Assessment of Arboricultural Effects

GREENSCENENZ
ENHANCING AND PROTECTING LIVING ENVIRONMENTS

Project Name:	**Northern Interceptor Wastewater Pipeline**
Report prepared for:	**Watercare Services Limited**
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1.0 Introduction

Watercare Services Limited ("Watercare") is proposing to build new wastewater pipelines and associated infrastructure to convey wastewater from north-western parts of Auckland to the Rosedale Wastewater Treatment Plant ("WWTP") in Albany. This project is known as the "Northern Interceptor". Construction of the Northern Interceptor is intended to be staged, with the timing of various stages depending on the rate of population growth.

GreensceneNZ Limited has been commissioned by Watercare to assess the potential arboricultural effects related to the construction, operation and maintenance of the proposed Northern Interceptor Phase 1.

The proposed work requires various resource consents under the Resource Management Act 1991 ("RMA"). This technical report provides specialist input for the *Northern Interceptor Phase 1 – Assessment of Effects on the Environment* report ("the main AEE") prepared by MWH New Zealand Limited, which supports the resource consent application.

Section 2 of this report provides a brief overview of the proposed works, an explanation of how the proposed route of the new pipeline has been divided (sectioned) for the purposes of this report and a description of the investigations undertaken to assess arboricultural matters

Section 3 of this report contains a brief outline of the statutory framework and relevant tree rules relating to arboricultural matters.

Section 4 of this report provides an arboricultural assessment of each section of the proposed pipeline inclusive of:

- A description of the existing environmental within the section;
- A description of the proposed works;
- An assessment of the actual or potential effects on trees within the existing environment in relation to the construction of the pipeline;
- Identification of design refinements or construction methodologies that could avoid, remedy or mitigate actual or potential adverse effects;
- Recommended mitigation and management measures.

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2.0 Proposed Works

The proposed Northern Interceptor Phase 1 will transfer existing flows from the Hobsonville Pump Station (PS) to the Rosedale WWTP. The proposed route is from the existing Hobsonville PS, under the State Highway 18 motorway, along the northern side of the motorway causeway, and then under the Upper Waitemata Harbour, through Greenhithe and then the commercial area of Rosedale.

Key elements of the project include:

- Upgrading of the existing Hobsonville PS;
- Installation of a pipe under State Highway 18;
- Installation of pipelines in a widened section of the existing motorway causeway;
- Installation of dual pipelines across the Upper Waitemata Harbour to Greenhithe via marine trenching or horizontal directional drilling ("HDD");
- Installation of dual pipelines under Te Wharau Creek via HDD;
- Construction of a pipe bridge between Witton Place and North Shore Golf Course;
- Installation of dual pipelines under Alexandra Stream via HDD;
- Trenched construction for pipeline installation in roads, open space and other land; and installation of associated infrastructure, including minor aboveground structures.

With the exception noted below, the proposed works are described in detail in the main AEE. The works described in the main AEE and shown on the appended drawings are assessed in this report.

Watercare is proposing some widening along the existing State Highway 18 motorway causeway near Hobsonville to provide for proposed water and wastewater infrastructure, including a section of the Northern Interceptor Phase 1 pipeline. That work forms part of Watercare's proposed Greenhithe Bridge Watermain Duplication and Causeway project. That project is part of a separate resource consent package, and is described in a report titled *Greenhithe Bridge Watermain Duplication and Causeway – Assessment of Effects on the Environment*, prepared by Aecom New Zealand.

For the purposes of this report the proposed route of the pipeline has been divided into sections that are aligned with the description of the proposed works as set out in the main AEE, which forms part of the application for resource consent.

Vegetation alongside and/or within the proposed working area of the pipeline route was surveyed and assessed as to whether it would be or potentially be adversely affected by the proposed works. This was completed by walking the proposed route and taking notes by hand and photographically recording areas of vegetation and individual trees of interest.

Tree protection measures will be a necessary component of the physical works process when the pipeline is under construction. Where this is appropriate, this report identifies where tree protection is necessary along the route. Specific tree protection measures appropriate for the works are contained in Section 7 of this report.

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3.0 District Plan Matters

3.1 Auckland Council District Plan – Waitakere Section 2003

According to the operative District Plan the works site areas on the Hobsonville side of the Upper Waitemata Harbour are subject to the following rules and designations.

3.1.1 *Riparian Margin / Coastal Edges Natural Area (15m) Rule 2 – Vegetation Alteration*

Rule 2.2 Controlled Activity – Any clearance of: (ii) vegetation listed in the Environmentally Damaging Plants Appendix, beyond 10% of the Riparian Margin / Coastal Edge on the site.

Comment: The proposed pipeline and access road at the Hobsonville PS will involve the removal of vegetation listed in the Environmentally Damaging Plants List that exceeds 10% of the Riparian Margin on the site.

3.1.2 *Riparian Margin / Coastal Edges Natural Area (15m) Rule 2 – Vegetation Alteration*

Rule 2.4 Discretionary Activity – The clearance of native vegetation for the purposes of establishing driveways, roads or infrastructure not meeting the standards in Rule 2.3(b).

Comment: The proposed works site area surrounding the micro tunnel located on the northern side of SH18 will require the removal of native vegetation from within areas with a Natural Area zoning of Riparian Margin / Coastal Edges Natural Area (15m).

3.1.3 *Restoration Natural Area Rule 2 – Vegetation Alteration*

Rule 2.3 Limited Discretionary Activity – any vegetation alteration not meeting the standards in Rule 2.1 (a), (b), (c), and (d) or 2.2.)

Comment: The proposed pipeline out of the Hobsonville PS will involve the removal of vegetation listed in the Environmentally Damaging Plants List that exceeds 10% of the Riparian Margin on the site.

3.1.4 *General Natural Area Rule 2 – Vegetation Alteration –*

Rule 2.2 Controlled Activity – (b) any work within the dripline of native vegetation and exotic vegetation which is more than 6m in height or more than 600mm in girth (measured at 1.4m above the ground).

Comment: The proposed construction of a vehicle access way on the western side of Hobsonville PS area from Buckley Avenue will require works to be undertaken within the dripline of existing exotic vegetation (large Eucalyptus trees).

3.1.5 *General Natural Area Rule 2 – Vegetation Alteration*

Rule 2.3 Limited Discretionary Activity – the clearance of native vegetation and exotic vegetation which is more than 6m in height or more than 600mm in girth (measured at 1.4m above the ground).

Comment: The proposed construction of a vehicle access way on the western side of Hobsonville PS area from Buckley Avenue will require the removal of native vegetation (several silver ponga) from within areas of the site with a Natural Area zoning of General Natural.

3.1.6 *Coastal Natural Area Rule 2 – Vegetation Alteration*

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Rule 2.4 Discretionary Activity - the clearance of any vegetation not meeting the standards in Rules 2.1, 2.2 and 2.3 for the establishment of a building platform, driveway or infrastructure provided that clearance on any site or proposed site does not increase the total cleared area (including any existing cleared area) of the net site area to more than 300m^2).

Comment: The proposed works site area surrounding the micro tunnel located on the northern side of SH18 and the construction of the pipeline from the micro tunnel through to Squadron Drive will require the removal of native vegetation from within areas with a Natural Area zoning of Coastal Natural Area beyond 300m^2 (inclusive of existing cleared areas).

3.2 **Auckland Council District Plan – North Shore Section,**

According to the Operative District Plan the works site areas on the Greenhithe side of the Upper Waitemata harbour are subject to various rules and designations.

3.2.1 *Rule 8.4.6.3 point a) i) & iii) states that any cut or alteration and works within the rootzone of any tree located on any road, public reserve or recreational land is considered to be a Limited Discretionary Activity.*

Comment: The proposal requires excavations to be undertaken within the dripline of trees located within road reserve, public reserves and/or recreational land.

3.2.2 *Rule 8.4.6.3 point b) i) states that any destruction or removal of any tree located within road reserve, public reserves and/or recreational land is considered to be a Discretionary Activity.*

Comment: The proposal requires the removal of trees which are located within either road reserves, public reserves and/or recreational land.

3.2.3 *Rule 8.4.2.4 Discretionary Activities*

a) Development, and / or the disturbance of soil, natural ground cover or vegetation, or the deposition of fill or any material within a riparian margin that is not a permitted, controlled or limited discretionary activity.

Comment: The construction of the pipe bridge over the stream located between Witton Place and North Shore Golf Club ("NSGC") may require vegetation to be removed from areas within 5m of the stream.

3.3 **Proposed Auckland Unitary Plan**

According to the proposed District Plan the site is subject to various rules and designations.

3.3.1 *According to the Activity Table found in Section 4.3, 1.2 of the PAUP, operative rules apply to Vegetation Management in Overlays where the vegetation is within areas encompassed by Significant Ecological Area overlays. Any vegetation alteration or removal within areas that are encompassed by Significant Ecological Areas overlays therefore requires consent to a Discretionary Activity.*

Comment: As per the Proposed Auckland Unitary Plan locations within Wainoni Park, the area between Witton Place and North Shore Golf Course, areas within North Shore Memorial Park and areas within Rosedale Park contain a Natural Resource: Significant Ecological Areas overlays.

3.3.2 This assessment has determined there will be a requirement to undertake vegetation alteration and/or destruction within areas within the Significant Ecological Area ("SEA") overlay areas and therefore these activities will be assessed as Discretionary Activities.

