP 156565 Low (relative to other sites)

5. Shaw 1	
General notes	Site could fit both reservoir and WTP.
Fatal flaws?	
Site principles	
Engineering feasibility and constructability	Shaw Road is really windy and narrow. Short tunnelling length to pump station at McKenzie's Camp. Connection at junction of Shaw and Exhibition Drive, tunnel to Shaw/Carter
Operability	
Cost considerations	
Heritage and archaeology	No recorded sites. Nearest recorded site R11/1456 on opposite site of Shaw Road, remains of Shaw timber mill.
Mana Whenua values	No recorded sites
Terrestrial Ecology	Small area of SEA on western side of site
Freshwater ecology	Nearby Natural Stream Management Area (not on site)
Landscape and visual effects	Small area of ridgeline protection on western properties
Social and community impacts - construction	Established rural residential area – long-term investment in personal assets (e.g. swimming pools)
Social and community impacts - operation	
Consenting risk	Countryside Living zone Overlays: Waitakere Ranges Heritage Area sub-precinct A, Ridgeline Protection,
Property risk	19 properties. Medium-high risk simply by virtue of number of properties.

6.	Carter 1	Carter 4	Carter 5	Carter 7
General notes	Split across Carter Road	Hard to see from road Could be appropriate to combine with Carter 5 as it's quite a tight site and combining with Carter 5 could get a better engineering outcome.	Hard to see from road See Carter 4 note.	Very large site – runs between Shaw Road and Carter Road.
Fatal flaws?				
Site principles				Large flattish area, largely cleared
Engineering feasibility and constructability	Reservoirs from Carter 7	High enough for reservoirs The hydraulics of site 4 restrict the site footprint- could be combined with site 5	Connection at junction of Shaw and Exhibition Drive, tunnel to Shaw/Carter	Access is good. Needs two large water mains running up Carter Road. Carter 7 requires a separate reservoir site- currently assumed to be Carter 1
Operability	Reservoirs are borderline (the same level as Titirangi). Could put them on Shaw 1 but then three main pipes would run up the main road – may not be able to fit these. The raw water main would run down most of Carter Road.			
Cost considerations				
Heritage and archaeology	No recorded sites	No recorded sites	No recorded sites	No recorded sites – when you look at the wider area, there are a number of heritage overlays – potentially associated with kauri timber industry?
Mana Whenua values	No recorded sites			
Terrestrial Ecology	Patches of SEA	Large patches of SEA – kauri trees visible	Patches of SEA	
Freshwater ecology	No Natural Stream Management Areas on site	Stream adjoins eastern corner	Nearest stream to north-west of site (Natural Stream Management Area)	One stream running through site – not classified as a Natural Stream Management Area
Landscape and visual effects	ONL on western side of site		ONL on western side of site (same ONL as Carter 1)	
Social and community impacts - construction	Rural residential subdivision immediately across the road	Orchard/clear space down driveway – behind new rural-residential subdivision	Low density residential houses	Large lots – largely rural rather than rural-residential School north of site (on corner of Shaw and West Coast Roads)
Social and community impacts - operation				
Consenting risk	Outside RUB Countryside living Overlays: SEA, ONL, Waitakere Ranges Heritage Area sub-precinct A	Outside RUB Countryside living Overlays: SEA, Waitakere Ranges Heritage Area sub-precinct A	Outside RUB Countryside living Overlays: SEA, ONL, Waitakere Ranges Heritage Area sub-precinct A	Outside RUB Countryside living Overlays: Waitakere Ranges Heritage Area sub-precinct A
Property risk	12 lots	12? lots	7 lots	17 lots – but WTP won't affect all sites Property values likely to be cheaper – multiple properties but these appear larger than e.g. Shaw 1

7.	Cochran 1	Cochran 3
General notes		Site down behind Cochran Glade?? Quite small
Fatal flaws?	Yes	Yes - access to Cochran 3 is unsuitable and this also needs a tunnelled treated water
Site principles		
Engineering feasibility and constructability	Located down a dead end road – access bad for both construction and operation Turn off from Carter Road is very difficult	Formed road ends halfway down site and turns into a paper road/walkway
Operability		
Cost considerations		
Heritage and archaeology	No recorded sites	No recorded sites
Mana Whenua values	No recorded sites	No recorded sites
Terrestrial Ecology	SEA associated with stream area. Some mature vegetation.	Most of site covered with SEA overlay
Freshwater ecology	Natural Stream Management Area on western boundary	Natural Stream Management Area on western boundary
Landscape and visual effects	ONL associated with stream and bush area. Hard to see from road – reasonable buffer.	ONL associated with stream area. Hard to see from road – reasonable buffer.
Social and community impacts - construction	Low density residential – reasonably high asset investment	New subdivision
Social and community impacts - operation		Paper road used as a walkway
Consenting risk	Outside RUB Countryside living Overlays: SEA, ONL, Waitakere Ranges Heritage Area sub-precinct A	Outside RUB Countryside living Overlays: SEA, ONL, Waitakere Ranges Heritage Area sub-precinct A
Property risk	12 lots – WTP and reservoirs likely to affect most of these sites	11 sites - WTP and reservoirs likely to affect most of these sites

8.	Parker 3	Parker 4
General notes		
Fatal flaws?		
Site principles		
Engineering feasibility and constructability	Tunnel to Carter from Shaw Road/Exhibition drive, Paper Roads to Parker Large site, two potential locations for WTP including reservoirs. The site closer to Parker Rd is more favourable hydraulically and for access Reasonably good access – wide road but dead end.	Tunnel to Carter from Shaw Road/Exhibition drive, Paper Roads to Parker Parker Track follows paper road to Scenic Drive Topography requires a short section of treated water tunnel.
Operability		
Cost considerations		
Heritage and archaeology	One scheduled heritage site – Theets Cottage at 132 Parker Road. Potentially affected by preliminary layout (northern option)	No recorded site
Mana Whenua values	No recorded site	No recorded site
Terrestrial Ecology	SEA associated with stream on western side of site	WTP is currently shown mostly on vegetated area – mostly kanuka scrub
Freshwater ecology	Natural Stream Management Area on western side of site	
Landscape and visual effects	Ridge Protection along Parker Road	Not many viewers
Social and community impacts - construction	Reasonably sized dwellings, new ish subdivision (northern area is currently being built on for residential dwellings).	Reasonable number of houses along road, with some clear patches – around 190 Parker Road there is one older house and another nearby (underneath 'ozone' on site map).
Social and community impacts - operation		
Consenting risk	Outside RUB Countryside living Overlays: SEA, Ridge Protection, Waitakere Ranges Heritage Area sub-precinct A, Heritage, Natural Stream Management Area	Outside RUB Countryside living Overlays: SEA, Ridge Protection, Waitakere Ranges Heritage Area sub-precinct A & B
Property risk	Mixture of small lots and reasonably large ones – WTP would affect at least 8	6 lots, paper road immediately north of site

