Tasman Bay Village

Ecological Effects Assessment

Report prepared for

Tasman Bay Estates Ltd

Prepared by

RMA Ecology Ltd

Report number and date

Job 2129

April 2024

BETTER ECOLOGICAL OUTCOMES

PREPARED FOR:

Tasman Bay Estates Ltd

6 Brooks View Heights

RD1, Upper Moutere

Tasman

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RMA ECOLOGY LTD

BETTER ECOLOGICAL OUTCOMES

Contents

1.0 Introduction

Tasman Bay Estates Ltd (TBEL) is undertaking a staged development of several adjoining properties at Tasman Village, Tasman. The development consists of 58 lots with associated infrastructure including roading, wastewater dispersal, and stormwater management across c. 41.5 ha (**Figure 1**), hereafter referred to as "the site".

TBEL has engaged RMA Ecology Ltd to undertake an ecological effects assessment of the proposed development[1]. A desktop assessment and field survey were used to gather data for the ecological effects assessment. This report contains:

- A description of the ecological values of the site and the significance of these values;
- A description of the proposed development and the potential effects of these activities on ecological values; and
- Recommendations for the management of potential adverse effects arising from the development.

[1] Offer of service dated 26 March 2021 with a variation dated 5 October 2022.

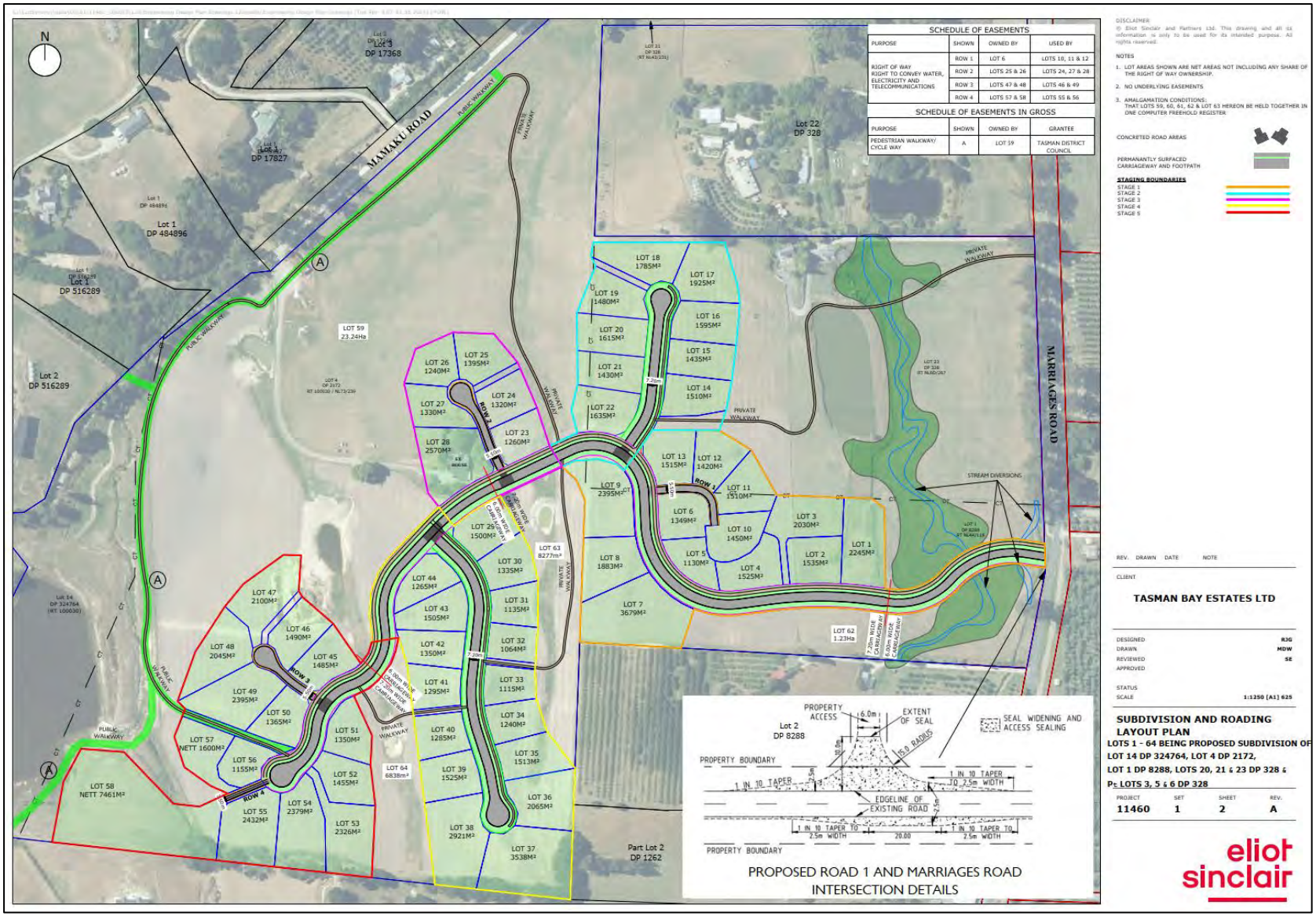

Figure 1. Subdivision and roading layout plan. Source: Eliot Sinclair.

2.0 Methods

A desktop assessment and field survey were used to determine the ecological values of terrestrial and aquatic values within and surrounding the site, as well as the significance of those values. This section of the report describes the methods used for the assessment.

2.1 Desktop assessment

A desktop assessment of the site was undertaken to identify ecological features. The following documents and databases were reviewed:

- New Zealand Freshwater Fish Database (FFDB);
- National Amphibian and Reptile Database System (Herpetofauna);
- DOC bat database;
- Land Environments of New Zealand (LENZ);
- Threatened Environment Classification (TEC);
- Bird Atlas of New Zealand; and
- Tasman Resource Management Plan (TRMP).

Aerial imagery (including Google Earth, Top of the South Maps, and Retrolens) was reviewed to identify existing vegetation, streams and overland flow paths present on the site and to establish an understanding of the ecological status of the watercourses present. Maps of these existing features were then ground-truthed.

Areas classified as Significant Native Habitats (SNH) by Tasman District Council (TDC) were also identified where that information was available. Areas with ecological values that were not listed as ecologically significant were assessed against the significance criteria developed by TDC.

Any native flora or fauna species found were recorded and their threat status checked against the New Zealand Threat Classification System[2] and relevant lists:

- Birds (Hugh *et al.,* 2021);
- Reptiles (Hitchmough *et al.,* 2021);
- Freshwater fish (Dunn *et al.,* 2017);
- Vascular plants (de Lange *et al.,* 2017); and
- Bats (O'Donnell *et al.,* 2022).

2.2 Field survey

Field surveys were carried out by RMA Ecology Ltd on 12 August 2021 and 11 October 2022 in order to ground-truth desktop-based assessments, and to identify ecological features which are either not

[2] https://nztcs.org.nz/

detectable remotely, or which require on-site assessment for accurate identification and classification.

2.2.1 Wetlands

The site was assessed for wetlands based on the definition in the TRMP and the Resource Management Act 1991 (RMA). All wetlands that are dominated by indigenous vegetation are considered to be critically threatened environments where protection should be prioritised.

The site was also assessed for wetlands based on the definition within the RMA and the National Policy Statement for Freshwater Management (NPS-FM) (updated January 2023). We understand that the National Environmental Standards for Freshwater (NES-F) and NPS-FM require Councils to ensure that the loss of extent of 'natural inland wetlands' is avoided, with few exceptions. The NPS-FM and NES-F also require a restriction on activities within a 10 m buffer around those wetlands, and controls on the level of potential adverse effects (from, for example, discharge of water or diversion of water) within a 100 m buffer around the wetland.

The methodology applied for the assessment of wetlands at this site was as follows:

- Visual assessment of areas where the vegetation composition includes species which are scored as wetland obligate, facultative wetland, or facultative (e.g., rushes, wet pasture or 'wetland-type' vegetation);
- Where these compositions exist, an assessment of vegetation, soils, and hydrology is required:
    - Vegetation is assessed through plant identification and percentage cover estimates (as per the NPS-FM Clarkson delineation protocol[3]) of 2 m x 2 m plot areas within each potential wetland area;
    - Soils are assessed by applying the criteria outlined in Fraser (2018)[4] for identifying hydric (wetland) soils – which involves excavation and examination for gleyed, mottled or wet soils;
    - Hydrology is assessed by applying the criteria outlined in the Ministry for the Environment tool[5].
- A wetland can be classified based on the definition within the TRMP and the RMA, but not be classified as a 'natural wetland' under the NPS-FM because the definition of the latter includes some exclusions. For example, the percentage cover of pasture species and the current and historic land use have a bearing on the classification of a wetland.
- The boundaries of potential wetland areas are delineated by carrying out assessments of the various vegetation communities and through professional judgement.

[3] Ministry for the Environment. 2020. Wetland delineation protocols. Wellington: Ministry for the Environment.

[4] Fraser S, Singleton P, Clarkson B 2018. Hydric soils – field identification guide. Envirolink Tools Contract C09X1702. Manaaki Whenua – Landcare Research Contract Report LC3233 for Tasman District Council.

[5] Ministry for the Environment. 2021. Wetland delineation hydrology tool for Aotearoa New Zealand. Wellington: Ministry for the Environment.

2.2.1 Watercourses

Watercourses at the site were assessed according to the definitions in the TRMP:

> *"River – means a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).*
>
> *Modified watercourse - means a river or stream that may have been subject to works or modifications for a variety of purposes and is or has one or more of the following features:*
>
> *(a) part of a river, stream or creek that has been channelled or diverted;*
> *(b) part of a wetland or swamp through which water has been channelled or diverted to flow either permanently or intermittently and which connects with other naturally occurring bodies of water;*
> *(c) a watercourse that has a natural headwater of either a channel or spring and generally follows the path of a historic river or stream or defined drainage channel that functions naturally by providing a connection between surface water and groundwater, and is capable of providing habitat for flora and fauna.*
>
> *Artificial watercourse - means a constructed watercourse that contains no natural portion from its confluence with a river or stream to its headwaters and includes any:*
>
> *(a) irrigation canal;*
> *(b) water supply race;*
> *(c) canal for the supply of water for electricity power generation;*
> *(d) roadside drain (or water table or culvert) that is constructed alongside or under roads used by vehicles and has as its primary function the drainage of surface water from the road;*
> *(e) farm drainage canal."*

Photographs and a general description of the watercourse were recorded to note characteristics including riparian species and cover, connectivity to other watercourses, average stream width, and potential barriers to stream functioning.

2.2.2 Vegetation

Vegetation at the site was mapped according to vegetation type. Each vegetation type was described and a species list was compiled. Vegetation was assessed against the significance criteria of the TRMP and the significance criteria included in the National Policy Statement for Indigenous Biodiversity 2023 (NPS-IB).

2.2.3 Fauna

A visual assessment of habitat quality for indigenous fauna (birds, bats, lizards, fish) was undertaken at the site. For lizards, debris (e.g., logs, anthropogenic debris) was inspected. However, this did not constitute a comprehensive survey using a range of methods (e.g., the use of artificial cover objects, pitfall traps, etc.). For birds, the various habitats onsite were visited and any observed or otherwise detected species were recorded.

3.0 Site overview

3.1 Ecological context

The site is located within the Moutere Ecological District and would have been originally completely forested. The Ecological District is characterised by rolling hill country with deeply weathered Moutere Gravel overlying lignite and clay which in pre-human times supported beech forest. Black beech (*Fuscospora solandri*) would have been dominant at the seaward end of the District where the site is located[6]. Lowland beech forest originally comprised 65 % of the Moutere Ecological District, but 95 % of this has now been cleared[7].

The site has been heavily modified from its pre-human condition. All original vegetation has been removed through logging and farming activities. The current land use of the site and surrounding areas is agriculture and horticulture (**Figure 2**).

There are no Significant Native Habitats (SNH) within the Stage 1 area. There is one SNH directly abutting the southern boundary of the site.

3.2 Site description

The c. 41.5 ha site is 1-2 km from the coast and within the catchment of the Moutere Inlet. It has flat to rolling topography (20-65 m above sea level) with a northerly aspect. The original vegetation was probably completely cleared in the 1800s for timber and to convert the land to agriculture.

Most of the site was used as an orchard since at least the 1940s. During this period of horticultural intensification, aquatic features were modified and created: three ponds were constructed, streams were channelised, and artificial channels were created for drainage. The orchards have since been removed.

The site is typical of the wider modified landscape and is surrounded by orchards, pastoral farmland and lifestyle properties. It is bordered by Marriages Road along the east and Mamaku Road along the north-west boundaries. Although the original natural ecology of the site and adjacent areas have been heavily modified or removed, the general area still contains some ecological values.

[6] McEwen, W. M. (Ed.) (1987). Ecological regions and districts of New Zealand (Third Revised Edition). New Zealand Biological Resources Centre, Department of Conservation, Wellington.

[7] Walls, G. and Simpson, P (2004). Tasman District Biodiversity Overview – Review of Indigenous Ecosystems on Private Land and Opportunities for Protection. Tasman District Council, Richmond.

Figure 2. Aerial image of the site (pink border) showing the lack of woody vegetation, and dominance of pasture.

4.0 Ecological values

4.1 Terrestrial values

4.1.1 Vegetation

Vegetation was assessed using aerial imagery and during the site surveys. The site is largely devoid of woody vegetation as a result of vegetation clearance and subsequent agricultural land use. Pasture is the dominant vegetation type, although during the most recent site survey, most of the site was bare earth (**Plate 1**). There are discrete areas that are rank ungrazed grass.

There are some areas of woody vegetation in the form of hedgerows. These are typically comprised of gum tree (*Eucalyptus* sp.), willow (*Salix* sp.), poplar (*Populus* sp.) or coastal banksia (*Banksia integrifolia*) (**Plate 2**). These hedgerows usually have no woody understory but occasionally includes self-seeded exotic hawthorn (*Crataegus monogyna*) and gorse (*Ulex europaeus*) and native karamū (*Coprosma robusta*).

Localised wetlands are dominated by exotic soft rush (*Juncus effusus*) and native rushes including fan-flowered rush (*Juncus sarophorus*), grass-leaved rush (*Juncus planifolius*), and wiwi (*Juncus edgariae*). The largest stand of juncus-dominated wetland is at the south-western corner of the site surrounding a constructed pond and abutting the SNH on the adjoining property (**Plate 3**).

The vegetation and habitats onsite were assessed for significance using the TDC and NPS-IB criteria – no vegetation or habitats at the site meet either of the criteria to be deemed significant.

The conservation status of native plant species at the site was reviewed – no species at the site are At Risk or Threatened.

4.1.2 Lizards

Favourable lizard habitat (e.g., decomposing woody material, farm debris) was inspected during the site surveys. No lizards were detected at the site, however, two native northern grass skinks (*Oligosoma polychroma*; Not Threatened) were detected at a pump shed near a bunded pond c. 900 m north of the site (**Plate 4**). This species may be found in a wide range of habitats which at this site includes rank grass, low weedland (e.g., blackberry), and farm debris (e.g., corrugated iron).

The DOC herpetofauna database was reviewed. Within 10 km of the site there are records for one additional lizard species: Raukawa gecko (*Woodworthia maculata*; Not Threatened). This species inhabits coastlines and native forest and so is extremely unlikely to be present at the site.

4.1.3 Bats

The site was assessed for bat habitat – no suitable bat habitat exists at the site. The DOC bat database was reviewed for records in the area surrounding the site – there are no bat records within 25 km of the site. Therefore, bats are extremely unlikely to use the site, even in a transitory manner.

4.1.4 Birds

A total of seventeen bird species (ten native; seven exotic) were recorded at the site during the site surveys (**Table 1**). The native species are common in rural areas and are neither rare nor threatened. The absence of woody vegetation across almost all of the site means that breeding habitat for arboreal species is limited, though the dense wetland vegetation alongside the pond in the south-west corner of the site offers some breeding habitat for waterfowl (**Plate 3**).

Table 1. List of birds recorded at the site during the site surveys.

Species	Common name	Conservation status
Anas platyrhynchos	Mallard	Introduced and Naturalised
Anser anser var. domesticus	Domestic greylag goose	Introduced and Naturalised
Aythya novaeseelandiae	New Zealand scaup	Not Threatened
Circus approximans	Kahu / swamp harrier	Not Threatened
Chloris chloris	European greenfinch	Introduced and Naturalised
Cygnus atratus	Black swan	Not Threatened
Gallirallus australis	Weka	Not Threatened
Himantopus himantopus	Pied stilt	Not Threatened
Hirundo neoxena	Welcome swallow	Not Threatened
Passer domesticus	House sparrow	Introduced and Naturalised
Porphyrio melanotus	Pūkeko	Not Threatened
Prosthemadera novaeseelandiae	Tūī	Not Threatened
Rhipidura fuliginosa	Pīwakawaka / fantail	Not Threatened
Sturnus vulgaris	Common starling	Introduced and Naturalised
Tadorna variegata	Paradise shelduck	Not Threatened
Turdus merula	Blackbird	Introduced and Naturalised
Turdus philomelos	Song thrush	Introduced and Naturalised

Plate 1. Most of the site was bare earth during the site survey on 11 October 2022.

Plate 2. Hedgerow of coastal banksia alongside an artificial watercourse.

Plate 3. Wetland vegetation alongside the south-western pond that developed following a drop in pond water level. This area offers habitat for waterfowl.

Plate 4. Pump shed where two northern grass skinks were detected.

4.2 Aquatic values

4.2.1 Wetlands

The wetland delineation protocols were applied at the site in order to identify and map wetlands. The ecological context, anthropogenic influence and historic aerial imagery were reviewed in order to provide a commentary on the likely provenance, history and state of these wetlands.

Eight wetlands totalling c. 3,050 m^2 were delineated at the site and are all located within 100 m of the south-western pond (**Figure 3**). This pond was created in the 1970s and in earlier images, there is no evidence of wetlands at this site. It is likely that the original top soil was removed and the pond area scrapped down to the underlying clay. Following pond creation, and until 2017, the pond level was higher than its current level and encompassed almost all of the current wetland extent around the pond. From 2017 until 2020, various earthworks were undertaken which resulted in the lowering of the pond level and exposed the up-stream portion of the pond. This area has developed hydric soil and the exposed ground has been colonised by wetland vegetation including exotic soft rush and native rushes including fan-flowered rush, grass-leaved rush, and wiwi (**Plate 3**). These wetlands are considered wetlands under the RMA but are excluded as natural inland wetlands under the NPS-FM as they have "developed in or around a deliberately constructed water body, since the construction of the water body".

Additional areas of wet-adapted species were observed in area that has been recently earth worked. We contend that these areas do not support a 'natural' ecosystem as the wet-adapted plant species have emerged as a result of mechanical intervention to remove a previously existing orchard in this area. The operation to remove the orchard clearly created small hollows within a clay substrate which were then able to collect water and then support wet-adapted species. Historic aerial imagery provides no firm evidence that these wetlands previously existed prior to the removal of the orchard or prior to the orchard being planted. Therefore, these five areas are excluded as wetlands under the RMA and the NPS-FM.

4.2.2 Watercourses

The watercourses at the site were mapped and classified according to the three types of watercourses defined in the Tasman Resource Management Plan (**Figure 3**):

- River/stream;
- Modified watercourse; and
- Artificial watercourse (which includes farm drainage canals).

The type and arrangement of watercourses at the site reflects the history of agricultural land management where most watercourses have been modified or created to support agricultural practices. Despite this, some watercourses retain moderate ecological value because of their habitat heterogeneity and moderate shading. Watercourses at the site generally flow from south to north and include:

- 1 stream reach of 168 m (labelled R1 in **Figure 3**; **Plate 5**):

    - This permanent stream is meandering and cobble-bottomed with a riffle-run sequence. It has retained good habitat and hydrological heterogeneity but it lacks woody riparian vegetation and shading and has been incised from its floodplain. This stream likely supports multiple native fish species.

- 6 modified watercourses totalling 1,526 m:
    - These permanent watercourses have been straightened and have therefore lost their habitat and hydrological heterogeneity. Some reaches are soft-bottomed while others are cobble-bottomed. They would have originally been meandering streams or areas of wetlands that have been drained. These watercourses likely support multiple native fish species.
- 9 artificial watercourses totalling 955 m (**Plate 2**):
    - These watercourses have been created to assist drainage at the site to facilitate productive agriculture. They are a combination of permanent and intermittent and have limited ecological value except for their ability to support shortfin eels.

4.2.3 Ponds

There are seven artificially constructed ponds at the site. Three were constructed in the 1970s-80s, and four were constructed in the last 2 years. These ponds are likely to support shortfin eels and some foraging habitat for waterfowl (**Plate 3**).

4.2.4 Fish

The New Zealand Freshwater Fish Database was reviewed. Between 2000 and 2014, fish surveys undertaken at or directly adjoining the site found four species of native fish:

- Shortfin eel (*Anguilla australis*; Not Threatened)
- Longfin eel (*Anguilla dieffenbachii*; At Risk – Declining)
- Banded kokopu (*Galaxias fasciatus*; Not Threatened)
- Inanga (*Galaxias maculatus*; At Risk – Declining)

Other surveys undertaken nearby within the same catchment found an additional two species of native fish:

- Giant kokopu (*Galaxias argenteus*; At Risk – Declining)
- Common bully (*Gobiomorphus cotidianus*; Not Threatened)

Some reaches of stream and modified watercourse offer good fish habitat with undercut banks, variable substrate and moderate shading, though most reaches are straightened and incised with poor connectivity to the flood plain. The seven ponds offer good habitat for shortfin eels.

Plate 5. Stream R1.

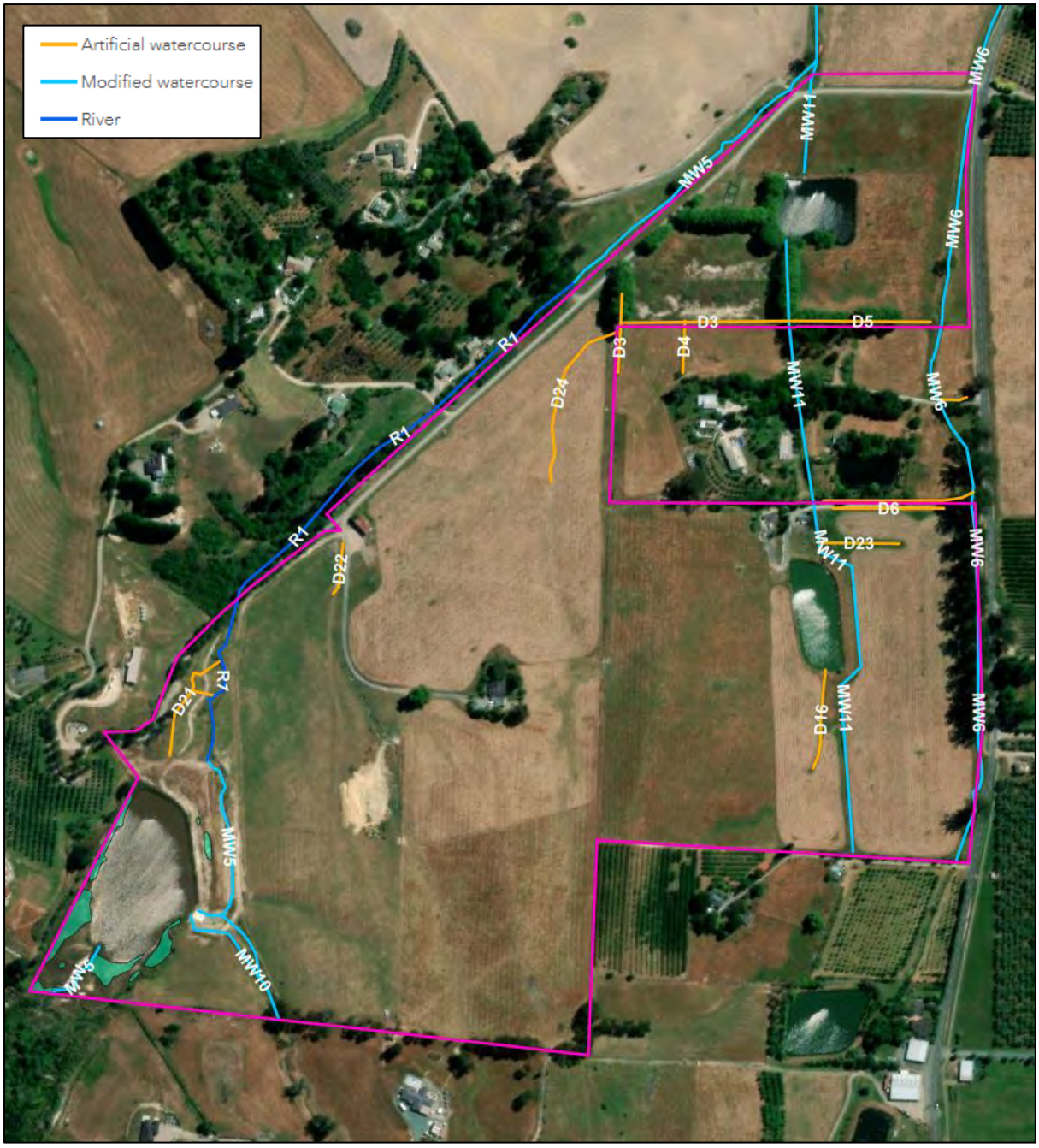

Figure 3. Watercourses at the site.

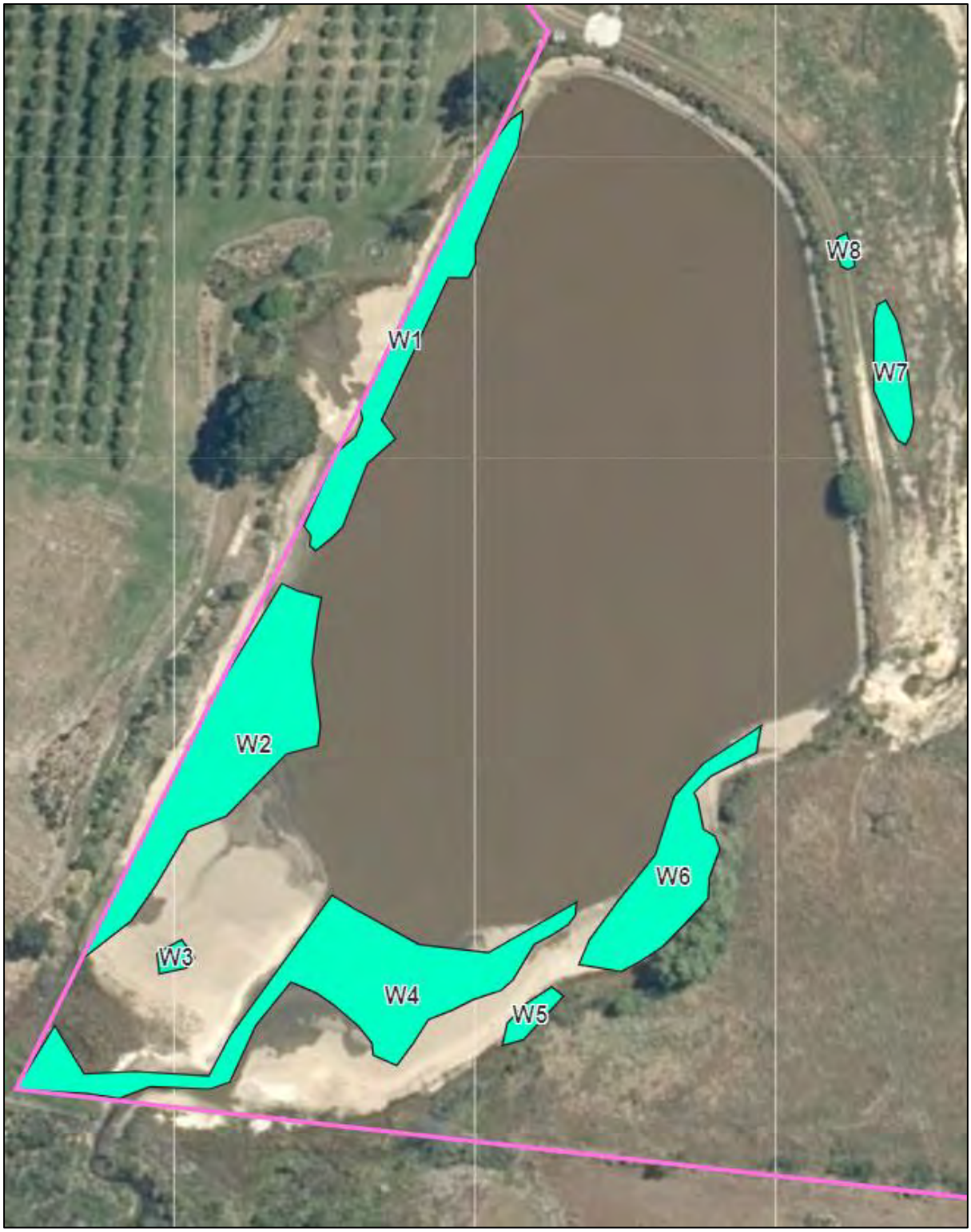

Figure 4. Wetlands (cyan) around the south-western pond that have formed as part of the historic construction of this waterbody. While these are wetlands under the RMA definition of 'wetland', they are not natural inland wetlands as defined by the NPS-FM as they are associated with an artificial waterbody.

4.3 Summary of ecological values

The site survey and desktop assessment identified the following ecological values:

- The original native vegetation has been completely removed and the site is now predominantly pasture/ bare earth, with some planted hedgerow of exotic trees;
- There are no SNH / SNA at the site that have been identified by TDC. No vegetation or habitat meets the definition of a SNH / SNA using the criteria developed by TDC or the criteria included in the NPS-IB. No native plant species at the site are listed as At Risk or Threatened;
- Native Not Threatened northern grass skinks are likely to be present at the site in areas of rank grass, low weedland (e.g., blackberry), and farm debris (e.g., corrugated iron);
- Bats do not use the site, even in a transitory manner;
- Seventeen bird species (ten native; seven exotic) were recorded at the site during the site surveys. The native species are common in rural areas and are not listed as At Risk or Threatened;
- There are eight wetlands as defined in the RMA totalling c. 3,050 m^2; there are no natural inland wetlands as defined under the NPS-FM on the site.
- There are watercourses at the site as follows:
    - 1 stream totalling 168 m;
    - 6 modified watercourses totalling 1,526 m; and
    - 9 artificial watercourses totalling 955 m.
- There are seven constructed ponds; and
- There are likely to be six species of native fish present at the site – three of which are Not Threatened, and three of which are At Risk – Declining.

5.0 Overview of the proposed development

The proposed works at the site includes the clearance of vegetation (predominantly exotic pasture), earthworks, diversions of modified watercourses (streams), culvert construction, the creation of wastewater dispersal fields and revegetation activities, which will allow the site to be developed into a 58-lot residential subdivision.

The design process was iterative and involved ecology, planning and engineering inputs. This resulted in effective avoidance, minimization and mitigation of ecological effects early and throughout the design process.

The proposed works at the site include:

- **Vegetation clearance:** Almost all of the vegetation clearance at the site will be of cultivated and grazed exotic pasture. There are a few discrete areas of rank grass, exotic trees, and exotic weedy vegetation totalling less than 500 m^2 that will also be cleared. The extent of vegetation clearance aligns with the earthworks extent (**Figure 5**);
- **Contouring earthworks:** Earthworks will be undertaken in order to achieve the desired surface for the development (**Figure 5**). Streams, wetlands, and a 10 m buffer to these will be avoided, except where stream diversions and culvert installations are proposed. The earthworks will include the construction of a network of grassed swales to convey stormwater across the site.
- **Stream diversions:** The development will require the diversion of modified watercourses in two locations (**Figure 5**) in order to:
    1. Facilitate infrastructure associated with the entry road off Marriages Road;
    2. Facilitate the creation of a building platform in one lot (Lot 1) and facilitate the reformation of the northern pond batter.
- **Culvert construction:** Streams will be culverted in three locations for road/driveway access;
- **Drain removal:** Two drains totalling 261 m will be removed;
- **Wastewater dispersal fields:** Wastewater will be treated and then discharged to 3.32 ha of wastewater dispersal fields; and
- **Revegetation activities:** Extensive native planting will be undertaken across the site including riparian margins of streams on average between 7 and 10 m in width on each side, pond edges, and other ‘biodiversity islands’ totalling c. 6.3 ha.

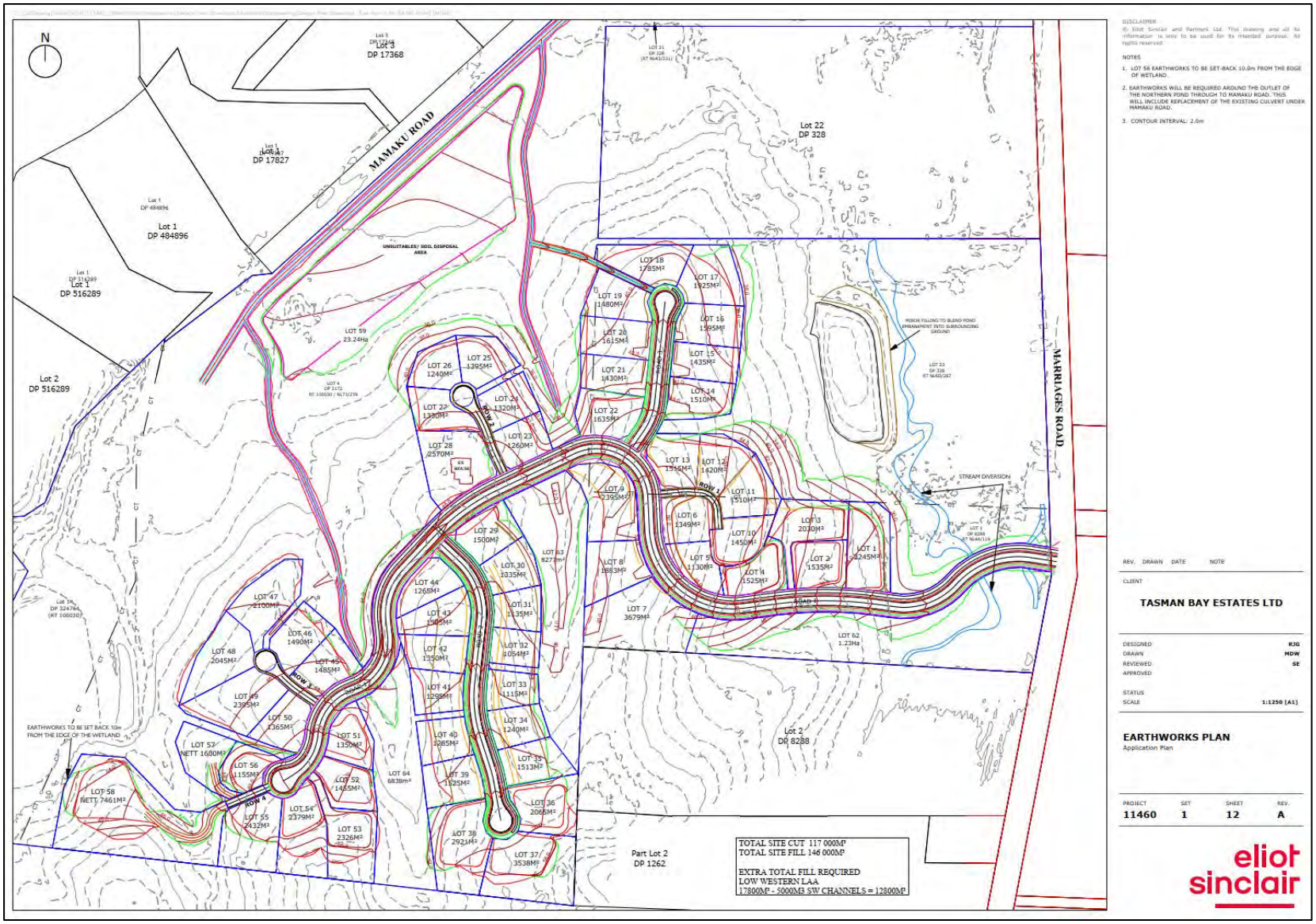

Figure 5. Earthworks extent. Source: Eliot Sinclair. Note that no earthworks will be undertaken within 10 m of the wetland located in Lot 58 (far western Lot).

6.0 Ecological effects management

Potential ecological effects were identified early in the design process. The mitigation hierarchy was actively applied during design iterations and the results are outlined in **Table 2**.

Table 2. List of potential adverse ecological effects initially identified at the commencement of the engineering design process, and the final designs to avoid, minimise, or remedy the impacts.

Potential ecological effects initially identified	Description	Mitigation hierarchy	Final design that incorporates management of ecological effects
Loss of native bird habitat	Native birds at the site are most abundant at the south-western pond and surrounding area. Some native birds utilise the exotic hedgerows or the exotic pasture at low density that is proposed for development.	Avoid Mitigate	The most important native bird habitat at the site (the south-western pond) is being retained. The amount of exotic woody vegetation to be cleared totals less than 500 m^2. Native revegetation planting will be undertaken across c. 6.3 ha which will result in significantly more and higher quality native bird habitat than what currently exists.
Loss of native birds	Mortality of Not Threatened native birds (chicks in nests) could occur without appropriate controls during exotic tree clearance.	Avoid	Tree felling will be undertaken outside of the core native bird breeding season (October-February). If this is not possible, then an assessment of trees to confirm no nests will be undertaken by an ecologist prior to tree felling. If nests of native birds are found, then the host tree and a 10 m buffer will be left unmodified until an ecologist has confirmed that the nest is unoccupied.
Loss of lizard habitat	Most of the site is cultivated and grazed exotic pasture unsuitable for lizards. Not Threatened northern grass skink are possibly found in discrete areas of rank grass and weedland that is found at the site, including within the earthwork footprint.	Avoid Mitigate	Very small areas (totalling less than 500 m^2) of habitat for Not Threatened northern grass skink (mostly rank exotic grass) will be lost. The edges of revegetated areas will be suitable habitat for this species once established.

Loss of native lizards	Most of the site is cultivated and grazed exotic pasture unsuitable for lizards. Not Threatened northern grass skink are possibly found in discrete areas of rank grass and weedland that is found at the site, including within the earthwork footprint.	Mitigate	Removal of potential native lizard habitat at the site will be undertaken under the supervision of a qualified herpetologist who holds a current Wildlife Act authority from the Department of Conservation.
Loss of native fish habitat (including fish passage)	Fish are likely to inhabit streams, ponds and drains across the site including those that are proposed to be removed, modified, or diverted.	Avoid Mitigate	Loss of stream extent will be avoided. Ponds will be retained and will not be fully dewatered during any part of the development. Fish passage will be accommodated through the three proposed culverts in accordance with Section 70(2) of the National Environmental Standards for Freshwater (NES-F). Two sections of drain totalling approximately 261 m are proposed for removal. One of the drains (D24; 168 m) is a recent construction (< 2 years) and has low laminar flows, is within an unvegetated paddock, and has a low likelihood of supporting shortfin eels. The other drain (D16; 93 m) is a more permanent feature with a higher flow that is more likely to support shortfin eels. The loss of fish habitat will be mitigated by an increase of stream extent (c. 78 m) through the diversion of streams in two locations, and the planting of riparian margins which will improve habitat, food resources, and shading while reducing bankside erosion and sedimentation and stock access.
Loss of native fish	Fish are likely to inhabit streams, ponds and drains across the site including those that are proposed to be removed, modified, or diverted.	Avoid	A fish salvage will be undertaken immediately prior to works to modify, divert, or infill a stream, pond, or drain. The details of these activities will be provided in a fish salvage plan prepared by an ecologist.
Sediment discharge into streams	Earthworks could result in sediment discharge to water without controls in place.	Minimise Remedy	Proposed sediment controls will generally comply with Council's Erosion and Sediment Control Guidelines (2019).

			Sediment will be managed through the use of new and existing ponds at the site. Earthworks will be staged to minimise the amount of worked surface at any one time.
Loss of stream length or value	Stream diversions and culverting are proposed.	Remedy Mitigate	Stream length will be maintained or increased where modified watercourses are diverted. Stream value will be improved along the entire extent of streams at the site on average between 7 and 10 m on each site. Stream value will be improved primarily through native restoration of riparian margins to 10 m on each side where possible. This will improve habitat, food resources, and shading while reducing bankside erosion and sedimentation and stock access.
Dewatering of streams and wetlands	Wetland and stream catchment alterations and changes to flow regimes / earthworks within 100 m of these features, including new stormwater swales that capture water.	Avoid	Streams will not be partially or completely dewatered during or following the development. Post-development, flow volumes will not be reduced. Earthworks within the catchment of a wetland are proposed at Lot 58. This wetland has formed following the creation of the adjoining pond and so is very likely to be hydrologically associated to the pond. Therefore, earthworks within the catchment of the wetland are very unlikely to dewater the wetland.
Discharge of contaminants into streams or wetlands	The completed subdivision will produce stormwater and wastewater. Contaminants could be discharged into streams or wetlands.	Avoid	Stormwater will be treated along the proposed grassed swales prior to discharge into existing streams. Wastewater will be treated and then discharged to dispersal fields. These will be setback by 20 m from streams and 10 m from the proposed stormwater swales. Disposal rates will be appropriate for the slope and soil type in order to avoid discharge to streams or wetlands.
Loss of stream shading	Some exotic trees that provide shading to streams will be removed.	Avoid Remedy	Two reaches of stream at the site are shaded by exotic woody vegetation: a

	215 m reach along MW6, and a 70 m reach along MW11. The woody vegetation (excluding weeds) along the 215 m reach of MW6 will be retained. The woody vegetation along the 70 m reach of MW11 will be removed. In both of these locations, native planting will be undertaken to remedy or enhance stream shading. Additionally, all other streams at the site will have their riparian margins planted to improve stream shading. This will result in an overall increase in stream shading at the site.

Potential ecological effects which cannot be avoided are:

- **Loss of native bird habitat:** Native birds that use exotic trees and exotic pasture will have their habitat affected. The amount of exotic woody vegetation to be cleared totals less than 500 m^2. The native birds that use these areas are not Threatened or At Risk and are common in a local, regional and national context. The removal of this vegetation is considered to have a negligible effect on their habitat overall. Native revegetation is proposed over c. 6.3 ha to mitigate this loss. We consider that this revegetation will more than mitigate the effects of any lost habitat, resulting in a net-gain. A native revegetation plan will be prepared by an ecologist.
- **Loss of lizard habitat:** Lizard habitat in the form of rank grass and weedland covering less than 500 m^2 will be removed. The only native lizard that is considered likely to be present at the site is the Not Threatened northern grass skink that is common in a local, regional and national context. The edges of revegetated areas will be suitable habitat for this species once established.
- **Loss of native fish habitat (including fish passage):** Three culverts will be installed and fish passage will be maintained through each. The culverts will provide for the same passage of fish upstream and downstream as would exist without the culvert. They will be at least 1.3 x the channel width, be embedded by 25 %, and the bed substrate will be present over the full length of the culvert. The culverts will be laid parallel to the slope of the existing stream and water velocity in the culvert will be no greater than that in immediately adjoining reaches.

  Modified watercourses that are being diverted will be restored in a manner that ensures at least as much fish habitat. This will be achieved by creating a natural sequence of run-riffle-pool, ensuring the same bed substrate as immediately adjoining reaches, inserting woody debris into stream banks, and planting the riparian margin on either side of the stream. In each instance, the total length of stream will increase. Detailed design of these diversions with ecologist input will be provided to Council for approval prior to undertaking works.

Native fish that may be present at the site include the At Risk longfin eel which is possibly present in the 261 m of artificial watercourses (drains) that are proposed to be removed. The extent of lost habitat is considered to be low in a local and regional context.

- **Sediment discharge into streams:** Sediment will be managed through the use of new grassed swales and new and existing ponds at the site. We assume that the risk of sediment loss to streams having an adverse effect is low given that sediment controls will generally comply with Council's Erosion and Sediment Control Guidelines (2019), that all streamworks and culvert installations will be constructed offline or while temporary stream diversions are in place, that sediment management devices will be installed downstream from all earthworks areas, and that earthworks will be staged to minimise the area of open ground at any one time.

- **Loss of stream length or value:** The two modified watercourse diversions will result in maintained or longer extent in each instance, i.e., no loss of stream extent. The diversion of MW6 will alter the length from 84.3 m to 85 m (with the final detailed design ensuring that the diverted reach is at least 84.3 m). The diversion of MW11 will alter the length from 359.3 m to 436.3 m (with the final detailed design ensuring that the diverted reach is at least 10 % longer than the existing reach, i.e., 395.3 m) (**Figure 6**).

  Ecological value will be improved by ensuring a natural sequence of run-riffle-pool, the same bed substrate as immediately adjoining reaches, and planting the riparian margin on 10 m either side of streams throughout the site.

  This will result in an overall increase to stream extent and an overall improvement to stream value at the site.

- **Dewatering of streams and wetlands:** Most of the streams and wetlands at the site have negligible or no change to their catchment such that they risk being dewatered.

  The catchment of Stream R1 (north-western one across boundary; see **Figure 3**) will be subject to an altered catchment due to the creation of a newly created channel (swale). We have been provided confirmation by the engineers (CGW) that "this should not affect the stream north of the exiting road."

  Earthworks within the catchment of a wetland are proposed at Lot 58. This wetland has formed following the creation of the adjoining pond and so is very likely to be hydrologically associated to the pond. Therefore, earthworks within the catchment of the wetland are very unlikely to dewater the wetland.

- **Loss of stream shading:** Loss of stream shading from the removal of predominantly exotic vegetation will affect approximately 70 m of streams at the site. It is intended that a riparian margin on each side of streams at the site will be planted in native vegetation on average between 7 and 10 m wide on each side, thereby improving stream shading at the site substantially in the medium-long term. In some instances (such as the position of a road within the riparian margin) the planted riparian margin will be less). We consider that this revegetation will more than mitigate the effects of any lost stream shading, resulting in a net-gain.

These potential ecological effects are assessed using the EIANZ effects matrix analysis (**Table 3**). Mitigation measures are included in the assessment of magnitude of effect and therefore the residual level of effect in **Table 3** is **after** mitigation and remedy have been applied.

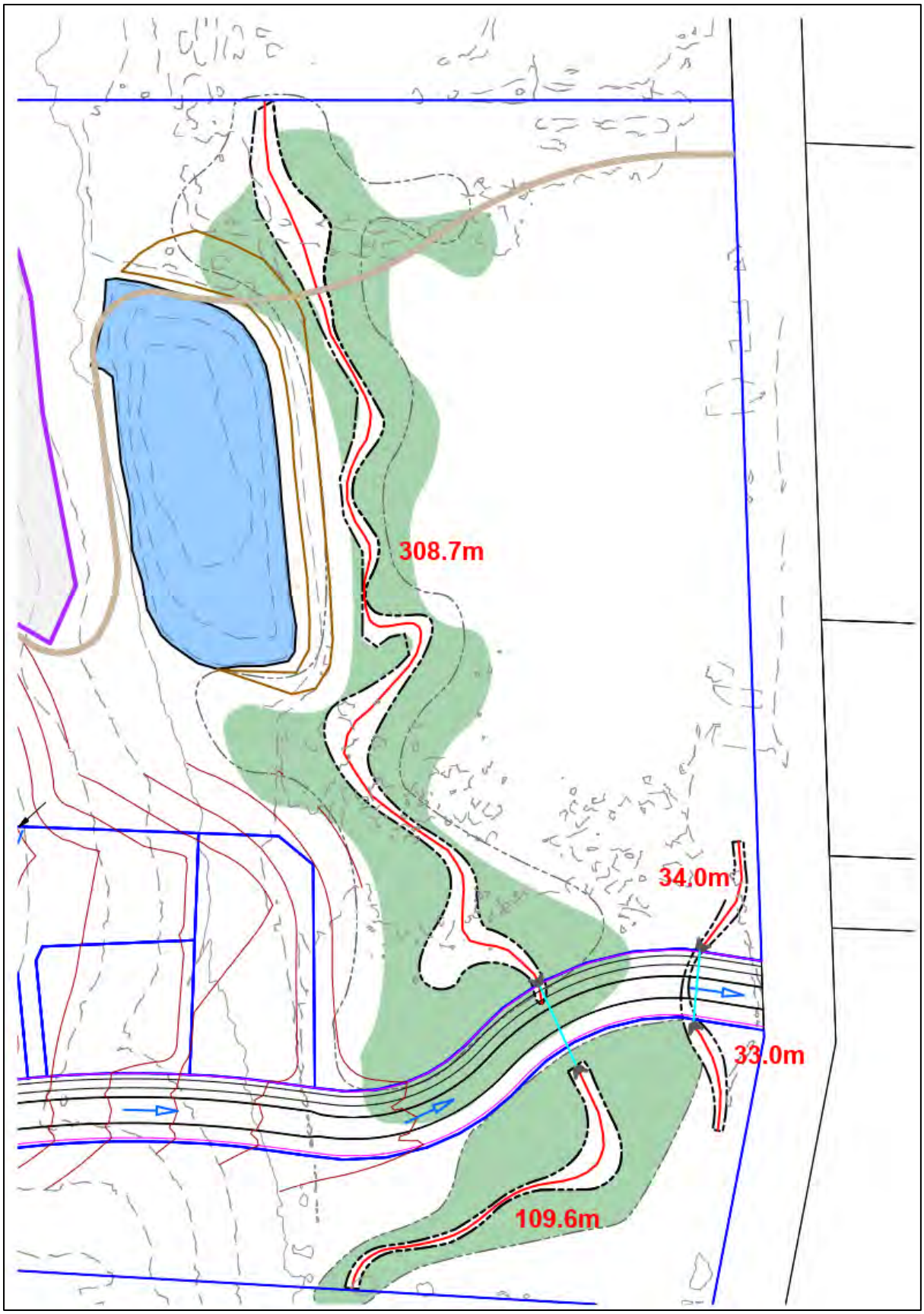

Figure 6. Stream diversion lengths. Note that the culvert lengths (light blue lines) are 18 m. Source: Elliot Sinclair.

Table 3. Assessment of significance of ecological effects using the EIANZ matrix method[8].

Factor	Value of resource[9]	Magnitude of effect[10]	Level of effect[11]
Loss of native bird habitat	Low	Negligible	Very low
Loss of lizard habitat	Low	Negligible	Very low
Loss of native fish habitat (including fish passage)	High[12]	Low	Low
Sediment discharge into streams	Moderate	Low	Low
Loss of stream length or value	Moderate	Net-gain	Positive
Dewatering of streams and wetlands	Moderate	Negligible	Very low
Loss of stream shading	Low	Net-gain	Positive

The EIANZ analysis indicates that all of the potential adverse effects (with mitigation applied) will be positive, very low, or low in ecological terms. This equates to negligible and less than minor adverse effect in RMA terms, respectively. Since the residual adverse effects after avoidance, remediation, and mitigation will be less than minor, the need for biodiversity offsetting or ecological compensation is not required.

Good practice principles for addressing adverse effects of this nature on loss of habitat for native fauna (birds, lizards, fish) is to undertake habitat enhancement in the form of native restoration planting which, as described above, will comprise riparian margins on each side of streams and other areas at the site totalling c. 6.3 ha. These native plantings will be of an appropriate composition, spacing and management regime to ensure canopy closure, the suppression of pest plants, and the eventual establishment of vegetation which will be similar in structure and composition to the original ecosystem type at the site (insofar as is possible with restoration planting of this nature).

With regard to statutory conformance, we note the following:

1. **NPS-Indigenous Biodiversity**

[8] As contained within the EIANZ EciA guidelines. Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. 2018. Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

[9] EIANZ matrix tables 5 and 6.

[10] EIANZ matrix table 8; measured in the context of the catchment (streams) or District (terrestrial values).

[11] EIANZ matrix table 10.

[12] Designated this value based on the assumption that the native longfin eel (At Risk – Declining) is present in artificial watercourses that are proposed to be removed.

- No part of the site listed as an SNA – therefore provisions that relate to SNAs in the NPS-IB do not apply to this site.

- There is no indigenous vegetation on the site that triggers requirements around protection or implementation of the effects management hierarchy.

- Indigenous wildlife (fauna) on the site will be managed appropriately to avoid adverse effects through salvage and relocation. There are no adverse effects that are significant (Clause 3.16 (1)), and therefore there is no requirements to apply the effects management hierarchy (although mitigation will be applied to reduce potential adverse effects to a nil or negligible level).

- Mitigation applied to wildlife salvage and relocation will ensure that the objectives and policies of the NPS-IB are given effect to, with particular emphasis on ensuring that Policies 13 and 14 are provided for by restoring indigenous biodiversity through landscape planting and waterways protection, and by increasing indigenous vegetation cover in this rural setting.

2. NPS-Freshwater Management and NES-Freshwater

- The project will result in no overall loss of stream bed (extent), no loss of stream length (extent), and no loss of stream condition (value); indeed, the development will result in a clear overall benefit for stream and watercourse ecological condition through riparian planting and improved instream management (in particular, the removal of stock).

- Earthworks will be undertaken within 10 m of a stream where a crossing over a stream is proposed and where diversion of the stream is proposed.

- Crossings included in this development will accord with Clause 70 design requirements to enable passage of native freshwater fish.

- There are no natural inland wetlands on the site, and therefore none of the provisions in the NPS-FW in this regard apply to this site.

3. TRMP Chapters 27 and 30

- With respect to Chapter 27, the development proposal will not result in the overall loss of stream length, extent, or values. Streams will be enhanced as a result of this development, through the use of native plant species along riparian margins. Fish passage will be maintained.

- With respect to Chapter 30, no wetlands will be dewatered by this project. Water quality will be improved on site and in the below catchment by removing stock from the site. Water will be diverted temporarily to facilitate the realignment of stream sections necessary for the design of the subdivision.

7.0 Recommendations

We recommend the following plans are prepared and approved by Council as a condition of consent:

- A Stream Diversion Plan is prepared with input by an ecologist to ensure that fish habitat is maintained or improved compared to the existing state;
- A Native Freshwater Fish Salvage and Relocation Plan is prepared by an ecologist; and
- A Native Revegetation Plan is prepared with input by an ecologist.

In addition, we recommend the following:

- Tree felling at the site is undertaken outside of the core nesting season (October-February) or otherwise an inspection by an ecologist to confirm no native nesting birds is undertaken prior to tree felling; and
- Removal of potential native lizard habitat at the site will be undertaken under the supervision of a qualified herpetologist who holds a current Wildlife Act authority from the Department of Conservation.

Stormwater Report

Tasman Bay Estates – Mamaku Block

Planscapes (NZ) Ltd

Document Number: 230069-RPT-C-001-B

Date: 19 March 2024

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CGW Ref: 230069-RPT-001-B
Date: 19 March 2024

Planscapes (NZ) Ltd.

RE: 230069 – Tasman Bay Estates

1. Introduction

CGW Consulting Engineers (CGW) have been engaged by Planscapes (NZ) Ltd (client) to undertake a stormwater management assessment for a proposed residential subdivision at Tasman Bay Estates – Mamaku Block, Tasman. The assessment has been carried out in accordance with the Nelson Tasman Land Development Manual 2020 (NTLDM) and the New Zealand Building Code (NZBC).

This report summarises our findings and recommendations and should be read in conjunction with the appended calculations.

2. Site Description

2.1 Existing Site

The subject site is accessed from Mamaku Road in the south of the Tasman region and is comprised of four existing parcels; Lot 14 DP 324764, Lot 4 DP 2172, Lot 21 DP 328, Lot 23 DP 328 & Lot 1 DP 8288. Topography varies, with the southern half of the site consisting of moderately steep hills and gulleys generally falling to the north where grades flatten out alongside Mamaku Road. Several small ponds exist within the aforementioned gulleys, with two larger ponds being located within Lot 23 DP 328 & Lot 21 DP 328. Aside from the ponds and an existing house and accessway at the approximate centre of the site, the ground cover consists primarily of pasture.

2.2 Proposed Works

As depicted in the supplied plans, it is proposed to develop a 61-lot residential subdivision (58 residential lots ranging from 1,064m² - 6,400m², & 3 balance lots) with associated 6.0m – 7.2m wide carriageways extending from the western side of Marriages Road.

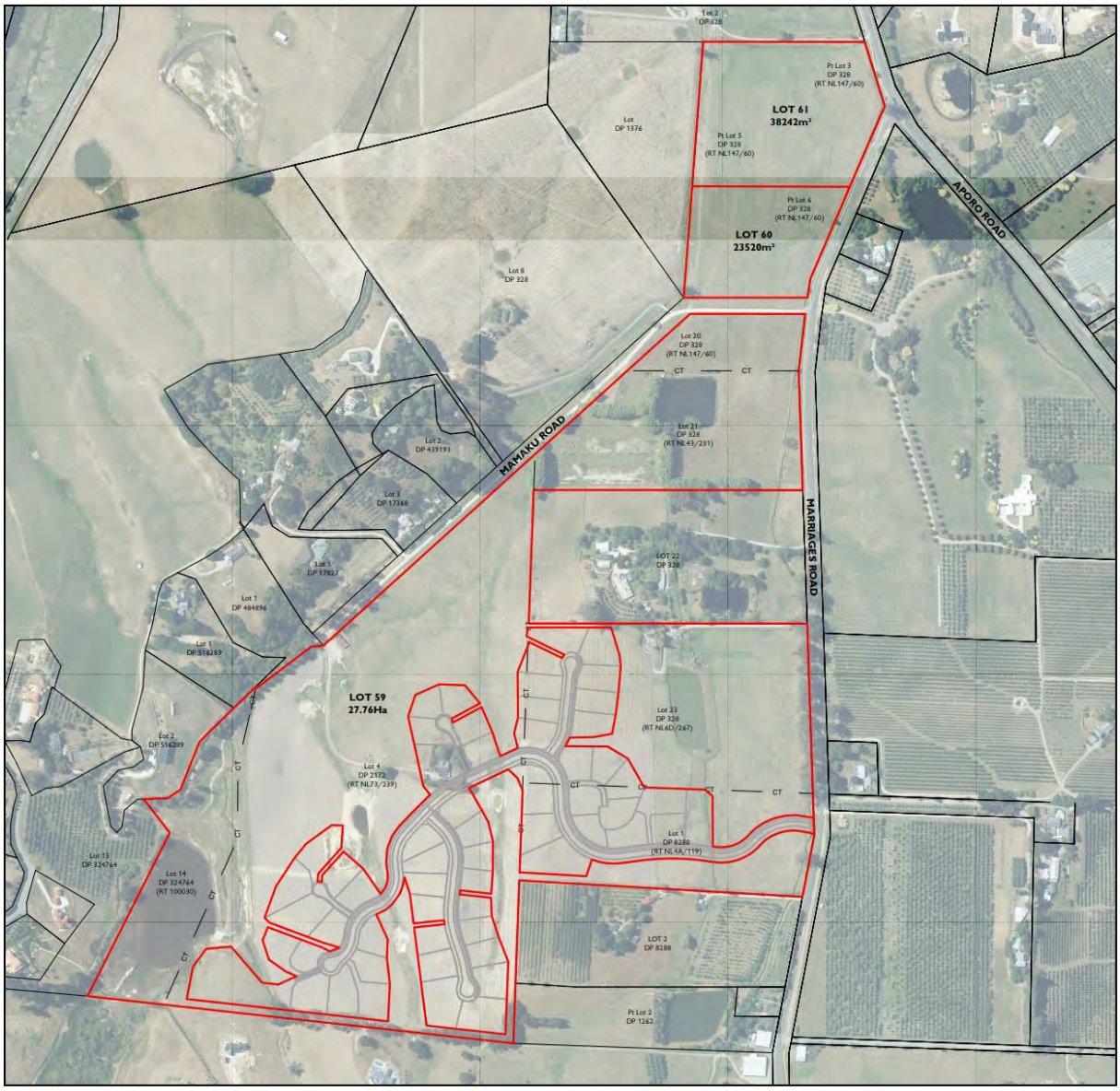


Figure 1: Snip of the proposed development layout (Ref. 11460 Eliot Sinclair).

The proposed works include the repurposing of two larger existing ponds, referred to as P1 & P2 herein, for stormwater detention. Several smaller ponds are also located throughout the site as shown in Figure 2 below.

Figure 2: Markup of Google Satellite screenshot showing existing ponds and structure at the site.

3. Assessment Scope

The scope of this report is limited to the following:

- Post-development primary flow catchment analysis up to the existing pond P2,
- Pre- and post-development secondary flow analysis up to proposed Lot 61,
- Preliminary recommendations for subdivision stormwater management channel sizing,
- Preliminary recommendations for subdivision stormwater detention pond parameters to accommodate for the increase in runoff flows resulting from development.

4. Catchment Analysis

4.1 Primary Flow Catchments

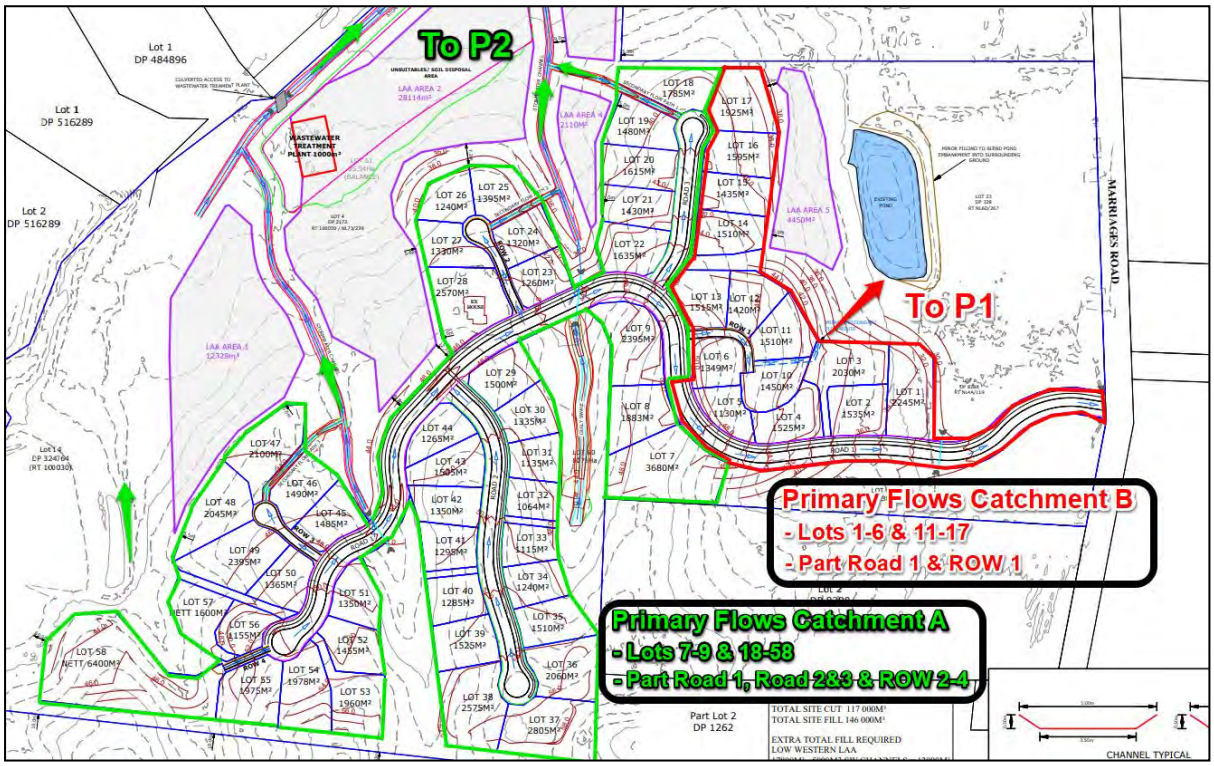


Figure 3: P1 & P2 primary flow catchments diagram.

The primary flow catchments requiring runoff mitigation were delineated from the provided development proposal plans. A 400m² impermeable coverage allowance for each residential lot has been assumed.

					Greenfields Conditions 12h Storm Duration Flow Rate (L/s)**	
Primary Flow Catchment	**Total Road Area (m²)**	**Total Residential Lot Impermeable Area (m²)**	**Total Impermeable Area (m²)**	**Tc (mins)***	10% AEP Storm	1% AEP Storm
P1	6966	5600	12566	10	51	92
P2	18280	17600	35880	18	145	262

**To ponds*

***Flow rate for 12h storm utilised. 12h storm duration determined as critical for the largest pond detention volume.*

4.2 Secondary Flow Catchments

Gulley Channel Catchments

Post-development secondary flow catchments (Cat1 & Cat2 per Figure 4 below) to the existing gulley channels were delineated from LINZ contour data and the provided development proposals.

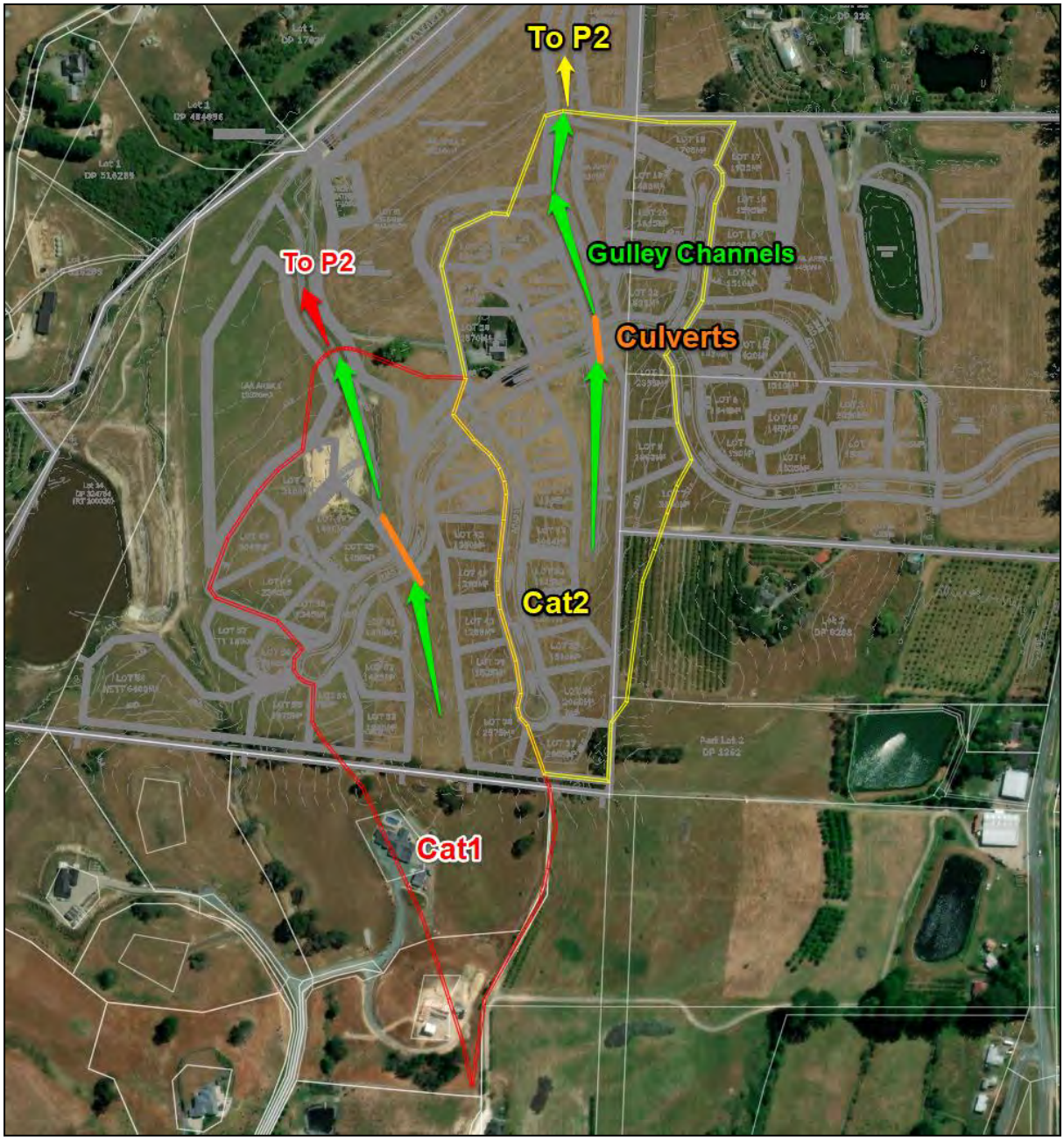


Figure 4: Gulley Channels' secondary flow catchments diagram.