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4.0 Report Methodology

4.1 This report describes the arboricultural effects of the proposed pipe alignment. The project has been described in thirteen sections according to the geographic locations and works methodology for distinct sections of the project in accordance with the main AEE.

4.2 Section 5.0 of this report describes each work section under subheadings that describe: the Existing Environment, the Proposed Works, the Arboricultural Effects and Mitigation Measures.

4.3 The existing environment is described in terms of the vegetation types present in the relevant works areas and where appropriate a list of the main species (native and exotic) present within the site has been provided.

4.4 A schedule that lists all important trees or groups of trees has been compiled and is provided as a separate *GreensceneNZ* document titled 'Tree Schedule' and dated May 2014.

4.5 The 'Tree Schedule' includes details of the identified trees/groups, including: the reference number assigned to them, the species, location, condition and relative values of each. The 'Tree Schedule' also sets out the District Plan zoning that applies to the land that the tree grows on and establishes the ownership and protection status of the tree or tree group. Finally, the 'Tree Schedule' outlines the proposed site works and the proposed tree works relevant to each identified tree or tree group.

4.6 The protection status of the listed trees and groups of trees has been assessed based on the currently applicable District Plan rules and the zoning of the land containing the tree. The protection status listed for each tree is a reflection of the applicability of rules that provide for protection of trees under the current rules. It should be noted that this does not imply protection on all trees within the groups of trees listed in the Tree Schedule, only that there are protected trees/vegetation present within the group.

5.0 Arboricultural Assessment

5.1 The alignment of the Northern Interceptor passes though a wide range of environments, from industrial property, major transport routes and commercial streets to stream side gullies, public parks/open spaces and estuarine habitats. The proposed works involving both open-cut trenching and horizontal directional drilling ("HDD") methodologies impact on trees that are located within the private and public realm. Where trees are affected, measures that avoid, remedy and mitigate the adverse effects on the natural environment are a necessary component of the project.

5.2 The following sections set out the proposed route and provide comments relating to the arboricultural issues that are encountered in each section of the project. The route of the proposed wastewater pipeline is described below in order of geographic location from west to east.

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5.3 Hobsonville Pump Station (PS) and SH18 crossing

5.3.1 Existing Environment

The vegetated areas of the work site area surrounding Hobsonville PS consist primarily of weed plant species. However there are the occasional native plant species, such as silver ponga (*Cyathea dealbata*) emerging from the understory areas.

To the west and on the higher ground above the pump station are several large and mature to over-mature gum trees (*Eucalyptus sp.*). On the southern portions of the ground occupied by the gum trees there are many silver ponga and karamu (*Coprosma robusta*) and other shade tolerant native plant species.

The vegetation types and their respective maturities reflect a pattern of continuous alteration of the ground over an extended timeframe, perhaps as a result of the adjoining road network development and the construction / development of the pump station itself. The primary plant species found within this area are detailed in Table 1 on the following page.

The work site area surrounding the northern access shaft of the proposed micro-tunnel that will be constructed under the Upper Harbour Motorway is occupied by newly-planted native vegetation such as flax (*Phormium tenax*).

Located immediately east of the proposed SH18 crossing works site there is a stormwater detention pond and on the southern side of this an access-way provides vehicle access to and from the northern end of Squadron Drive.

Native species		**Exotic species** ** = legally declared plant pest species*	
Common name	**Botanical name**	**Common name**	**Botanical name**
Silver fern	*Cyathea dealbata*	Gorse	*Ulex europaeus **
Karamu	*Coprosma robusta*	Black Wattle	*Acacia mearnsii*
		Chinese privet	*Ligustrum sinense **
		Japanese honeysuckle	*Lonicera japonica **
		Tree privet	*Ligustrum lucidum **
		Woolly nightshade	*Solanum mauritianum **
		Phoenix palm	*Phoenix canariensis **
		Gum tree	*Eucalyptus sp.*
		Pampas grass	*Cortaderia selloana **
		Monterey pine	*Pinus radiata*
		Sydney Golden Wattle	*Acacia longifolia*

Table 1 – Species of plants identified within the Hobsonville PS site

5.3.2 Proposed Works

The proposed works around the Hobsonville PS include the following:

- Construction of a permanent vehicle access way from Buckley Avenue on the western side of the site.
- Construction of a boundary fence along the Buckley Road frontage of the site.

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- Construction of a 710mm pipe by means of an open-cut trench from the southern end of the existing pump station building, along the eastern side of the site to a position north of the pump station.
- The construction of a micro-tunnel pit for the crossing of SH18.

The proposed works on the northern side of SH18 include:

- Construction of a compound for a micro tunnel pit for the crossing of SH18.
- Construction of a 710mm pipe by means of open-cut trench from the eastern end of the micro-tunnel and along to the area immediately north of the carriageway of Squadron Drive and the SH18 on-ramp.

5.3.3 Arboricultural Effects

Clearance of existing vegetation located around the existing pump station will be required to complete the permanent access road, open-cut trenching and boundary fence construction.

The largest trees affected in this site are gum trees, which are assessed to generally be in poor condition, likely as a result of a combination of insect browsing and historic alteration to their growing environment. The trees are large and highly visible, however their condition reduces their value from a visual perspective and the trees have no particular arboricultural qualities.

The understory native vegetation that is affected by the access road and boundary fence is not of any particular quality, however should be retained wherever possible as a natural ground cover. Removal of exotic weeds and revegetation with native species will enhance the qualities of the site.

There will be a requirement to clear an area of the recently planted vegetation located on the northern side of SH18, opposite the Hobsonville PS. This vegetation is small and therefore readily replaced.

5.3.4 Mitigation

The removal of existing protected vegetation will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology section of this report.

Where vegetation is removed this will be replaced in accordance with the recommendations of Appendix A - Tree Planting Protocol of this report.

5.4 SH18 to Causeway

5.4.1 Existing Environment

The proposed works site area for this section of the proposed pipeline runs along the northern side of the access-way located north of the Squadron Drive on-ramp. This includes a small area of land located between the access way and Squadron Drive on-ramp for a minor above ground structure.

The existing environment on the northern side of the access-way is devoid of vegetation. The area between the access way and Squadron Drive on-ramp has been recently planted with native vegetation.

Parts of the eastern end of the access-way where it drops on to the northern edge of the causeway area are vegetated with a mix of native plant species that has been colonised by exotic pest species.

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Native species		Exotic species * = legally declared plant pest species	
Common name	**Botanical name**	**Common name**	**Botanical name**
Mahoe	*Melicytus ramiflorus*	Tree privet	*Ligustrum lucidum* *
Ti Kouka	*Cordyline australis*	Woolly nightshade	*Solanum mauritianum* *
Karo	*Pittosporum crassifolium*		
Karamu	*Coprosma robusta*		
Pohutukawa	*Metrosideros excelsa*		
Mapou	*Myrsine australis*		
Flax	*Phormium tenax*		
Karaka	*Corynocarpus laevigatus*		

Table 2 - Species of plants identified within the SH18 to causeway alignment

5.4.2 Proposed Works

The proposed works involve construction of a 710mm pipe by means of open-cut trench from the micro-tunnel pit and along the northern side of the Squadron Drive on-ramp.

5.4.3 Arboricultural Effects

The works will involve clearance of the existing low-level vegetation located on the northern side of the Squadron Drive on ramp. This vegetation has been recently planted and is readily replaced.

5.4.4 Mitigation

Reinstatement of vegetation of the same type as the vegetation that is required to be removed is suitable in this instance. Vegetation should be replaced on a like-for-like basis and new vegetation planted in accordance with the recommendations of Appendix A - Tree Planting Protocol of this report.

5.5 Upper Waitemata Harbour crossing

5.5.1 Existing Environment

The causeway of SH18 is reclaimed land with rock-armoured retaining along the northern edge of the embankment. Pohutukawa trees and other vegetation has established within the fill and rock surface. These trees will be removed as part of the Greenhithe Bridge Watermain Duplication ("GBWD") project.

On the other side of this section of the works, the environment is a coastal reserve and road reserve surrounded by public amenities and residential properties. A steep, vegetation-clad coastal embankment rises above the road formation of Rahui Road. The area from the southern side of Rahui Road through to the mean high water springs mark is a small reserve with one small specimen tree. The area of the carriageway of Rahui Road and the intersection within the paper road area of Traffic Road is covered by a mix of native and exotic vegetation. One large pohutukawa and three maritime pines are significant trees on the embankment above Rahui Road.

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5.5.2 Proposed Works

It is proposed to horizontally drill or marine trench two 550 DN pipes from newly reclaimed land (pursuant to the resource consent package for GBWD) adjacent to the existing motorway causeway. The twin drill shots pass under the Upper Waitemata Harbour and exit at Rahui Road, Greenhithe.

Site compounds established at each end of the HDD operations will be constructed and used to house the required machinery.

5.5.3 Arboricultural Effects

Existing trees growing on the slope on the northern side of Rahui Road may be affected by the construction of the proposed site compound. The removal and/or works within the rootzone of trees in this location have the potential to have significant effects on the qualities associated with the trees in this location. In particular, a mature pohutukawa growing at the base of the road embankment is an important feature of the local treed environment here. Excavation into the slope in order to establish the works compound must avoid and/or minimise the loss of tree roots from the pohutukawa, if it is to be retained. Should large tree roots from this tree be encountered and be required to be removed (following assessment of all possible alternatives) the stability of the tree may become compromised.

A group of maritime pine trees and native/exotic understory will require removal to form the proposed site compound.

