

TASMAN DISTRICT COUNCIL FORESTS

TASMAN DISTRICT COUNCIL

FSC[®] Forest Management Plan

For the period 2020 / 2024



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Introduction

Principles and Criteria

Tasman District Council is committed to adopt the Forest Stewardship Council (FSC) Principles and to meet their Criteria and the FSC standards of good forest management. These standards include ecological, social and economic parameters.

Tasman District Council is committed to the PF Olsen FSC Group Scheme that is implemented through the Group Scheme Member Manual and associated documents.

About this Plan

This document provides a summary of the forest management plan and contains:

- Management objectives;
 - A description of the land and forest resources;
 - Environmental safeguards;
 - Identification and protection of rare, threatened and endangered species;
 - Rationale for species selection, management regime and harvest plan and techniques to be used;
 - Appropriate management of unstocked reserve areas;
 - Maps showing plantation area, legal boundaries and protected areas;
 - Provisions for monitoring and protection.
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Forest Landscape Description

Overview

This section describes the physical and legal attributes of the land on which the forests are located. Included in this section are discussions of:

- Location and access;
 - Topography;
 - Soils;
 - Climate;
 - Legal ownership and tenure.
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Legal ownership

The tenure of all land is freehold except for Moturoa / Rabbit Island which has been vested to the Council for plantation purposes under the provisions of the Reserves and Other Land Disposal and Public Bodies Empowering Act 1920.

An area of Kingsland forest is held as a reserve for waterworks purposes.

Small areas adjacent to Howard forest have Forestry Rights assigned to two different parties, with the Council receiving a share of net returns at harvest. A further Forestry Right at the Sherry River forest is held over a small area of Douglas-fir trees; however, the Council receive no share of harvest revenue.

The legal descriptions of the land on which the Council forests are situated on are contained in [Appendix 1](#).

Location and access

The Tasman District Council (Council) has forests at six different locations in the Nelson Region. The small Eves Valley forest, also part of the Council forest estate, is excluded from coverage under this Plan as its primary purpose is to complement the Eves Valley landfill operations.

Moturoa / Rabbit Island is located approximately 11km by road west of Richmond off State Highway 60.

Borlase is located approximately 45km south-west of Richmond. The main access is located off SH6.

Tunncliffe is located approximately 21km south of Richmond. The main access is located off SH6.

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Kingsland is located off Hill Street, Richmond at the southern end of Harts Road on the Richmond Hills, approximately 4km from central Richmond.

Sherry River is located in the Sherry River Valley approximately 15km south-west of Tapawera and 60km south of Richmond.

Howard is located approximately 110km by road south-west of Richmond off SH 63. It is located on the true right-hand side of the Howard River.

All forests have a good network of roads and tracks although in some cases substantial upgrades will be required at time of harvest.

The location of the forests in relation to Port Nelson is listed in Table 1 below and shown in Map 1. Major log processing facilities are located within 25km of the Port.

Table 1: Distances from forest to log markets

Forest	Distance from Port (km)
Moturoa / Rabbit Island	25
Borlase	60
Tunnicliff	35
Kingsland	20
Sherry River	75
Howard	105

Topography

Moturoa / Rabbit Island

The topography is predominantly flat with some rolling sand dunes. All harvesting is using ground-based systems. The altitude ranges from 0 to 10 metres above sea level.

Borlase

Rolling to steep hill country. Slopes range from 10 to 25 degrees. Harvesting is suited to mainly hauler-based systems.

Tunnicliff

Rolling to moderately steep hill country. Slopes range from 10 to 25 degrees. Harvesting is suited to ground-based systems.

Kingsland

Slopes are steep ranging from 20 to above 45 degrees. Harvesting is suited to hauler-based systems.

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Sherry River

Rolling to moderately steep hill country with large areas of flat river terraces. Harvesting is suited to a mix of ground based and hauler systems.

Howard

Strongly rolling to moderately steep dissected terraces. Slopes are short and range from 20 to 35 degrees with large areas of flat terraces. Harvesting is suited to a mix of ground based and hauler systems.

Soils and geology

The Council forests occupy a wide range of soil types and geology. In general, these are well suited to plantation forestry and impose few constraints for tree growth. Occasionally the addition of fertiliser is required to elevate levels of boron, phosphate and nitrogen.

Erosion risk is generally low-moderate and there are few environmental risks associated with roading and harvesting when industry best practice is applied. Soils are mostly stable however when soil conditions are wet windthrow can occur in combination with strong winds.

The NZ Land Resource Inventory classifies the entire area into the following units (Table 2):

Table 2: Soil types within the forest estate

Borlase	Vlle 11	
	Geology:	Moutere and Old Man gravels from weathered greywacke and granites
	Soil (general):	Hill soils, related to yellow grey earths
	Erosion:	Slight sheet; gully and soil slip erosion
	Nutrient Status:	Low
Howard	Vle 25	
	Geology:	Uncemented gravels and conglomerate
	Soil (general):	Hill soils related to lowland yellow-brown earths
	Soils (specific):	Howard silt and clay loams (rolling lands) Howard clay hill soils Kawatiri silt top stone hill soils
	Erosion:	Slight sheet and soil slip erosion
Nutrient Status:	Low	
Kingsland	Vlle 3	
	Geology:	Maroon and grey banded argillite
	Soil (general):	Steepland soils related to lowland yellow-brown earths
	Soils (specific):	Whangamoia steepland silt loams and stony loams
	Erosion:	Sheet and scree erosion
Nutrient Status:	Low to medium	

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Moturoa / Rabbit Island	Vle 24	
	Geology:	Beach gravels and dune sands from greywacke & granite
	Soil (general):	Yellow-brown sand
	Soils (specific):	Tahunanui sand and fine sand
	Erosion:	Slight to moderate wind erosion
	Nutrient Status:	Low
Sherry River	Floodplains IIIs2 & IVs3	
	Geology:	Uncemented gravel
	Soils:	Sherry sand and Sandy loam. Formed on granite alluvium
	Erosion:	Potential for slight stream bank erosion
	Nutrient Status:	Fertility is very low, and soil has very low levels of potassium, phosphorous and calcium. Soils are very acid and deficiencies in boron may occur
	Sandstones and Mudstones Vlle4, Vle6 & Vle18	
	Geology:	Soft sandstone and mudstone
	Soils:	Tadmor Hill soils. Formed on siltstone and sandstone on moderately steep hills
	Erosion:	Potential for slight soil slip and sheet erosion
	Nutrient Status:	Topsoils are generally shallow
	Granite Formations Vlle25, IVs13 & Vle21	
	Geology:	Coarse crystalline rock
	Soils:	Glenhope steepland soils and Kaiteriteri sandy loam. Found on very steep slopes or gently sloping country and formed on deeply weathered granite
	Erosion:	Potential for slight soil slop and sheet erosion
	Nutrient Status:	These soils are formed under high rainfall and have very low fertility
Tunnickliff	Vle 16	
	Geology:	Deeply weathered greywacke gravels, overlying lignite and clay
	Soil (general):	Hill soils related to yellow-grey earths or yellow-grey to yellow-brown earth intergrade
	Soils (specific):	Spooner Hill silt loams and stony loams
	Erosion:	Slight sheet and soil slip erosion
	Nutrient Status:	Low

Climate

The climate of the Nelson region is moderate with cool winters. Summer droughts can occur, and occasional sub-tropical origin storms can bring periods of intense rainfall and strong winds. Overall Nelson enjoys one of New Zealand’s most pleasant climates with high sunshine hours and is ideal for tree growing with few extremes.

The mean annual temperature, measured at Nelson airport is 12.1 degrees, with 89 days of ground frost per year. Wakefield, the epicentre of Council’s forests, receives around 1200 mm per year of rainfall.

The forests closest to the coast receive around 920 mm rain per year while the Howard receives the highest rainfall of about 1500 mm per year.

Highest rainfalls for all forests occur during September-October and the lowest rainfalls in January-February. In general rainfall is relatively evenly distributed throughout the year and is adequate for good tree growth although occasional low summer rainfalls limit tree growth during this period.

Forestry rights and mining licences

Howard Valley

Parts of the following blocks of Howard Forest are subject to a transfer grant of forestry rights for 30 years (*P. radiata*) and 40 years (*D. fir*) involving a joint venture with Martin Wells.

1. Sections 13, 14, and 15 Block XIV Howard Survey District being a block of 224.7876 ha, of which 6.6 ha *P. radiata* and 11.1 ha *D. fir* planted 1992. Total Forest Right area equals 17.7 ha.
2. Part Section 36 and 37 Block X Howard Survey District being 142.807 ha (access track only).

Tasman District Council to receive 16% of stumpage at harvest.

Parts of the following blocks of Howard Forest are subject to a similar transfer grant of Forestry Rights for 40 years involving a joint venture with D and A M Bier:

1. Section 9 Block X and Section 16 Block XIV Howard Survey District being 314.4406 ha (access track only).
2. Section 12, Block XIV Howard Survey District being 196.6772 ha, of which 31.0 ha *P. radiata* 1992, and 36.0 ha *D. fir* planted 1993. Total Forest Right area equals 67.0 hectares.

Tasman District Council to receive 20% of stumpage at harvest.

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A mining licence in favour of Lewis Creek Mining Society Ltd, C/- Rotoiti Community Council for a term of twenty years commencing 15 December 2004 is held over Sections 13, 14 and 15 of Block XIV Howard Survey District.

Sherry River

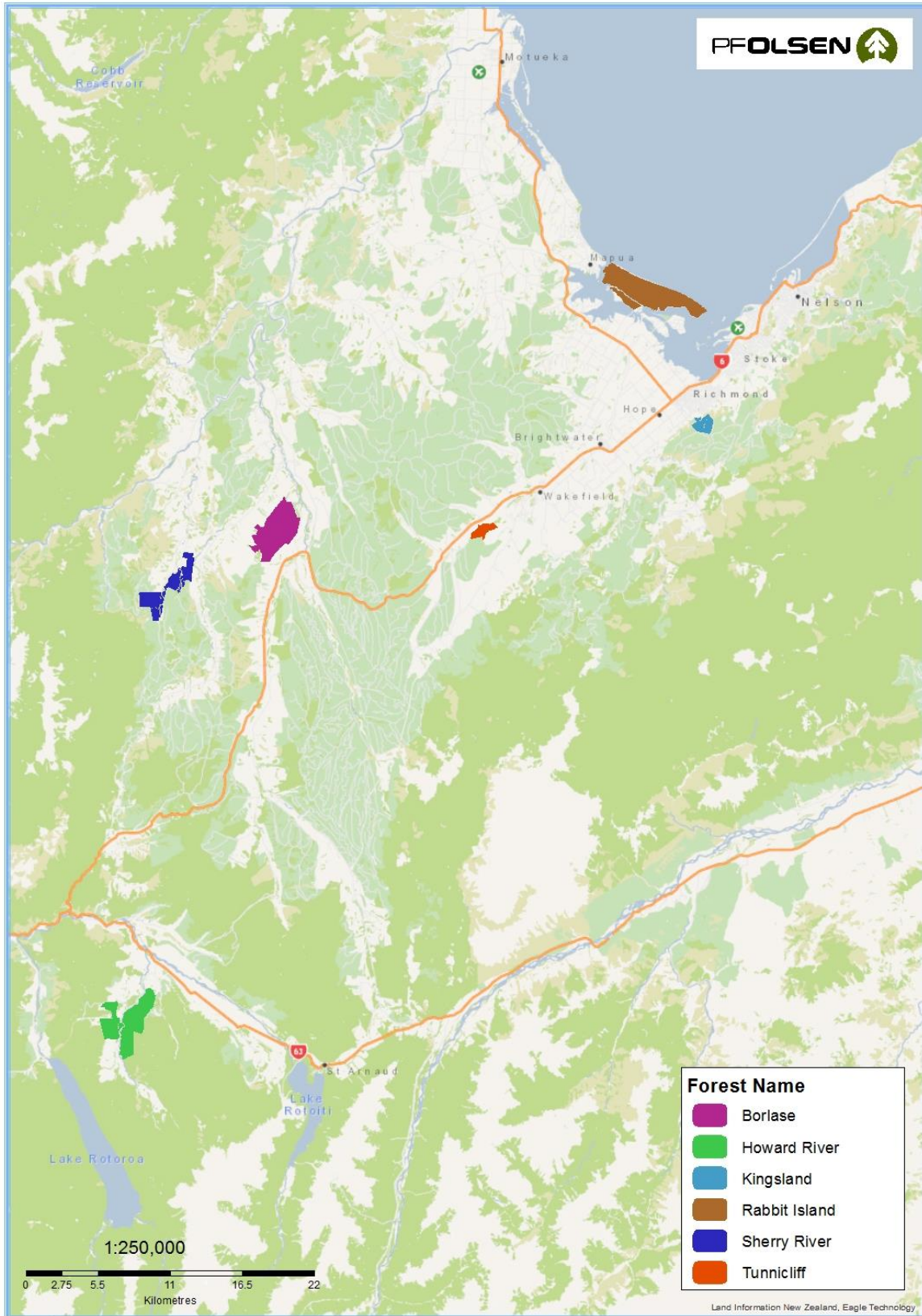
The property has a 99.4-hectare Forestry Right on it with the Shirtcliff's in the south western corner of the block. The Forestry Right involves:

1. The Grantee harvesting *P. radiata* prior to the trees reaching 30 years of age, and Douglas-fir/Larch prior to age 45.
2. Rates are payable by the Grantee until clearfell.
3. The Tasman District Council does not receive any percentage share of stumpage at harvest.

The block is progressively being felled and land handed back to Council for replanting. Areas of 18.6 ha, 7.7 ha 31.9ha and 2ha have been harvested planted by TDC in 2002, 2003, 2010 and 2012 respectively.

The last remaining area to be harvested is 7.4ha of Douglas-fir which was planted in 1982, the forestry right will expire for these trees in 2027.

Map 1 – Forest Location Map



The Broader Landscape

Ecological landscape The Council forest estate is geographically diverse and falls within several different Ecological Districts (ED's_ (Table 3). Several forests also fall across the border of several EDs, as shown below.

Table 3: Forest by Ecological District

Ecological District	Bryant	Motueka	Moutere	Arthur	Rotoroa
Kingsland	✓	✓			
Tunnickliff		✓	✓		
Moturoa / Rabbit Island		✓			
Sherry River			✓	✓	
Borlase			✓		
Howard					✓

Bryant

The Bryant Ecological District steep hill country comprised of a complex matrix of argillite, sandstone, mafic, ultramafic, greywacke and marine sediments. As a result, fertility and drainage varies significantly. The district includes Dun Mountain which is a unique mafic volcanic area with toxic soils and associated rare flora species assemblages.

Elsewhere, indigenous vegetation is restricted to the hills in the east and south, with mixed beech-podocarp forests at higher altitudes, moving into manuka dominated scrub down the altitudinal gradient. The coastal Boulder Bank provides habitat for Arctic breeding and NZ migratory waders, whilst the forests are home to falcon, kaka, kea, blue duck and yellow-crowned parakeet. Various skinks and geckos are also found along the rocky coast and tall forest.

Whilst areas of the district remain in tall forest and scrub, much has been replaced by sheep and beef farming and exotic plantation forest. Goat and pig damage is evident along the Bryant Range.

Motueka

The Motueka Ecological District is a small lowland district of plains dissected by the Moutere District hill country. Geological influences include the terrestrial and coastal alluvium at the coastal end, and terraced Moutere gravels within the remainder.

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Originally most of the district was forested with podocarp/hardwood/beechn and smaller areas of raupo/flax wetlands. Polynesian and European arrival saw much of the forest cleared and wetlands drained.

Extensive estuaries in the district provide habitat for more than 50 species of estuarine birds, including Arctic breeding migrants and banded rail and marsh crake. The common land use types today in the district (dairy farming, sheep and beef, horticulture) offers little habitat for other native species.

Moutere

The Moutere Ecological District is a lower altitude district, ranging from 800m to sea level. The geology is not complex, being almost entirely Pleistocene deeply weathered Moutere gravel, overlying lignite and clay with impeded drainage and moderate to low fertility.

The district was once fully forested with beech dominant forest types, with the addition of podocarps and hardwoods- totara, matai, rimu, miro, kahikatea in wide valley floors, and tawa, pukatea, titoki, karaka, matai, nikau closer to the coast. Much of the more complex hardwood/podocarp forest has been cleared, with only small isolated remnants remaining. One significant tract of beech forest remains, which is habitat for kaka, falcon and parakeet. Banded dotterel, pied stilt and black-fronted tern breed along the Motueka River.

Much of the lower district is now in extensive sheep and beef farming, horticulture and exotic plantation forest.

Arthur

The Arthur Ecological District is mostly mountains and hills 600m to 1500m above sea level, draining NE into Tasman Bay. It has a complex geological history, with marble, indurated mudstone, granite, and a range of schist and quartz subtypes. Most of the District is covered in montane and submontane indigenous vegetation, owing to the higher altitude and terrain. Podocarp and podocarp/beechn types are common in the lower slopes and valleys, moving into red-silver-black-mountain beech species up the altitudinal gradient. Above the tree line, the vegetation types are low shrubland, tussock land and herb fields.

The high remaining proportion of indigenous forest has allowed the persistence of kaka, blue duck, falcon, kea, and yellow-crowned parakeet throughout the ED, and Great Spotted kiwi in the southern end. Nelson Green gecko and several giant snail *Powelliphanta* species can be found in the Arthur Range.

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Rotoroa

The Rotoroa Ecological District is predominantly hill country, with shallow, stony gneiss and granite derived soils of low fertility. The district is predominantly still in tall red/silver/mountain beech forest, with podocarps present on warmer slopes. The extensive montane and submontane forests are habitat for Great Spotted kiwi, falcon, kea and kaka, plus several skink and gecko species.

Although much of the district remains as intact tall native forest, there are areas of more intensive sheep and beef, and exotic plantation at lower altitudes.

Protective status

Table 4 shows vegetation types as required by the National Standard for Plantation Forest Management in New Zealand revised in 2013.

Table 4: Protective status of the ecological landscape

Forest	Borlase	Howard River	Kingsland	Moturoa / Rabbit Island	Sherry River		Tunnickliff
Ecological District	Moutere	Rotoroa	Bryant and Motueka	Motueka	Arthur and Moutere		Motueka and Moutere
LENZ type	LENZ E1.1	LENZ P5.1	LENZ E1.1		LENZ E1.1	LENZ P6.2	LENZ B1.1
Original (pre-Maori) percentage of ecosystem type in Ecological District within land title	204,741 ha 100%	186,678 ha 100%	204,741 ha 100%		204,741 ha 100%	372,085 ha 100%	55,526 ha 100%
Natural ecosystem area remaining	83,944 ha 41%	130,675 70%	83,944 ha 41%		83,944 ha 41%	305,110 ha 82%	4,720 ha 8.5%
Proportion of remaining natural ecosystem under protection	14,270 ha 17%	98,006 75%	14,270 ha 17%		14,270 ha 17%	256,292 ha 84%	316 ha 6.7%
Protection by certificate holder	97.8 ha	121.7 ha	34.9 ha	17.1 ha	11.4 ha	3.4 ha	15.2 ha
Protected areas as a % of management estate	14.6%	21.1%	29.3%	1.6%	11.6%		17.6%
Protected areas as a % of the aggregated Group Scheme management estate by Ecological District	10.5%	21.1%	Bryant = 24.2% Motueka = 2.7%	1.5%	Arthur = 16.8% Moutere = 1.4%		Motueka = 0.6% Moutere = 1.3%

Historic and archaeological sites

Records of known archaeological and historical places are maintained in the NZ Archaeological Association (NZAA) Site Recording Scheme. The Archaeological Site Probability model published by the Department of Conservation¹ provides further guidance on the probability of pre-European archaeological evidence existing based on the geographical location of the forests and historical occupation of the local area.

If a site is found or suspected on any block, the protocols specified in PF Olsen’s EMS, and any others specifically developed in conjunction with Heritage New Zealand (HNZ) and iwi or other stakeholders must be observed. Where such circumstances require, an ‘Authority to Modify or Destroy’ will be sought from HNZ. Such authorities are similar in function to a resource consent and, if granted, normally come with conditions that must be met. The process to apply for authorities is documented in PF Olsen’s EMS.