- Areas outside the development extent zoned Rural 3 are assumed to have 15% impermeable coverage.
- Future culverts (marked in orange in Figure 4 above) through the gulleys are assumed to be free-flowing – further input is required at the detailed design stage.

Catchment	Total Area (m^2)	Total Permeable (m^2)	Total Impermeable (m^2)	Weighted CN	Tc (mins)*
Cat1	70000	46800	23200	82	15
Cat2	68270	45612	22117	81	12

**To end of gulley channel*

HEC-RAS Model Catchment

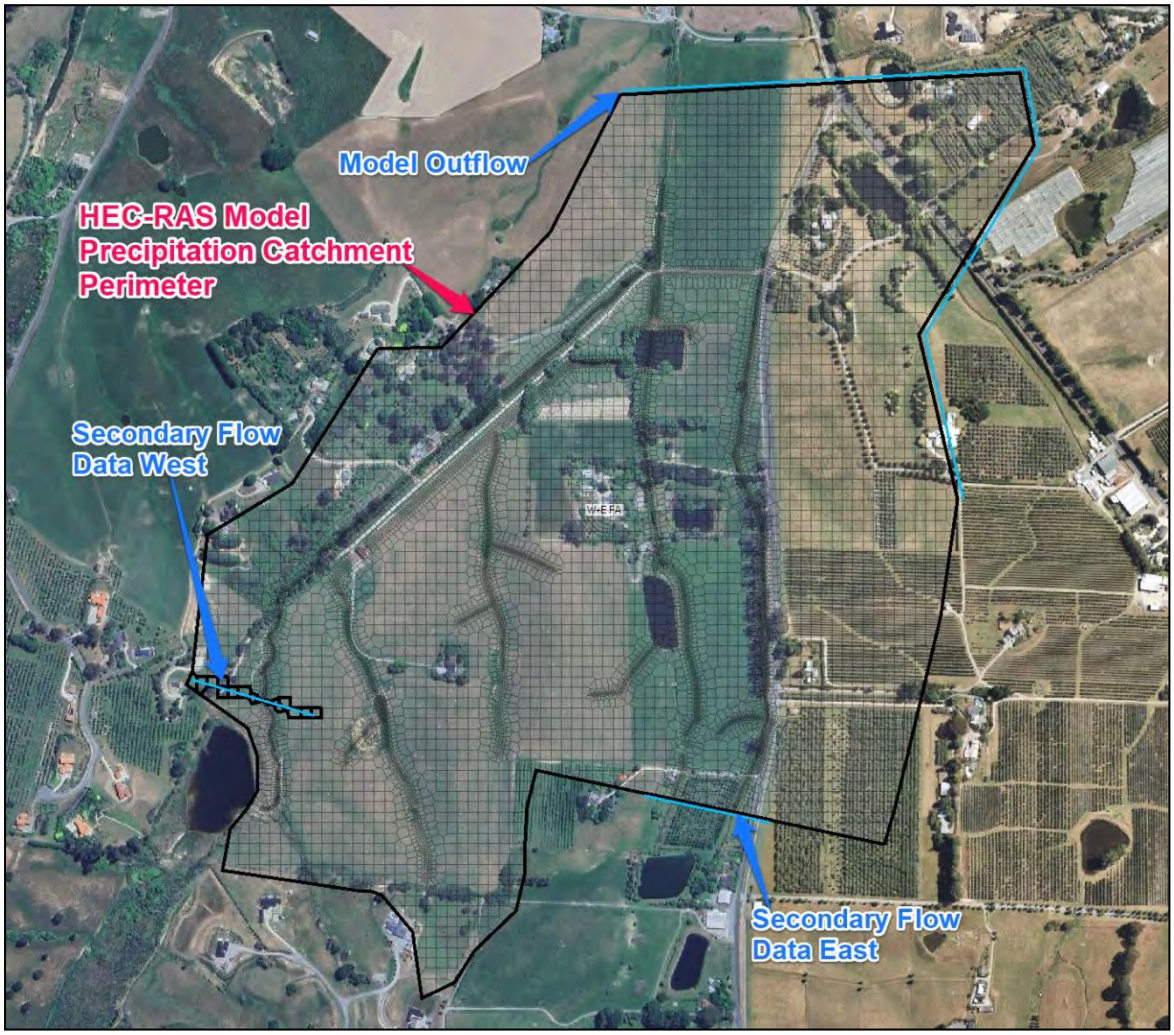


Figure 5: HEC-RAS model precipitation catchment perimeter with Google Satellite background imaging.

The HEC-RAS model catchment for the application of rain-on-grid precipitation in the model was delineated in the *RAS-mapper* environment and is shown in Figure 5 above.

The precipitation catchment extends from the southern boundary of the subject site to the northern boundary of proposed Lot 61 and the eastern side of Aporo Road, north of the development area. Secondary flow data for the catchment upstream of the subject site was provided by the council as described in Section 5 below.

5. HEC-RAS Model Inputs

A 2D HEC-RAS model was created to assess the effects of development on local flooding, suitable effluent disposal areas and secondary flow rates through ponds and channels.

Catchments & Model Terrain

The pre-development HEC-RAS model terrain consists of the following data, merged in Civil3D:

- LINZ 2022 LiDAR 1.0m DEM data.
- Elevation data from a drone survey provided by the client (Ref. #11460 Pond Survey).

The post-development model terrain consists of the following data, merged in Civil3D:

- Pre-development terrain as described above.
- Design Surface provided by the client (Ref. #11460 Design Surface 02.02.2024).

Terrain modifications were implemented in the RAS-mapper environment for the pre-and post-development terrains. This includes the following:

- Proposed stormwater channels for the post-development terrain as described in Section 7 of this report.
- All existing culverts through the streams flanking the site, referred to herein as "Mamaku Road Stream" and "Marriages Road Stream" (see Figure 6 below) were represented as channelised terrain modifications, assuming free-flow through culverts.
- Channelised terrain modifications were added to the pre-and post-development terrain models at the smaller existing pond (see Figure 2 "Existing Ponds") outlet locations to simulate free-flow through these ponds. Specific design for outlet structures for these ponds should be undertaken at the detailed design stage if these are to remain.
- Flat surfaces at the top of ponds P1 and P2 to simulate conditions when the ponds are full to above the invert level of the corresponding pond outflow channel.

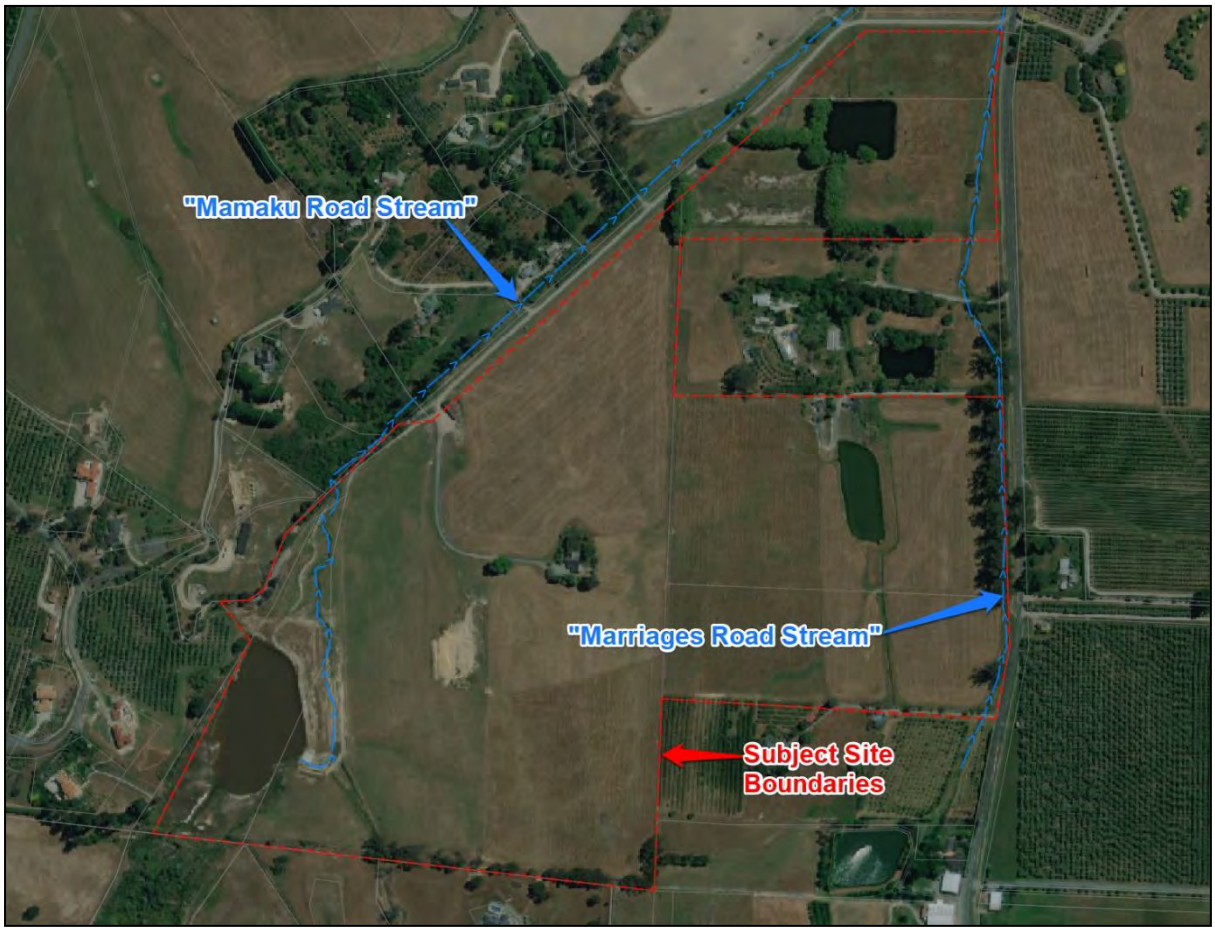


Figure 6: Diagram of "Mamaku Road Stream" & "Marriages Road Stream" alignments.

Model Inputs – Hydrology

Model inputs and assumptions pertaining to land cover and hydrologic characteristics are summarised below.

- The land cover layer utilised in the model was based on available satellite imaging, survey data and the supplied preliminary development proposal plans.
- Secondary flow rates for the 50- and 100-year storm events through the floodplains on the western and eastern sides of the proposed development (through Mamaku Road Stream and Marriages Road Stream) were provided by the council in the form of flow hydrographs. These hydrographs were imported into the model via inflow boundary conditions. Council have advised that the critical storm duration for design is 12 hours.
- 50- and 100-year storm event precipitation with a 12-hour duration from HIRDS North of SI hyetograph was applied to the model 2D flow area;

Storm ARI	12-hour duration depth (NIWA HIRDS RCP8.5 2081-2100)
50	169mm
100	190mm

- Infiltration losses modelled via SCS Curve Number method. Assumed no infiltration over impermeable surfaces;

Surface	% Impervious
Pasture	0
Gravel Roading	80
Pond	100
Structures	100
Sealed Road	100
Proposed Road Parcel	90
Proposed Resdiential Parcel	30

- Pervious Areas CN = 74 per TP108 (Type C soils, urban lawns)
- Pervious Areas Ia = 0.2S,
- Impervious Areas CN = 98.

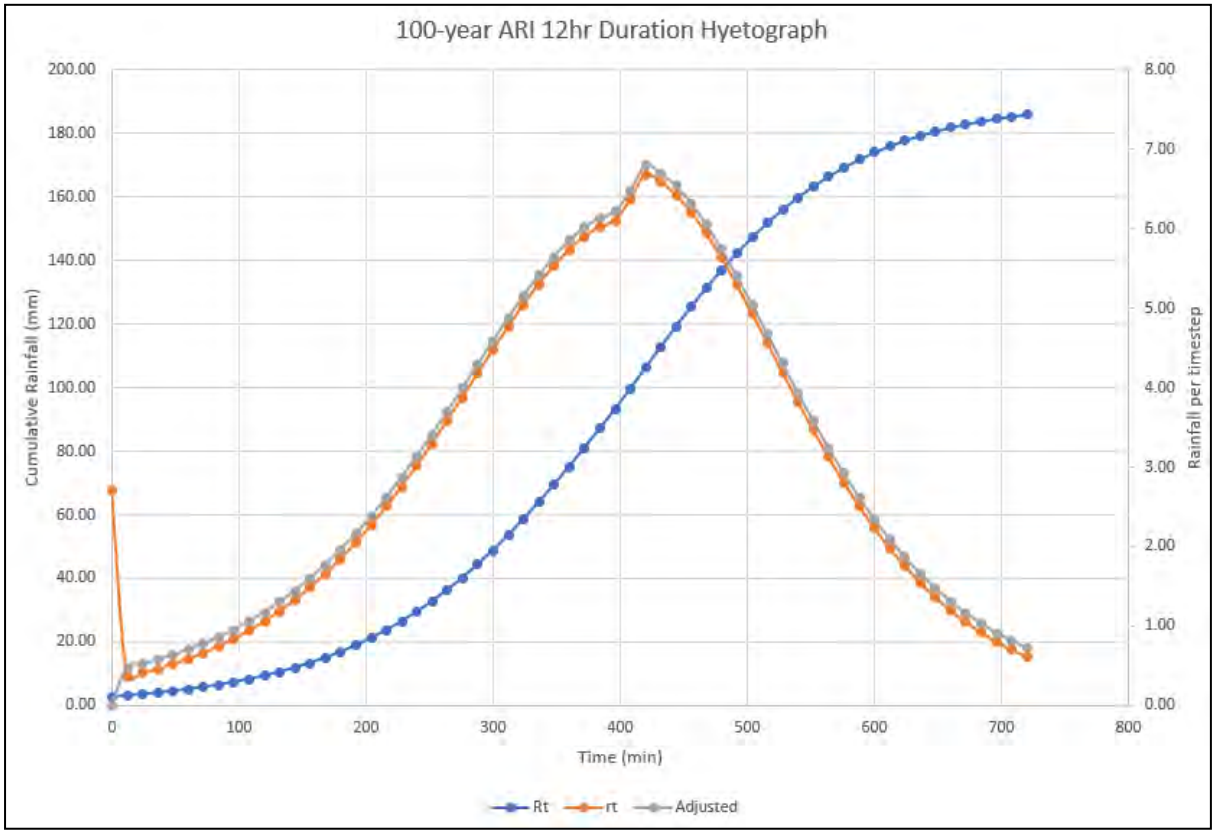


Figure 7: 100-year ARI 12hr Duration HIRDS North of SI Hyetograph.

Model Inputs – Hydraulics

Model inputs and assumptions pertaining to the model 2D flow area are summarised below;

- Rainfall modelled as precipitation (HEC-RAS Rain on Grid) over the 2D flow area (storm profile based on Hydrologic inputs described above).
- 2D flow area cell size ranging from 1.0m to 15.0m.
- A normal depth outflow boundary condition was implemented along the downstream (northern) edge of the 2D flow area.
- Inflow boundary conditions were added at the western and eastern floodplains with the provided hydrograph data as described above.
- Land cover regions were delineated based on available satellite imaging, survey data and the supplied preliminary development proposal plans. The regions and their associated Manning's n values, impervious % values and CN values were updated in the post-development model to simulate the effects of the proposed development on secondary flows. Manning's N values were based on HECRAS 2D manual guidance as below:

Surface	Manning's N
Pasture	0.03
Gravel Roading	0.025
Pond	0.035
Structures	0.3
Sealed Road	0.016
Proposed Road Parcel	0.02
Proposed Resdiential Parcel	0.08

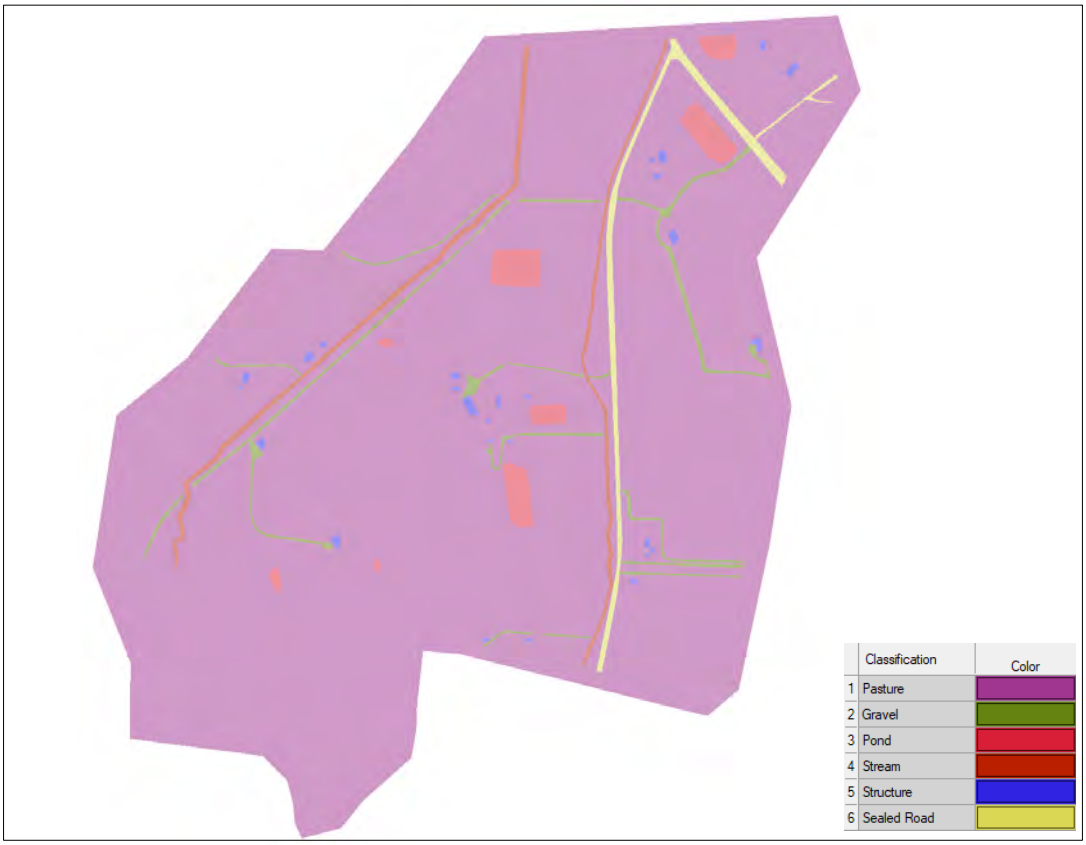


Figure 8: HEC-RAS model Pre-Development Land Cover layer.

Figure 9: HEC-RAS model Post-Development Land Cover layer.

- Culverts were added to the model geometry across the proposed fill area, west of Marriages Road, to check the feasibility of providing culverts at this location without causing adverse effects to the upstream environment. No recommendations for culverts servicing the subdivision are provided in this report as they will be sized at the detailed design stage.

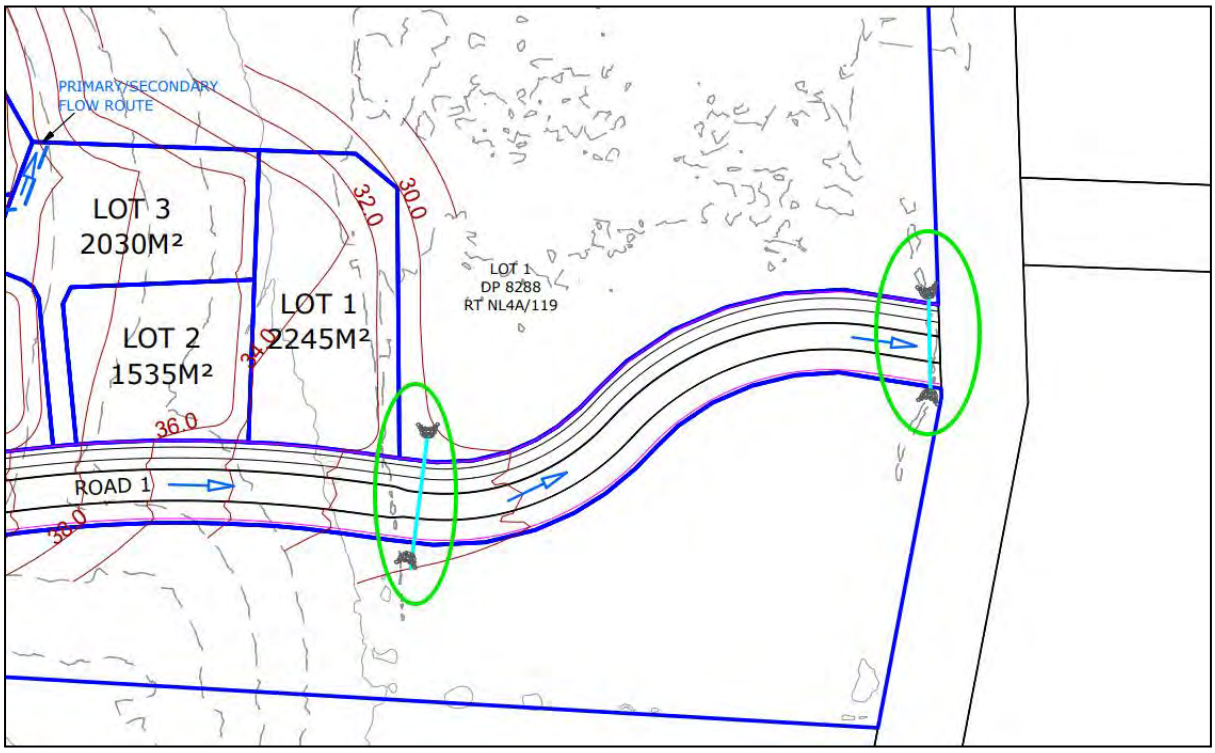


Figure 10: Markup of snip from 11460 Plan Set by Eliot Sinclair showing preliminary culvert modelling locations.

6. HEC-RAS Model Results

See Appendix A for a summary of pre- and post-development model results for the 100-year ARI storm event.

Areas of the model and corresponding results that require particular consideration are identified and discussed in Sections 6.1 & 6.2 below.

Measures are to be taken where required to mitigate the effects of the development on secondary flows and flooding in the properties upstream and downstream of the subject site. Assuming that the recommendations below are adhered to and adequate consideration of the items discussed in Sections 6.1 & 6.2 are given at the detailed design stage, the HEC-RAS model results show that the implementation of these measures will be achievable to ensure that the adverse effects of development will be less than minor.

The final ground level in the proposed development areas should be designed to allow secondary flows to escape to lower-lying areas, away from any structures.

General observations of the model results include;

- Maximum Water Surface Elevation and Maximum Depth results (see Results Maps & Appendix A XS Maximum WSE) do not differ significantly from the pre- to post-development scenarios (aside from the areas addressed in Sections 6.1 & 6.2),
- Flow rates are not shown to differ significantly in any of the assessed areas (see Appendix A XS Flow Hydrographs),

6.1 P2 Outflow Channel & Mamaku Road Culvert

The HEC-RAS model indicates that in the pre-development 100-year ARI storm event, flows will overtop the existing P2 outflow channel and spill over Mamaku Road into Pt Lot 6 DP 328 (proposed Lot 61) as shown in Figure 11 below. For the purposes of this assessment, the conveyance structure across Mamaku Road was represented as a channel with the same dimensions as the new P2 outflow channel.

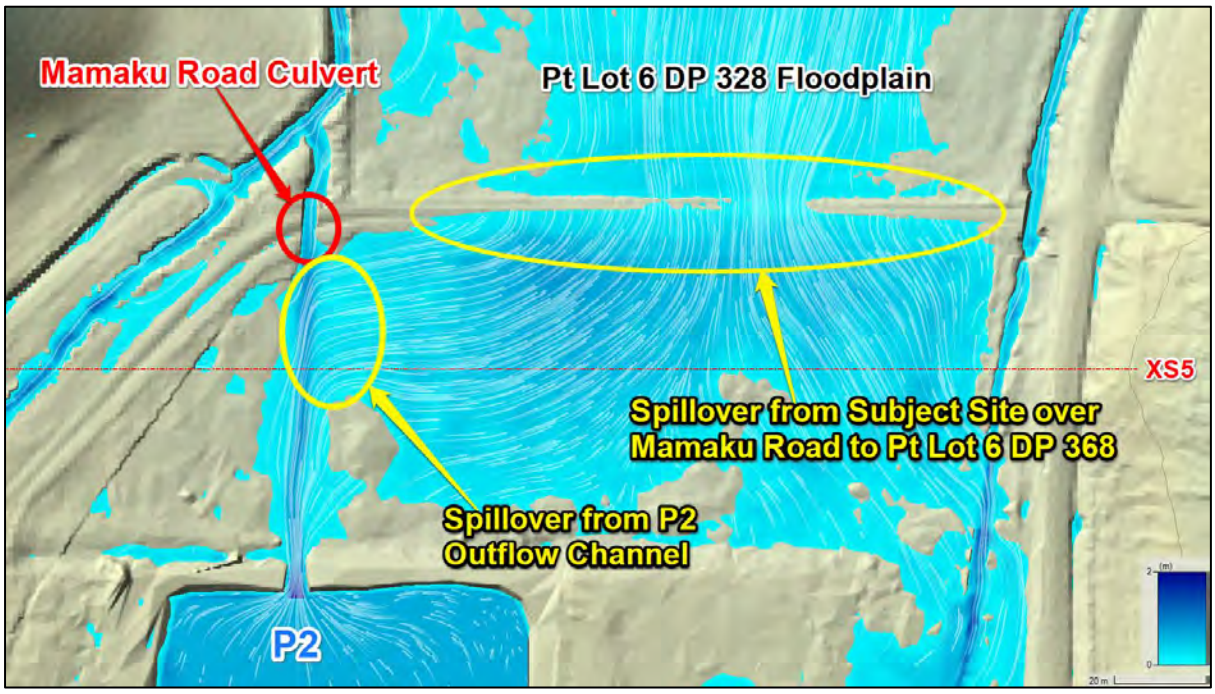


Figure 11: Screenshot from the HEC-RAS model showing pre-development terrain and 100-year ARI flood depth results at storm peak with particle tracing.

No changes were made to the P2 outflow channel layout in the post-development model. Figures A19 – A27 of Appendix A show that no significant changes in maximum velocity, flood elevation or flow rate occur through the environment north of P2 between the pre- and post-development scenarios. As such, the effects of development on flooding in the receiving environment north of P2 will be less than minor under the assumptions made herein.

The P2 outflow channel and downstream conveyance structure should allow for the 10% AEP storm event flows to be directed to the Mamaku Road Stream without overspill from the P2 outflow channel. Specific design for the P2 outflow channel and conveyance structure should be undertaken at the detailed design stage. Considerations may be made for additional conveyance structures along Mamaku Road depending on any future works for secondary stormwater management systems downstream of the subject site - this should be confirmed at a later stage.

6.2 Marriages Road to Proposed Road 1 Fill

A filled road area is proposed from Marriages Road extending into the subject site, crossing two existing channels as shown in Figure 12 below.

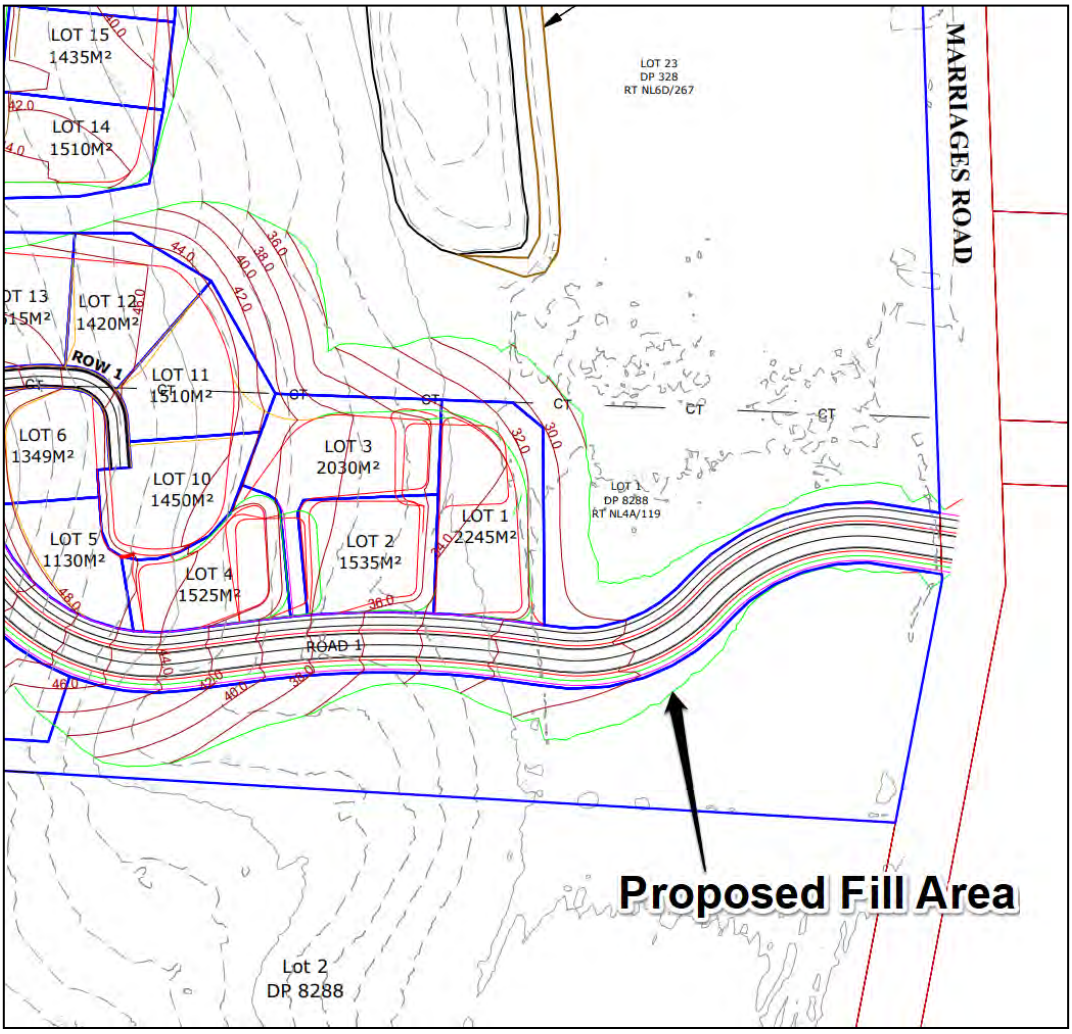


Figure 12: Screenshot of 11460 Plan Set by Eliot Sinclair showing proposed Road 1 and associated fill extent.

To undertake a high-level feasibility analysis of implementing culverts across the fill area through the existing channels, culverts were included in the HEC-RAS model geometry at these locations. Additionally, a ~300mm high bund was introduced between Marriages Road and the southern side of the proposed Road 1 to prevent overspill from the existing channel to Marriages Road. A depth increase of up to 100mm upstream of the fill area through XS1 is noted in the post-development scenario (see Figure A8).

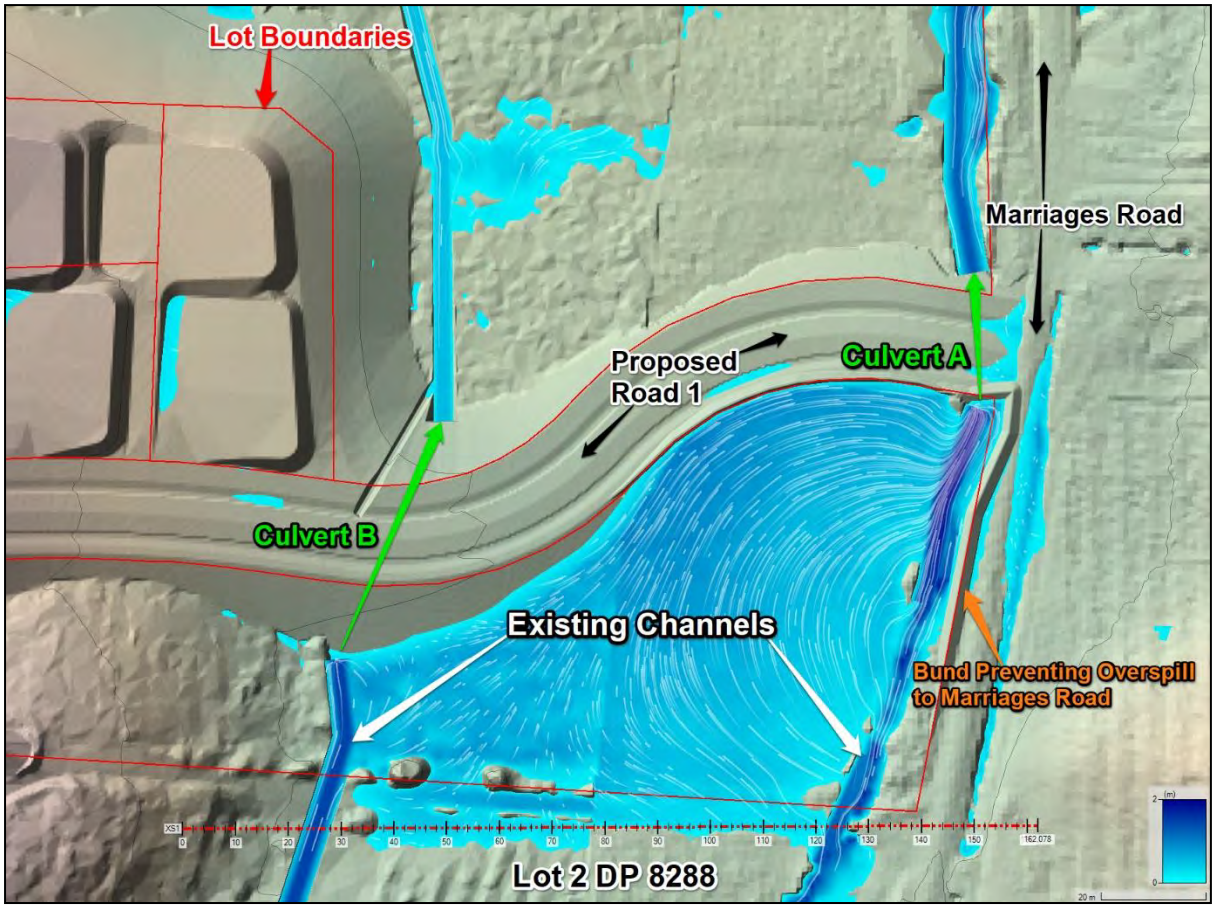


Figure 13: Screenshot from the HEC-RAS model showing post-development terrain and 100-year ARI flood depth results at storm peak with particle tracing.

Detailed culvert sizing and design should account for the effects of the fill area on the flood level in the upstream property (Lot 2 DP 8288). We conclude that the reduction/elimination of any adverse effects on the upstream property will be achievable at the detailed design stage through specific culvert design and/or the implementation of new channel systems in the subject site.

7. Stormwater Channel Sizing

A secondary stormwater flow management system will be required to service the development. The assessment and recommendations herein are intended to illustrate the feasibility of a stormwater channel system.

The secondary stormwater management system is required to safely convey 1% AEP storm event flows through the site to the receiving environment.

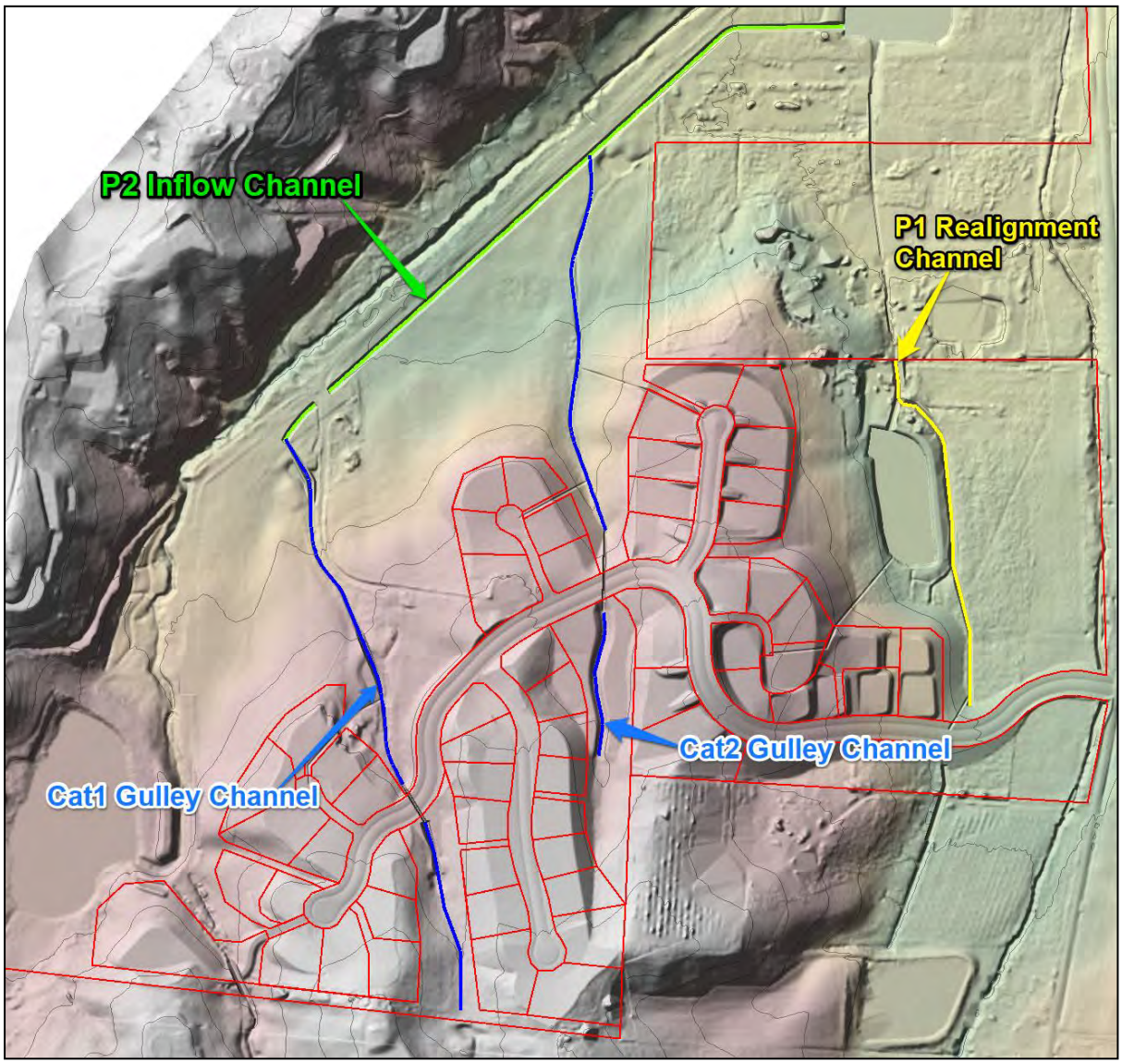


Figure 14: Screenshot from the HEC-RAS post-development terrain model with markups showing the proposed stormwater management channel centrelines.

- The Cat1 & Cat2 gulley channels are sized to accommodate secondary flows from the gulley catchments as described in Section 4.2 of this report. For the purposes of the gulley channel calculations, the channels are assumed to be trapezoidal at a minimum grade of 0.5%. Refer to Appendix B for channel sizing calculations.
- The P2 Inflow & P1 Realignment channels were sized in the HEC-RAS *RAS-mapper* environment to accommodate secondary flows in the 2D model without overspilling for the 1% AEP storm event.

Channel	X (m)	Y (m)	a
P1 Realignment Channel	2	1.25	2
P2 Inflow Channel	2.5	1	1.5
Cat1 Gulley Channel	1	0.5	1.5
Cat2 Gulley Channel	1	0.5	1.5

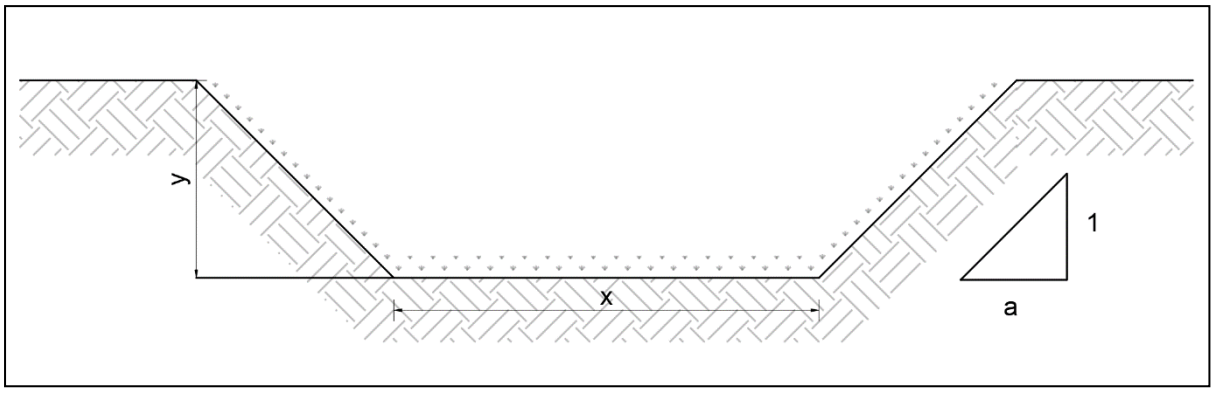


Figure 15: Indicative stormwater channel cross-section. Dimensions per Table above.

Additional channels will be required throughout the development area to direct secondary flows safely, away from structures, to the channels specified above. These channels should be sized at the detailed design stage.

8. Effluent Application Areas

The effluent application is being designed by Envirolink. CGW's related scope is to model channels to contain primary and secondary flows along the western side to maximise the available space for land application.

As per NZS1547:2012, wastewater effluent fields must lie outside the 1 in 20 year floodplain. Additionally, a Land Application Area (LAA) offset is required from surface water channels to the recommendations of the on-site wastewater designer for the project, Envirolink.

As the 20-year ARI flow hydrographs for the western and eastern floodplains are unavailable to us at the time of report-writing, the availability of areas within the site for effluent disposal

based on the above requirements has been assessed against the 50-year local flooding extent as indicated by the HEC-RAS model described above. The 50-year flooding extent and proposed Land Application Areas are indicated in Figure 16 below.

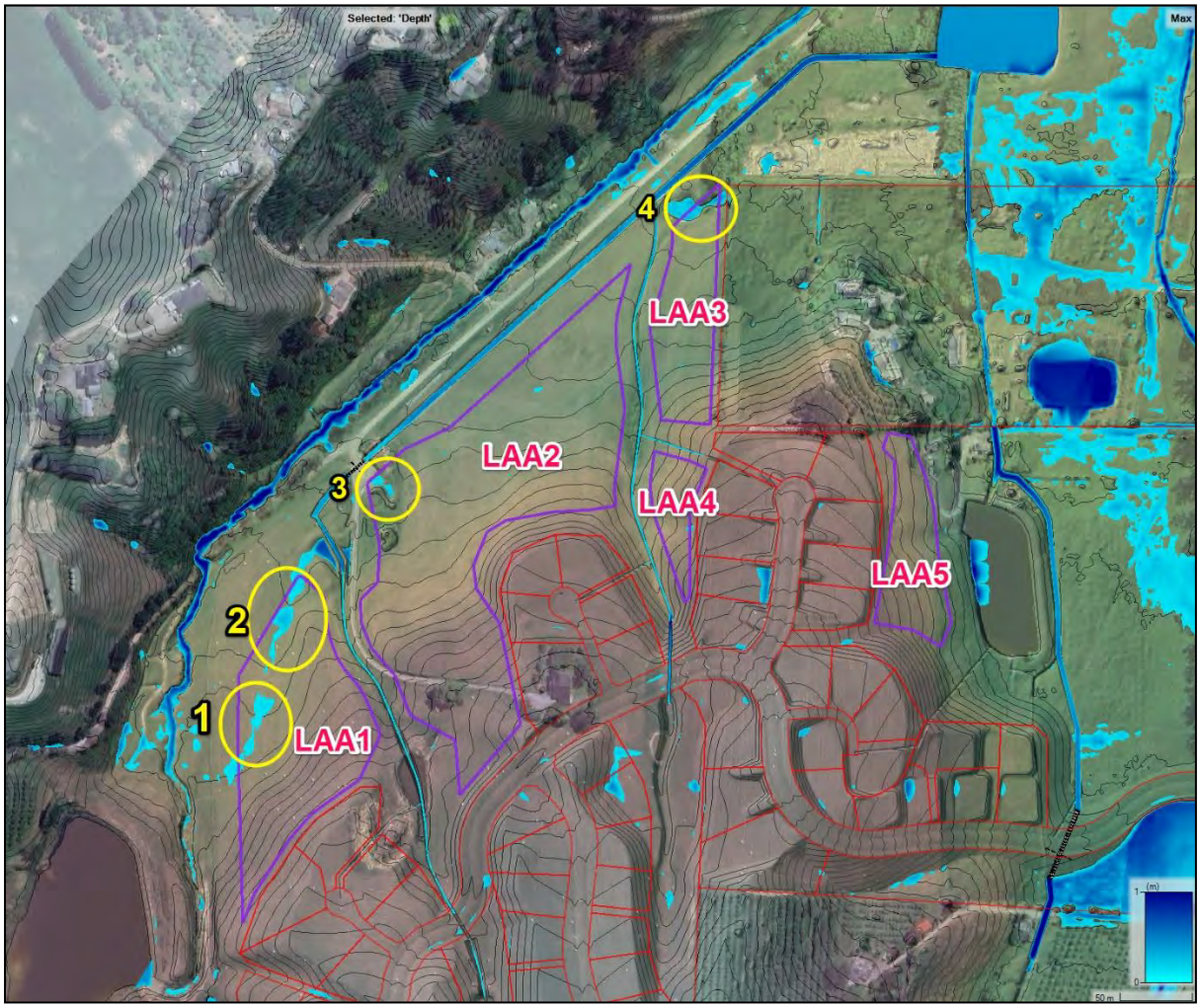


Figure 16: Subdivision Layout (red) and effluent LAAs (purple) with 50-year ARI maximum depth HEC-RAS flood model results (depths >100mm plotted). Post-development surface 1.0m contours in black.

Local ponding is noted (circled yellow in Figure 16 above) at points 1-4.

- Items 1 & 2 are attributed to low-lying areas in the existing terrain. These areas will be filled and shaped in a manner such that runoff is shed to the Mamaku Road stream to the northwest.
- Items 3 & 4 are attributed to existing ponds on-site that will be decommissioned or reformed where necessary to accommodate the LAAs as part of the development works.

Provided that the recommendations above are adhered to, the offset recommended by Envirolink can be achieved from the indicated LAAs to the 20-year ARI floodplain and surface water channels.

Layout and sizing for cutoff drains in compliance with council standards are to be determined at the detailed design stage. No cutoff drain layouts were provided for consideration in this assessment. We note that cutoff drains for LAA5 should generally and where practicable be directed towards detention pond P1.

9. Detention Pond Preliminary Design

The detention and flow attenuation of stormwater runoff will be required to mitigate the effects of the development on the downstream environment. Council have advised that Extended Detention and detention providing hydrologic neutrality for the 10% AEP and 1% AEP storm events is required. This will be achieved via the implementation of detention volumes in ponds P1 and P2.

The detention pond recommendations herein are intended to demonstrate that adequate detention measures accommodating the development, in accordance with council requirements, are feasible. Revision and further detail of the detention pond design is required at the detailed design stage.

9.1 Extended Detention

The preliminary assumptions and calculations for the extended detention volumes in ponds P1 and P2 are summarised below. Pond dimensions were extracted from the supplied drone survey.

P1 Extended Detention Volume

P1 Dimensions (Area) =	4100	m²
Total Proposed Impermeable Area (primary flows) to Pond =	12,566	m²
2yr 2 hr rainfall depth (NIWA HIRDS RCP8.5 2081-2100) =	40.2	mm
Runoff Volume = Total Impermeable Area x Rt =	505	m³
Hydraulic Height =	123	mm
Orifice size to release over 24 hours	72	mmØ

P2 Extended Detention Volume

P2 Dimensions Area =	4800	m²
Total Proposed Impermeable Area (primary flows) to Pond =	35,880	m²
2yr 2 hr rainfall depth (NIWA HIRDS RCP8.5 2081-2100) =	40.2	mm
Runoff Volume = Total Impermeable Area x Rt =	1442	m³
Hydraulic height =	300	mm
Orifice size to release over 24 hours	96	mmØ

9.2 10% + 1% AEP Design Storm Detention

The critical storm duration for sizing the basins for the 10% and 1% AEP detention volume was taken as the duration giving the largest detention volume. The "North of SI" HIRDS hyetograph, with rainfall values adjusted for climate change (RCP8.5 2081-2100), for durations of 1 hour, 6 hours, 12 hours and 24 hours were investigated in accordance with the SCS Curve Number Method, with the critical duration for detention being determined as 12 hours.

For the assumed pond dimensions, the following pond detention parameters are required:

		Attenuation Outlet*	Total Detention Volume (m^3)	Hydraulic Height (mm)
P1	10% AEP Detention	6 x 100mmØ	648	200
	1% AEP Detention	5 x 100mmØ	993	300
P2	10% AEP Detention	12 x 100mmØ	1541	360
	1% AEP Detention	10 x 100mmØ	2314	540

**Alternatively, specific design for flow attenuation weir structure or similar at detailed design stage.*

9.3 Total Detention Volume & Pond Quantities

The resulting total detention height (Extended Detention + 10% AEP Detention + 1% AEP Detention for P1 = 430mm. Investigation of the provided pond survey data indicates that this total detention volume can be accommodated in P1 with the pond's existing dimensions.

The resulting total detention height (Extended Detention + 10% AEP Detention + 1% AEP Detention for P2 = 840mm. Investigation of the provided pond survey data indicates that the pond will be able to accommodate this total detention volume. Adjustments to the pond dimensions may be required for the purposes outlined in Section 9.4 below.

9.4 Emergency Spillway Parameters

Emergency spillways are required to convey secondary flows assuming complete blockage of the ponds' service outlets. The spillways are to be sized to accommodate flows resulting from the 1% AEP storm event with 500mm freeboard above the calculated water level and confirmed adequate to pass a Probable Maximum Precipation event that is approximated as double the 1% AEP.

Sections were taken from the HEC-RAS model through the outflow channels of P1 and P2 to determine the anticipated 1% AEP storm event flow hydrographs. These hydrographs were imported into the Hydrocad software environment and the corresponding emergency spillway depths were determined via broad crested weir calculations.

The tailwater effects of the flood levels immediately downstream of the ponds in the outlet channels were accounted for in the spillway calculations. Note that the invert level of the spillway must be above this flood level.

P1 Spillway

Based on the surveyed pond dimensions, discharging the 1% AEP storm event over a spillway will require a width of 10.0m for 60mm flow depth. It is anticipated that accounting for the required detention volume height, there will be no difficulties in achieving the adequate freeboard requirements with the existing pond dimensions.

P2 Spillway

Based on the survey and LINZ LiDAR data utilised in the HEC-RAS model, P2 dimension characteristics and the downstream flood level can be summarised as follows:

- Outlet Channel IL / Extended Detention Outlet Level =21.30mRL
- Pond berm Level = 23.15mRL
- Height from Detention Outlet to Berm for Existing P2 Dimensions = 1.85m
- 1% AEP Flood Level at Mamaku Rd Spillover = 22.10mRL

The 1% AEP storm event's water depth was calculated at ~480mm over a 15.0m wide spillway crest.

The required pond height to accommodate the spillway will be dictated by the flood level, spillway water level and 500mm freeboard requirement.

The resulting required pond berm level is as follows:

- Required Berm Level = Flood Level + Spillway WL + 0.50m = 23.08mRL

The existing P2 berm level lies above this required level. Once detailed design for the Mamaku Road culvert and P2 outflow channel have been undertaken, the above parameters are to be reassessed to confirm the available height from the base detention outlet to the berm and the final required berm level. If the pond height is insufficient to accommodate the spillway and detention volumes and/or the existing pond berm lies below the required level, then the existing pond berm may need to be raised or the pond widened to accommodate the freeboard requirements.

10. Conclusion

Based on our analysis and conceptual design we can conclude the following:

- Through modification of the existing pond areas P1 and P2 into detention ponds following the recommendations in this report, hydraulic neutrality can be achieved at the downstream discharge for the 10% AEP and 1% AEP RCP8.5 2100 12-hr storm event using HIRDS rainfall depths and hyetographs as required by TDC and the NTLDM.
- Extended detention can be provided within both proposed ponds to discharge the 50% AEP storm event over 24hrs as required by TDC and the NTLDM.
- Through specific design of key culverts and bunding in locations, along with the other stormwater design components described in this report, offsite flood risks can be mitigated so that the effects are less than minor.
- Provision of the channels along the western boundary sized for primary and secondary flows will provide the offset required to the effluent land application areas designed by Envirolink.
- The specific design of inlet and outlet structures for any existing ponds on-site that are to remain post-development should be undertaken at the detailed design stage in accordance with the relevant standards.

11. Limitations

This report has been prepared solely for the benefit of our client, Planscapes Ltd, as per our brief and an agreed consultancy agreement. The reliance by any other parties on the information or opinions contained in this report shall, without our prior agreement in writing, be at such parties' sole risk.

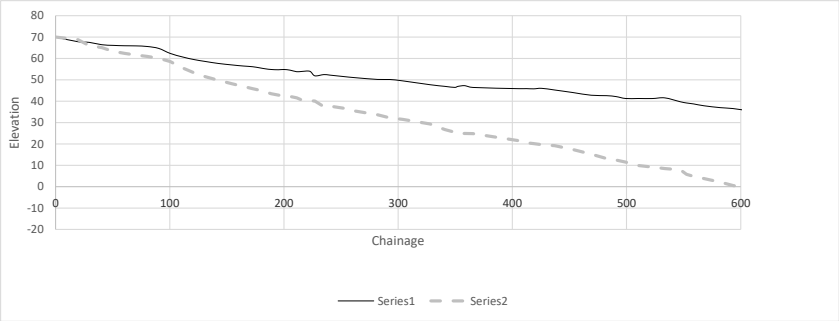
This report has been prepared solely to address the issues raised in our brief and shall not be relied on for any other purpose.

In the event the third-party investigation data has been provided to us, the client acknowledges that we have placed reliance on this information to produce our report and CGW will accept no liability resulting from any errors or defects in the third party data provided to us.

230069 – APPENDIX B

Cat1 to End of Gulley Channel

Slope Calculation : Equivalent area method



x	Elevation	h	Del X	Ave h	Del A
(m)	(m)	(m)	(m)	(m)	(m^2)
0	70	0.0	0	0	-
19.45	67.825	-2.2	19	-1.0875	- 21.2
29.45	67.516	-2.5	10	-2.3295	- 23.3
40.45	66.42	-3.6	11	-3.032	- 33.4
50.45	66.101	-3.9	10	-3.7395	- 37.4
60.45	65.929	-4.1	10	-3.985	- 39.9
70.45	65.865	-4.1	10	-4.103	- 41.0
80.297	65.585	-4.4	10	-4.275	- 42.1
90.314	64.683	-5.3	10	-4.866	- 48.7
100.331	62.352	-7.6	10	-6.4825	- 64.9
111.35	60.658	-9.3	11	-8.495	- 93.6
121.366	59.45	-10.6	10	-9.946	- 99.6
131.383	58.555	-11.4	10	-10.9975	- 110.2
142.402	57.66	-12.3	11	-11.8925	- 131.0
154.422	56.953	-13.0	12	-12.6935	- 152.6
164.439	56.446	-13.6	10	-13.3005	- 133.2
172.475	56.127	-13.9	8	-13.7135	- 110.2
178.568	55.608	-14.4	6	-14.1325	- 86.1
183.933	55.117	-14.9	5	-14.6375	- 78.5
188.864	54.829	-15.2	5	-15.027	- 74.1
195.028	54.704	-15.3	6	-15.2335	- 93.9
199.959	54.828	-15.2	5	-15.234	- 75.1
205.336	54.516	-15.5	5	-15.328	- 82.4
211.095	53.792	-16.2	6	-15.846	- 91.3
215.528	53.916	-16.1	4	-16.146	- 71.6
222.636	53.985	-16.0	7	-16.0495	- 114.1
227.02	51.865	-18.1	4	-17.075	- 74.9
234.925	52.444	-17.6	8	-17.8455	- 141.1
240.254	52.188	-17.8	5	-17.684	- 94.2
252.038	51.524	-18.5	12	-18.144	- 213.8
262.383	50.994	-19.0	10	-18.741	- 193.9
281.96	50.174	-19.8	20	-19.416	- 380.1
292.743	50.146	-19.9	11	-19.84	- 213.9
304.037	49.493	-20.5	11	-20.1805	- 227.9
327.805	47.704	-22.3	24	-21.4015	- 508.7
340.816	46.932	-23.1	13	-22.682	- 295.1
349.633	46.444	-23.6	9	-23.312	- 205.5
352.349	46.919	-23.1	3	-23.3185	- 63.3
358.345	47.259	-22.7	6	-22.911	- 137.4
365.491	46.428	-23.6	7	-23.1565	- 165.5
405.845	45.85	-24.2	40	-23.861	- 962.9
412.137	45.877	-24.1	6	-24.1365	- 151.9
418.75	45.772	-24.2	7	-24.1755	- 159.9
425.514	46.016	-24.0	7	-24.106	- 163.1
437.098	45.226	-24.8	12	-24.379	- 282.4
453.141	44.026	-26.0	16	-25.374	- 407.1
469.026	42.777	-27.2	16	-26.5985	- 422.5
482.549	42.585	-27.4	14	-27.319	- 369.4
490.849	42.137	-27.9	8	-27.639	- 229.4
499.152	41.256	-28.7	8	-28.3035	- 235.0
510.3	41.259	-28.7	11	-28.7425	- 320.4
522.41	41.227	-28.8	12	-28.757	- 348.2
533.487	41.549	-28.5	11	-28.612	- 316.9
547.102	39.719	-30.3	14	-29.366	- 399.8
552.494	39.162	-30.8	5	-30.5595	- 164.8
558.732	38.708	-31.3	6	-31.065	- 193.8
567.824	37.85	-32.2	9	-31.721	- 288.4
582.046	36.974	-33.0	14	-32.588	- 463.5
593.162	36.549	-33.5	11	-33.2385	- 369.5
608.458	35.422	-34.6	15	-34.0145	- 520.3
621.167	34.831	-35.2	13	-34.8735	- 443.2
627.134	34.242	-35.8	6	-35.4635	- 211.6
634.011	33.967	-36.0	7	-35.8955	- 246.9
642.088	33.581	-36.4	8	-36.226	- 292.6
650.968	33.404	-36.6	9	-36.5075	- 324.2
656.418	32.66	-37.3	5	-36.968	- 201.5
661.871	31.754	-38.2	5	-37.793	- 206.1
669.82	31.472	-38.5	8	-38.387	- 305.1
679.14	31.778	-38.2	9	-38.375	- 357.7
682.757	32.639	-37.4	4	-37.7915	- 136.7

690.922	32.251	-37.7	8	-37.555	-	306.6
			L= 691		A= -	14,666.0

Slope: $S_c = 2A/L^2$ = - 0.061

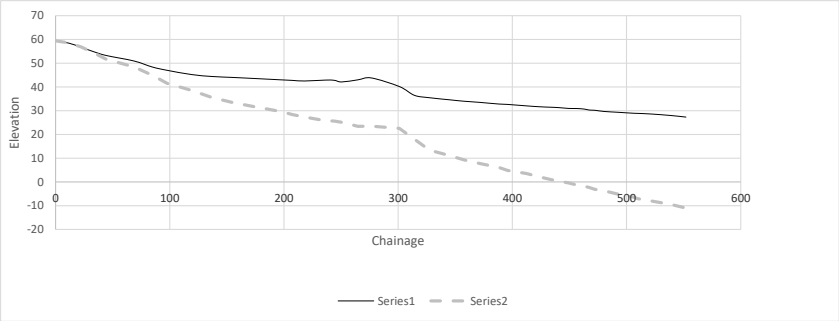
Time of Concentration Calculation

where: $tc = 0.14\ C\ L^{0.66}\ (CN/(200-CN))^{-0.55}\ S_c^{-0.30}$

0.8		C = Channelisation Factor
0.69	km	L = Catchment Length
82		CN = Weighted SCS Curve Number for Catchment
- 0.061		Sc = Catchment Slope
15	min	t_c = Time of Concentration

Cat2 to End of Gulley Channel

Slope Calculation : Equivalent area method



x	Elevation	h	Del X	Ave h	Del A
(m)	(m)	(m)	(m)	(m)	(m^2)
0	59.397	0.0	0	0	-
11.681	58.428	-1.0	12	-0.4845	- 5.7
22.255	56.71	-2.7	11	-1.828	- 19.3
33.415	54.82	-4.6	11	-3.632	- 40.5
44.1	53.259	-6.1	11	-5.3575	- 57.2
68.839	50.897	-8.5	25	-7.319	- 181.1
84.713	48.384	-11.0	16	-9.7565	- 154.9
97.735	46.988	-12.4	13	-11.711	- 152.5
118.973	45.223	-14.2	21	-13.2915	- 282.3
136.855	44.399	-15.0	18	-14.586	- 260.8
154.684	44.01	-15.4	18	-15.1925	- 270.9
172.972	43.573	-15.8	18	-15.6055	- 285.4
197.472	42.988	-16.4	25	-16.1165	- 394.9
207.528	42.745	-16.7	10	-16.5305	- 166.2
218.023	42.494	-16.9	10	-16.7775	- 176.1
236.382	42.883	-16.5	18	-16.7085	- 306.8
243.973	42.793	-16.6	8	-16.559	- 125.7
250.524	42.091	-17.3	7	-16.955	- 111.1
264.781	42.997	-16.4	14	-16.853	- 240.3
276.439	43.788	-15.6	12	-16.0045	- 186.6
301.037	40.158	-19.2	25	-17.424	- 428.6
314.296	36.45	-22.9	13	-21.093	- 279.7
327.565	35.45	-23.9	13	-23.447	- 311.1
345.465	34.553	-24.8	18	-24.3955	- 436.7
357.108	33.999	-25.4	12	-25.121	- 292.5
371.23	33.502	-25.9	14	-25.6465	- 362.2
388.011	32.806	-26.6	17	-26.243	- 440.4
395.812	32.634	-26.8	8	-26.677	- 208.1
412.215	32.026	-27.4	16	-27.067	- 444.0
423.872	31.647	-27.8	12	-27.5605	- 321.3
433.139	31.458	-27.9	9	-27.8445	- 258.0
440.599	31.293	-28.1	7	-28.0215	- 209.0
449.401	30.946	-28.5	9	-28.2775	- 248.9
456.588	30.905	-28.5	7	-28.4715	- 204.6
462.962	30.668	-28.7	6	-28.6105	- 182.4
467.512	30.251	-29.1	5	-28.9375	- 131.7
472.022	30.172	-29.2	5	-29.1855	- 131.6
480.308	29.673	-29.7	8	-29.4745	- 244.2
492.082	29.338	-30.1	12	-29.8915	- 351.9
505.2	28.942	-30.5	13	-30.257	- 396.9
510.159	28.849	-30.5	5	-30.5015	- 151.3
521.687	28.59	-30.8	12	-30.6775	- 353.7
538.561	27.975	-31.4	17	-31.1145	- 525.0
551.981	27.304	-32.1	13	-31.7575	- 426.2
		L=	552	A=	- 10,758.0

Slope: $S_c = 2A/L^2$ = - 0.071

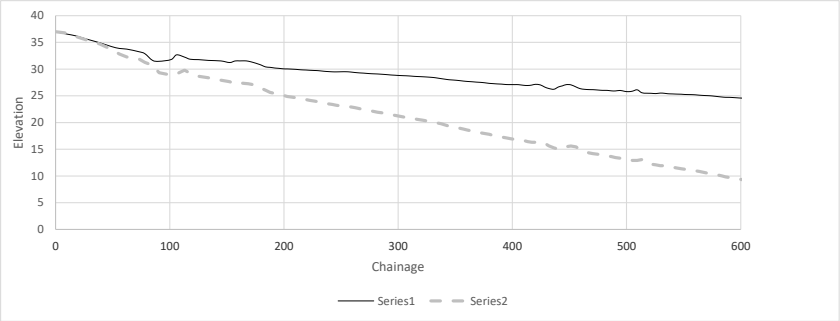
Time of Concentration Calculation

where: $tc = 0.14\ C\ L^{0.66}\ (CN/(200-CN))^{-0.55}\ S_c^{-0.30}$

0.8		C = Channelisation Factor
0.55	km	L = Catchment Length
81		CN = Weighted SCS Curve Number for Catchment
- 0.071		Sc = Catchment Slope
12	min	t_c = Time of Concentration

P2 Inflow Channel

Slope Calculation : Equivalent area method



x	Elevation	h	Del X	Ave h	Del A
(m)	(m)	(m)	(m)	(m)	(m^2)
0	37	0.0	0	0	-
10.213	36.54	-0.5	10	-0.2285	- 2.3
17.872	36.22	-0.8	8	-0.621	- 4.8
25.723	35.70	-1.3	8	-1.041	- 8.2
38.538	34.94	-2.1	13	-1.677	- 21.5
48.83	34.23	-2.8	10	-2.4135	- 24.8
55.86	33.87	-3.1	7	-2.951	- 20.7
62.32	33.74	-3.3	6	-3.1945	- 20.6
73.018	33.26	-3.7	11	-3.501	- 37.5
78.147	32.89	-4.1	5	-3.9265	- 20.1
84.817	31.65	-5.4	7	-4.7305	- 31.6
90.602	31.46	-5.5	6	-5.445	- 31.5
101.189	31.79	-5.2	11	-5.373	- 56.9
105.961	32.67	-4.3	5	-4.77	- 22.8
112.92	32.25	-4.8	7	-4.542	- 31.6
117.839	31.85	-5.2	5	-4.9535	- 24.4
125.141	31.78	-5.2	7	-5.1885	- 37.9
133.982	31.63	-5.4	9	-5.2975	- 46.8
144.764	31.53	-5.5	11	-5.421	- 58.4
152.433	31.23	-5.8	8	-5.6185	- 43.1
157.181	31.53	-5.5	5	-5.62	- 26.7
161.202	31.54	-5.5	4	-5.469	- 22.0
165.264	31.55	-5.4	4	-5.4565	- 22.2
168.728	31.48	-5.5	3	-5.4835	- 19.0
173.347	31.23	-5.8	5	-5.644	- 26.1
177.12	30.98	-6.0	4	-5.8945	- 22.2
180.326	30.73	-6.3	3	-6.144	- 19.7
183.871	30.41	-6.6	4	-6.4285	- 22.8
187.769	30.34	-6.7	4	-6.6265	- 25.8
191.971	30.21	-6.8	4	-6.729	- 28.3
195.211	30.15	-6.9	3	-6.822	- 22.1
199.676	30.05	-7.0	4	-6.9	- 30.8
202.772	30.04	-7.0	3	-6.9565	- 21.5
207.119	29.99	-7.0	4	-6.985	- 30.4
210.872	29.95	-7.1	4	-7.0295	- 26.4
214.75	29.87	-7.1	4	-7.09	- 27.5
218.998	29.83	-7.2	4	-7.148	- 30.4
222.538	29.79	-7.2	4	-7.191	- 25.5
226.469	29.75	-7.3	4	-7.234	- 28.4
229.773	29.71	-7.3	3	-7.27	- 24.0
235.173	29.60	-7.4	5	-7.345	- 39.7
238.377	29.55	-7.5	3	-7.4295	- 23.8
242.36	29.49	-7.5	4	-7.481	- 29.8
245.9	29.48	-7.5	4	-7.512	- 26.6
250.148	29.503	-7.5	4	-7.507	- 31.9
254.395	29.511	-7.5	4	-7.493	- 31.8
257.935	29.464	-7.5	4	-7.5125	- 26.6
262.175	29.367	-7.6	4	-7.5845	- 32.2
266.225	29.29	-7.7	4	-7.6715	- 31.1
269.634	29.248	-7.8	3	-7.731	- 26.4
274.218	29.171	-7.8	5	-7.7905	- 35.7
278.466	29.119	-7.9	4	-7.855	- 33.4
282.005	29.09	-7.9	4	-7.8955	- 27.9
285.545	29.039	-8.0	4	-7.9355	- 28.1
289.085	28.987	-8.0	4	-7.987	- 28.3
293.333	28.908	-8.1	4	-8.0525	- 34.2
296.872	28.86	-8.1	4	-8.116	- 28.7
300.892	28.806	-8.2	4	-8.167	- 32.8
304.66	28.773	-8.2	4	-8.2105	- 30.9
308.907	28.733	-8.3	4	-8.247	- 35.0
313.155	28.661	-8.3	4	-8.303	- 35.3
316.695	28.618	-8.4	4	-8.3605	- 29.6
321.731	28.568	-8.4	5	-8.407	- 42.3
325.628	28.515	-8.5	4	-8.4585	- 33.0
329.173	28.461	-8.5	4	-8.512	- 30.2
332.378	28.39	-8.6	3	-8.5745	- 27.5
337.225	28.232	-8.8	5	-8.689	- 42.1
341.081	28.11	-8.9	4	-8.829	- 34.0
344.529	28.014	-9.0	3	-8.938	- 30.8
348.552	27.953	-9.0	4	-9.0165	- 36.3