5.5.4 Mitigation

In order to minimise the impacts of the works in this area, the site compound establishment should attempt to retain the pohutukawa tree on Rahui Road. This might involve shifting the alignment of the open-cut trench and site compound as far to the south-east as possible (while staying within the envelope identified in the drawings) and/or changing the convergence of the two pipelines to narrow the works area. If the removal of the pohutukawa is unavoidable, larger scale mitigation planting should be implemented to replace the trees that are to be removed.

A landscape enhancement plan should be produced to show the planting that is required to mitigate the effects of the tree removal once the full extent of the tree removal within Rahui Road has been confirmed.

5.6 **Rahui Road to Greenhithe Road**

5.6.1 Existing Environment

The area north of the carriageway of Rahui Road and the intersection within the paper road area of Traffic Road is covered by a mix of native and exotic vegetation. There is a narrow area of grass running along the eastern side of the paper road of Traffic Road, which links to the private driveway of No.11 Traffic Road.

The formed part of Traffic Road contains grass berms with stand-alone street trees.

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Native species		Exotic species * = legally declared plant pest species	
Common name	**Botanical name**	**Common name**	**Botanical name**
ponga	*Cyathea dealbata*	Gorse	*Ulex europea**
tree daisy	*Olearia sp*	wild ginger	*Hedychium gardnerianum**
Karamu	*Coprosma robusta*	pampas	*Cortederia selloana**
Pohutukawa	*Metrosideros excelsa*	maritime pine	*Pinus pinaster*
Mapou	*Myrsine australis*		
kanuka	*Kunzea ericoides*		

Table 3 - Species of plants identified within the road side embankment of Rahui Road

Native species		Exotic species * = legally declared plant pest species	
Common name	**Botanical name**	**Common name**	**Botanical name**
kamahi	*Weinmannia racemosa*	Tree privet	*Ligustrum lucidum **
Mahoe	*Melicytus ramiflorus*	blue morning glory	*Ipomoea japonica**
cabbage tree	*Cordyline australis*	wild ginger	*Hedychium gardnerianum**
Karamu	*Coprosma robusta*	bone seed	*Chrysanthemoides monilifera**
kauri	*Agathis australis*	Gorse	*Ulex europea**
Mapou	*Myrsine australis*	Hakea	*Hakea sp.*
kanuka	*Kunzea ericoides*		
ponga	*Cyathea dealbata*		
titoki	*Alectryon excelsus*		
Karaka	*Corynocarpus laevigatus*		

Table 4 - Species of plants identified within Traffic Road (paper road), Greenhithe

5.6.2 Proposed Works

The 550 DN pipes will come together into a 710mm pipe within the site compound proposed to be established at Rahui Road. Construction of the site compound is proposed to require an area of the slope on the northern side of Rahui Road to be levelled to accommodate the drilling rig and associated plant for the HDD drilling. If marine trenching is utilised then the site construction area for this site may be considerably reduced.

The 710mm pipe will be installed by open-cut trench across Rahui Road, and along Traffic Road to the intersection with Rame Road and Greenhithe Road. An air valve drain pipe is proposed to run parallel to the pipeline route to discharge to a connection point in Traffic Road form an air-valve in Greenhithe Road.

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5.6.3 Arboricultural Effects

There will be a requirement to clear an area of vegetation within the paper road of Traffic Road to accommodate the open-cut trenching for the pipeline. The trees here are significant as they are well-established, diverse native species. Particular attention should be given one kauri tree that has emerged above the treeline. The pipeline should be installed as close as possible to the southern-eastern side of the paper road (taking into account existing overhead powerlines and neighbouring structures).

Works within the rootzone of retained vegetation within the paper road section of Traffic Road and trees located on the verge areas of the sealed section of Traffic Road has the potential to have adverse effects on the health and safety of trees.

5.6.4 Mitigation

The removal of existing protected vegetation will be undertaken in accordance good practices and the recommendations of the Tree Protection Methodology in Appendix B of this report so as to avoid adverse effects to trees that are to be retained adjacent to the clearance activities.

Where works are undertaken within the rootzone of protected vegetation these works will be undertaken in accordance with the recommendations of Appendix B - Tree Protection Methodology of this report.

A landscape enhancement plan should be produced to show the planting that is required to mitigate the effects of the tree removal once the full extent of the tree removal within Traffic Road has been confirmed.

5.7 Greenhithe Road to Wainoni Park South

5.7.1 Existing Environment

Greenhithe Road is an urban street that is sealed and kerbed. There are footpaths on either side of the street. There are no street trees or other protected vegetation with driplines within the proposed works site area along Greenhithe Road for the majority of the alignment along Greenhithe Road. The exception to this is newly planted street trees outside Wainoni Park and one pohutukawa on the corner of Greenhithe Road and Tauhinu Road.

Trees located on both sides of Greenhithe Road are located within private properties and generally clear of the proposed works site area.

At the intersection of Greenhithe Road and Sunnyview Road the areas on either side of Greenhithe Road are well vegetated with a mix of exotic and native vegetation. This vegetation is located on road reserve and the private properties of Nos.29A and 30 Greenhithe Road and a reserve strip located opposite Sunnyview Road.

5.7.2 Proposed Works

It is proposed to construct a 710mm pipe by open-cut trench from Rame Road/Tauhinu Road, along the carriageway of Greenhithe Road to Wainoni Park. New connections and minor above ground structures, (e.g. manhole covers) are to be installed at certain locations along the route, such as at the intersection of Greenhithe Road and Sunnyview Road. A 150mm DN scour valve drain pipe is required at this location to connect into the existing wastewater infrastructure within the reserve strip opposite Sunnyview Road.

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5.7.3 Arboricultural Effects

At the intersection of Greenhithe Road and Sunnyview Road there will be a requirement to clear existing protected vegetation (located within the road reserve and the recreational reserve) and to undertake works within the dripline of existing vegetation to facilitate the construction of the scour valve chamber and the 150mm diameter pipe feed off this and into the existing wastewater infrastructure.

Removal of one street tree outside Wainoni Park may be required to form the bend in the pipeline from Greenhithe Road to Wainoni Park South.

5.7.4 Mitigation

Where vegetation is required to be removed for the scour valve and associated wastewater connection, this will be replaced and new vegetation planted in accordance with the recommendations of Appendix A - Tree Planting Protocol of this report.

5.8 **Wainoni Park (South and North)**

5.8.1 Existing Environment

Wainoni Park South contains open spaces that are clear of trees and vegetation. This park is characterised by open paddocks grazed by horses. Groups of trees and vegetated areas throughout the park include shelterbelts, native riparian plants, exotic weeds and specimen trees and remnant farm-forestry specimens of various qualities.

Streams and bush-clad gullies transect portions of the park and there is an existing culvert vehicle crossing traversing the gully in the northern aspect of Wainoni Park. Both sides of this crossing are densely vegetated. To the east the vegetation is predominantly maturing native vegetation. To the west of the crossing the vegetation consists of a mix underlying native vegetation with a upper canopy of weed plant species. A list of vegetation found within this area can be found below in Table 5.

From approximately 25m east of the existing culvert vehicle crossing the small stream converges with another small overland flow area and turns and runs in a northerly direction to the Te Wharau Creek estuary. Immediately before the tidal area of Te Wharau Creek another existing culvert vehicle crossing crosses the small stream and provides a break in the vegetation of the gully area.

The northernmost aspect of Wainoni Park contains several hedgerows of trees and large oak specimens. The trees within the hedgerows consist of river she oak (*Casuarina cunninghamiana*) *and* Monterey pine (*Pinus radiata*). The trees have an average approximate height of 25m. Two large mature English oak trees are growing on the coastal edge adjacent to the eastern end of the pine hedgerow.

5.8.2 Proposed Works

It is proposed to construct a 710mm pipe by open-cut trench from Greenhithe Road through Wainoni Park. The pipe route bends into Wainoni Park at a location opposite No.77 Greenhithe Road. The pipeline will be constructed through the small stream in the northern aspect of the park.

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5.8.3 Arboricultural Effects

Four areas where trees are affected are detailed in the tree schedule in Appendix A of this report. The removal of trees including mature to over-mature pines, shelter belts and native/exotic riparian vegetation will reduce the total vegetation cover of the public open space.

Existing vegetation located within the vegetated area located on either side of the stream at the northern aspect of Wainoni Park is required to facilitate the construction of the pipeline. The effects on native vegetation will be less significant if the pipeline is located to the west of the existing culvert.

The construction of the over flow pipeline from the scour valve will implicate existing vegetation growing on both sides of the existing culvert vehicle crossing located within the vegetated area immediately south of the foreshore of Lucas Creek. Removal and or works within the rootzone of trees here has the potential to affect this vegetation, however this is mostly exotic invasive species.

Removal of trees within two hedgerows will create gaps in the continuous canopy of the rows of river she-oak and pine trees. Due to the gap created in the canopy, trees that may be retained at the edge of the pipe route may become unstable and/or prone to failure. For safety reasons it will be necessary to evaluate these 'edge effects' and carry out remedial measures to address any hazard. This might require that all of the trees in the hedgerow are removed.

The alignment of the pipeline should transect the hedgerow of *Casuarina* as far to the west as possible, as the trees at the western end are of lesser quality. The effects that the removal of selected trees may have on the remaining trees in terms of 'edge effects' will be evaluated at the time of tree removal. Measures to mitigate these edge effects, including removal and/or reduction of edge trees will then be implemented.