Note also that Authorities to Modify an archaeological site may sometimes be required from the local District Council and sites of cultural significance are often included in schedules of places and sites of significance in District Plans. Update checks for any sites will be required before any harvesting or related earthworks commences.

The locations of the NZAA sites relative to the forests are shown in Table 5 and on the forest stand maps in [Section 13](#).

There are also several areas identified to be ‘of-interest’ within Moturoa / Rabbit Island by the local iwi group Tiakina te Taiao. To date, no finds / discoveries of sites or artefacts have been made within the areas. No biosolid spraying is carried out in the areas but there are no other restrictions on any other operations. These areas are not recorded with NZAA. These areas are also shown on the forest stand maps in [Section 13](#).

Table 5: Archaeological and significant sites near the Council forest estate

Forest	Location	Site	Type
Borlase	190m from forest boundary	N28/19	Maori argillite working
	30m from forest boundary	N28/1	Findspot: Maori oven utensils
Howard River	Within forest	M29/28	Water race and hut
	35m from forest boundary	M29/36	Gold workings
	60m from forest boundary	M29/30	Possible guesthouse
	120m from forest boundary	M29/27	Gold working and road
Kingsland	50m from forest stand	N27/185	Historic dam

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¹ Arnold, G.; Newsome, P.; Heke, H. 2004: Predicting archaeological sites in New Zealand. *DOC Science Internal Series 180*. Department of Conservation, Wellington. 24 p.

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Forest	Location	Site	Type
Moturoa / Rabbit Island	Within forest	N27/101	Midden
	Within forest	N27/134	Midden
	Within forest reserve	N27/131	Hunter Brown Reserve. Oven and middens
	12m from forest boundary	N27/152	Artefact
	55m from forest boundary	N27/137	Findspot: adze. Oven and middens.
Sherry River	Within forest		Significant site: memorial
Tunnicliff	-	-	-

Threatened Environments Classification

The Landcare Threatened Environments Classification (TEC) is a measure of how much indigenous vegetation remains within land environments, its legal protection status, and how past vegetation loss and legal protection are distributed across New Zealand’s landscape. The TEC is a combination of three national databases:

- Land Environments New Zealand (LENZ)
- Landcover Database 2
- Protected Areas Network

The TEC uses indigenous vegetation cover as a surrogate for indigenous biodiversity, which includes indigenous ecosystems, habitats, and communities; the indigenous species, subspecies and varieties that are supported by indigenous vegetation; and their genetic diversity. It uses legal protection as a surrogate for the relative vulnerability of indigenous biodiversity to pressures such as land clearance, extractive land uses, and the effects of fragmentation. The TEC is therefore most appropriately applied to help identify places that are priorities for formal protection against clearance and/or incompatible land uses, and for ecological restoration to restore lost species, linkages and buffers.

Table 6 shows the threatened environments classifications as they pertain to Tasman District Council Forests (Maps 2 - 5).

The TEC status of the small reserves reflects the history of intensive pastoralism in the area. The reserves thus have value due to their paucity in the overall landscape.

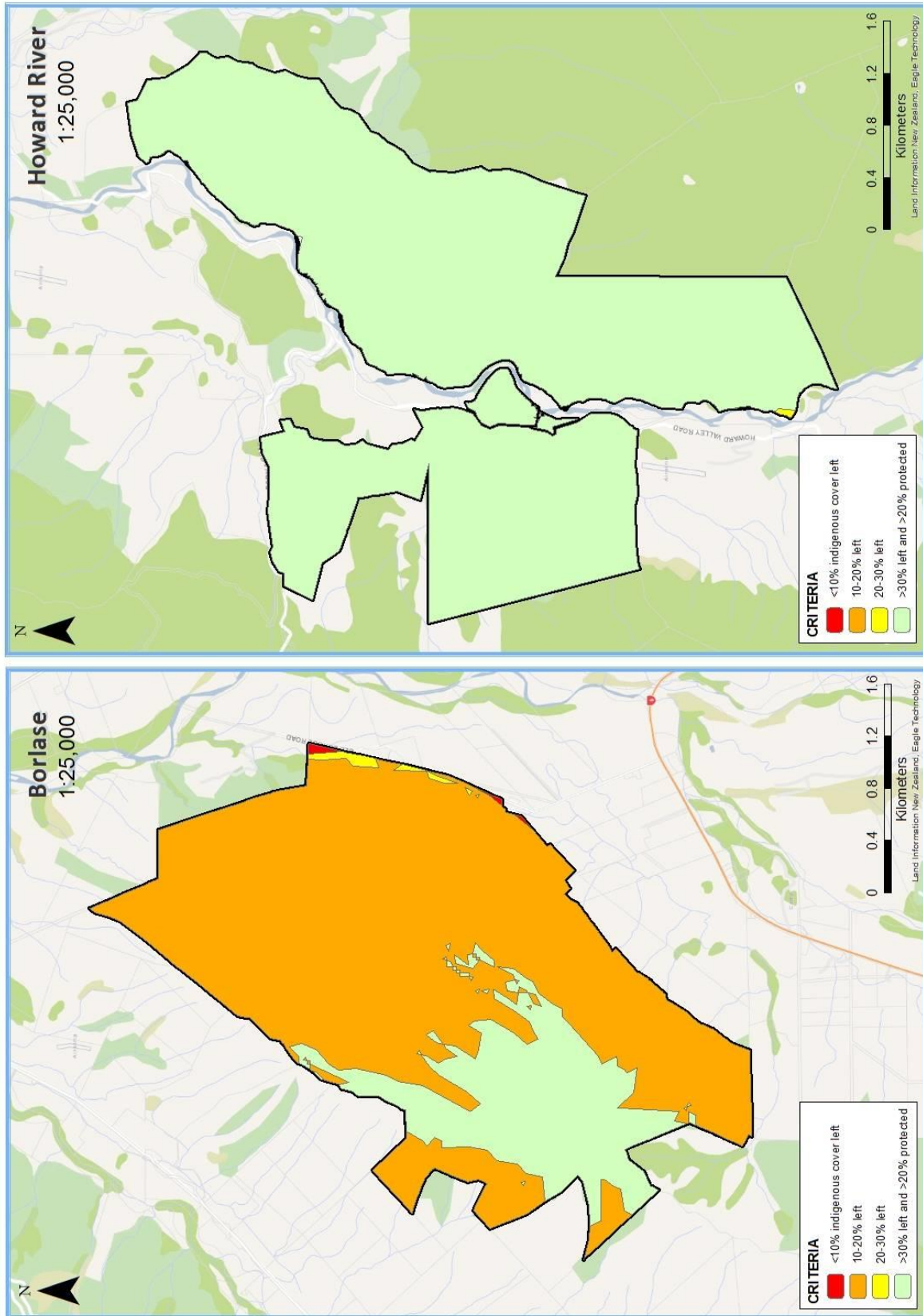
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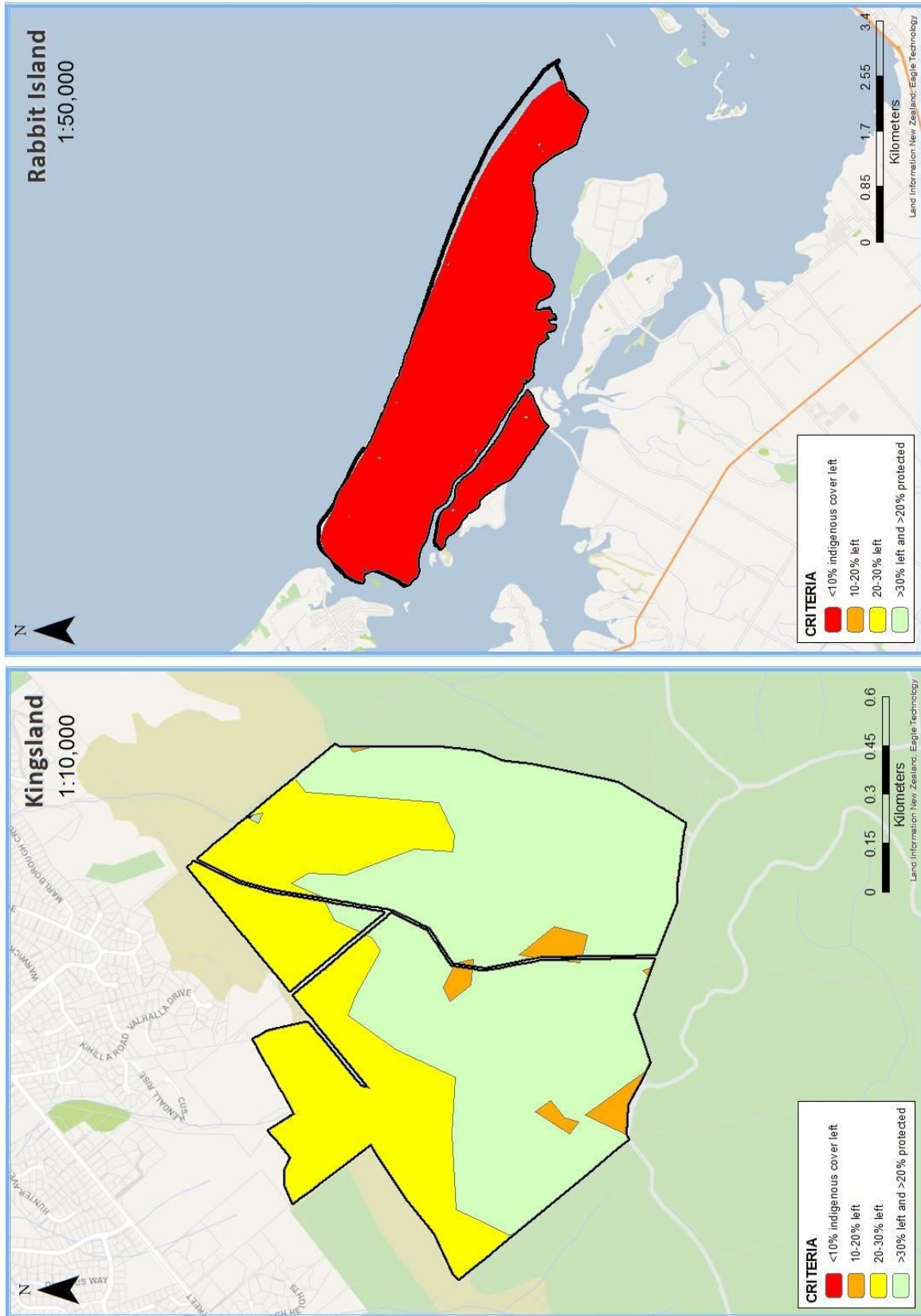
Table 6: Reserve areas by Threatened Environments Classification

Threat Class	<10% indigenous cover left	10 - 20% left	20 - 30% left	>30% left and >20% protected	Total Area
Borlase	1.7 ha 0.2%	768.2 ha 79.0%	4.9 ha 0.5%	197.4 ha 20.3%	972.2 ha
Howard River			0.64 ha 0.1%	962.3 ha 99.9%	962.7 ha
Kingsland		3.6 ha 2.3%	53.35 ha 33.8%	100.9 ha 63.9%	157.8 ha
Moturoa / Rabbit Island	1,218.6 ha 100%				1,218.6 ha
Sherry River	9.5 ha 1.7%	369.5 ha 66.3%	57.0 ha 10.2%	121.4 ha 21.8%	557.3 ha
Tunnickliff	129.5 ha 100%				129.5 ha

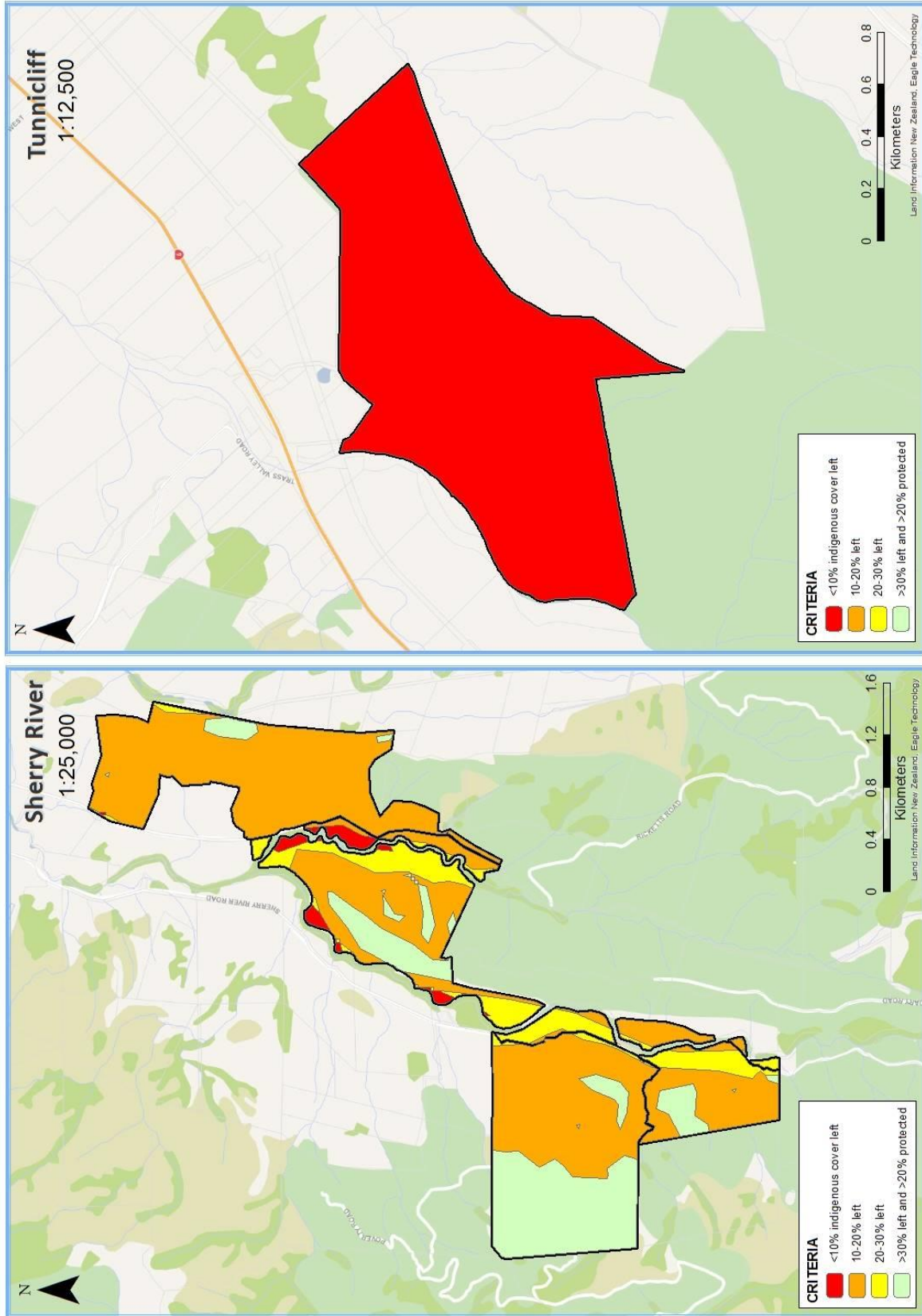
Map 2 – Borlase and Howard River’s Threatened Environment Classifications



Map 3 – Kingsland and Moturoa / Rabbit Island’s Threatened Environment Classifications



Map 4 – Sherry River and Tunnickliff’s Threatened Environment Classifications



Socio-economic profile and adjacent land

Forest history

The forests have been acquired and developed over many years. Property purchase since the 1990's has been opportunistic by acquisitions of uneconomic sheep farms with the intention to achieve a minimum stocked area of around 3,000 hectares. Priority has been given to land adjacent to existing holdings.

Borlase

Borlase was purchased to provide an alternative forest resource for the County in the event that Moturoa / Rabbit Island forest was lost to the County for production forestry. The forest was named after Jack Borlase, a Council Chairman. The bulk of the forest was purchased in 1972 but since then two further blocks have been added being the 160-hectare Moffat and the 104 hectare Quinney blocks acquired in 1992.

Howard

The Howard block, totalling 995 hectares, was purchased in 1993 from the Marshall family. About 40 hectares (including the homestead) was sold following purchase. Included with the purchase are two Forestry Right Joint Venture blocks, one of 23 hectares and the other of 70 hectares. The Council will receive a share of revenue at harvest. Management of these blocks is carried out independently by the holder of the forestry right and neither of these blocks is included in the certified area.

Kingsland

Kingsland Forest comprises the Waterworks Reserve Block, the Heslop Block and the most recent acquisition, the Brown Block. The 72-hectare Waterworks Reserve Block was acquired by the Council (the then Richmond Borough Council) to provide a protected water catchment for the Richmond Borough. It was bought by Council in 1923. The 54-hectare Heslop Block was bought by Council in 1988. The 18-hectare Brown Block was purchased and planted in 1994. A further small area was bought from the Heslop family in 2013, near the reservoir.

Moturoa / Rabbit Island

Moturoa / Rabbit Island is Crown Land which was vested to the Tasman District Council (formerly the Waimea County council) in 1921 for plantation purposes under the provisions of the Reserves and Other Land Disposal and Public Bodies Empowering Act 1920. In 1921 the first plantings of radiata pine took place, with afforestation coming under the Council Engineers Department. The Order in Council of 22 August 1921 excluded some 143 hectares of Moturoa / Rabbit Island from use for plantation purposes. This land area consisted mainly of a 5-chain wide strip of land along the northern, western, and eastern coasts of the Island, along with a 15-chain strip along part of the northern side of the Island which now includes the main public domain area. The domain area has since been increased to 240 hectares.

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Sherry River

The Tasman District Council purchased 623 hectares of terraces, hill country, pasture and reverting scrub land in the Sherry River area in November 1994. The better terraces and the homestead have since been sold, as have an additional 22 hectares of pasture which were sold in 2016. Included with the original purchase was a Forestry Right Joint Venture block that is progressively handed back to the Council, and currently the only remaining block comprises 7ha of Douglas-fir planted in 1982.

Tunnickliff

This block, legal title area 133 hectares, was purchased in 1971 from Henry Tunnickliff. Included in the title area is approximately 20 hectares of native bush. The first plantings took place in 1971-72 entirely in radiata pine. These have all been harvested and re-planted predominantly in radiata pine with some small areas of Douglas-fir and *Cupressus* species.

Current social profile

The forests on the Council estate all fall within the Tasman region – one of the least populated regions in New Zealand. Due to the size of the Council forests in a regional context, all of the workers are employed by contractors who also work for a number of other forestry companies and are not dependent on the Council forests for full time employment.

Table 7: Key statistics as summarised from 2013 Census² data

Census Category	Tasman Region	New Zealand
Ethnicity – European	93.1%	74.0%
Ethnicity – Māori	7.6%	14.9%
Formal Qualifications	76.7%	79.1%
Unemployment	4.0%	7.1%
Dominant Occupation	Managers	Professionals
Median Income	\$25,700	\$28,500
Family with Children	38.8%	41.3%
Internet Access	75.9%	76.8%
Home Ownership	75.0%	64.8%
Agriculture, Forestry & Fishing	26.3%	5.7%

Combining data from the Atlas of Deprivation (Ministry of Health) and average income from Statistics NZ, it is apparent that the Tasman region fares reasonably well in terms of overall wealth, and distribution of wealth throughout the district. Age and family statistics confirm the higher number of families and elderly within the region than the national average.

² http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-a-place.aspx?request_value=14546&tabname=

**Associations with
Tangata Whenua**

There are currently no direct ‘day to day’ associations with local Iwi; however, where input is required for resource consents extensive consultation is carried out. In the recent past, harvesting operations within Moturoa / Rabbit Island have involved Tiakina te Taiao Ltd, a non-profit iwi environmental agency that represents three of the nine iwi in the Whakatū and Motueka rohe.

Te Kahui Mangai, the NZ government’s directory of Iwi and Maori organisations, identify Iwi groups associated with a region by:

- Iwi recognised by the Crown in the Māori Fisheries Act 2004; and
- Any other iwi/hapū groups that have been formally recognised by the Crown for historic Treaty settlement purposes.