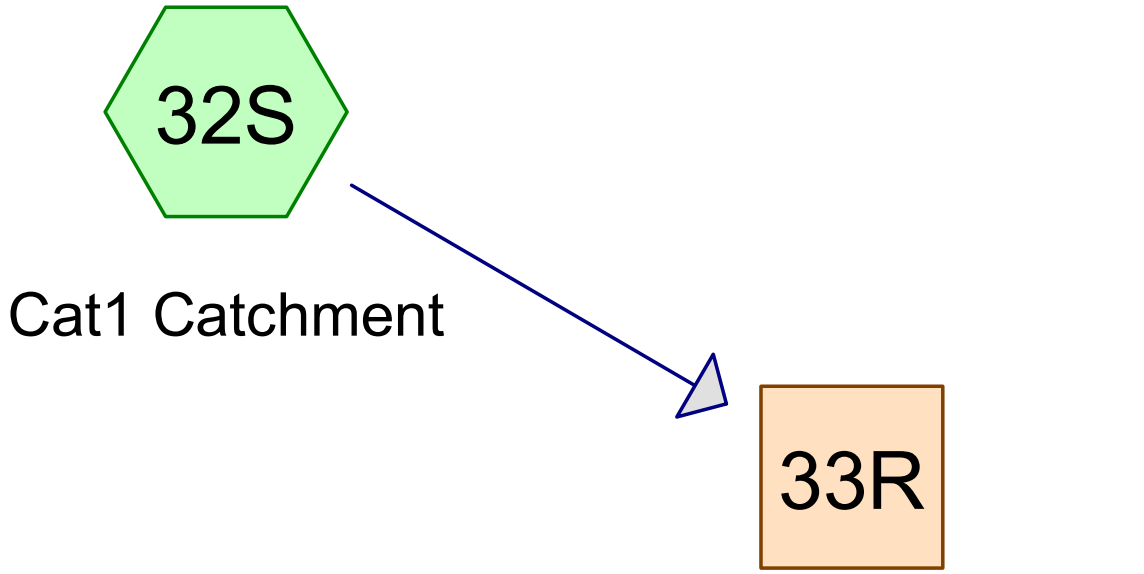
352.989	27.869	-9.1	4	-9.089	-	40.3
357.048	27.762	-9.2	4	-9.1845	-	37.3
360.588	27.695	-9.3	4	-9.2715	-	32.8
364.835	27.632	-9.4	4	-9.3365	-	39.7
368.375	27.568	-9.4	4	-9.4	-	33.3
371.915	27.523	-9.5	4	-9.4545	-	33.5
375.454	27.454	-9.5	4	-9.5115	-	33.7
379.702	27.335	-9.7	4	-9.6055	-	40.8
383.242	27.284	-9.7	4	-9.6905	-	34.3
386.782	27.226	-9.8	4	-9.745	-	34.5
390.431	27.192	-9.8	4	-9.791	-	35.7
394.666	27.112	-9.9	4	-9.848	-	41.7
398.531	27.102	-9.9	4	-9.893	-	38.2
402.108	27.1	-9.9	4	-9.899	-	35.4
405.282	27.093	-9.9	3	-9.9035	-	31.4
409.551	26.977	-10.0	4	-9.965	-	42.5
413.382	26.933	-10.1	4	-10.045	-	38.5
416.993	27.013	-10.0	4	-10.027	-	36.2
420.132	27.154	-9.8	3	-9.9165	-	31.1
424.435	27.047	-10.0	4	-9.8995	-	42.6
428.233	26.651	-10.3	4	-10.151	-	38.6
431.878	26.374	-10.6	4	-10.4875	-	38.2
436.333	26.228	-10.8	4	-10.699	-	47.7
440.383	26.664	-10.3	4	-10.554	-	42.7
443.785	26.865	-10.1	3	-10.2355	-	34.8
447.134	27.094	-9.9	3	-10.0205	-	33.6
451.228	27.058	-9.9	4	-9.924	-	40.6
455.693	26.662	-10.3	4	-10.14	-	45.3
459.284	26.348	-10.7	4	-10.495	-	37.7
463.136	26.219	-10.8	4	-10.7165	-	41.3
467.385	26.163	-10.8	4	-10.809	-	45.9
470.578	26.153	-10.8	3	-10.842	-	34.6
475.275	26.082	-10.9	5	-10.8825	-	51.1
478.815	26.024	-11.0	4	-10.947	-	38.8
483.062	26.019	-11.0	4	-10.9785	-	46.6
486.602	25.935	-11.1	4	-11.023	-	39.0
490.142	25.914	-11.1	4	-11.0755	-	39.2
494.386	26.008	-11.0	4	-11.039	-	46.8
498.436	25.837	-11.2	4	-11.0775	-	44.9
501.836	25.781	-11.2	3	-11.191	-	38.0
505.186	25.878	-11.1	3	-11.1705	-	37.4
509.278	26.126	-10.9	4	-10.998	-	45.0
513.287	25.58	-11.4	4	-11.147	-	44.7
517.337	25.492	-11.5	4	-11.464	-	46.4
521.387	25.475	-11.5	4	-11.5165	-	46.6
525.651	25.422	-11.6	4	-11.5515	-	49.3
529.488	25.516	-11.5	4	-11.531	-	44.2
533.094	25.477	-11.5	4	-11.5035	-	41.5
536.238	25.393	-11.6	3	-11.565	-	36.4
540.406	25.356	-11.6	4	-11.6255	-	48.5
544.338	25.32	-11.7	4	-11.662	-	45.9
547.978	25.302	-11.7	4	-11.689	-	42.5
551.089	25.251	-11.7	3	-11.7235	-	36.5
556.689	25.227	-11.8	6	-11.761	-	65.9
560.229	25.191	-11.8	4	-11.791	-	41.7
563.768	25.122	-11.9	4	-11.8435	-	41.9
568.016	25.063	-11.9	4	-11.9075	-	50.6
571.556	25.031	-12.0	4	-11.953	-	42.3
575.095	24.976	-12.0	4	-11.9965	-	42.5
578.635	24.89	-12.1	4	-12.067	-	42.7
583.49	24.779	-12.2	5	-12.1655	-	59.1
586.679	24.721	-12.3	3	-12.25	-	39.1
590.241	24.718	-12.3	4	-12.2805	-	43.7
594.121	24.667	-12.3	4	-12.3075	-	47.8
598.509	24.605	-12.4	4	-12.364	-	54.3
603.509	24.54	-12.5	5	-12.4275	-	62.1
608.509	24.438	-12.6	5	-12.511	-	62.6
613.555	24.356	-12.6	5	-12.603	-	63.6
626.879	24.097	-12.9	13	-12.7735	-	170.2
635.521	23.887	-13.1	9	-13.008	-	112.4
644.43	23.589	-13.4	9	-13.262	-	118.2
		L=	644	A=	-	5,287.5

Slope: $S_c = 2A/L^2$ = - 0.025

Time of Concentration Calculation

where: $tc = 0.14\ C\ L^{0.66}\ (CN/(200-CN))^{-0.55}\ S_c^{-0.30}$

0.8		C = Channelisation Factor
0.64	km	L = Catchment Length
82		CN = Weighted SCS Curve Number for Catchment
- 0.025		Sc = Catchment Slope
18	min	t_c = Time of Concentration



Subcat Reach Pond Link

Routing Diagram for Channel & Spillway Sizing
Prepared by CGW Ltd, Printed 13/02/2024

Summary for Subcatchment 32S: Cat1 Catchment

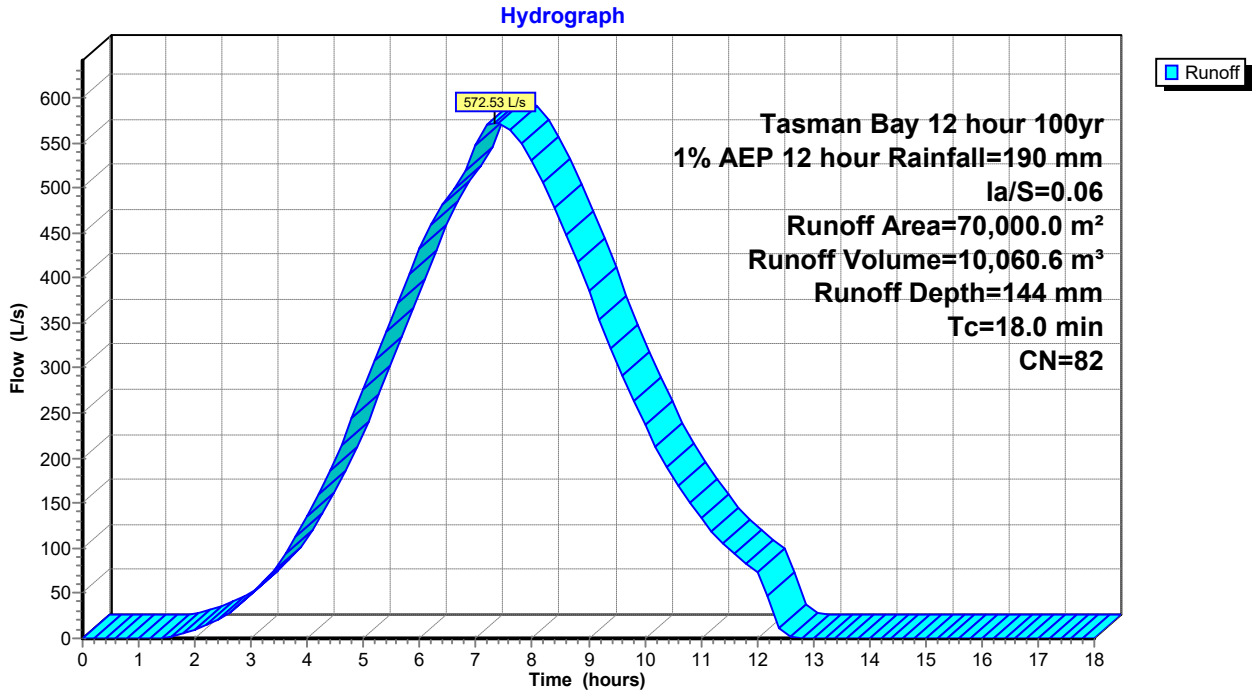
Runoff = 572.53 L/s @ 7.35 hrs, Volume= 10,060.6 m³, Depth= 144 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Tasman Bay 12 hour 100yr 1% AEP 12 hour Rainfall=190 mm, Ia/S=0.06

	Area (m²)	CN	Description
*	46,800.0	74	
*	23,200.0	98	
	70,000.0	82	Weighted Average
	46,800.0		66.86% Pervious Area
	23,200.0		33.14% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
18.0					**Direct Entry,**

Subcatchment 32S: Cat1 Catchment



Summary for Reach 33R: Cat1 / Cat2 Channels

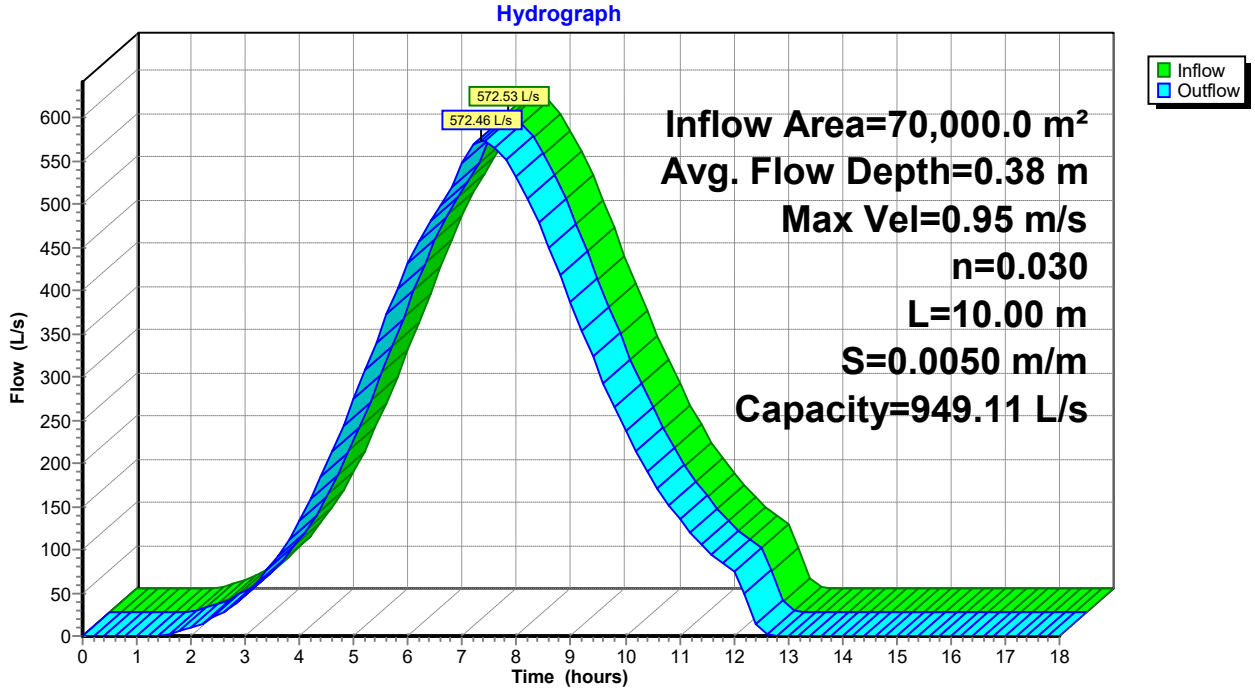
Inflow Area = 70,000.0 m², 33.14% Impervious, Inflow Depth = 144 mm for 1% AEP 12 hour event
Inflow = 572.53 L/s @ 7.35 hrs, Volume= 10,060.6 m³
Outflow = 572.46 L/s @ 7.35 hrs, Volume= 10,060.6 m³, Atten= 0%, Lag= 0.5 min

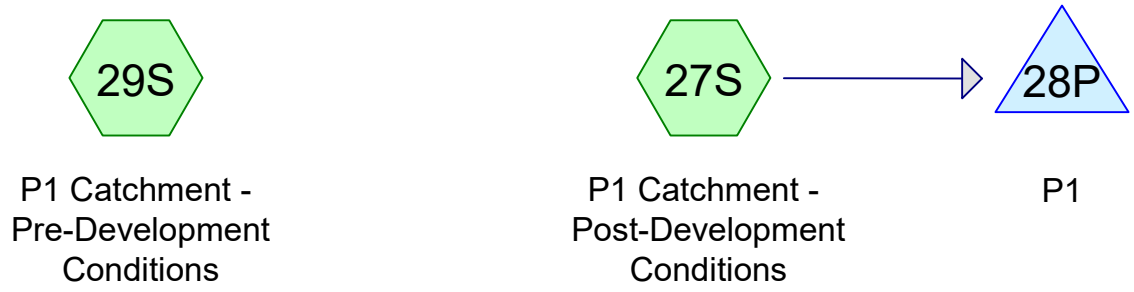
Routing by Stor-Ind+Trans method, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Max. Velocity= 0.95 m/s, Min. Travel Time= 0.2 min
Avg. Velocity = 0.63 m/s, Avg. Travel Time= 0.3 min

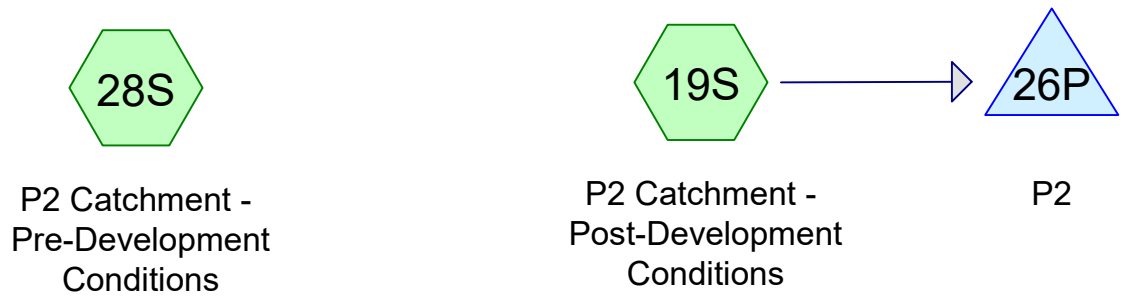
Peak Storage= 6.1 m³ @ 7.35 hrs
Average Depth at Peak Storage= 0.38 m
Bank-Full Depth= 0.50 m Flow Area= 0.88 m², Capacity= 949.11 L/s

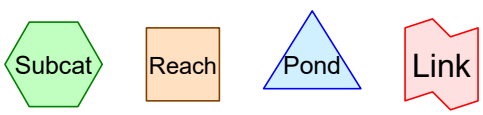
1.00 m x 0.50 m deep channel, n= 0.030
Side Slope Z-value= 1.5 m/m Top Width= 2.50 m
Length= 10.00 m Slope= 0.0050 m/m
Inlet Invert= 0.000 m, Outlet Invert= -0.050 m

Reach 33R: Cat1 / Cat2 Channels









Routing Diagram for Pond Sizings 12h storm
Prepared by CGW Ltd, Printed 12/02/2024

Summary for Subcatchment 19S: P2 Catchment - Post-Development Conditions

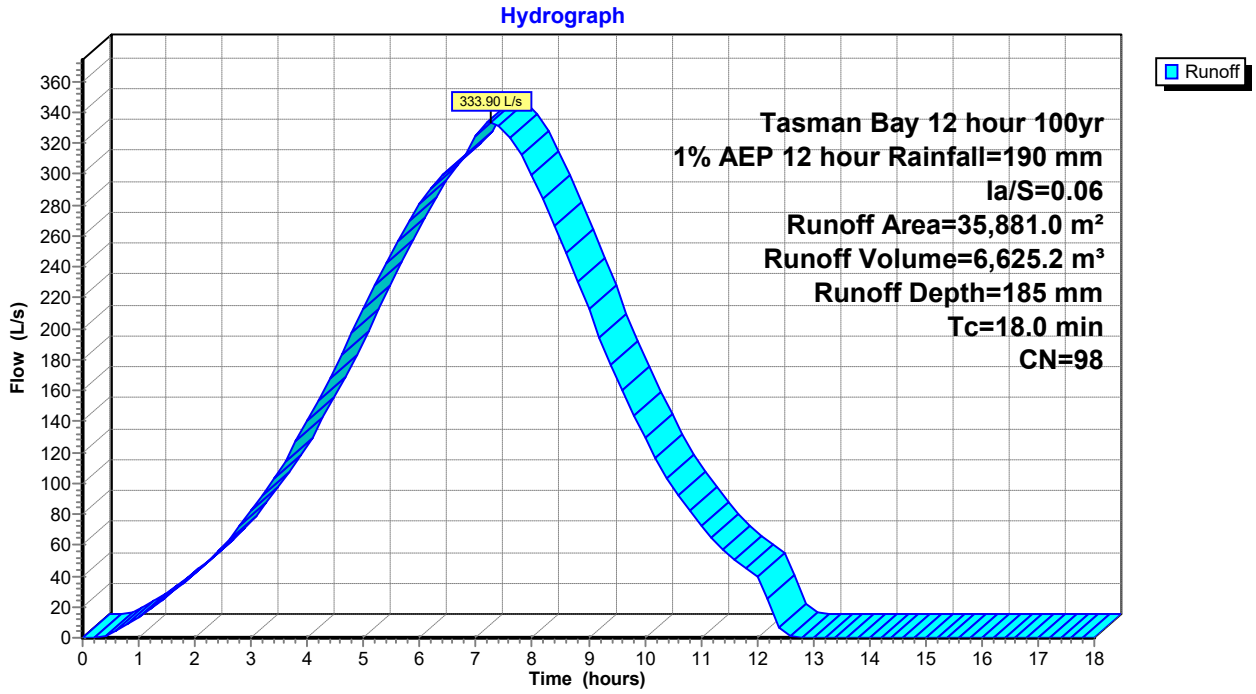
Runoff = 333.90 L/s @ 7.26 hrs, Volume= 6,625.2 m³, Depth= 185 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Tasman Bay 12 hour 100yr 1% AEP 12 hour Rainfall=190 mm, Ia/S=0.06

	Area (m²)	CN	Description
*	35,881.0	98	Total Developed Area - Impermeable
	35,881.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
18.0					**Direct Entry,**

Subcatchment 19S: P2 Catchment - Post-Development Conditions



Summary for Subcatchment 27S: P1 Catchment - Post-Development Conditions

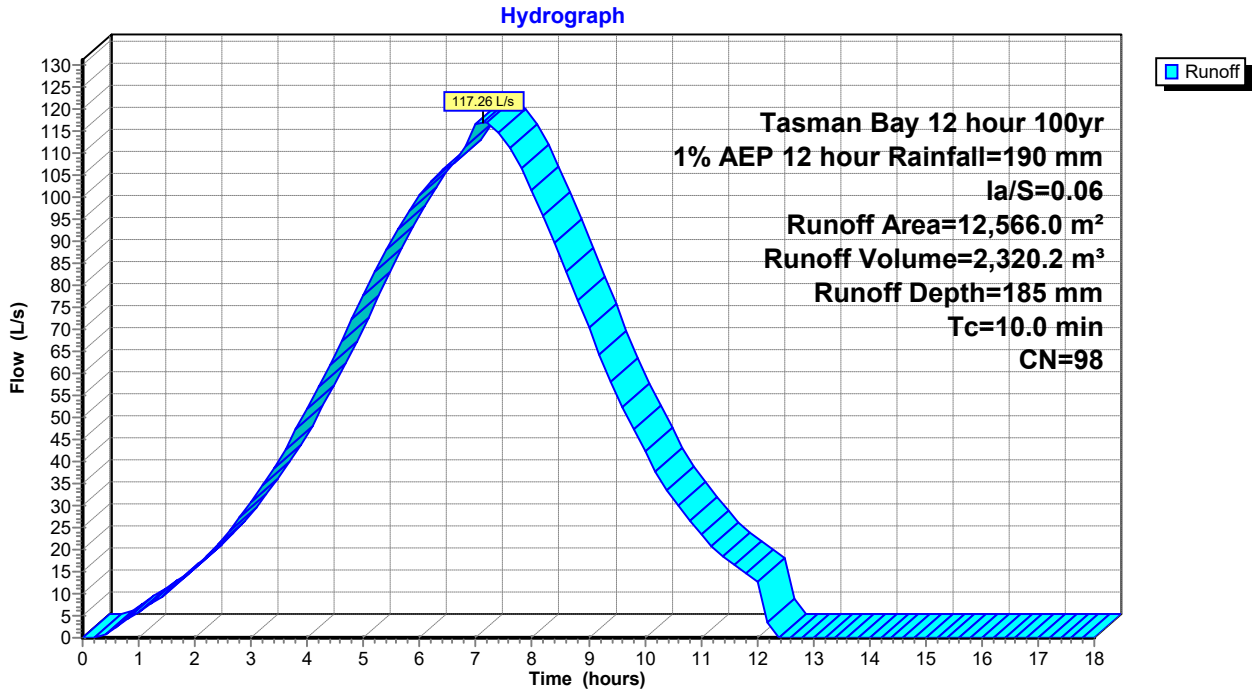
Runoff = 117.26 L/s @ 7.13 hrs, Volume= 2,320.2 m³, Depth= 185 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Tasman Bay 12 hour 100yr 1% AEP 12 hour Rainfall=190 mm, Ia/S=0.06

	Area (m²)	CN	Description
*	12,566.0	98	Total Developed Area - Impermeable
	12,566.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry,**

Subcatchment 27S: P1 Catchment - Post-Development Conditions



Summary for Subcatchment 28S: P2 Catchment - Pre-Development Conditions

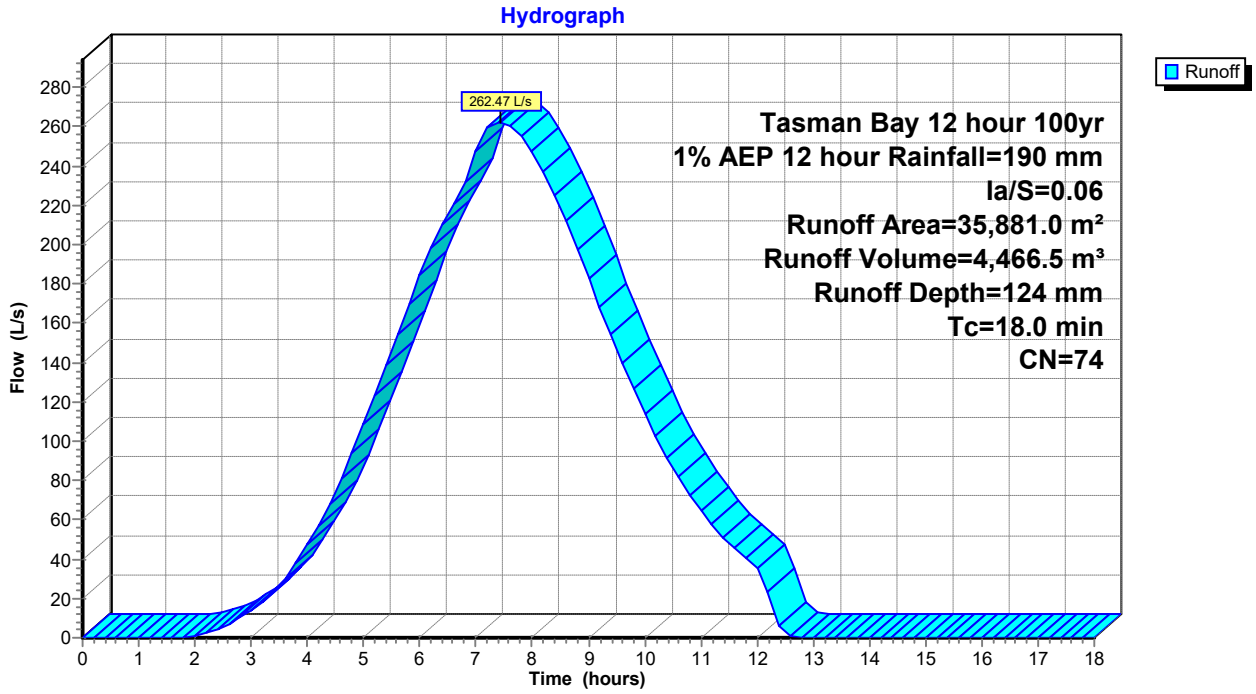
Runoff = 262.47 L/s @ 7.43 hrs, Volume= 4,466.5 m³, Depth= 124 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Tasman Bay 12 hour 100yr 1% AEP 12 hour Rainfall=190 mm, Ia/S=0.06

	Area (m²)	CN	Description
*	35,881.0	74	Total Developed Area - Grassed Conditions
	35,881.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
18.0					**Direct Entry,**

Subcatchment 28S: P2 Catchment - Pre-Development Conditions



Summary for Subcatchment 29S: P1 Catchment - Pre-Development Conditions

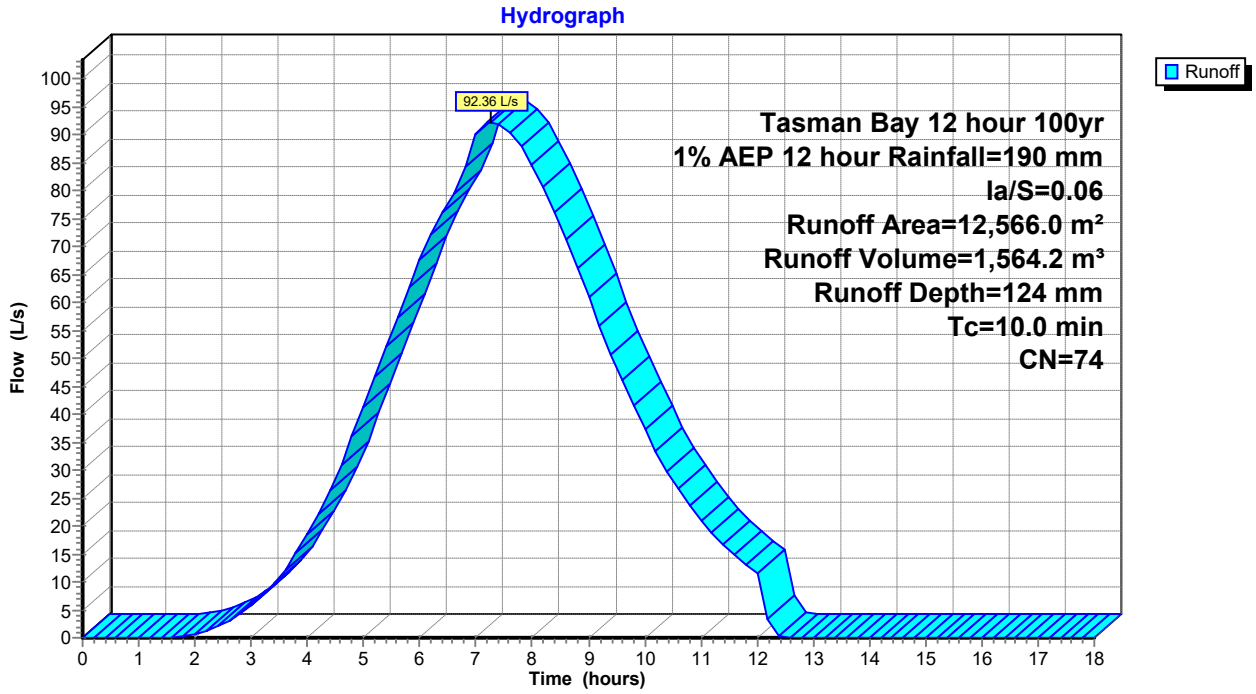
Runoff = 92.36 L/s @ 7.28 hrs, Volume= 1,564.2 m³, Depth= 124 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Tasman Bay 12 hour 100yr 1% AEP 12 hour Rainfall=190 mm, Ia/S=0.06

	Area (m²)	CN	Description
*	12,566.0	74	Total Developed Area - Grassed Conditions
	12,566.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry,**

Subcatchment 29S: P1 Catchment - Pre-Development Conditions



Summary for Pond 26P: P2

Inflow Area = 35,881.0 m²,100.00% Impervious, Inflow Depth = 185 mm for 1% AEP 12 hour event
Inflow = 333.90 L/s @ 7.26 hrs, Volume= 6,625.2 m³
Outflow = 247.30 L/s @ 8.62 hrs, Volume= 6,480.9 m³, Atten= 26%, Lag= 81.8 min
Primary = 247.30 L/s @ 8.62 hrs, Volume= 6,480.9 m³

Routing by Stor-Ind method, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Peak Elev= 0.533 m @ 8.62 hrs Surf.Area= 0.0 m² Storage= 2,313.9 m³

Plug-Flow detention time= 152.1 min calculated for 6,480.9 m³ (98% of inflow)
Center-of-Mass det. time= 145.9 min (560.3 - 414.4)

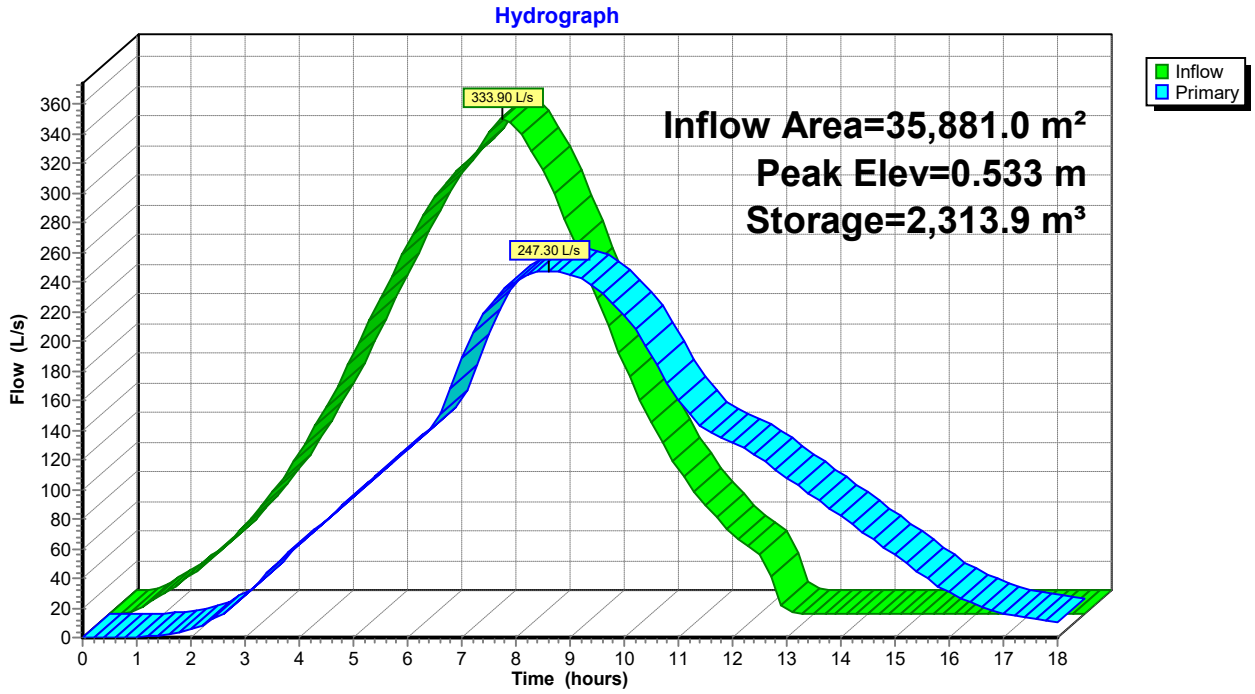
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	7,000.0 m³	**Custom Stage Data** Listed below

Elevation (meters)	Cum.Store (cubic-meters)
0.000	0.0
0.500	2,160.0
1.000	4,485.0
1.500	7,000.0

Device	Routing	Invert	Outlet Devices	
#1	Primary	0.000 m	**100 mm Vert. Orifice/Grate X 12.00**	C= 0.600
#2	Primary	0.360 m	**100 mm Vert. Orifice/Grate X 10.00**	C= 0.600

Primary OutFlow Max=247.27 L/s @ 8.62 hrs HW=0.533 m (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 174.07 L/s @ 1.85 m/s)
└─**2=Orifice/Grate** (Orifice Controls 73.20 L/s @ 0.93 m/s)

Pond 26P: P2



Summary for Pond 28P: P1

Inflow Area = 12,566.0 m²,100.00% Impervious, Inflow Depth = 185 mm for 1% AEP 12 hour event
Inflow = 117.26 L/s @ 7.13 hrs, Volume= 2,320.2 m³
Outflow = 78.74 L/s @ 8.74 hrs, Volume= 2,169.8 m³, Atten= 33%, Lag= 97.0 min
Primary = 78.74 L/s @ 8.74 hrs, Volume= 2,169.8 m³

Routing by Stor-Ind method, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Peak Elev= 0.282 m @ 8.74 hrs Surf.Area= 0.0 m² Storage= 993.1 m³

Plug-Flow detention time= 199.0 min calculated for 2,169.8 m³ (94% of inflow)
Center-of-Mass det. time= 181.8 min (588.8 - 407.0)

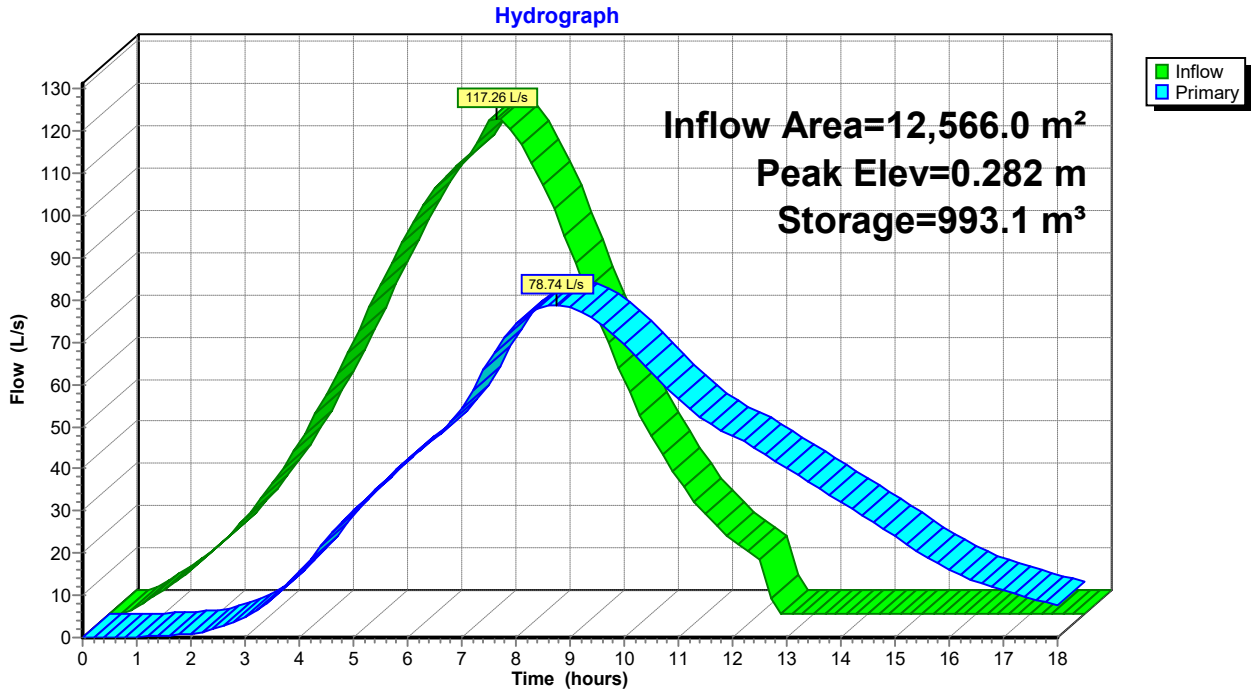
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	5,735.0 m³	**Custom Stage Data** Listed below

Elevation (meters)	Cum.Store (cubic-meters)
0.000	0.0
0.500	1,762.0
1.000	3,677.0
1.500	5,735.0

Device	Routing	Invert	Outlet Devices	
#1	Primary	0.000 m	**100 mm Vert. Orifice/Grate X 6.00**	C= 0.600
#2	Primary	0.200 m	**100 mm Vert. Orifice/Grate X 5.00**	C= 0.600

Primary OutFlow Max=78.72 L/s @ 8.74 hrs HW=0.282 m (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 60.28 L/s @ 1.28 m/s)
└**2=Orifice/Grate** (Orifice Controls 18.44 L/s @ 0.54 m/s)

Pond 28P: P1



Summary for Subcatchment 19S: P2 Catchment - Post-Development Conditions

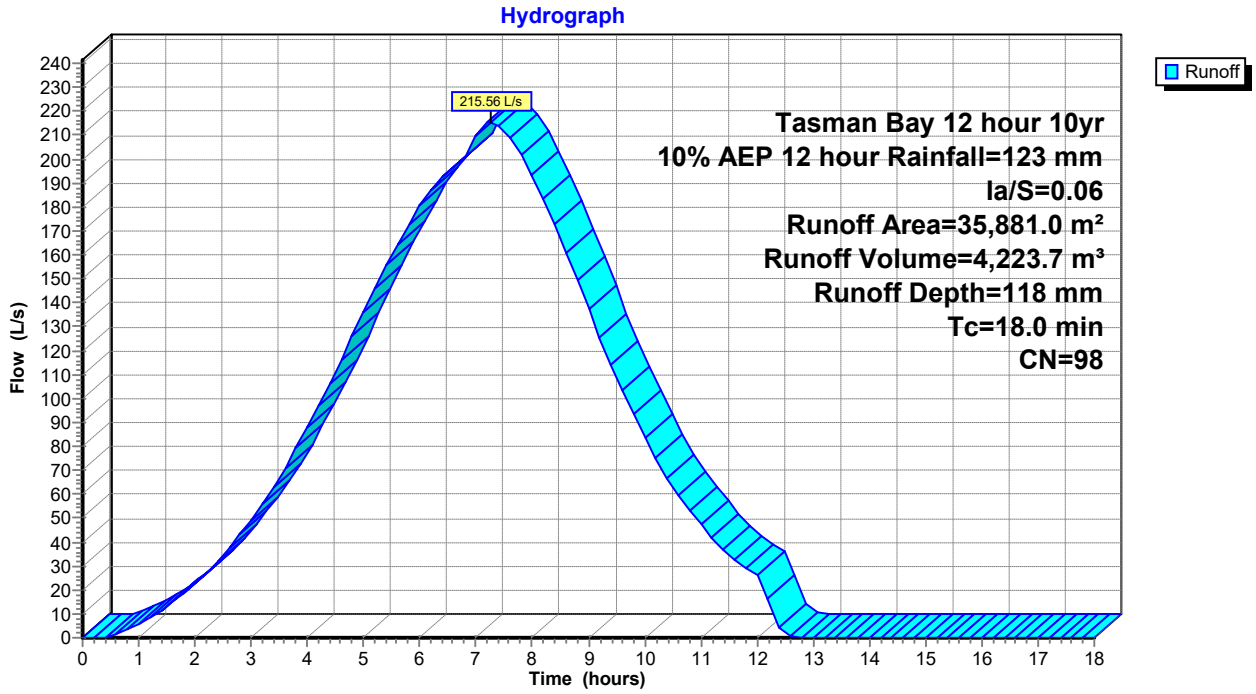
Runoff = 215.56 L/s @ 7.26 hrs, Volume= 4,223.7 m³, Depth= 118 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Tasman Bay 12 hour 10yr 10% AEP 12 hour Rainfall=123 mm, Ia/S=0.06

	Area (m²)	CN	Description
*	35,881.0	98	Total Developed Area - Impermeable
	35,881.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
18.0					**Direct Entry,**

Subcatchment 19S: P2 Catchment - Post-Development Conditions



Summary for Subcatchment 27S: P1 Catchment - Post-Development Conditions

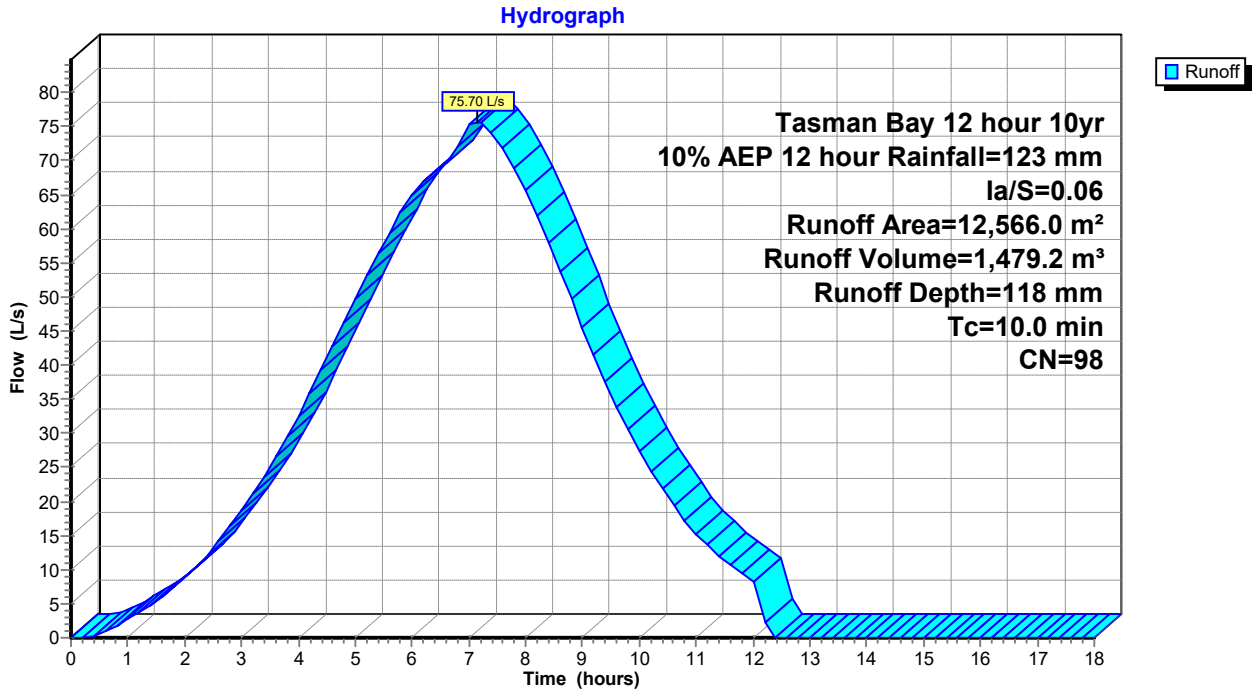
Runoff = 75.70 L/s @ 7.13 hrs, Volume= 1,479.2 m³, Depth= 118 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Tasman Bay 12 hour 10yr 10% AEP 12 hour Rainfall=123 mm, Ia/S=0.06

	Area (m²)	CN	Description
*	12,566.0	98	Total Developed Area - Impermeable
	12,566.0		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry,**

Subcatchment 27S: P1 Catchment - Post-Development Conditions



Summary for Subcatchment 28S: P2 Catchment - Pre-Development Conditions

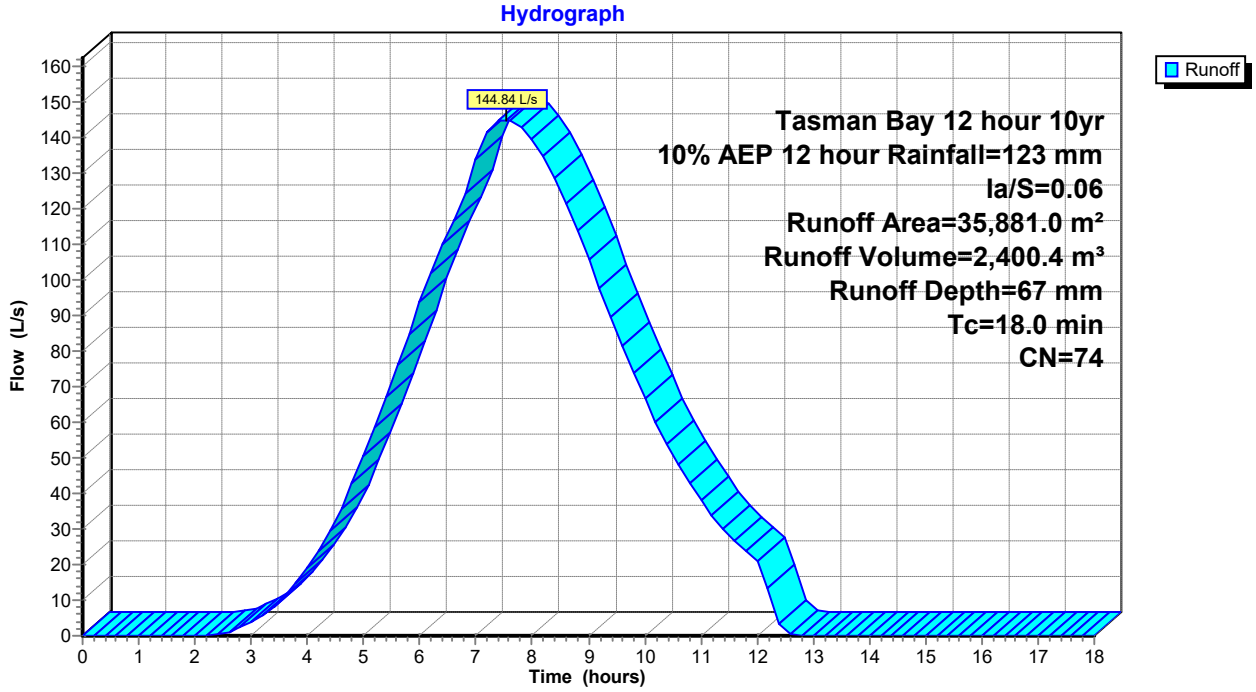
Runoff = 144.84 L/s @ 7.52 hrs, Volume= 2,400.4 m³, Depth= 67 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Tasman Bay 12 hour 10yr 10% AEP 12 hour Rainfall=123 mm, Ia/S=0.06

	Area (m²)	CN	Description
*	35,881.0	74	Total Developed Area - Grassed Conditions
	35,881.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
18.0					**Direct Entry,**

Subcatchment 28S: P2 Catchment - Pre-Development Conditions



Summary for Subcatchment 29S: P1 Catchment - Pre-Development Conditions

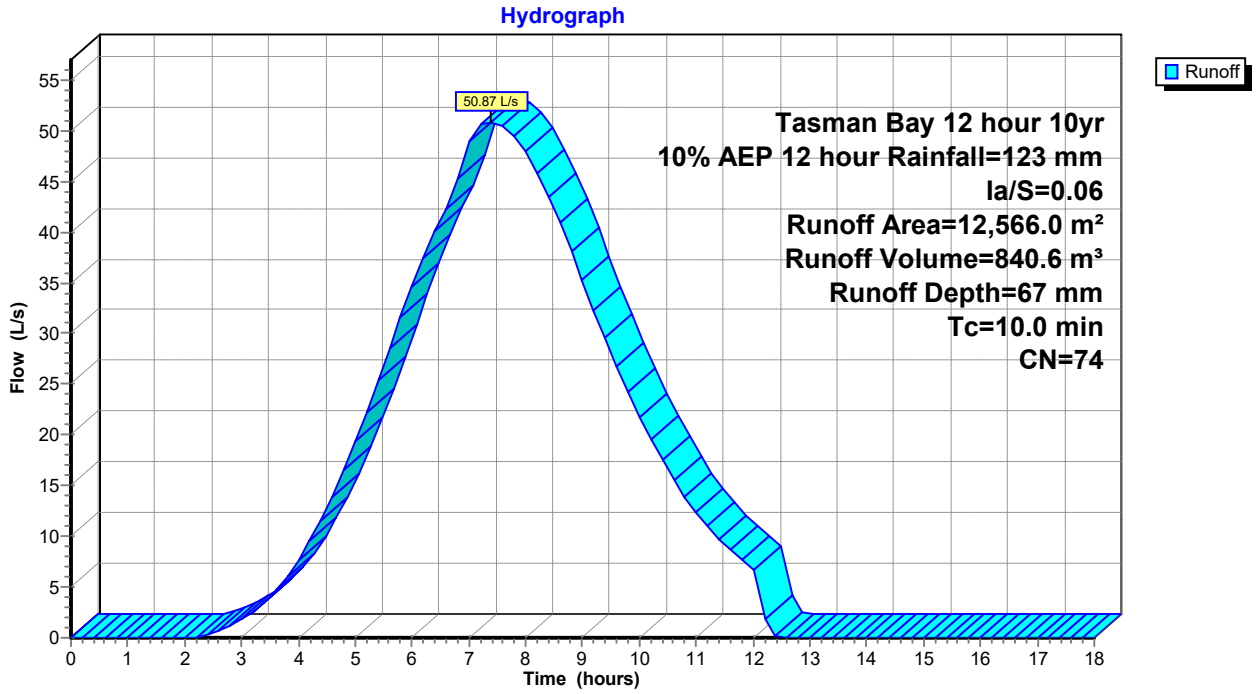
Runoff = 50.87 L/s @ 7.38 hrs, Volume= 840.6 m³, Depth= 67 mm

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Tasman Bay 12 hour 10yr 10% AEP 12 hour Rainfall=123 mm, Ia/S=0.06

	Area (m²)	CN	Description
*	12,566.0	74	Total Developed Area - Grassed Conditions
	12,566.0		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
10.0					**Direct Entry,**

Subcatchment 29S: P1 Catchment - Pre-Development Conditions



Summary for Pond 26P: P2

Inflow Area = 35,881.0 m²,100.00% Impervious, Inflow Depth = 118 mm for 10% AEP 12 hour event
Inflow = 215.56 L/s @ 7.26 hrs, Volume= 4,223.7 m³
Outflow = 138.70 L/s @ 8.98 hrs, Volume= 4,111.0 m³, Atten= 36%, Lag= 103.1 min
Primary = 138.70 L/s @ 8.98 hrs, Volume= 4,111.0 m³

Routing by Stor-Ind method, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Peak Elev= 0.357 m @ 8.98 hrs Surf.Area= 0.0 m² Storage= 1,540.8 m³

Plug-Flow detention time= 153.8 min calculated for 4,111.0 m³ (97% of inflow)
Center-of-Mass det. time= 146.3 min (564.0 - 417.6)

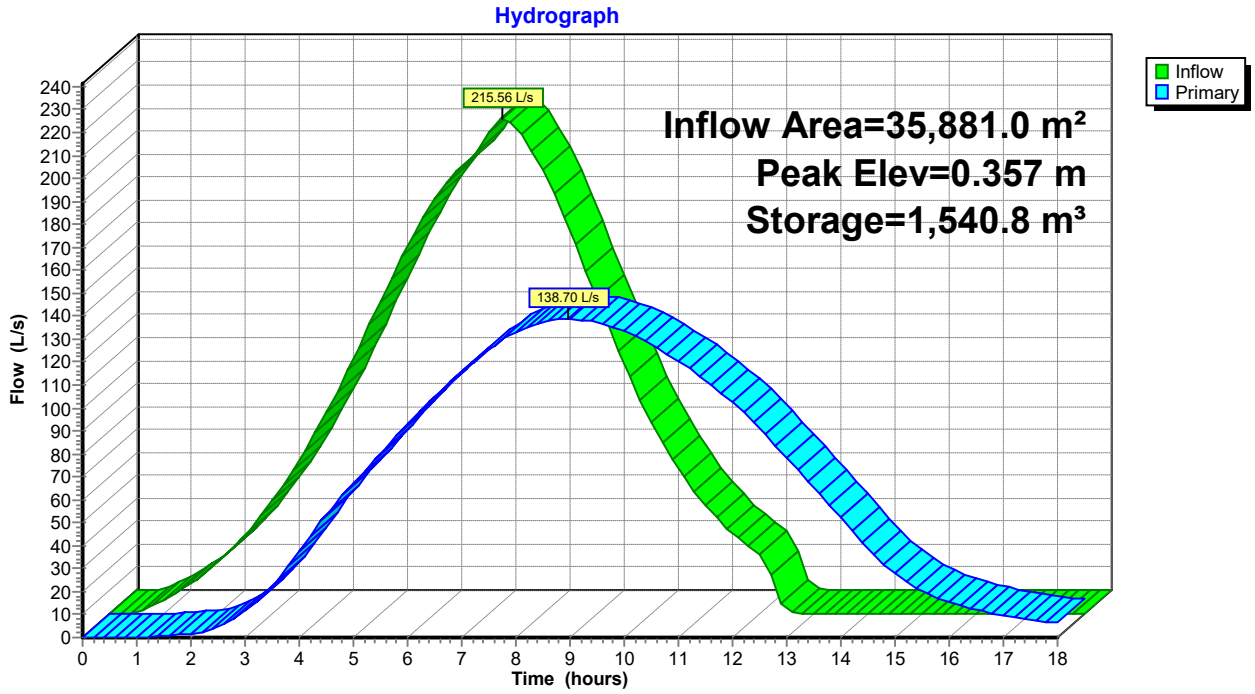
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	7,000.0 m³	**Custom Stage Data** Listed below

Elevation (meters)	Cum.Store (cubic-meters)
0.000	0.0
0.500	2,160.0
1.000	4,485.0
1.500	7,000.0

Device	Routing	Invert	Outlet Devices	
#1	Primary	0.000 m	**100 mm Vert. Orifice/Grate X 12.00**	C= 0.600
#2	Primary	0.360 m	**100 mm Vert. Orifice/Grate X 10.00**	C= 0.600

Primary OutFlow Max=138.69 L/s @ 8.98 hrs HW=0.357 m (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 138.69 L/s @ 1.47 m/s)
└─**2=Orifice/Grate** (Controls 0.00 L/s)

Pond 26P: P2



Summary for Pond 28P: P1

Inflow Area = 12,566.0 m², 100.00% Impervious, Inflow Depth = 118 mm for 10% AEP 12 hour event
Inflow = 75.70 L/s @ 7.13 hrs, Volume= 1,479.2 m³
Outflow = 45.83 L/s @ 8.99 hrs, Volume= 1,364.3 m³, Atten= 39%, Lag= 111.4 min
Primary = 45.83 L/s @ 8.99 hrs, Volume= 1,364.3 m³

Routing by Stor-Ind method, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Peak Elev= 0.184 m @ 8.99 hrs Surf.Area= 0.0 m² Storage= 648.3 m³

Plug-Flow detention time= 196.6 min calculated for 1,349.3 m³ (91% of inflow)
Center-of-Mass det. time= 179.5 min (589.8 - 410.2)

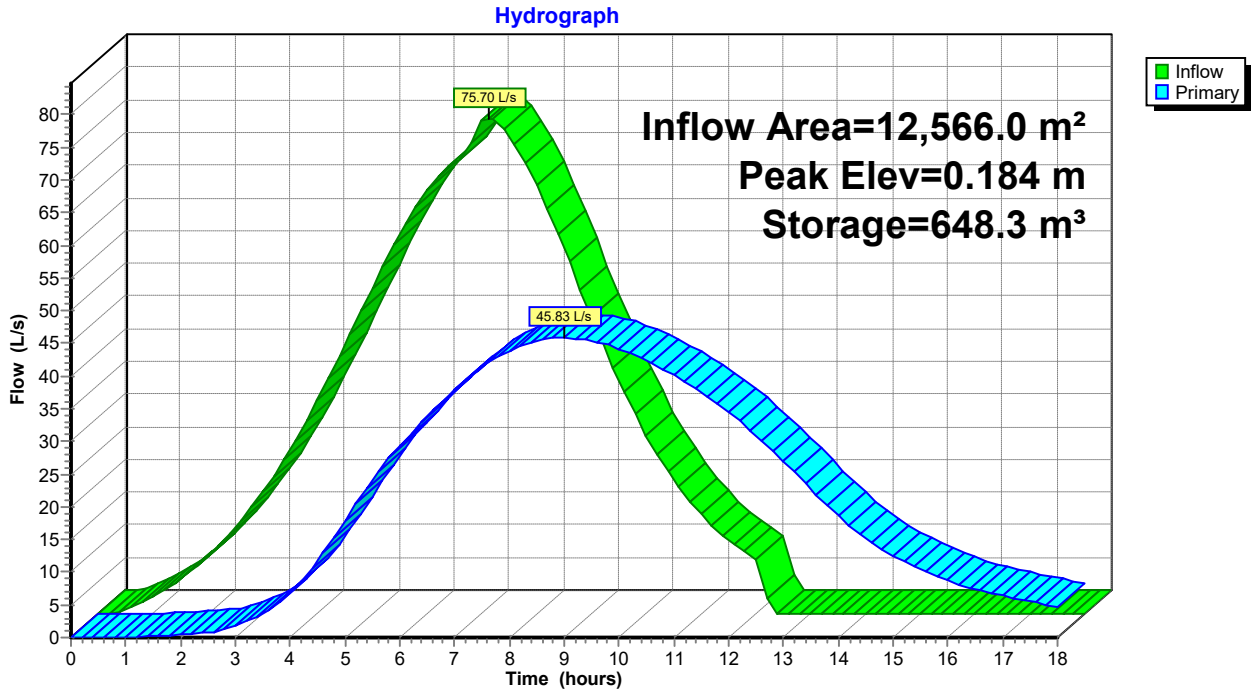
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	5,735.0 m³	**Custom Stage Data** Listed below

Elevation (meters)	Cum.Store (cubic-meters)
0.000	0.0
0.500	1,762.0
1.000	3,677.0
1.500	5,735.0

Device	Routing	Invert	Outlet Devices	
#1	Primary	0.000 m	**100 mm Vert. Orifice/Grate X 6.00**	C= 0.600
#2	Primary	0.200 m	**100 mm Vert. Orifice/Grate X 5.00**	C= 0.600

Primary OutFlow Max=45.83 L/s @ 8.99 hrs HW=0.184 m (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 45.83 L/s @ 0.97 m/s)
└─**2=Orifice/Grate** (Controls 0.00 L/s)

Pond 28P: P1



P1 Extended Detention Outlet: 24-hour release

Q=(C)(A)(2gh)^0.5	Q = orifice discharge capacity (m3/s)
	C = orifice constant (0.9), value considered conservative
	A = orifice area (m2)
	g = acceleration due to gravity9.8m/s2
	h = head on orifice (m)

Select orifice size (D)	0.072000			
Orifice Area (A)	0.004072			
Select hydraulic height	0.123000			
Flow from tank	5.690	*l/s*	20.48	m^3/h

Flow Required

Extended Det Volume	505.00	m^3		
24-hr release	5.845	*l/s*	21.04	m^3/h

P2 Extended Detention Outlet: 24-hour release

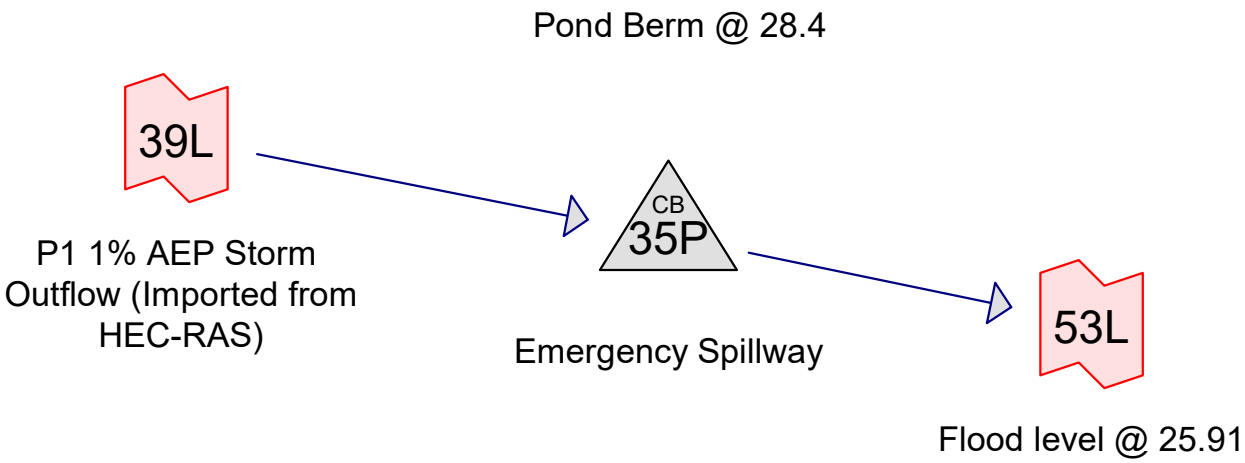
Q=(C)(A)(2gh)^0.5	Q = orifice discharge capacity (m3/s)
	C = orifice constant (0.9), value considered conservative
	A = orifice area (m2)
	g = acceleration due to gravity9.8m/s2
	h = head on orifice (m)

Select orifice size (D)	0.098000			
Orifice Area (A)	0.007543			
Select hydraulic height	0.300000			
Flow from tank	16.462	*l/s*	59.26	m^3/h

Flow Required

Extended Det Volume	1442.00	m^3		
24-hr release	16.690	*l/s*	60.08	m^3/h

P1 Spillway



Subcat Reach Pond Link

Routing Diagram for Channel & Spillway Sizing
Prepared by CGW Ltd, Printed 13/02/2024

Summary for Pond 35P: Emergency Spillway

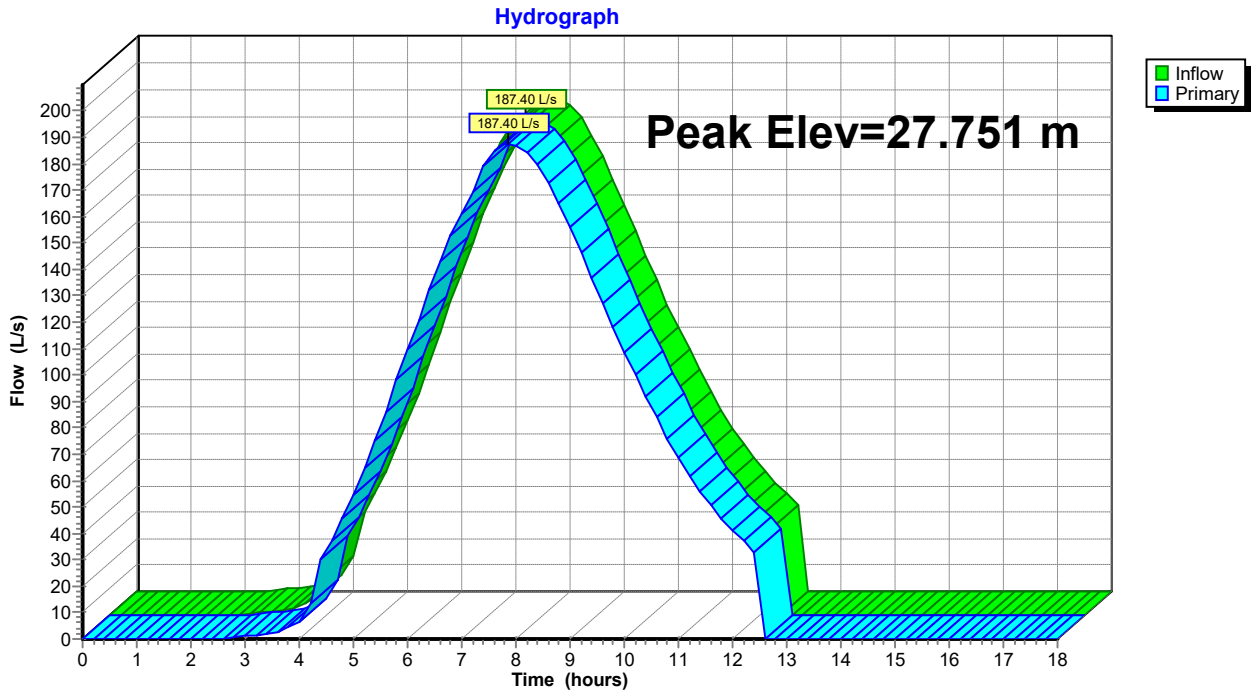
Inflow	=	187.40 L/s @	7.67 hrs, Volume=	3,232.4 m³
Outflow	=	187.40 L/s @	7.87 hrs, Volume=	3,232.4 m³, Atten= 0%, Lag= 12.0 min
Primary	=	187.40 L/s @	7.87 hrs, Volume=	3,232.4 m³

Routing by Sim-Route method, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Peak Elev= 27.751 m @ 7.87 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	27.700 m	**10.00 m long (Profile 7) Broad-Crested Rectangular Weir** Head (meters) 0.150 0.300 0.450 Coef. (Metric) 1.65 1.88 2.00

Primary OutFlow Max=187.05 L/s @ 7.87 hrs HW=27.750 m TW=25.910 m (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 187.05 L/s @ 0.37 m/s)