9.	West Coast 1	West Coast 2
General notes	Can't see from the road.	Bamboo currently screens the site and it's difficult to view from the road.
Fatal flaws?	Yes – due to access and hydraulics issues. Access to this site is unsuitable and the hydraulics would require major tunnelling	
Site principles		Quite steep
Engineering feasibility and constructability	Access and hydraulics are major issues.	Pumped raw water to the end of Shaw and then back uphill to Forest Hill or along West Coast Road Site requires a second tunnelled section under high points close to the site
Cost considerations		
Operability		
Heritage and archaeology		
Mana Whenua values		
Terrestrial Ecology		SEA
Freshwater ecology		Natural Stream Management Area along western side
Landscape and visual effects		ONL
Social and community impacts - construction		Lots of properties in proximity – reasonably dense residential use along road front opposite site.
Social and community impacts - operation		
Consenting risk	Rural conservation zone	Rural conversation zone Overlays: SEA, Natural Stream Management Area, ONL, Waitakere Ranges Heritage Area sub-precinct A & B
Property risk		WTP could affect approximately 10 properties

10.	Forest Hill 1	Forest Hill 3	Forest Hill 5
General notes			Can't see from the road – behind houses.
Fatal flaws?	Questionable whether this should be developed from an engineering perspective given that it is similar but further away from the road from Forest Hill 3, which would still need to be used for access and the reservoirs. However, this site is much less complex in terms of planning overlays and property risk when compared to Forest Hill 3.		
Site principles	Site requires a second tunnelled section under high points close to the site	Site requires a second tunnelled section under high points close to the site	Site requires a second tunnelled section under high points close to the site
Engineering feasibility and constructability	Raw water to the end of Shaw and then back uphill to Forest Hill or along West Coast Road  Pumped treated water  1 km away from the road Open, but not that flat (“rolling”) Would need to put reservoirs on Forest Hill 3 Long pipeline	Pumped raw water to the end of Shaw and then back uphill to Forest Hill or along West Coast Road  Likely to be an expensive option as the pipeline would have to travel a long distance – raw water main goes a long distance, and then the treated water main would be tunnelled twice. However, it's about 5km from the Waitakere Treatment Plant which is closer than any other sites.	Pumped raw water to the end of Shaw and then back uphill to Forest Hill or along West Coast Road  Reasonably tight site
Operability			
Cost considerations			
Heritage and archaeology	No recorded sites	Near a scheduled site – “Plaque” PAUP site 151	No recorded sites
Mana Whenua values	No recorded sites	No recorded sites	No recorded sites
Terrestrial Ecology	No overlays	SEA	SEA covers most of the site
Freshwater ecology	No overlays	Natural Stream Management Area – stream bounds eastern side of site	Natural Stream Management Area – stream runs through northern part of site
Landscape and visual effects	ONL just grazes the property boundary, doesn't affect potential WTP site	ONL over large amounts of the site Forest Hill Road has a Ridge Protection Overlay which affects the western side of the site.	ONL covers large amounts of the site One scheduled tree immediately north of the site
Social and community impacts - construction	Rural use	Rural residential subdivision	Residential housing at front of site.
Social and community impacts - operation			
Consenting risk	Countryside living zone Overlays: Waitakere Ranges Heritage Area sub-precinct A	Countryside living zone and Public Open Space - Conservation Overlays: Waitakere Ranges Heritage Area sub-precinct A, ONL, Ridge Protection, SEA, Natural Stream Management Area	Rural conservation zone Overlays: Waitakere Ranges Heritage Area sub-precinct B, ONL, Ridge Protection, SEA, Natural Stream Management Area
Property risk	One lot	8 lots, approximately half affected	13 lots, likely about 10 affected

Appendix B: Subject matter expert briefing  
material

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## Appendix C: Scoring of MCA criteria

Basis	Criteria	Criteria description and approach to scoring
Engineering	1. Key site characteristics	Fit with project objectives and principles. Level of service / efficiency and effectiveness (incl. minimise pumping + distance btw WTP and reservoirs, pipes in public roads, accessibility, etc).  Scoring of site undertaken by Engineering Specialist (Beca).
	2. Engineering feasibility and constructability	Physical constraints such as volume/extent of earthworks, slope, access, constructability, ability to locate reservoirs and attenuation ponds on site, potential buffer spaces general degree of difficulty.  Scoring of site undertaken by Engineering Specialist (GHD) with ancillary infrastructure scoring undertaken by Engineering Specialist (Beca).
	3. Access	Degree of difficulty relating to access for construction and operational traffic incl. distance to the arterial or main road, nature of the main access route, whether back-up secondary access is available.  Scoring of site undertaken by Traffic Engineer (Beca).
	4. Operability	Degree of difficulty relating to general operability, linkages to existing services and utilities, options for off-spec and contingency discharges, access.  Scoring of site and ancillary infrastructure undertaken by Operations Specialist (Watercare)
Cultural	5. Heritage and archaeology	Desktop assessment of effects on archaeological and heritage sites and features based on existing Auckland Council plan provisions and Cultural Heritage Inventory, and Heritage New Zealand archaeological records. Note: All sites will receive the same score unless a particular site or value already recorded for site.  Scoring of site undertaken by Planner (T+T).
	6. Mana Whenua values	Watercare to consult with Mana Whenua through Kaitiaki forum. Desktop assessment of effects on particular sites of significance as well as on customary resources, mauri of waterbodies, wāhi tapu, etc. Note: All sites will receive the same score unless a particular site or value already recorded for site.  Scoring of site undertaken by Planner (T+T).
Environmental	7. Terrestrial Ecology	Adverse impacts on terrestrial ecological values associated with a site, particularly indigenous vegetation which is nationally, regionally or locally significant in terms of habitat values and presence of known species. Desk-top assessment.  Scoring of site and ancillary infrastructure undertaken by an Ecologist (Boffa Miskell).
	8. Freshwater ecology	Adverse impacts on freshwater receiving environments (including from operational discharges and any works within or in proximity to a stream or wetland). Desk-top assessment.  Scoring of site and ancillary infrastructure undertaken by an Ecologist (Boffa Miskell).

Basis	Criteria	Criteria description and approach to scoring
	9. Landscape and visual effects	Adverse construction and operational impacts on visual effects and effects on existing landscape character (including degree of modification), any outstanding landscape and important landscape / natural features; visual and residential amenity. Desk-top assessment.  Scoring of site undertaken by Landscape Architect (Boffa Miskell).
Social	10. Social and community impacts - construction	Construction effects including noise and vibration, traffic, visual amenity, other matters including any particular H&S considerations. Assessment by relevant technical specialists (including acoustic expert, traffic engineer and landscape architect) feed into broad overall judgement which synthesizes these assessment and other matters.  Scoring of site undertaken by Planner (T+T).
	11. Social and community impacts - operation	Operational effects including noise and vibration, traffic, visual amenity, other matters including any particular H&S considerations. Assessment by relevant technical specialists (including acoustic expert, traffic engineer and landscape architect) feed into broad overall judgement which synthesizes these assessment and other matters.  Scoring of site undertaken by Planner (T+T).
	12. Property risk	Number of properties, any particular challenges in terms of property acquisition/degree of difficulty  Scoring of site undertaken Watercare Property Specialist.
Consenting risk	13. Consenting risk	Zoning, plan objectives and policies, major impediments. Desk-top assessment based on existing plan provisions and taking into consideration outcome of subject matter expert assessments.  Scoring of site undertaken by Planner (T+T).
Cost	14. Cost	Refer Beca report re scheme assessments.