In order to avoid effects on two significant oak trees, the pipe alignment and the site compound should be as far to the west as possible, without impacting on another hedgerow of pines running north-south at the western edge of the area.

5.8.4 Mitigation

Location of the pipeline to the west of the existing culvert crossing will minimise the effects on native vegetation and require the removal of lesser-quality vegetation.

Where mature trees are required to be removed, planting of new specimen trees will mitigate the adverse effects. New vegetation will be planted in accordance with the recommendations of Appendix A - Tree Planting Protocol of this report.

Where works are required to be undertaken within the dripline of trees and vegetation the works will be undertaken in accordance with the recommendations of Appendix B - Tree Protection Methodology of this report.

Works are to avoid the significant oak trees at the northern edge of Wainoni Park. Retention of these significant trees in an undisturbed growing environment will be an important mitigating factor.

5.9 **Te Wharau Creek crossing**

5.9.1 Existing Environment

The 10-15m strip of land on the Wainoni Park foreshore area bounding Te Wharau Creek is covered in vegetation that consists of weed plant species including a large area of bamboo, with occasional native plant species. Pohutukawa trees have been planted at regular spacings along this margin.

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Native specimens		Exotic specimens * = legally declared plant pest species	
Common name	**Botanical name**	**Common name**	**Botanical name**
Pohutukawa	*Metrosideros excelsa*	Chinese privet	*Ligustrum sinense*
Karamu	*Coprosma robusta*	Black Wattle	*Acacia mearnsii*
Ti Kouka	*Cordyline australis*	Japanese honeysuckle	*Lonicera japonica* *
Silver fern	*Cyathea dealbata*	Pampas grass	*Cortaderia selloana* *
Kanuka	*Kunzea ericoides*	Gorse	*Ulex europaeus* *
Mahoe	*Melicytus ramiflorus*	Tree privet	*Ligustrum lucidum* *
Mapou	*Myrsine australis*	Bamboo	*Phyllostachis sp*
Karo	*Pittosporum crassifolium*		

Table 5 – Species of plants identified within coastal margin at Wainoni Park

On the other side of Te Wharau Creek, vegetation on the coastal margin of NSMP includes the following:

Native specimens		Exotic specimens * = legally declared plant pest species	
Common name	**Botanical name**	**Common name**	**Botanical name**
Karamu	*Coprosma robusta*	Monterey pine	*Pinus radiata*
Silver fern	*Cyathea dealbata*	Gorse	*Ulex europaeus* *
Kanuka	*Kunzea ericoides*	Tree privet	*Ligustrum lucidum* *
Mapou	*Myrsine australis*		

Table 6 – Species of plants identified within the riparian margin areas of North Shore Memorial Park

5.9.2 Proposed Works

An HDD pit will be excavated/constructed at the northern edge of Wainoni Park. The HDD pit and associated compound will be excavated/constructed within the grassed area between the hedgerows and the coastal margin vegetation in a position that avoids the significant oak trees.

An HDD pit will also be excavated/constructed at the southern edge of North Shore Memorial Park. The HDD pit and associated compound will be excavated/constructed within a grassed area between the coastal margin and a small vegetated gully. The works include clean water diversions into the gully and coastal margin.

5.9.3 Arboricultural Effects

Removal of trees within the defined areas required to create the site works compounds will involve clearance of riparian vegetation, all of which adds to the natural environment in this coastal open space area. Removal and control of weed species will have positive effects in these locations.

Felling of larger trees on the Wainoni Park side of Te Wharau Creek will have adverse effects on the environment due to the loss of tree cover, shelter and visual amenity that the trees currently provide.

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5.9.4 Mitigation

Location of the HDD site compound to the west of the rootzone of the significant oak trees in Wainoni Park will minimise the effects on these trees. Retention of these significant trees in an undisturbed growing environment will be an important mitigating factor. The growing environment and visual appeal of these trees may be enhanced as part of the project through the removal of competing trees and vegetation.

Where mature trees are required to be removed, planting of new specimen trees will mitigate adverse effects.

New vegetation will be planted in accordance with the recommendations of Appendix A - Tree Planting Protocol of this report to mitigate the clearance of riparian vegetation.

The mitigation proposal for this area should place an emphasis on weed control and retention of native plants in the marginal areas to enhance the natural qualities of the location.

Where works are required to be undertaken within the dripline of trees and vegetation the works will be undertaken in accordance with the recommendations of Appendix B - Tree Protection Methodology of this report.

5.10 **North Shore Memorial Park**

5.10.1 Existing Environment

The proposed route of the pipeline through North Shore Memorial Park ("NSMP") will take place within open, grassed areas and the existing sealed road environment that provides access through the park.

The proposed route of the pipeline is clear of vegetation for the most part as the area is characterised by mown turf and formed park access roads. One hedgerow of Japanese cedar trees (*Cryptomeria japonica*) transects the grassed area in the centre of the park.

In the northern aspect of NSMP on either side of the sealed road many specimen trees have been planted. Many of these are 'memorial trees' that have a burial plaque located at the base of the tree. Many of these trees overhang the carriageway.

5.10.2 Proposed Works

It is proposed to construct a 710mm pipe by open-cut trench from the HDD pit for the Te Wharau Creek crossing to the entrance to NSMP at Schnapper Rock Road.

The proposed route will be within the carriageway of the south-southeastern portion of the ring road that provides vehicular access through NSMP.

5.10.3 Arboricultural Effects

The proposed work route dissects the hedgerow of Japanese cedar trees, through a naturally occurring gap between existing trees. The works corridor may have to be narrowed to avoid removal of trees in this hedgerow and adverse effects on the Japanese cedar trees either side of the works site. Works within the rootzone of the Japanese cedar trees on either side of the naturally occurring gap have the potential to have adverse effects on these trees.

The work will involve works within the rootzone of many exotic and some native trees located alongside the carriageway. These works are considered minor if the construction corridor can be confined to the bounds of the carriageway and not encroach on to the turf areas beyond the carriageway.

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A group of trees adjacent to the entrance to NSMP on Schnapper Rock Road is required to be removed for the pipeline route to be constructed. These trees, including Norfolk Island pine, add to the amenity values of the locality when viewed from Schnapper Rock Road.

5.10.4 Mitigation

Where works are undertaken within the dripline of protected vegetation these works will be undertaken in accordance with the recommendations of Appendix B - Tree Protection Methodology of this report.

Where trees are required to be removed, planting of new specimen trees will mitigate the adverse effects.

5.11 North Shore Memorial Park to North Shore Golf Club

5.11.1 Existing Environment

The proposed route of the pipeline from Schnapper Rock Road through to Witton Place is characterised by sealed road environments and wide, grassed verges. Between Schnapper Rock Road and Newbury Place the pipeline route runs across a wide road reserve with poor quality native trees, then along a narrow walkway which is devoid of trees.

The route of the pipeline from Witton Place through to North Shore Golf Club ("NSGC") is characterised by native plant species in a bush-clad environment. There is a stream flowing through the gully from east to west between Witton Place and Laurel Oak Drive.

Predominantly the vegetation consists of primary plant colonisers such a kanuka (*Kunzea ericoides*) with silver ponga sub-canopy. A list of species found within this area is provided in the following table.

A group of large, over-mature Monterey pine (*Pinus radiata*) is within the gully to the south of NSGC and adjacent to the eastern boundary of the proposed site compound.

Native specimens		**Exotic specimens** ** = legally declared plant pest species*	
Common name	**Botanical name**	**Common name**	**Botanical name**
Silver fern	*Cyathea dealbata*	Chinese privet	*Ligustrum sinense*
Karamu	*Coprosma robusta*	Tree privet	*Ligustrum lucidum **
flax	*Phormium tenax*	Woolly nightshade	*Solanum mauritianum **
Kanuka	*Kunzea ericoides*	Pampas grass	*Cortaderia selloana **
Mahoe	*Melicytus ramiflorus*	Monterey pine	*Pinus radiata*
Mapou	*Myrsine australis*	wild ginger	*Hedychium gardnerianum **
Ti Kouka	*Cordyline australis*		
five-finger/pate	*Schefflera pate*		

Table 7 - Species of plants identified within the gully between Witton Place and Laurel Oak Drive

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5.11.2 Proposed Works

It is proposed to construct a 710mm pipe by open-cut trench within the road reserve areas of Schnapper Rock Road, Newbury Place, Witton Place and Aberley Road. Between Schnapper Rock Road and Newbury Place the pipeline route runs through a narrow walkway. An air-valve drain pipe runs parallel to the pipeline route from outside NSMP to the walkway.

It is proposed to construct a pipe-bridge across the stream that flows between Witton Place and Laurel Oak Drive at the southern edge of the NSGC. In order to construct the site compound around the pipe-bridge and install the pipeline by open-cut trenching, it is proposed to create a level works platform from the southern boundary of NSGC to the northern side of the stream. This will require vegetation clearance and cut and fill earthworks and a retaining batter to form a stable platform. The works include a scour valve drain that extends the site compound towards the south and an air-valve drain that runs parallel to the pipeline route from NSCG to the gully.

The proposed pipe will then be constructed in an open-cut trench through to the NSGC grounds.

5.11.3 Arboricultural Effects

The works within the road reserves of Schnapper Rock Road, Newbury Place and Witton Place do not affect trees. Where the proposed pipeline route passes through the roundabout at the intersection of Abberly Road and Witton Place, the existing vegetation within the roundabout (4x Cabbage trees – *Cordyline australis* and various prostrate coprosma – *Coprosma sp.*) will require removal.