Pond 35P: Emergency Spillway



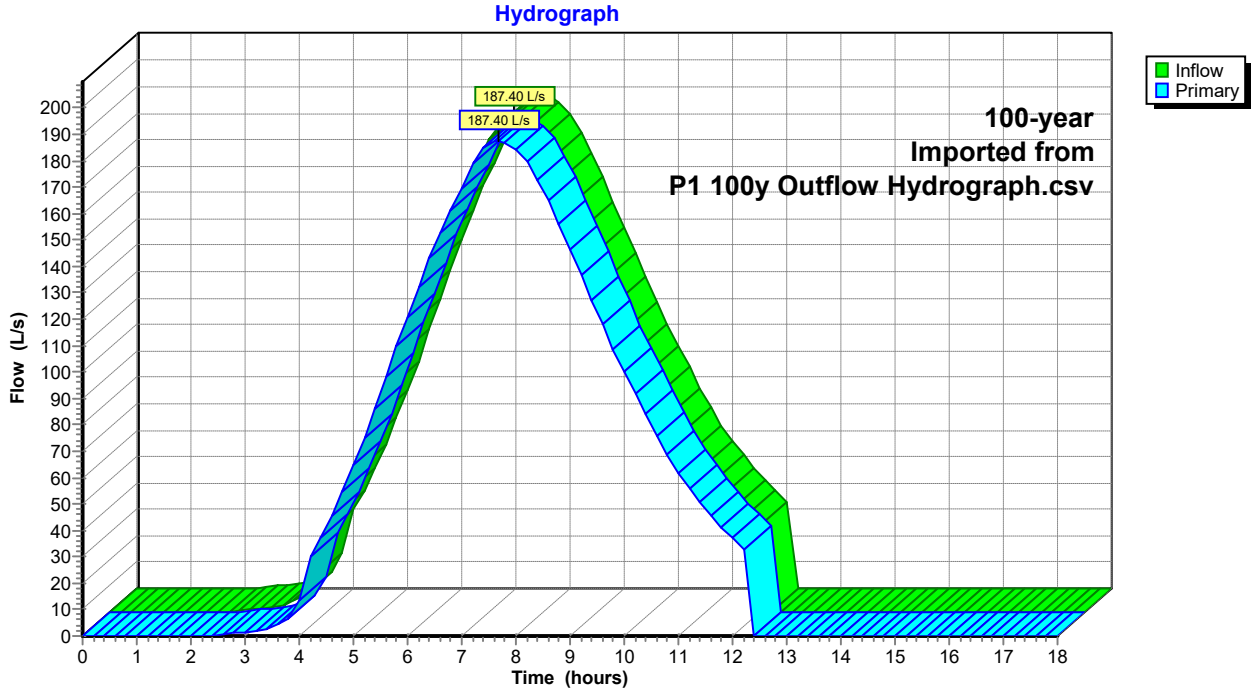
Summary for Link 39L: P1 1% AEP Storm Outflow (Imported from HEC-RAS)

Inflow = 187.40 L/s @ 7.47 hrs, Volume= 3,232.4 m³
Primary = 187.40 L/s @ 7.67 hrs, Volume= 3,232.4 m³, Atten= 0%, Lag= 12.0 min

Primary outflow = Inflow, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs

100-year Imported from P1 100y Outflow Hydrograph.csv

Link 39L: P1 1% AEP Storm Outflow (Imported from HEC-RAS)



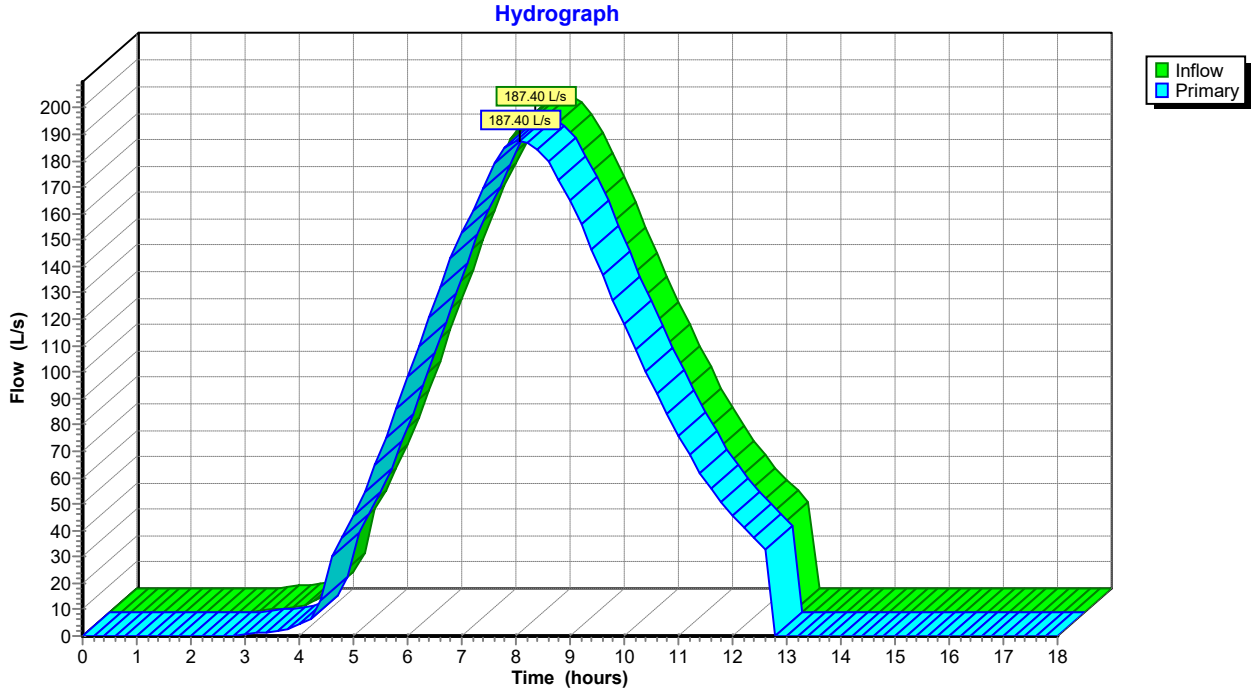
Summary for Link 53L: Flood level @ 25.91

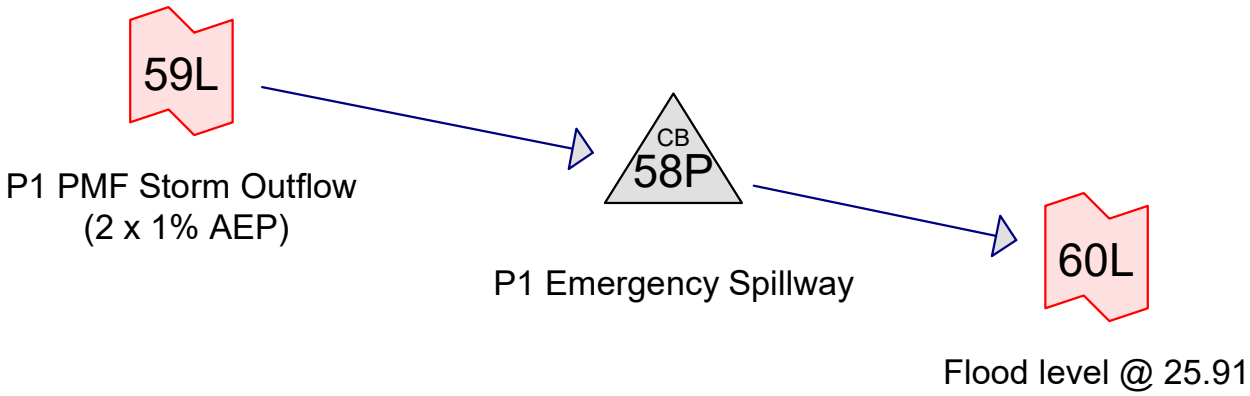
Inflow = 187.40 L/s @ 7.87 hrs, Volume= 3,232.4 m³
Primary = 187.40 L/s @ 8.07 hrs, Volume= 3,232.4 m³, Atten= 0%, Lag= 12.0 min

Primary outflow = Inflow, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs

Fixed water surface Elevation= 25.910 m

Link 53L: Flood level @ 25.91





Subcat Reach Pond Link

Routing Diagram for Channel & Spillway Sizing
Prepared by CGW Ltd, Printed 16/02/2024

Summary for Pond 58P: P1 Emergency Spillway

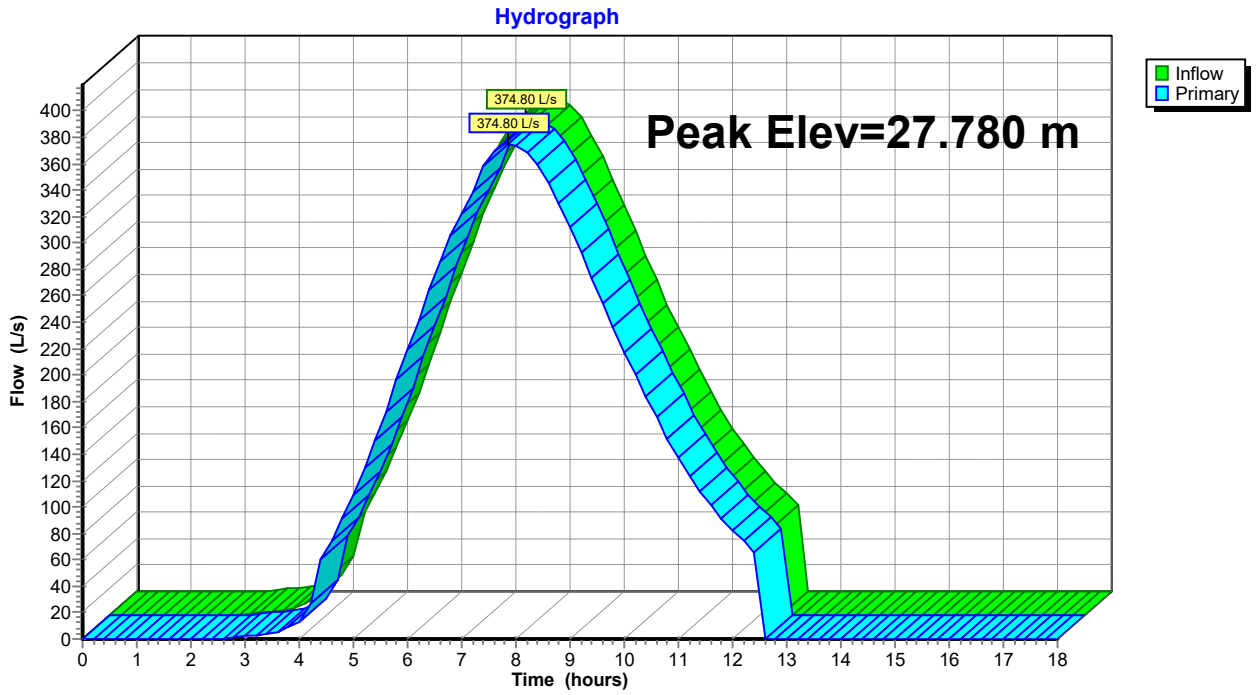
Inflow	=	374.80 L/s @	7.67 hrs, Volume=	6,464.7 m³
Outflow	=	374.80 L/s @	7.87 hrs, Volume=	6,464.7 m³, Atten= 0%, Lag= 12.0 min
Primary	=	374.80 L/s @	7.87 hrs, Volume=	6,464.7 m³

Routing by Sim-Route method, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Peak Elev= 27.780 m @ 7.87 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	27.700 m	**10.00 m long (Profile 7) Broad-Crested Rectangular Weir** Head (meters) 0.150 0.300 0.450 Coef. (Metric) 1.65 1.88 2.00

Primary OutFlow Max=374.11 L/s @ 7.87 hrs HW=27.780 m TW=25.910 m (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 374.11 L/s @ 0.47 m/s)

Pond 58P: P1 Emergency Spillway



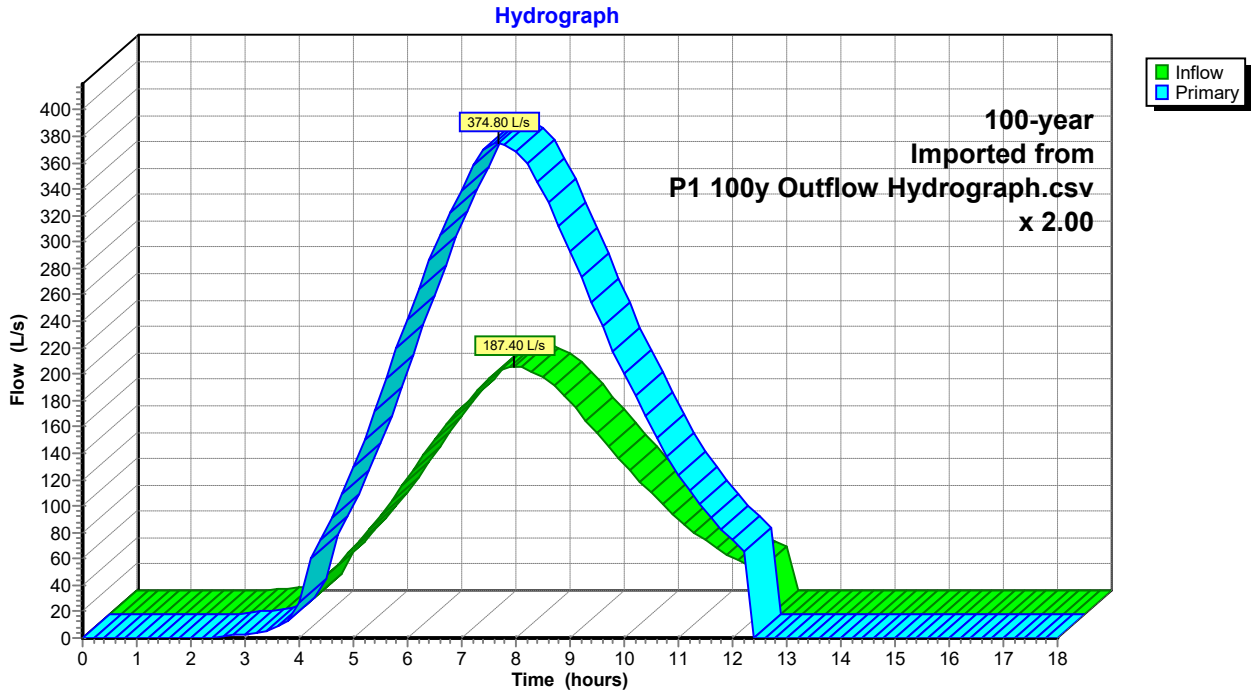
Summary for Link 59L: P1 PMF Storm Outflow (2 x 1% AEP)

Inflow = 187.40 L/s @ 7.47 hrs, Volume= 3,232.4 m³
Primary = 374.80 L/s @ 7.67 hrs, Volume= 6,464.7 m³, Atten= 0%, Lag= 12.0 min

Primary outflow = Inflow x 2.00, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs

100-year Imported from P1 100y Outflow Hydrograph.csv

Link 59L: P1 PMF Storm Outflow (2 x 1% AEP)



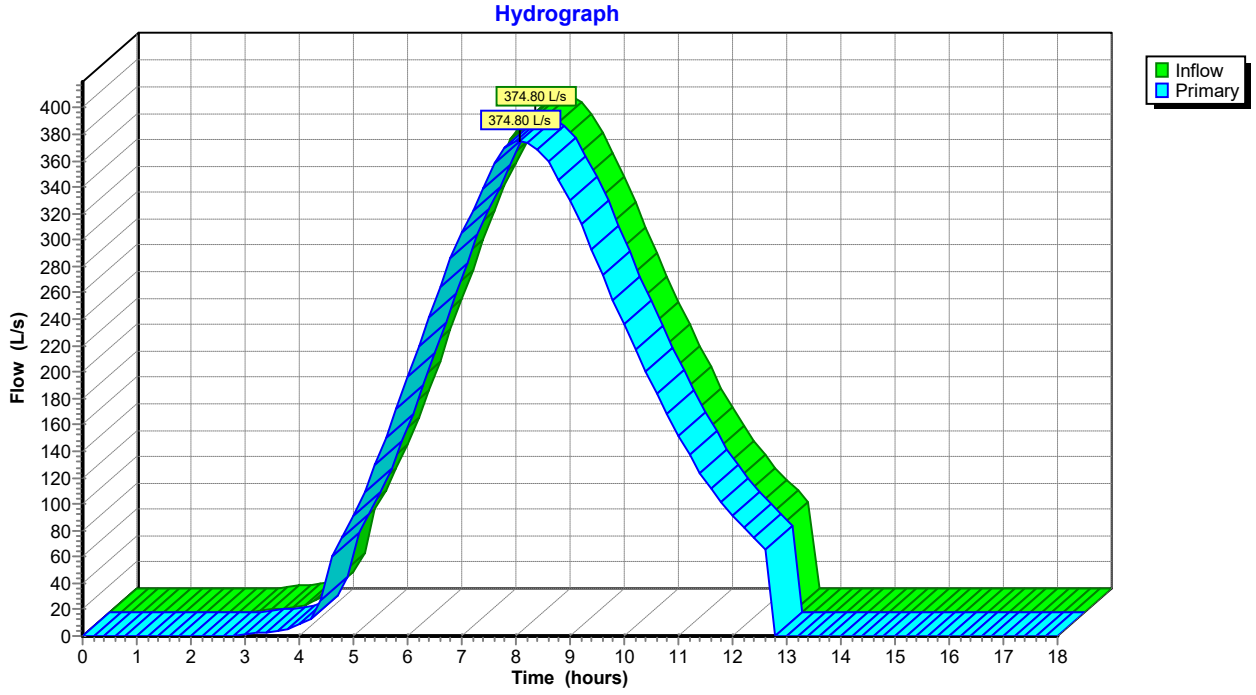
Summary for Link 60L: Flood level @ 25.91

Inflow = 374.80 L/s @ 7.87 hrs, Volume= 6,464.7 m³
Primary = 374.80 L/s @ 8.07 hrs, Volume= 6,464.7 m³, Atten= 0%, Lag= 12.0 min

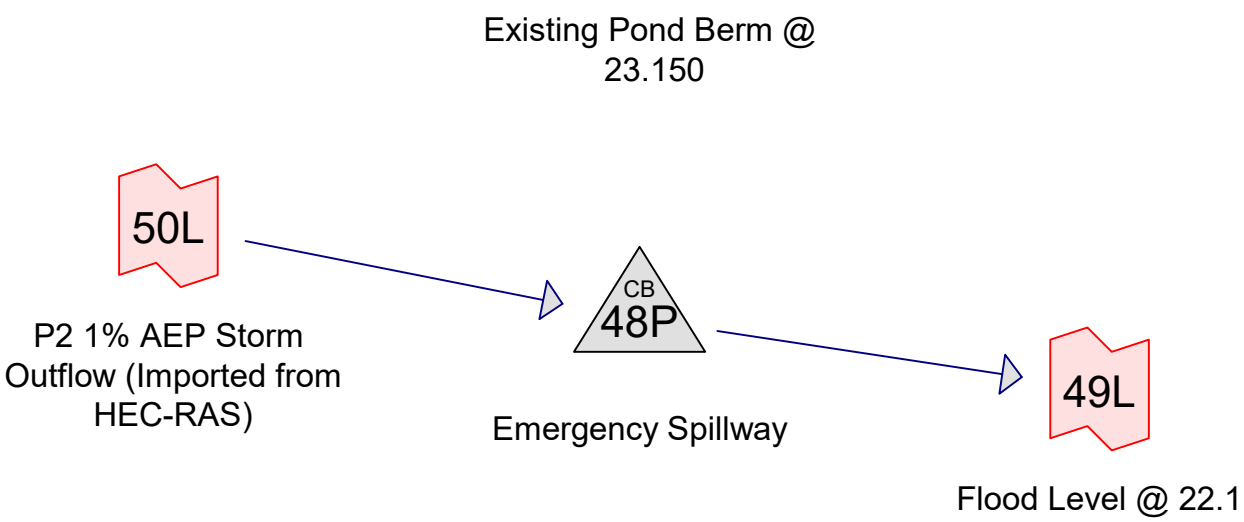
Primary outflow = Inflow, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs

Fixed water surface Elevation= 25.910 m

Link 60L: Flood level @ 25.91



P2 Spillway



Subcat Reach Pond Link

Routing Diagram for Channel & Spillway Sizing
Prepared by CGW Ltd, Printed 18/03/2024

Summary for Pond 48P: Emergency Spillway

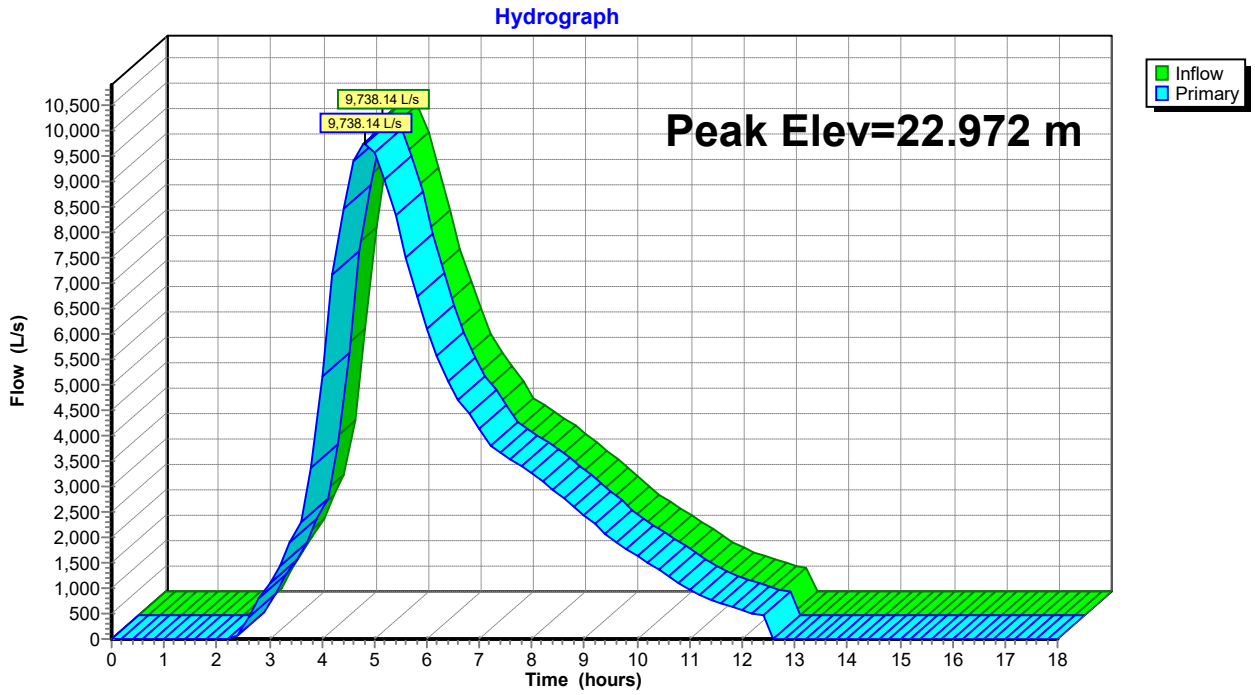
Inflow = 9,738.14 L/s @ 4.63 hrs, Volume= 125,662.0 m³
Outflow = 9,738.14 L/s @ 4.83 hrs, Volume= 125,662.0 m³, Atten= 0%, Lag= 12.0 min
Primary = 9,738.14 L/s @ 4.83 hrs, Volume= 125,662.0 m³

Routing by Sim-Route method, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Peak Elev= 22.972 m @ 4.83 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	22.500 m	**15.00 m long (Profile 7) Broad-Crested Rectangular Weir** Head (meters) 0.150 0.300 0.450 Coef. (Metric) 1.65 1.88 2.00

Primary OutFlow Max=9,708.81 L/s @ 4.83 hrs HW=22.971 m TW=22.100 m (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 9,708.81 L/s @ 1.37 m/s)

Pond 48P: Emergency Spillway



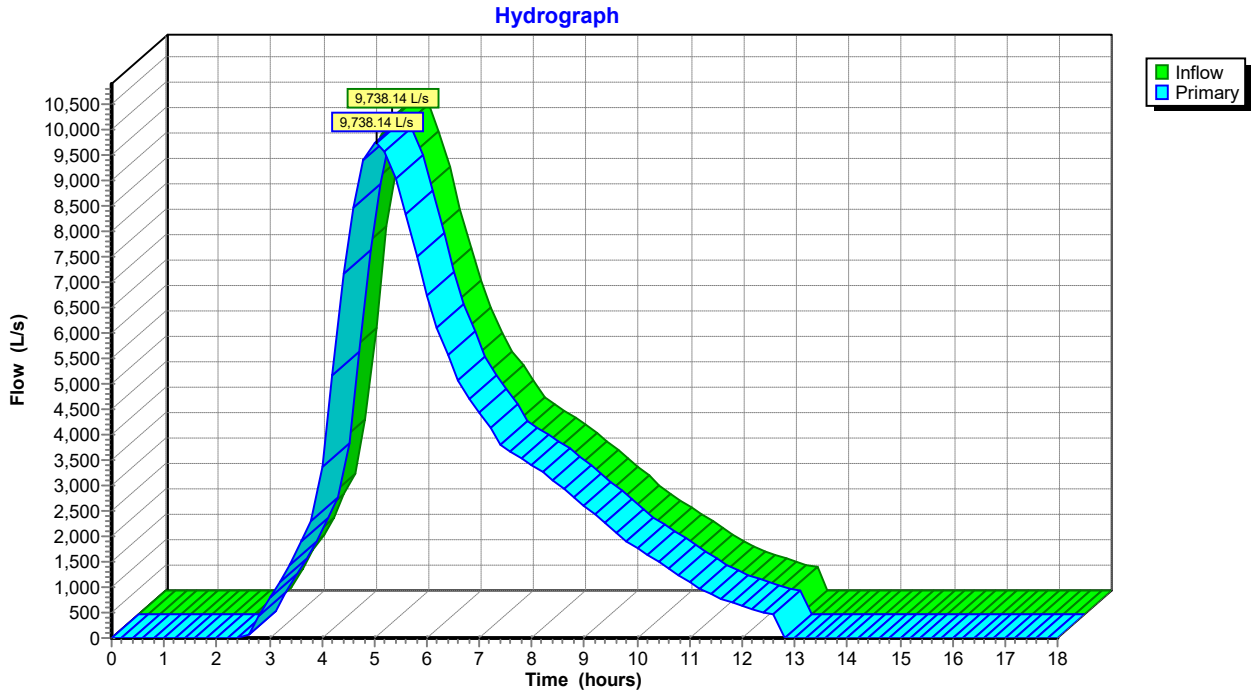
Summary for Link 49L: Flood Level @ 22.1

Inflow = 9,738.14 L/s @ 4.83 hrs, Volume= 125,662.0 m³
Primary = 9,738.14 L/s @ 5.03 hrs, Volume= 125,662.0 m³, Atten= 0%, Lag= 12.0 min

Primary outflow = Inflow, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs

Fixed water surface Elevation= 22.100 m

Link 49L: Flood Level @ 22.1



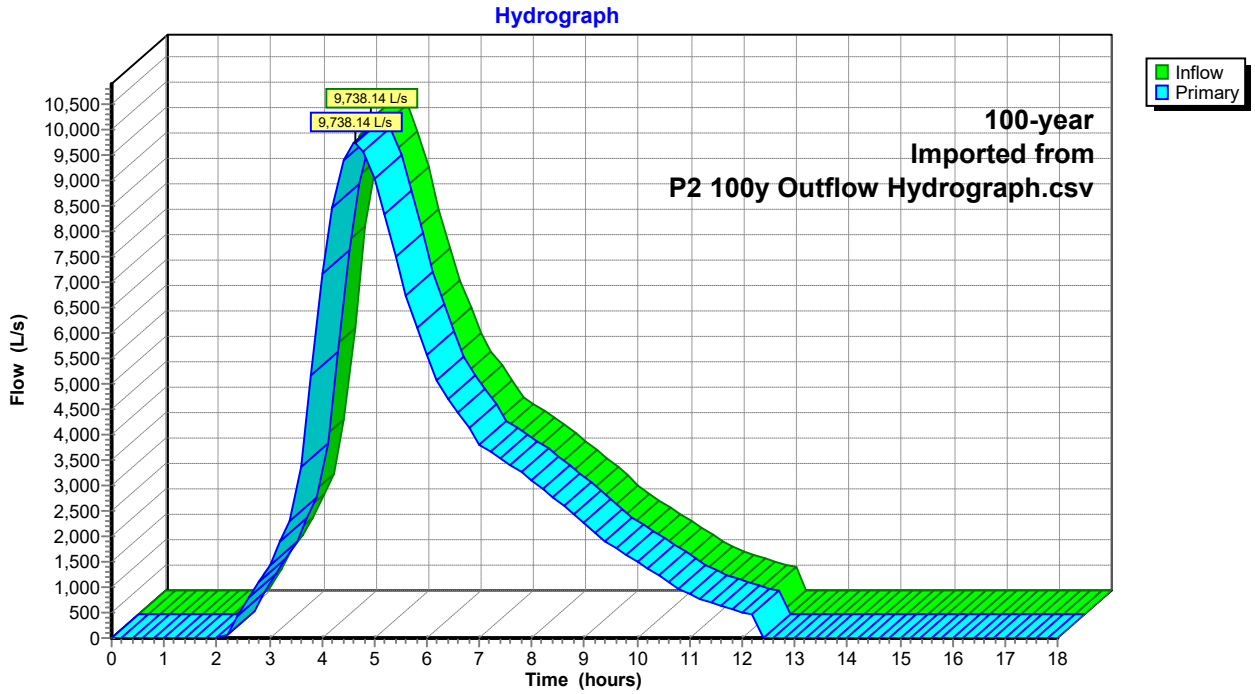
Summary for Link 50L: P2 1% AEP Storm Outflow (Imported from HEC-RAS)

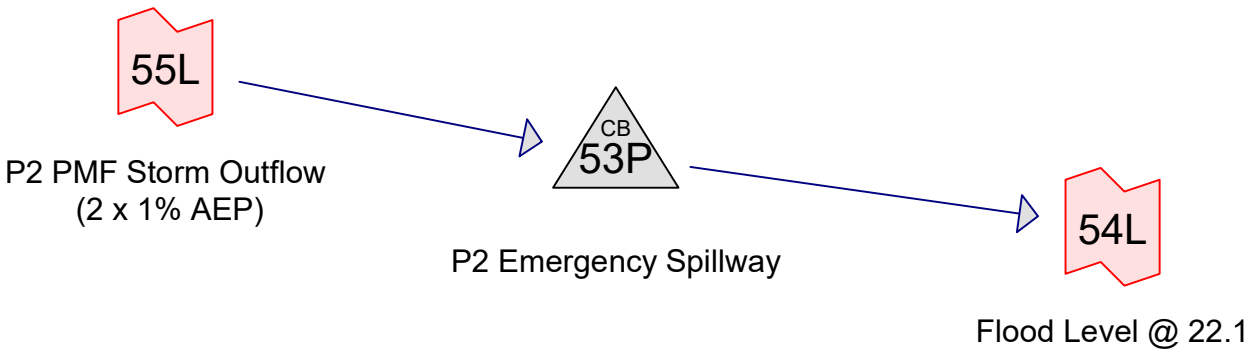
Inflow = 9,738.14 L/s @ 4.43 hrs, Volume= 125,662.0 m³
Primary = 9,738.14 L/s @ 4.63 hrs, Volume= 125,662.0 m³, Atten= 0%, Lag= 12.0 min

Primary outflow = Inflow, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs

100-year Imported from P2 100y Outflow Hydrograph.csv

Link 50L: P2 1% AEP Storm Outflow (Imported from HEC-RAS)





Subcat Reach Pond Link

Routing Diagram for Channel & Spillway Sizing
Prepared by CGW Ltd, Printed 18/03/2024

Summary for Pond 53P: P2 Emergency Spillway

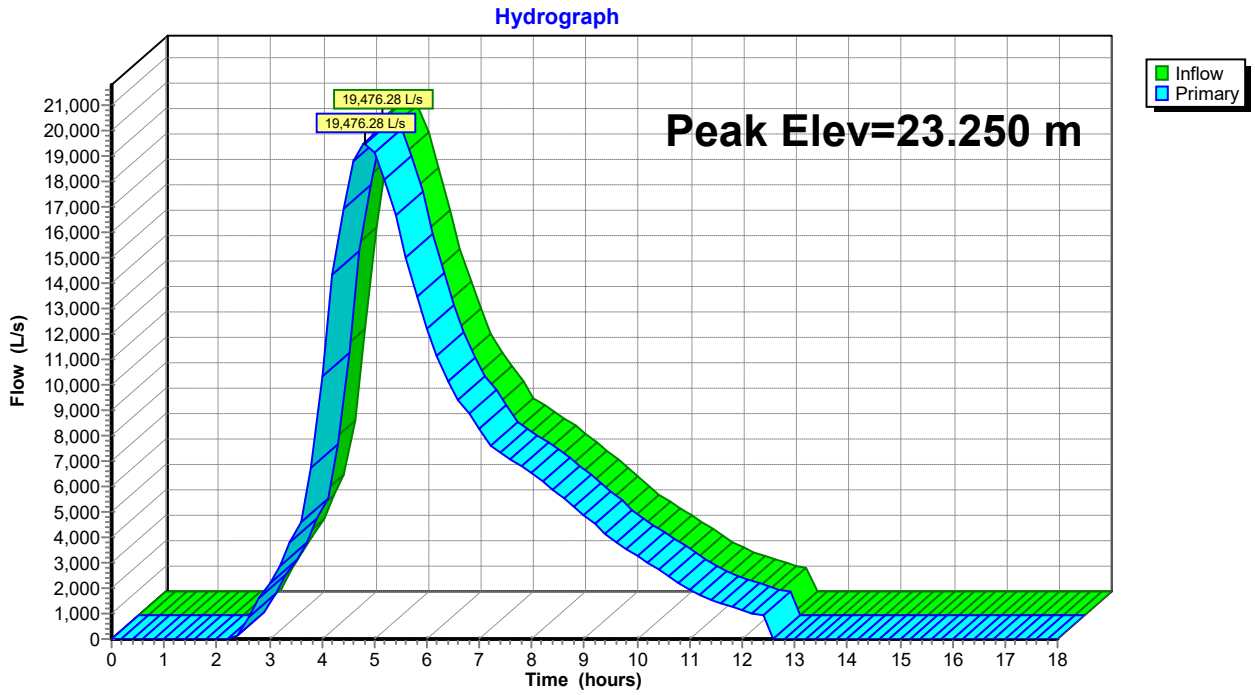
Inflow	=19,476.28 L/s @	4.63 hrs,	Volume=	251,324.1 m³
Outflow	=19,476.28 L/s @	4.83 hrs,	Volume=	251,324.1 m³, Atten= 0%, Lag= 12.0 min
Primary	=19,476.28 L/s @	4.83 hrs,	Volume=	251,324.1 m³

Routing by Sim-Route method, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs
Peak Elev= 23.250 m @ 4.83 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	22.500 m	**15.00 m long (Profile 7) Broad-Crested Rectangular Weir** Head (meters) 0.150 0.300 0.450 Coef. (Metric) 1.65 1.88 2.00

Primary OutFlow Max=19,417.62 L/s @ 4.83 hrs HW=23.248 m TW=22.100 m (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 19,417.62 L/s @ 1.73 m/s)

Pond 53P: P2 Emergency Spillway



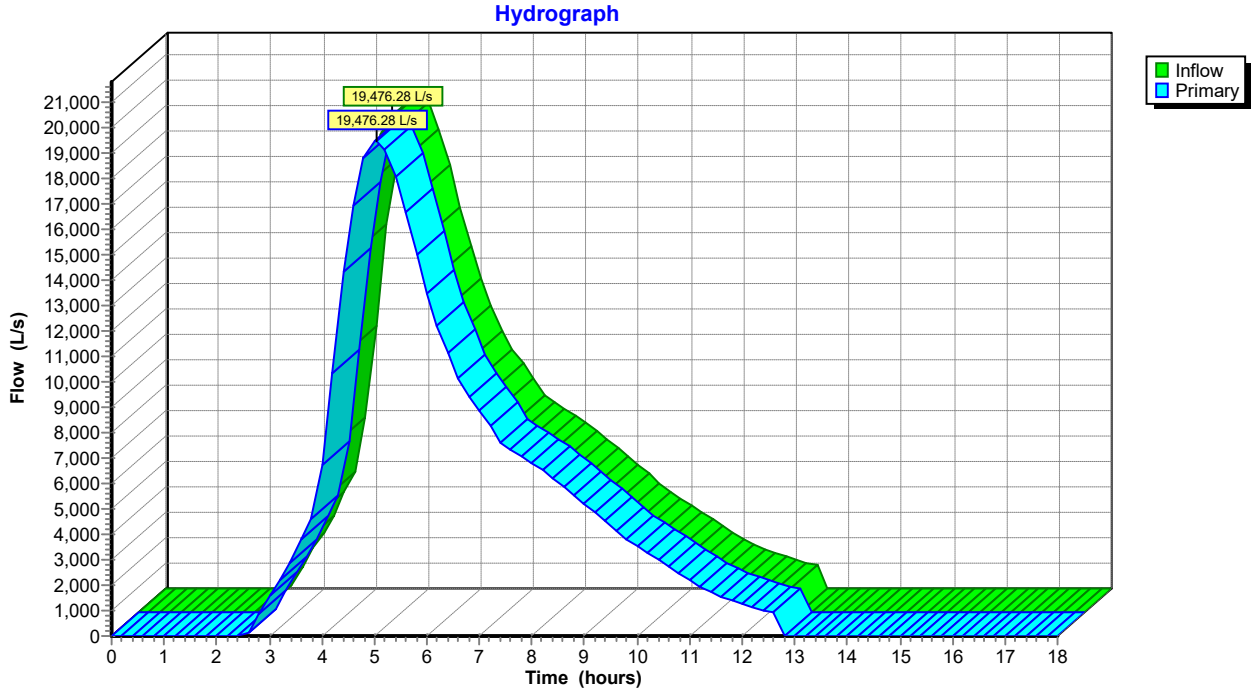
Summary for Link 54L: Flood Level @ 22.1

Inflow =19,476.28 L/s @ 4.83 hrs, Volume= 251,324.1 m³
Primary =19,476.28 L/s @ 5.03 hrs, Volume= 251,324.1 m³, Atten= 0%, Lag= 12.0 min

Primary outflow = Inflow, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs

Fixed water surface Elevation= 22.100 m

Link 54L: Flood Level @ 22.1



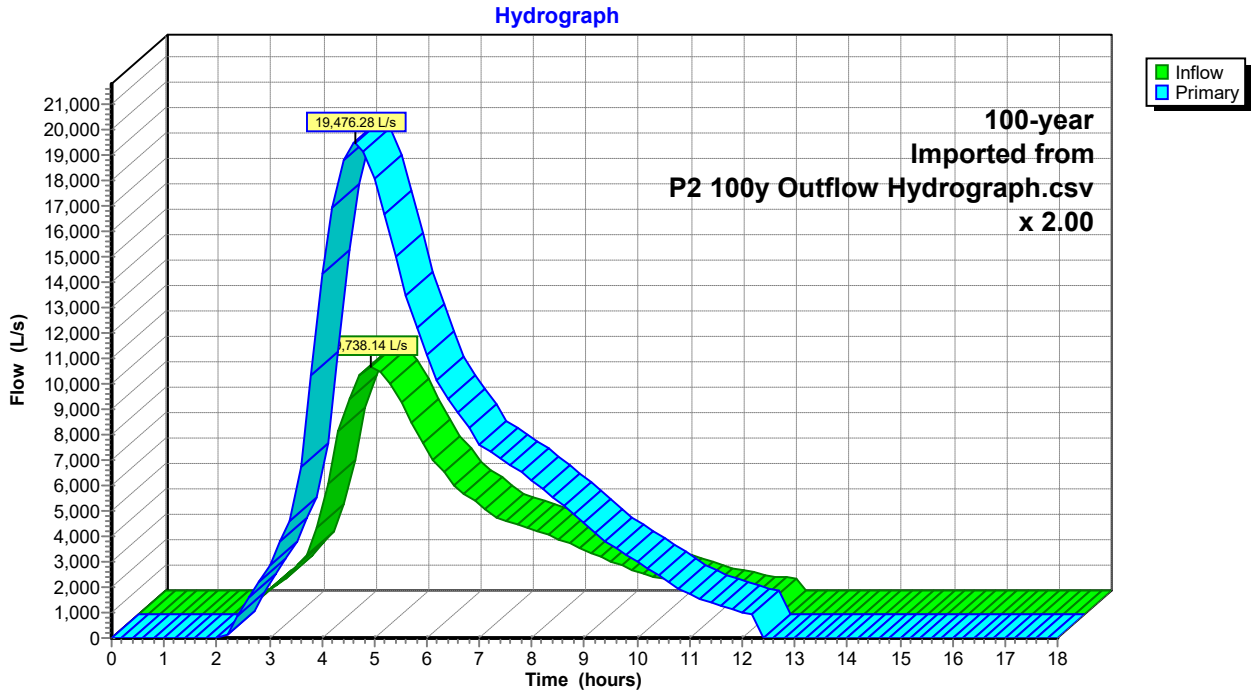
Summary for Link 55L: P2 PMF Storm Outflow (2 x 1% AEP)

Inflow = 9,738.14 L/s @ 4.43 hrs, Volume= 125,662.0 m³
Primary =19,476.28 L/s @ 4.63 hrs, Volume= 251,324.1 m³, Atten= 0%, Lag= 12.0 min

Primary outflow = Inflow x 2.00, Time Span= 0.00-18.00 hrs, dt= 0.20 hrs

100-year Imported from P2 100y Outflow Hydrograph.csv

Link 55L: P2 PMF Storm Outflow (2 x 1% AEP)



Wastewater Servicing Assessment

Tasman Bay Estates

17 April 2024

J000132-RPT-001-D

Prepared By

David Carlson-McColl

engineer, cp.eng

Contents

1.0 Introduction

Envirolink Limited have been engaged by Tasman Bay Estates (the Client) to assess onsite wastewater management to service a proposed subdivision. The subdivision encompasses several parcels of land including 64 Marriages Road and 77 Mamaku Road, Tasman. The site of development is shown in Figure 1.1 below.

Figure 1.1: Proposed development site (existing site boundaries shown in yellow).

A layout for the proposed development has been prepared in consultation with Envirolink to determine wastewater servicing requirements. The purpose of this report is to present a concept to manage wastewater generated on site to support a Resource Consent application.

2.0 Proposed Development

At present, development within the site consists of one dwelling. The site is farmed, and several irrigation dams have been developed. Envirolink Limited have been provided with a layout plan of the proposed subdivision prepared by Eliot Sinclair entitled “Tasman Bay Estates Ltd” dated 17 April 2024 Revision A. A section of this drawing is presented in Figure 2.1 below.

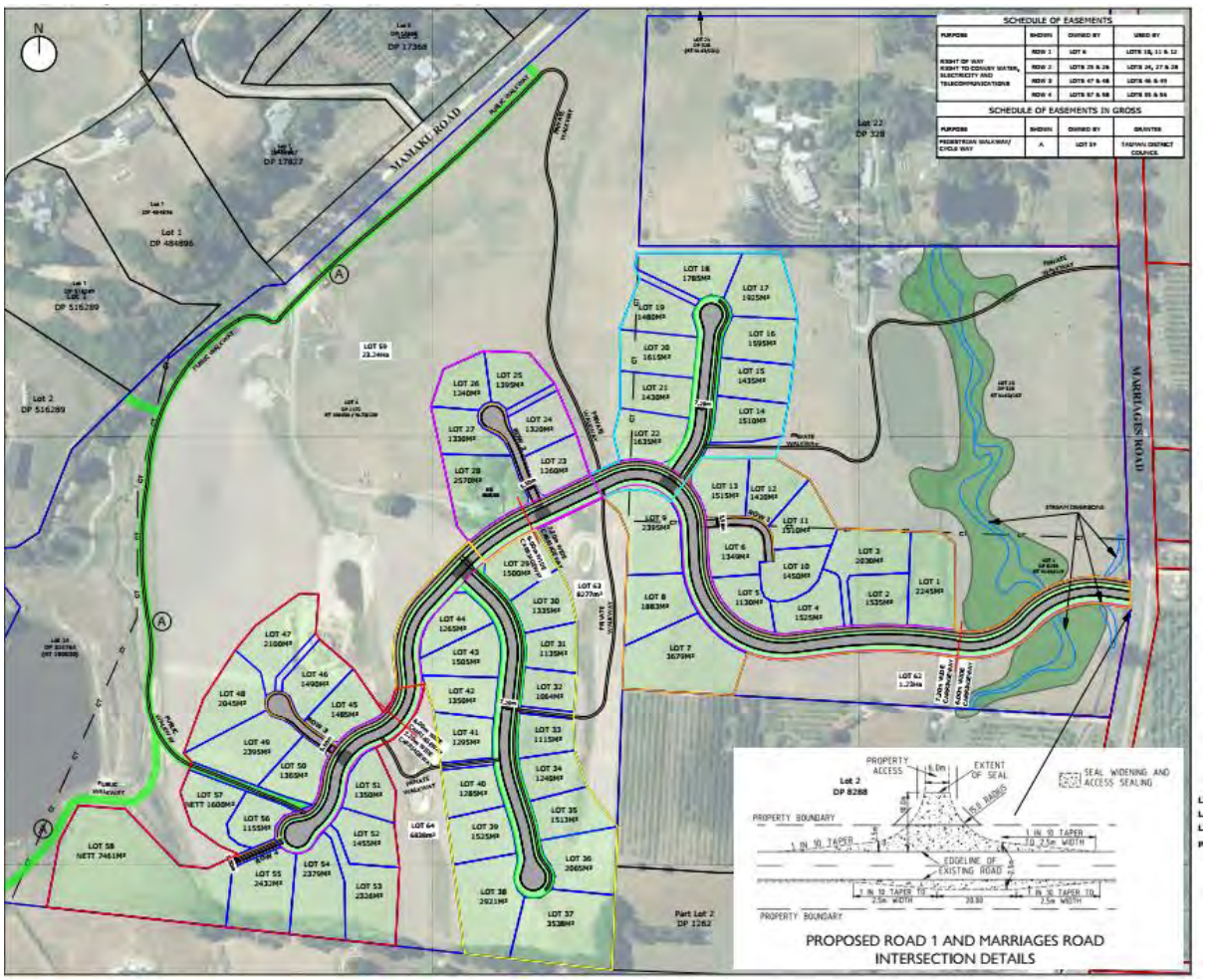


Figure 2.1: Conceptual Development Layout

At this point, the development layout includes 58 lots. Lot sizes vary however it is proposed that lots will generally be 1,000-2,000m^2 in area, and up to 7,461m^2, as shown in Figure 2.1. Following preliminary discussions with the project team, it has been determined that a communal wastewater management system is the preferred solution to manage effluent produced on site.

3.0 Regulatory Context

The site is in the Rural 3 Zone under the Tasman Resource Management Plan (TRMP). The site is within the Wastewater Management Area (WMA). In this case, lots are smaller than 2 hectares in size. A communal wastewater management system will be used and the total discharge will exceed 2m^3/day. Onsite domestic wastewater discharge is a Non-Complying Activity. It is recommended that other requirements for wastewater discharges in the WMA are generally met. In accordance with Rule 36.1.4.2 of the TRMP, the "Restricted Discretionary Activity" requirements are summarised as follows:

- The discharge must be designed to accommodate peak daily load.
- There must be a minimum of 0.6m of unsaturated soil beneath the disposal area.
- There must be 100% of the design disposal field area available as a reserve area.
- The discharge must be a minimum of 20m from any water body, adjacent disposal field or bore. The disposal field must be a minimum of 5m from any adjoining property boundary.
- Overland stormwater flow must be diverted away from the disposal field.

- Disposal must not occur on slopes greater than 20 degrees (36%).
- There is no increase in the concentration of pathogenic organisms in any groundwater bore used for potable water supply as a result of the discharge.
- Effluent is evenly distributed into the soil at a rate not exceeding 2mm/day. From previous discussions with TDC staff, Envirolink have clarified that the intent of the final point above is to limit the maximum loading rate to 2mm/day for Category 6 soils. This is consistent with AS/NZS1547:2012 – Onsite Domestic Wastewater Management.
- Effluent quality must not exceed the following standards
    - Biochemical Oxygen Demand (BOD): 30g/m^3
    - Total Suspended Solids (TSS): 45g/m^3

The TRMP does not condition the application of nitrogen from onsite wastewater treatment systems. For the discharge of dairy effluent, the TRMP specifies:

- The application of effluent is:
    - At a rate of not more than 200 kilograms of nitrogen per hectare per year by itself or in combination with any other applied fertiliser; or
    - At a rate not resulting in an elevation of groundwater nitrogen concentration.

4.0 Site Assessment

A site assessment was undertaken on 14th October 2022. From the inspection, the following observations are made.

General Site Observations

- The site was undergoing cultivation at the time of site assessment. Parts of the site were bare, having recently been re-sown, or planted in pasture crop.
- Generally, surface condition was good with no evidence of erosion or surface scour where crops were yet to establish.
- Standing water was observed in multiple irrigation dams.
- As the site had been cultivated, evidence of seasonally wet areas such as reed type vegetation could not be observed.
- The site will be earthworked to facilitate the development. This will include stripping topsoil and cutting levels to create building pads and roads. Topsoil may be placed in low lying areas of proposed disposal fields to reduce site slopes. This is discussed in more detail subsequently.
- Effluent disposal will take place across a large area however typical slope angles in areas to be used for effluent disposal are less than 20%.
- For this assessment, site slope angles have been assessed using LiDAR contours. Slope angles require re-assessment during detailed design as earthworks designs are finalised.
- The site is defined by several natural gullies. These gullies only convey runoff during or immediately following heavy rainfall. Gullies will be formalised as part of the development to improve stormwater management, as determined by others. At this point, it is recommended to assume an offset from wastewater disposal fields to the centreline of gullies of 10m, rather than the “waterway” offset of 20m. This will be reviewed as earthworks designs are finalised. A greater offset may be required in some areas such as gullies leading to flatter areas which are seasonally saturated.
- A minimum topsoil depth of 150-250mm is required by AS/NZS1547:2012. This was achieved in most locations however the addition of topsoil or mulch over driplines may be required in some areas.

- Diversion of stormwater runoff, including road runoff, around disposal fields is likely to be required for some disposal areas. This will involve relatively minor earthworks that can be undertaken when the fields are constructed.
- An irrigation pond has been developed to the west of bore hole BH12. Some mottling was observed at a depth of approximately 500mm BGS in BH12, indicating soils may be periodically waterlogged. It is expected that soils close to other irrigation dams will also be seasonally saturated. Where ponds will be retained, a 20m offset has been applied to disposal fields. If required, ponds will be decommissioned to facilitate the development.
- Sufficient soil investigation has been undertaken to understand soil conditions from a conceptual perspective. Further soil investigation will be undertaken as part of detailed design.

4.1 Soil Assessment

A total of 17 bore holes and 4 test pits were hand excavated. Logs for bore holes and test pits are included as Appendix A. Investigations are presented on the site layout plan, included as Appendix B. The investigation concluded that soil conditions are generally consistent across the site, summarised as follows. Typical soil conditions are shown in in Figure 4.1:

- 100-200mm of topsoil was observed in most bore holes.
- Beneath the topsoil layer, soil encountered was typical of Moutere Clay; light brown to yellow clay with sand inclusions to the extent of excavation. In most bore holes, lighter clays were encountered at depths of up to 300-1000mm below ground surface (BGS). Minimal force was required to form 2-3mm peds in this soil horizon.
- Evidence of mixing of topsoil was observed in several holes, with brown top soil observed mixed with yellow clay at depths of 300-500mm BGS.
- In some bore holes, slightly heavier clays were encountered. This material was more commonly observed at greater depths however shallower layers of heavier clay were encountered within some bore holes. More force was required to break this soil into peds and heavier clays had a lower sand content.
- Soil formed 60-80mm ribbons when worked in accordance with the method outlined in AS/NZS1547:2012.
- More favourable Category 5 soils do exist in places however the entire site is assessed as Category 6 Medium Clay in accordance with AS/NZS1547:2012 for the following reasons.
    - Layers of heavier clay were identified in most bore holes.
    - Where site soil conditions vary, 1547 requires the most conservative soil category to be adopted to avoid overloading less favourable soils.
    - Disposal fields for communal wastewater systems typically operate closer to peak flows than systems servicing an individual house. It is appropriate to select a conservative disposal rate.
- Bore holes were deliberately excavated in transects running perpendicular with contours to enable assessment of areas where the seasonally high groundwater level was assumed to be shallow.
- In BH1, BH7 and BH16 wet soil was encountered at 900-1000mm BGS.
- These bore holes were downslope of the presently proposed extent of the disposal fields.
- Orange mottling was observed at shallower depths.
- Based on these observations, the TRMP requirement for 600mm of unsaturated soil beneath an effluent disposal field will be met within nominated disposal field locations. Fields could extend further down the slope in some cases however again, a conservative approach is recommended at this point in the design.

- The addition of topsoil as fill, discussed subsequently, will allow separation distances to seasonally wet soils specified in the TRMP to be met.

Figure 4.1: Soil Conditions BH1

5.0 Wastewater Design Basis

Recommended design considerations set out below are based on conclusions from the site assessment. Detailed design of the site wastewater treatment and conveyance system must be undertaken in accordance with AS/NZS1547:2012 and other approved standards prior to Building Consent application for the wastewater treatment and disposal system.

The design of a centralised "community" wastewater treatment system has been prepared to a conceptual level assuming a single treatment system is developed with disposal split over multiple areas. The entire treatment system could be constructed as part of the initial development or the treatment plant could be staged, subject to development staging. The construction of disposal fields will be staged as the development progresses.

5.1 Conveyance

Wastewater from all dwellings must be conveyed to the proposed centralised wastewater treatment system. To recess buildings below ridgelines, the layout has been prepared with roads on ridgelines and building sites set below ridgelines. This will make gravity conveyance more difficult as gravity pipes located within roads and used by properties on both sides of the road will be very deep in places. Options for conveyance are either:

- Install gravity mains downslope of properties, with duplicate pipes for properties on each side of the road.
- Install a pressure sewerage scheme.

The installation of gravity sewer mains downslope of property boundaries will mean that reticulation pipes are installed in grass areas adjacent upslope of wastewater fields. Some of these areas are less accessible which will make maintenance more difficult. Duplicate gravity pipe involves a relatively high cost.

The installation of individual pump stations on each property with sewer rising mains in roads will reduce the amount of pipework installed and ensure the reticulation network is installed within the road corridor. Sewer pump stations reduce the amount of gravity pipework, reducing the potential for stormwater ingress through manholes in the reticulation. From a preliminary review, it is assumed that individual onsite pressure pump stations will be installed.

5.2 Flow Allowances

The focus of this investigation is the onsite wastewater treatment system rather than the reticulation network. The treatment system is designed for peak daily flow rather than peak instantaneous flow. Inlet balance tanks are used to manage short term peaks. Additional peaking factors should be applied to flow rates discussed below when designing the reticulation system.

The nature of the discharge is generally consistent with that anticipated by AS/NZS1547:2012 however the weekly effluent volumes will considerably exceed the maximum 14m^3/week stated to be within the scope of AS/NZS1547:2012. The site will be serviced with water via rainwater harvesting. As a 'residential density' development, it is possible that a reticulated water supply could be available in future. For this reason, wastewater production rates have been assessed assuming a reticulated water supply. Several sources of information have been considered to assess the rate of effluent production:

AS/NZS1547:2012: AS/NZS1547 recommends design for 145 to 200L/person per day for sites using a reticulated water supply, subject to the degree of water saving appliances. In this case, all new dwellings will be constructed. As a condition of consent, it is recommended to volunteer "Standard" water saving appliances are used for all lots in accordance with AS/NZS1547:2012. This includes dual flush toilets, shower flow restrictors and a water conserving washing machine. Peak load is 165L/person per day. 1547 recommends the design for peak occupancy assuming a minimum of 10 occupants per dwelling where dwelling use is unknown. This is a reasonable assumption for individual systems where peaking has a significant effect. For a community system, there is an averaging effect as all dwellings are unlikely to have peak occupancy at the same time. A peak average occupancy of 5 occupants per dwelling is considered reasonable. With these assumptions, peak effluent production is 825L/connection per day or **47.9m^3/day** for the entire development.

Nelson Tasman Land Development Manual (NTLDM): Design for 2.5 persons per house and an average dry weather flow of 225L/person per day giving a total average flow of **32.6m^3/day**. Peak dry and wet weather factors are also provided however these are typically used to calculate peak instantaneous flows, relevant to reticulation design rather than treatment systems.

Auckland Regional Council Guideline Document 2021/006 (GD06): GD06 provides further design guidance for onsite wastewater treatment systems. TP58, the predecessor to GD06, recommends adopting a minimum occupancy of 4 persons for clustered rural developments, plus allowing for additional occupancy based on the area where "large modern dwellings" are proposed. In this case the size of dwellings to be constructed is unknown. An allowance for one additional occupant is considered reasonable, validating the assumption of 5 occupants per dwelling discussed above.

According to Statistics New Zealand[1], the average occupancy for occupied howes across the Tasman District is 2.6 persons per household. This also indicates that the peak allowance of 5 persons per household is a reasonable conservative allowance.

Some allowance should also be made for inflow of storm water and infiltration of groundwater (I&I). As a new reticulation system, "I&I" will be far lower than that which typically occurs for municipal reticulation. A pumped reticulation system is proposed, further reducing I&I. An additional allowance of 10% of peak daily flow is recommended. This gives a total design wastewater volume of 52.7m^3/day or 908L/day per dwelling.

Based on typical occupancy in the Tasman district, average wastewater production is expected to be 23.9 m^3/day.

5.3 Treatment

Effluent Design Parameters

Secondary treatment of effluent is required to meet TDC requirements for this region, reiterated as follows:

- Effluent quality must not exceed the following standards
- Biochemical Oxygen Demand (BOD): 30g/m^3
- Total Suspended Solids (TSS): 45g/m^3

As discussed in Section 3, TDC do not impose a limit on nitrogen application for onsite wastewater disposal systems however a limit of 200kg/Ha per year is imposed for application of animal effluent. The draft Guidelines for Beneficial Use of Organic Materials on Productive Land[2], obtained from Water New Zealand, also propose a nitrogen limit of 200kg/Ha per year, as an average over 2 years. Whilst these guidelines have not progressed beyond a draft, they are considered a reasonable standard from which to assess the proposed discharge.

Typical total nitrogen concentrations in effluent treated by a "compact activated sludge" process without dedicated nitrogen removal is 20 to 40 mg/L based on information from GD06. At the maximum design land application rate of 1.6mm/day (discussed in Section 5.4), and the assumed

[1] https://www.stats.govt.nz/tools/2018-census-place-summaries/tasman-region

[2] Water New Zealand (2017) Guidelines for Beneficial Use of Organic Materials on Productive Land (draft) accessed via website.
https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=3291

effluent concentration of 20-40mg/L, the maximum annual nitrogen application rate is 117-233 kg/Ha per year. This assumes peak effluent flows every day. Theoretically, it would be possible to exceed the recommended maximum nitrogen application rate of 200 kg/Ha per year if a consent limit for nitrogen is not imposed. It is recommended to recommend a nitrogen limit of 34mg/L as a condition of consent. This will ensure that even if the system operates at peak flows of 52.7m^3/day every day, the annual average nitrogen loading rate will be less than 200kg/Ha per year.

Peak flows will not occur every day and the annual average loading is considered more important to assess the potential rate of nutrient leaching. At average flows, assuming the 34mg/L limit is met every day, the average rate of nitrogen application will be 90 kg/Ha per year.

The Water New Zealand guidelines do not specify any maximum BOD loading rates. BOD and TSS rates of 20mg/L BOD and 30mg/L TSS, lower than the TRMP standards, are commonly imposed for modern secondary treatment systems. It is recommended that the lower limits are adopted to reduce the risk of biomass and suspended sediment leading to clogging of emitters and poor irrigation field performance.

For clarity, recommended treatment parameters to be volunteered as a condition of consent are summarised as follows:

- The system is to be designed for peak effluent loading of 908L/day per connection or 52.7m^3/day assuming 58 dwellings are serviced.
- Effluent quality must not exceed the following standards
    - Biochemical Oxygen Demand (BOD):
        - 90% of samples ≤20g/m^3
        - No samples exceeding 30g/m^3
    - Total Suspended Solids (TSS):
        - 90% of samples ≤30g/m^3
        - No samples exceeding 45g/m^3
    - Total Nitrogen
        - 90% of samples ≤34g/m^3
        - No samples exceeding 50g/m^3

TP58, the previous version of GD06 identified nitrogen concentrations of 20-60g/m^3 for aerated treatment. Whilst this has been revised down in the newer edition of the standard, nitrogen is not specifically treated in a secondary treatment plant without dedicated nitrogen removal. Due to the specification of low water use appliances, wastewater could be more concentrated. An absolute limit of 50g/m^3 has been proposed for nitrogen to provide operational flexibility. With 10% of samples at this limit, the rate of nitrogen application is less than half of the TRMP nitrogen application limit at average flows.

A condition of consent is not volunteered for faecal coliforms. Faecal coliforms could present a risk to downstream habitat and human health if treated effluent is allowed to flow into downstream waterways. At the very low rates of effluent disposal proposed, the risk of discharge to surface water or ground water is very low. The risk of coliform contamination is mitigated through the low rate of land application and regular maintenance inspections in the disposal fields. Further mitigation such as UV disinfection will not materially alter the effect of the discharge on the receiving environment.

Treatment System Design

An activated sludge/aerated wastewater treatment system can achieve the effluent standards proposed above. Alkalinity or pH adjustment may be required to enhance nitrogen removal subject to effluent parameters and the selected treatment system. Treatment options include:

- A single dedicated plant to treat the proposed design capacity. This is typically a containerised unit such as a Smith and Loveless "Fixed Activated Sludge Treatment" (FAST) plant, shown in Figure 5.1 below. OR
- A modular onsite wastewater plant consisting of several modules installed in parallel to provide the required treatment capacity such as the Innoflow AX100 modules shown in Figure 5.2 below. These are typically installed below ground.

The exact treatment plant model and layout does not need to be determined at this point in the design process. Further evaluation can be undertaken as part of detailed design. In general terms, a modular plant from a well established supplier in New Zealand is likely to offer better technical support and parts availability. A containerised plant is likely to offer a smaller footprint. The proposed layout included in Appendix B offers ample land area for either solution.

For either option, a design basis is recommended as follows. These are technical parameters to inform the future design of the plant, only parameters identified in **bold** should be applied as conditions of consent.

- **A minimum 24 hours of emergency raw effluent storage at peak flows to allow for management of high inflows, such as wet weather ingress, and the use of offsite carting if necessary.**
- Designed for influent quality as follows:
    - Biochemical Oxygen Demand (BOD):
        - ≤450g/m^3
    - Total Suspended Solids (TSS):
        - ≤500g/m^3
- Designed for peak flow of 60m^3/day to ensure adequate treatment capacity if dwellings produce more effluent than that calculated.
- Design for average flows of 20-30m^3/day.
- **A packaged/proprietary treatment system must be used.**
- **Treated effluent storage equivalent to 12 hours of peak flows to allow further storage for management of peak inflows without overloading the disposal field.**
- Design for 10-20% of future load for the first 2-3 years. Depending on the model selected, some treatment plants will not operate effectively with organics loading far less than the design capacity. In this case, the system will need to be split into several smaller treatment stages.
- **The treatment plant should be designed with provision for future odour treatment. This** may not be necessary subject to system location and operation however odour can be an issue with onsite wastewater treatment systems. Provision for odour treatment such as allowing adequate land area for a carbon or bio filter and installing fittings for ventilation pipework will allow future retrofit if required.
- **A detailed Operation and Maintenance plan must be provided including an equipment schedule, 3 monthly and annual maintenance check lists, operating responsibilities, emergency response procedures and as built drawings.**

- **Maintenance by an authorised contractor, trained by the system designer, must be undertaken every at the interval specified by the system designer.**
- **Treated effluent samples must be obtained on the following frequency:**
    - **First 6 months of operation: Monthly**
    - **First 2 years of operation: 3 Monthly**
    - **Thereafter: 6 Monthly**
- **Samples must be analysed for BOD, TSS and total nitrogen.**
- **Flow to the disposal field must be continuously recorded. Flow must be recorded on both an instantaneous and totalised daily basis, recorded automatically with historic data retained electronically.**
- **Wastewater inflow to plant must be continuously recorded. Flow must be recorded on both an instantaneous and totalised daily basis, recorded automatically with historic data retained electronically.**

Figure 5.1: Smith and Loveless FAST Plant

Figure 5.2: Innoflow AX100 Modules

5.4 Land Application

For Category 6 Clay, a maximum effluent irrigation rate of 2mm/day is permitted by AS/NZS1547:2012. This must be reduced for site slopes greater than 10%. The available area for effluent disposal has been analysed and is presented in Appendix B. A summary of available area is presented in Table 5.1 below. Site slopes may change as a result of subdivision earthworks design and this has not been accounted for in the assessment.

Table 5.1: Tasman Bay Estates Land Application Area			
Site Slope (%)	**Disposal rate (mm/day)**	**Available disposal area (m^2)**	**Effluent disposal capacity (m3/day)**
0-10	2	33,020	66
11-20	1.6	18,480	29.6
21-30	1.0	0	0
Total		51,500	95.6
Dwellings	**Effluent Production (L/house per day)**	**Total Effluent Production (m3/day)**	**Reserve Area (m2)**
58	908	52.7	81%

Assumed conditions for the available wastewater fields are summarised below. Conditions which do not comply with the TRMP are highlighted in **bold** text.

- All disposal fields are a minimum of 20m from assessed water bodies.
- All disposal fields are a minimum of 10m from normally dry gullies.
- **All disposal fields are a minimum of 0.5m from property boundaries, where the disposal field is downslope of the disposal field.**
- All disposal fields are a minimum of 5m from property boundaries, where the disposal field is upslope of the property boundary.
- All disposal fields are located with a minimum of 600mm of unsaturated soil beneath the lowest extent of driplines.
- All driplines have a minimum of 100mm of topsoil or mulch cover.
- All disposal fields are to be located a minimum of 300mm elevation above the 5% Annual Exceedance Probability (AEP, ie 1 in 20 year) inundation level.

The calculated peak wastewater production rate of 52.7m^3/day can utilise the 0-10% land with 10-20% slope angle land retained as reserve area. The reserve area has capacity for 42.9m^3/day of effluent or approximately 81% of calculated peak production. Considering the relatively conservative proposed land application rate, this is considered a significant amount of reserve area. The available reserve area fits within the 33% - 100% reserve area recommended by GD06 for effluent disposal using subsurface pressure compensating drip irrigation.

As discussed previously, the proposed disposal field area is farmed at present. Land disturbance from farming activities meant that evidence of seasonally wet areas such as reeds was not visible at the time of inspection. Cut off drains will be required to divert surface runoff around disposal fields. This may further encroach on wastewater disposal fields.

It is possible that some areas presently shown as “suitable” will be considered unsuitable once a final assessment is made for detailed design and Building Consent. A conservative approach has been taken to determining the suitable wastewater disposal areas. It is likely that the extent of wastewater fields can be increased downslope of the presently shown extent to compensate for any areas found to be unsuitable.

In discussions, the Client has identified the possibility that stripped topsoil could be used to fil disposal fields, as identified in the Eliot Sinclair plans. AS/NZS1547:2012 cautions against disposal on fill. This is a particular issue for disposal beds or other high-rate land applications systems where effluent can preferentially track down voids in poorly consolidated fill. In this case, the risk is reduced due to the use of drip irrigation for effluent application at low rates. There is still a risk that compacted areas will have a lower capacity for effluent application due to poor soil structure arising from high rates of compaction. If topsoil is placed in areas to be used for effluent disposal, it is recommended that it is placed and densely planted at least one year prior to establishment of the disposal field to enable soil conditions to stabilise. The system is likely to be staged and the entire disposal field may not be installed initially. It is proposed that 0-10% slope land with no fill is prioritised for effluent application. Fill areas will be used either later in the project or as reserve fields. An earthworks specification will be developed to ensure fill areas are suitable for effluent disposal.

In preliminary discussions with TDC, TDC have identified that the possibility of productive agricultural uses within the disposal fields should be considered. Several productive uses are considered possible from a wastewater perspective, this could include:

- A feed crop such as hay. Cultivation, sowing and harvesting may damage drip irrigation. This could be partially mitigated by using low ground pressure machinery or increasing the spacing between drip lines however if this is done, it is recommended to avoid traffic over header lines and treat drip lines as disposable, requiring frequent replacement as they are damaged.
- Honey production. Planting fields with appropriate flowering vegetation such as Manuka and establishing hives.

Advice from an agronomist is recommended to understand other options and any long-term implications for crop or biosecurity management associated with the irrigation of productive crops with wastewater.