## Appendix D: MCA scoring results by scheme

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Woodlands Park Road scheme (Woodlands Park 3)

Criteria	WTP score	Commentary (WTP/reservoirs)	Ancillary score	Commentary (ancillary structures)
Key site characteristics	4	Elevation of site may require 2 stage pumping. Gravity feed through plant to reservoirs. Adequate area. Excellent proximity to existing water supply infrastructure.		
Engineering feasibility and constructability	3	Tight working conditions on site (similar to Carter 1).	5	Good access to raw water connection to aqueduct but restricted working environment. Can use existing raw water connection to Upper Nihotupu. 1.2 km tunnel - short length but alignment and topography risks. Trenched TW pipeline leaving site is challenging due to gully.
Access	3	Speed limit: 70km/hr. Sight distance issues. Fair pavement condition but possible pavement failure, access route alternatives. Possible to maintain traffic flow.		
Operability	4	Limited site footprint, close proximity to other stakeholders. Close to existing raw water, treated water and overflow infrastructure. Other services also available, including connections to local potable water system and sanitary sewer. Site can be approached from two directions. A lot of infrastructure already in place. Access for deliveries etc is reasonable.	4	Close to Raw and Treated Water system. Complicated by raw water pumping. Reservoir site limited, does not readily allow for future development. This option means retaining the aqueduct. Will need to maintain or replace soon.
Heritage and archaeology	4	No recorded heritage or archaeological sites within footprint of proposed plant. The existing Huia WTP and Nihotupu Filter Station are both listed structures and the linkages between these heritage structures and the new WTP should be considered.		
Mana Whenua values	5	No recorded Sites of Significance to Mana Whenua.		
Terrestrial Ecology	1	SEA score 2 (-1): Site is c. 95% SEA; Modified secondary scrub and mature kanuka - (kauri)-(podocarp) forest affected, though patches of rank grass are also present, and possibly could confine footprint to more recent scrub; on-site mitigation options are limited to covenanting/ weed control. Note: TeamView shows slightly different layout and the likely site layout is larger than Sarah initially released. Therefore, scoring confirmed as 1. No avoiding some quite significant vegetation. Most challenging site for this criteria. Other bush/habitat score 4: Small area of broadleaved scrub in recently cleared area; geckos likely to be present throughout but can be passively translocated into the surrounding area.	5	Tunnels beneath bush, otherwise follows road alignment.
Freshwater ecology	2	Warituna Stream headwaters; approximately 70 m of (probably) intermittent stream is likely to be affected; the area is bush covered so on-site mitigation is not possible. Score 3 (-2). Very challenging site for this criteria. In headwaters area. Confirmed as a 2.	5	No watercourses affected
Landscape and visual effects	3	WTP score 3: No landscape overlays. Adjacent to Scenic Drive. Reasonably flat topography (RL 105 to 115). SEA surrounds existing plant, expansion will affect existing vegetation and areas not currently plant have intact vegetation. Visual catchment extends to south similar to that for existing facility. Viewing audience includes proximate houses but heavily vegetated and but majority of proximate houses oriented away (eg Taraire Rd). Is visually well buffered. Houses on Scenic Drive elevated above. Intact vegetation high quality and typical Waitakere character. Reservoirs score 3: Close to Scenic Drive WCC sensitive ridgeline buffer. Topography reasonably flat - low RL130 – 135. Within SEA. Intact bush with existing single reservoir. Visual catchment extends to the south, similar to that of the existing facility. Proximate houses but heavily vegetated and but majority of proximate houses oriented away (e.g. Taraire Rd) Houses on Scenic Drive elevated above. Moderate / high context/quality – Intact vegetation high quality and typical Waitakere character.		
Social and community impacts - construction	3 (2)	Noise score 5: To comply with NZS6803:1999 noise limit of 70dB LAeq would not require significant mitigation. Although construction noise will be audible at neighbouring dwellings, the levels would readily comply with the limit and it is considered that keeping neighbours informed of Project works would be sufficient. Ready compliance with DIN4150-3:1999 would occur - there is a negligible risk of building damage Overall score 4-3 (2): Taking into account noise and vibration effects (minor), visual impact scoring (low-moderate), traffic (access route alternatives and possible to maintain traffic flow), no unusual health and safety issues. Discussion centred on the social impact of removing significant vegetation in this location. Score therefore revised downwards from a 4 to a 3 (and possibly a 2).		
Social and community impacts - operation	3	Noise score 2: To comply with night-time limit of 40dB LAeq would require non-conventional noise mitigation and would therefore be costly. 5 Lots inside 50dB LAeq contour may require acoustic treatment. More difficult consenting path from N&V point of view given high number of receivers. Around 99 dwellings within noise catchment.		

		Overall score 3: Taking into account N&V effects, traffic and visual impact as above. Near existing plant which provides a baseline for future operations.		
Consenting risk	2	Designated but high planning risk due to consent required for vegetation clearance		
Property risk	5	Site owned by WSL		

#### Laingholm

Criteria	WTP score	Commentary (WTP/reservoirs)	Ancillary score	Commentary (ancillary structures)
Key site characteristics	3	Low level. Needs separate site for reservoirs which will be a long way from the treatment plant. Low level – treated water pumping to reservoirs. Adequate area. Poor proximity to water supply infrastructure.		
Engineering feasibility and constructability	5	Assuming not a previous fill site: No unusual issues foreseen. Adequate buffer area. Little earthworks required.	4	Raw water connection to aqueduct is Mackie's Rest - good access. Raw water connection to Upper Nihotupu is a pipeline along Exhibition Drive. Short length of tunnel (~800 m), well understood. Trenched pipelines along Huia and Woodlands Park Roads.
Access	2	Speed limit: 50km/hr. Sight distance issues and road width less than 5m. Fair pavement condition but probable pavement failure. Difficult to maintain traffic flow. No access route alternatives.		
Operability	4	Flat site, provides additional opportunities for site development given large land area. Will require additional linkages to raw and treated water systems. Likely to improve Watercare's management of process discharges. Good roads. Site can be approached from two directions. Reservoirs on Manuka Road site.	<del>3-4</del> 4	Short raw water connection from Mackies Rest. Provides other opportunities to increase resilience. Replaces raw water aqueduct. Connects to existing treated water system. Significant treated water lift.
Heritage and archaeology	4	One recorded site R11/1993 "Homestead; no standing remains apparent. An historic midden (with pottery fragments) has been noted here eroding out of the slope on the southern side of the Pony club area." Archaeological investigation will be required to ascertain effects on any archaeological remains however, effects likely to be localised.		
Mana Whenua values	5	No recorded sites.		
Terrestrial Ecology	4	SEA score 4: Development footprint currently shown encroaching into the margin of SEA containing mature kauri-podocarp/kanuka forest, but scoring assumes this can be largely avoided given the size of the site. Scope for mitigation if needed. Other bush/habitat score 4: Wetland vegetation in tributary beneath indicative footprint but scoring assumes this is avoidable; A couple of mature pines and other moderate sized trees (not significant).	5	Tunnels beneath bush, otherwise follows road alignment. Off-spec discharges not taken into account yet.
Freshwater ecology	4	Site encompasses headwater tributaries of Woodlands Stream, but scoring assumes these are largely avoidable. Otherwise, at least intermittent streams are affected. Limited opportunity for on-site mitigation.	5	No watercourses affected
Landscape and visual effects	1	WTP score 1-2: Half site (east) within ONL but question mapping (error?). Topography RL 90 to 95 Approx flat - Low. Pasture / recreational open space. Intactness: Entirely open - reserve area. Visual catchment - Proximate urban settlement on Laingfield Terrace, Laingridge Place, Huia Road, Minnehaha Ave, houses overlook. Viewing audiences - high – within public reserve – Owen's Green, less developed area adjacent to mown area and within settlement. High amenity due to public reserve. Note: from a landscape perspective, this is the worst site.  Reservoirs score 3: These are remote from WTP on Woodlands Park Road - therefore same scoring applies.		
Social and community impacts - construction	2 (1)	Noise score 5: To comply with NZS6803:1999 noise limit of 70dB LAeq would not require significant mitigation. Although construction noise will be audible at neighbouring dwellings, the levels would readily comply with the limit and it is considered that keeping neighbours informed of Project works would be sufficient. Ready compliance with DIN4150-3:1999 would occur - there is a negligible risk of building damage. 64 properties potentially affected / within noise catchment.  Overall score: N&V manageable, however high visual impacts and traffic effects. Likely to affect use of the remainder of the reserve during construction. H&S considerations include nearby sensitive land uses (kindergarten). From a visual amenity perspective, this is the worst site. Works on open space felt to have a particular impact. Therefore, this score could be reduced to a 1.		