Most of these recognised iwi/hapū are represented by an Iwi authority for the purposes of the Resource Management Act 1991. Maori groups associated with the area containing the Council forest estate as recognised by Te Kahui Mangai are:

- Ngāti Toa Rangatira
- Te Atiawa o Te Waka-a-Māui
- Ngāti Apa ki te Rā Tō
- Ngāti Kuia
- Ngāti Rārua
- Ngāti Koata
- Ngāti Tama ki Te Tau Ihu
- Ngāi Tahu
- Rangitāne o Wairau

**Tenure & resource
rights**

The land tenure is freehold with the exception of Moturoa / Rabbit Island which was vested by the Crown by Order in Council in 1921 to the then Waimea County Council. A search of the Maori Land Online website (<http://www.maorilandonline.govt.nz/qis/map/search.htm>) returned no results.

Neighbours

Neighbours to the forest estate boundaries have a special interest in the management of the forest. Activities within the forest may positively or negatively impact upon their quality of life or businesses in a number of ways, while inappropriately managed operations could create risks of adverse health, safety and environmental hazards. Neighbours may use the forests for recreational purposes or place reliance on the forests for provision of water quality or quantity services. Boundary issues such as weed and pest control, access and boundary alignment issues may also involve neighbours.

[Appendix 2](#) lists the forest neighbours and their primary activities, while [Appendix 3](#) provides maps showing the locations of those neighbours in relation to the forests.. Some or all of these parties should be consulted when operations are proposed in forest areas adjacent to their boundaries.

REGULATORY ENVIRONMENT AND RISK MANAGEMENT

1. The Regulatory Environment

Regulatory considerations

Forestry operations throughout New Zealand are undertaken within the context of a regulatory framework that aims to ensure wider economic, social and environmental goals are achieved for the populace as a whole.

Failure to meet regulatory requirements is a key business risk that must be managed. The following section summarise key regulatory requirements and risk management controls exercised over forestry operations in the forest.

Health and Safety at Work Act 2015

Leadership, a constant focus on health and safety, and the strong message that safety rates as the number one priority ahead of any other business driver are all highly important for PF Olsen management. The company also takes the following steps to ensure worker health and safety:

- Contractor selection process including emphasis on:
 - safety systems and track record;
 - worker skills and training; and
 - equipment types and standard.
 - Work planning.
 - Contractor induction.
 - Monitoring, including random and reasonable cause drug testing, safe work practices and PPE.
 - Incident investigation and reporting, including investing in software, training and processes development to enable good transparency on lag and lead indicators.
 - Regular reporting to and interaction with the Client on matters related to safety.
 - Regular (annual) review and update of the critical risks as identified in PF Olsen data sets and from Industry indicators. Such a review shall focus on incidents that have caused harm and/or loss, any known cause factors and mitigations and revised controls.
-

Resource Management Act

The Council estate is subject to the provisions of the Resource Management Act (RMA) 1991. The RMA sets up a resource management system that promotes the sustainable management of natural and physical resources and is now the principal statute for the management of land, water, soil and other resources in New Zealand. Table 8 lists the organisations relevant to the Council estate forests.

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Table 8: Regional and District Councils under Council Estate Forests

Regional Councils ³	District Councils ⁴
Tasman District Council	Tasman District Council

Under the RMA, each Council has its own planning documents and associated rules that have been developed through public process. Any forestry operations must comply with the rules relevant to the Council area in which the operations are to take place. The contact details for the relevant councils can be seen in [Appendix 4](#).

**National
Environmental
Standard for
Plantation
Forestry (NES-PF)**

Coming into law on 1 May 2018, the NES-PF is a whole new rule hierarchy that applies the same rule set uniformly across most forestry operations in all parts of New Zealand. Operations will come under the legal force of this RMA instrument, though local Councils will retain the ability to regulate specific areas outside the NES-PF, e.g. Significant Natural Areas, Outstanding Landscapes, giving effect to the Coastal Policy Statement etc.

The underpinning the structure of the NES-PF is a rule hierarchy linked to the erosion susceptibility of the lands upon which forestry operations are to be conducted.

Work commissioned by the Ministry of Primary Industries led to the creation of a national spatial map, the ‘Erosion Susceptibility Layer’ (ESC) that classifies all of New Zealand into a series of four classes of erosion susceptibility from low (green) to very high (red).

The stringency of the rule’s hierarchy, i.e. whether consents are needed and the degree to which Councils can apply discretion to the conditions attached to a consent, is then tied closely to the recognised erosion susceptibility of the lands involved and the risks created by the operations. In the case of the council estate, Table 8 below indicates the proportion of the forest by the respective ESC classes.

In broad terms, harvesting, roading (earthworks) and new afforestation operations will need consents in the red zone. Earthworks will need consents in orange, and in the green and yellow zones most operations will be permitted subject to conditions. The coverage of the erosion classes within the estate are illustrated in Maps 5 to 7 and in Table 9.

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³ Regional Councils responsible for soil conservation and water and air quality issues

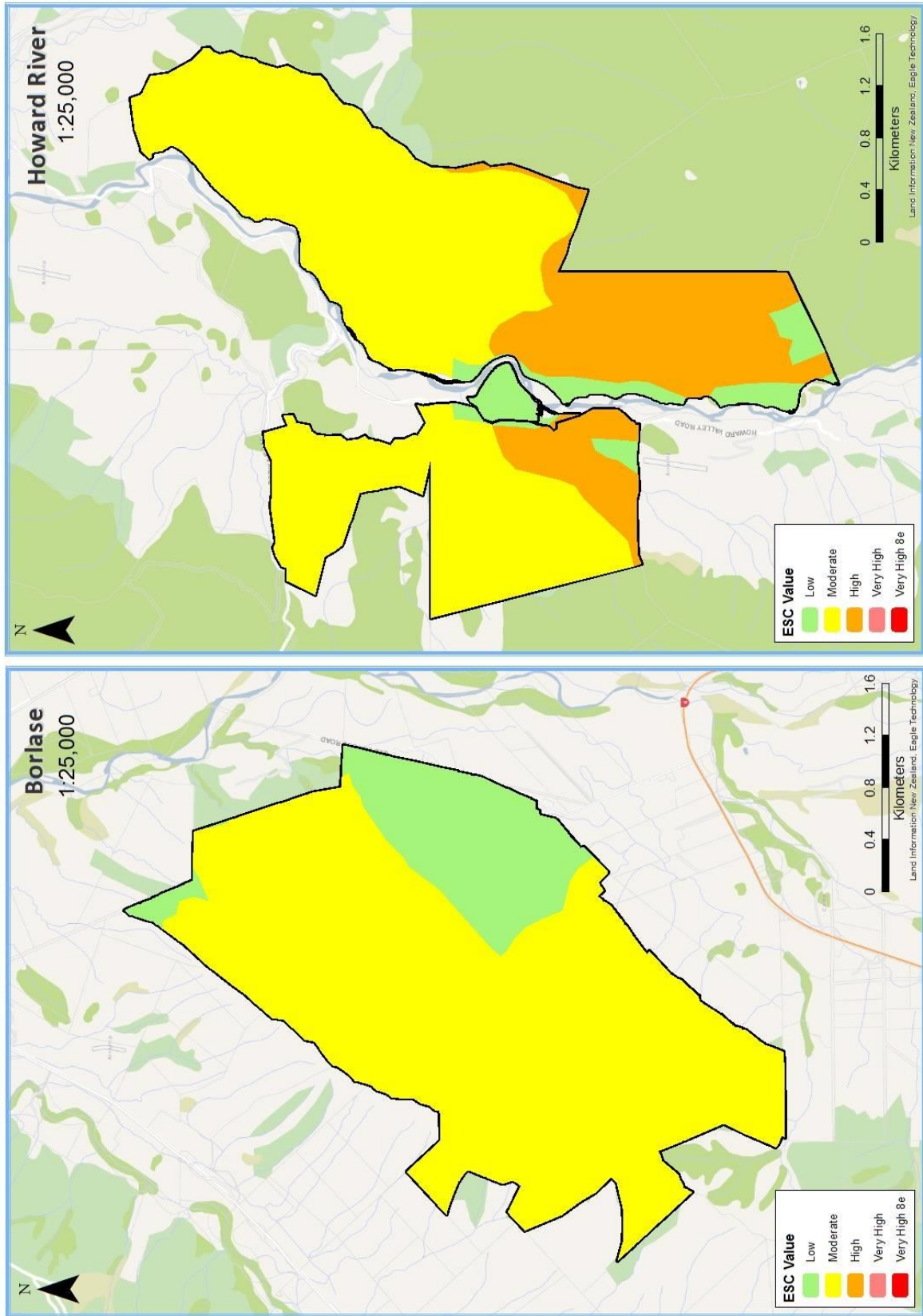
⁴ District Councils responsible for land use and biodiversity issues

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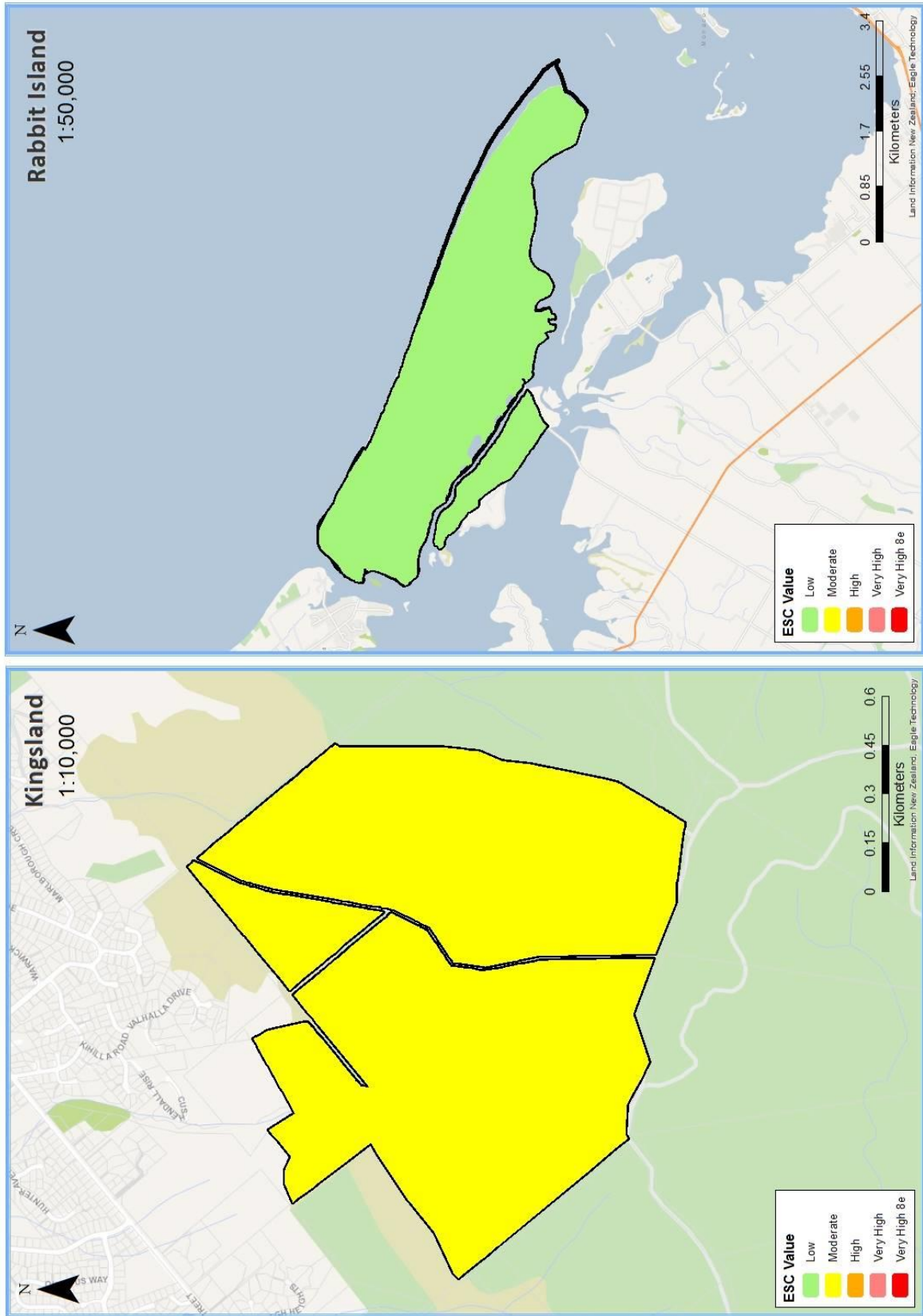
Table 9: ESC Classes (Erosion Risk) for Council Estate Forests

Forest	Low	Moderate	High	Water	Shingle	Total
Borlase	162.2 ha 16.7%	810.0 ha 83.3%				972.2 ha 100%
Howard River	61.5 ha 6.4%	651.9 ha 67.6%	248.4 ha 25.8%	1.3 ha 0.1%	1.2 ha 0.1%	964.2 ha 100%
Kingsland		157.9 ha 100%				157.9 ha 100%
Moturoa / Rabbit Island	1,216.7 ha 100%					1,216.7 ha 100%
Sherry River	176.4 ha 31.6%	260.7 ha 46.8%	120.3 ha 21.6%			557.4 ha 100%
Tunnicliff	129.5 ha 100%					129.5 ha 100%
Total	1,746.3 ha	1,880.4 ha	368.7 ha	1.3 ha	1.2 ha	3,997.8 ha

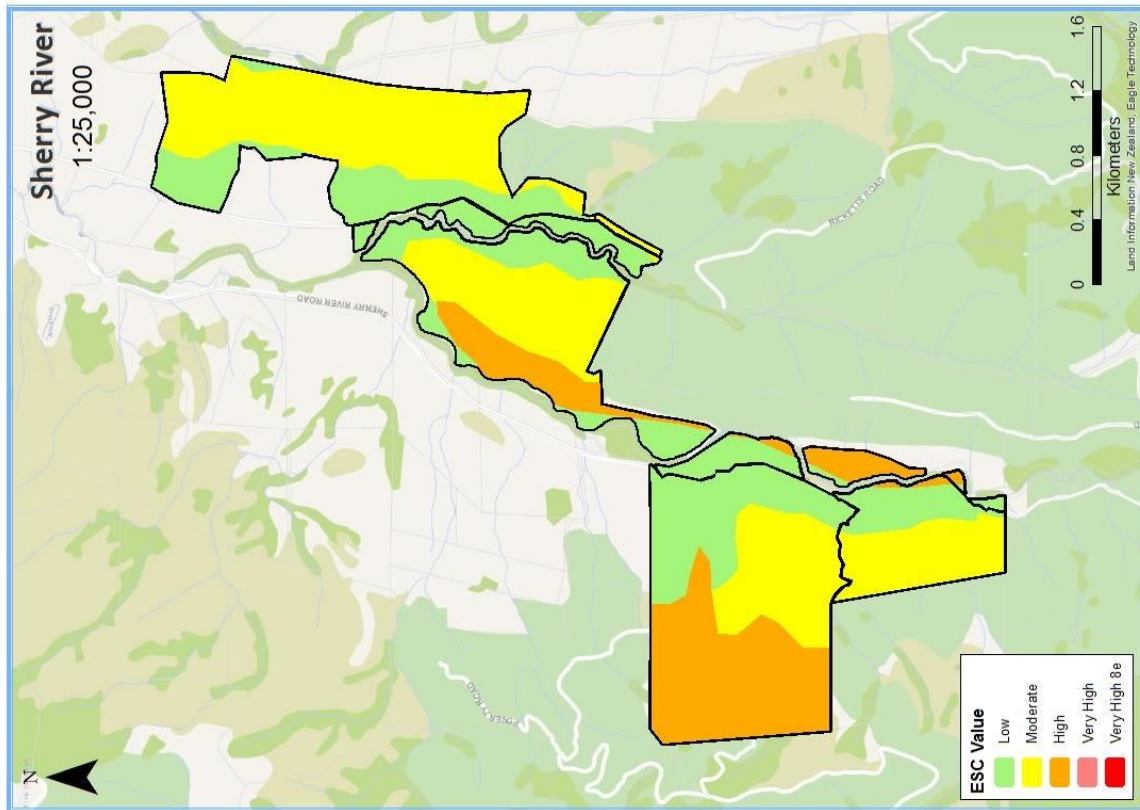
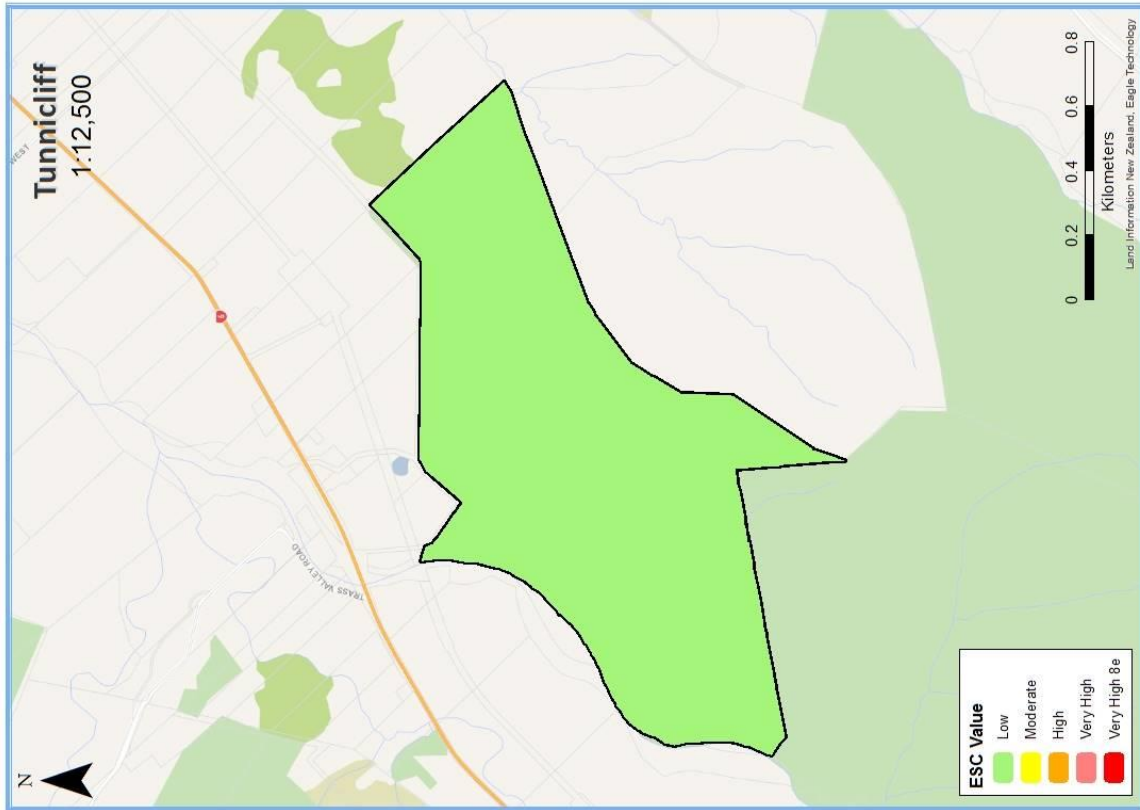
Map 5 – Erosion Susceptibility Classes in Borlase and Howard River Forests



Map 6 - Erosion Susceptibility Classes in Kingsland and Moturoa / Rabbit Island Forests



Map 7 - Erosion Susceptibility Classes in Sherry River and Tunnickliff Forests



Heritage New Zealand Pouhere Taonga Act 2014

Under the Heritage New Zealand Pouhere Taonga Act 2014 it is the landowner’s responsibility to identify any historic sites on their land prior to undertaking any work which may disturb or destroy such sites. Records of archaeological and historical places are maintained in the NZ Archaeological Association (NZAA) Site Recording Scheme <http://www.archsite.org.nz/>.

If a site is found or suspected on any block, protocols specified in PF Olsen’s EMS, and any others specifically developed in conjunction with Heritage New Zealand (HNZ), archaeologists and Iwi or other stakeholders, will be observed and the necessary Archaeological Authorities obtained with HNZ, and if necessary the local Territorial Authority.