6.0 Operation and Maintenance

Robust operation and maintenance procedures are critical to the long term successful operation of the proposed treatment and disposal system. Conditions were recommended in Section 5.3. A detailed maintenance plan will be developed in consultation with the treatment plant supplier however conditions regarding maintenance activities are expected to include:

- The system operator must enter into an Operations and Maintenance contract with a suitably qualified contractor, experienced in the maintenance of large onsite wastewater treatment systems.
- An Operations and Maintenance Manual must be prepared for the system in general accordance with the Watercare “Water Treatment Plant Operations Manual Structure and Style Guide” 2006 or an approved equivalent. This must include detailed as built drawings showing the process and piping layout, piping and instrumentation diagrams, electrical drawings and other details as relevant.

- An annual operating report should be prepared detailing compliance with quality and flow limits, the actual volume pumped to each field area and investigations into any exceedance or failure.

Specific maintenance is likely to include the following:

- Onsite Sewer Pump Stations
  - Annual inspections by a licenced plumber/drainlayer

- Treatment Plant
  - Instantaneous and total daily outflows recorded electronically.
  - 3 monthly inspections by a maintenance contractor, expected to be a licenced plumber/drainlayer or equivalent, trained by the manufacturer in the operation of the specific treatment plant in use.
  - It is expected that weekly inspections will be required by a system operator, trained by the manufacturer in the day to day operation of the treatment plant.
  - A site diary should be maintained documenting all maintenance work and changes made to the process.
  - Effluent samples obtained and analysed for BOD, TSS and total nitrogen as discussed in Section 5.3.
  - Sludge levels within treatment plant tanks assessed and removed as required.
  - Other requirements such as maintenance of odour management or chemical dosing systems shall be undertaken in accordance with manufacturer specifications.

- Disposal Field
  - Flushing of every disposal field. As a minimum, flushing of disposal field areas will be undertaken in disposal field zones regularly such that the entire field is flushed at least once every 6 months.
  - Assuming disposal fields are planted with grass, fields to be mown as required using suitable low ground pressure equipment.

7.0 Assessment of Environmental Effects

The most significant actual or potential environmental effect associated with any wastewater discharge to land is the release of additional nutrients or pathogens to the receiving environment. In this case, neighbouring properties, before eventually flowing through Tasman Bay Stream to the Moutere Inlet. The environmental values of the Moutere Inlet are recognised and hence the receiving environment is recognised to have elevated sensitivity.

The specification of a secondary treatment plant partially mitigates the effect of this discharge by reducing nutrient concentrations of the wastewater. Biological processes which are critical to further reducing concentrations of nutrients and pathogens take place within the soils of the disposal area. Provided there is no direct flow path between effluent and the adjacent gullies, the effect on the environment of the proposed discharge is considered insignificant. This can be managed provided that effluent is retained in the soil and there is no 'daylighting' or surface ponding of effluent.

For the proposed system, the application of effluent using driplines subsurface is an important control to eliminate the potential for such a direct link. The application of effluent at such low rates means that even under prolonged wet conditions, there is a very low probability of effluent ponding on the

ground surface provided the system is correctly maintained. The probability of effluent seeping into the gullies is considered very low with the proposed rate of effluent disposal and setback distances.

Provided that the wastewater management system is maintained in sound operating condition, the effect of the proposed discharge on the environment is considered less than minor. Robust ongoing maintenance has been specified. It is recommended that these requirements are imposed as a condition of consent to ensure ongoing successful operation of the system.

Consideration of alternatives has been undertaken including individual onsite systems and smaller clustered systems treating effluent from a group of properties. In accordance with TP58:

"A related problem from on-site disposal systems occurs as a consequence of clustering of properties, without adequate provision of open space. The intensification of individual on-site wastewater treatment and land disposal systems within a limited area has the potential for cumulative adverse effects on the environment."

GD06, the successor to TP58, provides less explicit guidance in this regard however the specification of a well-regulated community treatment system offers greater certainty that potential public health risks and environmental impacts will be managed.

8.0 Conclusions

A site evaluation for the purposes of onsite wastewater and stormwater disposal has been undertaken for a proposed subdivision located between Mamaku and Marriages Road, Tasman. The subdivision will involve the creation of 58 lots for the construction of residential dwellings. Effluent will be treated with a single community system. Design principles are outlined as follows:

Treatment

- The system is to be designed for peak effluent loading of 908L/day per connection or 52.7m^3/day assuming 58 dwellings are serviced.
- A secondary treatment system will be installed.
- Effluent quality must not exceed the following standards
    - Biochemical Oxygen Demand (BOD):
        - 90% of samples ≤20g/m^3
        - No samples exceeding 30g/m^3
    - Total Suspended Solids (TSS):
        - 90% of samples ≤30g/m^3
        - No samples exceeding 45g/m^3
    - Total Nitrogen
        - 90% of samples ≤34g/m^3
        - No samples exceeding 50g/m^3
- The system must include raw and treated effluent storage to provide operational resilience.

Land Application

- The site is assessed as Category 6 – Medium Clay for the purposes of onsite wastewater disposal.
- Effluent disposal rates must be reduced by the slope reduction factors presented in AS/NZS1547:2012.
- At present, 5.15 Ha of suitable wastewater disposal field has been identified.

- 2.6 Ha of land with a 0-10% slope angle is required for the primary disposal field.
- Reserve disposal area is available equal to 81% of the required primary disposal field.

General Items

- An Operations and Maintenance Manual must be prepared for the system.
- An Operations and Maintenance contract must be entered into. This is expected to involve 3 monthly inspections by a specialist maintenance contractor and weekly inspections by a suitably trained maintenance contractor however requirements will vary depending on the system chosen.

9.0 Limitations

This report has been prepared solely for the benefit of our client, Tasman Bay Estates, as per our brief and consultancy agreement. This report has relied on the investigations detailed above and further site investigation may identify conditions different to that assumed. Conclusions from the soil assessment are based on the conditions at the time of assessment and site survey or earthworks may affect the conclusions of this assessment. The reliance by any other parties on the information or opinions contained in this report shall, without our prior agreement in writing, be at such parties' sole risk. Structural and geotechnical engineering design or assessment is excluded from this work. Envirolink have not undertaken any service location, and this is recommended prior to detailed design. Envirolink have not undertaken any assessment of onsite flooding or inundation.

Appendix A: Bore Hole Logs

ID:	BH1	**Type:**	Bore hole	
Depth	Colour	Texture	Structure	Comments
0-200mm	Medium – Light Brown.	Topsoil	Moderate.	
200-500mm	Light Brown/yellow	Sandy clay	Moderate, forms peds readily upon disturbance	
500-900	Yellow with grey and orange mottling	Sandy clay	As above	
900mm		Sandy clay		Wet Soil. End of Hole.

ID:	BH2	**Type:**	Bore hole	
Depth	Colour	Texture	Structure	Comments
0-200mm	Medium-Light Brown	Topsoil	Moderate.	
200-500mm	Yellow	Sandy clay		Orange. Damp. No gravel inclusion.
500-700mm	Yellow	Sandy Clay	Moderate.	Damp Easily breaks into small peds.
700-1000mm	Yellow	Sandy Clay	Moderate.	Damp. White mottling. End of hole.

ID:	BH3	**Type:**	Test pit	
Depth	Colour	Texture	Structure	Comments
0-200mm	Medium-Light Brown.	Topsoil		
300mm	Light Brown	Sandy Clay.	Can observe peds in undisturbed soil however some force required to break soil into peds.	Soil test at 300mm and test to form ribbon as per AS/NZS1547:2012. Forms 55-60mm ribbon.
300-500mm	Yellow-Light Brown. Possible topsoil mixing.	Sandy Clay.	Moderate.	Orange mottling. Damp.
500-700mm	Yellow.	Sandy Clay	Moderate	Damp.

700-1000mm	Yellow.	Sandy Clay	Moderate	Forms ribbon without water. End of hole.

ID:	BH4	**Type:**	Bore hole	
Depth	Colour	Texture	Structure	Comments
0-500mm	Medium-Light Brown	Topsoil & Clay	Moderate	Damp.
500-700mm	Yellow-Brown (some topsoil mixing?)	Medium to heavy clay	Moderate	Plastic properties. Forms ribbon without water. Damp.
700-1000mm	Yellow	Sandy Clay	Moderate	Breaks into small peds with minimal force. Gravel inclusion. Damp. End of hole.

ID:	BH5	**Type:**	Bore hole	
Depth	Colour	Texture	Structure	Comments
0-500mm	Yellow with white sand layers	Sandy clay	Moderate	Damp
500-800mm	Yellow	Topsoil & Sandy Clay	Moderate. Forms small peds with minimal force.	Damp.
800-1000mm	Yellow with orange mottling.	Sandy Clay	Moderate	Damp, not wet. End of hole.

ID:	BH6	**Type:**	Test Pit	
Depth	Colour	Texture	Structure	Comments
0-300mm	Light Brown	Sandy clay	Moderate, peds visible in undisturbed soil.	Soil test at 300mm and test to form ribbon as per AS/NZS1547:2012. Forms 55-60mm ribbon. Swap from shovel to auger at 300mm
300-700mm	Light Brown/orange	Sandy clay	Moderate.	Damp. Forms small peds with minimal force.
700-1000mm		Sandy clay	Moderate	Damp.

				Higher sand content. No gravel inclusions observed. End of hole.

ID:	BH7	**Type:**	Bore Hole	
Depth	Colour	Texture	Structure	Comments
0-500mm	Yellow with white sand layers and orange mottling.	Topsoil & Sandy Clay	Moderate, sandier layers break up readily.	Damp. High sand content.
500-700mm	Orange/Yellow	Sandy Clay	Moderate.	Orange mottling. Damp.
700-1000mm	Orange/reddish	Sandy Clay	Moderate	Wet. Mostly sand. End of hole

ID:	BH8	**Type:**	Bore Hole	
Depth	Colour	Texture	Structure	Comments
0-400mm	Yellow/brown	Topsoil, medium to heavy clay	Poor, takes force to break up.	Damp. Forms ribbon without water.
400-700mm	Yellow	Clay	Moderate.	Damp.
700-1000mm	Yellow	Sandy Clay	Moderate	Wet. Water residue on augur. End of hole.

ID:	BH9	**Type:**	Bore Hole	
Depth	Colour	Texture	Structure	Comments
0-500mm	Yellow with orange mottling.	Sandy Clay	Moderate	Damp.
500-700mm	Yellow	Sandy Clay	Moderate.	Damp. Higher sand content.
700-1000mm	Yellow/orange mottling.	Sandy Clay	Moderate	Damp but not wet. End of hole.

ID:	BH10	**Type:**	Test pit	
Depth	Colour	Texture	Structure	Comments
300mm	Brown, topsoil	Sandy clay	Moderate	Hand excavated. Soil test at 300mm and test to form ribbon as per AS/NZS1547:2012. Forms 45-60mm ribbon.
300-600mm	Brown/yellow	Topsoil & Sandy Clay	Moderate.	Damp.
600-800mm	Yellow/white	Sandy Clay	Moderate	Damp. End of hole.

ID:	BH11	**Type:**	Bore Hole	
Depth	Colour	Texture	Structure	Comments
0-500mm	Yellow	Sandy Clay	Moderate	Damp.
500-900mm	Yellow	Sandy Clay	Moderate	Damp. Orange mottling.
900-1000mm	Yellow	Sandy Clay	Moderate	Damp. Orange mottling. End of hole.

ID:	BH12	**Type:**	Test pit	
Depth	Colour	Texture	Structure	Comments
0-300mm	Yellow/Brown	Sandy clay topsoil	Moderate	Hand excavated. Soil test at 300mm and test to form ribbon as per AS/NZS1547:2012. Forms 60-80mm ribbon.
300-500mm	Yellow/Brown	Topsoil & Sandy Clay	Moderate	Damp.
500-900mm	Yellow with orange mottling.	Sandy Clay	Moderate	Damp.
900-1000mm	Yellow/white	Sandy Clay	Moderate	Damp. End of hole.

ID:	BH13	**Type:**	Bore Hole	
Depth	Colour	Texture	Structure	Comments
0-300mm	Yellow/Brown	Sandy clay topsoil	Moderate	
300-700mm	Yellow	Sandy Clay	Moderate. Breaks into small peds with moderate force.	Damp.
700-1000mm	Yellow/White	Sandy Clay	Moderate	Higher sand content. Damp End of Hole.

ID:	BH14	**Type:**	Bore Hole	
Depth	Colour	Texture	Structure	Comments
0-500mm	Yellow/Brown	Topsoil and medium to heavy clay	Moderate. Takes force to break into small peds.	Damp.
500-1000mm	Yellow with orange mottling	Sandy Clay	Moderate	Damp.
1000mm				End of hole.

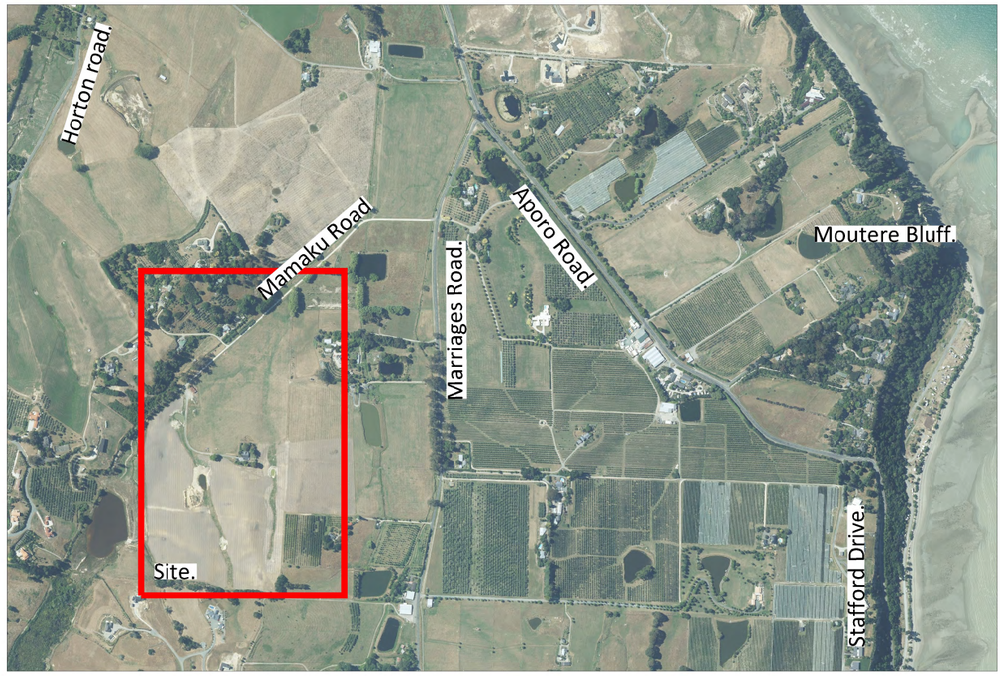
ID:	BH15	**Type:**	Bore Hole	
Depth	Colour	Texture	Structure	Comments
0-500mm	Yellow/Brown	Topsoil & Clay	Moderate. As for BH15, takes force to break into small peds.	Damp.
500-800mm	Yellow with orange mottling	Sandy Clay - Medium	Moderate	Damp.
800-1000mm				End of hole.

ID:	BH16	**Type:**	Bore Hole	
Depth	Colour	Texture	Structure	Comments
0-600mm	Brown mixed with yellow. White sandy layers.	Sandy Clay – Medium.	Sandy material breaks up easily. Layers of clay are plastic, take force to break up.	Damp.
600-1000mm	Yellow/white	Sandy Clay	Moderate – as above, force required to break up medium clay into peds.	More sand content. Wet. End of hole.

ID:	BH17	**Type:**	Bore Hole	
Depth	Colour	Texture	Structure	Comments
0-400mm	Yellow/Brown	Topsoil & Clay	Moderate. As for BH16, takes force to break into small peds.	Damp.
400-800mm	Yellow/white sand layers and orange mottling.	Sandy Clay	As per BH16, sandy material breaks up easily. Layers of clay are plastic, take force to break up.	Damp. No gravel inclusions.
800-1000mm	Yellow/white sand layers	Sandy Clay	Moderate	End of hole.

Appendix B: Conceptual Layout Drawing

Tasman Bay Estates Development.



Site Location Plan

Scale NTS

Sheet Index

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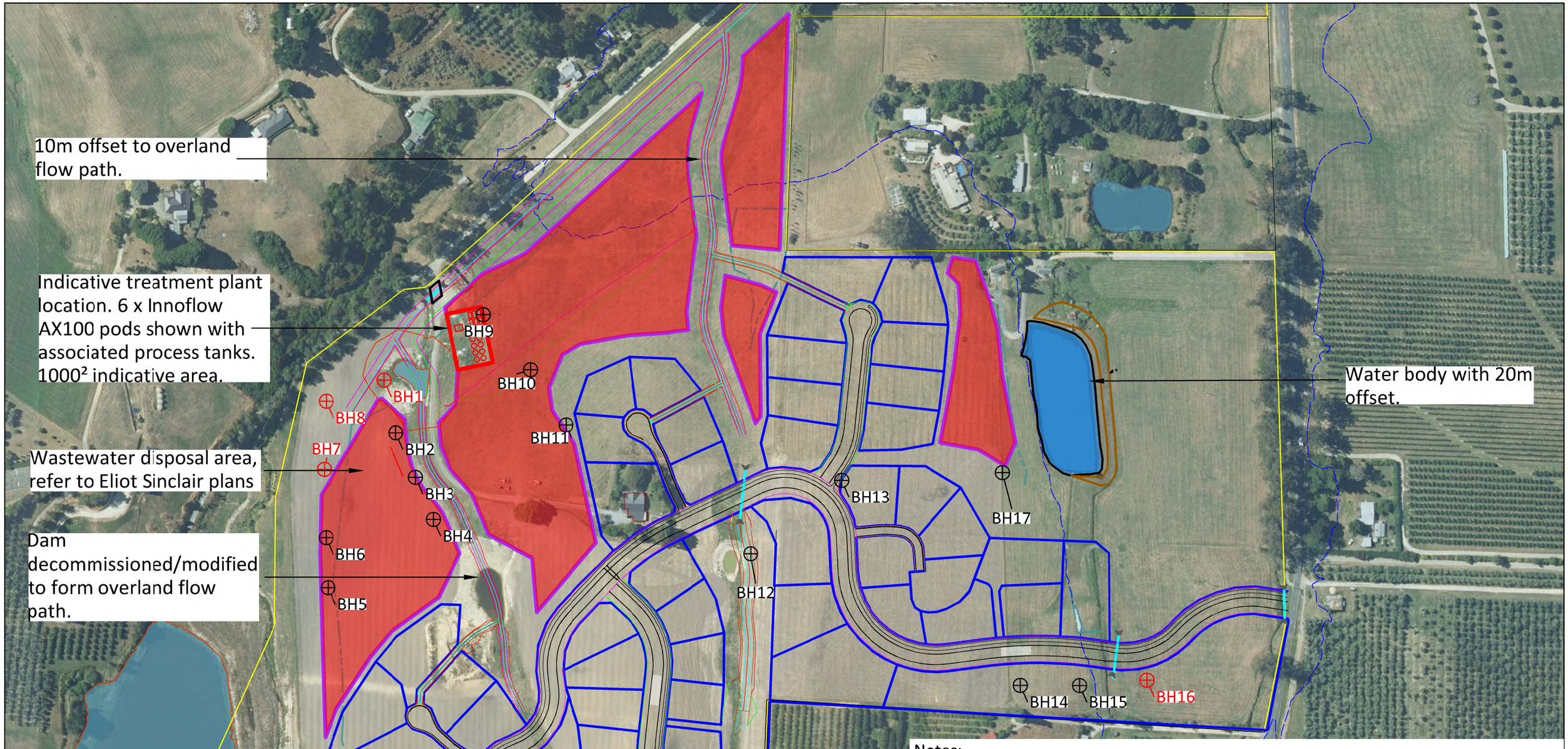
Drawing Title	Tasman Bay Estates Wastewater	
Drawing Sheet	Title Sheet	

	Name	Date
Surveyed		
Drawn		
Reviewed	David Carlson McColl	17/04/2024
Approved	David Carlson McColl	17/04/2024

Scale	NTS
Size	A3
Client	Tasman Bay Estates
Drawing	J000132-DWG-001-D
Revision	D
Issue	CONCEPT
Sheet	1/2



Notes:

- Bore hole location with normal soil condition indicated as BH.
- Bore hole location with wet soil observed indicated as BH.
- Assessed suitable wastewater disposal area indicated as:
- Field slopes represents only the maximum slope of the specific disposal field section.
- Aerial Image from Top of the South Maps.
- All infrastructure location are indicative only and subject to detailed design.
- Not for Construction, conceptual design only. Refer to J000132-RPT-001-D for assumptions.
- No service location has been completed. This is required as part of future design work.
- The information in this drawing is copyrighted and may not be used for any purpose other than that for which it has been prepared.

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Drawing Title: Tasman Bay Estates Wastewater

Drawing Sheet: Indicative Layout Plan & Soil Investigation Locations.

	Name	Date
Surveyed		
Drawn		
Reviewed	David Carlson McColl	17/04/2024
Approved	David Carlson McColl	17/04/2024

Scale: NTS

Size: A3

Client: Tasman Bay Estates

Drawing: J000132-DWG-001-D

Revision: D

Issue: CONCEPT

Sheet: 2/2

DESKTOP SOIL AND LAND PRODUCTIVITY ASSESMENT

MARRIAGES-MAMAKU ROAD SITE

Contents

Assessment undertaken by Landsystems.
Report date: Draft: 11/10/2023; Final: 18/04/2024

INTRODUCTION

BeatsonHill Limited trading as Landsystems ("Landsystems") has been engaged to undertake a preliminary desktop soil and Land Use Capability (LUC) assessment using available soil and LUC map information) of 40.16 ha hectares collectively referred to in this report as the 'Marriages-Mamaku Road site' (**Figure 1**).

Figure 1. Location of the Marriages-Mamaku Road site.

The purpose of the assessment is to provide:

1. A desktop assessment of the soil and LUC units,
2. A revised Productive Land Classification (PLC), and
3. A soil based framework for guiding the master plan to retain the most productive land on the site.

Two previous reports describing the soils, LUC units, soil versatility and productive values of the site form the basis of the assessment[1,2] as well additional soil information and other supporting land data that has subsequently become available. This summary provides a set of initial maps and accompanying explanations.

SOIL MAP INFORMATION

The soil assessment by Campbell (2014) identified five soils on the Marriages-Mamaku Road site. The soils included two soils (Mapua X and Braeburn X) that had not previously been documented in earlier regional soil map information. These soils were subsequently renamed Neudorf (Mapua X) and Kina (Braeburn X).

The report from the assessment describes the properties of the soils from on-site soil observations as well as soil versatility classification assessment of the soils. The accompanying soil map from the assessment was not available.

In 2017/18, soil mapping of an area covering approximately 1250ha (**Figure 2**) including the Marriages-Mamaku Road site was undertaken and provides a better definition of the soils within this locality[3].

[1] Campbell IB. 2014. Report on the soil evaluation at Harakeke 2015 Ltd Properties, Tasman District, Nelson.
[2] Bealing J. 2015. Assessment of Effects on Productive Values, Harakeke 2015 Ltd Proposed Subdivision, Ruby Bay Hills, Tasman.
[3] Campbell IB. 2018. Soils of the Tasman District – Rural 3 and Coastal Tasman. Report prepared for Tasman District Council by Land & Soil Consultancy Services. Nelson. 13p.

Figure 2. Area covered in the survey of the soils of Tasman District.

REVISED SOIL MAP INFORMATION

The soil information for the Marriages-Mamaku Road site was revised using a combination of the Campbell (2014) report and Campbell (2018).

A desktop derived soil map for the Marriages-Mamaku Road site was derived from the soil map information provided by the survey of the soils of Tasman District. The resulting soil map included the following revisions:

1. Exclusion of non-productive land and anthropic soils using aerial photo interpretation of modified soil areas where the soils have been irreversibly modified and are no longer considered potentially productive (see map provided in **Appendix 1**).
2. Improved delineation of soils on flat to gently undulating, undulating, rolling, and strongly rolling slopes using regionally available DEM derived slope data (see map provided in **Appendix 2**).

3. Improved delineation of imperfectly to poorly drained Neudorf soils associated with flow lines (see flow lines and revised soil drainage maps provided in **Appendix 3** and **Appendix 4** respectively).

The revised soil map for the Marriages-Mamaku Road site is shown in **Figure 3**.

Figure 3. Desktop revised soil map units for the Marriages-Mamaku Road site.

SOIL CHARACTERISTICS

The following section provides a brief description of the characteristics of the main soils on the Marriages-Mamaku Road site. Where possible a photo of the soil profile or the topography of the soil location has been provided. These photos are sourced from Campbell (2018) and not taken on the site itself. However, they can be considered indicative of the likely soils on the site.

Soils on the Marriages-Mamaku Road site are either formed on Moutere Gravel materials on undulating to rolling slopes, or sediments from eroded Moutere Gravels on the gully and valley floors. **Table 1** summarises the soils identified, their parent material and topographic position.

Table 1. Soils, their parent material and topographic position on the Marriages-Mamaku Road site.

Soil name (series) (Campbell, 2018)	Soil map units	Parent material	Topography
Mapua rolling (MpR)	Mapua rolling (MpR)	Moutere Gravels	Dissected rolling land
Mapua undulating (MpU)	Mapua undulating (MpU)	Moutere Gravels	Dissected undulating land
Neudorf (Nu)	Neudorf (Nu), Kina + Neudorf (Kn+Nu)	Moutere derived colluvium/ alluvium	Undulating colluvial toe slopes and gully floors
Braeburn (Bn)	Kina + Braeburn (Kn+Bn)	Moutere derived alluvium	Valley floor
Kina (Kn)	Kina (Kn), Kina + Neudorf (Kn+Nu), Kina + Braeburn (Kn+Bn)	Moutere derived alluvium	Valley floor

MAPUA UNDULATING (MPU) AND MAPUA ROLLING (MPR) SOILS

Mapua soils occur the broader elevated surfaces and are Mapua undulating soils occur on slopes between 3° and 7°, and Mapua rolling soils occur on steeper rolling slopes between 8° and 15°. Based on the descriptions provided by Campbell (2014), the Mapua soils on the Tasman Bay Estate site are typical of the Mapua soils found elsewhere in the region.

Topsoils are weakly structured and moderately deep (average 18cm), with textures ranging from sandy loam to clay loam. The subsoils have clay, clay loam or sandy clay loam textures with mottles within the upper 20-80cm of the soil profile. The mottling indicates periods of oxidising and reducing conditions due to slow movement of water through the soil (drainage status is moderately well drained). The soil profile has few stones throughout, commonly residual, hardened, or oxidised relic clasts, remaining from the initial gravelly parent material.

The subsoil has a medium to coarse blocky structure (sometimes weakly prismatic) that is firm to very firm, dense and with few fine pores. As a consequence moisture and root penetration are restricted and largely occurs along the planes formed by the soil aggregates.

Shrinkage during summer drying allows roots and colloidal material (fine clay and organic matter) to penetrate to moderate depths in the subsoil but swelling during wet periods reduces the penetrability and restricts drainage.

Where the subsoil is deeper (average depth 70cm) the soil comprises in situ weathered Moutere Gravel material. This is generally only weakly structured or structureless and less compact than the overlying clayey subsoil. The textures are sandy clay to sandy clay loam, reflective of original character of the Moutere Gravel material and physically, the material has a pattern of coarse mottles that is related to weathering of the stones. The stones are usually completely weathered, commonly retaining their original shape and identity (termed ghosts).

The properties of the Mapua soils vary across the landscape. Topsoil thickness ranges between 9 cm to 25 cm due to erosion and over-thickening from down slope sediment movement. The intensity of mottling also varies across the landscape, mainly relating to topographic

differences, however, this only occasionally results in a change in the soil drainage class. The depth to underlying weathered Moutere Gravels varies between 40 cm and 110 cm, with the effective rooting depth varying by the same range. Indicative soil profiles for the Mapua soils are provided in **Figure** 4.

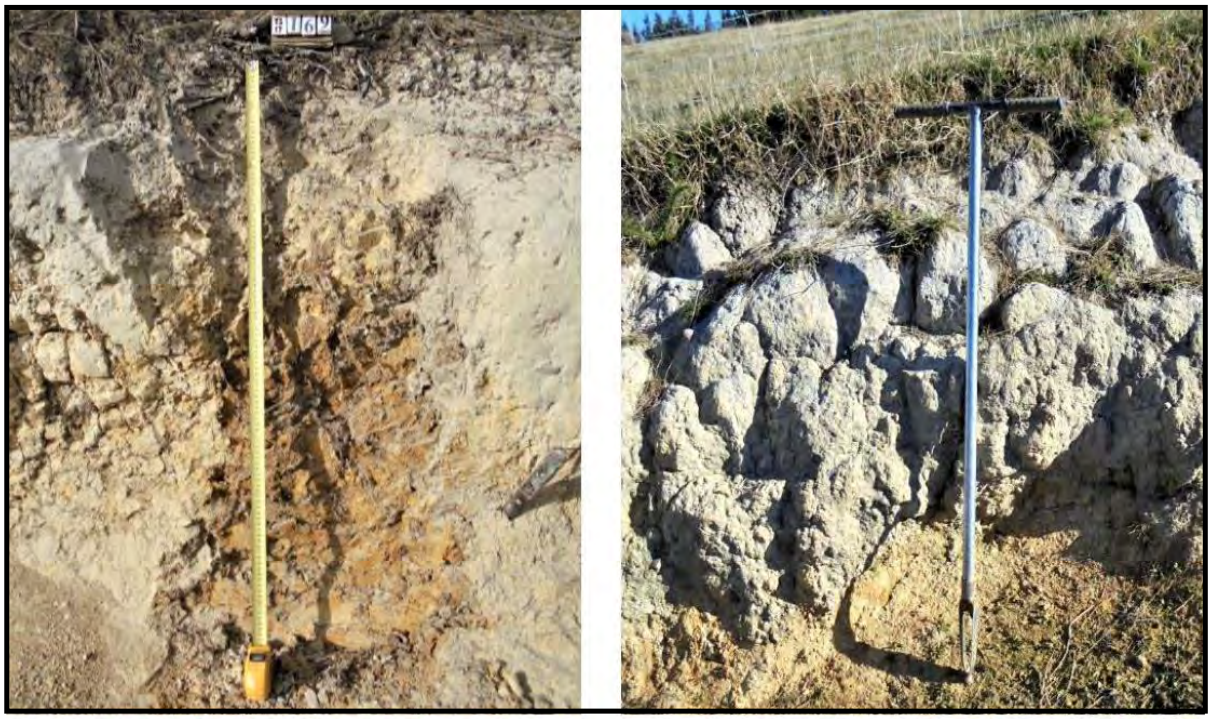


Figure 4. Example soil profiles or the Mapua soils (from Campbell, 2018).

NEUDORF SOILS (NU)

Neudorf soils are formed in Moutere colluvium and alluvium and occupy flat to gently undulating (0°-3°) toe slopes and undulating (3 -7°) gully floors. These soils have a significant soil drainage impediment (imperfectly to poorly drained) and probably remain wet throughout the winter months.

The Neudorf soils have a weakly developed brownish sandy loam topsoil of variable thickness (between 15 cm and 60 cm) overlying a blackish buried former topsoil. The upper brownish soil horizon represents sediments that have accumulated on the lower lying surfaces, being derived from erosion of the soils on the slopes above. Campbell (2014) recorded this in 60% and commented that this indicated the widespread extent of past soil erosion and movement of sediment from the higher to the lower surfaces under early land use management. The underlying subsoil is clay textured and characterised by extensive grey or whitish and brown mottling indicative of the imperfect soil drainage. An example of the topographic position of the Neudorf soils and a core of the soil profile from the location are shown in **Figure 5**.

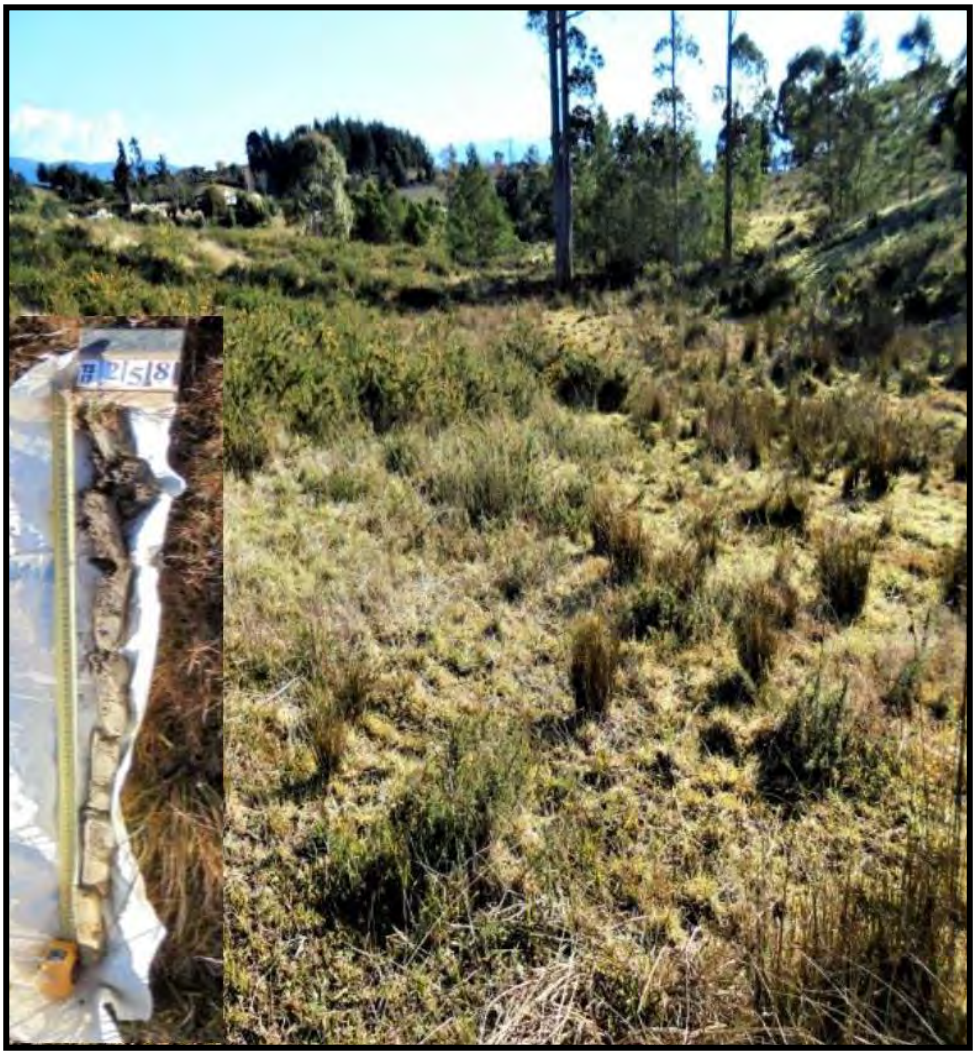


Figure 5. An example of the topographic position of the Neudorf soils and a core of the soil profile from the location (from Campbell, 2018)

BRAEBURN SOILS (BN)

Braeburn soils were not identified by Campbell (2014). Although mapped in association with Kina soils by Campbell (2018) and shown in Figure 3, they are a sub-dominant soil within the soil map unit. Given their occurrence with the poorly drained Kina soils, they are most likely to be clay loam textured and have imperfect drainage. A view of the Kina and Braeburn soil map unit on the Marriages-Mamaku Road site (Marriages Road) with flat to gently undulating topography shows the high winter water table (August 2018) and pale subsoil colours indicative of the poor drainage (**Figure 6**).

Figure 6. A view of the Kina and Braeburn soil map unit on the Marriages-Mamaku Road site with flat to gently undulating topography shows the high winter water table and pale subsoil colours indicative of the poor drainage (image from Google Maps street view).

Campbell (2018) describes Braeburn soils as imperfectly to moderately drained soils with a very dark brown to dark brown topsoil (average 21cm thick) and silt loam to clay loam texture, passing into silt loam to clay loam subsoil with strong brown and light grey or white distinct mottles. An underlying C horizon of compact sand or gravelly sand may be present at an average depth of 72cm.

KINA SOILS (KN)

These soils have formed on alluvium derived from weathering and erosion of Moutere Gravel materials and the Mapua soils. The Kina soils on the Marriages-Mamaku Road site occur on flat to slightly undulating land (slopes between 0° and 3°) and are poorly drained with a near surface water table evident in wetter moths (Campbell (2014). Below the topsoil, Braeburn X soils are characterised by predominantly white to grey subsoil colours resulting from prolonged reducing conditions. Reddish coloured mottles at variable depths and sometimes with dark brown concretions forming an indistinct iron pan may be present. The soils vary considerably with buried topsoils present and textural variation in places indicating additions of alluvium from flooding events. An indicative example of the topographic position of the poorly drained Kina soil on the valley floor is shown in **Figure 7**.

Figure 7. An indicative example of the topographic position of the poorly drained Kina soil on the valley floor (from Campbell, 2018).

LAND USE CAPABILITY

The LUC map information provided in the NZLRI was originally sourced from *Soils and agriculture of Waimea County, New Zealand, scale 1:126 720* [4].

This survey was originally at a scale of 1:126 720, and subsequently integrated into the NZLRI (at 1:50,000 scale). The distribution of NZLRI LUC map units for the Marriages-Mamaku Road are shown in **Figure 8.**

The LUC map information provided **Figure 8** indicates that two LUC units are represented on the Marriages-Mamaku Road site (LUC 3w1 and LUC 3e6).

LUC unit 3w1 indicates that the land has a moderate soil wetness limitation and includes imperfectly drained Neudorf soils and poorly drained Braeburn and Kina soils.

These soils are capable of supporting pastoral land uses and seasonal (summer) cropping but are less suitable for intensive cropping and horticulture requiring deep, well drained soils.

LUC unit 3e6 indicates that the land has a moderate susceptibility to erosion (especially under cultivation) and includes the Mapua soils (rolling and undulating phases).

These soils are capable of supporting pastoral land uses, arable cropping and horticultural land uses.

[4] Chittenden ET, Hodgson L, Dodson KJ. 1966. Soils and agriculture of Waimea County, New Zealand, scale 1:126 720.

Figure 8. LUC map for the Marriages-Mamaku Road site.

LAND PRODUCTIVITY ASSESSMENT

The potential productivity of the site was assessed using existing classifications for soil versatility[5] and Land Use Capability (LUC)[6], and the Productive Land Classification (PLC)[7].

The soil versatility ratings for the soils identified by Campbell (2014) were adopted and ratings assessed for any additional soils identified in the revised soil map. The LUC units for the site were determined using the New Zealand Land Resource Inventory LUC data available through the Manaaki Whenua-Landcare Research LRIS portal[8]. Individual soils and soil map units identified in the revised soil map were assessed against the PLC criteria to determine PLC Land classes for the site.

SOIL VERSATILITY

A summary of the soils and their soil properties identified on the Marriages-Mamaku Road site from Campbell (2014) and the revised soil map is provided in **Table 2**. Also included in **Table 2** is a summary of the soil versatility ratings from Campbell (2014) and LUC units for each of the soils.

[5] Webb TH, Wilson AD, 1995. A manual of land characteristics for evaluation of rural land. Landcare Research Science Series 10 32p.

[6] Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF. 2009. Landuse capability handbook- a New Zealand handbook for the classification of land 3rd ed. Hamilton, AgResearch; Lincoln Landcare Research; Lower Hutt, GNS Science. 163p.

[7] Agriculture New Zealand. 1994. Classification system of productive land in Tasman District. Contract report prepared for Tasman District Council by Agriculture New Zealand, MAF, Richmond, Nelson.

[8] https://lris.scinfo.org.nz/layer/48135-nzlri-south-island-edition-2-all-attributes/

Table 2. Summary of the soils, soil versatility ratings, and LUC units identified on the Marriages-Mamaku Road site based on Campbell (2014) and Campbell (2018).

Soil name (Campbell, 2018)	Soil name (Campbell, 2014)	Slope (degrees)	Soil drainage	Soil Depth (m)	Soil versatility score	Soil versatility rating (Campbell 2014)	LUC unit	LUC limitation
Mapua undulating (MpU)	Mapua	4-7	Moderately well drained	Moderately deep with some shallow inclusions	2.5	Moderate to low	3e6	Erosion (e)
Mapua rolling (MpR)	Mapua	8-15	Moderately well drained	Moderately deep with some shallow inclusions	2.6 (assessed in this report)	Moderate to low	3e6	Erosion (e)
Neudorf (Nu)	Mapua X	0-7	Imperfectly drained	Deep	3.1	Low	3w1	Wetness (w)
Braeburn (Bn)	Not identified	0-3	Imperfectly to moderately well drained	Moderately deep	2.8 (assessed in this report)	Moderate to low	3w1	Wetness (w)
Kina (Kn)	Braeburn X	0-3	Poorly drained	Deep	3.5	Low	3w1	Wetness (w)

The detailed soil versatility scores for the soils identified in Figure 3 (based on Campbell (2014) and as assessed in this report), are shown in **Table 3**.

Table 3. Detailed soil versatility scores for the soils identified on the Marriages-Mamaku Road site based on the revised soil map in Figure 3.

Soil name	Mapua undulating	Mapua rolling	Mapua hill	Neudorf	Braeburn	Kina
Topography	2	3	4	2	1	1
Drainage	2	2	2	3	2	4
Profile available water	2	2	3	2	3	3
Permeability	3	3	3	4	3	4
Stoniness	2	2	2	2	2	2
Effective rooting depth	3	3	3	3	3	4
Trafficability	2	2	5	4	3	4
Workability	3	3	5	4	3	4
Waterlogging	2	2	1	4	3	4
Nutrients	4	4	4	4	5	5
Erosion/flooding	3	3	4	2	3	3
Mean score	**2.5**	**2.6**	**3.3**	**3.1**	**2.8**	**3.2**
Soil versatility rating*	**Moderate to Low**	**Moderate to Low**	**Low**	**Low**	**Moderate to Low**	**Low**

* 0-1 Highly Versatile; 1-2 Moderate to High Versatility; 2-3 Moderate to Low Versatility; 3-4 Low Versatility; 5 Non Versatile

The resulting soil versatility ratings for the soil map units shown previously in **Figure 3** are provided in **Table 4**.

Table 4. Soil versatility ratings and LUC units for the soil map units identified on the Marriages-Mamaku Road site, based on the revised soil map.

Soil map unit	Soil versatility rating	LUC unit
Mapua undulating (MpU)	Moderate to Low	3e6
Mapua rolling (MpR)	Moderate to Low	3e6
Neudorf (Nu)	Low	3w1
Kina + Neudorf (Kn+Nu)	Low	3w1
Kina + Braeburn (Kn+Bn)	Low	3w1
Kina (Kn)	Low	3w1

For the soil map units with two soils identified (Kina + Braeburn and Kina + Neudorf), the dominant soil (named first) occupies the greatest area and limits the range of land use options (versatility) for the map unit.

Based on soil and land properties irrespective of the economic viability of land use options, the Marriages-Mamaku Road site comprises only moderate to low and low versatility soils. Over the long term, these soils are capable of supporting forestry and pastoral land uses but have only moderate to low suitability for more intensive land uses such as arable cropping.

The resulting soil versatility map for the Marriages-Mamaku Road site is shown in **Figure 9**.

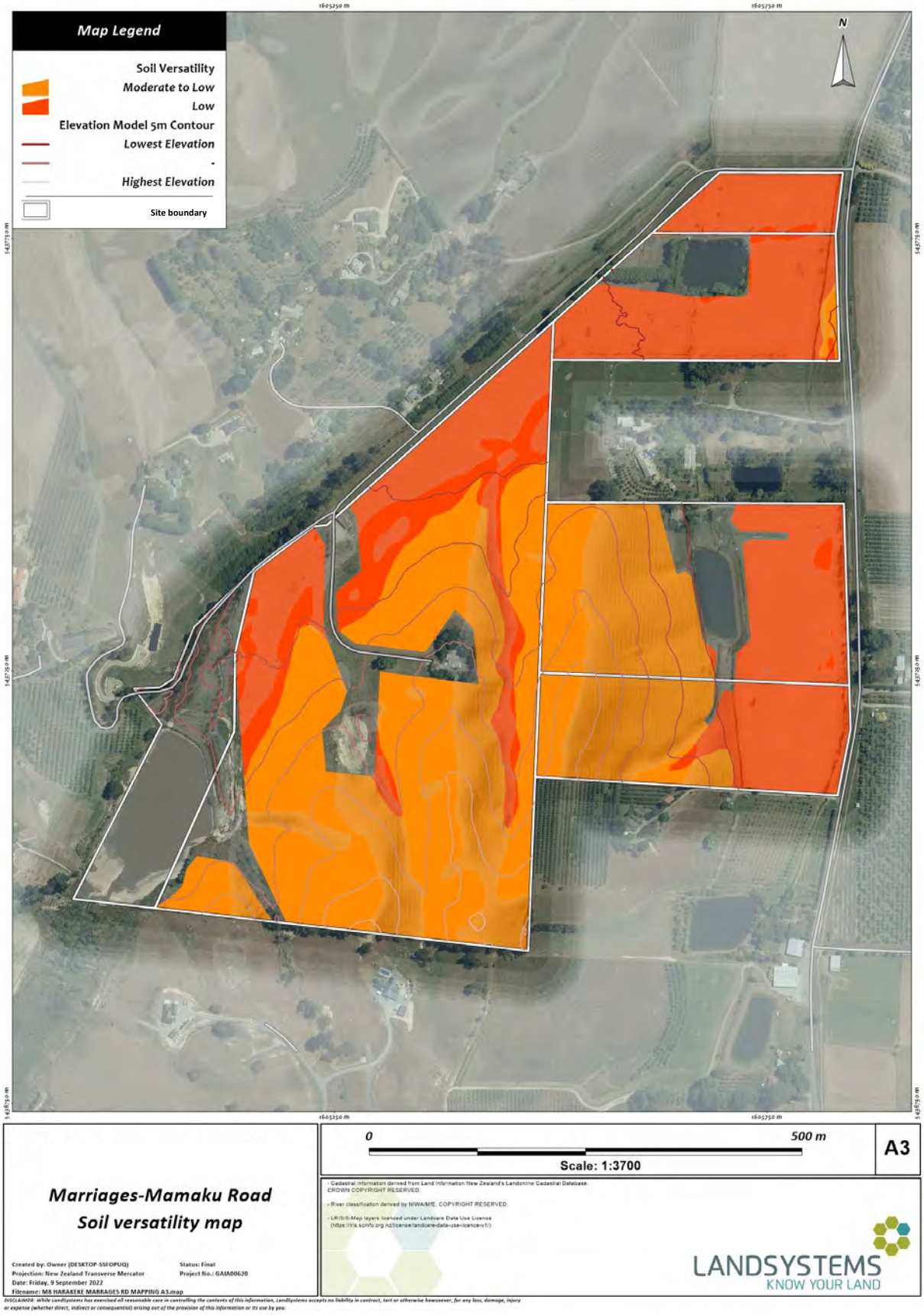


Figure 9. Soil versatility map for the Marriages-Mamaku Road site.

PRODUCTIVE LAND CLASSIFICATION (PLC)

The Tasman District Council (TDC) uses the Productive Land Classification (PLC) for rural land use decision making in the Tasman region. The PLC is based on the report 'Classification system of productive land in Tasman District' (ANZ, 1994)[9].

PLC land classes for the Marriages-Mamaku Road site were determined using a combination of the revised soil map information, and the soil properties for the soils identified provided by the NZLRI Fundamental Soil Layer data and slope class data provided by the regional DEM data. The soil property values were assessed against the PLC land classification criteria shown in **Table 5.**

Table 5. Summary of PLC land classification criteria (from ANZ, 1994).

Versatility	Land class	Criteria													
		Climate					Topography		Soil						Past use
		Altitude (m)	Length of growing season	Heat over summer	Rainfall	Wind	Slope (degrees)	N/S aspect	Fertility	Water holding capacity	Rooting depth (m)	Erosion	Structure /texture	Soil Drainage /permeability	
Very versatile	A	< 50	1-4	1-5	4-6	1-5	≤ 3	n/a	1-5	1-5	≥ 1.0	0	3-6	1-3	
	B	< 50	1-9	1-7	3-6	1-5	≤ 15	N	1-5	1-5	≥ 0.8	0-1	2-6	1-3	
	C	< 300	1-9	1-8	2-6	1-5	≤ 15	N/S	1-5	1-5	≥ 0.6	0-1	2-6	1-3	
	D	< 300	1-11	1-8	2-5	1-5	≤ 18	N/S	1-4	1-4	≥ 0.6	0-1	2-6	1-3	
	E	< 300	1-11	1-8	2-5	1-5	≤ 28	N	1-4	1-3	≥ 0.6	0-2	2-5	1-4	
	F	< 1200	1-12	1-10	1-6	1-6	≤ 35	N/S	1-4	1-3	≥ 0.2	0-3	2-4	1-4	
	G	< 600	1-12	1-10	1-5	1-6	≤ 35	N/S	1-5	1-3	≥ 0.8	0-4	2-4	1-4	
Not versatile	H	-	1-12	1-10	1-6	1-6	-	N/S	1-5	1-5	-	0-6	1-6	1-5	

For the purpose of applying the PLC to the site, climate criteria are considered constant, and not limiting. The site is assumed to be in the Coastal foothills district used in the ANZ (1994) report. The following value scores for the PLC climate criteria are applied to the site (**Table 6**).

Table 6. PLC climate criteria are applied to the Marriages-Mamaku Road site.

PLC criteria	Site criteria value	PLC value	Possible PLC Land classes
Altitude	20 - 60 m	-	A, B, C, D, E, F, G, H
Length of growing season	>150	2	A, B, C, D, E, F, G, H
Heat over summer	11 - 12	2	A, B, C, D, E, F, G, H
Rainfall	800 - 1200	4	A, B, C, D, E, F, G, H
Wind	Low	2	A, B, C, D, E, F, G, H

Table 7 provides a summary of the PLC classes and the limiting criteria for each of the soils identified on the Marriages-Mamaku Road site.

A map of the PLC classification classes for the Marriages-Mamaku Road site is shown in **Figure 10**.

[9] Agriculture New Zealand. 1994. Classification system of productive land in Tasman District. Contract report prepared for Tasman District Council by Agriculture New Zealand, MAF, Richmond, Nelson.

Table 7. A summary of the PLC classes for each of the soils identified on the Marriages-Mamaku Road site.

Soil map units identified	Slope (degrees)	Orientation (north/south)	Rooting depth (m)	Soil drainage	PLC class	Soil map unit PLC classification	Comment
Mapua undulating (MpU)	≤15	North	≥0.6	Moderately well drained	B	B+F	Orientation can be delineated; there is no map information to delineate shallow soils; shallow soils are present but are less common.
			≤0.6		F		
		South	≥0.6		C	C+F	
			≤0.6		F		
Mapua rolling (MpR)	≤15	North	≥0.6	Moderately well drained	B	B+F	Orientation can be delineated; there is no map information to delineate shallow soils; shallow soils are present but are less common.
			≤0.6		F		
		South	≥0.6		C	C+F	
			≤0.6		F		
Neudorf (Nu)	≤15	Not applicable (gentle slope)	≥0.6	Imperfectly drained	B	B	Predominantly ≤3 degree slopes but some 4-7 degree slopes present; Campbell (2014) confirmed soil drainage was imperfectly drained. Imperfectly drained land has the limitation of a high water table (30 to 60 cm from the surface) and precludes such crops requiring well drained soils. Susceptibility to pugging damage and ponding also occurs on imperfectly drained soil and machine access for spring planting and autumn harvesting can also be an issue when the soils are wet and soft. In my opinion a lower PLC class seems more appropriate for Neudorf soils.
Kina + Neudorf (Kn+Nu)	≤15	Not applicable (gentle slope)	≥0.6	Poorly drained	E	E+B	Predominantly ≤3 degree slopes; dominant PLC class (E) noted first - Kina is the dominant soil in the map unit.
				Imperfectly drained	B		
Kina + Braeburn (Kn+Bn)	≤3	Not applicable (gentle slope)	≥0.6	Poorly drained	E	E+B	Dominant PLC class (E) noted first - Kina is the dominant soil in the map unit.
				Imperfectly to moderately well drained	B		
Kina (Kn)	≤3	Not applicable (gentle slope)	≥0.6	Poorly drained	E	E	Poor soil drainage.

Figure 10. PLC classification classes for the Marriages-Mamaku Road site.

LAND OF "HIGH PRODUCTIVE VALUE"

The definition for land with high productive value is defined in Chapter 2 'Meaning of words" in the Operative Tasman Resource Management Plan (TRMP):

High productive value – in relation to land, means land which has a combination of at least two of the following features, one of which must be (a):

(a) a climate with sufficient sunshine that supports sufficient soil temperature;

(b) a slope of up to 15 degrees;

(c) imperfectly drained to well-drained soils;

(d) soil with a potential rooting depth of more than 0.8 metres and adequate available moisture;

(e) soil with no major fertility requirements that could not be practicably remedied;

(f) water available for irrigation;

where that combination is to such a degree that it makes the land capable of producing crops at a high rate or across a wide range.

NOTE: This meaning is adapted from "Classification System for Productive Land in the Tasman District", Agriculture New Zealand, December 1994 and is equivalent to land under classes A, B, and C.

The *high productive value* definition although based on the PLC only requires the land to have two of the features listed, rather than classifying the land based on the greatest limitation as used by the PLC. This means that land that is poorly drained, has shallow soils, or has slopes of >15 degrees (all of which make the land unsuitable for cropping and horticulture) could be classified as land with high productive value, although they must also meet the requirements of the last sentence in the definition: i.e. "that combination is to such a degree that it makes the land capable of producing crops at a high rate or across a wide range".

An assessment of the LUC units on the Marriages-Mamaku Road site against these features in the definition is provided in **Table 8**.

Table 8. Assessment of the LUC units on the Marriages-Mamaku Road site against high productive value definition features.

High productive value *feature*	Soil code and LUC unit				
	MpR	MpU	Nu	Bn	Kn
	3e6	3e6	3w1	3w1	3w1
(a) climate	yes	yes	yes	yes	yes
(b) slope	yes	yes	yes	yes	yes
(c) soil drainage	yes	yes	yes	no	no
(d) rooting depth	no	no	no*	yes	yes
(e) fertility	yes	yes	yes	yes	yes
(f) irrigation	yes	yes	yes	yes	yes

*Based on a high water table limiting rooting depth (30-60 cm).

Applying the definition as stated requires the land to meet the climate feature (a), and one other feature. Although I have not reviewed climate data, the site is assumed to meet the climate (a) feature for the definition, given the presence of cropping and horticulture in the area. The soils on the site range in fertility from high to low soil fertility. However, fertility can be rectified by the addition of nutrients and trace elements with the addition of fertiliser. Additionally, water is available for irrigation. Therefore, applying the definition all land on the site is classed as high productive value, irrespective of limitations of poor drainage (Braeburn – Bn and Kina - Kn) and soil depth limitations (Neudorf - Nu).

Assessed against the last part of the definition 'where that combination is to such a degree that it makes the land capable of producing crops at a high rate or across a wide range', LUC 3e6 land is likely to meet the TRMP requirement of land capable of producing crops at a high rate or across a wide range. However, given the moderate wetness limitation associated with LUC 3w1, the range of crops will be restricted, and the land is unlikely to meet the TRMP requirement.

COMMENTS ON PRODUCTIVE POTENTIAL

As stated in the report by Bealing (2015) none of the land on the Marriages-Mamaku Road site is classified as PLC land class 'A' land, therefore, there is no potential loss of the TDC's most

productive horticultural soil types. Based on **Table 7**, PLC land class 'B' is present but is variable in its distribution, with PLC classes 'F' and 'E' often present within the same map units. The presence of these lower PLC land classes in these areas reduces their overall productive potential.

The Neudorf soil classifies as PLC Land class 'B'. As noted in **Table 7**, imperfectly drained soils have the limitation of a high water table (30 to 60 cm from the surface) and precludes such crops requiring well drained soils. Susceptibility to pugging damage and ponding also occurs on imperfectly drained soil and machine access for spring planting and autumn harvesting can also be an issue when the soils are wet and soft. In my opinion, a lower PLC class seems more appropriate for Neudorf soils.

The main limitations of the soil and land are the availability of water for irrigation, shallow soil depth and soil erosion on the Mapua soils. These limitations are greater on the Mapua rolling soils where the slopes are steeper, and the occurrence of shallow soils is likely to be greater.

Intensive horticulture such as orchards will likely have reduced production where soils are shallow and tree rooting depth is limited. Broad scale arable cropping will have reduced production where soils are shallow due to the lower water holding capacity of the soil, and cultivation may also be difficult on areas where the soils are shallow.

On the remaining soils (Neudorf, Kina + Neudorf, Kina + Braeburn, and Kina soil map units), imperfect and poor soil drainage means that these soils are not well suited to intensive horticulture such as orchards and arable cropping is limited to drier seasons (provided water is available for irrigation). The report by Campbell (2014) highlighted that the soils have long periods of soil wetness and waterlogging which restricts trafficability and workability, and that extensive stock pugging was observed at the soil surface. The soils are best suited to moderate to low intensity pastoral land use.

The report by Bealing (2015) notes that the small size of the Mapua soil areas and their fragmentation by the imperfectly drained 'fingers of Neudorf soils limits their viability for primary productive use, especially for fixed row horticulture such as orchards.

COMPARISON OF ORIGINAL CONSENTED AND REVISED PLAN

A comparison of the original consented and revised plan for Stage 1: Tasman Bay Village is provided in **Figure 11**.[10]

[10] Boffa Miskell. 2024. Concept Plan for Tasman Bay Estates – Stage 1: Tasman Bay Village. March 2024.

Figure 11. Comparison of the original consented and revised plan for Stage 1: Tasman Bay Village.

The original consented plan allowed for 24 private allotments plus a commonly owned lot. The area (footprint) occupied by buildings and curtilage (and lost from production) totalled 116,500 m^2 (11.65 ha).

The revised plan will have 58 residential lots (34 more lots), ranging from smaller lot sizes of around 1100m^2, up to larger more generous lot sizes of up to 7650m^2. The area (footprint) occupied by buildings and curtilage (and lost from production) will be105,000 m^2 (10.5 ha), 1.15 ha smaller than originally consented.

Therefore, based on the concept plan provided,[11] the revised plan with 58 residential lots does have more lots but the location and reduced size of the lots, results in a reduced net loss of productive land of 1.15 ha, compared with the original consented plan.

Compared with the original consented plan, the revised plan proposes 34 additional but smaller lots, clustered along ridgelines on the Mapua soils, while keeping available the balance of the site's land available for productive use.

The clustering and positioning of the lots reduces the effects of subdivision on the productive capacity of the site by:

- maximising the available productive land on the site following subdivision,
- maximising the achievable contiguous areas of productive land to allow for more practicable land use,

[11] Section 5, page 7 - Boffa Miskell. 2024. Concept Plan for Tasman Bay Estates – Stage 1: Tasman Bay Village. March 2024.

- locating the lots predominantly on ridgelines to utilise what are likely to be shallower Mapua soils and avoid more productive, deeper Mapua soils which are more likely to occupying the mid-slopes and toe-slopes, and
- avoiding the LUC 3w1 land with more favourable topography for land use activities.

PRODUCTIVE POTENTIAL OF WASTEWATER AREAS

The proposed wastewater areas for the Marriages-Mamaku Road site are shown in **Figure 12**.[12] The wastewater area is shown in green includes primary and reserve irrigation areas of which 3.32 ha is the expected maximum primary area.

Figure 12. Proposed location of the wastewater areas on the Marriages-Mamaku Road site (wastewater areas shown in green).

The wastewater areas have been located on the moderately well drained Mapua soils with undulating and rolling slopes and a LUC classification of LUC 3e6.

My understanding is that the presence of the subsurface wastewater infrastructure means that there are practical challenges for cropping and other land uses.

Although the range of land uses is likely reduced, the areas will remain available for long term productive use (they will not be built on) and can include productive uses such as a feed crop (such as hay) and manuka planting which may provide honey production or carbon sequestration benefits.

[12] Section 3, page 5 - Boffa Miskell. 2024. Concept Plan for Tasman Bay Estates – Stage 1: Tasman Bay Village. March 2024.

Depending on the depth of wastewater irrigation, the addition of wastewater into the subsoil may improve soil moisture during drier months, resulting in increased plant growth during these periods.

RIPARIAN PROTECTION AND SEDIMENT MITIGATION

The concept masterplan for Stage 1: Tasman Bay Village provided shows enhanced riparian areas and a detention pond (**Figure 13**).[13]

Figure 13. Concept masterplan for Stage 1: Tasman Bay Village showing enhanced riparian areas and a detention pond, Marriages-Mamaku Road site.

The enhanced (retired and planted) riparian areas (4) and the detention pond (5) will result in some loss of potentially productive land. However, these areas are likely to have greater value increasing the stability of waterway banks and reducing ongoing surface loss of sediment from the productive land on the site to waterways.

[13] Section 5, page 7 - Boffa Miskell. 2024. Concept Plan for Tasman Bay Estates – Stage 1: Tasman Bay Village. March 2024.

CONCLUSIONS

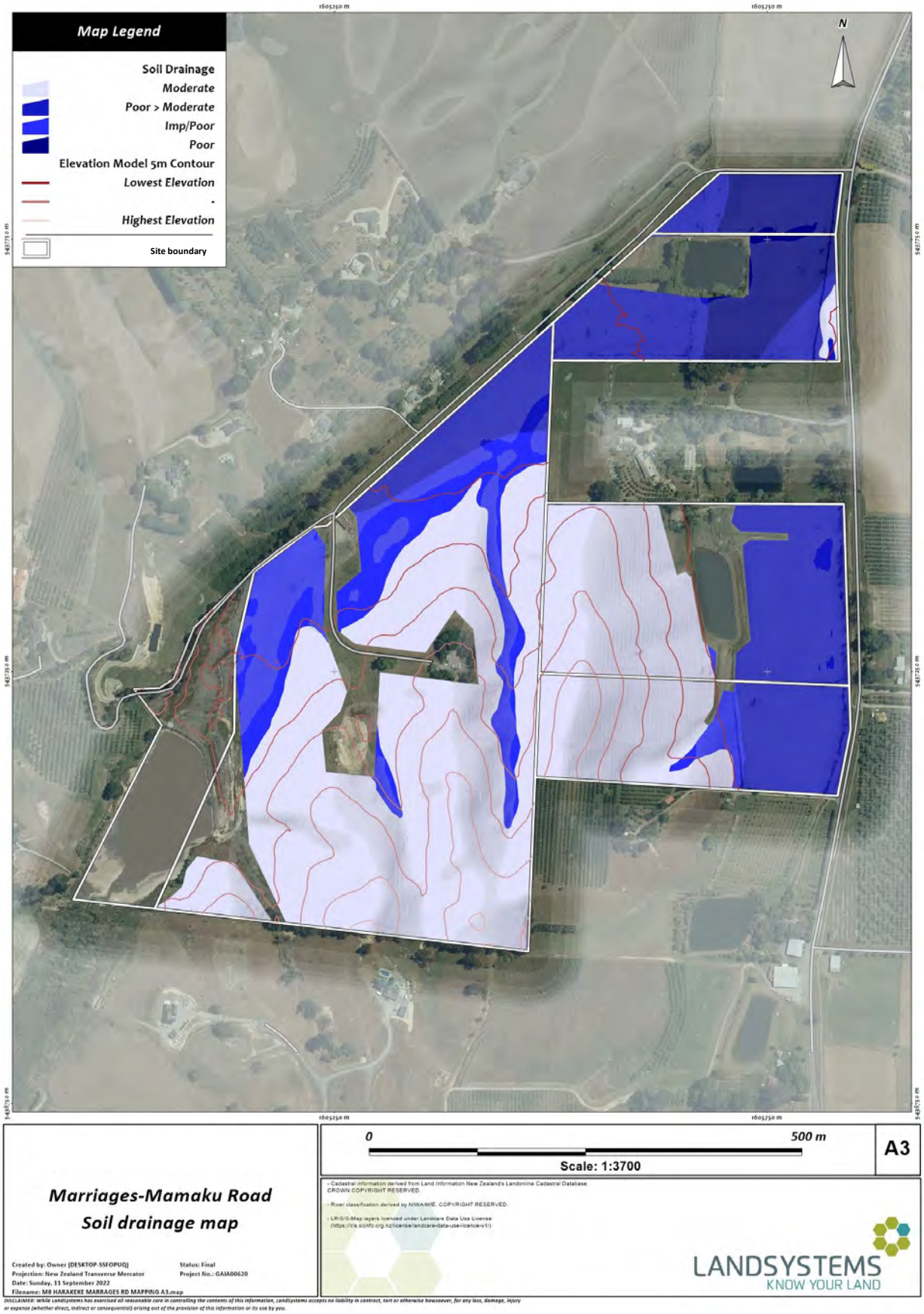
- A revised soil map was developed using recent soil map information in combination with DEM derived contour data.
- The revised soil map provided the base data for assessing the soils and productive potential of the land comprising the Marriages-Mamaku Road site.
- The revised soil map identified similar soils on the site to those identified by the field assessment of Campbell (2014).
- The potential productivity of the site was assessed using existing classifications for soil versatility and LUC, the PLC and TRMP land of high productive value.
- Overall, the Marriages-Mamaku Road site has at best moderate to low soil versatility, with the with the balance of the area being low soil versatility and non-productive land.
- The moderate to low soil versatility areas are predominantly Mapua undulating and Mapua rolling soils, interfingered with low soil versatility Neudorf soils, which reduces the potential use of the combined areas for broad scale primary production.
- The surrounding flat topography is predominantly low versatility soils (Neudorf, Braeburn and Kina soils).
- The LUC units on the site are LUC unit 3e6 and LUC unit 3w1, which are assessed as having moderate to low suitability for arable cropping and are best suited to moderate to low intensity pastoral land use due to their respective erosion and wetness limitations.
- There is no PLC land class 'A' on the site, therefore, there is no potential loss of the TDC's most productive horticultural soil types. Although PLC Land classes 'B' and 'C' are present on the site, these map units include lower rated PLC Land classes ('E' and 'F') which reduce the overall productive potential of the areas.
- Although the range of land uses on the wastewater areas is likely reduced, the areas will remain available for long term productive uses such as a feed crop (such as hay) and manuka planting which may provide honey production or carbon sequestration benefits.
- The proposed enhanced riparian areas and the detention pond will have positive benefits which include increasing waterway bank stability and reducing ongoing surface loss of sediment from the productive land on the site to waterways.
- Clustering lots along ridgelines with Mapua soils, aims to preserve the majority of the land for productive use. This strategy maximizes available productive land, encourages more practical land use, and avoids deeper Mapua soils and more favourable topography for land use activities, reducing the impact of subdivision on the site's productive capacity.
- Based on the concept plan provided, the revised plan with 58 residential lots does have more lots but the location and reduced size of the lots, results in a reduced net loss of productive land of 1.15 ha, compared with the original consented plan.

APPENDIX 1: NON-PRODUCTIVE LAND MAP.

APPENDIX 2: SLOPE CLASS MAP.

APPENDIX 3: FLOW LINES MAP.

APPENDIX 3: REVISED SOIL DRAINAGE MAP.



Harakeke Ltd Development Cultural Impact Assessment

Prepared by Aneika Young for

Tiakina te Taiao

April 2015

Tiakina te Taiao

‘Anei ngā mea i whakataukitea ai e ngā tūpuna, ko te kaha, ko te uaua, ko te pakari’

Here are the things valued by the ancestors; it is the strength, the vigour, and the sturdiness’[1] .

[1] This whakatauki refers to the importance of ‘Ngā taonga tuku ihu’ the taonga gifted and passed down from the tūpuna, such as the natural resources and wāhi tapu, which are to be protected and safe guarded as taonga.