Social and community impacts - operation	2 (1)	Noise score 2: To comply with night-time limit of 40dB LAeq would require non-conventional noise mitigation and would therefore be costly. 6 Lots inside 50dB LAeq contour may require acoustic treatment. More difficult consenting path from N&V point of view given high number of receivers.  Overall score 2: Noise potentially an issue as above, high visual impact and ongoing traffic effects. Ongoing impact of operation on public open space. Again, from a visual amenity perspective, this is the worst site. Works on open space felt to have a particular impact. While there could be off-site mitigation, the potential for this is not established at this stage. Therefore, this score could be reduced to a 1.		
Consenting risk	2	Likely to be contentious due to the visible nature of the fields and their use for public recreation/sensitive land uses		
Property risk	4	3 affected land owners – largest block being Auckland Council at \$1.175 mil. Note that Auckland Council may not be keen although could consider a land swap.		

#### Scenic Drive (Scenic 5)

Criteria	WTP score	Commentary (WTP/reservoirs)	Ancillary score	Commentary (ancillary structures)
Key site characteristics	3	Site is below the ideal elevation band so it falls down on site characteristics E3 and E5. Treated water pumping to reservoirs. The reservoirs are located at a separate location. The topography is challenging. OK area. OK proximity to existing water supply infrastructure.		
Engineering feasibility and constructability	3	Good buffer area. Significant earthworks required on site.	4	Raw water connection to aqueduct: Good access but restricted working environment. Raw water connection: Can use existing raw water connection to Upper Nihotupu. Short tunnel length (~700 m) but topography risky. Trenched pipelines: Well understood on roads but pipelines across site are challenging due to topography.
Access	1	Speed limit: 50km/hr. Sight distance issues and road width less than 5m. Poor pavement condition with probable pavement failure. Difficult to maintain traffic flow. No access route alternatives. Access to site from Phillip Avenue will require a bridge or culvert and embankment to cross an existing gully. Illegal use by heavy traffic.		
Operability	3	Elevation is not efficient, and site contours would make site set out complex. Access is very poor and likely to increase risk to Watercare. No secondary site access.	3	Deep raw water tunnel. Connection to aqueduct will be challenging. Does not replace aqueduct. Sleeved aqueduct? Poor access to reservoirs.
Heritage and archaeology	5	No recorded sites.		
Mana Whenua values	5	No recorded sites.		
Terrestrial Ecology	3	SEA score 3: Footprint currently encroaches into SEA comprising c. 90 yr old scrub and regenerating kauri - podocarp-broadleaf riparian forest) but may be able to largely avoid through careful design; opportunities for protecting/ enhancing the remainder. Other bush/habitat score 3: Development would result in the loss of several individual indigenous trees/ stands of trees within grassland area.	2	Between Chainage 750 & 300, pipeline route intersects regenerating kauri - podocarp forest
Freshwater ecology	3	Site contains a main tributary of Kaurimu Stream, and numerous flow paths/ minor tributaries, some of which are likely to be affected; some opportunities for onsite mitigation.	3	Pipeline route crosses Kaurimu Stream tributary
Landscape and visual effects	3 (4)	WTP score 3: WCC Sensitive Ridge Buffer to west of site and patches of SEA but able to avoid, long access into site from Scenic Drive. Topography: one of the greater cross falls. Low intactness. Catchment extends to north toward urban area, location in valley. Potential visibility from Glengary/ Oratia Drive / Philip Ave / Foothills Lane residential area to north – potential to screen. Moderate to high context/quality - pastoral and contained by bush. Reservoirs score 3 - located approx 600m to south pipes. Look to be within WCC Sensitive Ridgeline buffer. Patches of SEA but able to avoid? Lesser visual catchment relatively contained. Limited houses within close proximity - possible visibility from Tawini Road ridgeline/houses.		

		Concluded this could possibly even be a 4 for this criteria.		
Social and community impacts - construction	3	Noise score 5: To comply with NZS6803:1999 noise limit of 70dB LAeq would not require significant mitigation. Although construction noise will be audible at neighbouring dwellings, the levels would readily comply with the limit and it is considered that keeping neighbours informed of Project works would be sufficient. Ready compliance with DIN4150-3:1999 would occur - there is a negligible risk of building damage. Up to 57 dwellings affected / within noise contour.  Overall score 3: Main issues will be associated with construction traffic. Visual and N&V impacts are reasonably minor. No unusual H&S risks identified		
Social and community impacts - operation	3	Noise score 2: To comply with night-time limit of 40dB LAeq would require non-conventional noise mitigation and would therefore be costly. 2 Lots inside 50dB LAeq contour may require acoustic treatment. More difficult consenting path from N&V point of view given high number of receivers. Overall score 3: Taking into account ongoing operational traffic and N&V impacts, but minor visual impacts.		
Consenting risk	4	Generally low risk with the possible exception of traffic issues, provided that impacts on native vegetation and visual impacts can be managed.		
Property risk	4	2 affected land owners – one large rural land holding of \$3.7m CV and smaller one of \$570k		

#### Shaw Road (Scenic 4)

Criteria	WTP score	Commentary (WTP/reservoirs)	Ancillary score	Commentary (ancillary structures)
Key site characteristics	4	Generally meets the principles. A pumped raw watermain presents challenges around maintaining a gravity supply from the Upper Nihotupu Dam. Elevation good – gravity feed through plant to reservoirs. Adequate area. Good proximity to existing water supply infrastructure.		
Engineering feasibility and constructability	3	Significant earthworks will be required on site. Relatively tight site. Some steep grades and on-site lagoon will require earthworks.  Highly likely to be contaminated based on existing and historical use (horticulture)	3	Raw water connection to aqueduct: Good access but restricted working environment. Can use existing raw water connection to Upper Nihotupu. Short length tunnel but alignment and topography risks. TW trenched pipeline leaving site is challenging due to gully.
Access	1	Speed limit: 50km/hr. Sight distance issues and road width less than 5m. Poor pavement condition with probable pavement failure. Difficult to maintain traffic flow. No access route alternatives. Illegal use by heavy traffic. Would require significant works / widening of Shaw Road.  Beca (JB) confirmed that access to the site is likely to be via bridge from Shaw Road, rather than onto Scenic Drive.		
Operability	2	Elevation is not efficient, and site contours would make site set out complex. Access is very poor and likely to increase risk to Watercare. No secondary site access. Transmission works reasonably well.	2	Complex arrangement. No connection to Titirangi Reservoirs or supply to the city. Treated water pumping."
Heritage and archaeology	5	No recorded sites.		
Mana Whenua values	5	No recorded sites.		
Terrestrial Ecology	3	SEA score 4: Indicative footprint encroaches into SEA which comprises c. 65 year old kanuka forest, but scoring assumes this is largely avoidable, with opportunity for on-site mitigation. Access from Shaw Road (likely bridge through bush) may reduce this score from 4 to 3. Other bush/habitat score 4: Numerous tall, old pines and scrappy scrub offers habitat for lizards and bats. Good opportunities for mitigation by way of buffer planting, expanding the SEA vegetation, etc. May be some wetland vegetation associated with ponds.	5	Tunnels beneath bush, otherwise follows road alignment.