There will be a requirement to clear existing vegetation to construct the pipe bridge and the associated site works compound. The earthworks associated with this will require removal of a stand of large pine trees and clearance of mature kanuka forest with native understory. Where earthworks are within the rootzone of pine trees adjacent to the site compound, the trees will potentially be compromised by changes to their growing environment. Removal of trees that are deemed to be adversely affected will be necessary to prevent hazards resulting from affected trees.

The proposal contributes significant alteration to the environment and tree cover of the area around the stream and the banks of the gully. The adverse effects on visual amenity values and the intrinsic values of tree cover in general are significant due to the size of the trees and the qualities of riparian vegetation.

5.11.4 Mitigation

In order to minimise the impacts of the works in this area, the site compound establishment should attempt to retain vegetation wherever possible. A landscape enhancement plan should be produced to show the planting that is required to mitigate the effects of the tree removal once the full extent of the tree removal has been confirmed. The landscape planting plan proposed provides a conceptual treatment of this area using native trees that will rapidly re-establish a canopy cover over the land. The extent to which planting is required will be determined following the clearance of trees that are required to be removed, as deemed by an arborist at the time of construction.

A detailed landscape planting plan commensurate with the scale of vegetation clearance required to establish the site compound and suitable of the future maintenance requirements of the site and pipeline should be prepared prior to reinstatement of the site.

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The removal of existing protected vegetation will be undertaken in accordance with correct arboricultural practices and the recommendations of the Tree Protection Methodology section of this report so as to avoid adverse effects to trees and vegetation that are to be retained adjacent to the clearance activities. Felling of pine trees should avoid damage to understory and adjacent native vegetation so as to limit the footprint of the disturbance that is required to be mitigated.

Where works are undertaken within the rootzone of trees and vegetation that are to be retained, these works will be undertaken in accordance with the recommendations of Appendix B - Tree Protection Methodology of this report.

5.12 North Shore Golf Club to Albany Highway

5.12.1 Existing Environment

The proposed route of the pipeline through NSGC is characterised by areas of turf with specimen trees located throughout and a sealed road and carpark environment bounded by specimen trees and shelterbelt plantings.

Appleby Road is sealed with kerb and channelled edging and footpaths along both sides. The southern side of Appleby Road contains a series of small pin oak (*Quercus palustris*) that are planted in the grass verge between the road kerb and the footpath.

5.12.2 Proposed Works

The proposed pipe will be constructed in an open-cut trench through this section of the proposed pipeline route. An air-valve drain is proposed to be installed into a portion of Clear Reserve to connect to existing infrastructure.

5.12.3 Arboricultural Effects

Removal of trees on the southern edge of NSGC will occur as part of the construction of the site compound detailed as part of the previous section. The alignment diagonally through the carpark avoids the large shelter-belt of trees on the southern edge of the carpark.

Works will be undertaken within the rootzone of trees that are to be retained adjacent to the northern side of the entrance to NSGC. These trees overhang the proposed construction corridor, but are sufficiently set back from the road so as not to be significantly affected by works carried out in accordance with tree protection methodologies.

Pruning of trees with branches that overhang the access road may be required to allow a clear works corridor.

5.12.4 Mitigation

Where works are undertaken within the rootzone of trees that are to be retained, these works will be undertaken in accordance with the recommendations of Appendix B - Tree Protection Methodology of this report.

Removal of trees will be mitigated by planting of trees to a standard that is commensurate with the number of trees requiring removal to complete the works.

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5.13 Albany Highway to William Pickering Drive

5.13.1 Existing Environment

Properties between Albany Highway and William Pickering Drive are large-scale light industry sites, some of which have no development on them. The alignment reaches John Glenn Avenue from Albany Highway via a vacant site. No trees are present within the road environment between Albany Highway and William Pickering Drive and the few privately-owned trees are considered to be unaffected by the works.

5.13.2 Proposed Works

The proposed pipe will be constructed in an open-cut trench within the road reserve through this section of the proposed pipeline route, with valves installed in strategic locations.

5.13.3 Arboricultural Effects

No adverse arboricultural effects are anticipated from the works in this section.

5.13.4 Mitigation

No mitigation is deemed to be necessary, given adherence to tree protection measures.

5.14 Piermark Drive to Bush Road

5.14.1 Existing Environment

Piermark Drive is a commercial street with road reserve and footpath on both sides. Small trees are planted within the berms.

The rear of the industrial property at No.169 Bush Road contains an area of grass lawn at the end of the sealed driveway. The site compound for crossing of the Alexander Stream is to be set up within this area, which is covered in the next section.

5.14.2 Proposed Works

The proposed pipe will be constructed in an open-cut trench through this section of the proposed pipeline route.

5.14.3 Arboricultural Effects

Street trees on Piermark Drive are potentially affected by open-cut excavation works and associated activities.

5.14.4 Mitigation

Works undertaken in accordance with the recommendations of the Tree Protection Methodology in Appendix B of this report will avoid effects on street trees.

5.15 Rosedale Park to Rosedale WWTP (including Alexandra Stream crossing)

5.15.1 Existing Environment

The gully that Alexander Stream runs through is heavily vegetated. The vegetation within this environment is characterised by maturing weed plant species with shade tolerant native plant species among the understory species.

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The side of the proposed stream crossing is within the commercial property at No.169 Bush Road, where there is a prominent hedgerow of river she-oak trees (*Casuarina cunninghamiana*) and stand-alone black wattle trees. On the western side of Alexander Stream the prominent canopy species is black wattle (*Acacia mearnsii*) with other weed plant species and shade tolerant native species forming the sub-canopy.

Within the water course and straddling the banks of Alexander Stream the prominent upper canopy is formed by crack willow (*Salix fragilis*).

Immediately east of Alexander Stream and bounding the mown turf areas of Rosedale Park there is a hedgerow of mature Monterey pine (*Pinus radiata*). These form the demarcation between the streamside vegetation and the open grassland of Rosedale Park.

The amenity landscaped areas of Rosedale Park contains open grassland and groups of young specimen trees such as American sweet gum (*Liquidambar styraciflua*) and michelia (*Michelia doltsopa*). Larger trees within Rosedale Park include hedgerows and group plantings of macrocarpa (*Cupressus macrocarpa*) and Monterey pine (*Pinus radiata*). Along the boundary dividing Rosedale Park and Rosedale WWTP there is native vegetation planted in a strip along the western boundary of the WWTP.

Native specimens		**Exotic specimens** ** = legally declared plant pest species*	
Common name	**Botanical name**	**Common name**	**Botanical name**
Silver fern	*Cyathea dealbata*	Monterey cypress	*Cupressus macrocarpa*
Karamu	*Coprosma robusta*	Chinese privet	*Ligustrum sinense**
Kanuka	*Kunzea ericoides*	Pampas grass	*Cortaderia selloana **
Mahoe	*Melicytus ramiflorus*	Monterey pine	*Pinus radiata*
Mapou	*Myrsine australis*	crack willow	*Salix fragilis*
Ti Kouka	*Cordyline australis*	Montbretia	*Crocosmia × crocosmiiflora*
Karo	*Pittosporum crassifolium*	Convolvulus	*Convolvulus sp.*
		Sydney golden wattle	*Acacia longifolia*

Table 8 - Species of plants identified within the gully between Bush Road and Rosedale Park

Native specimens		**Exotic specimens** ** = legally declared plant pest species*	
Common name	**Botanical name**	**Common name**	**Botanical name**
rimu	*Dacrydium cupressinum*	American sweet gum	*Liquidambar styraciflua*
kahikatea	*Dacrycarpus dacrydioides*	swamp cypress	*Taxodium distichum*
pohutukawa	*Metrosideros excelsa*	Monterey cypress	*Cupressus macrocarpa*
Kanuka	*Kunzea ericoides*	White Mexican cypress	*Cupressus lusitanica*
Ti Kouka	*Cordyline australis*	Michelia	*Michelia doltsopa*
totara	*Podocarpus totara*	oak	*Quercus sp*
		Monterey pine	*Pinus radiata*

Table 9 - Species of plants identified within the open space areas of Rosedale Park

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Native specimens	
Common name	**Botanical name**
Ngaio	*Myoporum laetum*
Puriri	*Vitex lucens*
Karo	*Pittosporum crassifolium*

Table 10 - Species of plants identified within the boundary of Rosedale WWTP

5.15.2 Proposed Works

The crossing of Alexander Stream will be carried out by HDD methods with a pit at the rear of No.169 Bush Road and a pit within the mown turf of Rosedale Park.

From the HDD pit in Rosedale Park, the proposed pipeline will be constructed by open-cut trenching methodology into Rosedale WWTP.

5.15.3 Arboricultural Effects

Removal of trees within No.169 Bush Road is required to create the site compound for the HDD operation. The trees are large, but not particularly significant from an arboricultural perspective. The effects of tree removal will be confined to the intrinsic qualities of large trees.

The establishment of the site compound for the HDD operation should take into account the large number of trees within the park and be designed to minimise the tree removal requirements.

The open-cut trenching section will require existing vegetation within Rosedale Park to be removed, due to the intention of keeping the park road open and trenching through the grass land to the south of the park road. Most of the trees here are small and relatively recently planted and can be readily replaced with large-grade replacement trees. The removal and replanting is a set-back to the establishment of new trees within the reserve. The pipeline alignment should avoid the larger established trees.