These responses may include, but are not limited to:

- Map and ground surveys to identify, mark and protect known heritage sites.
- Iwi consultation and surveys for unknown sites.
- Archaeological Authorities to modify sites if required.

Accidental Discovery Protocols to stop work and engage experts if sites are discovered during operations.

Consents & authorities held

There are two current resource consent that applies to the Council forests at present, as below.

Table 10: Resource consents applicable to the Council forest estate

Consent ID	Expiry	Forest	Details
RM190636	31/05/2054	Howard River	Construction of a single-span bridge on the Howard River
2016/1211	25/07/2021	Moturoa / Rabbit Island	Recorded and unrecorded sites

The Emissions Trading Scheme

Forests in New Zealand are governed by rules related to New Zealand’s Kyoto commitments to reduce the nation’s carbon footprint and contribution to associated climate change.

The Council forests contain 1,964.3 hectares of forest that was existing forest as at 31st December 1989. At the time of harvest, these stands will be subject to a deforestation tax equivalent to the tonnes of CO₂ projected to be released from decomposition of the forest at a unit financial value determined by the internationally traded emission units. This tax is payable if the forest is not replanted or, if left to regenerate naturally, does not achieve the regulated heights and stocking densities.

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A total of 1,065.7 hectares was planted on 'Kyoto compliant' land that was vacant as at 31st December 1989 and have been registered to participate in the NZ Emissions Trading Scheme. These areas are subject to the accrual of emissions credits and liabilities under that scheme.

**Other relevant
legislation**

There are numerous other statutes and regulations that impact on forest operations. Forest owners can be held liable for breaches of these Acts and may be held responsible for damage to third party property. Management processes seek to manage and minimise these risks.

Other relevant legislation is listed in [Appendix 5](#).

2. Commercial Risk Management

Market access retention

It is a major focus of the Property Manager to ensure contracted products are delivered on time and in specification to ensure Tasman District Council retains credible access to its markets.

Tasman District Council maintains independent third party environmental certification for its estate under Forest Stewardship Council certification (FSC). PF Olsen Ltd acting under the instruction of its client will be responsible for the execution and maintenance of the required FSC certification elements of which this management plan forms an important component.

Forest insurance

Not Publicly Available

Log customer credit risk

There have been a number of NZ sawmills fail in recent years leaving log customers unpaid for the last month’s deliveries. The PF Olsen Investment Manager manages customer credit risk exposure and mitigation measures for export markets while PF Olsen manages these risks for domestic log customers.

PF Olsen also provides a Payment Protection insurance at a cost of 0.16% of log sales revenue. TDC has opted to not use this insurance but can opt in at any time.

Infrastructure damage or service disruption

The Council estate is traversed by several powerline utilities. Risks around these are managed by:

- Identification on maps and on the ground any utilities at planning stage.
 - Early engagement with utility owner to plan operations to minimise risks.
 - Operational execution of agreed plans with parties specifically qualified for the tasks involved when working close to utilities.
-

Pests and diseases

Pests and diseases are managed according to any statutory obligations and best practices as identified by scientific research and past experience, with the type and intensity of treatment (if any) subject to what is at risk and the age of trees (see [Section 14](#)).

3. Environmental Risk Management

Environmental risk

Environmental risk is managed by PF Olsen as appointed property manager, through a cascade framework from high level ‘intent’ determined by the Forestry Rights owner, through PF Olsen’s own environmental policies, thence through defined and documented processes constituting an Environmental Management System (EMS), supported by monitoring and reporting. PF Olsen’s policies and Tasman District Council’s business objectives are considered to be well in alignment.

Environmental policy

PF Olsen Limited is committed to:

- *Sustainable forest and land management;*
- *Promoting high environmental performance standards that recognise the input of the community in which we operate;*
- *Supporting an environment of continuous improvement in environmental performance;*
- *Obtaining and retaining independent 3rd party forest certification in conformance with the Principles and Criteria of the Forest Stewardship Council and / or the Programme for Endorsement of Forest Certification as specified by forest owning clients, or in any case ISO:14001 Environmental Management Systems.*

In order to achieve these commitments **PF Olsen** (and PF Olsen Certification Scheme Members) will undertake the following:

- Where applicable to a particular forest, comply with the presiding **Certification Standards** as set out in any agreements between the forest owners and PF Olsen.
 - **Planning** of operations to avoid, mitigate or remedy degradation of **ecological, heritage** and **amenity** values;
 - Compliance with all relevant **legislation** and where appropriate exceed environmental statutory requirements;
 - **Training** for all employees and contractors to ensure an understanding of certification member’s commitments to high standards of environmental performance, their responsibilities under the environmental legislation and to assist the implementation of sound environmental practices;
 - **Monitoring** environmental and socio-economic research and international agreements that may improve PF Olsen environmental and certification performance;
 - Regular environmental performance **audits** of operations;
 - Support for environmental **research**;
 - Undertake forest management in accordance with the principles and ethics of the **NZ Forest Accord** the **Principles for Commercial Plantation Forest Management in NZ**, and other relevant agreements, conventions and accords.
 - Promotion of the prevention of **waste** and **pollution**; and efficient use of **energy**;
 - Due regard for the well-being of the **community**.
-

Objectives, targets and monitoring

PF Olsen’s objectives, targets and monitoring categorised across five key aspects of the business:

1. Economic
2. Legal
3. Social
4. Health & safety
5. Environment

A systematic management approach ensures these objectives and targets remain the cornerstone of PF Olsen’s business, backstopped by monitoring processes that form a regular review of practices.

EMS framework

The Environmental Management System (EMS) is an integrated set of cloud based, defined and documented policies, processes and activities that govern the physical implementation of forest management activities. The EMS applies a systematic approach certified to ISO:14001 standards to ensure that prevention of adverse and harmful impacts is effective.

The framework is reviewed annually with the input of an Environmental Management Group (EMG).

Environmental Code of Practice

As a member of the New Zealand Forest Owners Association, all operations carried out on the properties should be undertaken in conformance to the NZ Forest Owners Association ‘New Zealand Environmental Code of Practice for Plantation Forestry’. This publicly available document sets out guidelines that underpin the requirements for sound and practical environmental management.

Forest Road Engineering Manual

As a member of the New Zealand Forest Owners Association, roading and engineering techniques employed within the forests should conform to the industry best practice as outlined in the New Zealand Forest Owners Association publication, ‘NZ Forest Road Engineering Manual’, published 2012.

Assessment of environmental risks

Environmental risks arising from forest operations are assessed and managed on a site-by-site basis prior to execution. The relative probability and magnitude of adverse effect attributable to any particular operation on any particular site is highly variable.

Earthworks, planting and harvesting have the potential to destroy or damage any historic places that may be present. Native vegetation has the potential to be killed by harvesting into the reserve or spraying of the

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reserve. Water quality can be negatively affected by sediment runoff because of harvesting, stream crossing and earthwork operations. In addition, the entry of oil and fuel and fertilisers will reduce the quality of water.

The level of potential risk has been evaluated in the matrix as high ‘H’, medium ‘M’ or low ‘L’, or not applicable ‘NA’ and is thus indicative of the level of care that might need to be applied to ensure the potential for adverse effects is minimised (Table 11).

Table 11: Risk assessment for key aspects involved in forest management activities

Forestry Operational Activities	Environmental Values / Issues matrix												
	Erosion & Sediment Control	Water Quality	Soil Conservation & Quality	Air Quality	Aquatic Life	Native Wildlife	Native Vegetation	Historical & Cultural Values	Landscape & Visual Values	Neighbours	Public Utilities	Recreation Values	Threatened Species
Harvesting	H	M	M	L	M	L	L	L	M	H	L	L	H
Earthworks	H	H	M	L	H	L	L	L	H	L	L	L	H
Slash Management	H	M	L	L	M	L	L	L	L	L	L	L	L
Stream Crossings	H	H	L	L	H	L	L	L	L	L	L	L	L
Mechanical Land Preparation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	H
Burning	L	L	L	H	L	L	L	L	H	H	L	H	NA
Planting	L	L	L	L	L	L	L	L	L	L	L	L	L
Tending	L	L	L	L	L	L	L	L	L	L	L	L	L
Fertiliser Application	L	H	L	L	H	L	L	L	L	L	L	L	M
Agrichemical Use	L	H	L	L	H	L	H	L	L	H	H	H	H
Oil & Fuel Management	L	H	L	L	H	L	L	L	L	H	L	L	L
Waste Management	L	L	L	L	L	H	L	L	L	L	L	L	L
Forest Protection	L	L	L	L	L	L	L	L	L	L	L	L	L

Hazardous substances management

Hazardous substances are any substances, which may cause adverse environmental impacts and/or injury or health problems if incorrectly handled or used.

The hazardous materials which may be used within the Council estate are:

- Pesticides
 - Herbicides: for commercial and ecological weeds;

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- Fungicides: for forest fungal disease control; and
- Vertebrate or Invertebrate Toxins: used for control of pest mammals (e.g. hares and possum or wasps).
- Fuels and oils
- Fire retardants: (only ever used if there is a fire)
- Surfactants: to increase herbicide efficacy

Transportation, storage and labelling of these hazardous materials must all comply with the provisions of legislative controls under the Environmental Protection Agency (EPA) and the NZS 8409:2004 Management of Agrichemicals code of practice.

During actual usage, the highest risks are associated with chemical trespass or bulk fuel spillages. These risks are managed by:

- Neighbour consultation over planned spray operations.
- Careful planning and timing of any aerial operations having regard to wind and spray drift.
- Unsprayed buffer strips on neighbour boundaries and riparian or other protected reserves.
- GPS flight path control and records.
- Monitoring and recording of weather conditions during the operation, including using smoke bombs and photos/video.
- Moving contractors into the use of double skinned bulk fuel storage tanks as the preferred method of containment for all larger capacity tanks.
- Tracking of all active ingredient usage within the estate.

Risk management includes active involvement in and review of technologies and research into alternative methods for the control of weeds, pests and diseases where these are effective and efficient.

Fuel use is directly related to the machinery used in forestry operations and the market locations. Using modern efficient machine technology is still the primary area where efficiency gains can be made. There is a steady programme to transfer chain bar oils to vegetable based low toxicity oils.

Highly hazardous chemicals

There are five agrichemicals that have been classified ‘highly hazardous’ (HH) by FSC that are used in forestry and conservation operations within PF Olsen group certified forests. All these five have recently been added to FSC’s HH list.

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Special derogations to continue usage of these chemicals, subject to conditions, are being applied for by PF Olsen as FSC Group Manager in conjunction with the wider NZ certified industry. The derogation process is run according to specific policies put in place by FSC, including extensive canvassing of stakeholder views. These chemical pesticides are listed in Table 12.

All the classes of formulations used are registered and legally approved for in use New Zealand by the NZ Environmental Protection Agency, subject to various controls, and for the purposes to which they are applied as listed below.

Table 12: FSC Highly Hazardous chemicals used or potentially used in Council estate forests

Active Ingredient	Purpose	Common Usage
Copper based Products	Fungicide	Needle cast control
Picloram	Herbicide	Establishment weed control
Carbaryl	Insecticide	Localised wasp control
Cholecalciferol	Vertebrate pesticide	Localised possum control
Pindone	Vertebrate pesticide	Rabbit and hare control
<i>Use subject to Animal Health Board emergency provisions only</i>		
Sodium Cyanide	Vertebrate pesticide	Animal Health Board only, ground based possum control
Sodium Monofluoroacetate (1080)	Vertebrate pesticide	Animal Health Board only, extensive aerial possum control

THE MANAGED PLANTATION ESTATE

4. Commercial Plantation Estate

**Productive
Capacity strategy**

Forest management is carried out to ensure the productive capacity of the Council estate forests is not compromised. This encompasses multiple aspects that include:

- Pests, weeds and forest health: can reduce productivity
- Inventory: to feed into growth estimation, a core step in timing silviculture and formulating the cutting strategy
- Silviculture: to enhance the value of the resource
- Harvesting: achieving a successful harvest in terms of the forest owner’s health and safety, environmental and commercial objectives.

Forest area

The net stocked areas have been measured from a map produced by PF Olsen (Table 13).

Table 13: Council Estate Forest Area (ha)

Forest	Net Stocked Area	Area Awaiting Restocking	Reserves & Protected Ecosystems	Total Area
Borlase	596.5	130.6	244.2	971.3
Howard	459.2	19.0	596.2	1,074.4
Kingsland	104.7	0.0	78.9	183.6
Moturoa / Rabbit Island	953.3	62.3	125.4	1,141.0
Sherry River	385.6	0.3	406	791.9
Tunnicliff	98.9	0.0	18.6	117.5
Total (ha)	2,598.2	212.2	1,469.3	4,279.7

Current species

There are a range of species grown in the Council estate forests predominantly Radiata Pine (Table 14). These species have been chosen to best meet the management objectives set out above, given the characteristics of the forest land.

As all forests were purchased as existing planted and often semi-mature stands, the current ownership has inherited the historical decisions of past management. Radiata pine had been selected to best meet the management objectives of the previous owners. Subsequently purchased by the current owners, these forests were acquired because they generally continued to meet the investment criteria of the new owners.

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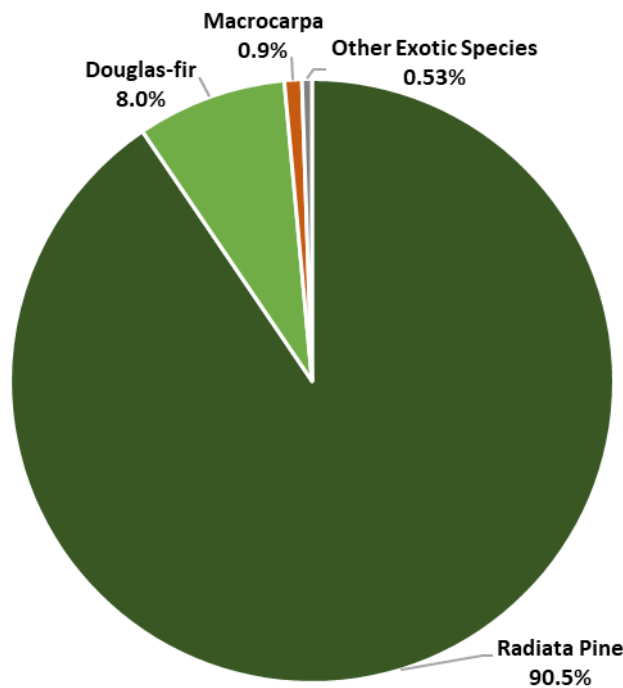
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Table 14: Species in Council Estate Forests

Species	Net Stocked Area (ha)
Radiata pine	2,374.7
Douglas-fir	210.7
Macrocarpa	24.6
Other Exotic Species	14.0

The species mix of Council estate forests is Figure 3 below.

Figure 3: Species composition by area for Council Estate Forests



Productivity indices Site index is a measure of productivity of a site in terms of height growth of radiata pine (Table 15). The parameter used is the mean height in metres of the largest 100 trees per hectare at age 20 years. Equations exist to predict this height given a measured height at any age.

The 300 index is another measure of productivity of a site based on stem volume growth (mean annual increment) of 300 stems per hectare.

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Table 15: 300 Index and Site Index ranges for each TDC forest

Forest	300 Index	Site Index
Borlase	Medium 22.5 - 30.0m ³	Medium 22.5 - 30.0m ³
Howard	Low 17.5 - 22.5m ³	Medium 22.5 - 27.5m ³
Kingsland	High 27.5 - 35.0m ³	High 27.5 - 35.0m ³
Moturoa / Rabbit Island	Low 17.5 - 22.5m ³	High 27.5 - 32.5m ³
Sherry River	Medium 22.5 - 30.0m ³	Medium - High 22.5 - 35.0m ³
Tunnickliff	Medium 25.0 - 32.5m ³	Very High 32.5 - 35.0m ³

Current crop status Measurement data from the most recent inventory is stored in FIPS and summarised in reports to provide the current status of the stands. Due to the large volume of data for this estate this information can be found in [Appendix 8](#).

5. Commercial Crop Establishment and Silvicultural Operations

Introduction

The choice of species is the most important issue in plantation forestry. The species must be suitable for the site and meet the objectives of Tasman District Council. Also important is to ensure that the planting material is of good quality.

Forest operations are implemented to ensure a good quality crop and maximum growth. These operations include land preparation, establishment, weed control, pest and disease control, fire protection, pruning and thinning and general property maintenance.

Forest management goals

Tasman District Council are committed to ensure that the forests will be managed to:

- Grow trees and produce logs for the manufacturing of different wood products in New Zealand and overseas with a focus on 'fit for purpose' log production;
- Ensure that the productivity of the land does not decline;
- Ensure that environmental values are identified and maintained;
- Ensure that historic sites are identified and protected;
- Ensure that other forest values and products are identified, protected and where possible enhanced;
- Ensure that the forest estate's contribution to carbon cycles is maintained or enhanced;
- Harvest the trees as close as possible to their economic optimum age and achieve the best possible financial returns to the owners;
- Replant following harvesting where agreements require;
- Meet all statutory requirements and comply with forest industry best practice;
- Provide recreational opportunities where practical;
- Act as a good corporate citizen and neighbour; and
- Ensure all forest management practices are consistent with the principles of the Forest Stewardship Council and NZS AS: 4708:2014

These goals are further detailed in 'PF Olsen Key Aspects - Objectives, Targets and Monitoring' ([Appendix 6](#)).

Crop species

Radiata pine, when intensively managed, will produce a range of different log types suitable for various processing options. The pruned butt log can be used to make knot-free veneer or decorative timber. The unpruned logs can be used for structural timber, for veneer or for feedstock for fingerjointing. The small logs and those with defects and excessive knots can be used for pulp and paper, MDF and other reconstituted wood products such as tri-board and particle board.

Radiata pine is the most common species processed in New Zealand and export markets are well developed for both finished products and logs.

In New Zealand radiata pine is also the main focus in terms of research and development. Past research and development have resulted in improvements in growth, form, disease resistance and wood characteristics as well as development of a range of finished products, building codes and timber standards.

Pre-establishment considerations

While a plantation crop is generally likely to confer beneficial habitat buffering rather than cause adverse effects, prior to re-establishment of the tree crop a review will be conducted to identify whether there are any rare, threatened or endangered species of flora or fauna within the area to be planted and what, if any, adjustments in planting may be required to accommodate improved environmental outcomes in the subsequent rotation. This may include the extension of an existing wildlife corridor or riparian area by increasing setbacks at the time of crop replanting. These considerations are covered by the afforestation checklist and riparian rules contained within the EMS.

Unwanted pine spread

Re-establishment programmes will include a spread risk assessment using the Wilding Spread Risk Calculator to inform decisions about replant boundaries and monitoring or other control strategies if required. There is no intention to plant or replant in other species with known high spread risk. The use of the Calculator is also a requirement under the NES-PF, and this will be adhered to.

Re-establishment

There is re-establishment planned within the Council forest estate during the period of this management plan, following harvesting of existing crop. Establishment will aim to use high quality tree stocks suitable for the site and market, targeting stock with high wood density. These will be investigated at time of establishment.

Since 1992, genetically improved radiata pine planting stock of Growth and Form (GF) factors ranging from 16 to 30 has been used at stockings of 600 to 900sph. In addition, areas of Douglas-fir, macrocarpa and lusitanica cypress have been established at 1200 stems/ha.

Tending

Originally a pruning regime was adopted for all TDC forests. This involved planting to 1,200 stems per hectare and pruning and thinning down to 350 stems/ha.

Since the early 2000's, pruning has been phased out due to lack of financial viability following declining pruned log price premiums over unpruned logs. The current standard regime is to plant high quality genetics radiata pine seedlings at 900 stems per hectare, and thin to 500-600 stems/ha at age 8.

Pruning is ongoing at **Moturoa / Rabbit Island** to reduce fire risk and facilitate Biosolids spraying. Pruning is not financially viable on its own and should the biosolids spraying methodology be changed such that pruning is not required, then pruning should be re-evaluated with regards to reduced fire risk against cost effectiveness.

Historically, production thinning has been part of the management strategy at **Moturoa / Rabbit Island** but has not been practiced for at least 20 years. Changing log prices or a cost-effective harvesting solution may make it viable again in the future.