Freshwater ecology	3	Site encompasses main stem and tributaries of Kaurimu Stream, and numerous flow paths/ minor tributaries, along with two ponds. Main stem is avoided but intermittent streams and ponds likely to be affected. Fairly limited opportunities for on-site mitigation.	5	No watercourses affected
Landscape and visual effects	4	WTP score 4: No landscape overlays. Topography RL 130 to145 - Approx flat- Low. Fingers of SEA but potential to avoid. Visual catchment: Small, located in basin below Scenic Drive mixed vegetation surrounding, has potential for separation and screening. Viewing audience: 15 +/- houses on north side Scenic Drive partially overlook site but existing view low quality / fractured, potential to separate and screen. Low intactness - Existing horticulture / has semi 'industrial scale and low quality. Reservoirs are co-located with the WTP. Relatively good from a landscape perspective as plant can likely be contained within the site.		
Social and community impacts - construction	4	Noise score 5: To comply with NZS6803:1999 noise limit of 70dB LAeq would not require significant mitigation. Although construction noise will be audible at neighbouring dwellings, the levels would readily comply with the limit and it is considered that keeping neighbours informed of Project works would be sufficient. Ready compliance with DIN4150-3:1999 would occur - there is a negligible risk of building damage. Overall score 4: Visual impact and N&V manageable. Construction traffic will be the significant issue for this site. No unusual H&S issues identified.		
Social and community impacts - operation	3	Noise score 2: To comply with night-time limit of 40dB LAeq would require non-conventional noise mitigation and would therefore be costly. 13 Lots inside 50dB LAeq contour may require acoustic treatment. More difficult consenting path from N&V point of view given high number of receivers. Overall score 3: Taking into account ongoing operational traffic and N&V impacts, but minor visual impacts.		
Consenting risk	4	Generally low risk with the possible exception of traffic issues, provided that impacts on native vegetation and visual impacts can be managed.		
Property risk	3	6 affected land owners on predominantly large rural blocks with CV range of \$470k to \$1mil  Change to scoring for consistency with scoring template.		

#### Upper Carter

Criteria	WTP score	Commentary (WTP/reservoirs)	Ancillary score	Commentary (ancillary structures)
Key site characteristics	3	The majority of the site is below the ideal elevation range– treated water pumping to reservoirs. The area at a suitable for reservoirs is limited and the land between the WTP and the reservoirs is steep. Adequate area. Good proximity to existing water supply infrastructure.		
Engineering feasibility and constructability	3	Site is relatively tightly constrained with space. Some earthworks required.	3	Raw water connection to aqueduct: Mackie's Rest - good access. Raw water connection to Upper Nihotupu via bush. Long length of tunnel. Good road access to trenched pipelines:
Access	2	Speed limit: 70km/hr. Sight distance issues, and road width less than 5m. Pavement condition fair with possible pavement failure. There are access route alternatives. Steep gradients. Maintenance of traffic flow difficult.		
Operability	3	Low site elevation, loss of system hydraulic efficiency due to need to gravitate to below HGL and then pump. Site can be approached from two directions.	3	Replaces aqueduct. Inefficient hydraulic profile.
Heritage and archaeology	5	No recorded sites		
Mana Whenua values	5	No recorded sites		
Terrestrial Ecology	2	SEA score 2-3: Footprint as currently shown encroaches into SEA margins comprising an area of c. 60-70 yr old scrub, and a stand of kauri - podocarp - kanuka forest; limited opportunity to wholly avoid bush due to site constraints; some opportunities	3	Pipeline route intersects stand of regenerating kauri - podocarp - kanuka forest (SEA) within the Carter 1 site envelope

		for protecting/ revegetating surrounds. Other habitat/bush score 3: 10 - 15 yr old gorse - kanuka scrub which may offer lizard habitat; possible wetlands around minor tributaries; tall old pines offer potential bat roosts.		
Freshwater ecology	3	The site encompasses flowpaths/ minor tributaries of Cochrane Stream, some of which are likely to be affected; fairly limited opportunities for onsite mitigation	5	No watercourses affected
Landscape and visual effects	2	WTP score 3: Western edge of site extends into ONL but should be able to avoid intrusion. Topography: RL 65 to 85 20m cross fall- Moderate. SEA patches within WTP site. Low intactness. Visual catchment: Somewhat in basin but potential Parker Rd / Shaw Rd visibility. Proximate rural res (8 +/- houses) to south. Potential to screen. Viewing audiences: Moderate built up area. Variable pattern - horticulture/rural residential/bush.  Reservoirs in close proximity score 3 2. Away from ONL. RL 120 - High point adjacent to road. Escarpment between WTP and Res SEA – Vege not significant - 3 or 4 houses, Parkin Rd short no exit Rd. Low intactness. Visual catchment - Located on local high point by Carter Road, road bends around site, houses to east across road. Moderate built up area. Ariable pattern - horticulture/rural residential/bush. Changed to 2 due to likely visual impact of reservoirs – GHD/Beca confirmed that there is not much allowance to move these reservoirs or screen them by building them into the ground, as they are only just at the right elevation at this particular location.		
Social and community impacts - construction	3	Noise score 5: To comply with NZS6803:1999 noise limit of 70dB LAeq would not require significant mitigation. Although construction noise will be audible at neighbouring dwellings, the levels would readily comply with the limit and it is considered that keeping neighbours informed of Project works would be sufficient. Ready compliance with DIN4150-3:1999 would occur - there is a negligible risk of building damage. Overall score 3: No big visual issues, ability to manage N&V is good, however impacts on nearby school will need to be managed (particularly traffic).		
Social and community impacts - operation	3	Noise score 4: To comply with night-time limit of 40dB LAeq would require only conventional noise control, therefore would be more cost-effective than some other schemes. Overall score 4 3: Operational traffic and N&V will need to be managed however this is achievable. Visual impact score reduced due to likely prominence of reservoirs. Therefore, likely to additional social impacts (visual amenity).		
Consenting risk	3	Generally low risk however impacts on sensitive receivers e.g. Oratia School and kindergarten would need to be managed carefully. Visual impact of reservoirs likely to be an issue, as they are not able to be moved or screened. Note that visual amenity has been a significant effects for the Runciman Reservoirs (currently being discussed in the Environment Court).		
Property risk	2	10 affected land owners - predominantly lifestyle / developed properties		