Realignment of the pipeline route to the open grassed area behind the groups of trees and reconfiguration of the HDD compound to avoid trees is recommended to minimise the effects on the public tree resource.

5.15.4 Mitigation

Where works are undertaken within the rootzone of trees and vegetation that are to be retained, these works will be undertaken in accordance with Appendix B - Tree Protection Methodology of this report.

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6.0 Conclusions

6.1 Effects

Overall the proposed work will require areas of existing vegetation and individual trees to be either removed or be subject to works within their driplines. There are no scheduled or heritage trees (as per relevant District Plans) that are adversely affected by the proposed works. Several sites contain large mature trees and stands of native vegetation that are important to the local environment.

Implementation of methodologies for tree protection will be required to manage construction activities that may adversely affect retained trees and allow for these trees to continue contributing to the environment. This largely relates to managing the works sites so driplines are protected from construction activities and where necessary appropriate measures are undertaken to minimise adverse affects on trees. Appropriate treatment of tree roots that may be encountered may minimise the effects of the work on those trees.

Works within the road carriageway should have no more than minor effects on the roots of trees, as the incidence of tree roots below the sealed surfaces is expected to be minimal.

Where continuous areas of existing vegetation require removal the removal process will be managed so vegetation being retained on the periphery is not adversely affected by the removal process. Where existing large trees are being removed the removal process will be undertaken by skilled persons in accordance with the accepted industry standards.

Overall the effects on the tree resource in some localised areas along the route are significant and have the potential to be more than minor if no mitigation is undertaken. These effects are to be mitigated through replanting to a level commensurate with the level of vegetation removal required within each work location.

6.2 Mitigation

Where existing vegetation is removed it is proposed that this will be replaced by planting of native trees and quality specimen trees. Where the vegetation being removed is part of a continuous area of vegetation replanting should be done so the existing natural environment is replicated or enhanced. This will require removal and control of weed species as well as tree planting/revegetation. The Replacement Planting Protocol in Appendix A of this report sets out measures that will assist to develop mitigation measures that are suitable to mitigate the scale of effects generated by tree removal.

Where existing stand-alone trees are required to be removed these will be replaced in consultation with the asset manager or land owner for the site, as necessary. Where larger trees (exceeding 4m in height) are required to be removed, these should, with the agreement of the land-owner be replaced with 2 replacement trees.

Provided that the works occur in accordance with tree protection measures that are suitable for the scale of the pipe installation operations and site specific works are designed to prevent harm to the trees adjacent to the route, damage to the above ground portions of the trees can be avoided.

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Protection of trees will need to include protection of their growing environment, which will require the permeable rootzone areas of trees to be protected from soil compaction, and contamination from activities associated with the works. The Tree Protection Methodology in Appendix B of this report sets out measures that are suitable to minimise effects on trees that are to be retained.

With the implementation of mitigation measures the overall effects of the proposal can be considered to be no more than minor.

7.0 Recommendations

7.1 An arborist should be appointed for the supervision of all works within the root zone of trees that are to be retained.

7.2 All trees that are to be retained should be protected from damage for the duration of the works. This is to be achieved by compliance with the Arboricultural Assessment and Tree Protection Methodology provided in Appendix B of this report.

7.3 Replacement planting should be carried out within the planting season immediately following the completion of each stage of the project in accordance with suitable replacement planting protocols, as detailed in Appendix A of this report.

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Appendix A - Replacement Planting Protocol

Where continuous areas of vegetation are removed the cleared areas will be re-vegetated in accordance with the following parameters:

(a) The re-vegetation will take place within the first planting season (typically May to September) following the completion of the construction activities.

(b) Plant species to be used will be appropriate to the area, site specific and where possible will be eco-sourced.

(c) The use of cultivars, varieties, and hybrids is inappropriate in natural areas.

(d) Plants should be an equal mix of grade sizes between root trainer and PB 12, and will be spaced no greater than one metre apart or as appropriate to the grade, species type and specific location within the site being planted.

(e) Where possible the planted areas will have a 75mm deep layer of well-composted organic mulch spread evenly over them. This mulch layer is to be maintained until canopy closure or for a minimum of two years from planting whichever is the greater.

(f) The planted areas will be kept weed free.

(g) The selected plants will be of good quality nursery stock and maintained to the satisfaction of Council for a period of two years from the date of planting. Any of the replacement plants that die within this period will be replaced and maintained as per the stated conditions.

Where stand-alone trees greater than 4m in height are removed replacement trees should be established on a two-for-one basis. The species, size and location of the replacement trees will be determined in consultation with the asset manager or property owner responsible for the site.

Where trees or vegetation is removed from Council-owned and managed land the arborist appointed by Auckland Council to oversee the project will record the species and size of all trees/plants that are required to be removed and provide these details to Council's Arboriculture and Landscape Advisor. The recorded numbers and species will form the basis of the replacement planting scheme.

The extent, location, species selection and plant grades for the replacement planting scheme will be suitable for the future access and maintenance requirements of the site and to the satisfaction of Council.

The planting will be implemented within the planting season immediately following the completion of the works.

The planted areas will be maintained in accordance with correct arboricultural/horticultural practices, including watering, mulching, weeding and replacement of plants that fail to establish for two years following planting.

Where required, site-specific planting plans should be provided to show the details of areas that are required to be replanted, including (but not limited to), plant species selection, ground preparation, weed control measures, planting methodologies and maintenance.

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Appendix B - Tree Protection Methodology

The following arboricultural construction methodologies relate to all works associated with the installation of the Northern Interceptor Phase 1 route. The provisions of this Tree Protection Methodology apply to all works and work related activities when within the dripline of trees to be protected. Trees to be protected include trees that are protected by applicable District plans and other trees of merit that are to be retained.

All trees that are to be retained growing in close proximity to the proposed works are to be protected in a manner that ensures that the effects of the works on the surrounding trees are no more than minor, unless specific permission is received in writing in the form of a land owner consent. This is to be achieved by compliance with the following tree protection construction methodologies:

B.1 Appointed Arborist

An Arborist (Appointed Arborist) will be employed to monitor, supervise and/or direct all works within close proximity to all protected trees, for the duration of the Northern Interceptor Phase 1 installation works.

The Appointed Arborist will mark out site-specific areas where arboricultural supervision, monitoring and/or direction are required. This will occur prior to works commencing on individual work sites.

B.2 Induction

Prior to commencement of any works within close proximity to protected trees on each specific site, a meeting (induction) is to be convened. At each site-specific induction, the Appointed Arborist will explain the resource consent conditions, tree protection measures and associated matters to all contractors, sub-contractors and supervisory staff. The induction meetings may be attended by appropriate Auckland Council staff.

The induction meeting may also be attended by the relevant Council's Arborist Advisor responsible for the tree asset and Councils Resource Consents Arborist. The consent holder will give Council's Arborist's five working days prior notice of the intended date of the meeting.

The consent holder will ensure that all contractors, sub-contractors and work site supervisory staff who are carrying out any works within the dripline of any protected tree covered by this consent are advised of the Conditions of Consent and act in accordance with the conditions.

A copy of the resource consent and this report will be available at all times on the work site.

B.3 Tree Protection Fences

Where appropriate, protective fencing (consisting of a 1.8 metre high pole mesh fencing or protective water filled barriers or acceptable equivalent) will be erected and positioned between the line of works and all permeable areas within close proximity to protected trees so as to restrict access to/storage on such areas. The protective fencing is to be erected prior to any works occurring in close proximity to any protected tree. The Appointed Arborist will determine the need for protective fencing installation and, if required, its position and composition.

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B.4 Excavation

The principle method of excavation within close proximity to protected trees is to be by way of machine excavation. Hand-digging, probing and exploratory excavation will be carried out where specified by the appointed arborist.

The Appointed Arborist is to determine the excavation methodology to be used when working in close proximity to protected trees covered by this consent.

All excavation machinery is to operate from outside the dripline of protected trees unless the machinery can operate from and remain fully on top of existing impermeable hard surfaces (e.g. carriageway) or temporary surfaces specified by the appointed arborist to prevent soil compaction.

When undertaking excavation works within close proximity to protected trees, the machine excavator will be fitted with a straight blade bucket (unless use of an alternative bucket i.e. toothed bucket is agreed to by the Appointed Arborist). Machine excavation will only take place within close proximity to protected trees under the supervision and direction of the Appointed Arborist.

When undertaking excavation works within close proximity to protected trees, the canopies, trunks and roots will be protected from damage. The Appointed Arborist will monitor, direct and/or supervise these works.

B.5 Tree Pruning

Where pruning of tree branches is required, consultation with the Council's Parks Arborist (when concerning protected Council street trees) or the owner of the land on which the tree is located will be undertaken before such pruning works are carried out. Any required tree pruning will be carried out in accordance with correct arboricultural practices by a competent arboricultural contractor.

B.6 Materials/Equipment

In respect to the position, operation, delivery and/or storage of vehicles, machinery, equipment, spoil and/or materials (and all associated activities/items) within close proximity to protected trees, the following restrictions will apply:

No vehicles, machinery, equipment, spoil and/or materials will be positioned, operated, delivered, stored, wheeled or driven within close proximity to protected trees unless it can be kept within the bounds of an existing impermeable hard surface (e.g. vehicle crossing, carriageway, footpath, base course and/or acceptable alternative) and does not conflict with any above ground portion of any protected tree.