Tree nutrition

The soils in the Council estate forests are not likely to be deficient in nutrients for healthy tree growth. However, there are soils within New Zealand that are deficient in one or more nutrients. The most common nutrient deficiencies are likely to be:

- **Magnesium** – Magnesium deficiency is a particular problem of the Central North Island and is associated with the phenomenon known as mid crown yellowing where the middle of the tree crown turns a yellow colour. Heavily pruned trees and some seedlots are more predisposed to the deficiency than others.
- **Boron** – Boron deficient trees can suffer dieback from the terminal buds and this symptom is closely associated with moisture stress and drought. Trees growing on the drier East Coast of both Islands and on the pumice soils of the Central North Island are prone to boron deficiency.

Foliar samples will be taken if nutrient deficiency symptoms are seen or expected. Fertiliser will only be applied if the health and the growth of the trees are significantly affected.

Site productivity and tree nutrition are actively researched components of industry research programmes in which PF Olsen is an active stakeholder and all harvesting entities are a financial contributor through the Forest Research Levy Fund.

6. Harvesting Strategy and Operations

Harvesting strategy The objective of the long-term cutting plan is to produce a smoothed flow of timber with rotation ages targeting 26 years for unpruned stands and 28 years for pruned stands.

The current harvesting plan for the TDC estate is to harvest at approximately 100K tonnes per year over the next 5 years, after which harvest levels will drop back to approximately 60K tonnes per year for the next 5 years, after which levels drop back to 30K tonnes. A perfectly normal forest age class in the TDC estate would yield 55K tonnes per year, although due to having an uneven age class, it is not possible to achieve this.

As a plantation with a non-normalised age-class structure, the harvesting strategy employed across the TDC forest estate is to harvest the forest or constituent stands as close as possible to the optimum economic age as practical subject to the additional caveat that the resource is to be managed to be a more or less continuous operation to the extent possible within the age-classes present.

Of importance in this assessment is the actual growth of the tree crop, the market for the wood at the time of the harvest and the outlook then and for the near future. These factors, together with logistics such as the availability of suitable harvest contractors and the requirements of resource consents, will determine the actual harvest time.

Moturoa / Rabbit Island, Howard, Sherry, Tunnicliff and Eves Valley are all primarily suitable for ground-based harvesting systems, while Borlase forest is primarily suitable for cable harvesting systems.

Despite occasional snow damage to the radiata pine crop in the **Howard** forest, it is still showing significantly higher financials returns to that of the Douglas-fir crop. Low returns coupled with high wilding spread risk of the Douglas-fir means it should be considered whether the Douglas-fir crop be harvested early to make way for the more profitable and lower wilding risk radiata pine.

Planning and preparing for harvest

Forward planning is essential when considering harvesting activities. Harvest planning should ideally commence two years before harvesting to enable roading infrastructure to be developed and any resource consents, archaeological surveys, etc. to be undertaken. This reduces the chance of hold-ups to the commencement of harvesting, which can be costly when log prices are fluctuating.

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Harvest planning is conducted within a detailed structured framework controlled within the PF Olsen FIPS system. Planners are guided through a total of 100 elements involving environmental, cultural, community, infrastructural, and safety issues that must be addressed as well as direct operational and economic considerations, prior to the issuing of final prescriptions. Harvesting operations will be undertaken by contractor and supervised by the forest manager.

Infrastructure

The roading and other infrastructure work proposed for the areas to be harvested in the first year are detailed in the Annual Cutting Plan.

Forest infrastructure includes roads, tracks, landings, bridges and culverts. Design specifications for these are outlined in the 'PF Olsen Standard Specifications for Road and Landing Construction'.

Typically, infrastructure within an early- to mid-rotation age 'greenfields' forest is limited to access for a 4WD vehicle. During harvest planning, upgrades of existing roads/culverts/bridges and planning for new roads, landings and crossings will be identified and scheduled. The type of infrastructure designed and constructed is influenced by topography, harvest duration and intensity of use.

Once established, these require maintenance. The PF Olsen Asset Hazard Register is a GIS-linked database of forest assets that includes bridges, culverts and crossings under resource consent. This provides the framework for a record of the asset attributes, and its associated maintenance schedule, some of which are required under consent conditions.

Land hand back

The process for land handback is unique to each individual forest agreement. They can involve quite a few steps and vary from block to block.

Contractor management

Prior to engaging a new contractor, a comprehensive review of the contractor's safety systems, safety record, systems of work organisation and equipment is carried out. With regard to crew configuration, where topography and terrain allows, mechanised felling, extraction and processing is a mandatory requirement. PF Olsen as the Property Manager must be satisfied on this review, regardless of the tendered price.

Upon appointment all new contractor crews undergo a comprehensive safety and environmental induction, while PF Olsen Ltd, in conjunction with its contractors and NZQA training providers NorthTec, runs a comprehensive programme of training to ensure the workforce is competent for the work they are required to perform. The formal NZQA qualifications are supplemented periodically by internally run training courses including those on environmental matters.

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All harvesting, engineering and silviculture contractors are subject to quarterly contractor monitoring audits and random drug testing. A full safety systems audit is scheduled and carried out annually. Full crew re-inductions take place every 5 years.

Weekly crew visits and monthly (or fortnightly according to risk) KPI assessments including environmental audits pick up corrective actions and follow-up on those. WorkSafe undertakes audits on an unannounced basis from time to time.

7. Forest Inventory, Mapping and Forest Records

Inventory

Forest growth and development is monitored through forest inventory. Forest inventories providing stand information are required at different times and for different reasons throughout the life of the rotation:

- Pre-assessment: for silviculture rate setting and validating operational timing vs silvicultural targets;
 - Quality control: to check contractor’s performance and update stand records;
 - Mid-crop: to collect measurement inputs for growth modelling;
 - Pre-harvest inventory is scheduled for stands around age 24, to collect measurement data on the crop. This is used for harvest planning, marketing and revenue estimation.
 - New technologies may see some of this information gathered and analysed using remote sensing in the future.
-

Mapping

All mapping of the Council estate forests is in digital format and is constantly updated in a Geographic Information System (GIS) that is linked to FIPS. The GIS system spatially records a vast array of forest data, from stand and legal boundaries, to reserves, rivers, roads, infrastructure, topography and soils.

Accurate mapping also assists budgeting, planning, calculation of future revenue/tree crop value, calculation of payments, infrastructure location, and harvest planning.

New plantings are remapped from new aerial photography around age four (when the trees are visible on aerial photography) to accurately determine boundaries and areas and also around two years prior to harvesting to assist with harvest planning.

Forest records

Detailed records of each stand’s silvicultural management history, productivity, inventory and other attribute data are compiled and maintained in a stand records database and Geographic Information System (GIS). These records form the basis for informing silvicultural scheduling, harvesting schedules and other management activity.

NON-COMMERCIAL ESTATE MANAGEMENT & PROTECTION

8. Protected Forests, Habitats, Ecosystems and Species

Introduction

Indigenous biodiversity management in or associated with exotic forests is a normal component of everyday forest management. Environmental certification systems place obligations upon the forest manager to be aware of and, where required, enact procedures to assist with the maintenance and protection of important biodiversity where they are able.

Exotic forests can and do provide a level of biodiversity, though this is often enhanced by natural forest ecosystem remnants embedded within the plantation matrix. These are often the most important contributor to the total of the productive landscape’s biodiversity. However, rare and threatened species can also be found associated with exotic forests and may require special attention for management.

Protected ecosystems

The protected ecosystem assessment process includes classification of each area on the basis of its representativeness, rarity, size, connectivity, and landscape values. A score is applied to each assessed component resulting in an overall ecological ranking, which will be used to assist future management prioritisation.

Efforts have been made to locate and describe all indigenous ecosystems within the Council forest estate (T. A steady programme of qualitative survey has been implemented. Coarse-level assessment and mapping has been done, and the larger and more ecologically significant areas have been described in greater detail. The remaining small areas will be further assessed as pre-operational planning progresses in each of the forests, particularly prior to harvesting in areas adjacent.

The 378.7 ha of protected natural and semi-natural ecosystems identified have been mapped and classified. The results are summarised to show the major identified land cover associations and their current protective status.

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Table 16: Protected ecosystems and reserve areas

Stand	Area (ha)	Protective Status	Protective Function	Forest Type Description	LENZ Remaining (%)	LENZ Protected (%)	Protection Category	
BORL – PRIF – 01	36.1	NZ Forest Accord	Terrestrial Ecosystem	Beech Hard/Red Dominant	41.0	17.0	Full	
BORL – PRIF – 02	33.3		Riparian Ecosystem				Special	
BORL – PRIF – 03	3.9						Limited	
BORL – PRIF – 05	7.8	NZ Forest Accord	Riparian Ecosystem	Beech Hard/Red Dominant	41.0	17.0	Limited	
BORL – PRIF – 04	9.8						Special	
HOWD – PRIF – 02	50.0		Terrestrial Ecosystem				Full	
HOWD – PRIF – 05	17.7							
HOWD – PRIF – 01	6.7							
HOWD – PRIF – 04	13.1							
HOWD – PRIF – 03	7.1							
HOWD – WETL – 01	1.8	Management Plan	Wetland Ecosystem	Semi-Wetland Sedge			Limited	
HOWD – SECF – 01	8.4	NZ Forest Accord	Terrestrial Ecosystem	Beech Hard/Red Dominant	70.0	75.0	Passive	
HOWD – LEPT – 03	5.1	Management Plan		Manuka/Kanuka/Broadleaved HW				
HOWD – SECF – 02	2.8	NZ Forest Accord		Beech Hard/Red Dominant				
HOWD – LEPT – 05	3.7	Management Plan		Manuka/Kanuka/Broadleaved HW				
HOWD – LEPT – 01	2.1			Riparian Ecosystem				Beech Hard/Red Dominant
HOWD – SECF – 03	0.5			Terrestrial Ecosystem				Manuka/Kanuka/Broadleaved HW
HOWD – LEPT – 04	2.1							
HOWD – LEPT – 02	0.6							
KING – SECF – 01	23.5	NZ Forest Accord		Riparian Ecosystem				Lowland
KING – SECF – 02	11.4							
RABB – WETL – 01	2.7	SNA	Wetland Ecosystem	Leptospermum/Coprosma	0.0	0.0	Limited	
RABB – LEPT – 01		Management Plan		Duneland small leaved				
RABB – DEPG – 01	6.1	Management Plan	Rare Species	Adventive and Exotic				
RABB – DUNE – 01	5.6			Duneland small leaved				
SHER – PRIF – 01	5.7	NZ Forest Accord	Terrestrial Ecosystem	Hardwood/Podocarp/Beech	41.0	17.0	Limited	
SHER – PRIF – 02	3.4				82.0	84.0		
SHER – LEPT – 02	2.7	Management Plan	Terrestrial Ecosystem	Manuka/Hardwoods	41.0	17.0	Passive	
SHER – LEPT – 01	3.0	NZ Forest Accord						
TUNN – PRIF – 01	12.9			Hardwood/Podocarp/Beech			Full	
TUNN – SECF – 01	2.3	Management Plan	Riparian Ecosystem	Kahikatea/Matai/Podocarp	8.5	6.7	Passive	

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All protected ecosystems are recorded and ranked on the basis of ecological criteria reflecting the stands representativeness, rarity of species, size and connectivity, function and landscape values. Relative value in terms of the ‘ecological landscape’ (Section 4) also informs that process.

Actions are prioritised according to the ‘Protection Category’ status allocated to the areas from the assessments and classifications undertaken (Table 17). The management implications pertinent to each status are summarised in the table below. Prioritisation of work effort will also be based on the principle of ensuring successful and maintainable outcomes at limited scales as a priority over wide scale but marginally beneficial outcomes.

Table 17: Protected Ecosystems Management Categories

Protection Category	Primary Management Objective	Activity Level	Monitoring
Passive	<ul style="list-style-type: none"> Minimise non-essential damage maintain area 	<ul style="list-style-type: none"> Fire protection 	<ul style="list-style-type: none"> Area- with adjacent stand assessments
	<ul style="list-style-type: none"> Observe RPMS obligations 	<ul style="list-style-type: none"> 3rd party arrangements re: pests Apply RPMS 	<ul style="list-style-type: none"> Pests- to meet RPMS General forest health survey
Limited	<ul style="list-style-type: none"> Protect from non-essential damage Maintain area Maintain function (where practical) 	<ul style="list-style-type: none"> Fire protection 	<ul style="list-style-type: none"> Sample forest condition monitoring
	<ul style="list-style-type: none"> Observe RPMS obligations 	<ul style="list-style-type: none"> 3rd party arrangements re: pests, Apply RPMS Associated maintenance pest control 	<ul style="list-style-type: none"> Low level pest monitoring where relevant Sample related fauna if relevant
Full	<ul style="list-style-type: none"> Protect from all controllable damage Maintain area and function 	<ul style="list-style-type: none"> Fire protection 	<ul style="list-style-type: none"> Area monitoring
	<ul style="list-style-type: none"> Improve quality 	<ul style="list-style-type: none"> Specific management 	<ul style="list-style-type: none"> Forest condition monitoring
	<ul style="list-style-type: none"> Observe RPMS obligations 	<ul style="list-style-type: none"> Targeted pest control 3rd party arrangements re: pests. 	<ul style="list-style-type: none"> Pest monitoring where relevant Related fauna monitoring if relevant
Special	<ul style="list-style-type: none"> Restoration if practical 	As above, plus: <ul style="list-style-type: none"> Fencing Covenanted Co-management agreements Funding where practical 	As above, plus <ul style="list-style-type: none"> As defined in any restoration agreement

Table 18 details the areas in each protection category within Council estate forests, categorised by protective function.

Table 18: Protected ecosystems management categories by function and area

Forest	Protective Function	Protective Category			
		Passive	Limited	Full	Special
Borlase	Riparian Ecosystem		21.5	33.3	
	Terrestrial Ecosystem				36.1
Borlase - Total Area (ha)			21.5	33.3	36.1
Howard River	Riparian Ecosystem	2.1			
	Terrestrial Ecosystem	23.2		50.0	44.6
	Wetland Ecosystem		1.8		
Howard River - Total Area (ha)		25.3	1.8	50.0	44.6
Kingsland	Riparian Ecosystem			11.4	
	Terrestrial Ecosystem			23.5	

Kingsland - Total Area (ha)				34.9	
Moturoa / Rabbit Island	Rare Species		5.6		6.1
	Wetland Ecosystem				5.4
Moturoa / Rabbit Island - Total Area (ha)			5.6		11.5
Sherry River	Terrestrial Ecosystem	9.1	5.7		
Sherry River - Total Area (ha)		9.1	5.7		
Tunnickliff	Riparian Ecosystem	2.3			
	Terrestrial Ecosystem			12.9	
Tunnickliff - Total Area (ha)		2.3		12.9	
Total Area (ha)		36.7	34.6	131.1	92.2

Management and riparian setbacks

A standardised GIS-based stream classification system based on NIWA’s River Environment Classification (REC) has been used to develop a rationale for defining riparian management with a set of rules in the EMS that apply to operations occurring near the riparian corresponding with each stream category. Categorisation of each stream reach is done by the physical characteristics of the particular reach, e.g. underlying geology, streambed slope, climate, and reach order.

It also provides the minimum setbacks upon establishment or reestablishment of forest after harvest where riparian setbacks had not existed before. The morphology of streams can mean that the minimum setback is wider in many instances.

The stream categories within the Council estate forests are summarised in Table 19. The total length of waterways within the forests is 35.4 kilometres.

Table 19: Length (m) of stream by REC class and Forest

REC Class	Borlase	Howard River	Kingsland	Sherry River	Tunnickliff
<i>Large, low, wet, hard</i>		41.5			86.8
<i>Large, low, wet, soft</i>		2,613.8		311.0	111.8
<i>Large, mod, wet, soft</i>				176.4	
<i>Med, low, dry, hard</i>	162.7				
<i>Med, low, wet, hard</i>		1,879.6			
<i>Med, low, wet, soft</i>		6,069.7		1,070.5	
<i>Med, mod, dry, hard</i>	6,649.3		658.5		
<i>Med, mod, wet, hard</i>			999.7	3,371.5	
<i>Med, mod, wet, soft</i>		947.4			
<i>Small, low, dry, hard</i>	442.3				
<i>Small, low, dry, soft</i>	52.4				
<i>Small, low, wet, hard</i>					758.7
<i>Small, low, wet, soft</i>		3,004.3		690.1	
<i>Small, mod, dry, hard</i>	3,555.6				
<i>Small, mod, wet, hard</i>				1,023.3	
<i>Small, mod, wet, soft</i>				719.9	
Total	10,862.3	14,556.3	1,658.3	7,362.3	957.3

Rare and threatened species

Numerous rare and threatened species have been sighted in the Council estate forests including Kea and Karearea.

Records of sightings and locations were originally collected and reported in FIPS, but an app call iNaturalist is now used. Over time these databases have enabled the build-up of a spatial distribution picture of species within different geographical locations. Recorded sightings within the plantations and indigenous reserves are summarised in Table 20. These records are made available to conservation authorities.

A listing of key species of interest is held by all contractors and staff, along with the login details for [iNaturalist](#).

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Table 20: Rare and threatened species reported in Council Estate Forests

NZ Threat Classification System Category	Species	Borlase	Howard River	Kingsland	Moturoa / Rabbit Island	Sherry River	Tunnickliff
Nationally Critical	White Heron				1		
Nationally Endangered	Kea	2	2				
	Black-Fronted Tern		1				
Threatened	New Zealand Black Robin		1				
	Black Stilt				1		
Recovering	Karearea / NZ Falcon	2		1	2		
	Variable Oystercatcher				2		
	Pied Shag				1		
At Risk	South Island Robin		1				
	Bar-tailed Godwit				1		
Nationally Vulnerable	Banded Dotterel				1		
Naturally Uncommon	Royal Spoonbill				1		
	Little Black Shag				1		
Not Threatened	Bellbird		2				
	Weka			2	4		1
	Tui		1				
	South Island Tomtit		1				
	South Island Fantail				3		
	White-Faced Heron				1		
	New Zealand Kingfisher				1		
Total		4	9	3	20	0	1

Fish

PF Olsen uses the Freshwater Environments of New Zealand (FWENZ) models to inform the potential for threatened fish species that may be present in streams affected by operations and if necessary, any response to such a presence. The Fish Spawning Indicator published by NIWA to accompany the NES-PF is also used, particularly for works over/in stream beds.

Primary management actions in relation to fish, in addition to those already covered under water quality are:

- Development and maintenance of a register of crossings and an inspection routine to ensure fish passage;
- Sound design and construction of all new stream crossings;

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- Timing of in bed crossing construction to avoid peak spawning period;
 - Minimising damage to streamside environments and provision of setbacks where they were not originally present;
 - Identification of, and avoidance and/or buffering of waterbodies during aerial spraying for replanting and *Dothistroma* control or aerial fertilisation if ever required; and
 - Protection of any wetlands identified within the plantation matrix.
-

Avifauna

While the local lists of threatened bird species are much more extensive, most of those species’ habitats are shore, sea, estuarine and riverbed focussed. Of the forest birds, many of the more common species listed can be expected to be regularly within or transient through the plantation forest.

Primary management actions in relation to avifauna are:

- Adherence to industry protocols developed for management of NZ falcon kiwi, bats and shortly, lizards;
 - Inclusion of threatened species sightings into the PF Olsen sightings database, and subsequently into the NZ Forest Owners iNaturalist – Biodiversity in Plantations Project⁵;
 - Minimising damage to natural forest areas and any small wetlands and scrublands during harvest and reforestation, particularly any gully systems that already form natural corridors through the larger plantation areas;
 - Promotion of the development of improved riparian corridors after harvest; and
 - Co-operation with neighbouring landowners undertaking vertebrate pest control within the wider area.
-

CITES species

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments.

Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 34,000 species of animals and plants.