#### Lower Carter

Criteria	WTP score	Commentary (WTP/reservoirs)	Ancillary score	Commentary (ancillary structures)
Key site characteristics	2	All of the site is below the ideal elevation range resulting in increased pumping requirements and the reservoir located at an alternative site. The closest site for a reservoir is limited in size and only just at a high enough elevation. Adequate area. Good proximity to existing water supply infrastructure only.		
Engineering feasibility and constructability	4	Construction of the treatment plant is ideal but the reservoir construction is challenging due to limited site footprint and dual pipelines in Carter Rd. No foreseeable constructability issues on site – limited earthworks required. Site for reservoirs relatively tight (-1). Preliminary geotechnical review noted potential for liquefaction at north end of site but distant from proposed WTP location. Likely to be contaminated from previous horticultural use.	2	Shaft needed at Shaw-Exhibition for raw water connection to aqueduct. Existing raw water connection to Upper Nihotupu. Long length of tunnel. Trenched pipelines: Two pipelines in narrow road
Access	3	Speed limit: 70km/hr. Pavement condition fair with possible pavement failure. There are access route alternatives. Maintenance of traffic flow difficult.		
Operability	2	Lowest site elevation, loss of system efficiency due to need to gravitate to below HGL and then pump. Pumping to off-site reservoir not well covered. Reservoirs to be located some distance away. Site can be approached from two directions. Requires large pumping station (60m lift).	2	Inefficient hydraulic profile. Does not replace the raw water aqueduct. No connection to Titirangi Reservoirs or supply to the city. Deep tunnel and complex connection. Treated Water Pumping

Heritage and archaeology	5	No recorded sites		
Mana Whenua values	5	No recorded sites		
Terrestrial Ecology	4	SEA score 5: No SEA overlay. Other bush/habitat score 4: Hedgerows, shelterbelts, rough scrub present may harbour lizards. Score 4 Score remains 4 due to reservoirs at the Upper Carter site. Otherwise the Carter 7 site could be scored 5.	5	Tunnels beneath bush, otherwise follows road alignment.
Freshwater ecology	4	Site encompasses Sunde Stream and an unnamed tributary of Oratia Stream, and associated flow paths and minor tributaries. Footprint is currently shown over the main stem of Sunde Stream, but scoring assumes this can be avoided. As a minimum, intermittent tributaries are likely to be affected; opportunities for onsite mitigation are available. Score 3-4 Score of 4 on the basis that GHD (MM) confirmed that there is room on this site to move the WTP footprint off the Sunde Stream.	5	No watercourses affected
Landscape and visual effects	2	WTP score 4: No overlays. Topography RL60 to 65 - 5m cross fall - Pretty flat. Open, old orchard / rural. Low intactness. Within valley between Carter and Shaw Road (potential extending west to Parker), low density rural and rural res within immediate visual catchment. Moderate built up area- open rural / res and increasingly urban. Variable pattern horticulture / rural res / increasingly urban - Low. Reservoirs are in the same location as Upper Carter 1. Score 4-2: Score of 4 was a typo (this should have been a 3). Score reduced to 2 due to impact of reservoirs and lack of ability to move these.		
Social and community impacts - construction	3	Noise score 5: To comply with NZS6803:1999 noise limit of 70dB LAeq would not require significant mitigation. Although construction noise will be audible at neighbouring dwellings, the levels would readily comply with the limit and it is considered that keeping neighbours informed of Project works would be sufficient. Ready compliance with DIN4150-3:1999 would occur - there is a negligible risk of building damage. Overall score 3: No big visual issues for WTP but important consideration for reservoirs, ability to manage N&V is good, however impacts on nearby school will need to be managed (particularly traffic).		
Social and community impacts - operation	3	Noise score 4: To comply with night-time limit of 40dB LAeq would require only conventional noise control, therefore would be more cost-effective than some other schemes. Overall score 4 3: Operational traffic and N&V will need to be managed however this is achievable. <del>Visual impact limited.</del> Visual impact score reduced due to likely prominence of reservoirs. Therefore, likely to be additional social impacts (visual amenity).		
Consenting risk	3	Generally low risk however impacts on sensitive receivers e.g. Oratia School and kindergarten would need to be managed carefully. Visual impact of reservoirs likely to be an issue, as they are not able to be moved or screened.		
Property risk	4	3 affected land owners of mainly large rural land holdings with CV range of \$1.1m and \$1.4m		

#### Parker Road

General note: Scores for this site to be based on the northern layout of the WTP.

Criteria	WTP score	Commentary (WTP/reservoirs)	Ancillary score	Commentary (ancillary structures)
Key site characteristics	4	Very good elevation. Site is located some distance from existing infrastructure- especially the raw water. Gravity feed through plant to reservoirs. Adequate area. Poor proximity to existing water supply infrastructure. Lots of flexibility of WTP configuration on site.		
Engineering feasibility and constructability	5	Lots of flexibility on site for WTP configuration. Large buffer area. Flat site - little earthworks required.	3	Raw water connection to aqueduct: Mackie's Rest - good access. Raw water connection to Upper Nihotupu: Pipeline route via bush. Tunnel: Long length and curve. Trenched pipelines: Good roads
Access	3	Speed limit: 70km/hr. Road width less than 5m. Pavement condition fair with possible pavement failure. No access route alternatives. Steep gradients. Maintenance of traffic flow difficult.		

Operability	5	Seems to provide most effective integration into HGL. Access limited to approach from single direction. Most favourable site from an operations perspective.	5	Integrates logically into HGL and maximises use of gravity. Replaces aqueducts. Will need additional works in the Transmission network to provide redundancy to Titirangi Reservoirs "
Heritage and archaeology	4	One scheduled heritage site – Theets Cottage at 132 Parker Road. Potentially affected by preliminary layout (northern option), however should be able to avoid in detailed design.		
Mana Whenua values	5	No recorded sites.		
Terrestrial Ecology	4	SEA: Site encompasses SEA comprising mature kanuka - broadleaved forest with scattered kauri and podocarps. Development footprint currently shown encroaching into the SEA margin, but scoring assumes this can be avoided. Score 5 Other bush/habitat: Hedgerows/ shelterbelts, patches of indigenous and exotic scrub. Potential lizard habitat. Within the Parker 3 envelope, pipeline route intersects area of low kanuka scrub surrounding a stream tributary (not SEA). Scope for on-site mitigation. Score 4	5	Tunnels beneath bush, otherwise follows road alignment.
Freshwater ecology	4	Site encompasses Allen Swamp Stream and numerous flow paths/ minor tributaries, some of which are likely to be affected; opportunities for onsite mitigation. Score 4	4	Pipeline route crosses headwaters of Allen Swamp stream tributary
Landscape and visual effects	3	WTP: Parker Road has WCC Sensitive Ridgeline buffer, ONL to east within bush area in valley – can avoid. Topography: RL120 to 105 Or 130 to 115 Approx flat - Low. Finger of vegetation within site SEA - can avoid. Low intactness. Primarily immediate Parker Road visual catchment. Viewing audiences: Rural residential and horticulture, houses generally orientated out from ridge so screening potential. Variable pattern horticulture / rural res / bush- Low context/quality. Score 3. Reservoirs are immediately adjacent to the WTP so effects are the same. Score 3. This scoring assumes that there is space for visual mitigation.		
Social and community impacts - construction	4	Noise score 5: To comply with NZS6803:1999 noise limit of 70dB LAeq would not require significant mitigation. Although construction noise will be audible at neighbouring dwellings, the levels would readily comply with the limit and it is considered that keeping neighbours informed of Project works would be sufficient. Ready compliance with DIN4150-3:1999 would occur - there is a negligible risk of building damage. Approx. 6 dwellings affected. Best site from a noise perspective. Overall scoring 4: Visual amenity impacts appear reasonably low, noise & vibration are minor, traffic manageable, no unusual H&S issues identified		
Social and community impacts - operation	4	Noise score 4: To comply with night-time limit of 40dB LAeq would require only conventional noise control, therefore would be more cost-effective than some other schemes. This site is best from a noise perspective. Overall scoring 4: Ongoing access and N&V taken into account however low visual amenity impacts		
Consenting risk	4	No significant consenting issues identified, providing that significant vegetation can be avoided.		
Property risk	4	12 affected land owners with 3 of them being high value lifestyle properties of \$1.3 mil CV. Original score was based on full extent of site which encompassed Parker 3 and Parker 4. However Parker 3 is approx.. 3 sites therefore score revised to reflect this.		