Where site constraints require storage or movement of vehicles, machinery, equipment, spoil and/or materials within the rootzone of trees and this is unavoidable, the ground surface shall be protected prior to this activity. The ground protection measures will be specified by the appointed arborist and designed to prevent any contamination or compaction of the soil.

No vehicles, machinery, equipment, spoil and/or materials are to be placed or temporarily stored against the trunk or branches of any protected tree.

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B.7 Root removal

Tree root removal associated with any excavation within close proximity to any protected tree is to be undertaken in the following manner:

Where roots are required to be removed, necessary only to complete the proposed works, these will be cleanly cut back to the edge of excavations using a sharp implement such as a handsaw or secateurs. All retained roots and cut ends of tree roots will be protected from drying out by a covering of hessian (or acceptable alternative) that is to be kept damp until the excavated area can be backfilled.

All root pruning as detailed above is to be undertaken either by the Appointed Arborist or under the guidance and direction of the Appointed Arborist.

B.8 Reinstatement

The installation of emulsion, bitumen, Rugasol and all other manufactured products which can cause harm to trees will be undertaken in a manner that ensures that no direct spray or spray drift comes in contact with any portion of any protected tree. The Appointed Arborist is to advise on how works using such products are to be undertaken when in close proximity to any protected tree.

Any washing off of products as referenced above will be undertaken in a manner that ensures that no water or resulting slurry comes in contact with any portion of any protected tree.

B.9 Tree Removal

The permitted removal of trees will be carried out in accordance with acceptable arboricultural standards and practice by a suitably qualified and experienced Arborist in a manner that avoids damage to adjacent protected vegetation where possible. The removal of vegetation will only be undertaken following pre-commencement walk through with Council's Arborist to confirm the trees that are to be removed. Trees that are to be removed will be clearly marked with spray paint. Trees that are to be retained will be marked by a ribbon around their trunks or hazard tape to demarcate the area.

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Tree Schedule

GREENSCENENZ
ENHANCING AND PROTECTING LIVING ENVIRONMENTS

Project Name:	**Northern Interceptor Wastewater Pipeline**
Report prepared for:	**Watercare Services Limited**
Date:	**June 2015**

Notes:

Tree No.: - 'G' denotes a group of trees, 'T' denotes individually identifiable trees

ACDP = operative Auckland Council District Plan

WS = Waitakere Section of ACDP

NSS = North Shore Section of ACDP

PAUP = Proposed Auckland Unitary Plan

POS = Public Open Space

PS = Pump Station

SH18 = State Highway 18

NSMP = North Shore Memorial Park

NSGC = North Shore Golf Club

WWTP = Wastewater Treatment Plant

The protection status of the listed trees and groups of trees has been assessed based on the currently applicable District Plan rules and the zoning of the land containing the tree. The protection status listed for each tree/group is a reflection of the applicability of rules that provide for protection of trees under the current rules. It should be noted that this does not imply protection on all trees within the groups of trees listed in the Tree Schedule, only that there are protected trees/vegetation present within the group.

Refer to the *GreensceneNZ Limited* Assessment of Arboricultural Effects, June 2015, for tables containing the species lists for each group, where required.

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Tree No.	Site	Location	Species	Comments		ACDP		PAUP		Ownership	Protection Status	Proposed Works	
				Condition	Values	Designations	Zoning	Overlays	Zoning			Site work	Tree work
G 1.	Hobsonville PS and SH18 crossing	West of pump station	Various native and exotic, plus gums (*Eucalyptus*) – refer to Table 1	Poor quality vegetation. High percentage of plant pest species and fragmented edges reduce quality of trees.	Provides a degree of visual amenity (in an area otherwise largely devoid of vegetation).	Nil	General Natural Area (WS).	Nil	POS - Conservation	Watercare	Protected.	Vehicle crossing and access around western and northern edge of site. Fence on southern boundary	Remove trees within alignment of road and fence. Retain and protect edge trees. Mitigation planting
G 2.	Hobsonville PS and SH18 crossing	North of Pump Station	Various native and exotic – refer Table 1	Small, young trees	No particular merit	Nil	General Natural Area (WS).	Nil	POS - Conservation	Watercare and Transit NZ.	Not Protected.	Southern end of micro tunnel to be constructed under SH18.	Remove trees as necessary. Mitigation planting
G 3.	Hobsonville PS and SH18 crossing	East of Pump Station.	Various native and exotic – refer Table 1	Small, young trees	No particular merit. High percentage of plant pest species.	Nil	Restoration Natural Area, Riparian Margin, Coastal Edge Natural Area (WS).	Nil	POS - Conservation	Watercare	Protected.	Construct a new 750mm pipeline to the east of pump station through to micro tunnel under SH18.	Remove trees as necessary. Mitigation planting
G 4.	Hobsonville PS and SH18 crossing	Northern side of SH18, opposite pump station	Various native, primarily flax (*Phormium tenax*)	Small trees / groundcovers	Recently planted as part of SH18 construction. High amenity values	Nil	Coastal Natural Area, Restoration Natural Area, Riparian Margin / Coastal Edges Natural Area (WS).	SEA – Marine	Strategic Transportation Corridor	Transit NZ	Protected.	Northern end of micro tunnel under SH18. Open-cut trench for pipeline installation	Remove plants as necessary. Mitigation planting
G 5.	SH18 to causeway	Northern side of SH18 and Squadron Drive	Various native and exotic – refer to Table 2	Small, young trees	Planted area with some weed infestation	Nil	Coastal NA, Restoration NA, Riparian Margin / Coastal Edges NA (WS).	Nil	Strategic Transportation Corridor	Transit NZ	Protected	Open-cut trench for pipeline installation	Remove trees as necessary. Work within dripline of retained trees. Mitigation planting
T 6.	Upper Waitemata Harbour Crossing	Reserve land adjacent to public toilet on Rahui Road, Greenhithe	pohutukawa (*Metrosideros excelsa*)	Small healthy tree	Prime position for a tree of this species	Coastal Conservation Area	Recreation 3	Nil	General Coastal Marine, Coastal Transition	Auckland Council	Protected	HDD site compound to send/ receive infrastructure under upper Waitemata Harbour	Transplant or remove tree
G 7.	Upper Waitemata Harbour Crossing	Reserve land adjacent to public toilet on Rahui Road, Greenhithe	tree privet (*Ligustrum lucidum*) and giant reed (*Arundo donax*)	Good health	Weed species that should be targeted for removal	Coastal Conservation Area	Recreation 3	Nil	General Coastal Marine, Coastal Transition	Auckland Council	Not protected	Site compound for HDD operations	Remove to extend compound as far south as possible
T 8.	Rahui Road to Greenhithe Road.	Roadside embankment opposite toilet block	pohutukawa (*Metrosideros excelsa*)	Healthy large tree with typical form. Precarious position above road and toilet block, but upright specimen on well-secured root plate	High ecological values associated with maturing native vegetation in close proximity to harbour foreshore. Significant local visual amenity	Coastal Conservation Area	Road Reserve (NSS).	Nil	Road	Auckland Transport	Protected	Site compound for HDD operations	Retain and protect if possible. Move site compound as far south as possible and locate cut in bank away from tree (to outside crown spread if possible)
T 9.	Rahui Road to Greenhithe Road.	Roadside embankment on Rahui Road	maritime pine (*Pinus pinaster*) x3	Good overall condition	High amenity value as large trees with upright habit	Coastal Conservation Area	Road Reserve (NSS).	Nil	Road	Auckland Transport	Protected	Site compound for HDD operations	Remove trees. Mitigation planting