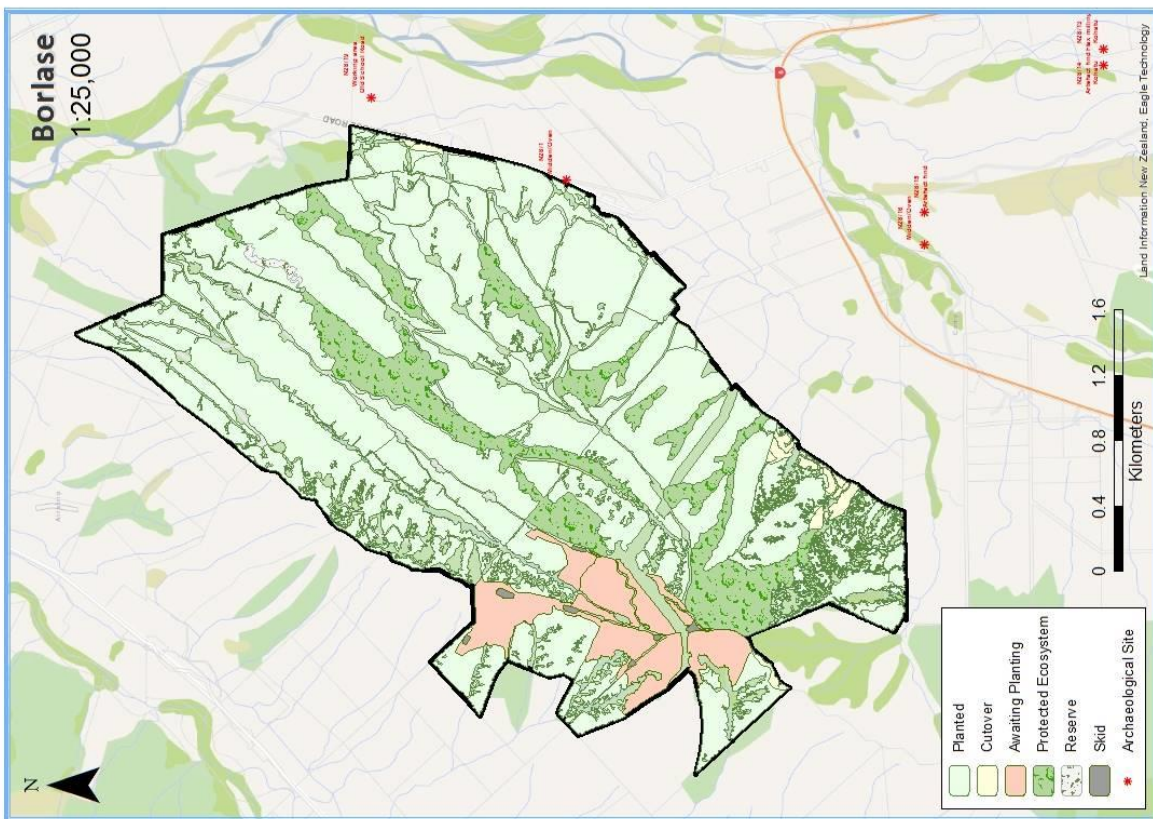
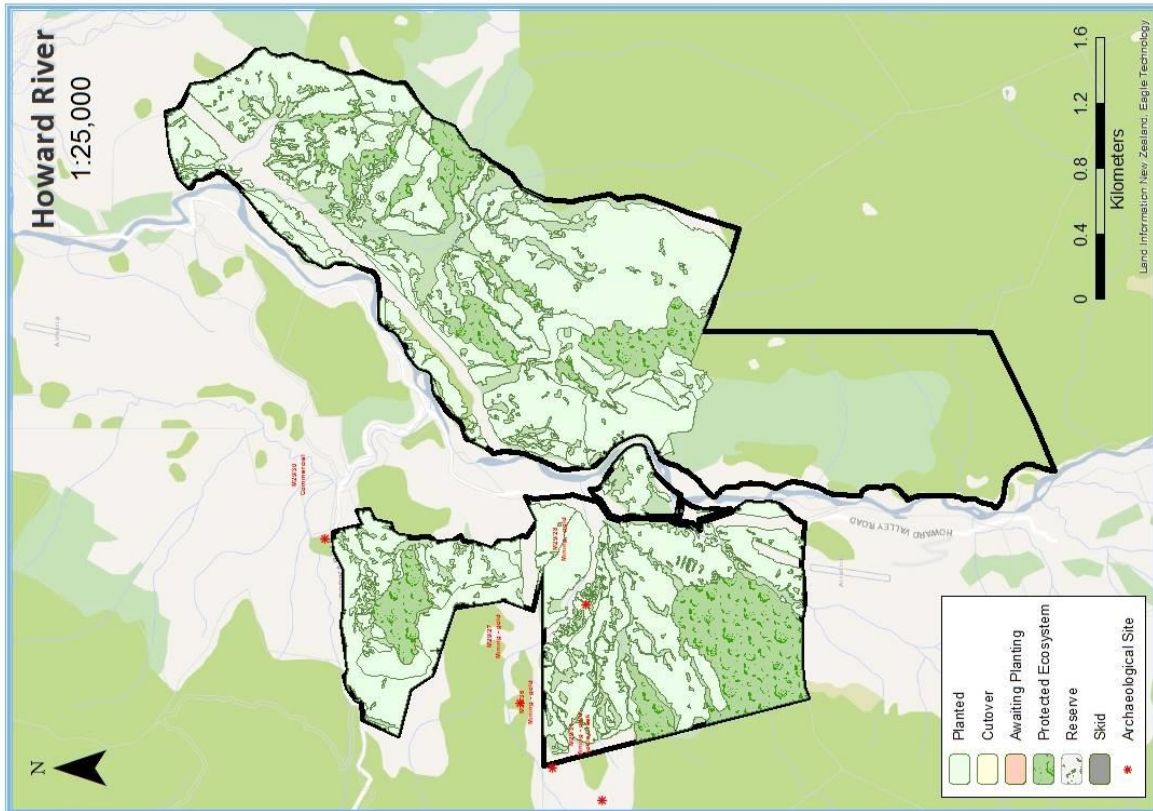
The full list of New Zealand CITES listed species are available on the [Department of Conservation’s website](https://www.doc.govt.nz/conservation/cites/).

High Conservation Value Forests

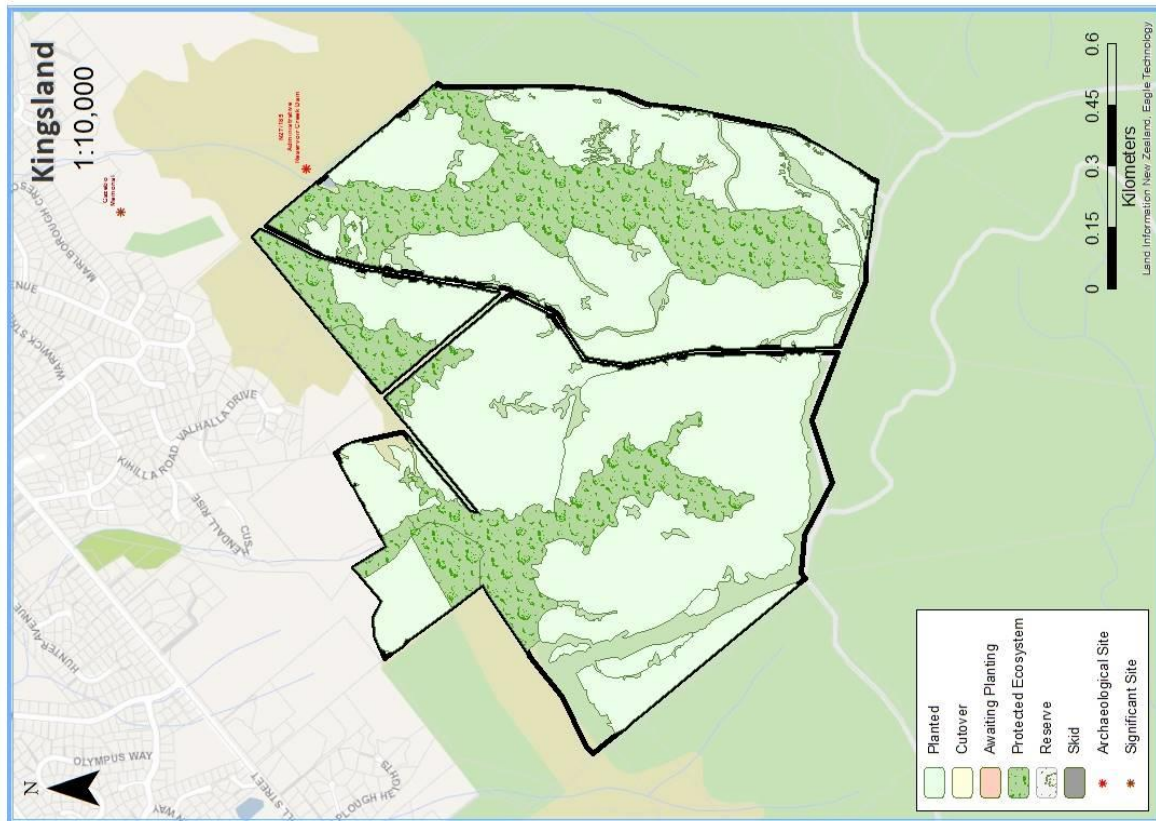
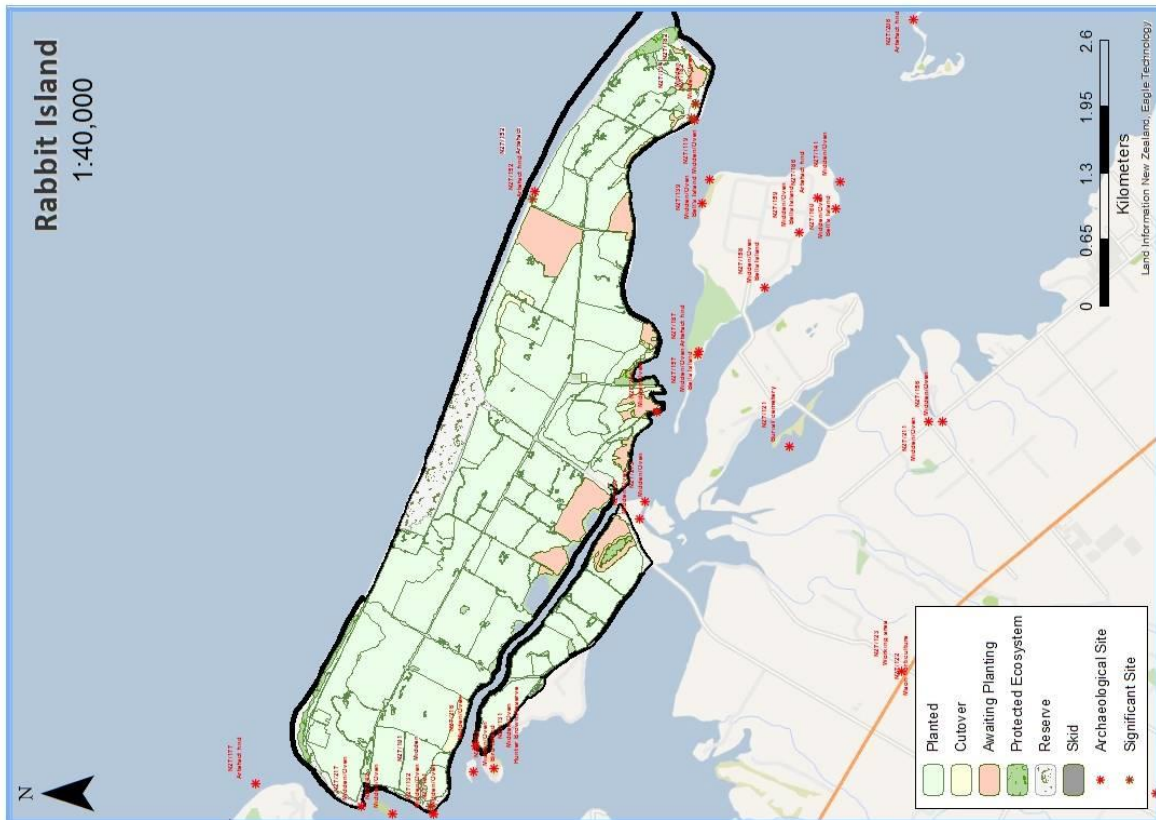
To date, no High Conservation Value Forests have been identified.

⁵ <https://www.inaturalist.org/projects/biodiversity-in-plantations>

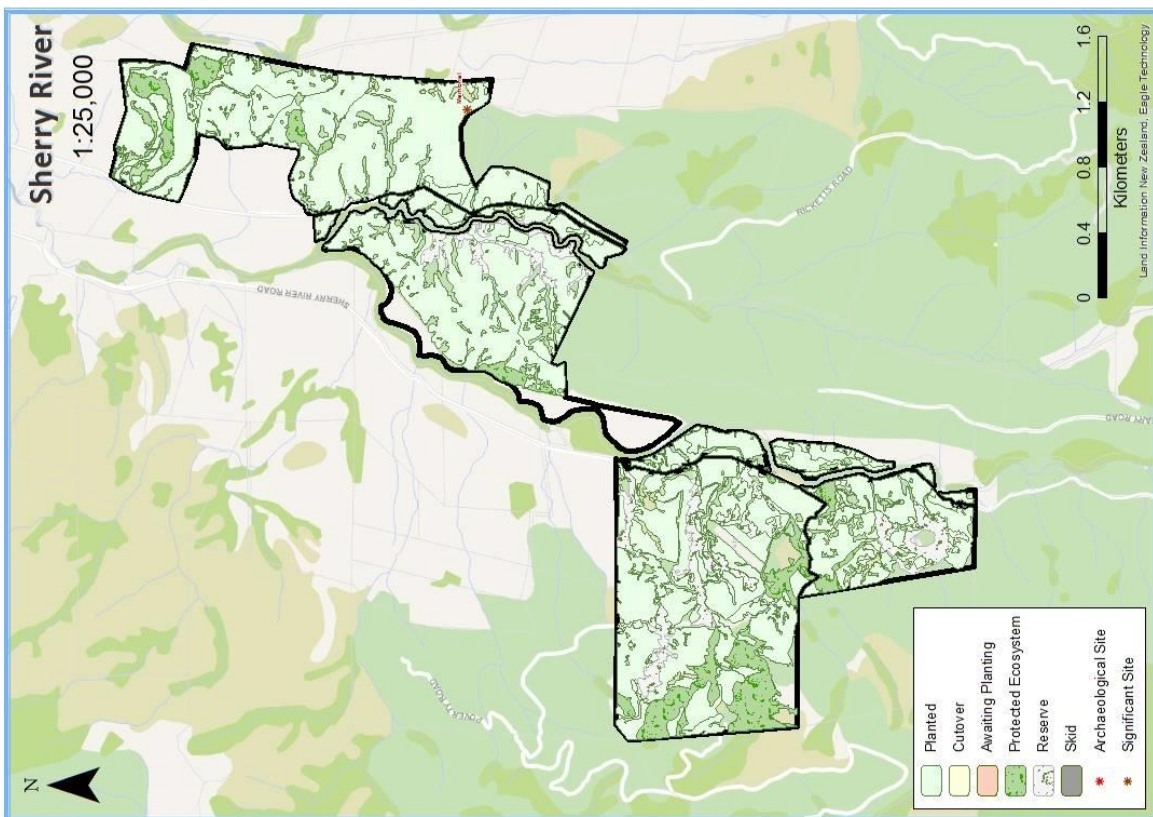
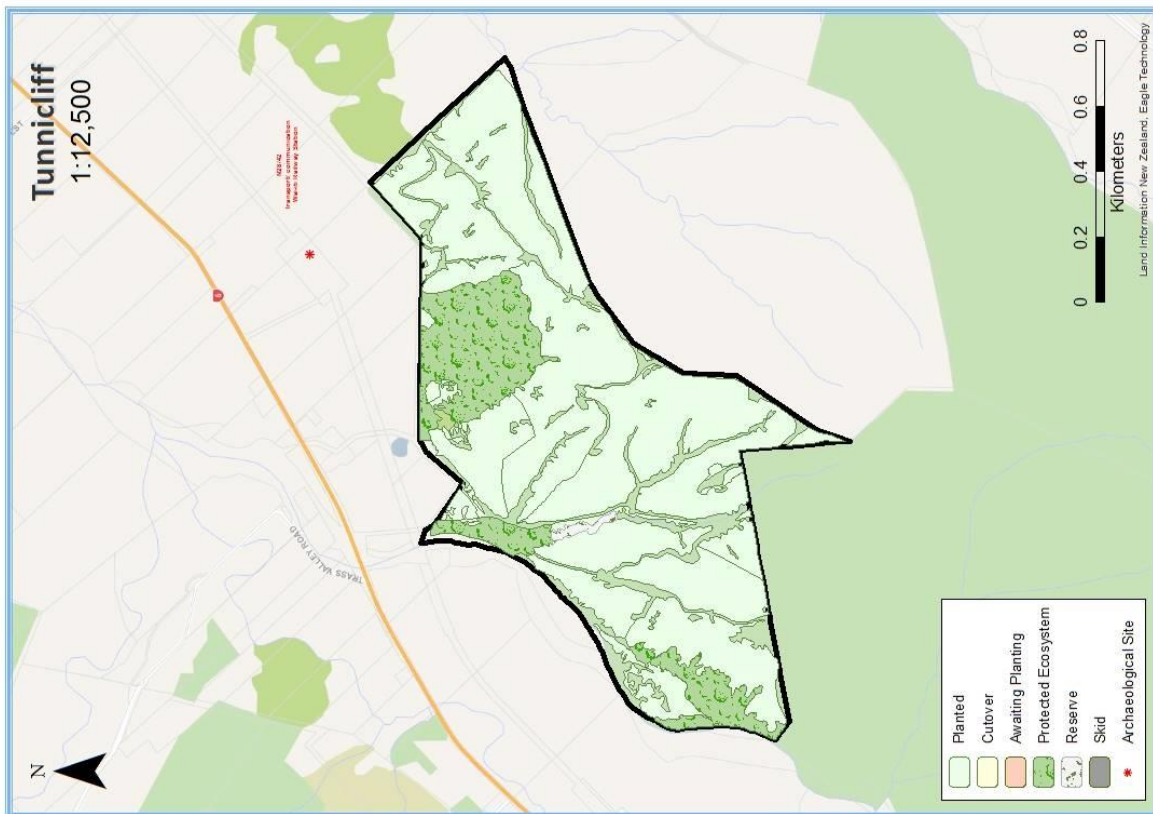
Map 8 - Borlase and Howard River Forest Stands Maps



Map 9 – Kingsland and Moturoa / Rabbit Island Forest Stands Maps



Map 10 – Sherry River and Tunnickliff Forest Stands Maps



9. Property Management and Protection

Statutory pest obligations

Pest management within the Council estate forests is subject to statutory obligations under the Tasman Nelson Regional Pest Management Plan 2019 - 2029.

The strategy applies to both pest plants and animals and categorises them, in terms of management objectives. The categories, objectives and landowner obligations are summarised the Regional Pest Management Plan. These plans are [maintained online](#) by the relevant Regional Council.

Plant Pests

The overall objective in managing plant and animal pests is to:

- Meet statutory obligations under the Regional Pest Management Strategy,
- Reduce their direct impacts on both plantations and indigenous biodiversity values,
- Ensure that any impacts on neighbouring properties are promptly dealt with,
- Monitor the abundance and distribution of these species within the Council estate forest.

The major plant species potentially threatening production values within the forest can be seen in [Appendix 7](#).

Animal Pests

The PF Olsen Integrated Pest Management provides guidance on application and execution of the PF Olsen Ltd Environmental Management System (EMS) for pest control and chemical use.

The main animal pest in the Council forest estate that is also a commercial risk is the introduced possum. Possums attack the growing tips of both plantation and native trees, causing stem malformation and die back. Possums are also a threat to neighbouring property owners who are farmers as they can carry and spread tuberculosis to domestic stock.

Other commercial pests include rabbits and hares at the time of establishment.

Animal pests in the Council forests will be controlled using ground control methods as required, which prevent impacts on non-target species. The forest manager will coordinate operations with organisations such as the Regional Council and the Department of Conservation to achieve effective and efficient control within the forest area and on neighbouring land, where required.

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Local groups, the Moturoa / Rabbit Island Trapping Group and Native Bird Recovery Richmond are actively trapping for ecological pests, primarily rats and stoats in the Kingsland protected ecosystems and at Moturoa / Rabbit Island around the bird nesting zones. Close liaison will be maintained to support the efforts of those groups and their objectives as defined and established in conjunction with Council reserves management.