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Shea Gillison (Canopy Landscape Architects)

Amanda Young (Archaeologist)

Deb Foster (Archaeologist)

Mark Dwyer (Cherry Hill Property Manager)

Aneika Young (Cultural and Environmental Consultant)

Contents

1.0 Kupu Whakataki/Introduction

1.1 Tāhuhu Kōrero/Executive Summary

This CIA is put together in response to resource consent applicant Alan Trent's proposed subdivision and development on the property. The report is to identify manawhenua iwi values both in relation to the proposed activities, identify potential issues as a result of these activities and provide recommendations for proposed works. Historical accounts from the wider literature, archaeological surveys provide background context to inform the cultural precinct, but to also collate information with regard to customary association and long occupation of manawhenua iwi to the area of interest. Tiakina te Taiao represents the following manawhenua iwi: Ngāti Tama manawhenua ki Te Tau Ihu Iwi Trust; Te Ātiawa Manawhenua ki Te Tau Ihu Iwi Trust; Ngāti Rārua Iwi Trust; Ngāti Koata Trust; and two Māori organisations: Ngāti Rārua Ātiawa Iwi Trust (NRAIT) and Wakatū Incorporation[2]. Manawhenua iwi acquired the lands in the Motueka Tasman District through conquest during the Hekenga migrations and land wars in the 1820's.

The Harakeke property is located either side of Aporo Road in the western Tasman Bay between Motueka and Mapua. The proposed site is 180 hectares of Rural 3 land and is within Rural 3 Zone, which can be subdivided and developed if the guidelines are met in the Tasman Resource Management Plan. As part of the guidelines the development must align with landscape values of the site, such as natural values, productive values, archaeological and cultural values. The CIA therefore provides for the cultural values of the development.

[2] Note: NRAIT was formed via the Ngāti Rārua Ātiawa Iwi Trust Empowering Act 1993 and represents the descendants of the original owners for the Whakarewa native reserve lands in Motueka. Wakatū Incorporation represents approximately 4000 land owners who descend from Ngāti Koata, Ngāti Rārua, Ngāti Tama and Te Ātiawa. Collectively manawhenua iwi have customary rights and responsibilities as kaitiaki of the Wakatū Nelson and Aorere Tasman rohe, recognising the relationship of Māori and their culture and traditions with their ancestral lands, water, wāhi tapu and other taonga.

2.0 Ngā Whāinga/CIA Objectives and Purpose

2.1 Objectives

The objective of the CIA is to provide a report documenting Māori cultural values, interests and associations with the area and affected resources, outlining the potential impacts of the proposed activity on these. CIA's are a tool to facilitate meaningful and effective participation of Māori in impact assessment and natural resource management. A CIA should be regarded as technical advice, much like any other technical report such as ecological or hydrological assessments. Whilst the content and structure of a CIA may differ between iwi/hapū groups and with the nature and scale of the proposed activity, however a CIA should always include;

- Information on the relevant cultural values associated with the site or area (noting that iwi/hapū may choose not to fully disclose information about some sites);
- The effects on those values, and the relationship of tāngata whenua to them, as a result of the proposed activity; and
- Recommendations to avoid remedy or mitigate adverse effects, including but not limited to the recommended conditions of consent should the application be granted.
- Archaeological assessments and surveys, which provides tāngata whenua with information needed to assess impacts on archaeological values from a cultural perspective.

2.2 Purpose

The purpose of this CIA is to provide the resource consent applicant with an assessment of the potential effects on manawhenua iwi cultural values relevant to the site, and to make recommendations that can help inform planning and decision-making around chosen works to mitigate any cultural impacts.

3.0 Ngā Kauneke/ Methodology

The methodology for CIA's is through a 'Māori Focused Research'[3] approach which aspires to hapū and iwi objectives and Te Tiriti o Waitangi. Māori focused Research was developed by Mahina-a-Rangi Baker and is made up of three key components (1) Decolonising research, (2) Cross-cultural research, and (3) Kaupapa Māori research. The aim of the report is to therefore privilege manawhenua iwi in Te Tau Ihu o te Waka a Māui to ensure their values are outlined in the report. Cross-cultural research allows for an interface to develop to acquire expert advice from the appropriate stakeholders. The following process was followed in the preparation of this CIA;

- Outlining of appropriate legislation and planning framework
- A literature review providing information gathered in relation to manawhenua iwi cultural history for proposed works on Harakeke Property from Tiakina reports resources, iwi Trusts and members, online resources, library resources, council reports, archaeological reports and court evidence.
- Contact NZAA Arch Site for archaeological site assessment and maps
- Collation of a cultural map layer.
- Site Visit of iwi representatives to the property
- Consultation with relevant parties to ensure the best knowledge is sourced for this CIA.
- Outline of issues relating to the proposed remedial works with appropriate recommendations.
- Draft CIA circulated to Tiakina te Taiao Board and Manager for comments and amendments.
- Final presentation of the Cultural Impact Assessment is provided to the applicant for the resource consent application.

[3] Māhina-a-Rangi Baker, (2009). A Methodological Approach to Māori-focused Research.

4.0 Planning Framework

4.1 Legislative Context

There are a number of strong provisions in the Resource Management Act 1991 (RMA), the Historic Places Act (HPA) and the Local Government Act 2002 (LGA) which require both the recognition of Māori culture and traditions and provision for iwi participation in environmental decision-making. In particular: Sections 6-7 of the RMA require local authorities to recognise and provide for, as a matter of national importance, Māori culture, traditions, customary activities, protection of heritage sites and also have regard to kaitiakitanga[4]. Section 8 of the RMA, Section 4 of the Local Government Act and the Reserves Act (via the First Schedule of the Conservation Act) require local authorities to give effect to or take into account the principles of Te Tiriti ō Waitangi. These principles include the duty to act reasonably and in good faith, to consult and to actively protect Māori interests.

Under the RMA Council has the statutory responsibility to recognise and provide for the protection of cultural heritage from inappropriate subdivision, use and development. As matters of national importance, Council must also ensure the relationship of Māori and their culture and traditions with their ancestral links, water, sites, wāhi tapu and other taonga. Sections 14, 77, 81 and 82 of the LGA emphasises the importance of councils' relationship with Māori and requires councils to be more active in facilitating Māori involvement in local authority decision-making.

Heritage New Zealand (HNZ) has statutory responsibility for the identification, protection, preservation and conservation of historical and cultural heritage of New Zealand under the Heritage New Zealand Pouhere Taonga 2014 Act. This includes managing any destruction, damage or modification of archaeological sites under the archaeological authority process[5]. As well as the legislation above the Deed of Settlement legislation for Te Tau Ihu ō te Waka ā Māui iwi provides statutory acknowledgement of local governing bodies to consult with each iwi in Te Tau Ihu ō te Waka ā Māui, on issues that arise as a result of the Treaty Settlements Process.

[4] Manawhenua iwi acknowledge kaitiakitanga as on-going involvement in environmental decision-making over natural resources and to exercise guardianship of the natural and physical resources in accordance with tikanga Māori. Manawhenua iwi have a duty and obligation to tūpuna (ancestors), current and future generations to manage natural resources, places of cultural significance and other taonga (collectively ngā taonga tuku iho - the treasures passed down) in their rohe. Kaitiakitanga is carried out through the use of tikanga (customs), kawa (protocol) and mātauranga Māori (Māori knowledge). The enhancement and maintenance of the "mauri" of all living things is central to manawhenua iwi cultural values.

[5] Tiakina Te Taiao, (2014). Cultural Impact Assessment: 36 Tahi Street Mapua.

4.2 Confidentially Clause

The information in this report is culturally sensitive in nature and is regarded as tapu, particularly mātauranga Māori Intellectual property of that information that is identified in the report. The information is subject to specific protocols regarding its dissemination and publication. It is provided in good faith and solely for the purposes of this report. It is not to be distributed or copied to any other person, organisation or third party unless this is agreed in writing by the authors of the report. Such persons, organisations or any other third party are bound by this provision regarding confidentiality and this obligation must be made clear to such persons, organisation or any other third party.

5.0 Ngā Uara/ Manawhenua values

This section provides an overview of manawhenua iwi values in relation to coastal marine environment of Moutere Bluff and inland into Harakeke where the proposed catchment restoration efforts are to take place, in effort to raise awareness and understanding of the impact of the proposed development on manawhenua iwi.

5.1 Te Ao Māori

Te Ao Māori (the Māori worldview) is holistic and based on whakapapa and the relationship with all living things such as natural resources including freshwater, springs and groundwater. Whakapapa links people with places inextricably, and is a living record of the relationship between early tūpuna and the natural environment. For manawhenua iwi, their identity is shaped and affirmed by their connection to the Moutere area, the maunga, river flats, wetlands, estuary, tributaries, coastline and all other things that make up the character and form the surrounding landscape.

In a Māori worldview there are a number of ngā atua kaitiaki responsible for their domains in the natural world. For example, Tangaroa is the spiritual guardian of wai and Tanemahuta of the forests, trees and birds living along river banks and in the surrounding catchments. Every living entity has a mauri, and wairua, which binds body and spirit together. In recognition of the mauri and wairua that exists in all taonga and some natural resources are considered tapu. Through their whakapapa and spiritual relationship with ngā atua kaitiaki, manawhenua iwi have a duty to their ancestors (those living and those to come) to take care and protect wai and other taonga. Manawhenua iwi are the āhikaa-roa, kaitiaki, a duty demonstrated in the practice of kaitiakitanga. For manawhenua iwi, their spiritual and physical survival is dependent on their ability to safeguard resources as kaitiaki of an area.

5.2 Ancestral relationship

For manawhenua iwi there is an ancestral connection to the Moutere whenua, coast and catchment which is represented through acquisition and long-term occupation. This connection is a spiritual and physical link between the past and the present. The Tasman Valley Catchment and whenua known as ‘Harakeke’ was central to the wellbeing and survival of tūpuna living in the rohe. These awa, streams and wetland areas provided a natural pathway for accessing inland areas, where many resources could be gathered. The whole catchment is important as māhinga kai, harvesting resources from the mountain streams and lakes, the river valleys, wetlands and the river mouths. Tūpuna camp sites, occupation and permanent settlements were located. These resources include indigenous freshwater fish species such as inanga and tuna, habitats of species, shellfish gathering areas and sites where plants are collected for weaving and rongoā purposes. This ancestral relationship is reinforced by the whakapapa connection of hapū to these places.

5.3 Cultural significance of wai

Wai is a living taonga, acknowledged under Article II of the Te Tiriti o Waitangi. A sacred treasure, wai symbolises the wairua link between past and present. The lifeblood of Papatuānuku and the tears of Ranginui, wai flows through the land via channels and waterways, creating wetlands, streams and swamps on its path. Waterways connect the mountains with the sea. For manawhenua iwi, this spiritual and physical relationship with wai is intertwined, both elements are essential to life. The Tasman Valley Catchment and Te Tai ō Aorere coastline continues to be an integral part of manawhenua iwi life, customs and traditions. Maintaining and enhancing the health and wellbeing of taonga resources such as these is a key management principle for āhikaa-roa whānau, hapū and iwi. In relation to the development the preservation of wai is a key component of sustaining ngā taonga tuku iho and maintaining tikanga and hapū identity.

5.4 Protecting the mauri of wai

As kaitiaki manawhenua iwi are responsible for protecting the mauri and wairua of the wai flowing through the waterways including springs, groundwater, and the wai of coastal marine ecosystems across the rohe. Mauri gives being and form to the Moutere and associated water bodies. Wairua is closely associated with the mauri, because the spiritual and physical elements of wai are joined together by the life force. Therefore, maintaining and enhancing the mauri and wairua of wai is a key management principal for manawhenua iwi. Maintaining and enhancing the mauri and wairua of wai is fundamental to the cultural identity of manawhenua iwi.

Tohu or environmental indicators are essential for measuring the health and well-being of wai. For example, the health and wellbeing of plants, fish and bird life living in and around water bodies provide an indication of the state of the health of wai. The health of a water body is also an indication of the health of ngā atua kaitiaki and manawhenua iwi. Where wai has been compromised by human activities, this has a negative impact on the spiritual guardians and people. In such cases, manawhenua iwi are concerned with enhancing the mauri to a level where physical and spiritual health of the water way can be sustained. Maintaining the integrity of wai is central to maintaining the cultural identity of manawhenua iwi. Protecting the mauri of wai is vital to ensure the survival of everything living in the rohe. The protection of indigenous flora and fauna and natural habitats and ecosystems associated with Moutere which is of huge importance to manawhenua iwi[6]. Manawhenua iwi acknowledge the restoration and enhancement efforts proposed in the development but re-emphasise their aspirations to ensure these areas meet kaitiakitanga objectives to protect the mauri of wai.

[6] Tiakina te Taiao., (2014). A Māori Cultural Impact Assessment of the Motueka Waste Water Treatment Plant

5.5 Use of mātauranga and application of tikanga

The use of mātauranga and tikanga is fundamental in the management of Moutere and associated areas. Healthy ecosystems sustain a diverse range of indigenous habitats and their inhabitants. The mātauranga associated with those habitats and indigenous species underpin the cultural identity of tāngata whenua, this mātauranga forms the basis of manawhenua iwi tikanga. Loss of biodiversity is not only an affront to ngā atua kaitiaki of those taonga; it also results in the loss of cultural identity through the inability of manawhenua iwi to apply mātauranga and tikanga connected with those natural resources.

Mātauranga Māori customs and traditions are intertwined with the natural environment and associated ecosystems through long-term occupation and association to the Moutere area. The value manawhenua iwi have with this area is reflected in the use of wāhi ingoa, whakatauki, karakia and waiata to describe different parts of the landscape. Every mountain, hill, waterway, and valley is named. Many names and whakatauki describe the value tūpuna placed on the state of the resources or relationships within the area. The mātauranga provides historical and natural context but elevates the voices of tūpuna that once occupied this area through subsistence lifestyles.

5.6 Maintaining customary use

Customary practices of harvesting whitebait, fish, birds, tuna, kaimoana and other resources from coastal wetland habitats is part of manawhenua iwi life. Traditionally, māhinga mātaitai associated with these habitats were used to sustain the spiritual and physical wellbeing of manawhenua iwi. Although fewer healthy māhinga mātaitai exist today, they are still an important part of cultural life and therefore enhancing and maintaining these areas is even more important. Manawhenua iwi continue to maintain core cultural values such as mānaakitanga providing hospitality to visitors, by offering local specialities from the area. If food baskets are healthy, this reflects on the mana and wellbeing of the manawhenua iwi, and their ability to safeguard local resources as the kaitiaki. Customary use also relates to the use of flora and fauna and other materials for medicinal rongoa Māori, building and weaving purposes.

The coastal environment continues to be an important resource for customary harvest of kaimoana and rongoa plants and it is vital to maintain access to māhinga mātaitai kai areas (see cultural map) of both historical and contemporary significance. The revitalisation of māhinga kai is a kaitiakitanga obligation and objective for manawhenua and the restoration of these areas is welcomed not only to sustain the health of the people but to ensure the mauri of these ecosystems and species are enhanced.

5.7 Protecting wāhi tapu and taonga associated with Moutere

There are numerous wāhi tapu associated with the Moutere and Kina area. Wāhi tapu provide tāngata whenua with a physical and spiritual link to their tūpuna places or sites become known as wāhi tapu because of associations with tapu events, taonga, kōiwi or tapu objects. Wāhi tapu can also signify āhikaa-roa in an area as they are indicators of manawhenua iwi identity, confirmed and protected by the use of tapu. As kaitiaki, manawhenua iwi are responsible for the protection of wāhi tapu and taonga in their rohe. Tiakina support the return of taonga back to hapū and iwi, and suggest that taonga be returned directly to the local hapū.

The Moutere and Kina coastline was extensively used by manawhenua iwi to access food and other resources. Remains of traditional camp sites used as a base from which to gather seasonal food and waka landing sites are widespread along this area (see cultural map overlay). Numerous sites exist near wetlands or at the confluence of tributaries. Wāhi tapu associated with the Moutere include, but are not limited to: urupā, sites used for ceremonial purposes, māhinga mātaitai, māhinga kai, pā sites, waka landing sites, camping sites, work areas and places for harvesting rongoā. Protecting wāhi tapu is essential to manawhenua iwi wellbeing and cultural identity.

5.8 Ki Uta Ki Tai

The concept of 'Ki uta ki tai' outlines the way in which manawhenua iwi view the environment. It is a way to manage ecosystems and natural resources from a 'whole-of-landscape' approach from the mountains to the sea. This value underpins Te Ao Māori emphasising the interconnectedness of ecosystems which is intrinsically linked through whakapapa. Māori don't compartmentalise different aspects of the environment but view it as one system. This concept also aligns with ecological approaches such as integrated catchment management that can be applied in this situation.

5.9 Maintaining kaitiaki obligations as manawhenua

The kaitiaki role is focused on making decisions about how to manage natural resources, using mātauranga Māori, according to tikanga of manawhenua iwi values. The ability to maintain kaitiakitanga within Moutere is reliant on manawhenua iwi having decision-making powers over natural resources, māhinga kai, while providing protection of wāhi tapu[7]. Kaitiakitanga is a long-term intergenerational obligation for future generations to come. Through the relationship with ngā kaitiaki atua, the manawhenua iwi have a duty or obligation to their ancestors, those living and future generations to come, to take care of, and protect places of cultural significance, natural resources and other taonga in the Motueka District. In former times, the manawhenua kaitiaki

[7] Tiakina te Taiao., (2014). A Māori Cultural Impact Assessment of the Motueka Waste Water Treatment Plant.

controlled and regulated access over all natural resources. Kaitiaki were mandated by and on behalf of whānau, hapū and iwi to care for and protect the productive and spiritual wellbeing of ngā taonga within a particular rohe or area. The duty of kaitiaki is to protect and strengthen both the intangible mauri and the physical of the resource or taonga[8].

[8] Tiakina te Taiao., (2010). Draft Cultural Assessment for Assessment of Environmental Effects Land Use and Subdivision Consents: Carter Holt Harvey HBU LTD Kina Peninsula, Moutere.

6.0 Arotake Mātātuhi/ Literature Review

The following section provides an assessment of relevant literature that relates to the proposed site. The following includes archaeological assessment reports, NZAA site records and maps, early surveys of archaeological sites of significance, mātauranga Māori from hapū members, relevant Tiakina te Taiao reports, court evidence, and other relevant resources. The site visit is also included here. This section is to help inform the cultural assessment, provide context in terms of the cultural significance and ensure that all historical accounts are taken into consideration.

6.1 Cultural Significance of Moutere Kina and Harakeke

Manawhenua iwi have lived in the Moutere and Kina area since pre-European times dating back to the early 1800's. For manawhenua iwi the whenua and moana unites kinship and individual identity through the close relationship and association with these environments, providing a link between the past, the present and the future. Māori view they are interconnected to natural resources and place through whakapa. It is through this connection that Māori identity and belonging is shaped and affirmed. Land is recognised by Māori as a taonga of paramount importance and kaitiakitanga is the obligation of manawhenua iwi to be responsible for the well-being of the landscape and ngā taonga tuku iho, for future generations.

Moutere and the surrounding environment is therefore of immense cultural, spiritual, ecological and historical significance to mana whenua iwi. Moutere, Kina and Harakeke provided an abundance of kaimoana, while Harakeke and associated lowlands provide kai from the wetlands. For Tūpuna, this coastline was integral to the seasonal movement between fishing grounds, inland cultivation sites and coastal forest resource harvesting areas. The Moutere Inlet and Tasman Valley tributaries offered Māori travelling along the coast by waka or on foot a place to rest. The access to the sea and its resources was important for tūpuna to access food supplies such as shellfish, seaweed and fish. In addition, the forested hills and lowland areas filled with toitoi and harakeke provided Māori with the materials needed to catch fish and build whare[9].

Te Papa, Te Momokai and Te Mamaku are all wāhi tapu areas of cultural heritage and importance. There are many pā and occupation sites located along this particular coastline which is tribute to the strategic location of the pā for the purpose of defence but also the close proximity to rivers and wetlands for resources, as well as access to Te Tai ō Aorere. The pā were located on prominent hills and were fortified settlements with palisades and defensive terraces. Tūpuna living in the Bay were able to retreat to the pā in times of threat. The battles that occurred in this area also emphasis the immense tapu of pā.The pā and associated papakāinga, fishing grounds and urupā are all signs of Māori cultivation and settlement of the coastline area. The number of wāhi tapu revealed the importance of the area to tūpuna. Modified soils, middens, gardens, pits, stake holes, terraces and artefacts all indicate these areas were a permanent occupation site[10].

[9] Challis, A. J., (1978). Motueka: An Archaeological Survey.

[10] Tiakina te Taiao. (2015). Tapu Bay Pipeline Cultural Audit Report.

6.2 Mātauranga Māori

Mātauranga Māori is a way in which Māori perceive and interpret the world; it is knowledge that defines Te Ao Māori through tikanga and cultural expression. Mātauranga is a knowledge based system derived from locally based ways of life, which is embedded in a defined geographical area. Te Ao Māori the Māori world view is based on a transmission of this knowledge 'ngā taonga tuku iho' passed down from the tūpuna that shapes tikanga. There is tikanga Māori associated with the area such as waiata, pūrakau, whakatauki that provide oral cultural evidence of manawhenua iwi customary association to these lands. There is much research to consider in this area and the scope of the report does not cover the potential to unlock many of the kōrero from the local people with regards to the proposed site. The following members provide oral accounts of mātauranga that provides korero and context to the relevant site.

John Katene

John Katene is of Te Ātiawa descent from Motueka. John alludes to the name of the pā site 'Te Papa' and associates it with the clear view of Tūao Wharepapa Mt Arthur the mountain which is seen behind, on-looking from the pā. He also highlights that the area around the pā is a highly sensitive and there have been significant finds in close vicinity to the development. John indicates there is a 60ft waka located down the bottom of the cliffs on the beach, and an urupā which is located on the Moutere Bluffs. John also states that the area was a significant battle ground during the hekenga migrations in the nineteenth century. John highlights that the site was chosen for it's prime location to scout invaders across the bay[11].

Rōpata Taylor

Rōpata Taylor is of Ngāti Rārua, Te Ātiawa, Ngāti Koata, Ngāti Kuia, Ngāti Apa descent and lives locally in Motueka. The following represents his kōrero on the area through personal conversations with him. Rōpata explains that Te Papa Pā is associated to Ngāti Tūmatakokiri and Ngāti Apa from the Kurahaupo and who are the predecessors of the current manawhenua[12]. This pā was attacked by Ngāti Rārua, Ngāti Tama and Te Ātiawa Taranaki and Tainui waka, when they were gathered there for a fishing expedition. Rōpata outlines that this occurred during the Te Heke Niho Mango (the migration of the tooth shark) migrations, which was also the same period as the invasion that took place at Te Mamaku Pā on the Kina Peninsula. This battle extended from Te Mamaku Pā into Lower Moutere and along the shores of the Moutere Inlet and further inland where many of the Kurahaupo people were massacred on the run from the invaders. Associated artefacts also suggest that Te Mamaku was occupied in later prehistory[13].

Barney Thomas

Barney is of Ngāti Rārua, Te Ātiawa, Ngāti Tama, Ngāti Kuia, and Kai Tahū. Barney explains that the name Harakeke refers to the Tasman Valley Catchment as a harvesting area. Harakeke has various uses; kete, hinaki, kororwai, whariki and rongoa. Barney reiterates that Harakeke is a prominent

[11] Katene. J., (2015). Personal communication.
[12] Taylor. R., (2015). Personal communication.
[13] Taylor. R., (2012). Evidence of Rōpata Wilson Tamu Taylor. ENV-2011.WLG-000059.

feature of wetlands and supports the health of these wetland ecosystems and associated biodiversity such as birds. The name therefore reflects the māhinga kai relevance, harvesting practices of the area and association of manawhenua iwi to this place[14].

6.3 Cultural Map Overlay

The cultrual map provides a manawhenua iwi overlay of cultural areas of significance both pre and post European settlement. The map is to inform the applicant of the context of occupation in relation to the area of interest to give perspective to the whole cultural landscape. The map shows a cultural precent which is the buffer zone surrounding wāhi tapu. This cultural precenct is a highly senstive area where potential finds can occur. The map also identifies māhinga matatai; coastal harvesting areas, and māhinga kai; gathering sites in the valley floor, and wetlands. These areas provide evidence relating to the long-term occupation and actvities relating to harvesting natural resources. The map identifies sourrounding kainga such as Kina peninsula or 'Kaingaroa'contributing to the notion of occupation along the coastline (see figure 3 below)[15].

[14] Thomas. B.,(2015). Personal communication.

[15] Note: It is important to understand that a map can only offer so much in terms of the functions of a cultural landscape. The hard lines on a map are subjective to interpretation; the manawhenua iwi understanding is that there were no defined enclosed boundaries rather the tribal boundaries overlapped within the landscape in relation to location of natural resources. The map therefore provides a Te Ao Māori holistic overview in relation to occupation sites and natural resources.

Figure 3: Cultural Map Overlay

6.4 Archaeological Assessment

The archaeological assessment of the property provides cultural and historical context of pre-European and Post European activity from an archaeological perspective, but does not necessarily convey Manawhenua iwi customary accounts or mātauranga Māori of the area of interest and values associated with those sites.

Amanda Young Archaeological Assessment

An Archaeological Report was put together for the Cherry Hill Development by Amanda Young. Amanda has outlined in her report that there is a significant archaeological site recorded on the property, N27/74[5] Te Papa Pā, which is located on the edge of the Moutere Bluffs. Amanda Young highlights that there are various archaeological sites nearby sites in the Moutere Inlet, along the Kina Peninsula and to the south in Ruby Bay and Mapua. As outlined by Amanda Young previous archaeological and historical research suggests that Māori Settlement in the Moutere sub-region was sparse as a result of the infertile Moutere clay soils. Inland of the Moutere Bluffs were used in as resource gathering sites or māhinga kai. As expressed by Young recorded sites are generally associated with transitory activity, for example, isolated artefact/taonga finds pots, or refuges. There have also been a number of taonga found in this area that has not been referenced in Amanda's Report.

Amanda Young states that Māori settlement was concentrated along the coast. The Moutere Inlet, Kina Peninsula, Ruby Bay and Mapua all have evidence of relatively dense and long-standing Māori occupation; these areas provide evidence such as sheltered canoe spots, campsites, waka landing sites. There was easy access to various estuarine, river and marine resources as well as to wetlands, different forest zones and land able to be cultivated. The Aporo Streams provided access from the Moutere Inlet through to the forest resources and wetlands, also providing a through route. The archaeological assessment seems that the Moutere Bluffs were unfavourable in relation to occupation as it was infertile and the adjacent lands such as Moutere Inlet, Kina Peninsula, Ruby Bay and Mapua that contained favourable living conditions. The Moutere Bluffs not only has restricted access to the coast and the estuary and therefore the archaeological evidence is relatively sparse.

The following points have been identified as archaeological sites in Amanda's report; N27/71 a Midden which is recorded at the top and base of the cliffs. N27/161 is a possible modified soil at the low point of the cliffs. To the south next to the Tasman Memorial Domain is N27/72 a greenstone adze findspot possibly associated with a burial, and the adjacent N27/73 pa/ovens/artefacts. Again the cliffs are lower here therefore more suitable for occupation. As identified in the report N27/73 is known as Te Mamaku Pā (see figure 1, and appendix 1 and 2)[16].

Amanda has carried out three archaeological assessments of the Moutere Bluffs since 2000 from north of Cherry Hill to the golf course, and further out to Kina Peninsula and around the Moutere

[16] Amanda Young (2015). Archaeological Assessment Cherry Hills Property Ltd, Tasman

Inlet. The site has had previous monitoring work with the removal of pines from Te Papa pā and with the establishment of a subdivision with five residential allotments. Amo Stafford was the iwi monitor who assisted in assessing the earth piles during the subdivision and it was recorded that no cultural material was found at that time.

Amanda refers to historical work of Moira Jackson which outlines the settlement patterns in Te Tau Ihu[17]. Jackson states that the pa at Moutere Bluffs (Te Papa Pā) was a site of conflict between Kurahaupo and northern iwi who were the victors. The report states that there is the possibility of isolated koiwi tāngata and taonga find spots across the property as a result of past battles held between Kurahaupo iwi and Taranaki, Tainui Taua. Amanda's concluding remarks state that the area is 'generally' of low archaeological value as a result of modifications that have occurred previously[18].

[17] Jackson, M., (2014). Settlement Patterns and Indigenous Agency in Te Tau Ihu, 1770-1860.
[18] Amanda Young (2015). Archaeological Assessment Cherry Hills Property Ltd, Tasman

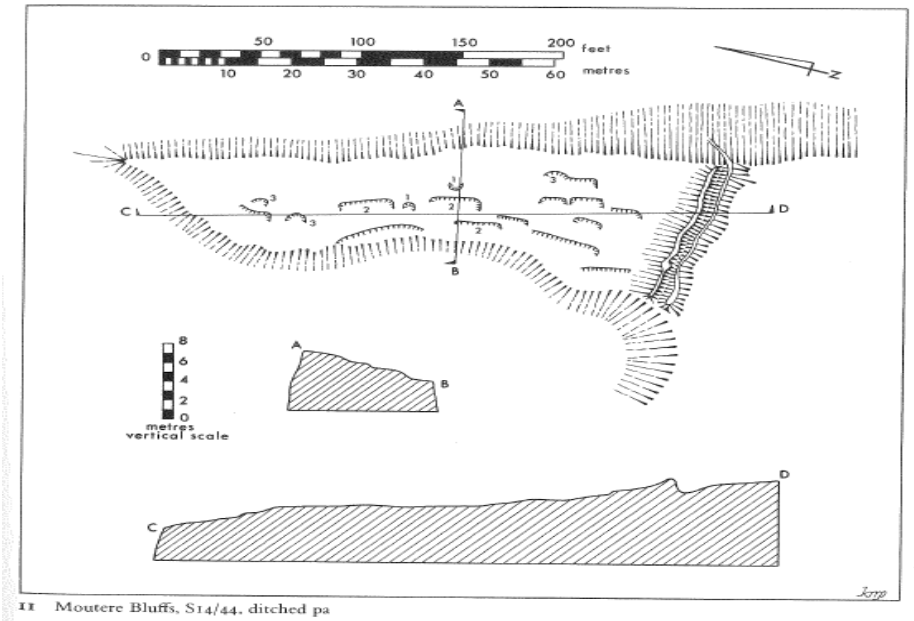
Figure 1: Arch Site archaeological points

Aidan Challis Survey of Moutere Bluff Te Papa Pā

The pā sites in the Motueka Tasman area were originally recorded by Challis in 1976[19]. Aidan Challis made a significant contribution to the documentation of pā such as Te Papa Pā and Te Mamaku Pā which is located along the Kina down from Te Papa Pā (see Appendices 1 and 2). Te Papa Pā is a ditched cliff line promontory pā. Challis describes this pā as Class II pā: Transverse ditches and banks across ridge and promontory sites. The transverse ditches are most commonly ditches, with the material that has been dug out being used to form internal banks such as seen on Te Papa Pā. On the odd occasion the soil would be used to construct terraces. The combined amplitude of ditch depth and bank height is substantial for Te Papa Pā reaching 1.30m.

Access to this pā was most commonly through the ditch terminals. This may be defensively significant since an enemy detected in the ditch would be extremely vulnerable. At Moutere Bluffs a narrow causeway across the ditch and a break in the bank at the extreme western end allows entry. All the Pā defences enclosed living areas. In cases where the ground is undisturbed, elements of layout can be seen. Buildings probably occupied the terraces which are seen in most cases levelled to the slopes. Terraces at Moutere Bluffs occupy much of the small interior, and at one point their proximity suggests the presence of two phases of building (Challis, 1978). Pā were often only occupied when mana whenua felt under threat and not permanent residence. The location of the Moutere pā in relation to food and water resources also suggests that this pā was only inhibited in times of trouble. Evidence as described by Challis that Te Rauparaha made raids on Te Mamaku Pā and Te Papa Pā suggesting that the pā were contemporary, although they may have been used in prior times. Area (m^2): 1500m^2[20].

Figure 2: Moutere Bluffs Ditched Pā



11 Moutere Bluffs, S14/44, ditched pa

[19] Amanda Young (2015). Archaeological Assessment Cherry Hills Property Ltd, Tasman.
[20] Challis (1976). Motueka An Archaeological Survey

6.5 Old Tasman Bay

Old Tasman Bay is a book which states historical accounts of activity in the Tasman Bay. The book was first published in 1937 by J. D. Peart. Peart interviews iwi members from the Tasman Bay to engage historical stories and associations to the area. Peart outlines the conquest of the Motueka District happened along the Moutere Bluffs and in particular in and around Kina north of the Moutere Bluffs. Both Ngāti Tumatakokiri and Ngāti Apa were living along the coast here under the leadership of the rangatira Pakipaki. There were various pā located along the Bluffs, Te Mamaku being the main pā which was close to Kina Beach. It was not identified whether the pā were occupied permanently; evidence suggests that the pā were seasonal in nature as they were closely situated to māhinga kai and māhinga mātaitai. The pā were not large in size and would not hold a large amount of people therefore were not suitable for long term occupation. Peart suggests there were temporary where scattered around the main pā to accommodate for larger numbers.

The land wars took place during this time which was to be known as the bloodiest along the Tasman Coastline. Residents at the pā noticed waka landing on the shore and the men in the waka armed with muskets. Many of the residents took refuge and retreated inland to the back country to Moutere, Pokororo and the Motueka River. While some made an escape others were not so lucky, many were massacred along Lower Moutere hills and the Moutere inlet. Those that escaped were eventually captured and killed. Te Mamaku was the main occupation for these people and after the fall of the pa many were killed off. These accounts of the battle along Kina describe the activities that were happening in the Moutere during that time but also the area as a whole may possibly have remains scattered throughout the landscape[21].

[21] Peart., (1937). Old Tasman Bay

6.5 Site Visit

The site visit took place on March the 31st with Iwi representatives of Tiakina te Taiao, Rima Piggott (Ngāti Rārua ki Motueka) and John Katene (Te Ātiawa ki Motueka) along with Tiakina staff, Frank Hippolite (General Manager), Aloma Sheerer (Administrator) and Aneika Young (Environmental, Resource Management Consultant). Moetu Stephens of Ngāti Tama put in his apologies for the visit. The property manager Mark Dwyer escorted the group around the property to relevant sites. The purpose of the site visit was for Tiakina te Taiao iwi representatives to assess the land and areas of cultural significance in relation to the development and have a feel of the place to understand the scope of the project.

Site One: Nursery

The first site was to the nursery. There were discussions about Tiakina te Taiao potentially utilising the nursery in future restoration projects in a possible joint-management situations. The nursery would provide a functioning site to assist with the rehabilitation and enhancement of the development with indigenous species.

Site Two: Te Papa pā site

The iwi reps went onto the pā to assess the state of the pā. The initial response was very positive and overwhelming for them. The group noticed that the site was overgrown with wattle and that native restoration would be required to enhance the site. Two Rengarenga plants were discovered on the very end point of the pa along with other native plants such as toitoi that are indigenous to the site. These Rengarenga were also very poignant and was a clear indication of occupation. The group commented on how perfect the location of the pā site was for sighting and invading tribes. The visibility across to the other side of Tasman Bay was clear as well as further north and south of the site along the coastline. This backs up the suggestions made that it was only occupied in times of intertribal war. The group were also intrigued in the ditch and that the site had not been extensively modified.

Figure 4: Looking on to Te Papa Pā

Figure 5: Looking out from Te Papa Pā

Site Three: End of Permin Road Section

This section was north of the pā and has recently been purchased. The group drove from the pā to the outer fence line of the Harakeke property. There were discussions on the section in relation to the coastal access way down to the beach. It was identified that the private property had the easiest access route down to the beach giving reference to gentle slope on the section. The slope was modified prior which prompted discussions around previous iwi monitor work on the site.

Site Four: Horton Road to Marriages Road

The group drove from Horton Road along the parameter of the property and back down Marriages Road to view the inland section of the proposed development and get an idea of the size of the section. There was discussion about the boundaries of the property and where potential residential and commercial sites would be situated.

Site Five: Tuckers Dam

The group stopped and discussed the future enhancement and restoration work that would occur at the Tuckers Dam. Generally there was positive feedback about what the potential for this site and the extent of the restoration work for the Tasman Valley Catchment. The group were supportive of restoring habitats for inanga and tuna. The Dam would also be ideal as an māhinga kai in future and potential species recovery programmes and community work could add value here.

Figures 6 and 7: Tuckers Dam

7.0 Proposed Activity

The proposed activities have been outlined and summarised by Landmark Lile Ltd to inform the following section.

7.1 General Overview

The applicant seeks to create some 200 residential allotments of varying sizes and generally located in clusters. Approximately 150 of these residential allotments are between 4000m^2 and 7000m^2. The remaining residential allotments are residential apartments with individual freehold titles. The development also involves the creation of a commercial precinct in a central position, for the purpose of providing an area that will serve the residents and wider community in the long term. Buildings within this commercial area have been carefully laid out and designed. The subdivision will also involve the vesting of land for both recreation reserve and also as esplanade reserve. The total development has been designed in response to topography, productive values, natural values, hazards, and cultural and archaeological values.

7.2 Site Description

The Property is owned by Alan Trent which is located either side of Aporo Road in the western Tasman Bay between Motueka and Mapua (see figure 1). The Cherry Hill subdivision and development involves some 180-hecatres of Rural 3 land located south of Permin and Horton Roads, north of Marriages Road, and generally extending between the Buleugh Ridge subdivision and the Moutere cliffs. This land is within the Rural 3 Zone, which is an area available for residential development[22] the property consists of gentle topography with rolling hills covered with a thin layer of top soil and flat undulating flood plains. The soils have been identified as low fertility, shallow and erodible alluvial clay loams, and leached clay sub soils derived from strongly weathered sedimentary gravels (Moutere Gravels). There is a strip of fluvial deposits along the Aporo Stream that runs along Marriages Road The Moutere bluffs are high steep cliffs that are crumbly and prone to erosion. This section is a steep cliff alongside the coast with no access to the beach[23].

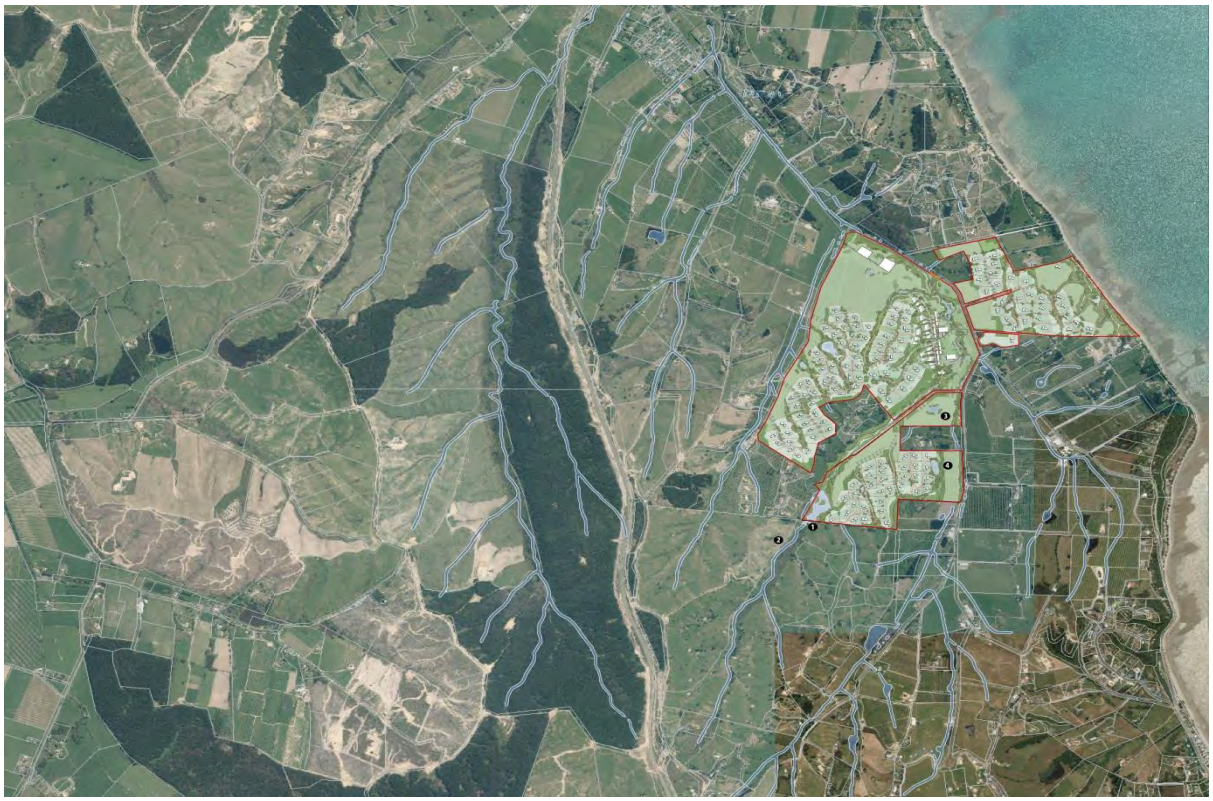
Historically this area was lowland wetlands with swamp podocarp forest. There was coastal vegetation along the cliffs and in the gullies as well as riparian strips of vegetation along the waterways and streams[24]. The Harakeke Property has had over 100 years of land use activities that have taken place over the years have modified the natural environment, from tobacco to pip fruits production with the development of dams to accommodate for irrigation needs.

[22] Lile. M., (2015). Summary of Cherry Hill Development (Unpublished).

[23] Amanda Young (2015). Archaeological Assessment Cherry Hills Property Ltd, Tasman.

[24] Kroos Tom., (2015). Cherry Hill (Ruby Hill) Subdivision. Draft Report Prepared by Fish and Wildlife for Landmark Lile.

Figure 8: Proposed Development Plans



7.3 Subdivision

The proposed subdivision will be undertaken in stages. Flexibility in terms of staging of the development will be critical. Freehold titles are proposed for the residential allotments as well as for the commercial areas. The subdivision involves the creation of roads to vest, numerous rights of ways and also an intricate network of walkways throughout the site. Services easements will also be required. In terms of the walkways, strategic linkages with the Regional Cycleway has been provided for, while pedestrian access to the coastal marine area will also a significant positive outcome.

7.4 Access to the beach

Public access to the beach is an objective of the development which is not currently available. The options available are to provide a pedestrian walkway linkage to the coastal marine area are significantly limited due to the steep topography of the cliffs. The proposal is to form a public

walkway down through one of the incised gullies. Public safety will be important in the selection of an option. Potential sites have been discussed close to the Moutere Bluff side of the development as there are natural depressions and gullies that head down to the coast. This conversation is in the early stages but manawhenua iwi have recommended that the public access way be located away from Te Papa Pā. Further guidance and dialogue is required in this area to ensure that the location is set away from the wāhi tapu to avoid cultural impacts and further erosion from pedestrians.

7.5 Earthworks

The overriding concept with the development of this Rural 3 subdivision has been to minimise the impact on the physical shape of the land. The design is intended to lay a network of roads, and shared paths over the land so that large scale earthworks are not necessary.

The earthworks identified include;

a. To achieve road, right-of-way, walkway and cycleway grades and layouts;

b. To create a new enhanced channel for Aporo Stream, Permin Stream and Mamaku Stream;

c. Disturbance or removal and replacement of topsoil to remove contaminated soil;

d. Minor "fine-tuning" of the topography of the land to create high-quality residential living; and creation of building platforms.

To avoid sediment migrating into water bodies full sediment control measures will be put in place to control all sources of sediment and ensure that water is not contaminated. Earthworks on the coastal block section will have to be closely monitored. It is preferred that these sections are not too close to the pa and that they are clearly within the cultural precinct. In terms of risks to cultural or archaeological values, an accidental discovery protocol will be adopted. Also, in appropriate locations such as the coastal block, the applicant is volunteering that an iwi monitor to be present at necessary times during re-contouring[25].

7.6 Infrastructure

Waste Water

With no sewer reticulation to the site all wastewater must be treated and applied to the land onsite. The apartments and commercial area will be served by a combined community wastewater treatment plant. Providing a combined system is effective as it is centralised allows for a very high standard of wastewater treatment. The wastewater will be treated to a secondary level which is

[25] Lile. M., (2015). Summary of Cherry Hill Development (Unpublished).

appropriate for shallow discharge to land where it can be taken up by plants. From the community treatment plant the wastewater will be discharged to a wastewater irrigation field. The irrigation field will be in discrete garden and landscape areas. The wastewater will be applied to the ground through drip irrigation tubes which evenly disperse the wastewater and allow grass and plants to take up the water and nutrients.

The wastewater will be discharged as follows:

- At a rate of 2mm/day;
- Over a land area of 1.7 hectares (2.5 hectares including 50% reserve area);
- 20m from any surface water body or any bore for domestic water supply
- At a reduced rate on steep slopes

The low-density residential areas will be serviced by their own individual onsite wastewater systems. Wastewater on these lots must also be treated to a secondary standard and typically will be discharged using shallow drip irrigation as described above. The restrictions placed on the discharges are:

- A reserve wastewater treatment area equal to 50% of the minimum area required;
- A 5m offset to any boundary;
- 20m from any surface water body or bore used for domestic water supply
- At a reduced rate on steep slopes

Water Supply

There is no reticulated potable water available along Aporo Road, therefore all water to supply the proposed low- and medium-density residential units and commercial tenancies must be sourced from either groundwater, rainwater or both. The provision of fire-fighting and potable water for the development is built on the following principles:

- Provision of a large volume of centralised gravity-fed storage serving the development;
- A requirement for purchasers of lots to install a large volume of rainwater storage;
- Full reticulation of fire fighting water using centralised storage;
- Commercial and medium-density residential lots to be reticulated from central storage;
- Low-density residential lots to be serviced by rainwater storage but with the ability to obtain some backup water during prolonged dry periods.

The centralised storage tanks will be supplied by six bores on the property.

Storm water

The pre-development and post-development flows have been modelled and the increase in storm water runoff is very small (about 0.4%). This does not take into account the extra planting that is to be undertaken in and either side of drainage channels and streams. As a result it is expected that the change in the rate of storm water runoff will be the same or less than the existing farmland.

7.7 Enhancement of Freshwater Values

As set out in the report from Fish & Wildlife Services Ltd (Mr Tom Kroos, dated 23 March 2015), the enhancement of freshwater values is a significant element of the proposed subdivision and development. The physical work and associated improvements required as a part of achieving these significant ecological objectives will be undertaken with involvement and input from iwi. The methodology of undertaking these works is likely to mirror that currently being undertaken by the Tasman District Council in their work with Borck Creek (Richmond West).

The enhancement project has identified that there is potential to improve water quality and aquatic ecology of the Tasman Valley Stream and tributaries with the Cherry Hill Subdivision property.

7.8 Commercial Activities

The plans indicate that the commercial area will be located at the base of the toe slope, west of Aporo Road. The commercial area will require appropriate land use consents for the commercial activities that will contribute to a larger commercial centre. These commercial activities are explained in the TRMP as the sale of liquor excluding service stations and motor vehicle sales, community activities including child care facilities, doctor's surgeries and other health professionals. There will also be a rural selling place[26].

[26] Lile. M., (2015). Summary of Cherry Hill Development (Unpublished).

8.0 Aroturuki/ Monitoring

A strong aspect of the cultural assessment is the monitoring component of the project that will take place in phase two of the development. Manawhenua iwi have adopting a monitoring system for both earth works for taonga, wāhi tapu and cultural health monitoring of ecosystems.

8.1 Iwi Monitors for earthworks

The earthworks that will take place for the development will be extensive and although it has been outlined that it will have moderate earthworks manawhenua iwi acknowledge the need for on-going dialogue between manawhenua iwi, contractors, sub-contractors, archaeologists, planners and TDC in relation to when iwi monitors would be required. Iwi monitors are all trained in assessing taonga, koiwi, hangi pits, oven stones, and other cultural sites. The areas within the

8.2 Cultural Health Indicators (CHI)

The purpose of CHI monitoring tool is to assess the health and wellbeing of natural resources from a Māori worldview and framework based on cultural attributes and to facilitate the input and participation of mana whenua iwi on land and freshwater management processes and decision making. Cultural attributes include native fisheries, flora and fauna, estuarine habitats, native birds, rongōa species, māhinga kai areas, seawater/freshwater interface and water quality. The CHI tool enables mana whenua iwi to take an active role in monitoring programs. This section examines how each cultural indicator Tiakina considered when assessing the health and māhinga kai value of sites along the Tasman Valley Catchment and the Moutere coastal area. These indicators are all tohu (signs) of the health of ngā atua kaitiaki (the spiritual guardians) and therefore each indicator has been grouped under the appropriate kaitiaki[27].

Tangaroa

Tangaroa is the guardian of inland waters, such as ngā awa, streams, ngā roto , wetlands and the coastal marine area.

[27] Tiakina te Taiao., (2014). Borck River Cultural Health Indicators Report.

Creek condition

The health of the creek relates to the degree of erosion that can be seen at each site and the amount of cover or vegetation that exists to reduce the effects of erosion and shade the water.

Sediment in river

Sedimentation occurs naturally, but is also caused by human activity. Therefore, the health of wai can be measured by looking at the type of sedimentation covering the creek stones, whether the sediment is in the form of green or brown slime and whether there are mossy growths in the water.

Water clarity

This indicator relates to watercolour 'turbidity', whether the water is clear or discoloured and whether the stones and river gravel can be seen through the water. Human pollution may also be measured if it appears in the form of foam or oil on the surface of the water.

Water flow

A healthy river is always flowing and wai can be measured by the nature of its movement. Key considerations are whether the sound of flowing water can be heard, whether the water is moving and at what rate. Where the flow of the river is fast and the gradient steep, it is more likely that the sound of the current can be heard and visible movement can be seen.

Water quality/temperature

Water temperature is a critical factor of river health, as life within a waterway can only be maintained within a specific temperature range. Shading from indigenous vegetation protects wai from extreme heating. The amount of wai in a waterway is also a factor; there must be sufficient wai to sustain life. Water temperature is directly linked to the extent of riparian vegetation and the volume of wai in the waterway.

Shape and form of river

The shape and form of rivers relates to the natural pattern of the river; whether it is naturally bending and curving through ngā whenua and whether the river contains pools and riffles. Riffles are an indicator of good water flow and of water being aerated.

Insect life

Tutewehiwehi is the guardian of insects and lizards. Insects are significant indicators of river health, as many insects rely on high water quality for their survival. The degree to which insects can be seen in the water, rising off the water and/or in the surrounding environment are key considerations.

Fish life

The abundance and diversity of fish and eels indicates whether the river environment is able to sustain life. A river with few or no fish will have a severely degraded mauri. Therefore, it is important to monitor the number and type of indigenous populations present and whether māhinga exist in a healthy state.

Tanemahuta

Tanemahuta is the atua kaitiaki of the forests, trees and plants. Tane is also the father of many manu species including kiwi, kaka and tui.

Riparian vegetation

Riparian vegetation creates habitat for species associated with wai. Plant life also provides shading to protect wai from heating. Flowering plants are important indicators of the time for harvesting certain species. In addition, plant litter is an important part of the food chain. Assessing the health of riparian margins, whether there is shading for indigenous species within the river, and the types of vegetation that exists along riverbanks is a significant measure of river health.

Bird life

A healthy waterway has ngā manu present, both on the river and in the surrounding environment. For mana whenua, it is important to monitor the number and type of bird species living in a water environment.

Haumietiketike and Rongomatane

Haumietiketike is the atua kaitiaki of wild foods and Rongomatane of cultivated foods.

Māhinga kai or rongoa species present

The abundance of māhinga kai species is an indication of the mauri of a river – a healthy river flows with life as well as wai. Where indigenous species exist in populations to support customary harvest, the mauri of ngā awa is strong. Discharges to the water, surrounding land use the sight of rubbish and pollution in and around water, the “feeling in the puku” and taste, are all factors tāngata whenua consider when assessing whether māhinga kai species are safe to eat.

Tūmatauenga

Tūmatauenga is the atua kaitiaki of ngā tāngata. Traditionally, Tūmatauenga was called upon throughout the lives of tāngata whenua. Tāngata were often dedicated to him in tohi.

Use of the river

The use of the river may impact on the health of the river environment. Therefore, identifying different uses and associated impacts on wai provides another strand of information to determine whether a waterway is healthy or not.

Use of the river margins

Activities undertaken on the river margin can have major impacts on the health of life supported by ngā awa (the rivers). It is therefore important to consider what the river margin is used for and whether these activities enhance or degrade the river environment.

Access to the creek

Access is an important factor in the relationship between manawhenua and ngā taonga tuku iho. Where access is limited or non-existent, the health of tāngata whenua is greatly reduced; the ability of tāngata whenua to practice kaitiakitanga is also lost.

Tawhirimatea

Tawhirimatea is the atua kaitiaki of the air. Air links the different elements of the natural world and is therefore a taonga to tāngata whenua.

Smell

A healthy freshwater environment has a distinctive smell. Therefore discharges of foul-smelling and/or hazardous contaminants to air will ultimately contaminate freshwater environments and the wāhi tapu associated with wai. A polluted waterway with a high level of contaminants and low flows may also result in an unpleasant smell.

Feeling in puku

The “feeling in your puku” refers to the feeling tāngata whenua have deep in the stomach when standing by a river. This feeling may be sad or heavy, or it may be strong and light, where the mauri of ngā awa is felt to be healthy.

9.0 Ngā Take /Manawhenua Issues

In principle manawhenua iwi agree to the activity but have identified the following issues with regards to the proposed activity. The scope of the project is large and the potential for future issues to arise at a later date is possible. The following issues outline some current concerns that need to be taken into consideration before the development is to proceed.

9.1 Potential lack of consultation

Lack of consultation prior, during and after the proposed works is of concern. Consultation and continual conversation around options and designs for the new subdivision is essential to ensure all iwi issues are identified and included in the process. The lack of decision-making powers and participation in the process is also a concern. Manawhenua identify that it is a great opportunity to collaborate in what looks like an exciting development, but stress the importance to be involved at the onset and during the process where necessary. Manawhenua would like to have input where necessary and where manawhenua can add value particularly with restoration of wāhi tapu and māhinga kai.

9.2 Moutere identified as wāhi tapu

It is vital that contractors and stakeholders understand that the whole Moutere Kina area inclusive of the proposed site is referred to by manawhenua as wāhi tapu (see figure 3). Although it is identified as a residential zone and is modified in some areas the coastline is of high cultural significance. There are numerous pā and occupation sites along the coastline indicating it is in a sensitive area historically, which consequently increases the chance of an accidental find and discovery of taonga. Manawhenua iwi can't stress enough the value and importance of this area. It is therefore essential not to view the proposed site and identified cultural sites in isolation, but to understand the context of the cultural landscape.

9.3 Protection of wāhi tapu and taonga

Manawhenua iwi have concerns with regards to the potential for contractors unearthing artefacts, kōiwi, middens, pits, terraces, and other taonga during property development, earthworks and construction of utilities in the case that these are unearthed and destroyed. It is vital that there is a continual iwi monitoring regime for earthworks, to protect wāhi tapu in culturally sensitive areas. There is a concern that there will be a lack of consultation by contractors during the earthworks.

9.4 Proposed activities for infrastructure

The management of infrastructure such as waste water, water takes, storm water and other utilities are of concern in terms of future impacts on the environment. Infrastructure requires access to resources and the potential for discharges of wastewater and contaminants. Manawhenua iwi would like to see on-going monitoring in this area to mitigate and environmental impacts on natural resources the impact of utilities on the wider environment.

9.5 Environmental impacts

Protecting the health of ecosystems and biodiversity within the proposed site during development of the subdivision, construction and implementation of utilities and the enhancement project is of concern. Continual dialogue is required to make sure this the environmental impacts are mitigated and reduced to a minimum. If the environment is unhealthy then the people are unhealthy.

9.6 Sustaining the mauri of coastal and wetland ecosystems

The mauri or health of Moutere Kina coastal marine ecosystem is of concern to manawhenua iwi. The area has been severely affected by modification, residential, horticulture, and agriculture compromising the health of biodiversity and habitats. The development potentially poses threats to the mauri and health of these ecosystems.

9.7 The ability to harvest kai

The loss of māhinga kai and mātaitai has been a huge issue for manawhenua iwi. The loss of harvesting kai from the Moutere area and coastline has diminished the mana of manawhenua iwi which is reflected in their ability to mānaaki and provide for manuhiri. The restoration, protection and access to these māhinga kai and māhinga mātaitai are vital to ensure these customary practices and values are upheld.

10.0 Recommendations

The following recommendations have been made to mitigate any potential effects on the cultural values of manawhenua iwi to the proposed development.

10.1 Communication and further consultation

Manawhenua iwi stress the importance of continual consultation and communication with stakeholders involved in the project, to maintain on-going dialogue with Tiakina te Taiao regarding any proposed changes in operations, design, plans and future activities before they are implemented. A regular contact person could facilitate this process. Manawhenua iwi would also like to have more in depth conversations around the decided options prior, during and after commencement of work to get a better understanding of what the final stages will involve. It is also recommended that all contractors are to contact iwi monitors if any earthworks are operating within the cultural precinct (see cultural map). Manawhenua iwi and Tiakina te Taiao would like to be informed on any plan changes in advance and post works to avoid any further conflicts.

10.2 Protecting taonga and wāhi tapu

As kaitiaki, manawhenua iwi are responsible for the protection of wāhi tapu in their rohe. Wāhi tapu includes pā sites, ditches, terracing, kōiwi, kumara pits, hangi stones, middens, taonga, artefacts, urupā, battle grounds and waka landing sites, kāinga, māhinga kai or any other sites that are of culturally significant to manawhenua iwi. Manawhenua iwi recommend that iwi monitors be present for any earthworks during the development such as any movement of soil, digging of holes, use of heavy machinery with any significant movement of earth.

The handling of taonga is also of concern to manawhenua iwi. It is advised that if there is an accidental find that Tiakina iwi monitors be alerted straight away and the accidental discovery protocol to be in place. Tiakina te Taiao would also like to encourage the training of contractors of particular protocols around culturally sensitive areas such as Te Papa Pā if there is any type of work to take place. Finds can be registered with Te Awhina Marae whereby iwi have kaitiaki role of securing and protecting the taonga. The unearthing of koiwi and urupā are highly sensitive and tapu and have particular protocols to consider which are located in the accidental discovery protocol. In this instance iwi monitors will be required instantly.

10.3 Development within the cultural precinct

The Moutere wāhi tapu has been identified by mana whenua iwi as a highly sensitive area in particular around the pā on the cliffs and along the coastline. It has been recommended to consult further with iwi Trusts and key iwi people to discuss the development area closest to the pā. The houses proposed along the edge of the development are within the vicinity of wāhi tapu and therefore in a sensitive area. Around the wāhi tapu there is potential for unearthing urupā, taonga and kōiwi, kāinga, therefore a cultural precinct has been established to account for accidental discovery.

10.4 Protecting the mauri of wai

The mauri of the water environment has been reduced to a level where physical and spiritual health of the associated ecosystems and species has been severely compromised as a result of prior modification. Maintaining the integrity of wai is central to maintaining the cultural identity of manawhenua iwi. Protecting the mauri of water bodies is vital to ensure these waters can sustain life. In order to protect the mauri of wai, manawhenua iwi consider it essential for the implementation of a CHI framework to provide a cultural application of values through monitoring. Manawhenua iwi recognise the work of Tom Kroos and support the ecological restoration and rehabilitation of this work. CHI would complement his work and provide a cultural perspective. Site visits and CHI monitoring prior, during and post the enhancement work is advised and will require further dialogue

10.5 Restoration and enhancement

Manawhenua iwi recommend that the Planners and land owners collaborate with Tiakina te Taiao, to explore ways to rehabilitate the area to enhance the area with appropriate coastal and wetland indigenous vegetation. Restoration through a soft engineering approach can significantly enhance and promote ecosystem health, while offsetting the disruption and modification of the area as a result of inappropriate development. Manawhenua iwi would like to be involved in the long term restoration of the area through the selection of taonga species in particular rongoa and re-establishing vegetation that was once evident in the area. This will be an on-going conversation. Manawhenua iwi also encourage eco-sourcing of species that are found from the area or nearby. Manawhenua iwi would also assist planting on the ground where necessary and would be happy in a joint management role for the current nursery to improve its functions and productivity.

Te Papa Pā restoration

While on site visit to the Cherry Hill there were indigenous coastal plants identified on the pā. Mana whenua see it important to restore the pā site and surrounding cliffs to mitigate any further erosion and provide natural aesthetic. Manawhenua also acknowledge the archaeological significance of the pā and would like to maintain features such as ditching, pits and terracing where planting may not be appropriate. In this case large shrubs or trees would not be appropriate directly on the pā itself. The pā is vulnerable to further erosion; therefore manawhenua would like to see the area restored with the appropriate coastal vegetation. The following species have been identified as appropriate to restore the coastal cliff area next to the Te Papa Pā and on the pā itself and in keeping with the indigenous flora;

- Rengarenga (kai/rongoa species)
- Toetoe (taonga species)
- Hebe (rongoa species)
- Flax (taonga/rongoa species)
- Muehlenbeckia
- Kawakawa (rongoa/taonga species)
- Karamu (kai species)
- Astelia
- Horokaka
- Tauhinu
- Karo

While visiting the site with iwi reps, two Rengarenga (Arthropodium cirratum) plant species were located on the very end point of the pā. Rengarenga also known as māikaika, is a lily which colonises on rocky coastal area with a distribution from the North Cape down to Greymouth. Rengarenga has been identified as having both cultural and spiritual significance to Māori. Culturally they were harvested by tūpuna as a food source and for medicinal purposes. The thick fleshy root or rhizome were cooked in an earth oven and eaten and was heavily cultivated and the roots were roasted and beaten to a pulp and applied to unbroken tumours or abscesses[28]. The presence of this species on the site is hugely significant as they have been associated with Māori occupation and cultivations. More discussion is to take place in terms of the protection and management of the ditch, terracing and pits on the pā to enable appropriate landscape protection.

[28] Harris and Te Whaiti, (1996). Rengarenga lilies and Māori occupation at Matakitaki-a-kupe (Cape Palliser): An ethonobotanical study.

Figure 9: Rengarenga (Arthropodium cirratum)

10.6 Manawhenua iwi input into concept design and planning

Manawhenua iwi are extremely pleased to be a part of the planning and design process and recommend the following to ensure hapū aspirations are honoured. It is important for manawhenua to have a presence in the area not only because of long term occupation and connection but to ensure their kaitiakitanga obligations are maintained.

- The implementation and construction of poupou to represent manawhenua hapū and iwi connection to the area in particular on the Te Papa Pā site.
- The potential transfer of the land around the Te Papa Pā site to the appropriate hapū/iwi organisation. This will also require further consultation and legal advice on the correct process in which to proceed. Further management options will also be discussed as manawhenua would like to see the restoration of the site and eventually the complete return of this site.
- Further discussion about access for manawhenua to Te Papa Pā and providing a landscaping area where manawhenua can gather.
- Input into design and planning of the new public access walkway to the beach. Manawhenua iwi encourage the public access way to be restricted from culturally significant sites such as the pā and other wāhi tapu to avoid any vandalism and to respect the sensitivity of the site. The site is also prone to erosion and access down to the beach via the gully closest to the pa may trigger further erosion.
- Manawhenua iwi have identified that the construction of interpretation panels would be appropriate to convey their stories, and customary connection with the Tasman Valley

Catchment ‘Harakeke’ where the enhancement project is taking place, as well as around the Te Papa Pā. There may be other areas where interpretation panels will be required such as māhinga kai areas.

- Māori Street Names; the naming will require further consultation and planning with appropriate hapū members to ensure appropriate names are considered and reflect hapū names from the rohe.
- Access to existing and restored māhinga kai sites for customary harvest purposes.
- Input into a long-term restoration management plan to ensure inclusion of taonga species for example harakeke, raupo, kahikatea, kuta, Rengarenga and kawakawa are included.

11.0 Kupu Whakatepe/Conclusion

The CIA provides a tool that enables an understanding of the nature of wāhi tapu that are located in this area, while emphasising the importance of maintaining and protecting cultural landscapes, wāhi tapu, taonga, natural resources, biodiversity and ecosystems significant to manawhenua iwi. Manawhenua iwi identify the whole area as a wāhi tapu and of cultural significance. The Te Ao Māori understanding of viewing the landscape is based on the concept 'ki uta ki tai' from mountains to the sea. In modern times this concept still applies but is complex as a result of a new land tenure system and privatisation of ancestral lands. The privatisation, modification and development of Māori land do not remove the kaitiaki obligation to manage and safe guard natural resources. The recommendations made are to reflect manawhenua iwi aspirations for the protection and enhancement of the proposed development site. Continual communication and dialogue is a key component of adhering to manawhenua values and priorities. Manawhenua iwi therefore support the proposed activity given the recommendations and conditions given are adhered to. Manawhenua would also like to take this opportunity to acknowledge those involved with the development and look forward to collaborating with interested parties in the future work of the development.

12.0 References

Baker, M., (2009). A Methodological Approach to Māori-focused Research. Working Paper Prepared for McGuinness Institute (Sustainable Future Institute). Retrieved 02/09/14, available from: http://mcguinnessinstitute.org/Site/Publications/Working_Papers.aspx.

Challis. A., (1978). Motueka, An Archaeological Survey.

Harris. G. F., and Te Whaiti. H., (1996). Rengarenga lilies and Māori occupation at Matakitaki-a-kupe (Cape Palliser): An ethonobotanical study. The Journal of the Polynesian Society, 105 (3).

Jackson, M., (2014). Settlement Patterns and Indigenous Agency in Te Tau Ihu, 1770-1860. A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy, Department of Anthropology and Archaeology, University of Otago, New Zealand.

Kroos. T., (2015). Ecological Assessment of the Tasman Valley Catchment (draft report) Prepared by Tom Kroos Fish and Wildlife Services for Land Mark Lile Ltd.

Lile. M., (2015). Summary of Cherry Hill Development (Unpublished)

Peart. J. D., (1998). Old Tasman Bay. First published in R Lucas And Son Ltd

Taylor. R. T., (2012). Evidence of Ropata Wilson Tamu Taylor. ENV-2011.WLG-000059. In the Matter as appeal under section 120 of the Resource Management Act 1991, between Carter Holt Harvey HBU Ltd (Appellant/Applicant) and Tasman District Council (Respondent).

Tiakina te Taiao., (2014). Borck River Cultural Health Indicators Report.

Tiakina te Taiao. (2015). Tapu Bay Pipeline Cultural Audit Report.

Tiakina te Taiao., (2014). A Māori Cultural Impact Assessment of the Motueka Waste Water Treatment Plant.

Tiakina Te Taiao, (2014). Cultural Impact Assessment: 36 Tahi Street Mapua.

Tiakina te Taiao., (2010). Draft Cultural Assessment for Assessment of Environmental Effects Land Use and Subdivision Consents: Carter Holt Harvey HBU LTD Kina Peninsula, Moutere.

Young. A., (2015). Archaeological Assessment Cherry Hills Property Ltd, Tasman. Report prepared for Cherry Hill Properties Ltd.

13.0 Appendix

13.1 Te Papa Pā

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

ARCHSITE archaeological site recording scheme

Site Record Form

NZAA SITE NUMBER: N27/74

SITE TYPE: Pa

SITE NAME(s): Moutere Bluffs Pa

DATE RECORDED:

SITE COORDINATES (NZTM) Easting: 1606652 **Northing:** 5438348 **Source:** On Screen

IMPERIAL SITE NUMBER: S14/44 **METRIC SITE NUMBER:** N27/74

Finding aids to the location of the site

Situated on cliff edge between Permin Road and Moutere Bluff.

Brief description

Terraced promontory pa defended by a transverse ditch/bank.

Recorded features

Ditch - transverse, Terrace, Ditch - transverse, Pit, Terrace

Other sites associated with this site

Printed by: debfoster 22/03/2015

1 of 10

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE RECORD HISTORY	NZAA SITE NUMBER: N27/74

Site description

'Updated 06/03/2015 (Field visit), submitted by amandayoung , visited 23/09/2014 by Young, Amanda
Grid reference (E1606652 / N5438348)

Both Taylor (2012) and Tiakina te Taiao (2007) name this pa as Te Pa Pa. The pa is registered by Heritage NZ (#5864) and scheduled on the Tasman Resource Management Plan (TDC13005). There is no definite evidence of an occupation period for Te Pa Pa. Jackson found mention of the pa in Armstrong which states that the pa was the site of a battle between Kurahapo iwi and the Tainui – Taranaki taua (who were the victors) . No reference to the pa was found in other accounts of the taua such as Mitchell 2004 and Taylor 2012, or in Clark 1999 and Gillingham 2000 . Challis had a clear surface view of the internal features in 1976. He suggests that the proximity of two terraces suggests two phases of building . It is likely that the pa was used sporadically over a long period of time.
References are given in A. Young 2015. Archaeological Assessment of Cherry Hills Property, Tasman.'