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Tree No.	Site	Location	Species	Comments		ACDP		PAUP		Ownership	Protection Status	Proposed Works	
				Condition	Values	Designations	Zoning	Overlays	Zoning			Site work	Tree work
G 10	Rahui Road to Greenhithe Road.	Roadside embankment on Rahui Road	Various native and exotic – refer to Table 3	Fair quality native plants mixed with invasive pest plants	Some amenity and ecological value	Coastal Conservation Area	Road Reserve (NSS).	Nil	Road	Auckland Transport	Protected	Site compound for HDD operations	Remove trees as required. Mitigation planting
G 11	Rahui Road to Greenhithe Road.	Traffic Road (paper road)	Various native and exotic - refer to Table 4	Good quality native specimens with good diversity, some plant pests	High amenity values as area provides visual screening of buildings from areas beyond the immediate area	Nil	Road Reserve (NSS).	Nil	Road	Auckland Transport	Protected	Open-cut trench for pipeline installation	Remove trees as required, retain and protect trees on edge of clearance. Mitigation planting
G 12	Rahui Road to Greenhithe Road.	end of formed portion of Traffic Road	pohutukawa (*Metrosideros excelsa*), pride of Bolivia (*Tipuana tipu*) x2, American sweet gum (*Liquidambar styraciflua*)	Good quality, early-mature trees	High degree of visual amenity	Nil	Road Reserve (NSS).	Nil	Road	Auckland Transport	Protected	Open-cut trench for pipeline installation	Retain and protect from damage. Crown-lift pruning to establish clearance above works area
G 13	Greenhithe Road to South Wainoni Park	Intersection of Sunnyview Road and Greenhithe Road	various	Variable quality trees and shrubs	Moderate visual amenity values	Nil	Road Reserve (NSS).	Nil	Road	Auckland Transport	Protected	Scour valve and connection to existing wastewater infrastructure	Remove trees as required. Locate valve as far from trees on corner of Sunnyview Road as possible. Mitigation planting
T 14	Wainoni Park (South and North)	adjacent to eastern boundary of Wainoni Park and outside rear of Nos 40-46 Te Wharau Drive	Monterey pine (*Pinus radiata*) x3	Large, mature trees in fair condition	Highly visible and characteristic of the local area	Nil	Recreation 4 (NSS).	Nil	POS – Sport and Active Recreation	Auckland Council	Protected	Open-cut trench for pipeline installation	Remove trees. Mitigation planting
G 15	Wainoni Park (South and North)	Centre of Wainoni Park North	various native and exotic – refer to Table 5	Variable quality trees, shrubs and groundcovers	Ecological value degraded by weed infestation	Nil	Recreation 4 (NSS).	SEA	POS – Informal Recreation	Auckland Council	Protected	Open-cut trench for pipeline installation. Scour valve, air valve and connection to existing wastewater infrastructure	Remove as required. Locate stream crossings to minimise effects on native vegetation. Mitigation planting and/or weed control plan
G 16	Wainoni Park (South and North)	North-eastern aspect of Wainoni Park	river she-oak (*Casuarina cunninghamiana*)	Mature trees of variable health and suppressed growth due to close proximity planting	Hedgerow with amenity / shelter values	Nil	Recreation 4 (NSS).	Nil	POS – Informal Recreation	Auckland Council	Protected	Open-cut trench for pipeline installation	Remove selected trees. Remove additional trees that may be affected by 'edge effect'
G 17	Wainoni Park (South and North)	North-eastern aspect of Wainoni Park	Monterey pine (*Pinus radiata*)	Mature trees, suppressed growth due to close proximity planting	Hedgerow with good amenity /shelter values	Nil	Recreation 4 (NSS).	Nil	POS – Informal Recreation	Auckland Council	Protected	Open-cut trench for pipeline installation	Remove selected trees. Remove additional trees that may be affected by 'edge effect'
G 18	Te Wharau Creek crossing	Northern margin of Wainoni Park	various native and exotic – refer to Table 5	Variable quality trees, shrubs and groundcovers with significant weed presence	Band of trees on coastal margin. High ecological values	Coastal Conservation Area	Recreation 1 & 4 (NSS).	Nil	POS - Conservation	Auckland Council	Protected	Site compound for HDD operations	Selective removal of trees, retain and protect native species where possible. Mitigation should include weed removal and control

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Tree No.	Site	Location	Species	Comments		ACDP		PAUP		Ownership	Protection Status	Proposed Works	
				Condition	Values	Designations	Zoning	Overlays	Zoning			Site work	Tree work
T 19	Te Wharau Creek crossing	Northern margin of Wainoni Park	English oak (*Quercus robur*) x2	Mature specimens in good health, good form	Significant specimen trees	Coastal Conservation Area	Recreation 1 & 4 (NSS).	Nil	POS – Conservation	Auckland Council	Protected	Site compound for HDD operations	Retain and protect trees. Move site compound to west as far as possible to avoid rootzone
G 20	Te Wharau Creek crossing	Western aspect of North Shore Memorial Park	various native and exotic – refer to Table 6	Variable quality trees, shrubs and groundcovers with significant weed presence	Ecological values	Coastal Conservation Area	Special Purpose 4 (NSS).	SEA	Cemetery	Auckland Council	Protected	Site compound for HDD operations	Remove trees for clean-water diversion outfall to gullys. Mitigation planting
T 21	North Shore Memorial Park	Central open area of NSMP	Japanese cedar (*Cryptomeria japonica*)	Good health and form	Hedgerow of trees. Moderate amenity values	Nil	Special Purpose 4 (NSS).	Nil	Cemetery	Auckland Council	Protected	Open-cut trench for pipeline installation.	Retain and protect trees on both sides of pipe alignment
G 22	North Shore Memorial Park	Adjacent to main road from entrance within NSMP	various native and exotic	Good health and from	Specimen trees planted singularly or in groups. High amenity value	Nil	Special Purpose 4 (NSS).	SEA	Cemetery	Auckland Council	Protected	Open-cut trench for pipeline installation.	Retain and protect trees on both sides of pipe alignment, prune trees as required to clear construction corridor
G 23	North Shore Memorial Park	Adjacent to entrance to NSMP form Schnapper Rock Road	Norfolk Island pine (*Araucaria heterophylla*) x3, claret ash (*Fraxinus oxycarpa* 'Raywoodii) x2, totara (*Podocarpus totara*), titoki (*Alectryon excelsum*)	Good health and form	High amenity value	Nil	Special Purpose 4 (NSS).	Nil	Cemetery	Auckland Council	Protected	Open-cut trench for pipeline installation.	Remove trees within pipeline alignment. Mitigation planting
G 24	North Shore Memorial Park to North Shore Golf Club	Northern side of Schnapper Rock Road	kanuka (*Kunzea ericoides*), tanekaha (*Phyllocladus trichomanoides*) with weed infestation	Poor quality trees	Limited value	Open Space Linkages	Road Reserve (NSS).	Nil	Road	Auckland Transport	Protected	Open trench for pipeline installation	Remove trees within pipe alignment, if requried. Mitigation planting and/or weed removal and control
T 25	North Shore Memorial Park to North Shore Golf Club	Intersection of Abberley Road and Whitton Place	ti kouka/cabbage tree (*Cordyline australis*)	Fair	Limited visual amenity value	Nil	Road Reserve (NSS).	Nil	Road	Auckland Transport	Protected	Open trench for pipeline installation, valve installation within roundabout	Remove trees
G 26	North Shore Memorial Park to North Shore Golf Club	Gully north of Whitton Place	various native and exotic – refer to Table 7	Good quality mature kanuka (*Kunzea ericoides*) with dense native understory	Significant value to ecology and visual amenity values	Nil	Structure Plan A (G) (NSS).	SEA	POS - Conservation	Auckland Council	Protected	Pipe bridge construction and associated works	Remove trees within alignment of pipe and pipe-bridge. Retain and protect edge trees and mitigate 'edge effects'. Landscape mitigation planting plan
G 27	North Shore Memorial Park to North Shore Golf Club	Gully south of NSGC	Monterey pine (*Pinus radiata*)	Maturing pine trees of variable health and form. Quality native undergrowth	Significant value to ecology and visual amenity values	Open Space Linkages	Structure Plan A (G) and Recreation 4 (NSS).	Nil	POS – Sport and Active Recreation	Private	Protected	Pipe bridge construction and associated works for access and site compound	Remove pine trees. Mitigation planting and measures to mitigate 'edge effects'. Landscape mitigation planting plan
G 28	North Shore Golf Club to Albany Highway	Adjacent to carpark of NSGC	Monterey cypress (*Cupressus macrocarpa*)	Fair health and form	Shelter and amenity	Nil	Recreation 4 (NSS).	Nil	POS – Sport and Active Recreation	Private	Protected	Open-cut trench for pipeline installation	TBC

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Tree No.	Site	Location	Species	Comments		ACDP		PAUP		Ownership	Protection Status	Proposed Works	
				Condition	Values	Designations	Zoning	Overlays	Zoning			Site work	Tree work
G 29	North Shore Golf Club to Albany Highway	Adjacent to road to NSGC	Various exotic specimen trees	Good health and form	High visual amenity value	Nil	Recreation 4 (NSS).	Nil	POS – Sport and Active Recreation	Private	Protected	Open-cut trench for pipeline installation	Works within rootzone. Crown-lift pruning to allow access to works corridor
G 30	North Shore Golf Club to Albany Highway	Appleby Road	pin oak (*Quercus palustris*)	Good health, fair form	Specimen street trees	Nil	Road Reserve (NSS).	Nil	Road	Auckland Transport	Protected	Open-cut trench for pipeline installation	Isolate trees from works activities
G 31	Piermark Road to Bush Road	Rear of No.169 Bush Road	various, including river she-oak (*Casuarina cunninghamiana*) shelterbelt	Fair health and form	No particular qualities beyond shelter	Nil	Business 10 (NSS).	Nil	Light Industry	Privately-owned	Not protected	Open-cut trench for pipeline installation Site compound for HDD operations	Remove as required. Retain where possible
G 32	Rosedale Park to WWTP	Western edge of Rosedale Park	various native and exotic - refer to Table 8	Variable quality mature pine trees with variable quality understory	Ecological and visual amenity associated with large trees and streamside location	Designated site (163)	Recreation 4 (NSS).	SEA, Indicative Stream	POS – Sport and Active Recreation	Auckland Council	Protected	Site compound for HDD operations	Remove / retain and protect as required. If possible, locate HDD compound to south and minimise scale to avoid trees. Mitigation planting
G 33	Rosedale Park to WWTP	Adjacent to park road through Rosedale Park	various native and exotic - refer to Table 9	Variable quality and various age class	Visual amenity in park setting	Designated site (163)	Recreation 4 (NSS).	SEA, Indicative Stream	POS – Sport and Active Recreation	Auckland Council	Protected	Open-cut trench for pipeline installation	Remove / retain and protect as required. If possible, locate open trench within open space above/behind tree groups. Mitigation planting
G 34	Rosedale Park to WWTP	Western boundary of WWTP	various native - refer to Table 10	Good health and variable form	Visual amenity in park setting and screening of WWTP	Site of Special Wildlife Interest, Designated site (164)	Special Purpose 3	Nil	Light Industry	Watercare	Protected	Open-cut trench for pipeline installation	Remove / retain and protect as required. If possible directional drilling would avoid effects here. Mitigation planting

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