In addition, recreational hunters are encouraged in Borlase and Howard forests to help control ungulate pests such as deer and pigs.

Parts of the plantation forests in general are subject to common invasive weeds such as broom, gorse and pampas which are subject to boundary or containment control requirements under the Regional Pest Management Strategy (RPMS). Forest boundaries will require periodic inspection and treatment where such weeds occur.

In addition, substantial voluntary effort (Keep Richmond Beautiful group) has and continues to be directed and further supported by professional contractors and significant funds from the Council reserves management department to control serious ecological weeds infesting protected ecosystems in Kingsland and other areas. Key targets for these efforts include old man's beard, banana passionfruit, *Bomarea caldasii*, hawthorn, tree privet and English ivy to name a few.

Much progress has been made but an important aspect of ongoing integration between the commercial forest manager and these groups and Council's reserves management will be to try to ensure good control of weeds at the marginal interface between the plantations and (particularly) the HCVF protected ecosystems to preserve the gains being made within the reserves by these groups' efforts.

Diseases, which can affect the forest trees and adjacent native vegetation, are monitored throughout the year by the forest manager, and once a year by a professional independent forest health assessor. Most diseases cause little damage and do not require control. The exception is *Dothistroma*, a fungus which attacks pine needles. This fungus is controlled using a copper-based fungicide, but only when the infection reaches a critical level.

Dothistroma infection can also be controlled through silviculture by timely thinning and pruning operations, which increases air movement and lowers humidity levels.

Depending on the results of the annual infection inspections there may be a need for *Dothistroma* control to take place in the Council estate forests.

Douglas-fir wilding risk All Douglas-fir plantations are now within the age bracket when coning will be present. The Howard plantations are identified as presenting the greatest risk of creating an unwanted and difficult to control spread risk. Within the term of this plan an assessment of evidence of spread is required and if necessary early control of any seedling presence within adjacent native forest.

Fire prevention and control With the weather patterns normally experienced in New Zealand during the period late spring/summer, fire can be a real threat to the forest. This can be minimised by:

1. Having an effective fire plan.
2. Active prevention measures which include restrictions on allowable access, fire prevention signage, publicity when fire danger increases, access to adequate water sources, and selective forest grazing to reduce fuel within stands.
3. Effective detection systems include good communication systems, mapping, and fire plan alert procedures.
4. A close link with the relevant fire authorities, and an understanding of equipment and trained manpower requirements.
5. Good forest management that recognises the influence of terrain, roading network and accessibility, and fuel build-up from silvicultural practice, that will influence fire prevention and control measures.

Fire authority responsibilities Under the newly legislated Fire Emergency New Zealand Act (FENZ) which came into existence on the first of July 2017 the legal responsibility for fighting and administering forest fires in the TDC estate is the responsibility of the Te Ihu FENZ Region. Additionally, the FENZ Principal Rural Fire Office is specifically responsible for controlling vegetation fires. It also monitors the fire danger, declares restricted and prohibited fire seasons and issues fire permits.

Public liability insurance Not Publicly Available

Fire insurance Not Publicly Available

OTHER BENEFITS FROM THE FOREST

10. Recreation, Forest Products and Other Special Values

Introduction

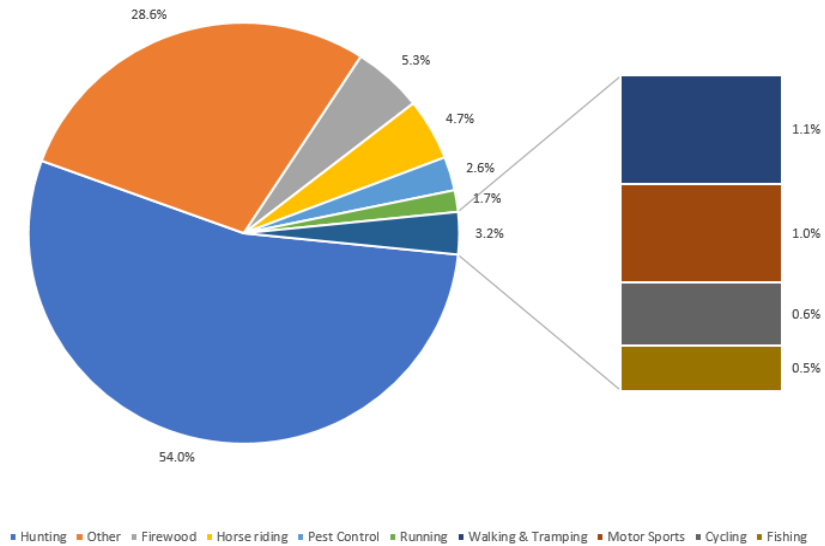
Forest plantations may also provide for non-timber forest products that enhance the economic well-being of the owner or legitimate forest users. Non-timber products are an important means of maximising the production capacity of the forest whilst maintaining environmental and social values. The forest management plan provides procedures for developing and managing these resources.

Forests can also provide many other special values, which are also provided for and managed through the forest management plan.

Recreational usage

The Council forests receive significant recreational demand from the wider public. Since 2010, 1,541 access permits were issued, of which 1,082 (70%) were for recreational purposes (Figure 7).

Figure 7: Permits issued throughout the Council Estate since 2010



Borlase, Moturoa / Rabbit Island and Kingsland are of particular importance for their recreational value, and they are the most utilised of the estate. Passive recreation in Kingsland and Moturoa / Rabbit Island (walking, cycling, swimming and horse riding at Moturoa / Rabbit Island) are uncontrolled and open to the public subject only to fire danger and hours of darkness. Other forms of recreation (e.g. pig hunting in Borlase) are controlled by the permit system to ensure strict controls on access to avoid conflicts between users, or to protect public safety.

Tunnickliff forest is also used for similar recreational activities including cycling, horse riding and other passive uses.

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At Moturoa / Rabbit Island, there is a large reserve on the north coast excluded from timber production solely for the purpose of public recreation (the 'domain'), plus a buffer on the west and east side of the island that is available for public entry. The domain and coastal reserves are controlled by council bylaws and the Reserves Act 1977. In response to the demands and to meet legislative requirements under the Reserves Act a Moturoa / Rabbit Island Reserves Management Plan has been produced and periodically updated since 1989.

In 1994 a local equestrian organisation was given approval to lease approximately 19 hectares of recreation reserve on Rough Island. This has been developed as an equestrian centre.

The [Great Taste Cycle Trail](#), which opened in 2012, forms a big loop of the Nelson-Tasman region, taking in Nelson, Wakefield, Richmond, Motueka and Kaiteriteri. The Trail travels through Moturoa / Rabbit Island Forest on the Richmond to Mapua section and runs immediately adjacent to Tunnicliff Forest on the Belgrove to Wakefield section. The development of the Trail has resulted in a sharp increase in the number of recreational cyclists coming out to the forests.

Within Moturoa / Rabbit Island Forest this has led to the development of the Moturoa Forest Trail, an additional designated in-forest route that was developed in conjunction with the Council to provide a safe trail for riders and to confine riding to areas that could be safely managed in conjunction with forest operations such as harvesting and sewerage disposal.

The location of Moturoa / Rabbit Island and Kingsland forests close to significant suburban populations means the forests are highly valued for their recreational opportunities. Moturoa / Rabbit Island and Kingsland public recreation is administered by the Tasman District Council via a Council Recreation Policy.

All the forests have formed and unformed legal roads, the location of which can be viewed on the Walking Access Commission's mapping website at www.wams.org.nz. The WAC promotes the '[NZ Outdoor Access Code](#)', which outlines the rights and responsibilities of adjacent landowners, and those wishing to utilise legal roads.

A section in the Code specifically acknowledges the importance of obtaining an access permit to enter a forest to ensure that forestry companies have user's contact details, and can provide information about fire risk, forestry operations and other hazards. Because Council has a general open forests policy, subject to permit, the use of existing formed infrastructure is strongly encouraged.

Non-timber forest products

There are no FSC certified non-timber products currently being produced or developed in the Council forest estate.

Other special values

The following special values have also been identified in Council estate forests:

- Sewerage irrigation is carried out over plantation areas within Moturoa / Rabbit Island. These areas are well away from publicly used recreational areas, with restrictions put in place on public access where required. Irrigation is strictly controlled by resource consents that are held by Council for effluent disposal and provide comprehensive management and monitoring conditions.
 - Possum trapping for fur in Howard and Moturoa / Rabbit Island forests.
-

Public access roads and/or trails

There are no public tracks and trails near or within the forest as the forest is located on privately owned farmland. All signage of roads and tracks must be followed and those using the routes will still require a permit if there is any intention to access the forest from the road routes.

These public road locations are publicly viewable in the Walking Access Commission website⁶. Any users are expected to abide by the Outdoor Access Code⁷ published by the Walking Access Commission.

⁶ https://www.wams.org.nz/wams_desktop/index.html

⁷ <https://www.walkingaccess.govt.nz/knowledge-base/the-outdoor-access-code/>

11. Monitoring

Introduction

To ensure that the management objectives identified in this plan are being achieved, various monitoring exercises outside normal operations management have been developed. Monitoring results are summarised and reported to Tasman District Council as and when required and are also, where appropriate, made publicly available through the PF Olsen webpage.

Values monitored

Management inspections are undertaken regularly. The forest monitoring framework that would generally be applied to the forests is shown below. The monitoring may not include all of these elements.

Table 21: Environmental process monitoring framework

Monitored Element	Components	Data Source	Data Medium	Reporting / Website Frequency
Chemical Usage	- A.I Usage - Area Overuse	- Operational Supervisors	- FIPS - <u>Form</u>	- On Demand - Annual
Client Satisfaction	- Post-operation client survey	- Clients	- Survey Form	- Post-operational - Annual
Consultation Activity	- Complaints - Other Interactions	- Operational Supervisors - Planners	- FIPS - <u>Form</u> - <u>Meeting Minutes</u>	- Annual - Annual
Environmental Incidents	- Incident Number - Categories	- Operational Supervisors	- FIPS - <u>Form</u>	- On Demand - Annual
Environmental Goals	- All	- Environmental Management Group	- Meeting Minutes	- Annual
Environmental Training	- Courses - Numbers - Names	- Staff	- FIPS - NZQA	- Annual - Individual
Flora & Fauna	- Species & Status - Frequencies - New Finds	- Operational Supervisors - Public - Crews	- FIPS - <u>Form</u> - <u>iNaturalist</u>	- On Demand - Annual
Forest Estate Structure	- Area: Plantation & Protected Ecosystem - Age-class - Species - Forest Type - Protection Status	- Management Plans - Stand Records	- FIPS Stand Records	- On Demand - Annual

Continued on next page...

...continued

Monitored Element	Components	Data Source	Data Medium	Reporting / Website Frequency
Forest Growth	- PSP Protocols - Periodic Inventory - ISO 9001	- Contractors	- Volume Reconciliations - Estate model	- Periodic-annual - Not on web
Forest Health	- Disease & health	- NFH Surveillance Program ⁸	- Document	- Periodic-Annual - Not on web
FSC Membership	- Block - Location - Name	- Certifying Body	- Certificate	- On Demand - Annual
Health & Safety Statistics	- LTI / MTI / TIFR - Accidents & Incidents - Initiatives	- Operational Supervisors	- Assura	- Monthly - Annual
High Conservation Value Forests	- Condition Trends - Photopoint Monitoring	- Contractors - Supervisors	- Spreadsheet	- Annual
Internal Audit CAR Activity	- Frequency * - Category	- Auditors(ees) - Operational Supervisors	- Assura	- Annual
Log Production	- Total Logs - FSC Certification	- Log docketts at harvest	- Woodtrack	- On Demand - Annual
Operational Monitoring	- Audit Trends - Cause Analysis	- Operational Supervisors	- FIPS - <u>Form</u>	- Monthly - Annual
Pests	- RTC / RTI - Kill Returns - Other	- Contractors - Supervisors - Permittees	- FIPS - Various	- Annual - Where Relevant
Protected Ecosystem Condition	- Condition Trends - Photopoint Monitoring	- Contractors - Supervisors	- Spreadsheet	- Bi-annual if restoration initiated
Recreational & Non-Timber	- Permits Issued	- Branch Offices - Forest Security	- FIPS	- Annual
Resource Consents	- Number - Compliance	- Operational Planners	- FIPS	- Monthly - Annual
Social Survey	- Demographics, - Values - Work Conditions	- Contractors	- Survey form	- 3 yearly
Stream Monitoring	- Clarity +/- other specific - Full NOF	- Supervisors - Contractors - BOPRC	- Various	- Operational - BOPRC S.o.E.

⁸ Forest health inspections are undertaken annually, by an independent specialist forest health assessor, through the NZ Forest Owners Association forest health scheme.

**Other
monitoring**

Budget versus expenditure is monitored through the PF Olsen FIPS system and presented to Tasman District Council when requested. This information is not made public.

Other operational standards are monitored through a variety of concurrent and post operational assessment procedures that cover all critical aspects of the business of the forest. This information which includes log manufacturing quality performance, safety performance, financial and budget performance as well as stakeholder feedback and client satisfaction surveys and other private or commercially sensitive is not made public.

12. Future Planning

Introduction

This plan pertains to the management of the Council estate forests and will be adhered to for the next 5 years. Any deviation from this plan will be justified only on the basis that the changes do not adversely affect the environment. Any changes, which are contrary to the policies contained in this management plan, will require a full review of this plan. The next review date for this plan is June 2024.

Deviations from this plan will be justified on the basis that the changes do not adversely affect the environment and are necessary or beneficial to achieving the management goals and objectives.

The forest management plan is used for both medium and long-term planning.

Operation plans

Short term tactical planning is accomplished through development of annual operations plans in conjunction with detailed budgeting. These plans are prepared in accordance with this Management Plan. Harvesting operations are also planned on a block by block basis because of the level of detail required.

This operation plan and associated budget are subject to approval by Tasman District Council at the beginning of each financial year.

Stakeholder consultation

Consultation with key stakeholders has been enabled as part of the development of this plan which will be publicly available on the PF Olsen Certification website. Feedback from stakeholders (and others as they become apparent) is monitored, including actions undertaken to resolve disputes and issues and may inform changes in operational practice or future plan reviews.

13. Register of Plan Change and Review

Introduction

This plan pertains to the management of Council estate forests and will be reviewed on an annual basis. This section documents specific changes made during each review.

Date	Section / Page	Change
Mar 23	HCV and Monitoring	Update information

Appendix 1 – Legal Descriptions

Forest	Parcel ID	Legal Reference	Area (ha)
Borlase	3598356	Lot 1 DP 19523	103.2
	3599076	Lot 2 DP 8304	8.3
	3602589	PT Section 60 SO 10466	10.4
	3604337	Section 63 Blk XVI Wangapeka SD	41.4
	3609763	Section 48 Blk XVI Wangapeka SD	158.8
	3614498	Lot 2 DP 16062	48.7
	3615285	Lot 1 DP 16062	56.4
	3616838	Section 61 Blk XVI Wangapeka SD	63.2
	3618562	Section 49 Blk XVI Wangapeka SD	113.2
	3623571	Section 58 Blk XVI Wangapeka SD	39.7
	3624743	Section 39 Blk XVI Wangapeka SD	68.0
	3633590	Section 38 Blk XVI Wangapeka SD	52.5
	3634037	PT Section 86 SO 10466	7.9
	3650726	Section 50 Blk XVI Wangapeka SD	78.7
	3655222	Lot 1 DP 13330	78.4
	3656994	Section 54 Blk XVI Wangapeka SD	1.3
3659851	Section 57 Blk XVI Wangapeka SD	37.5	
Howard River	3599892	Section 14 Blk X Howard SD	14.3
	3599903	Section 15 Blk X Howard SD	1.9
	3604082	Section 13 Blk XIV Howard SD	210.0
	3604256	Lot 1 DP 14681	125.9
	3616292	Section 9 Blk X Howard SD	300.7
	3628721	PT Section 36 SO 7412	96.0
	3651899	Section 12 Blk X Howard SD	200.6
	3654252	Section 16 Blk X Howard SD	14.8
Kingsland	3617943		2.7
	3625974	Lot 1 DP 350	52.5
	3633362	PT Section 3 SQ 1	5.4
	3636910	Section 4 Blk VII Waimea SD	1.1
	3638879	PT Section 3 SQ 1	14.3
	3638920	PT Section 3 SQ 1	6.0
	3640497		25.9
	3649425	PT Section 3 SQ 1	7.0
	3651335	PT Section 3 SQ 1	7.3
	3657325	PT Section 83 SQ 1	35.8
	3659151	PT Section 83 SQ 1	38.0
Moturoa / Rabbit Island	3608703	Pt Island No 5 Rabbit Waimea East District	131.4
	3617387	Pt Island No 5 Rabbit Waimea East District	12.7
	3618195	Pt Island No 5 Rabbit Waimea East District	3.5
	3625164	Section 1 Section Island No 5 Rabbit Waimea East District	50.3
	3627858	Pt Island No 5 Rabbit Waimea East District	494.9
	3630955	Pt Island No 5 Rabbit Waimea East District	0.3

Forest	Parcel ID	Legal Reference	Area (ha)
	3642781	Island No 3 Rough Waimea East District	89.3
	3644226	Section 1 Section Island No 3 Rough Waimea East District	57.9
	3654712	Pt Island No 5 Rabbit Waimea East District	174.2
	3656767	Pt Island No 5 Rabbit Waimea East District	263.5
	3595552	Pt Island No 5 Rabbit Waimea East District	2.2
	3661609	Pt Island No 5 Rabbit Waimea East District	3.3
Sherry River	3597925	Section 3 Blk II Tadmor SD	132.1
	3601739	Section 46 Blk III Tadmor SD	40.4
	3601802	PT Section 20 Blk III Tadmor SD	12.8
	3605118	PT Section 9 Blk III Tadmor SD	22.6
	3607060	Section 10 Blk III Tadmor SD	19.4
	3607297	Section 19 Blk II Tadmor SD	0.7
	3607365	PT Section 19 Blk III Tadmor SD	16.9
	3607367	PT Section 4 Blk III Tadmor SD	13.2
	3607868	PT Section 121 Blk III Tadmor SD	10.7
	3609046	PT Section 17 Blk III Tadmor SD	20.9
	3610156	PT Lot 2A DP 1951	67.5
	3613208	Section 18 Blk II Tadmor SD	58.3
	3618565	PT Section 99 SQ 5	1.0
	3623997	Section 134 Blk III Tadmor SD	6.1
	3625665	PT Section 12 Blk III Tadmor SD	8.4
	3626785	PT Section 141 SQ 5	11.0
	3629888	Section 17 Blk II Tadmor SD	2.4
	3629484	Section 3 Blk III Tadmor SD	28.1
	3631840	PT Section 140 SQ 5	3.9
	3640659	Section 20 Blk II Tadmor SD	1.0
3657796	Section 14 Blk III Tadmor SD	39.0	
3658002	Section 5 Blk III Tadmor SD	6.6	
3658503	Section 11 Blk III Tadmor SD	40.9	
3659653	PT Section 23 Blk III Tadmor SD	3.1	
Tunnicliff	3630084	PT Section 33 Wai-iti Hills District	68.7
	3637203	PT Section 37 Wai-iti Hills District	61.0
	3673093		10.6

Appendix 2 – Forest Neighbours

Not Publicly Available

Appendix 3 – Neighbour Location Maps

Appendix 4 – Contact details for Regional and District Councils with jurisdiction over Council Estate Forests

Entity	Phone	Email	Website
Tasman District Council	03 543 8400	info@tasman.govt.nz	https://www.tasman.govt.nz/