Condition of the site

'Updated 06/03/2015 (Field visit), submitted by amandayoung , visited 23/09/2014 by Young, Amanda

Te Pa Pa was inspected in September prior to subdivision of the surrounding property. Te Pa Pa is very well preserved notwithstanding at least two efforts at removing pine trees from the site (pre-1976 and 2002). It is a beautifully preserved small, cliff top defence. The defensive ditch is still as recorded by Challis in the 1970s with some additional natural infilling and erosion. The internal features are no longer visible due to the ground cover but it is expected that they are also the same as recorded. There has been recent hand clearance of vegetation including the removal of wilding pines. No machinery has been on the site.
Root raking has occurred along the edge of the cliffs. No evidence of any archaeological material was found along the cliffs in the vicinity of the pa or immediately inland.

Since the pine trees were removed from the pa in 2002 there has been substantial re-growth in wattle and bracken, also some small wilding pines. Some erosion damage to the ditch and bank (2009).'

Statement of condition

Current land use:

Updated: 06/03/2015, Visited: 23/09/2014 - Rural residential, Coastal margins

Threats:

Updated: 06/03/2015, Visited: 23/09/2014 - Subdivision, Erosion, Tree planting (other than forestry), Vegetation clearance

AD AI AE BB AA IC

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE RECORD FORM

Map number S14
Map name Motueka
Map edition 2nd
Grid Reference 448379

SITE NUMBER S14/144

SITE NAME: MAORI
OTHER Montere Bluffs

SITE TYPE Pa/terraces.

1. Aids to relocation of site E644800 N6837900
West of an orchard in pine plantation immediately north-east of an irrigation pond. See sketch map.

2. State of site; possibility of damage or destruction
Pine trees felled. Land now under scrub.

3. Description of site (NOTE: *This section is to be completed ONLY if no separate Site Description Form is to be be prepared.*)

4. Owner R.H. Deck
Address Tasman

Tenant/Manager
Address

Attitude Concerned and Cooperative

Attitude

5. Methods and equipment used Level and staff, tape and compass survey.
Photographs taken: ~~Yes~~/No (Describe on Photograph Record Form)
Date recorded 9.9.1975

6. Aerial photograph or mosaic No.

Site shows:
Clearly/badly/not at all

7. Reported by A.J. Challis
Address

Filekeeper J.Y. Wallis

Date 16.6.1976

Date

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION SITE DESCRIPTION FORM Map Number S14 Map Name Motueka Map Edition 2nd Grid Reference 44 8379	SITE NUMBER S 14/44 SITE NAME: MAORI / OTHER Montere Bluffs SITE TYPE Pa / terraces

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

Promontory site: an elongated rectangle, internal dimensions 82 x 28 m., internal area 1500 square metres. Natural defences on 3 sides and transverse bank and outer ditch on the fourth side.

Situation. A gently sloping plateau, sloping down to the northand to the west, bounded to the east by a precipitous cliff line of over 100 ft to the Tasman Sea, sheer to the north east and slightly less so to the south east, and bounded to the west by a sheer vertical slope of 50 to 100 ft to a narrow stream ravine which reaches the coast to the north of the site and terminates in a head-wall slump to the south west. From the site there are extensive views of Tasman Bay from D'Urville Island to Separation Point. To the south and west of the site the land level rises, so the view landward can never have been extensive.

Defences. The cliff and ravine are effective in this respect. It was not possible to examine the eroded sections because of unstable overhang in the loose Mapua Soil and Montere Gravel. The artificial defences cross the neck of the promontory just north of the ravine head-wall, giving maximum internal area. The internal bank is 0.6 m. high and 5.0 m. wide. It appears to be constructed of clean Montere Gravel-derived clay. The external face is steep and contiguous with the ditch cutting. The ditch is 0.7 metres deep and 4.0 m. wide. Its internal face is continuous with the external face of the bank, but the external face of the ditch is gradual. The ditch presumably supplied material for the bank. Erosion of the bank and infilling of the ditch is evident, accelerated by pine tree growth and litter accumulation.

Access. To the east, access to the ditch can be gained from the beach by a winding passage up the very steep slope. The bank to the east runs out to the cliff edge. To the west there is a causeway across the ditch at its abutment with the ravine edge, a feature which appears original. Also to the west the bank does not run to the ravine edge but ends in an almost vertical wall allowing a space of 30 cm. for a foot track to pass into the interior from the ditch causeway. At the extreme north, this narrow track cuts off a portion of bank which remains at the ravine edge, suggesting that it may have been a passage-way between parts of the bank rather than a peripheral feature.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S14
Map Name Motueka
Map Edition 2nd
Grid Reference 448379

SITE NUMBER S14/44

SITE NAME: MAORI / OTHER Moutere Bluffs

SITE TYPE Pa / terraces

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

Water supply. The western ditch terminal held water. The ravine to the west has running water for most of the year.

Internal features. There are a number of terraces cut back into the slight slopes of the interior, generally on the western, more sheltered side. There are several types of features:

a) Larger levelled terraces, rectalinear, 7 to 8 m. long.
b) Smaller levelled terraces 4 to 5 m. long.
c) Smaller circular or squared depressions up to 2 m. across.
d) Larger levelled areas 10 to 14 m. long.

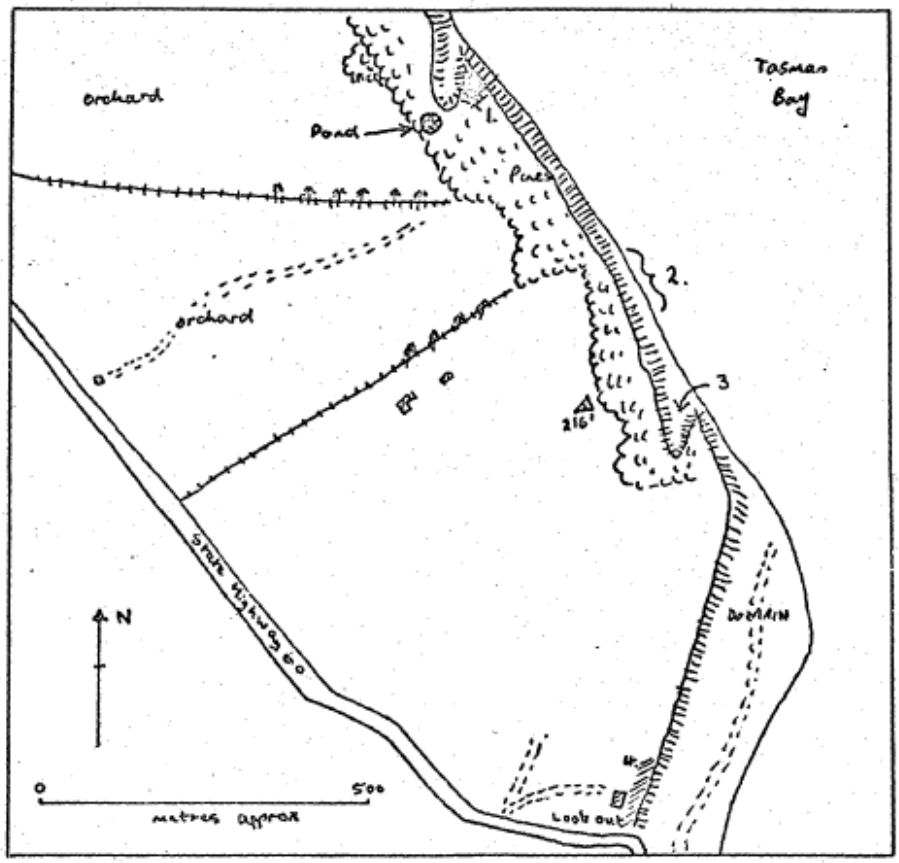
Types a) and b) are most pronounced. See plan.

Condition. The site does not appear to have been disturbed by earthworking of any kind. Pine trees have recently been felled to minimise root damage, but regrowth of wattle, pine, and manuka is rapid and control is necessary. The landowner understands the problem.

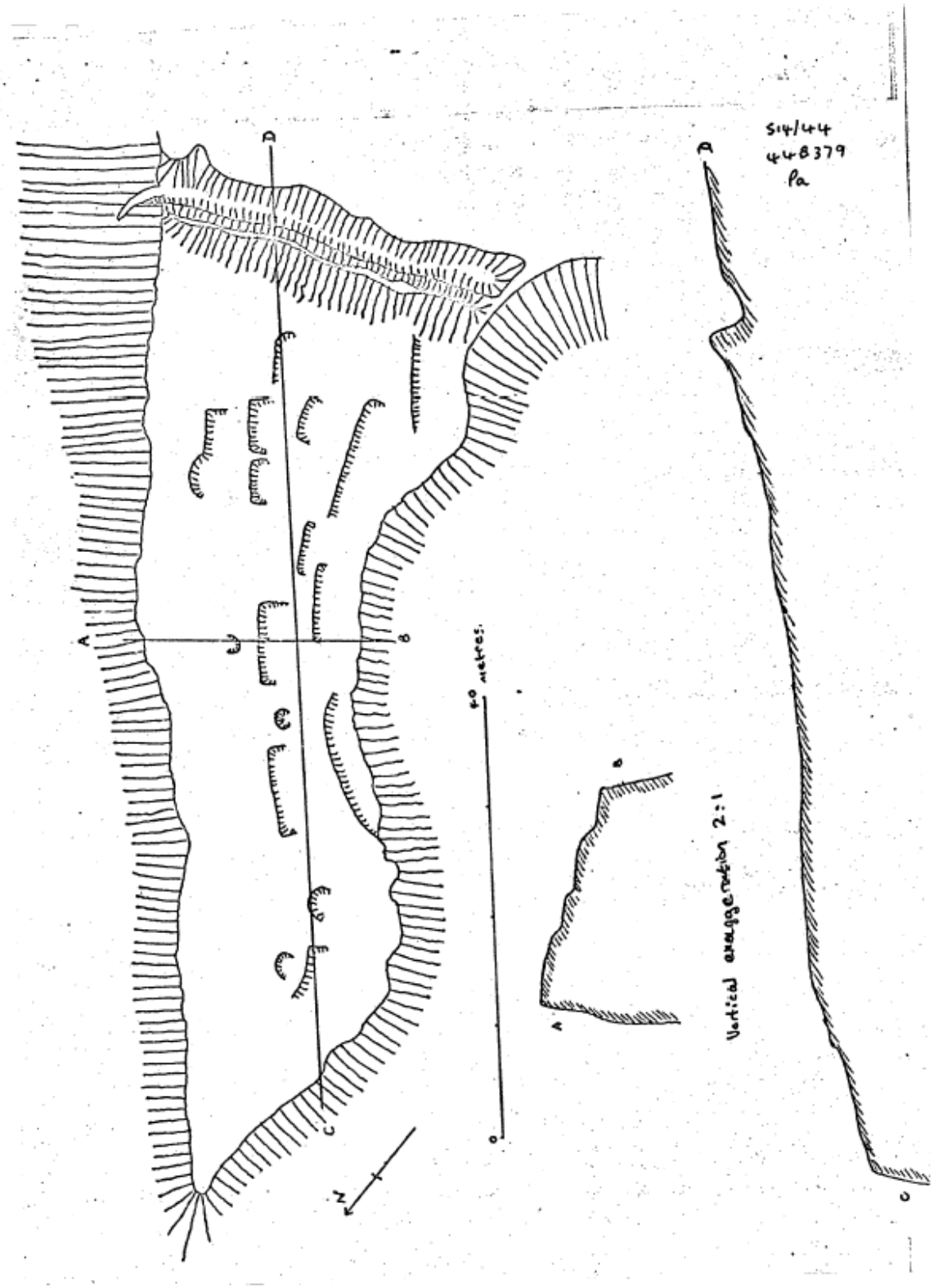
Other points. A few surface mussel shells of some age. Otherwise no midden or artefact evidence.

An extant earthwork of the highest importance.

S14/44
448379
Pa



1. S14/44
2. S14/45
3. S14/46
4. S14/47


S14/44
448379
Pa
A
B
C
D
E
50 metres
N
Vertical exaggeration 2:1

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

S14/44

TASMAN BAY COASTAL ARCHAEOLOGICAL SURVEY

SITE REPORT Site No: 027/74

Date visited: 9/1/85 Site Name: Moutere Bluffs Pa

Condition of Site

Site has clearly deteriorated since Challis' visit in 1976. Ditch and bank very apparent and clearly defined but internal features of pa masked by thick regrowth. Regenerating vegetation will cause serious damage to internal features defined by Challis.

Vegetation

Pinus radia, Acacia, pseudopanax sp., akeake, bracken blackberry and manuka growing up in thick profusion (all about 5-10 years old) through tangle of felled pines and debris.

Management Recommendations

Regeneration and old pine debris should all be carefully removed from site otherwise damage will be considerable. Becuase Acacia and pines are well established and seeding in the area - this will have to be an ongoing process.

Blackberry and bracken should be sprayed or burnt. Ideally site should be grassed and grazing by sheep may help keep regrowth down.

Although remainder of land in orchard the land above the bluffs on which the site lies does not seem to be utilised.

According to Challis S.R.F. owner Mr Deck concerned to protect site. However he has in recent years spent considerable time overseas and perhaps as a result

S14/44

TASMAN BAY COASTAL ARCHAEOLOGICAL SURVEY

SITE REPORT Site No:

Date visited: Site Name:

management of the site has been neglected. He was overseas at the time of my visit.

Rank: 1

S14/44

Site Information **NZAA Metric Site Number** **N27-074**

NZMS 260 Map Number	N27	**Site Type**	PA
Name	Moutere	**Maori Name**	
Edition	2000	**Other Name**	Moutere Bluffs Pa
Grid Reference - Old Easting	2516600	**Old Northing**	6000000
Grid Reference - New Easting		**New Northing**	
Grid Reference - GPS Easting		**GPS Northing**	**GPSAccuracy +/-m**
Land Owner		**Council Name**	Tasman District Council
Address		**TDC Status**	Active
Date of Last Record	2002	**Date of Visit**	
Aids to relocation	Site situated on cliff, just to north of Moutere Bluff.		
Current site condition	Pine trees recently removed from site, with no damage. Site not to be replanted.		
Current land use			
Threats			
Iwi/Hapu	Contact Te Awhina Marae, Motueka for guidance.		
Updated by	K Greig	**File District**	Nelson
Address	s 9(2)(a)	**File Date**	
Photos	☐	**Maps/ drawings**	☐
Recommendations			
Additional Information	NZ Historic Places Trust Registration No. 5864. See Young, A. 2002. Report for NZHPT Authority 2002/170: N27/74 Moutere Bluffs Pa. Unpublished report, NZHPT Authority 2002/170.		
Upgrade Project notes	Site excluded from Upgrade Project fieldwork as recent and accurate information is available.		

13.2 Te Mamaku Pā

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

ARCHSITE archaeological site recording scheme

Site Record Form

NZAA SITE NUMBER: N27/73

SITE TYPE: Pa

SITE NAME(s):

DATE RECORDED:

SITE COORDINATES (NZTM) Easting: 1605512 **Northing:** 5440594 **Source:** CINZAS

IMPERIAL SITE NUMBER: S14/43 **METRIC SITE NUMBER:** N27/73

Finding aids to the location of the site

To come.

Brief description

Pa site.

Recorded features

Other sites associated with this site

Printed by: debfoster 22/03/2015

1 of 8

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE RECORD HISTORY	NZAA SITE NUMBER: N27/73
Site description **Condition of the site** **Statement of condition** **Current land use:** **Threats:**	

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S14
Map Name Motuekea
Map Edition 2nd
Grid Reference 437404

SITE NUMBER S14/43

SITE NAME: MAORI Te Manuka
OTHER

SITE TYPE Pa / ovens / artefacts

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

Situation. An elongated rectangular promontory, 90 m. x 20 m., internal area 1200 square metres. Natural defences on three sides and a transverse bank and outer ditch on the fourth. Elevated from the surroundings by an old cliff line to the west east and a steep narrow stream cutting to the west. There are extensive views of Tasman Bay but the view inland is limited by rising levels.

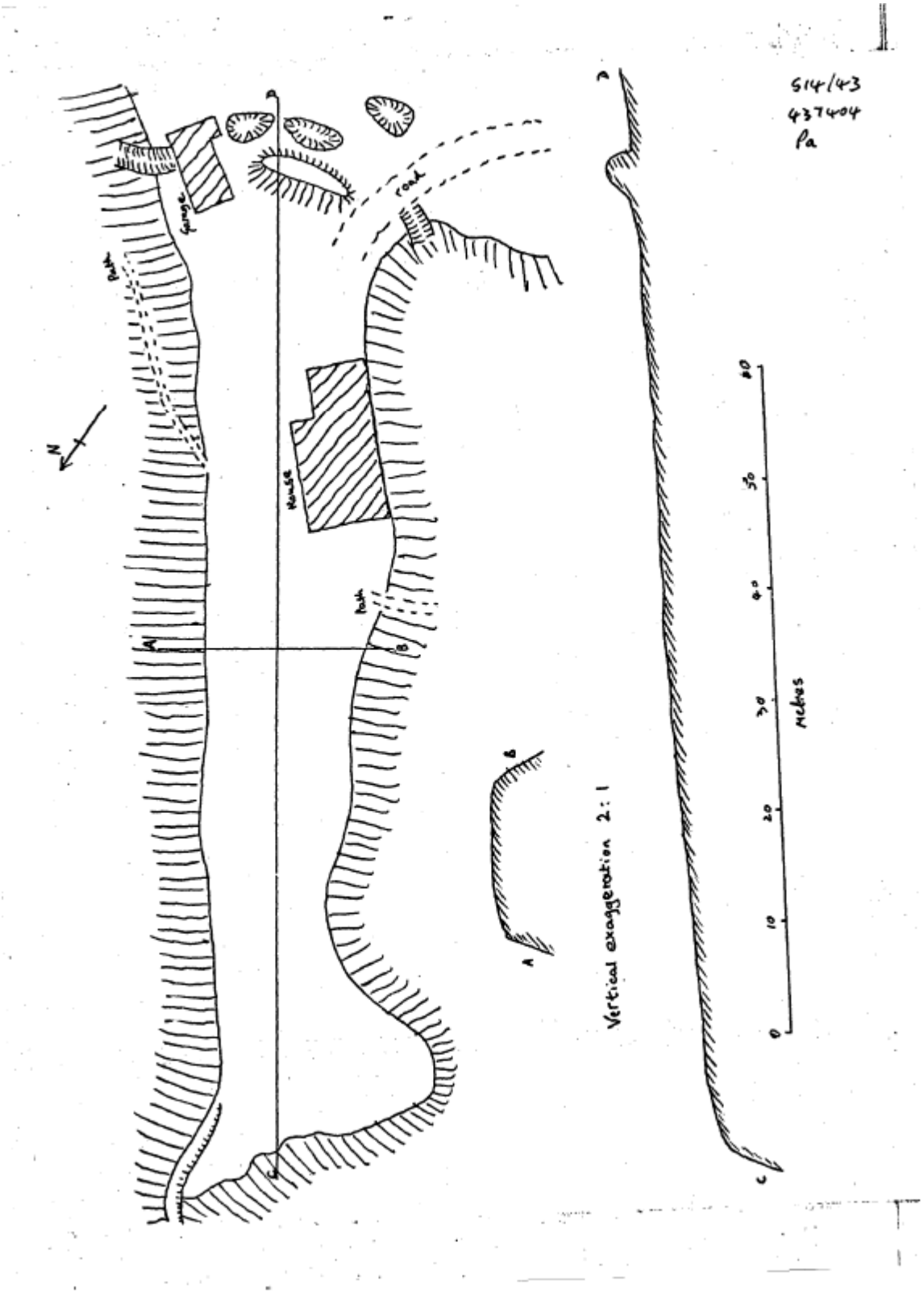
Defences. Cliffs 30 - 40 ft. high and stream cutting 15 - 30 ft. deep. Before bulldozing 30 or 40 years ago the defences across the neck of the promontory were continuous and had a combined amplitude of over 2 metres. The location of the bank and ditch is at a narrow place south of which the cliffline and the stream cutting deviate. The surviving bank section is 1·20 m. high and 4·20 m. wide. It has a gentle inner but almost vertical outer face. It is made of clayey gravel presumably duug from the ditch. Surviving ditch sections at either end and beyond the bank are shallow, less than 50 cm. deep, but the ditch is said to have been 1·30 m. deep before infilling. See plan.

Access. This it would appear was from the ditch terminations, giving access to the beach 100 metres distant and a water supply in the stream to the west.

Condition. Extensively disturbed in the 1930's by the building of a house and garage and driveways, yards, and gardens. The defences are breached in two places, the ditch is largely filled in, and the interior has been intensively cultivated.

Artefacts. The owner-occupier of the house, Mr. Vic. Ward, now of 10 Fry St., Motueka, found large numbers of oven stones and a lot of very black soil when gardening. The oven stones were 8 inches or more across, often split, and most commonly were in the area between the garage and the house. No midden refuse was present on the site. The path to the east is claimed to be an antiquity. Metasomatised argillite adzes from the site are owned by Mr. Ward, who has given many away. They include four rough-outs and four small adze blades, one of the former having a chin-ridge. See sketches.

Tradition. The site has since the early European period been consistently known locally as the Te Manuka pa, scene of the Te Ramparaha raid on the Motueka Maoris.


S14/43
437404
Pa
road
garage
house
path
path
N
A
B
C
D
Vertical exaggeration 2:1
0
10
20
30
40
50
metres

C.B AI AE BB AA IC

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE RECORD FORM

Map number S14
Map name Motueka
Map edition 2nd
Grid Reference 437404
E643700 N6040400

SITE NUMBER S14/43

SITE NAME: MAORI Te Mamuka
OTHER

SITE TYPE Pa/ovens/artefacts

1. Aids to relocation of site

Promontory south of the Tasman Memorial Domain, set a little back from the shore. See location map with S 14/43.

2. State of site; possibility of damage or destruction

Built on, cultivated, and partly bulldozed.

3. Description of site *(NOTE: This section is to be completed ONLY if no separate Site Description Form is to be be prepared.)*

4. Owner R. A. Eberhart
Address Tasman

Tenant/Manager
Address

Attitude Cooperative

Attitude

5. Methods and equipment used Tape, compass, dumpy level, and staff survey

Photographs taken: Yes/No (Describe on Photograph Record Form)
Date recorded 13.10.1974

6. Aerial photograph or mosaic No.

Site shows:
Clearly/badly/not at all

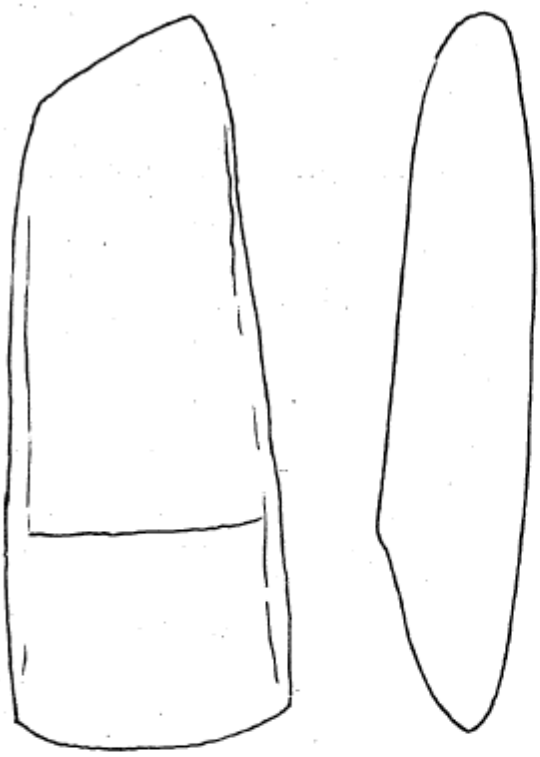
7. Reported by A. J. Challis
Address

Filekeeper J. Y. Walls

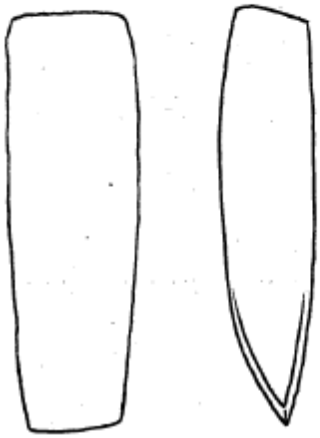
Date 16.6.1976

Date

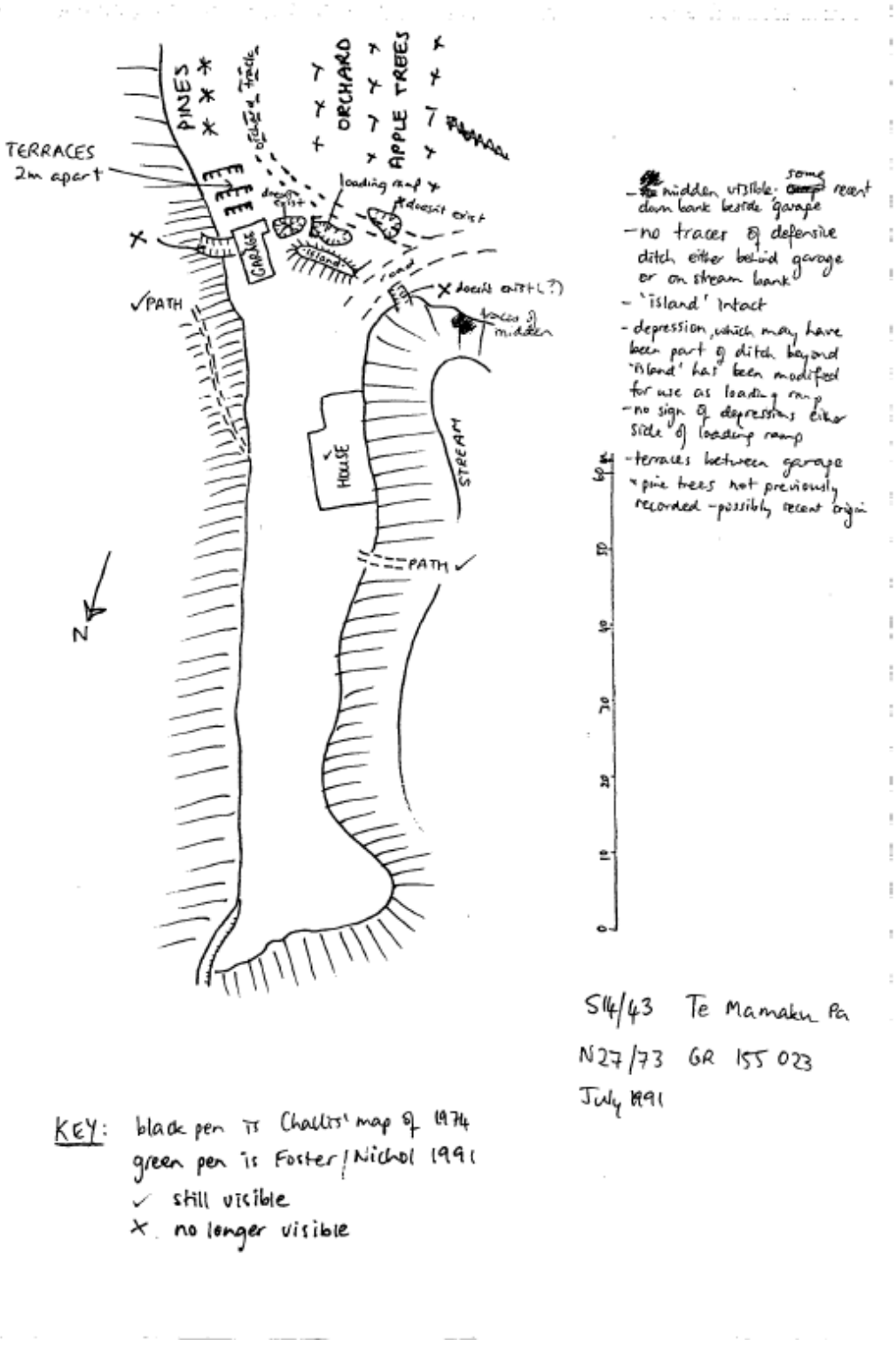
S 14/43
437404
Pa.



Actual size.
U. Ward.
coarse metasomatised argillite.
Flaked, (a flake adze)
hammerdressed, and the
beginnings of polishing.
Chin ridge.
unused.



Actual size
U. Ward.
Fine metasomatised argillite.
Flaked and finely polished.
Fine condition.


PINES
ORCHARD
APPLE TREES
TERRACES
2m apart
loading ramp
doesn't exist
GARAGE
island
road
PATH
HOUSE
STREAM
PATH
N
midden visible - some recent
down bank beside garage
- no traces of defensive
ditch either behind garage
or on stream bank
- 'island' intact
- depression, which may have
been part of ditch beyond
'island' has been modified
for use as loading ramp
- no sign of depressions either
side of loading ramp
- terraces between garage
& pine trees not previously
recorded - possibly recent origin
0
10
20
30
40
50
S14/43 Te Manaku Pa
N27/73 GR 155 023
July 1991
KEY: black pen is Challis' map of 1974
green pen is Foster/Nichol 1991
✓ still visible
✗ no longer visible

S14/43

Site Information **NZAA Metric Site Number** **N27-073**

NZMS 260 Map Number	N27	**Site Type**	PA
Name	Moutere	**Maori Name**	
Edition	2000	**Other Name**	
Grid Reference - Old Easting	2515500	**Old Northing**	6002300
Grid Reference - New Easting		**New Northing**	
Grid Reference - GPS Easting		**GPS Northing**	**GPSAccuracy +/-m**
Land Owner		**Council Name**	Tasman District Council
Address		**TDC Status**	Active
Date of Last Record	1991	**Date of Visit**	
Aids to relocation			
Current site condition			
Current land use			
Threats			
Iwi/Hapu	Contact Te Awhina Marae, Motueka for guidance.		
Updated by	K Greig	**File District**	Nelson
Address	s 9(2)(a)	**File Date**	
Photos	☐	**Maps/ drawings**	☐
Recommendations			
Additional Information			
Upgrade Project notes	Site excluded from Upgrade Project fieldwork as landowner consent was unable to be obtained.		

Date record printed Monday, 17 November 2003

14.0 Glossary

Kupu Māori	Kupu Pākehā/English translation
Āhikaa-roa	Title to land through long term occupation
Atua	God
Awa	River
Hapū	Subtribe
Hinaki	Tuna catching net/basket
Ingoa	Name
Iwi	Tribe
Kai	Food
Kaimoana	seafood
Kaitiaki	Guardian
Kaitiakitanga	Guardianship, stewardship
Karakia	Prayer
Kawa	Marae protocol
Kete	Flax Basket
Kōiwi	Human remains
Korowai	Feather Cloak
Mauri	Life principle, essence of all living things
Māhinga kai	Food gathering places
Māhinga Mātaitai	Customary seafood gathering site
Mana	Prestige, authority, influence
Mānaakitanga, mānaaki	Hospitality
Manawhenua	Authority over land
Manu	Bird
Manuhiri	Visitors
Mātaitai	Customary seafood gathering site
Mātauranga	Knowledge
Maunga	Mountain
Moana	Sea, ocean

Ngā	Plural
Ngā taonga tuku iho	The treasures passed down from the tūpuna
Pā	Fortified village
Papakāinga	Village, settlement, communal Māori land
Pakohe	Argillite
Puku	Stomach
Rongoa	Māori herbal medicine
Roto	Lake
Tāngata whenua	People of the land
Taonga	Treasure
Te Tai ō Aorere	The Tasman Bay
Te Tau Ihu o te Waka ā Māui	The Top of the South Island
Tino-rangatiratanga	Self-determination, autonomy
Te Ao Māori	The Māori world view
Te Tai ō Aorere	The Tasman Bay
Te Tiriti ō Waitangi	The Treaty of Waitangi (Māori version)
Tikanga	Protocol
Tohi	Baptism
Tohu	Sign, indicator
Tūpāpaku	Dead body
Tūpuna	Ancestors
Urupā	Burial ground
Wāhi ingoa	Place name
Wāhi tapu	Sacred place
Wai	Water
Wairua	Spirit
Whakatauki	Proverb
Whakapapa	Genealogy
Whānau	Family
Whariki	Mat

cultural heritage

AMANDA YOUNG

consultant

Archaeological Assessment: Harakeke 2015 Ltd Property, Tasman

Report Prepared for Harakeke 2015 Ltd
25 May 2015

Te Pa Pa (N27/74), 2014.

by
Amanda Young MA(Hons)

s 9(2)(a)

1.0 Introduction

Harakeke 2015 Ltd owns a large property in Tasman contained within a large number of separate titles. The property is either side of Aporo Road (previously the Coastal Highway) in western Tasman Bay. It is currently in pasture.

Figure 1: Location of Harakeke 2015 Ltd Property.

Harakeke 2015 Ltd has asked for an assessment of the property's archaeological values and consideration of the impact of a subdivision on those values. This report provides such an assessment. The report deals only with archaeological values. It does not consider places of significance to Maori besides these. Cultural issues are the province of Maori. Consultation with Maori regarding cultural places and values is recommended. I understand this is occurring.

2.0 General Context of the Property

The Harakeke 2015 Ltd property is situated in western Tasman Bay with Ruby Bay to the south and Tasman to the north. It is situated either side of Aporo Road. The larger portion of the property is on the west side of the road between Horton Road and Marriages Road. A smaller section is between Aporo Road and the Moutere Bluffs.

The property consists of slight to rolling hills of Moutere Gravel (clay-bound gravels) covered with a thin layer of topsoil (Mapua sandy loam). This has been described as "Shallow, sandy, easily erodible loam with deep, heavy, leached clay subsoil and impeded drainage. Derived from underlying strongly weathered sedimentary gravels. Low fertility but good moisture-holding ability. Not drought-prone." [1] There is a narrow strip of fluvial deposits along the Aporo Stream[2] valley.

Aporo Stream runs alongside Marriages Road and then down the west side of Aporo Road. There is a flat, swampy area next to Marriages Road (south of the intersection with Mamaku Road). A small side stream enters from Permin Road. To the west of Aporo Road small spurs lead from the stream valley towards the interior.

The Moutere Bluffs are high, steep and crumbly. The section along the front of the property has no natural access to the beach below. A large part was re-contoured in ca.2002 to form a gentler slope down to the beach.

The pre-European vegetation of the area was podocarp - mixed beech forest, coastal shrublands, and swamp forest in gullies and hollows and on gentle toe-slopes.[3]

[1] http://www.doc.govt.nz/Documents/conservation/native-plants/nelson-marlborough/ecological-restoration/tasman-bay/moutere-downlands-hill-country.pdf

[2] No natural stream was found for the stream that have been used in historical sources including Aporo and Tasman.

[3] http://www.doc.govt.nz/Documents/conservation/native-plants/nelson-marlborough/ecological-restoration/tasman-bay/moutere-downlands-hill-country.pdf

The Harakeke 2015 Ltd property has had over 100 years of land modification. The land east of Aporo Road has been disked (except for the south west corner) and some re-contouring has also occurred[4]. It is in pasture with small isolated vegetation patches, particularly along the Bluffs. Previously the land was in orchard and *Pinus radiata* (pine). There are still buildings, farm tracks and irrigation ponds. The area west of Aporo Road has more a mixture of use. There are a number of houses and workers baches, irrigation ponds, tracks and pasture. Some of the area has been disked and re-contoured (i.e. along the side of Aporo Road). New planting has been carried out either side of Aporo stream.

3.0 Archaeological Context

There is one archaeological site recorded on the property, N27/74[5] Pa (Te Pa Pa) that is on the edge of the Moutere Bluffs. There are other recorded sites nearby.

The land adjacent to the Moutere Bluffs was included in an intensive archaeological study of the Motueka region by Aidan Challis in the mid 1970s[6]. The Moutere Bluff sites on the NZ Archaeological Association site record file were initially recorded by Challis. Challis also recorded a large number of sites around the Moutere Inlet and along the Kina Peninsula, and to the south in Ruby Bay and Mapua. Athol Anderson also recorded and investigated sites in the wider area for his MA thesis on back-beach deposits around Tasman Bay[7]. Steve Bagley included Moutere Bluffs in the Tasman Bay Coastal Archaeological Survey and Site Registration project in 1984/85[8]. Moutere Bluffs was re-examined to a limited extent by Debbie Foster and Reg Nichol in 1991 as part of a survey of the Motueka Coast[9]. Foster has also more recently carried out an archaeological

[4] Personal Comment M. Dwyer, Farm Manager, 23/9/2014.
[5] New Zealand Archaeological Association Site Record Number
[6] Challis 1978.
[7] Anderson 1966.
[8] Bagley 1985.
[9] Nichol & Foster 1991.

assessment of the Baigent Memorial Domain, Kina Peninsula for a subdivision proposal[10].

Moira Jackson has recently completed a thesis on early historic Maori settlement patterns Te Tau Ihu o te Waka a Maui (Top of the South)[11]. She studied where people were recorded as residing and how they used the landscape during the period 1770 to 1860. Jackson used historical maps and charts augmented with archaeological, historical and ethnographic information such as reports commissioned by iwi. This work includes the Moutere district and provides an excellent summary of all the historical data.

I have carried out three archaeological assessments of the Moutere Bluffs since 2000, covering the coast from just north of the subject property to the golf course. I have carried out further work at Kina Peninsula to the north, around the Moutere Inlet, for the Ruby Bay Bypass and south at McKee Domain and Ruby Bay. I checked many of the sites in the area for the 2003 NZ Archaeological Association site upgrade project.

The Harakeke 2015 Ltd property has been the subject of two previous pieces of archaeological work. In 2002 Amos Stafford, iwi monitor, and I monitored the removal of pine from Te Pa Pa (N27/74) under NZHPT authority 2002/170. The pa was undamaged by the work. In 2009 10.64 ha to the immediate south of the property was subdivided into five residential allotments (the Cherry Hill subdivision). These are between the cliffs and Aporo Road and adjacent to Te Pa Pa. The Harakeke 2015 Ltd property was partly included in the subdivision initial site assessment. Significant earthmoving for the subdivision had already occurred on the property prior to the site visit. No archaeological material was found within the disturbed areas or elsewhere within the subdivision or in the near vicinity. It is my understanding that an iwi monitor monitored further earthworks. The iwi monitor also examined spoil heaps for taonga. It is believed that the iwi monitor found no archaeological or cultural material.

[10] Foster 2010.
[11] Jackson 2014.

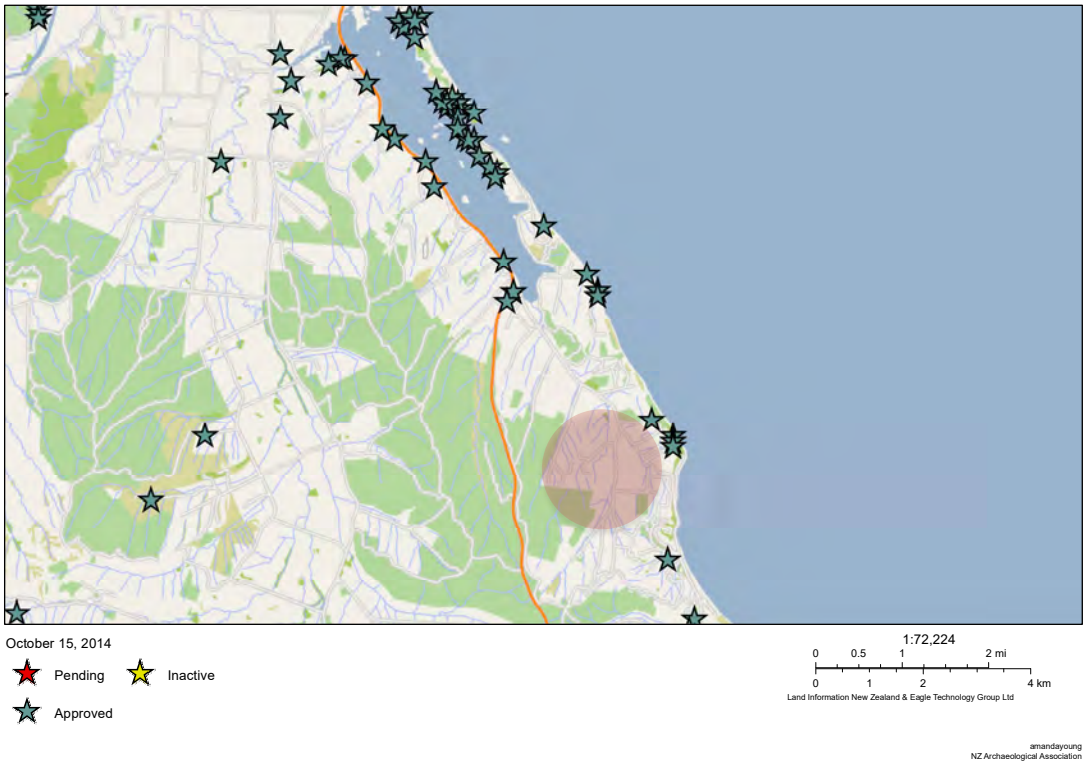


Figure 2: Recorded archaeological sites in the vicinity of the property.

Previous archaeological and historical research suggests that Maori settlement in the Moutere sub-region, with its infertile Moutere clay soil, was generally sparse. The interior region was used primarily as a resource gathering area, a through route, and a refuge in times of trouble. Recorded sites are generally associated with transitory activity, for example, isolated artefact / taonga findspots, or refuges. Interesting, a Tasman resident, Barry James, told me in 2007 about a promontory surrounded by swamp on the old family farm at Williams Road (to the north of the subject property)[12]. A number of adzes have been found on the promontory over the years. I have found no other reference to this site.

[12] Telephone conversation with Barry James 1/7/2007 as part of the Ruby Bay Bypass project (Young 2007).

Maori settlement was concentrated along the coast. The Moutere Inlet, Kina Peninsula, Ruby Bay and Mapua all have evidence of relatively dense and long-standing Maori occupation. These places have sheltered canoe routes, landings and campsites. There was easy access to various estuarine, river and marine resources as well as to wetlands, different forest zones and land able to be cultivated.

Aporo Stream was likely to have been used to access the interior from the Moutere Inlet. It would have allowed access to forest resources such as mature trees and food as well as providing the start of a through route. Tom Kroos, ecologist, believes that the stream would have been navigable as far as about the Jester Café, downstream of the subject property[13].

The Moutere Bluffs lie between the more favourable settlement areas of Moutere Inlet / Kina Peninsula and Mapua / Ruby Bay. The land at the top of the Moutere Bluffs has restricted access to the sea or to the estuary. The soil is infertile. It was a far less appealing settlement area and consequently archaeological evidence is relatively sparse. At the northern end of the cliffs near the Moutere Inlet, and where the cliffs are lower (about 26 m high), is N27/71 midden, which is recorded at the top and base of the cliffs. N27/161 is a possible modified soil (at a low point of the cliffs). To the south next to the Tasman Memorial Domain is N27/72, a greenstone adze findspot possibly associated with a burial, and the adjacent N27/73 pa / ovens / artefacts. Again the cliffs are lower here.

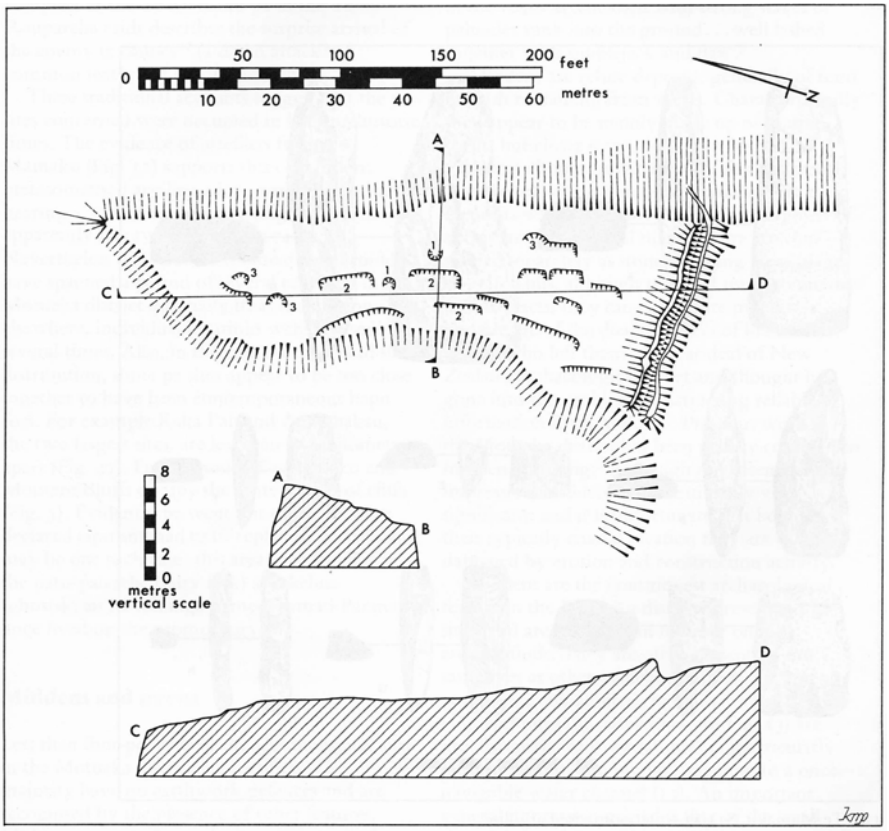
The pa N27/73 is situated on a natural promontory. It is known locally, by Challis and on the site record form as Te Mamaku Pa. It is also called that by Taylor (2012) and Tiakina te Taiao (2007). The pa is associated with Ngati Tumatakokiri and Ngati Apa[14]. A large number of Ngati Tumatakokiri and Ngati Apa were gathered at the pa for a

[13] Personal comment 17/12/2014.
[14] Mitchell 2008:71; Taylor 2012.

fishing expedition when it was attacked by Ngati Rarua, Ngati Tama and Te Atiawa[15]. Taylor clarifies that this was during the 1829 migration known as Te Heke Niho Mango (the migration of the shark tooth)[16]. A running fight extended from Te Mamaku into Lower Moutere and along the shores of the Moutere Inlet[17]. Associated artefacts also suggest that Te Mamaku was occupied in later prehistory[18].

N27/74 Pa is recorded over 2 km to the south of N27/73. N27/74 is within the subject property. Both Taylor (2012) and Tiakina te Taiao (2007) name this pa as Te Pa Pa. The pa is registered by Heritage NZ (#5864) and scheduled on the Tasman Resource Management Plan (TDC13005). The pa was originally recorded as an archaeological site by Challis in 1976. It is on a natural promontory edged by steep ravines and approximately 60 m high cliffs. A small area is defended by a transverse ditch (0.7 m deep by 4 m wide in 1976) and bank (0.6 m high by 5 m wide). Challis noted a narrow causeway across the ditch and a break in the bank at the extreme western end, which would have allowed entry into the pa. Challis saw the start of a very steep track from the eastern end of the ditch down the cliff face to the beach. This was not seen in 2002 or 2014. The defended area contains a number of terraces, presumably for houses and cooking shelters, as well as possible bin pits (up to 2 m across). The larger terraces were 7 m to 8 m long and the smaller ones 4 m to 5 m long. There were also some larger levelled areas 10 m to 14 m long. No features have been recorded outside the defences. Challis found water in the western ditch terminal and saw running water down the western ravine.

[15] Jackson 2014:239; Taylor 2012.
[16] Taylor 2012.
[17] Tiakina te Taiao 2007:35.
[18] Challis 1978:23; NZAA Site Record Form N27/74 Pa.



11 Moutere Bluffs, S14/44, ditched pa

Figure 3: Te Pa Pa. Challis 1978:11.

Features marked "1" were interpreted by Challis as bin pits; "2" house terraces; and "3" possible cooking shelters [19]. The other terraces were thought to also be house terraces. These descriptions are based on surface evidence and remain unproven.

Approximately 500 m to the south of Te Pa Pa, and about 400 m south of the subject property, is N27/75 midden / ovens. The site was recorded by Challis from hearsay. It appears from the site record form that oven stones and pipi shells were found at the base of the cliffs. Not far away is N27/76, which records the site of burials, and associated artefacts found in a gully, perhaps in caves. Again the site was recorded from hearsay. Challis could find no trace of either site in 1976. Access to these two sites was refused by the landowner during the NZ Archaeological Association site upgrade project in 2003.

[19] Challis 1978: 35, 39.

The last site along the cliffs is N27/77 ovens that Challis recorded from hearsay as being above the McKee Domain just north of the look out. This is right at the southern end of the Moutere Bluffs. No evidence was found in the area when in 2002 I monitored work for a new water tank.

4.0 Historical Context[20]

Tasman was first called Moutere Bluffs then White Bluffs. It became Aporo in 1912 before finally becoming Tasman in 1916. It is unclear when the first settlement occurred at Tasman, perhaps from the 1850s – 1860s, perhaps slightly later. Titles to land in Tasman changed frequently with many absentee owners. Initially land was cleared for sheep but as this proved generally unsuccessful much of the land reverted back to manuka, bracken, fern and gorse. A deep drain was said to been dug through the grassy flats of Tasman Valley in the late nineteenth century[21]. The drain is shown on a ca.1911-1915 plan of the third Tasman Fruit Lands subdivision[22].

In 1908 the appearance of Tasman changed dramatically with the establishment of the first apple orchards. The Tasman district and township grew at a rapid rate and the hills were soon covered in orchards. By 1911 there was a road between Motueka and Tasman. Prior to this the state of the roads in the Moutere Hills was such that coastal transport was much easier. Much of the change was at the instigation of the landowner and orchardist Arthur McKee and his orchard supervisor Fred Nottage. After buying up large blocks of land in Moutere Hills – Tasman, McKee (as part of Tasman Fruit Lands Ltd) subdivided the land into orchards, which he sold off in three stages between 1910 and ca.1916. Although the emphasis of the subdivided land was on growing apples, tobacco and berries were also planted. McKee also promoted the planting of pine on the land unsuitable for orchards (in some cases after unsuccessful blocks were ripped up). The trees supplied the wood needed for apple boxes.

[20] This section is based on information in Mackay 2008, Mitchell 2004, Wells 1990. Young 2007.
[21] Wells 1990:22.
[22] Reproduced in Mackay 2008:26.

The subject property was part of the Tasman Fuit Lands subdivisions. The plan of the third subdivision shows that much of the property had been part of the first (or perhaps second) subdivision and was already in orchard. On the corner of Horton and Aporo Road was Mr T. Horton's Orchard with his experimental orchard next to Aporo Road. Mr Kirks next to Mamaku Road is shown among unlabelled sections. Between Mamaku and Marriages Roads were the orchards of His Honour Mr Justice Chapman, Mr Hallam, Mr Harris and Mr Andrews. On the east side of Aporo Road were three sections and the orchards of Mr Decks and Mr Cleland. Some of these owners would have been absentee investors. The current roads (with the exception of the very recent ones) are also shown on the plan although many were not formed until slightly later.

The plan of the third subdivision also shows historic drains. One of these channelled water from the Mamaku Road wetlands. It flowed along Mamaku Road then north across the Tasman Fruitland Subdivision lots until it joined the Aporo Stream forming an "Arterial Drain" along the west side of the main road. The ditches were originally dug in the mid to late nineteenth century to drain swampy land.

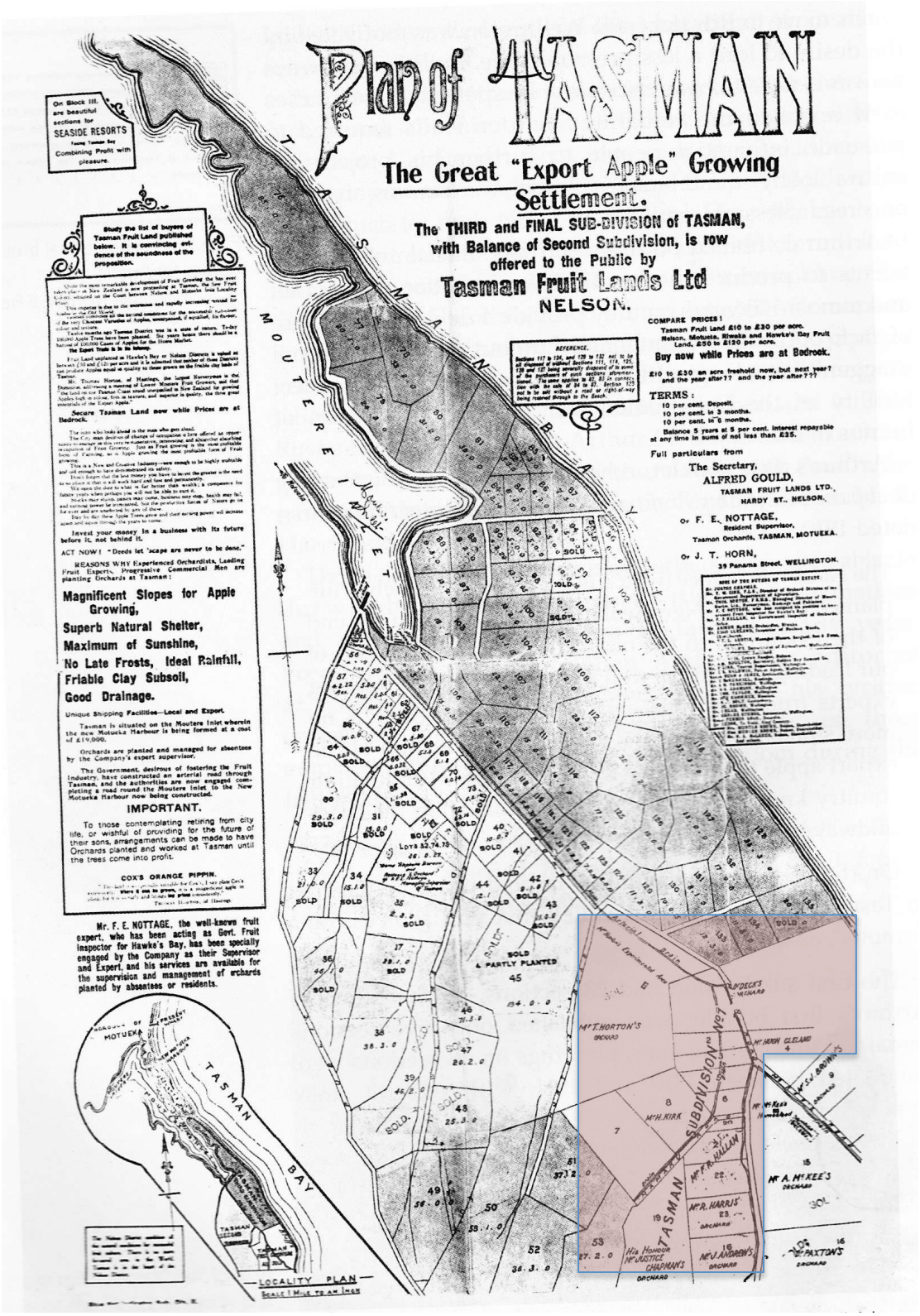


Figure 4: Plan of the Tasman Fuit Lands Subdivision (reproduced from Mackay 2008:26 & courtesy of Rush family). Approximate property boundaries overlaid in red.

Forestry, grazing and lifestyle blocks gradually replaced the orchards. Certainly by 1976, when Challis visited the eastern side of the subject property, it was still orchard with a strip of pines along the cliff edge. Google Earth images from 2003 show the extensive changes to the landscape that was occurring at that time. Among the remnant orchards and pasture are large areas of recent re-contouring and surface clearing. This is particularly noticeable along the Moutere Bluff edge, on the eastern side of Aporo Road and next to Horton Road. The pines have been removed.

Figure 5: The eastern part of the subject property.

Figure 6: The western part of the subject property.

5.0 Site Visit

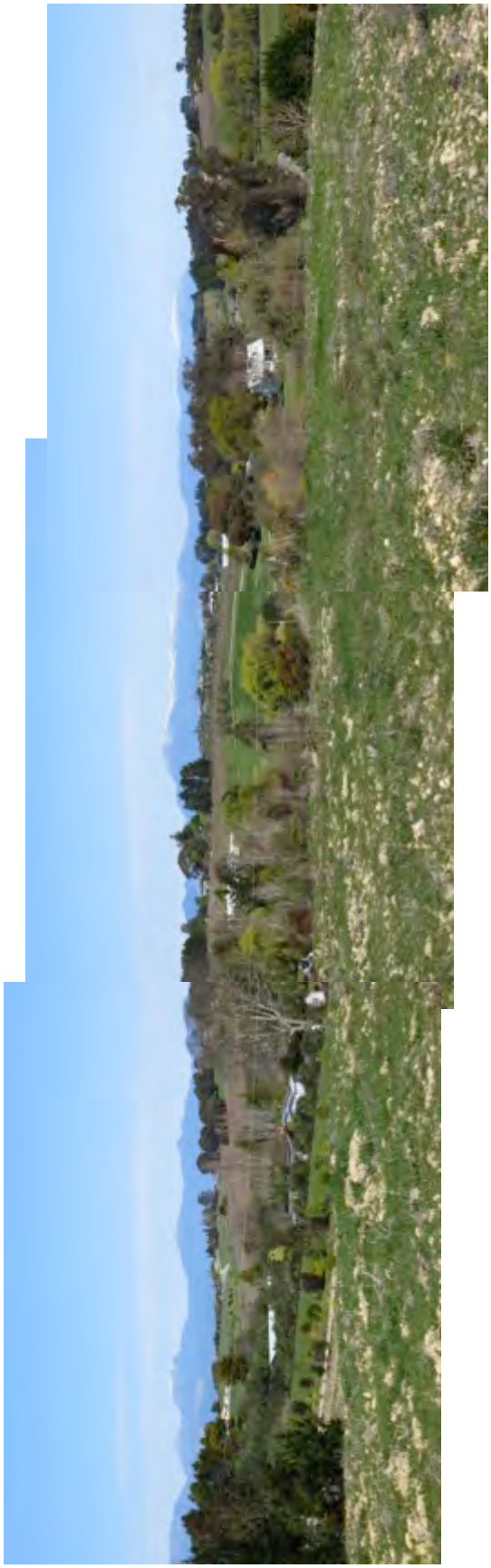
The property was visited on 23 September 2014. The farm manager Mark Dwyer was available to assist with the visit and provide information about recent site history. The first part of the site visit was attended by an iwi monitor, John Katene, who then had to leave to attend a tangi. Mr Katene was able to participate in the initial discussion, inspection of part of the Aporo Stream edge and the upper edge of the bluffs, and a visit to Te Pa Pa. He was showed the property boundaries on the plans and had them pointed out from Aporo Road and from the Bluffs.

Figure 7: The edge of the Moutere Bluffs (looking south; taken from just north of Te Pa Pa).

Figure 8: The edge of the Moutere Bluffs (looking north).

The archaeological assessment concentrated on the areas of most sensitivity, namely the pa, the coastal edge (the top of the Bluffs and the beach below) and the stream margins. These areas were all inspected by foot. Visibility was generally good as the areas had been recently disked or cleared of vegetation. The cliff section was viewed from above and below (in case erosion had revealed archaeological material). The crumbling face of the Bluffs was partly covered in vegetation. The remainder of the property was visited by car. The boundaries were driven with excursions by vehicle and foot to points of interest in the interior. This approach was justified for the western part of the property and the eastern section adjacent to Aporo Road due to the reduced likelihood of surface features or material, the size of the property, the degree of modification (particularly to the eastern side), the grass cover and presence of buildings and associated gardens.

Figure 9: Aporo Stream next to Aporo Road (2014).



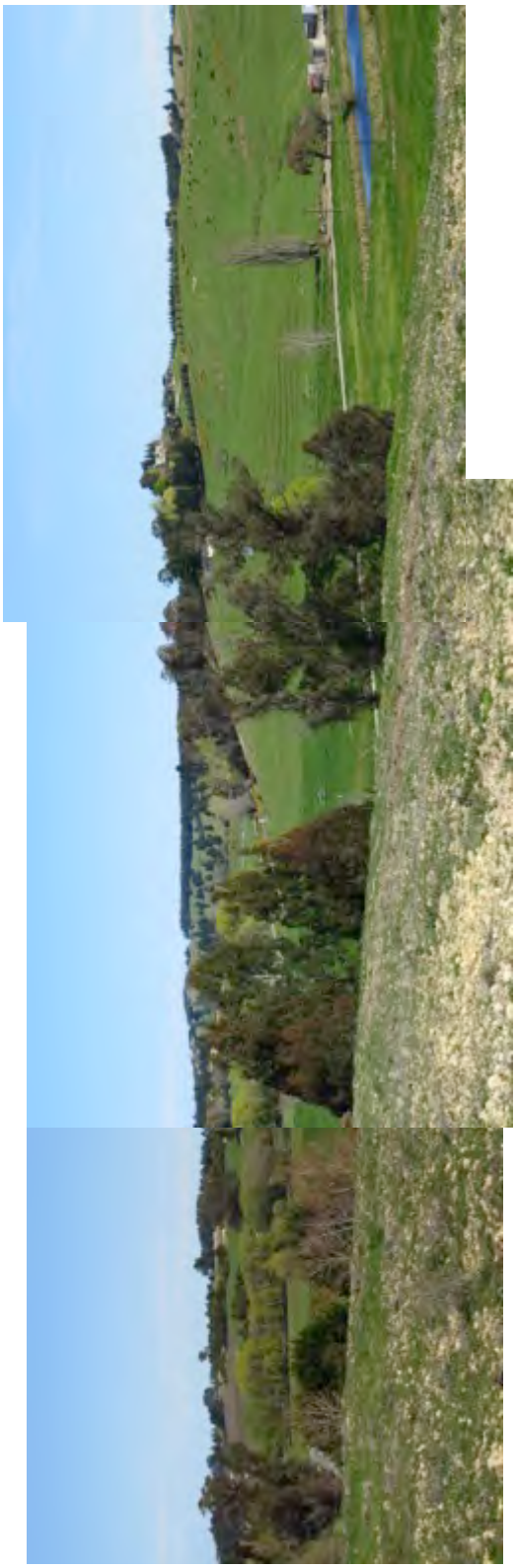


Figure 10: Panorama of the western part of the Harakeke 2015 Ltd property from the eastern side of Aporo Road. The first photographs show the earthworked land on the eastern side of the property in the foreground. The last section has the line of the historic drain crossing mid photograph from left to right (shown in red).

Two subsequent visits were made to the property to look for remains of the nineteenth century drainage system and inspect the area adjacent to the stream. These visits were made 5 & 9 March 2015.

6.0 Results

No archaeological material was found on the Harakeke 2015 Ltd property other than the already recorded features of Te Pa Pa. The historic drains were also located.

Te Pa Pa was inspected. It is a beautifully preserved small, cliff top defence. Contrary to local gossip, the pa was not damaged during the 2002 removal of pines from within the defences nor by the recent Cherry Hills subdivision. The defensive ditch is still as recorded by Challis in the 1970s with some additional natural infilling and erosion. The internal features are no longer visible due to the ground cover but it is expected that they are also the same as recorded. There has been recent hand clearance of vegetation including the removal of wilding pines. Mr Dwyer confirmed that no machinery has been on the site. He is aware of that prohibition and has made it clear to his staff and contractors.

Living and gardening areas are well documented as often extending outside the defended area of a pa. The large flat area immediately outside the pa defences was walked over in 2002, 2009 and again in 2014. The area has been disked and partly earthworked. No archaeological evidence was found during any of the visits.

Figure 11: Te Pa Pa from the beach (2014).

Figure 12: The interior of Te Pa Pa (2014).

Figure 13: The ditch and bank from the southern side of the pa (2014).

The historic drainage system that flows across the Harakeke 2015 Ltd property is still predominantly intact as a functional watercourse. The Mamaku Stream / Drain flows alongside Mamaku Road. A tributary diverts north following the route of the historic drain. The drain has a "U' shaped profile and is about 1 m wide at the base and 1.5 m to 2 m deep. It flows along the toe of the hill and to the east of the farm buildings. The historic plan shows the Mamaku Drain joining up with Aporo Stream before becoming one channel called the Arterial Drain. This area has been recently been re-contoured and root raked. The channels have been reconfigured and the area has no resemblance to the historic plan.

Figure 14: The drain to the north of Mamaku Road (looking north). March 2015.

Figure 15: The Mamaku Drain north of the farm buildings and south of the confluence with Aporo Stream. March 2015.

Figure 17: 2013 image with the approximate line of the historic drains superimposed. The solid line signifies drain is present (although in a modified form), and the dotted line is where the drain is missing.

www.topofthesouthmaps.co.nz

Figure 16: Aporo Stream in the area where the Arterial Drain used to flow.

The recently root raked and re-contoured area next to Aporo Stream was briefly walked through. The stream banks were checked (some areas were obscured by vegetation). No archaeological material was found.

7.0 Assessment of Values

There is one recorded archaeological site on the property, N27/74 Te Pa Pa. There is also evidence of a nineteenth century drainage system.

N27/74 Te Pa Pa is on the edge of the steep cliffs in the southeast corner of the property. It is likely that Te Pa Pa was used as a defended retreat in times of war or invasion. It is believed unlikely that there was long term occupation of the area centred on the pa, or that it was part of a seasonal round. As outlined above, the conditions would have been unfavourable for that kind of use. However, during this and previous site visits settlement outside the pa defences was not ruled out. No evidence of any archaeological

material was found along the cliffs in the vicinity of the pa or immediately inland. This is suggestive but not definitive.

There is no definite evidence of an occupation period for Te Pa Pa. Jackson found mention of the pa in Armstrong[23] which states that the pa was the site of a battle between Kurahapo iwi and the Tainui – Taranaki taua (who were the victors)[24]. No reference to the pa was found in other accounts of the taua such as Mitchell 2004 and Taylor 2012, or in Clark 1999[25] and Gillingham 2000[26]. Challis had a clear surface view of the internal features in 1976. He suggests that the proximity of two terraces suggests two phases of building[27] . It is likely that the pa was used sporadically over a long period of time.

Te Pa Pa is very well preserved notwithstanding at least two efforts at removing pine trees from the site (pre-1976 and 2002). It is one of only two recorded pa in the Moutere District. The other pa, Te Mamaku, is partly damaged by residential development. Te Pa Pa is an excellent example of a fortified promontory pa and regionally significant for archaeological and cultural reasons.

The nineteenth century drains were originally dug mid to late 1800s. The Arterial Drain no longer exists in the nineteenth century form. The location of that drain has been modified and the stream course altered. The Mamaku Drain between Mamaku Road and Aporo Road appears to be in the same location as originally dug. The drain is not believed to have archaeological value - it would have been re-dug and cleared out many

[23] Armstrong, D.A. (1997). Ngati Apa Ki Te Ra To. Report commissioned by the Ngati Apa ki te Waipounamu Trust in association with the Crown Forestry Rental Trust, Wellington, N.Z.
[24] Jackson 2014:239. Reviewed in Jackson 2014.
[25] Clark, M. (1999) Ngati Tama Manawhenua ki Te Tau Ihu: The Manawhenua Report. Report commissioned by the Ngati Tama Manawhenua ki Te Tau Ihu Trust in association with the Crown Forestry Rental Trust. Reviewed in Jackson 2014: Appendix 3.
[26] Gillingham, M. (2000), Ngatiawa/Te Atiawa Lands in the West of Te Tau Ihu: Alienation and Reserves Issues, 1839-1901. Wellington, Research report commissioned by the Crown Forestry Rental Trust on behalf of the claimants. Reviewed in Jackson 2014: Appendix 4.
[27]Challis 1978:20-21.

times. However, the line and form of the drain has historical merit. There are few remaining nineteenth century structures in the Tasman region. The on-going and extensive changing land use is gradually removing all evidence of traditional farming and orchards.

The property has been extensively used, modified and re-contoured. This includes the land either side of Aporo Stream. Previous land uses include orcharding and forestry. The location is mostly not conducive to long term settlement or occupation. There is only a small part of the sensitive coastal edge within the property and that has been extensively modified and eroded.