#### Forest Hill and West Coast Roads

Criteria	WTP score	Commentary (WTP/reservoirs)	Ancillary score	Commentary (ancillary structures)
Key site characteristics	2	Site is below the ideal elevation range, a long way from existing infrastructure and a separate site needed for reservoirs. Low level – treated water pumping to reservoirs. Adequate area. Distant from existing water supply infrastructure. Costly to address issues. Second site for reservoir is good.		
Engineering feasibility and constructability	2	Shallow instability noted from preliminary geotechnical review – additional foundation works required. Relatively steep site. Long access road required.	2	Raw water connection to aqueduct at Mackie's Rest - good access. Raw water connection to Upper Nihotupu would be a pipeline route via bush.

				Long length of tunnel. Trenched pipelines: Narrow windy roads, geotechnical concerns, long distance.
Access	4	Speed limit: 70km/hr. Sight distances issues. Pavement condition fair with possible pavement failure. There are access route alternatives, with second access to the site via Henderson Valley Road and Gum Road. Maintenance of traffic flow possible.		
Operability	2	While site affords opportunities for further development and optimal site layout, this area is remote from existing infrastructure.	2.05	Complex raw and treated water setup. Will make connections to the transmission system complete. Replaces aqueduct.
Heritage and archaeology	5	No recorded sites.		
Mana Whenua values	5	No recorded sites.		
Terrestrial Ecology	5	SEA score 5: No SEA overlay. Other bush/habitat score 5: No significant woody vegetation cover.	3	Route intersects sections of riparian mixed podocarp-broadleaved forest surrounding Anamata Stream, Norman Glen and McLeod Stream tributary
Freshwater ecology	4	The site encompasses McLeods Stream (currently shown within the development footprint, but likely to be avoidable) and associated flow paths and minor tributaries, some of which are likely to be affected but all of which appear degraded and poorly vegetated; opportunities for onsite mitigation are available.	4	Pipeline route crosses Anamata and Norman Glen Streams, and a tributary of McLeod Stream.
Landscape and visual effects	2	WTP score 2: Site just clips ONL in west corner can be avoided. Topography: RL 80 to 95 15m cross fall - Moderate. Pasture - almost clear of other vegetation. Entirely open rural - low intactness. Visual catchment limited to local area, low level residential in surrounds. Valley with potential ability to screen viewing audiences. Low context/quality. Reservoirs approx. 800m up road from WTP – score 2: Reservoirs on sensitive ridgeline buffer and proximate to / within ONL (question mapping!) Topography: WCC Sensitive ridgeline buffer. SEA separates WPT from Reservoirs - Reservoirs site free of vegetation. Open and rural - low intactness. Visual catchment limited to local areas. Houses along this stretch of Forrest Hill Road - 20+. Low context/quality.		
Social and community impacts - construction	5	Noise score 5: To comply with NZS6803:1999 noise limit of 70dB LAeq would not require significant mitigation. Although construction noise will be audible at neighbouring dwellings, the levels would readily comply with the limit and it is considered that keeping neighbours informed of Project works would be sufficient. Ready compliance with DIN4150-3:1999 would occur - there is a negligible risk of building damage. Overall scoring 5: No significant issues identified in terms of visual amenity, N&V, traffic, H&S		
Social and community impacts - operation	5	Noise score 4: To comply with night-time limit of 40dB LAeq would require only conventional noise control, and given the low number of adjacent receivers, is the scheme which will have the easiest consenting path from an acoustic perspective. Overall scoring 5: No significant issues identified in terms of visual amenity, N&V, traffic, H&S.		
Consenting risk	4	Relatively straightforward from a consenting perspective in terms of effects however likely to be challenged on rationale for location given remoteness of site and relationship with existing structure.		
Property risk	2	5 affected land owners but predominantly lifestyle / developed properties		

## Appendix E: Mana Whenua site visit - minutes

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# Minutes of Meeting

Subject: Huia Water Treatment Plant (WTP) Upgrade Meeting

Date: 8 December 2015

Time: 1.00pm

Location: Huia WTP, Woodlands Park Rd, Titirangi

Attendees: Moana Waa (MW) (Ngāti Whātua o Ōrākei) Keith Williams (KW) (Te Kawerau a Maki), Priyan Perera (PP) (Watercare Services Ltd), Alastair Stewart (AS) (Watercare Services Ltd) and Simon Greening (SG) (Watercare Services Ltd)

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## General

- Apologies:
  - Tame Te Rangi (Te Rūnanga o Ngāti Whātua)
- Huia WTP Replacement – Engagement presentation was tabled.

## Introduction and Background

- AS opened meeting and welcomed those in attendance.
- PP explained history of the Huia WTP, the dams in the Waitākere and natural deterioration of water quality in the dams which will require changes in the treatment process.

## Work to Date & Next Steps

- AS stated the process to find a site for a replacement WTP has started.
- AS highlighted the guiding principles WSL are working to (elevation, size, location, vicinity of existing infrastructure)
- AS noted that current work to identify sites was guided by a GIS study
- AS showed a map (in confidence) of long-list sites. Comment was made that although some sites do show vegetation, this in some instances relates to steeper sloped areas that didn't meet the guiding principles, and hence would be avoided where possible.
- SG highlighted the fact that the Waitākere Ranges is known for its vegetation and there will be effects of some sort, but these need to be considered alongside other implications. The ultimate decision for where the WTP is located will be Watercare's, but this will be done by assessing all available information and making a decision that balances the four bottom line values (environmental, economic, cultural and social).
- MW queried how Watercare will consider effects on cultural values?

- SG explained that the significance of any site would need to be understood fully and then considered depending on the range of options available. This would ideally be identified at the shortlisting stage and Watercare would rely on expert Mana Whenua input to understand this. The example shared was of an Urupa (cemetery) site vs a midden. The relative values of these features would dictate the way Watercare viewed potential sites and the likely outcome in scoring at MCA time (i.e. Urupa scoring much more highly than midden). If another site (off-site or within site) was similar in every other respect but is absent of significant cultural values, then that would be a motivating factor to avoid sites that may have cultural value.

### **Site Selection Process**

- AS explained that the long-list will be scored against criteria to narrow it down to a short-list.
- It was agreed with KW and MW that Mana Whenua assessment of the sites would be best suited and most appropriate at the short-list stage when there are approximately 3-5 sites left.
- Watercare will contact the relevant Mana whenua at this stage to invite input, which could include separate Cultural Impact Assessment (CIAs) for each site, or a combined CIA for the total number of sites.
- AS queried whether a CIA could be developed conjunctively between the Mana Whenua?
- KW noted this could be feasible

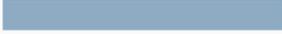
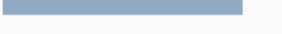
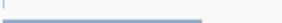
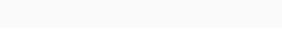
### **General**

- AS thanked everyone for attending.
- A tour of the WTP was completed and the treatment process explained along the way.