Appendix 5 – Other Relevant Legislation

Commercially Relevant Statutes & Regulations

- Accident Compensation Act 2001 #49
- Animal Welfare Act 1999
- Biosecurity Act 1993
- Climate Change Response Act 2002
- Conservation Act 1987
- Crown Forest Assets Act 1989
- Fencing Act 1978.
- Fire and Emergency New Zealand Act 2017
- Forestry Rights Registrations Act 1983
- Forests Act 1949
- Forest and Rural Fires Act 1977.
- Forests Amendment Act 1993.
- Freshwater Fisheries Regulations 1983
- Hazardous Substances and New Organisms Act 1996
- Health and Safety at Work Act 2015
- Heritage New Zealand Pouhere Taonga Act 2014
- Noxious Plants Act 1978.
- Pesticides Act 1979.
- Protected Objects Act 1975
- Reserves Act 1977
- Resource Management Act 1991 regulations
- Soil Conservation and Rivers Control Act 1941
- The Treaty of Waitangi Act 1975
- Trespass Act 1980
- Wildlife Act 1953

Relevant regulations to the above legislation also apply as well as various industry Accords, Codes of Practice as listed below:

- New Zealand Forest Accord
- Principles of Commercial Plantation Forest Management
- New Zealand Environmental Forestry Code of Practice
- New Zealand Code of Practice for the Management of Agrichemical
- Climate Change Accord
- NZ Log Transport Safety Accord
- Eliminating Illegal Forest Products in New Zealand
- MoU Federated Farmers and Forest Owners Association and Farm Forestry Association
- New Zealand Forest Road Engineering Manual
- Forest Practice Guides

Appendix 6 – PF Olsen Significant Aspects: Objectives, Targets and Monitoring

PF Olsen Significant Aspects - Objectives, Targets and Monitoring																	
(within the organisational context)																	
Economic			Legal			Social & Cultural			Health & Safety			Environment					
Objectives			Commercial viability Valuable forest asset Sustainable resource supply Sustainable work			Compliance with the letter Compliance with the intent			Retain our Licence to Operate Respect for our stakeholders, & rights of indigenous people Good employer Accountable in the community			Home safe every day Drug and alcohol free work Culture of care Safest forestry company			Protect biodiversity Protect water Minimise erosion Responsible chemical use		
Targets			<ul style="list-style-type: none"> Appropriate R.O.L Maintain and enhance value Log grade outturn value maximised Sustained product flows and employment Appropriate land use 			<ul style="list-style-type: none"> Zero non-compliance <ul style="list-style-type: none"> RMA Heritage New Zealand Act Worksafe Financial Employment Professional & transparent Valid & fair contracts — all staff and contractors Taxes / payment, and royalties paid 			<ul style="list-style-type: none"> External complaints < 3% of incidents Zero unauthorised damage to cultural sites Customer rankings rising Recognition of transparency and respect in dealings with Tangata Whenua Workforce trained and engaged Communication to community Contractor / staff training 			<ul style="list-style-type: none"> Crew visit increase, year on year LTIFR = 3, TIFR = 7 Drug free, D&A testing 100% 100% Safetree sign-up Safe Start-up HPI > 90% close-out by due date 100% inducted 			<ul style="list-style-type: none"> Crew performances > 91—92 % Non Compliance = 0, Marginality <1% Skid check / Post op tail <5% Zero unauthorised damage to cultural / archaeological sites Zero unauthorised damage to key terrestrial ecosystems Rare Fauna BPG's applied Setbacks on all streams Chemical A.I usage Protect enhance key ecosystems (where applicable) Carbon sequestration 100 % inducted 		
Factor			Frequency			Mode			Factor			Frequency			Mode		
R.O.L against investment model			Annual			Woodstock			Regulatory Authority / Worksafe inspections			Monthly			Noggin incidents		
Estate valuation			Annual			Financial			Environmental incidents			Ad hoc			Noggin		
Product flows			Annual			Woodtrack			Consultation: Pre-certification & post-operation			As required			FIPS / Meetings		
Plantation area / species / reserve trends			5 yearly			FIPS report / GIS			Resource consents			Monthly / Annual			FIPS		
Log quality audits			Continually			Noggin			Archaeological Post-Op AEE's			Monthly			Noggin incidents		
Client reporting			Monthly			Written			Enforcement Actions			Ad hoc			Noggin incidents		
Independent accounting audit			Annual			Written			Complaints — meeting minutes			Annual			Form		
Forest growth — PSP's, periodic inventory, ISO-9001			Periodic / Annual			FIPS			Social survey			3 yearly			Form		
Forest health			Periodic / Annual			NFH surveillance program			Staff survey			Annual			Survey Monkey		
TQM — CAR system			Continually			Noggin			NorthTec gap analysis, NZQA & other training			Annual			Cloud database		
ISO internal audits (sample)			Annual			Noggin			1 full day / year environmental advocate training, including cultural awareness			Annual			FIPS training		
									Formal reporting SMT			Quarterly			Power Point		
									Recreational Permits			Annual			FIPS		
									TQM — CAR system			Continually			Noggin		
									ISO internal audits (sample)			Annual			Noggin		
									Safety Incident Management - Statistics & closeout of HPI			Continually			Noggin		
									Sentinel (near miss)			Monthly			Noggin		
									Safety system audits			Rolling Quarters			Noggin		
									D & A testing			Random			External		
									Safetree			Annual			FIPS		
									Safe Start-ups			Actual			FIPS		
									Safety Champs Meetings			Bi-monthly			Written		
									Central Safety Committee			Bi-monthly			Written		
									Formal Reporting			Monthly			Written		
									Regional Branch Compliance			Various			Operational / BOPRC		
									Carbon Sequestration			Tri-Annual			FIPS + written		
									EMG Meeting			5 yearly			Estate model		
									Formal Reporting			Annual			Written		
									Formal Reporting			Annual			Power Point		
									Induction Records			As required + 5 yearly			FIPS		
									TQM — CAR system			Continually			Noggin		
									ISO internal audits (sample)			Annual			Noggin		

TQM & Roving Quality Managers

Executive Management Team

Appendix 7 – Marlborough Regional Pest Management

Pests to be managed under the Marlborough Regional Pest Management Plan

Common Name	Scientific Name	Pest Designation
African Feather Grass	<i>Pennisetum macrourum</i>	Total Control
Bathurst Bur	<i>Xanthium spinosum</i>	Total Control
Boneseed	<i>Chrysanthemoides monilifera</i>	Total Control
Bur Daisy	<i>Calotis lappulacea</i>	Total Control
Cathedral Bells	<i>Cobaea scandens</i>	Total Control
Chinese Pennisetum	<i>Pennisetum alecuroides</i>	Total Control
Climbing Spindleberry	<i>Celastrus orbiculatus</i>	Total Control
Eel Grass	<i>Vallisneria australis</i>	Total Control
Evergreen Buckthorn	<i>Rhamnus alaternus</i>	Total Control
Giant Needlegrass	<i>Stipa rudis</i>	Total Control
Madeira Vine	<i>Anredera cordifolia</i>	Total Control
Moth Plant	<i>Arauja sericifera</i>	Total Control
Parrots Feather	<i>Myriophyllum aquaticum</i>	Total Control
Saffron Thistle	<i>Carthamus lanatus</i>	Total Control
Senegal Tea	<i>Gymnocoronis spilanthoides</i>	Total Control
Spartina Grass	<i>Spartina anglica</i>	Total Control
Broom	<i>Cytisus scoparius</i>	Containment Control
Chilean Needlegrass	<i>Nassella neesiana</i>	Containment Control
Contorta Pine	<i>Pinus contorta</i>	Containment Control
Gorse	<i>Ulex europaeus</i>	Containment Control
Kangaroo Grass	<i>Themeda triandra</i>	Containment Control
Nassella Tussock	<i>Nassella trichotoma</i>	Containment Control
Nodding Thistle	<i>Carduus nutans</i>	Containment Control
Ragwort	<i>Senecio jacobaea</i>	Containment Control
Reed Sweet Grass	<i>Glyceria maxima</i>	Containment Control
White-Edged Nightshade	<i>Solanum marginatum</i>	Containment Control
Blue Morning Glory	<i>Ipomoea indica</i>	Surveillance
Climbing Asparagus	<i>Asparagus scandens</i>	Surveillance
Cotton Thistle	<i>Onopordum acanthium</i>	Surveillance
Egeria	<i>Egeria densa</i>	Surveillance
Kahili Ginger and Yellow Ginger	<i>Hedychium gardineramum and H. Flavescens</i>	Surveillance
Lagarosiphon	<i>Lagarosiphon major</i>	Surveillance
Purple Loosestrife	<i>Lythrum salicaria</i>	Surveillance

Common Name	Scientific Name	Pest Designation
Rooks	<i>Corvus frugilegus</i>	Total Control
Feral Rabbits	<i>Oryctolagus cuniculus</i>	Containment Control
Possums	<i>Trichosurus vulpecula</i>	Containment Control
Darwin Ants	<i>Doleromyrma darwiniana</i>	Surveillance

Appendix 8 – Crop Status

Stand	Year Planted	NSA (ha)	Tot. Stocking (sph)	BA (m ² /ha)	MTH (m)	Mean DBH (cm)	Pruned Stocking (sph)	Pruned Height (m)
BORL – 0001 – 01	1999	15.0	483	9.8	10.5	16.1	483	-
BORL – 0001 – 02	2000	50.6	466	11.1	13.0	17.5	466	-
BORL – 0001 – 03	2001	21.8	492	8.7	12.4	15.2	492	-
BORL – 0001 – 05	1999	12.5	538	16.2	15.7	20.0	538	-
BORL – 0001 – 10	2000	4.5	642	21.1	17.9	20.5	642	-
BORL – 0001 – 11	2005	5.2	525	16.0	13.7	19.7	525	-
BORL – 0001 – 12	1999	5.2	507	12.3	11.0	17.6	507	-
BORL – 0001 – 13	1996	1.2	333	10.6	-	20.1	333	-
BORL – 0001 – 14	1989	0.3	625	78.0	32.1	39.9	625	-
BORL – 0001 – 15	1994	0.8	380	40.6	33.9	36.9	380	-
BORL – 0001 – 16	1997	1.8	333	6.3	-	15.4	333	-
BORL – 0001 – 17	1993	1.0	493	38.8	21.0	31.7	493	-
BORL – 0002 – 02	2001	19.4	535	10.4	12.7	15.8	535	-
BORL – 0002 – 03	2001	31.9	544	11.1	12.5	16.2	544	-
BORL – 0002 – 04	2000	29.4	513	10.8	12.9	16.6	513	-
BORL – 0002 – 05	2000	4.3	722	22.8	17.0	20.1	722	-
BORL – 0002 – 06	2002	8.8	550	11.3	11.8	16.7	517	-
BORL – 0003 – 02	2003	65.3	507	8.9	11.3	15.3	507	-
BORL – 0003 – 03	2002	38.5	533	10.1	12.2	16.4	480	-
BORL – 0004 – 01	2003	29.3	492	11.0	12.2	17.6	453	-
BORL – 0004 – 02	2002	24.5	495	9.0	12.0	15.2	495	-
BORL – 0004 – 03	2002	14.5	467	9.0	11.7	15.7	467	-
BORL – 0005 – 01	1989	13.6	313	41.5	29.6	41.1	313	-
BORL – 0005 – 06	1993	85.0	361	47.9	26.4	41.1	361	-
BORL – 0006 – 02	2003	17.0	517	12.1	11.5	17.9	485	-
BORL – 0006 – 05	1992	46.4	329	40.2	26.4	39.4	329	-
BORL – 0006 – 08	1997	15.2	494	4.1	7.8	10.3	494	-
BORL – 0006 – 09	1998	3.0	456	3.8	7.3	10.3	456	-
HOWD – 0001 – 01	1993	69.0	301	40.3	27.5	41.3	301	-
HOWD – 0001 – 02	1993	6.0	413	24.2	15.9	27.3	413	-
HOWD – 0001 – 03	1997	4.8	221	5.3	10.3	17.6	375	5.7
HOWD – 0002 – 01	1993	3.4	320	34.3	20.0	36.9	320	-
HOWD – 0002 – 04	1994	15.7	302	46.5	28.0	44.3	302	6.8
HOWD – 0002 – 05	1994	7.8	419	28.9	19.2	29.7	419	-
HOWD – 0002 – 08	1995	5.6	550	22.7	13.5	23.5	522	-

HOWD – 0003 – 01	1994	83.5	457	22.6	15.2	25.1	457	-
HOWD – 0004 – 01	1994	27.4	446	19.1	13.8	23.4	446	-
HOWD – 0004 – 03	1998	0.5	467	19.7	11.7	23.2	467	-
HOWD – 0004 – 04	1998	2.7	317	3.6	10.2	18.0	142	5.5
HOWD – 0006 – 01	1995	71.9	365	10.4	-	19.1	365	-
HOWD – 0006 – 02	1995	8.3	444	21.8	15.1	24.9	444	-
HOWD – 0007 – 01	1995	81.9	355	10.3	12.0	19.3	355	6.2
HOWD – 0007 – 02	1995	1.0	367	18.3	12.5	24.8	367	-
HOWD – 0007 – 03	1998	2.8	267	4.3	6.9	13.1	233	2.6
KING – 0001 – 02	1988	4.3	210	46.4	36.3	53.1	210	-
KING – 0001 – 03	1990	29.3	316	53.2	31.0	46.3	316	-
KING – 0001 – 04	1990	5.4	483	42.1	31.1	33.3	483	6.0
KING – 0001 – 05	1994	18.9	316	42.8	26.4	41.5	316	-
KING – 0001 – 06	1994	3.4	338	38.3	21.0	38.0	338	-
KING – 0001 – 08	1998	1.4	463	12.4	12.6	22.2	338	3.3
KING – 0001 – 09	2009	20.2	633	11.6	12.1	15.4	622	-
RABB – 0001 – 05	2003	3.8	944	6.2	11.1	12.7	456	3.2
RABB – 0001 – 06	2009	14.4	817	8.1	13.1	17.8	324	5.8
RABB – 0002 – 01	2004	6.2	371	14.6	13.9	22.4	371	5.9
RABB – 0002 – 05	1992	41.7	467	49.5	31.1	36.7	467	-
RABB – 0002 – 07	2008	16.5	915	9.0	13.7	18.1	348	6.4
RABB – 0002 – 08	2011	24.0	844	5.0	8.4	13.0	379	3.7
RABB – 0003 – 01	1997	8.8	395	8.9	12.4	17.1	395	6.6
RABB – 0003 – 07	1996	2.5	400	34.4	31.9	33.1	400	-
RABB – 0003 – 08	2008	32.4	845	10.2	13.0	18.5	382	6.2
RABB – 0004 – 01	1997	22.4	392	8.8	12.3	16.9	392	6.6
RABB – 0004 – 06	1995	2.1	360	36.4	28.0	35.9	360	-
RABB – 0004 – 07	1998	4.1	396	10.3	15.4	18.3	396	-
RABB – 0005 – 01	2004	28.8	417	13.6	15.0	21.4	379	6.2
RABB – 0005 – 05	1991	4.9	337	45.8	36.1	41.6	337	-
RABB – 0005 – 06	1998	3.4	396	9.5	13.8	17.5	396	-
RABB – 0006 – 01	1995	20.7	366	45.0	32.4	39.5	366	-
RABB – 0006 – 03	2004	13.9	424	13.6	13.7	22.2	355	5.9
RABB – 0006 – 06	1994	23.4	408	46.8	33.4	38.2	408	-
RABB – 0006 – 08	2010	11.2	792	7.5	9.2	16.0	375	4.1
RABB – 0006 – 09	2010	4.8	839	4.3	8.0	11.9	383	3.5
RABB – 0007 – 01	1996	25.9	385	40.6	32.9	36.7	385	-
RABB – 0007 – 02	1996	36.2	379	41.8	31.6	37.5	379	-
RABB – 0007 – 03	1996	15.4	418	39.2	31.0	34.6	418	-

RABB – 0008 – 04	1988	20.2	289	49.2	35.1	46.6	289	-
RABB – 0008 – 05	2005	23.6	665	11.3	14.2	20.4	342	6.1
RABB – 0008 – 06	2010	3.1	658	7.1	11.9	18.1	275	4.5
RABB – 0009 – 02	1992	16.2	424	52.1	37.4	39.6	424	-
RABB – 0009 – 03	1993	25.7	433	33.1	28.8	31.2	433	6.1
RABB – 0010 – 02	1989	22.8	317	51.9	39.8	45.7	317	-
RABB – 0010 – 03	1990	27.0	322	50.3	38.7	44.6	322	-
RABB – 0010 – 04	1991	19.7	364	54.6	35.9	43.7	364	-
RABB – 0010 – 05	2009	8.5	807	9.9	12.2	19.0	350	5.8
RABB – 0011 – 04	1991	32.4	369	51.9	33.1	42.3	369	-
RABB – 0011 – 05	2006	11.2	394	11.5	13.0	20.5	350	6.0
RABB – 0011 – 06	2007	15.2	900	7.9	13.1	16.3	396	6.1
RABB – 0011 – 07	2010	13.4	661	7.8	10.3	16.8	353	4.7
RABB – 0012 – 05	2005	4.9	472	14.3	13.6	22.1	372	6.1
RABB – 0012 – 06	2006	26.9	369	12.7	13.2	21.1	365	6.1
RABB – 0012 – 07	2007	18.4	838	10.1	13.3	18.5	375	6.3
RABB – 0012 – 08	2005	4.0	500	11.5	10.3	17.1	500	-
RABB – 0013 – 01	1994	11.4	317	34.3	26.7	37.1	317	5.7
RABB – 0013 – 02	2002	8.1	437	9.2	12.6	16.4	437	-
RABB – 0013 – 03	2002	4.7	428	10.7	12.9	17.8	428	6.5
RABB – 0013 – 07	2003	0.3	437	9.2	12.6	16.4	437	-
RABB – 0014 – 01	2003	15.2	383	15.1	13.4	22.3	383	5.9
SHER – 0001 – 01	1995	23.8	340	51.3	36.9	43.8	340	-
SHER – 0001 – 02	1995	14.3	452	24.7	15.1	26.4	452	-
SHER – 0001 – 03	1996	2.4	343	7.4	-	16.5	343	-
SHER – 0001 – 05	1998	5.4	-	-	13.8	26.3	-	6.7
SHER – 0001 – 07	2010	6.9	438	7.4	10.9	15.7	450	-
SHER – 0002 – 01	1995	36.3	329	50.5	34.3	44.2	329	-
SHER – 0002 – 02	1995	7.5	317	15.7	14.4	22.2	400	-
SHER – 0002 – 03	1997	1.6	183	3.5	7.9	11.5	183	3.7
SHER – 0002 – 04	1998	1.4	363	10.2	13.4	18.9	363	-
SHER – 0002 – 05	2002	14.9	375	6.7	12.5	15.6	353	-
SHER – 0002 – 06	2003	5.9	489	8.9	11.6	15.2	489	-
SHER – 0003 – 01	1995	69.0	306	48.1	29.1	44.7	306	-
SHER – 0003 – 02	1996	18.6	335	39.0	28.6	38.5	335	-
SHER – 0003 – 03	1997	3.6	375	8.9	-	17.4	375	-
SHER – 0003 – 04	1998	1.4	-	-	13.7	21.8	-	6.8
SHER – 0004 – 01	1996	66.3	312	47.5	29.3	44.0	312	-
SHER – 0004 – 02	1997	9.6	369	9.5	12.7	18.2	369	6.9

SHER – 0005 – 01	1996	27.7	321	49.1	30.1	44.1	321	-
SHER – 0005 – 02	1998	0.5	200	9.2	8.7	16.6	200	4.2
SHER – 0005 – 03	1997	23.2	356	9.3	12.1	18.2	356	6.8
SHER – 0006 – 01	2010	35.0	447	3.7	7.6	10.2	447	-
TUNN – 0001 – 01	1998	15.0	388	9.9	11.7	18.0	388	6.5
TUNN – 0001 – 02	1998	19.4	406	10.4	13.9	18.1	406	7.0
TUNN – 0001 – 03	1998	22.8	400	9.0	13.2	17.0	400	6.8
TUNN – 0001 – 05	1998	7.5	423	9.2	11.6	16.6	423	-
TUNN – 0001 – 06	1999	3.8	550	14.9	14.8	24.6	317	6.1
TUNN – 0001 – 07	1996	10.7	412	45.3	30.3	37.4	412	-
TUNN – 0001 – 08	1997	5.1	420	9.9	12.0	17.3	420	6.8
TUNN – 0001 – 09	1997	3.5	354	9.6	11.5	18.5	354	-