There is the possibility of isolated koiwi tangata and taonga / findspots across the property especially as a result of Kurahaupo iwi (Ngati Apa, Ngati Tumatakokiri and Ngati Kuia) fleeing inland from the invading Taranaki – Tainui taua(s)[28]. This risk is no more or less than any other property in the district.

Besides the above considerations, it is believed that most of the eastern part of the property has generally low archaeological value. This opinion is mostly based on the extensive and recent modifications that have occurred to the land. It is also based on a review of environmental factors, archival sources and archaeological data. The Moutere Bluffs has evidence of pre-European Maori occupation in the form of two pa, a greenstone adze, midden / oven stones, a possible made soil, and a burial. Most of these sites are recorded at low points in the cliffs, at the margins or below the cliff edge. The unfavourable living conditions on top of the high portion of the cliffs (limited water supply, unfertile soil and restricted access) suggest only limited and sporadic occupation of the area. The subject property is within this zone. However, nearby areas, such as Kina Peninsula, were important places of settlement. Taylor also explains that Te

[28] Mitchell 2004:122-125; Taylor 2012; Tiakina te Taiao 2007.

Mamaku Pa, where the cliffs are much lower, was part of a larger landscape of gardens, food gathering places and waterways[29].

Figure 17: Damage from disking along the top of the Moutere Bluffs (2014).

Figure 18: The area of Moutere Bluffs that have been lowered in ca.2002.

[29] Taylor 2012.

Although the western side of the Harakeke 2015 Ltd property has not been comprehensively surveyed, its archaeological values are believed to be low. The Moutere Hills were generally unfavourable for Maori settlement. They were used for food gathering, transitory activity and places of refuge – all activities unlikely to show in the archaeological record. No signs of pits, terraces or other earthworks denoting a refuge pa or storage area were found during the site inspection. Evidence of transitory occupation cannot be ruled out, for example, taonga / findspots and camps, but are unlikely to be easily found. The areas of most probability are the stream valley, in the drained wetlands or on the main ridge. The stream valley has been recently root raked, re-contoured and modified. There are no known pre-1900 residences in the area; however, there may be remnant structures such as drains, building foundations and fences.

8.0 Potential Affects of the Proposed Subdivision

Harakeke 2015 Ltd is in the process of finalising a subdivision proposal for the property. I was provided with preliminary subdivision plans dated 17 December 2014. The plans have been designed by Canopy, Landscape Architects, with the input from a number of experts and feedback from Tasman District Council staff.

The design has three clusters of small residential sections - on the hills to the west of Aporo Road, the southern side of Mamaku Road and the eastern side of Aporo Road. Orchards, pasture and landscaped amenity areas surround the residential sections. The edge of the cliffs is one such amenity area. There is a commercial / residential centre between the toe of the hill and Aporo Road. Roads, walking and cycling paths will cross the property.

Te Pa Pa will be preserved in the design. The intention is also to maintain it. The design creates a public walking path inland from the cliff edge. It has been purposely positioned some distance from Te Pa Pa. The area outside the pa, although usually an


Permin Road
701
2.67 ha
Reserve to Vest
Existing Private ROW
102
6220m²
101
5620m²
NETT
103
6300m²
Lot 2
DP 18919
104
5820m²
105
6830m²
106
5580m²
107
6370m²
Private ROW & Public Walkway
Bore
Existing Water
Lot 1
DP 474549
Water
116
1.180 ha
117
1.115 ha
119
12.130 ha
Road to Vest
704
4300m²
Public Walkway
Te Pa Pa
702
1.41 ha
108
5480m²
115
5240m²
118
6950m²
120
6060m²
121
5570m²
109
4580m²
Private ROW
114
7080m²
122
7740m²
123
6250m²
110
4950m²
703
2.84 ha
Apoo Road
111
5830m²
124
8370m²
126
6020m²
Existing Private Walkway & Stormwater
113
9530m²
127
4550m²
Existing Stormwater
Existing Private Walkway
112
5850m²
NETT
125
1.113 ha
128
5730m²
129
6700m²
NETT
Public Walkway
Bore
Water
711
Water Utility Lot
Public Cycleway
Existing Private ROW
Existing Water
130
1.864 ha
Pt Lot 1
DP 13391
Lot 1
DP 9739
Lot 2
DP 439005
Lot 4
DP 439005
Lot 3
DP 439005
Lot 1
DP 439005
Pt Lot 2
DP 13391
DO NOT SCALE
ORIGINAL SIZE A3
COPYRIGHT ©
N
W
E
S
Warning
Key:
Building Location Area (BLA)
Comprised
Applicant
Harakeke 2015 Ltd, Tasman
Resource Consent
Application Plan
Coastal
Cluster
11601
1:3000 at A3
Sheet 2 of 6
30 April 2015
STAIG & SMITH

area of archaeological sensitively, has been disked and modified. Shallow excavation for a path is unlikely to damage any archaeological values. Heritage NZ has confirmed that if the path is confined to areas already damaged, and excavation occurs within the damage zone (ca. 100 to 200 mm deep), then an archaeological authority is not needed for the work to commence[30].

The commercial / residential center is positioned across the route of the Mamaku Drain. The preservation of the drain has been discussed and considered by the design team. Relocating buildings away from the drain is not an option. There are enhanced ecological values associated with stopping water flowing into the drain so the flow of Aporo Stream is increased. The plan shows this is the preferred option rather than keeping the drain as a watercourse, the best outcome from an historical perspective. There may be the possibility to use part of the drain for stormwater disposal or to preserve the visual line of the two end sections. This is encouraged. The drain's value is believed to be historical not archaeological. Planting, partial infilling and other modifications are therefore acceptable. Heritage NZ has confirmed that an archaeological authority is not needed for modification of the historic drains[31].

Stream restoration work includes planting the watercourse alongside Mamaku Road. This will not harm any archaeological or historic evidence. The Aporo catchment will also be enhanced with planting and stream bank work. The area has already been so modified it is not expected that any further work will damage archaeological or historic features.

The possibility of inadvertent uncovering of koiwi tangata and taonga / findspots can be mitigated by a robust inadvertent discovery protocol and thorough briefing of contractors before work commences.

[30] A.Young and D. Rudd (Heritage NZ): Telephone conversation and email confirmation 21 May 2015.
[31] A.Young and D. Rudd (Heritage NZ): Telephone conversation and email confirmation 21 May 2015.

9.0 Conclusion & Recommendations

The archaeological values of the subject property are believed to be generally low with the exception of the regionally important Te Pa Pa (N27/74). There are also historic values associated with the nineteenth century drain.

1. Te Pa Pa

The future of Te Pa Pa needs to be considered to ensure that it is protected and preserved into the future.

- A management plan should be developed to guide future care, including on-going vegetation control and erosion prevention;
- No vehicles should enter the site;
- A protective margin should be reserved in front of Te Pa Pa to protect the site, the view, and any external sub-surface evidence if it exists. No paths or landscaping should occur within this buffer zone;
- Any paths or landscaping immediately outside the pa and it's buffer zone should not involve excavation unless confined to 100 mm or less in areas already disked to that depth;
- Formal protective mechanisms should be explored to provide for the pa's on-going preservation. This should include extensive consultation with iwi. Options include covenanting; joint management; use as a reserve contribution; or outright gifting to an appropriate organisation.
- Interpretation of the site is encouraged. This should be developed in conjunction with iwi.

2. Mamaku Drain

- Minimise damage to the drain with emphasis placed on preserving the visual line of the feature (if the watercourse cannot be maintained);
- Photographs have been taken of the drain. Measured drawings are not believed to be necessary due to the continual modification of the feature.

3. Monitoring and Accidental Discovery Protocols

The general archaeological values of the property are low. Archaeological monitoring of earthworks should only be required for work in the vicinity of Te Pa Pa (such as the paths and any further earthworks for the nearby residential lots). Iwi monitoring requirements are decided by iwi.

The possibility of accidental discovery of archaeological sites or taonga can be covered by:

- Pre-earthworks briefing of contractors regarding archaeological and cultural values and protocols;
- Development and widespread dispersal of Accidental Discovery Protocols.

  For example:

  If koiwi, taonga or an archaeological site, or possible / suspected archaeological site, is uncovered at any time on the property:

  - Stop all work likely to damage the site;
  - Do not damage or investigate the site, or allow anybody else to do so;
  - Mark off the area;
  - Notify all contractors on site (to avoid the risk of inadvertent damage);
  - Immediately notify an archaeologist, and iwi if a Maori site, so the site can be assessed;
  - Notify iwi, the police, the District Coroner and NZHPT if any koiwi are uncovered; and then be under the guidance of iwi with regards to cultural requirements;
  - Do not recommence work in the area until the archaeologist and iwi, if a Maori site, have given approval to do so.

As a reminder, any pre-1900 'physical evidence of human activity' on the property falls under the blanket protection given to archaeological sites in the *Heritage New Zealand Pouhere Taonga Act* 2014. It is unlawful for any person to destroy, damage or modify the whole or any part of an archaeological site without the prior authority of the Heritage NZ. This is the case regardless of the legal status of the land on which the site is located, whether the activity is permitted under the District or Regional Plan or whether a

resource or building consent has been granted. Tasman District Council also has specific requirements for working in the vicinity of archaeological sites.

An archaeological authority under the *Heritage New Zealand Pouhere Taonga Act* 2014 is not needed for any subdivision or landscaping works to commence on the property. If archaeological material is uncovered during site works then an archaeological authority will need to be applied for. An archaeological authority will also be needed if any work is proposed to Pa Pa that involves land modification (including tree planting). This is regardless of the owner.

The *Protected Objects Act 1975* requires any finds of Maori artefacts to be notified to the Ministry of Culture and Heritage or the nearest public museum within 28 days of finding. It should be noted that pre-1900 Maori artefacts found *in-situ* also fall under the archaeological provisions of the *Heritage New Zealand Pouhere Taonga Act* 2014.

10.0 Bibliography

Anderson, A.J. 1966. Maori Occupation Sites in Back Beach Deposits Around Tasman Bay. Unpublished Master of Arts in Geography Thesis, University of Canterbury.

Bagley, S. 1985. Coastal Tasman Bay. Archaeological Site Registration Project. Report to NZ Historic Places Trust.

Challis, A. 1978. *Motueka. An Archaeological Survey*. NZ Archaeological Association Monograph Number 7. Longman Paul.

Foster, D. 2010. Archaeological Assessment of Kina Peninsula Subdivision for Carter Holt Harvey. Unpublished report.

Jackson, M. 2014. Settlement Patterns and Indigenous Agency in Te Tau Ihu, 1770-1860. A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy, Department of Anthropology and Archaeology, University of Otago, New Zealand.

Mackay, D. 2008. *Aporo: A taste of Tasman*. Tasman Community Area Board.

Mitchell, H. and J. 2004. Te Tau Ihu o Te Waka: A history of Nelson and Marlborough. Volume 1. Published by Huia Publishers in association with Wakatu Incorporation.

Mitchell Research. 2008. Cultural Significance of Maori Archaeological Sites and Waahi Tapu in the Tasman District. Report prepared for Tasman District Council.

New Zealand Archaeological Association Site Recording Scheme accessed through www.archsite.co.nz.

Nichol, R. and Foster, D. 1991. A Pilot Second Order CRI Study: Archaeological Sites on the Motueka Coast. Unpublished document.

Rattenbury, M.S., Cooper R.A., Johnston, M.R. (compilers). 1998. Geology of the Nelson Area. Published by Institute of Geological & Nuclear Sciences.

Taylor, R. 2012. Evidence of Ropata Wilson Tamu Taylor. ENV-2011-WLG-000059. Environment Court Evidence: Carter Holt Harvey HBU Ltd v. Tasman District Council.

Tiakina te Taiao. 2007. A Cultural Impact Assessment for the Ruby Bay Bypass. Unpublished document.

Wells, B.L. 1990. *The Fruits of Labour. A History of the Moutere Hills Area served by the Port of Mapua.* Self published.

Young, A. 2000. Archaeological Assessment of Sloan Property147 Kina Beach Road, Kina Peninsula Lot 85 DP427. Unpublished report prepared for Staig and Smith.

Young, A. 2000a. Archaeological Assessment of L. Brooks Property Permin Road. Lot 1 DP19860, Lot 8 DP17905 & Lot 121 DP426. Unpublished report prepared for Staig and Smith.

Young, A. 2000a. Archaeological Assessment of G.A.Brooks Property Permin Road. Lots 2-3 DP19752. Unpublished report prepared for Staig and Smith.

Young, A. 2007. Archaeological Assessment of the Ruby Bay bypass. Unpublished report prepared for Transit NZ.

Young, A. 2009. Archaeological Assessment: Proposed Subdivision of Pt Lot 2 DP9739, 1500 Coastal Highway (SH60), Tasman. Unpublished report prepared for Cherry Hills JV Ltd.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

ARCHSITE archaeological site recording scheme

Site Record Form

NZAA SITE NUMBER: N27/74

SITE TYPE: Pa

SITE NAME(s): Moutere Bluffs Pa

DATE RECORDED:

SITE COORDINATES (NZTM) Easting: 1606652 **Northing:** 5438348 **Source:** On Screen

IMPERIAL SITE NUMBER: S14/44 **METRIC SITE NUMBER:** N27/74

Finding aids to the location of the site

Situated on cliff edge between Permin Road and Moutere Bluff.

Brief description

Terraced promontory pa defended by a transverse ditch/bank.

Recorded features

Ditch - transverse, Terrace, Ditch - transverse, Pit, Terrace

Other sites associated with this site

SITE RECORD HISTORY	NZAA SITE NUMBER: N27/74

Site description

'Updated 06/03/2015 (Field visit), submitted by amandayoung , visited 23/09/2014 by Young, Amanda
Grid reference (E1606652 / N5438348)

Both Taylor (2012) and Tiakina te Taiao (2007) name this pa as Te Pa Pa. The pa is registered by Heritage NZ (#5864) and scheduled on the Tasman Resource Management Plan (TDC13005). There is no definite evidence of an occupation period for Te Pa Pa. Jackson found mention of the pa in Armstrong which states that the pa was the site of a battle between Kurahapo iwi and the Tainui – Taranaki taua (who were the victors) . No reference to the pa was found in other accounts of the taua such as Mitchell 2004 and Taylor 2012, or in Clark 1999 and Gillingham 2000 . Challis had a clear surface view of the internal features in 1976. He suggests that the proximity of two terraces suggests two phases of building . It is likely that the pa was used sporadically over a long period of time.
References are given in A. Young 2015. Archaeological Assessment of Cherry Hills Property, Tasman.'

Condition of the site

'Updated 06/03/2015 (Field visit), submitted by amandayoung , visited 23/09/2014 by Young, Amanda

Te Pa Pa was inspected in September prior to subdivision of the surrounding property. Te Pa Pa is very well preserved notwithstanding at least two efforts at removing pine trees from the site (pre-1976 and 2002). It is a beautifully preserved small, cliff top defence. The defensive ditch is still as recorded by Challis in the 1970s with some additional natural infilling and erosion. The internal features are no longer visible due to the ground cover but it is expected that they are also the same as recorded. There has been recent hand clearance of vegetation including the removal of wilding pines. No machinery has been on the site.
Root raking has occurred along the edge of the cliffs. No evidence of any archaeological material was found along the cliffs in the vicinity of the pa or immediately inland.

Since the pine trees were removed from the pa in 2002 there has been substantial re-growth in wattle and bracken, also some small wilding pines. Some erosion damage to the ditch and bank (2009).'

Statement of condition

Current land use:

Updated: 06/03/2015, Visited: 23/09/2014 - Rural residential, Coastal margins

Threats:

Updated: 06/03/2015, Visited: 23/09/2014 - Subdivision, Erosion, Tree planting (other than forestry), Vegetation clearance

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE RECORD INVENTORY	**NZAA SITE NUMBER:** N27/74

Observations about this site made in

Author	Year	Title	Publication Details

Supporting documentation held in ArchSite

AD AI AE BB AA IC

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE RECORD FORM

Map number S14
Map name Motueka
Map edition 2nd
Grid Reference 448379
E644800 N937900

SITE NUMBER S14/144

SITE NAME: MAORI
OTHER Montere Bluffs

SITE TYPE Pa/terraces.

1. Aids to relocation of site
West of an orchard in pine plantation immediately north-east of an irrigation pond. See sketch map.

2. State of site; possibility of damage or destruction
Pine trees felled. Land now under scrub.

3. Description of site (NOTE: This section is to be completed ONLY if no separate Site Description Form is to be be prepared.)

4. Owner R.H. Deck
Address Tasman

Tenant/Manager
Address

Attitude Concerned and Cooperative

Attitude

5. Methods and equipment used Level and staff, tape and compass survey.
Photographs taken: ~~Yes~~/No (Describe on Photograph Record Form)
Date recorded 9.9.1975

6. Aerial photograph or mosaic No.

Site shows:
Clearly/badly/not at all

7. Reported by A.J. Challis
Address

Filekeeper J.Y. Walls

Date 16.6.1976

Date

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S14
Map Name Motueka
Map Edition 2nd
Grid Reference 448379

SITE NUMBER S 14/44

SITE NAME: MAORI , OTHER Moutere Bluffs

SITE TYPE Pa / terraces

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

Promontory site : an elongated rectangle, internal dimensions 82 x 28 m., internal area 1500 square metres. Natural defences on 3 sides and transverse bank and outer ditch on the fourth side.

Situation. A gently sloping plateau, sloping down to the northand to the west, bounded to the east by a precipitous cliff line of over 100ft to the Tasman Sea, sheer to the north east and slightly less so to the south east, and bounded to the west by a sheer vertical slope of 50 to 100 ft to a narrow stream ravine which reaches the coast to the north of the site and terminates in a head-wall slump to the south west. From the site there are extensive views of Tasman Bay from Tata Island to Separation Point. To the south and west of the site the land level rises, so the view landward can never have been extensive.

Defences. The cliff and ravine are effective in this respect. It was not possible to examine the eroded sections because of unstable overhang in the loose Mapua Soil and Moutere Gravel. The artificial defences cross the neck of the promontory just north of the ravine head-wall, giving maximum internal area. The internal bank is 0.6 m. high and 5.0 m. wide. It appears to be constructed of clean Moutere Gravel-derived clay. The external face is steep and contiguous with the ditch cutting. The ditch is 0.7 metres deep and 4.0 m. wide. Its internal face is continuous with the external face of the bank, but the external face of the ditch is gradual. The ditch presumably supplied material for the bank. Erosion of the bank and infilling of the ditch is evident, accelerated by pine tree growth and litter accumulation.

Access. To the east, access to the ditch can be gained from the beach by a winding passage up the very steep slope. The bank to the east runs out to the cliff edge. To the west there is a causeway across the ditch at its abutment with the ravine edge, a feature which appears original. Also to the west the bank does not run to the ravine edge but ends in an almost vertical wall allowing a space of 30 cm. for a foot track to pass into the interior from the ditch causeway. At the extreme north, this narrow track cuts off a portion of bank which remains at the ravine edge, suggesting that it may have been a passage-way between parts of the bank rather than a peripheral feature.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
SITE DESCRIPTION FORM

Map Number S14
Map Name Motuekta
Map Edition 2nd
Grid Reference 448379

SITE NUMBER S14/144

SITE NAME: MAORI / OTHER Moutere Bluffs

SITE TYPE Pa / terraces

(This form may be used for recording any descriptive information or other supplementary information on the site, or for maps and drawings.)

Water supply. The western ditch terminal held water. The ravine to the west has running water for most of the year.

Internal features. There are a number of terraces cut back into the slight slopes of the interior, generally on the western, more sheltered side. There are several types of features:

a) Larger levelled terraces, rectalinear, 7 to 8 m. long.
b) Smaller levelled terraces 4 to 5 m. long.
c) Smaller circular or squared depressions up to 2 m. across.
d) Larger levelled areas 10 to 14 m. long.

Types a) and b) are most pronounced. See plan.

Condition. The site does not appear to have been disturbed by earthworking of any kind. Pine trees have recently been felled to minimise root damage, but regrowth of wattle, pine, and manuka is rapid and control is necessary. The landowner understands the problem.

Other points. A few surface mussel shells of same age. Otherwise no midden or artefact evidence.

An extant earthwork of the highest importance.

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE RECORD FORM

Map number S14
Map name Motueka
Map edition 2nd
Grid Reference 452376

N27 75 167 997

SITE NUMBER S14/145

SITE NAME: MAORI / OTHER

SITE TYPE Midden/ovens

1. Aids to relocation of site
300 yards north of the southern end of the sea-coast Moutere Cliffs.
See location map with S14/144.

2. State of site; possibility of damage or destruction
Covered by earth slips.

3. Description of site *(NOTE: This section is to be completed ONLY if no separate Site Description Form is be prepared.)*

Red fired oven stones and quantities of pipi shells were present here but have not been visible recently. Information from D.A. Austin, landowner. Site visited: no evidence found. Site presumably covered by earth sli

4. Owner D. A. Austin
Address Tasman

Tenant/Manager
Address

Attitude Cooperative

Attitude

5. Methods and equipment used Site examined

Photographs taken: Yes/No (Describe on Photograph Record Form)
Date recorded 23.9.1975

6. Aerial photograph or mosaic No.

Site shows:
Clearly/badly/not at all

7. Reported by A.J. Challis
Address

Filekeeper J.Y. Walls
J.Y. Walls

Date 16.6.1976

Date 23/7/76

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

SITE RECORD FORM

Map number S14
Map name Motueka
Map edition 2nd
Grid Reference 45 2374

N27/76 169 996

SITE NUMBER S14/146

SITE NAME: MAORI
OTHER W Bluffs

SITE TYPE Burials

1. Aids to relocation of site

Gully cut into the cliffs north of the McKee Memorial Domain.
See location map with S 14/144

2. State of site; possibility of damage or destruction

Subject to fluvial and marine erosion and cliff falls.

3. Description of site *(NOTE: This section is to be completed ONLY if no separate Site Description Form is to be be prepared.)*

In this gully, artefacts have been found together with evidence of burials in the form of several skulls. There were caves here; the burials may have been in them.

Information from Mrs. N. McPherson, Mapua.

4. Owner Austin Orchards Ltd
Address Tasman

Tenant/Manager
Address

Attitude Cooperative

Attitude

5. Methods and equipment used Site not examined.

Photographs taken: ~~Yes~~/No (Describe on Photograph Record Form)
Date recorded 17.11.1975

6. Aerial photograph or mosaic No.

Site shows:
Clearly/badly/not at all

7. Reported by A. J. Challis
Address

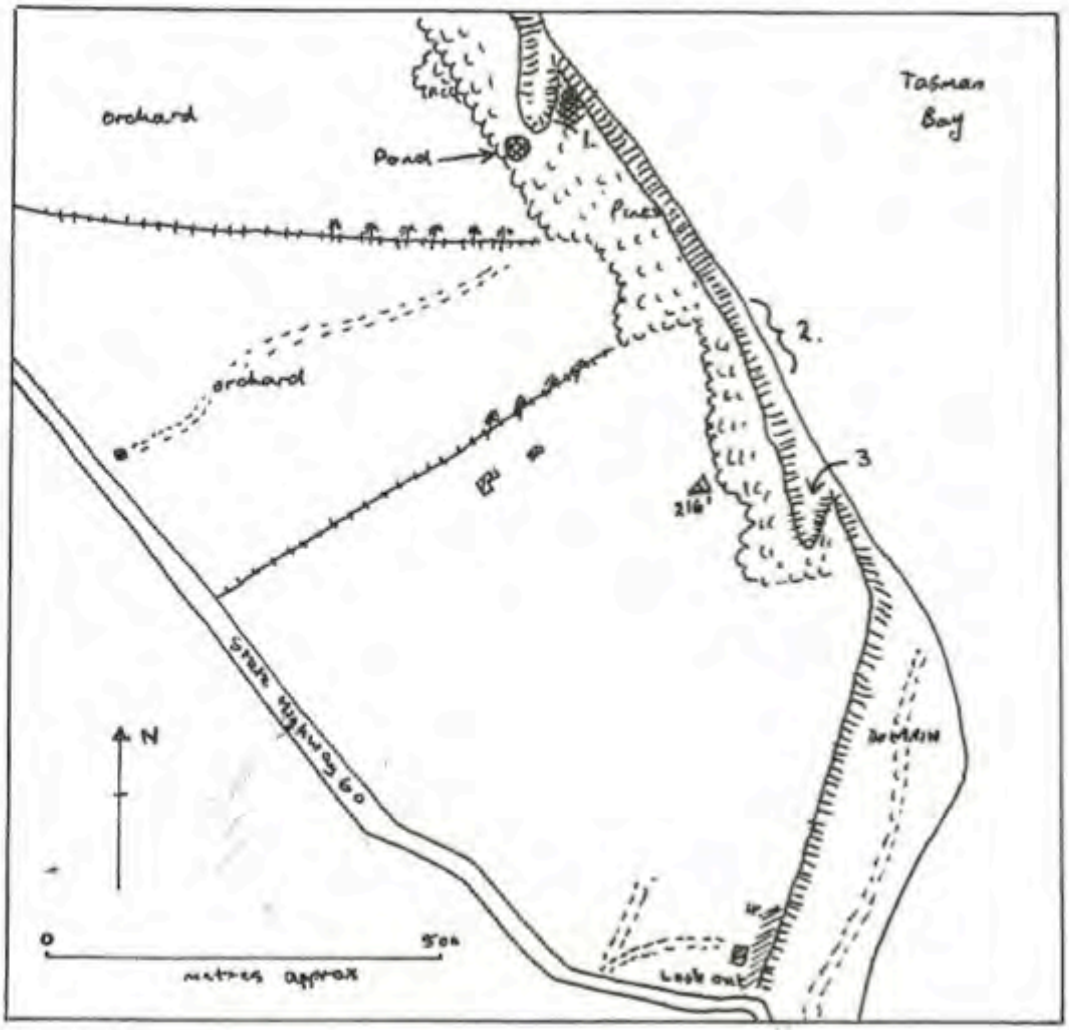
Date 16.6.1976

Filekeeper J. Y. Wells

J.Y. Wells

Date 23/7/76

S14/44
448379
Pa



1. S14/44 N27/74
2. S14/45 N27/75
3. S14/46 N27/76
4. S14/47 N27/77

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **100030**

Land Registration District **Nelson**

Date Issued 10 December 2003

Prior References

100143 NL73/207

Estate Fee Simple

Area 2.9896 hectares more or less

Legal Description Lot 14 Deposited Plan 324764

Registered Owners

Tasman Bay Estates Limited

Interests

Appurtenant hereto is a right of way created by Deed of Easement 24719 (19D/403) - 11.1.1994 at 12:00 am

Appurtenant hereto is a right of way created by Deed of Easement 33951 (34D/12) - 21.5.1907 at 11:00 am

Appurtenant hereto is a right of way created by Deed of Easement 33952 (34D/14) - 11.1.1994 at 12:00 am

Appurtenant hereto is a right of way created by Deed of Easement 38078 (41D/579) - 21.5.1907 at 11:00 am

112986 Land Improvement Agreement pursuant to Section 30A Soil Conservation and Rivers Control Act 1941 (affects the part formerly containted in CT NL73/207) - 7.11.1967 at 10.50 am

Appurtenant to the part formerly Lot 5 DP 2172 is a right of way specified in Easement Certificate 350686.7 - 10.8.1995 at 11:00 am

Subject to a right of way and right to transmit electricity and telephonic communications over part marked E on DP 324764 created by Easement Instrument 5539944.5 - 2.4.2003 at 9:00 am

The easements created by Easement Instrument 5539944.5 are subject to Section 243 (a) Resource Management Act 1991

Appurtenant to the part formerly contained in CT 100143 is a right to transmit electricity created by Transfer 5539944.7 - 2.4.2003 at 9:00 am

The easements created by Transfer 5539944.7 are subject to Section 243 (a) Resource Management Act 1991

Subject to a right of way and right to transmit electricity and telephonic communications over part marked E on DP 324764 created by Transfer 5539944.8 - 2.4.2003 at 9:00 am

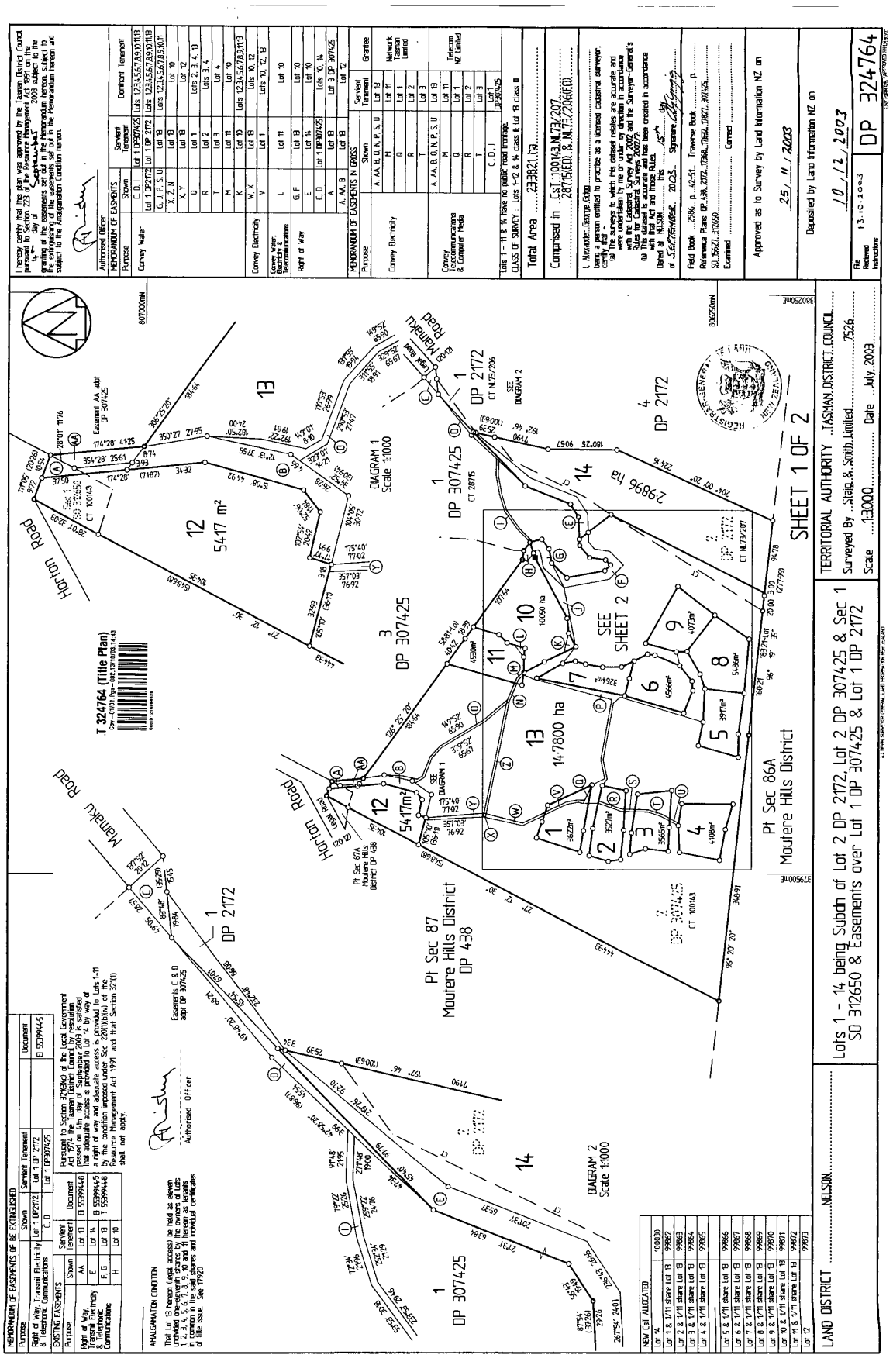
The easements created by Transfer 5539944.8 are subject to Section 243 (a) Resource Management Act 1991

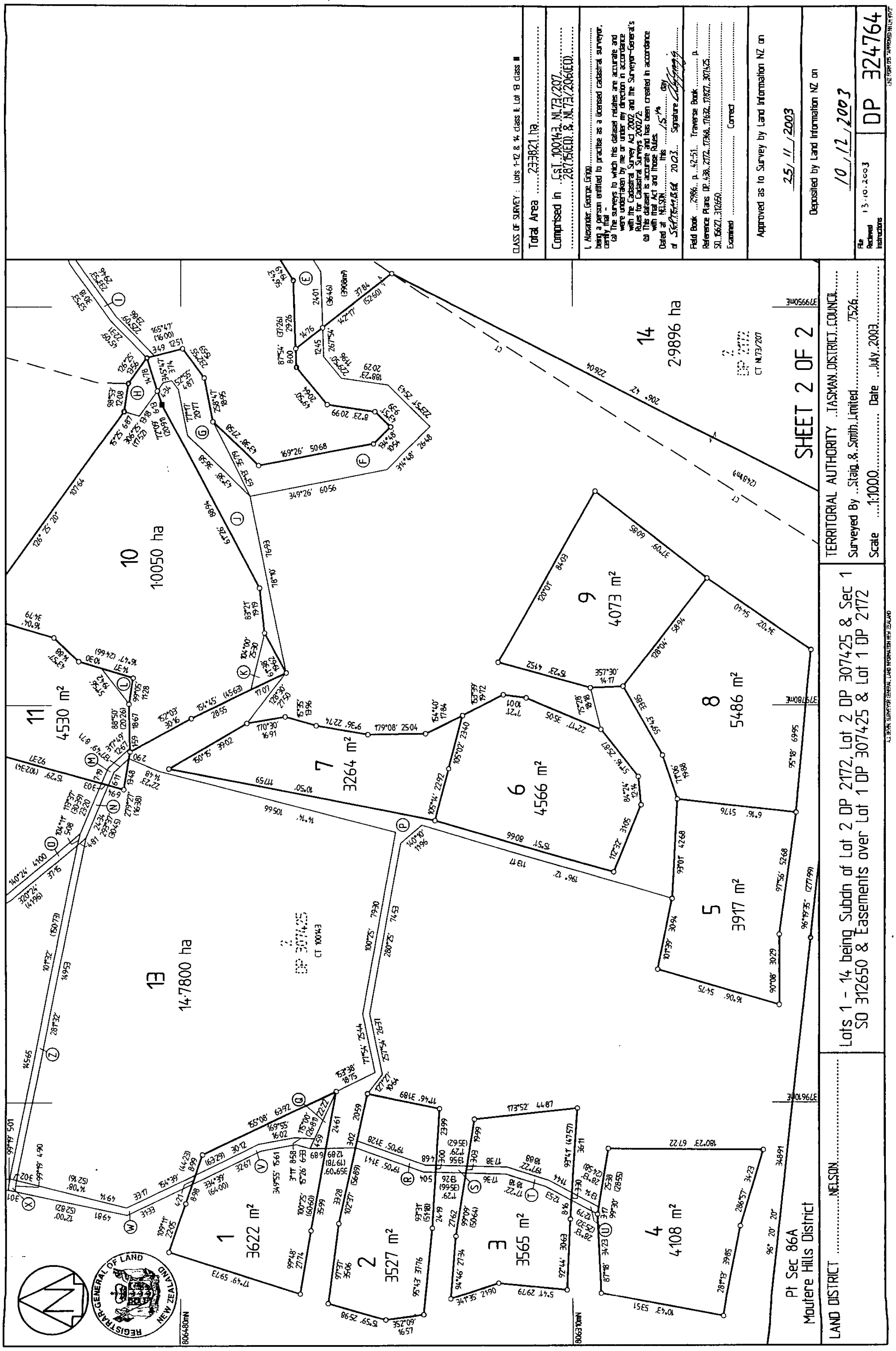
Subject to a right of way over part marked E on DP 324764 created by Easement Instrument 5831745.13 - 10.12.2003 at 9:00 am

Appurtenant hereto is a right of way created by Easement Instrument 5831745.13 - 10.12.2003 at 9:00 am

Some of the easements created by Easement Instrument 5831745.13 are subject to Section 243 (a) Resource Management Act 1991

10015714.6 Surrender of the right of way marked E on DP 484896 appurtenant to Lot 1 DP 484896 specified in Easement Certificate 5539944.5 - 27.8.2015 at 11:33 am


T 324764 (Title Plan)
Lots 1 - 14 being Subdn of Lot 2 DP 2172, Lot 2 DP 307425 & Sec 1 SO 312650 & Easements over Lot 1 DP 307425 & Lot 1 DP 2172
TERRITORIAL AUTHORITY ..TASMAN DISTRICT COUNCIL
Surveyed By ..Slaig & Smith Limited
Scale ..1:3000
Date ..July 2003
LAND DISTRICT ..NELSON
DP 324764
Horton Road
Mahitahi Road
Pt Sec 87 Moutere Hills District DP 438
Pt Sec 86A Moutere Hills District
Pt Sec 87A Moutere Hills District DP 438
DIAGRAM 1 Scale 1:1000
DIAGRAM 2 Scale 1:1000
SEE SHEET 2
SHEET 1 OF 2
MEMORANDUM OF EASEMENTS TO BE EXTINGUISHED
EXISTING EASEMENTS
AMALGAMATION CONDITION
That Lot 13 hereon (legal access) be held as tenants in common in the same shares as Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 hereon as tenants in common in the said shares and individual certificates of title issue. Sec 17(2)(c)
That Lot 14 hereon (legal access) be held as tenants in common in the same shares as Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 hereon as tenants in common in the said shares and individual certificates of title issue. Sec 17(2)(c)
NEW CST ALLOCATED
Lot 1 & 1/11 share Lot 13 100030
Lot 2 & 1/11 share Lot 13 99862
Lot 3 & 1/11 share Lot 13 99863
Lot 4 & 1/11 share Lot 13 99864
Lot 5 & 1/11 share Lot 13 99865
Lot 6 & 1/11 share Lot 13 99866
Lot 7 & 1/11 share Lot 13 99867
Lot 8 & 1/11 share Lot 13 99868
Lot 9 & 1/11 share Lot 13 99869
Lot 10 & 1/11 share Lot 13 99870
Lot 11 & 1/11 share Lot 13 99871
Lot 12 99872
Lot 13 99873


Total Area 23.3821 ha
Approved as to Survey by Land Information NZ on 25/11/2003
Deposited by Land Information NZ on 10/12/2003
DP 324764
SHEET 2 OF 2
TERRITORIAL AUTHORITY TASMAN DISTRICT COUNCIL
Surveyed By Staig & Smith Limited
Scale 1:1000
Date July 2003
Lots 1 - 14 being Subdn of Lot 2 DP 2172, Lot 2 DP 307425 & Sec 1 SO 312650 & Easements over Lot 1 DP 307425 & Lot 1 DP 2172
LAND DISTRICT NELSON
Pt Sec 86A Moutere Hills District
1 3622 m²
2 3527 m²
3 3565 m²
4 4108 m²
5 3917 m²
6 4566 m²
7 3264 m²
8 5486 m²
9 4073 m²
10 1·0050 ha
11 4530 m²
13 14·7800 ha
14 2·9896 ha

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **NL147/60**

Land Registration District **Nelson**

Date Issued 03 December 1958

Prior References
NL51/255

Estate Fee Simple

Area 7.4247 hectares more or less

Legal Description Lot 20, Part Lot 3 and Part Lot 5-6 Deposited Plan 328

Registered Owners
Tasman Bay Estates Limited

Interests

24719 (19D/403) Deed of Easement creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	The land in CT 43/121	Part	Lot 20, Part Lot 3 and Part Lot 5-6 Deposited Plan 328 - herein	

33951 (34D/12) Deed of Easement creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	The land in CT NL43/121	Part	Lot 20, Part Lot 3 and Part Lot 5-6 Deposited Plan 328 - herein	

33952 (34D/14) and 38078 (41D/579) Deeds of Easement creating the following easements

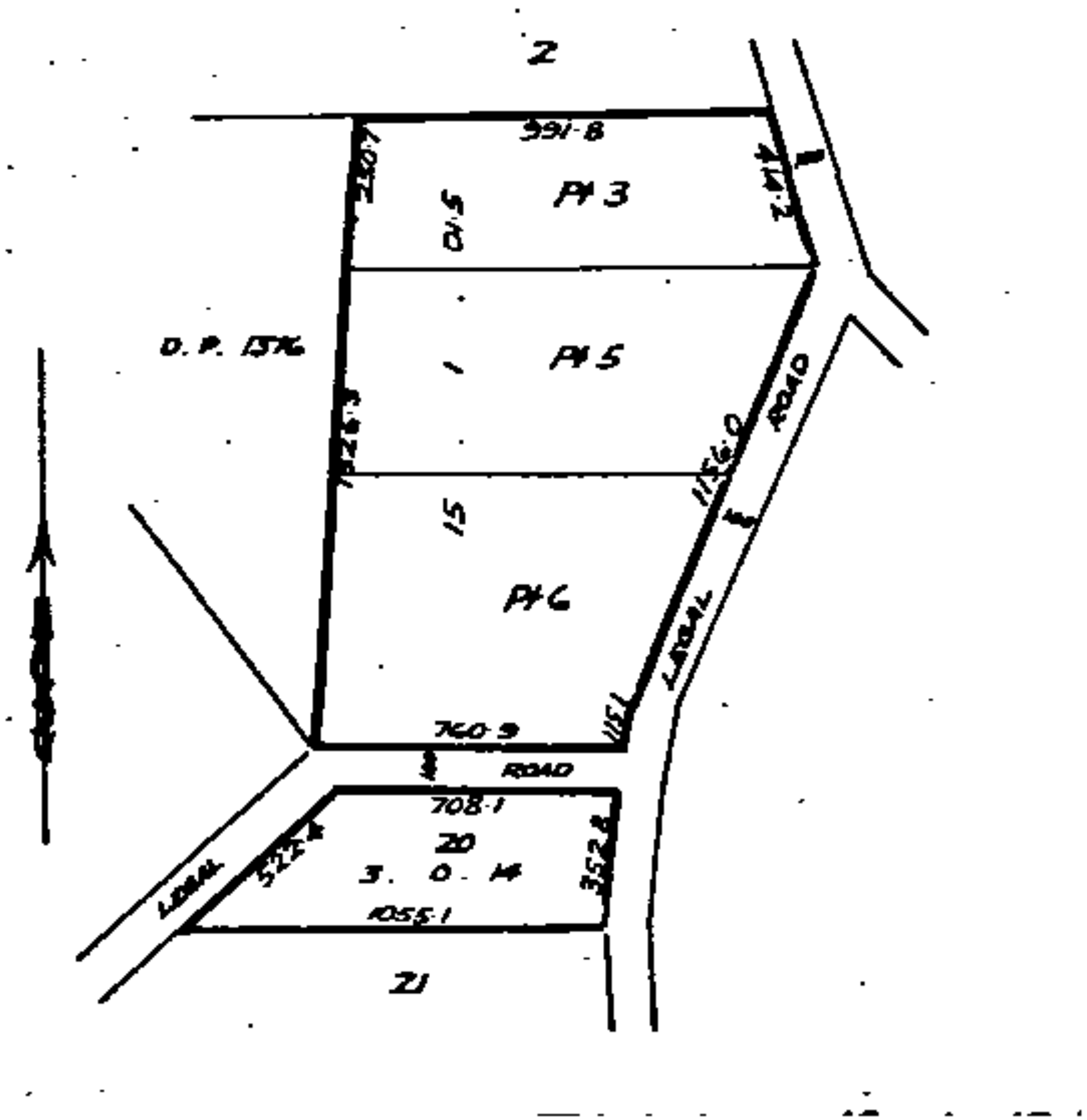
Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	The land in CT NL10C/449	Part	Lot 20, Part Lot 3 and Part Lot 5-6 Deposited Plan 328 - herein	
Right of way	The land in CT NL5D/627	Part	Lot 20, Part Lot 3 and Part Lot 5-6 Deposited Plan 328 - herein	
Right of way	The land in CT NL10A/792	Part	Lot 20, Part Lot 3 and Part Lot 5-6 Deposited Plan 328 - herein	
Right of way	The land in CT NL43/121	Part	Lot 20, Part Lot 3 and Part Lot 5-6 Deposited Plan 328 - herein	

70546 Transfer creating the following easements - 24.9.1959 at 2.14 pm

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction

Well and water	Lot 20, Part Lot 3 and	Part herein	The land in CT
pipe line and	Part Lot 5-6 Deposited		NL46/292
electric power line	Plan 328 - herein		
Well and water	Lot 20, Part Lot 3 and	Part herein	The land in CT NL61/56
pipe line and	Part Lot 5-6 Deposited		
electric power line	Plan 328 - herein		
Well and water	Lot 20, Part Lot 3 and	Part herein	Balance of the land in
pipe line and	Part Lot 5-6 Deposited		CT NL76/198
electric power line	Plan 328 - herein		

163613.1 Gazette Notice declaring part of the adjoining road to be a limited access road - 18.3.1975 at 2.22 pm


2
991·8
Pt 3
Pt 5
Pt 6
D. P. 1376
1156·0
ROAD
LEGAL
760·9
ROAD
708·1
20
3 . 0 . 14
1055·1
LEGAL
352·8
21

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **NL43/231**

Land Registration District **Nelson**

Date Issued 16 January 1919

Prior References
NL34/274

Estate Fee Simple

Area 4.2568 hectares more or less

Legal Description Lot 21 Deposited Plan 328

Registered Owners
Tasman Bay Estates Limited

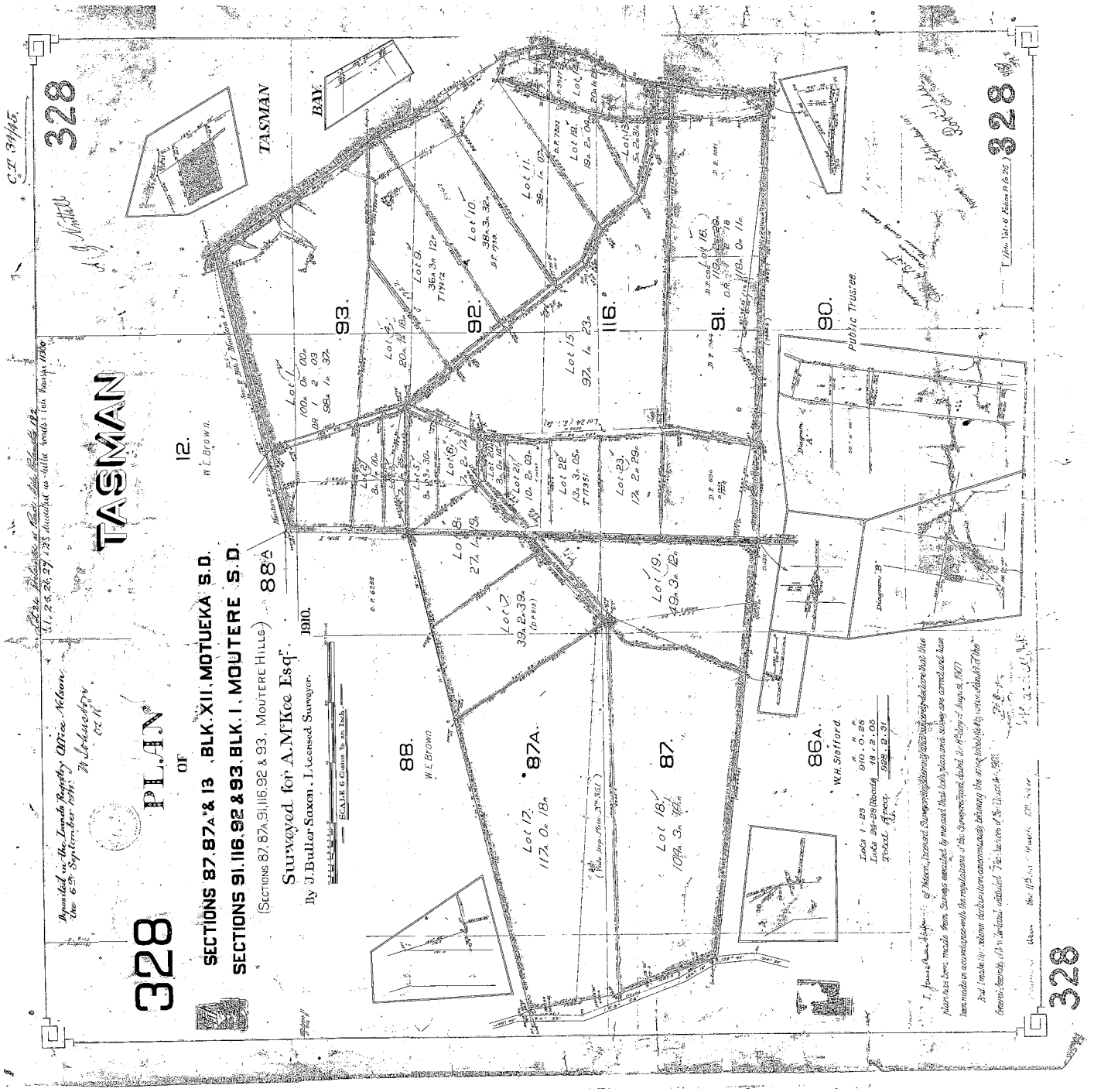
Interests

33951 (34D/12), 33952 (34D/14), 38078 (41D/579) & 24719 (19D/403) Deeds creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	Land in CT NL43/121	Part	Lot 21 Deposited Plan 328 - herein	

33952 (34D/14) & 38078 (41D/579) Deeds of Easement creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	Land in CT NL5D/627	Part	Lot 21 Deposited Plan 328 - herein	
Right of way	Land in CT NL10A/792	Part	Lot 21 Deposited Plan 328 - herein	
Right of way	Land in CT NL43/121	Part	Lot 21 Deposited Plan 328 - herein	


328
TASMAN
PLAN
OF
SECTIONS 87, 87A & 13 BLK. XII. MOTUEKA S.D.
SECTIONS 91, 116, 92 & 93 BLK. I. MOUTERE S.D.
(SECTIONS 87, 87A, 91, 116, 92 & 93, MOUTERE HILLS)
Surveyed for A. McKee Esq.
By J. Butler Saxon, Licensed Surveyor.
1910.
SCALE 6 Chains To an Inch.
TASMAN BAY
W. E. BROWN
W. H. Stafford
Public Trustee
Lot 17 117a. 0r. 18p.
Lot 18 104a. 3r. 6p.
Lots 1-23 910. 0. 25
Lots 24-28 (Roads) 18. 2. 03
Total Area 928. 2. 31
328

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **NL4A/119**
Land Registration District **Nelson**
Date Issued 11 April 1973

Prior References
NL49/289

Estate Fee Simple
Area 4.4502 hectares more or less
Legal Description Lot 1 Deposited Plan 8288
Registered Owners
Tasman Bay Estates Limited

Interests

33951 (34D/12) Deed of Easement creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	Part of the land in CT NL43/121	Part	Lot 1 Deposited Plan 8288 - herein	

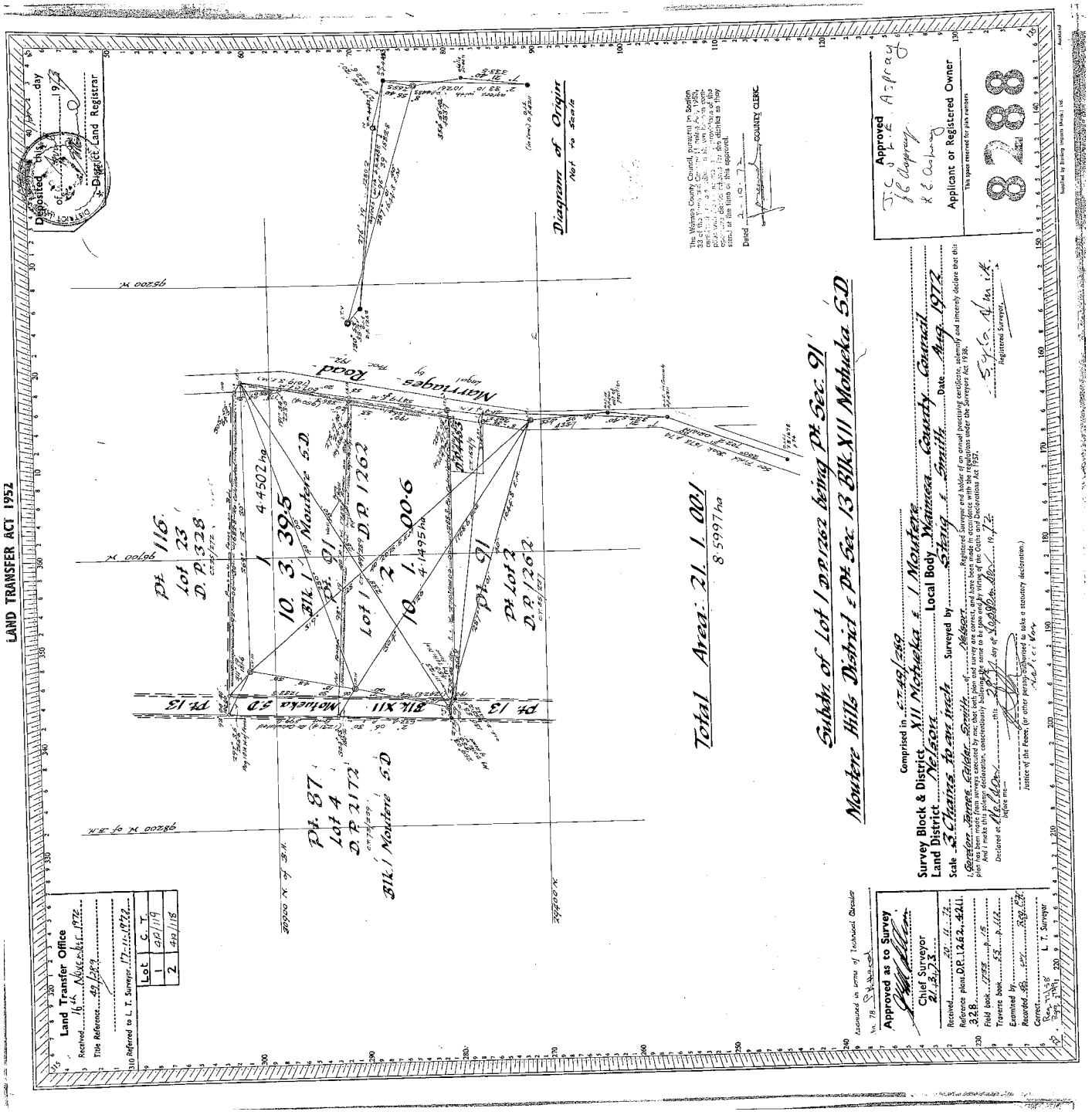
33952 (34D/14) Deed of Easement creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	part of the land in CT NL5D/627	part	Lot 1 Deposited Plan 8288 - herein	
Right of way	part of the land in CT NL10A/792	part	Lot 1 Deposited Plan 8288 - herein	
Right of way	part of the land in CT NL10C/449	part	Lot 1 Deposited Plan 8288 - herein	
Right of way	part of the land in CT NL43/121	part	Lot 1 Deposited Plan 8288 - herein	

38078 (41D/579) Deed of Easement creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	part of the land in CT NL5D/627	part	Lot 1 Deposited Plan 8288 - herein	
Right of way	part of the land in CT NL10A/792	part	Lot 1 Deposited Plan 8288 - herein	
Right of way	part of the land in CT NL10C/449	part	Lot 1 Deposited Plan 8288 - herein	
Right of way	part of the land in CT NL43/121	part	Lot 1 Deposited Plan 8288 - herein	

Fencing Provision in Transfer 184416.2 - 24.11.1977 at 9.43 am


LAND TRANSFER ACT 1952
Land Transfer Office
Received 16.11.1972
Title Reference 49/119
Referred to L. T. Surveyor 17.11.1972
Lot | C. T.
1 | 49/117
2 | 49/118
Approved as to Survey
Chief Surveyor
21.3.73
Received 22.11.72
Reference plans D.P. 1262, 2411, 3218
Field book 1295 p. 15
Traverse book 58 p. 112
Examined by
Recorded 58 p. 67
Correct
L. T. Surveyor
Examined in terms of Technical Circular No. 78
Diagram of Origin
Not to Scale
Subdn of Lot 1 D.P. 1262 being Pt Sec. 91
Moutere Hills District & Pt Sec. 13 Blk. XII Motueka S.D
Total Area: 21.1.00
8.5997 ha
Lot 1 D.P. 1262
10.3.39.5
4.4502 ha
Lot 2
10.1.00.6
4.1495 ha
Pt Lot 2 D.P. 1262
Pt 116 Lot 23 D.P. 3328
Pt 91
Pt 13
Blk. XII Motueka S.D
Pt. 87 Lot 4 D.P. 2172
Blk. I Moutere S.D
Marriages Road
Comprised in C.T. 49/120
Survey Block & District XII Motueka & I Moutere
Land District Nelson
Local Body Waimea County Council
Scale 3 Chains to an inch
Surveyed by Haig & Smith
Date Aug. 1972
Approved
Applicant or Registered Owner
This space reserved for plan numbers
688

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **NL6D/267**

Land Registration District **Nelson**

Date Issued 23 February 1983

Prior References
NL35/272

Estate Fee Simple

Area 7.1554 hectares more or less

Legal Description Lot 23 Deposited Plan 328

Registered Owners
Tasman Bay Estates Limited

Interests

33951 (34D/12), 33952 (34D/14), 38078 (41D/579) & 24719 (19D/449) Deeds creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	Land in CT NL43/121	Part	Lot 23 Deposited Plan 328 - herein	

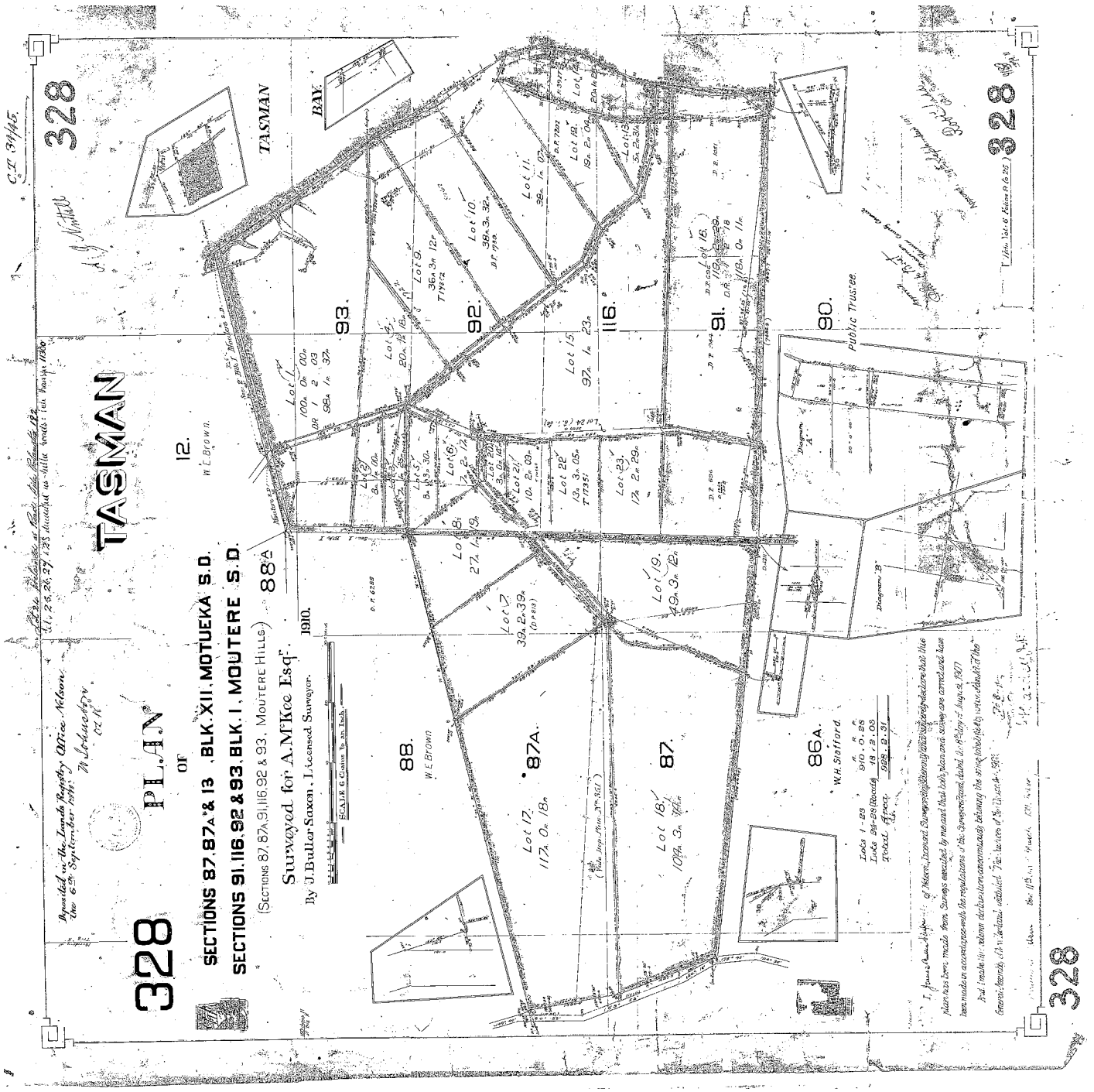
33952 (34D/14) & 38078 (41D/579) Deeds creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	Land in CT NL5D/627	Part	Lot 23 Deposited Plan 328 - herein	
Right of way	Land in CT NL10A/792	Part	Lot 23 Deposited Plan 328 - herein	
Right of way	Land in CT NL10C/449	Part	Lot 23 Deposited Plan 328 - herein	

41581 Transfer creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Water	Lot 23 Deposited Plan 328 - herein	Part herein	Land in CT NL1D/902	
Water	Lot 23 Deposited Plan 328 - herein	Part herein	Land in CT NL6B/1129	
Water	Lot 23 Deposited Plan 328 - herein	Part herein	Land in CT NL6B/1260	

Land Covenant in Covenant Instrument 11398598.33 - 4.6.2019 at 3:44 pm


TASMAN
PLAN
328
SECTIONS 87, 87A & 13 BLK. XII. MOTUEKA S.D.
SECTIONS 91, 116, 92 & 93 BLK. I. MOUTERE S.D.
(SECTIONS 87, 87A, 91, 116, 92 & 93, MOUTERE HILLS)
Surveyed for A. McKee Esq.
By J. Butler Saxon, Licensed Surveyor.
1910.
SCALE 6 Chains To an Inch.
TASMAN BAY
88A
88.
87A.
87.
86A.
93.
92.
116.
91.
90.
12.
W. E. Brown
W. H. Stafford
Public Trustee
Lot 17 117a. 0r. 18p.
Lot 18 104a. 3r. 6p.
Lots 1-23 910. 0. 25
Lots 24-28 (Roads) 18. 2. 03
Total Area 928. 2. 31

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **NL73/239**
Land Registration District **Nelson**
Date Issued 19 June 1933

Prior References
NL34/234

Estate Fee Simple
Area 20.1293 hectares more or less
Legal Description Lot 4 Deposited Plan 2172
Registered Owners
Tasman Bay Estates Limited

Interests

24719 (19D/403) Deed of Easement creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	Land in CT NL43/121	Part	Lot 4 Deposited Plan 2172 - herein	

33951 (34D/12) Deed of Easement creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	Land in CT NL43/121	Part	Lot 4 Deposited Plan 2172 - herein	

33952 (34D/14) Deed of Easement creating the following easements

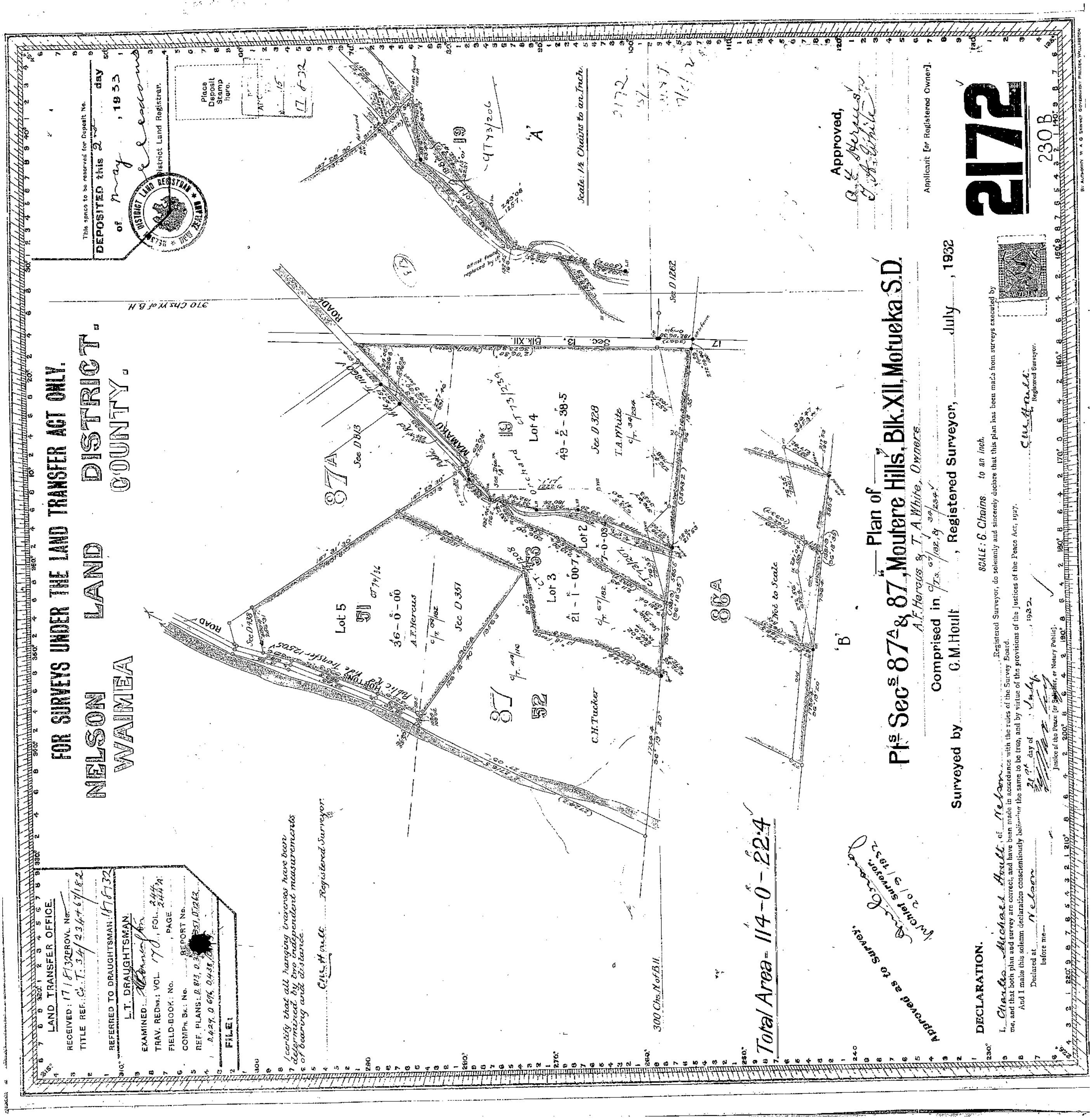
Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	Land in CT NL5D/627	Part	Lot 4 Deposited Plan 2172 - herein	
Right of way	Land in CT NL10A/792	Part	Lot 4 Deposited Plan 2172 - herein	
Right of way	Land in CT NL10C/449	Part	Lot 4 Deposited Plan 2172 - herein	
Right of way	Land in CT NL43/121	Part	Lot 4 Deposited Plan 2172 - herein	

38078 (41D/579) Deed of Easement creating the following easements

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Right of way	Land in CT NL43/121	Part	Lot 4 Deposited Plan 2172 - herein	
Right of way	Land in CT NL5D/627	Part	Lot 4 Deposited Plan 2172 - herein	
Right of way	Land in CT NL10A/792	Part	Lot 4 Deposited Plan 2172 - herein	

Right of way	Land in CT NL10C/449	Part	Lot 4 Deposited Plan 2172 - herein

112986 Land Improvement Agreement pursuant to Section 30A Soil Conservation and Rivers Control Act 1941 - 7.11.1967 at 10.50 am


FOR SURVEYS UNDER THE LAND TRANSFER ACT ONLY.
NELSON LAND DISTRICT.
WAIMEA COUNTY.
Plan of
Pts Secs 87A & 87, Moutere Hills, Blk.XII, Motueka S.D.
Total Area 114-0-22.4
2172