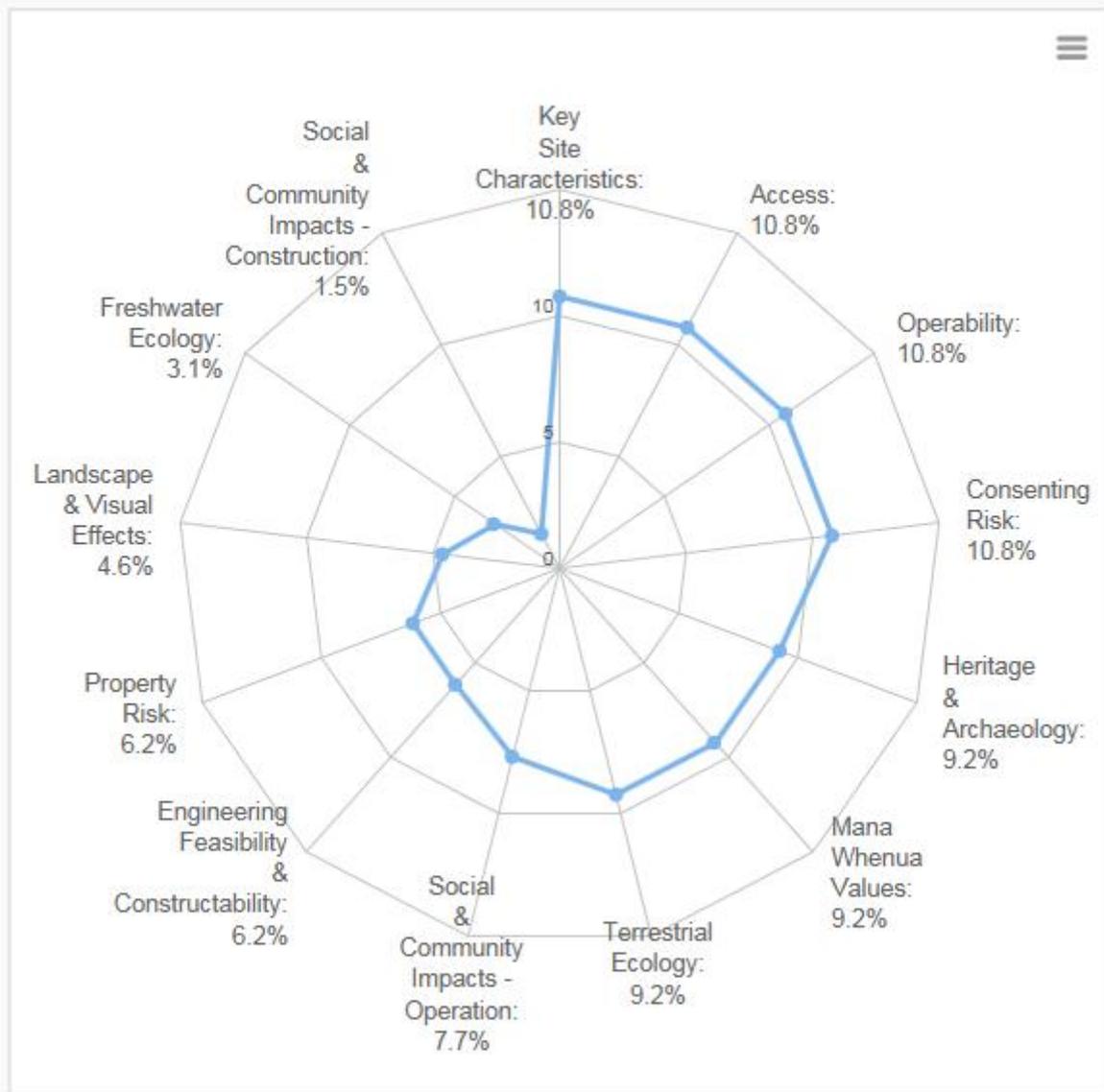
## Appendix F: 1000 Minds output

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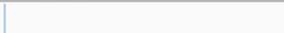
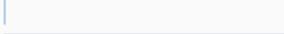
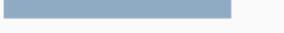
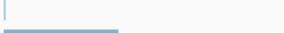
## MCA Huia WTP - Plant

Key Site Characteristics		Bar graph
	0.0 %	
Key Site Characteristics	<b>10.8 %</b>	
<b>Access</b>		
	0.0 %	
Access	<b>10.8 %</b>	
<b>Operability</b>		
	0.0 %	
Operability	<b>10.8 %</b>	
<b>Consenting Risk</b>		
	0.0 %	
Consenting Risk	<b>10.8 %</b>	
<b>Heritage &amp; Archaeology</b>		
	0.0 %	
Heritage & Archaeology	<b>9.2 %</b>	
<b>Mana Whenua Values</b>		
	0.0 %	
Mana Whenua Values	<b>9.2 %</b>	
<b>Terrestrial Ecology</b>		
	0.0 %	
Terrestrial Ecology	<b>9.2 %</b>	
<b>Social &amp; Community Impacts - Operation</b>		
	0.0 %	
Social & Community Impacts - Operation	<b>7.7 %</b>	
<b>Engineering Feasibility &amp; Constructability</b>		
	0.0 %	
Engineering Feasibility & Constructability	<b>6.2 %</b>	
<b>Property Risk</b>		
	0.0 %	
Property Risk	<b>6.2 %</b>	
<b>Landscape &amp; Visual Effects</b>		
	0.0 %	
Landscape & Visual Effects	<b>4.6 %</b>	
<b>Freshwater Ecology</b>		
	0.0 %	
Freshwater Ecology	<b>3.1 %</b>	
<b>Social &amp; Community Impacts - Construction</b>		
	0.0 %	
Social & Community Impacts - Construction	<b>1.5 %</b>	

## Radar chart of criterion weights



## MCA Huia WTP - Ancillary Structures

		Bar graph
<b>Operability</b>		
	0.0 %	
Operability	<b>12.5 %</b>	
<b>Heritage &amp; Archaeology</b>		
	0.0 %	
Heritage & Archaeology	<b>12.5 %</b>	
<b>Mana Whenua Values</b>		
	0.0 %	
Mana Whenua Values	<b>12.5 %</b>	
<b>Terrestrial Ecology</b>		
	0.0 %	
Terrestrial Ecology	<b>12.5 %</b>	
<b>Consenting Risk</b>		
	0.0 %	
Consenting Risk	<b>12.5 %</b>	
<b>Engineering Feasibility &amp; Constructability</b>		
	0.0 %	
Engineering Feasibility & Constructability	<b>10.0 %</b>	
<b>Social &amp; Community Impacts - Operation</b>		
	0.0 %	
Social & Community Impacts - Operation	<b>7.5 %</b>	
<b>Freshwater Ecology</b>		
	0.0 %	
Freshwater Ecology	<b>5.0 %</b>	
<b>Social &amp; Community Impacts - Construction</b>		
	0.0 %	
Social & Community Impacts - Construction	<b>5.0 %</b>	
<b>Property Risk</b>		
	0.0 %	
Property Risk	<b>5.0 %</b>	
<b>Access</b>		
	0.0 %	
Access	<b>2.5 %</b>	
<b>Landscape &amp; Visual Effects</b>		
	0.0 %	
Landscape & Visual Effects	<b>2.5 %</b>	

## Radar chart of criterion weights

