



# McPherson Quarry

## Vegetation Assessment

Expansion Stages 1 to 3



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# Contents

Executive Summary .....	1
1 Introduction .....	2
1.1 Background .....	2
1.2 Purpose and Scope .....	2
2 Project Description .....	2
3 Methodology .....	2
3.1 Desktop Assessment .....	2
3.2 Vegetation Field Survey .....	3
3.3 Assessment of Effects Methodology .....	3
4 Vegetation Description .....	5
4.1 Ecological Context .....	5
4.2 Vegetation .....	7
5 Value of vegetation .....	15
5.1 Assessment of Values .....	15
6 Assessment of Ecological Effects .....	16
6.1 Magnitude of Effects .....	16
6.2 Magnitude of Effects Summary .....	17
7 Overall Level of Effects Rating .....	17
8 Effects Management .....	18
8.1 Exotic Vegetation Clearance .....	18
8.2 Indigenous Vegetation Clearance .....	18
8.3 Mitigation Recommendations .....	18
8.4 Offset Recommendations .....	18
9 Discussion and conclusions .....	19
References .....	20
Appendix A Plant species list .....	22

## Document History and Status

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## Executive Summary

The proposed plan to expand the activity of the McPherson Quarry at 47 McPherson Road and 93 Irish Road over the next 3 to 4 decades will remove all vegetation within the construction footprint. The vegetation on site was assessed for value and effect:

- The majority of the vegetation is pasture and gorse of Negligible value.
- The effect of pasture and gorse removal has been assessed as having Low.
- Approximately 4 hectares of indigenous vegetation are part of a Significant Natural Feature that has been assessed as having High or Moderate value.
- The presence of manuka, an At-Risk species, and the identification of a portion of this site as a Significant Natural Features are key matters influencing the value rating.
- The 4ha of indigenous vegetation impacted by the quarry expansion is a small proportion of the extent of the Significant Natural Feature and regenerating podocarp/hardwood/broadleaf forests that exist in the area. The affected areas have been modified to varying degrees by grazing and other land management activities.
- The overall level of effect of indigenous vegetation removal has been assessed as Moderate in Stage 1 and Low in Stage 3.
- The Operative WDC identified a SNF corridor linking the adjacent indigenous forests through the quarry site access. The quarry access supports no vegetation and area is not suitable as a biodiversity corridor.
- Offset and mitigation planting has been recommended to compensate for the loss of indigenous forest.
- The offset will form a definitive link between the existing indigenous forests blocks along the northern boundary of the quarry, forming a functional ecological corridor.

# 1 Introduction

## 1.1 Background

McPherson Resources Limited proposes to expand its operation at the McPherson's Quarry to extract aggregate from a greater area to meet the increasing demand within the district. The quarry is operating with existing use rights and will require a resource consent to continue future operations and to provide storage areas for overburden removed from the quarry site. Most of the quarry expansion footprint and overburden storage areas impact upon vegetation of negligible value (pasture and gorse). However, the expansion footprint also impacts upon relatively small areas of regenerating native forest located within the boundary of a Significant Natural Feature (SNF) identified in Operative Waikato District Plan. Therefore, an assessment of the effects of the impact of the future quarrying operations on vegetation is necessary to support resource consent applications.

## 1.2 Purpose and Scope

The purpose of this report is to provide an assessment of effects of the proposed quarry expansion on the vegetation of the site.

The scope of this report comprises the following:

- A description of the vegetation;
- An assessment of the existing vegetation values, with particular focus on the value of the vegetation within the SNF;
- An outline of the nature and magnitude of potential adverse effects from the expansion of the quarry activities and overburden storage on vegetation; and
- Proposed measures to avoid, remedy or mitigate adverse ecological effects, where necessary.

# 2 Project Description

McPherson Quarry is currently operating to extract aggregate from a site situated in a rural environment in the foot of the Bombay Hills, North Waikato. This quarry is within the Manukau Ecological District in the south west area of the Hunua Ranges. The Mt William Walkway is to the west and Pouraureroa Stream Bush is to the east.

The proposed quarry expansion involves a three-staged extension of the quarry footprint. Stage 1 which, in part, includes the existing quarry, will continue into the immediate future, Stage 2 is likely to commence in 10-15 years' time, with Stage 3 commencing in 30 years. Stages 1 and 2 are situated within property 302646 at 47 McPherson Road, Mangatawhiri. Stage 3 is within property 2015363 at 93 Irish Road, Mangatawhiri. It is proposed to locate the overburden storage areas on low lying ground in the southern part of both properties (Figure 3).

# 3 Methodology

## 3.1 Desktop Assessment

The desktop assessment included a review of the following:

- Aerial photographs and topographic maps;
- Layout and expansion plans;
- The Operative and Proposed Waikato District Plans, planning Maps and schedules (2013; 2018);
- Significant Natural Areas of the Waikato District (van der Zwan & Kessels, 2018).

- Existing or potential presence of indigenous plant species determined from species lists (Cameron, 1999) and LENZ database,

## 3.2 Vegetation Field Survey

The vegetation field survey was carried out during a site visit on 31 July 2018 undertaken by Doug Bridge (Ecologist, WSP-Opus). The goal of which was to determine the existing indigenous vegetation on the impact site and confirm the SNF status of the regenerating forest affected.

The impact site had two areas that lay within the identified SNF. The first, along the western edge (impacted by Stage 3) was regenerating vegetation that was subjected to regular grazing with predominantly canopy species only present. Therefore, the indigenous tree species, saplings and ferns (Figure 10) were recorded in this locality.

Working eastward from the western edge, most of the proposed quarry expansion area was vegetated with grazed pasture and areas of gorse. This only warranted a walkover to confirm the low vegetation values. This approach was also used for pasture, where the overburden storage site was proposed to be (Figure 3). Where indigenous trees stood within the grazed area these were noted and height and their diameter at breast height (dbh) recorded.

The second of the areas within the SNF was along the eastern edge of the proposed impact site in stage one (Figure 3). It was a 2.6 ha block of regenerating forest. The vegetation assessment for this block consisted of four plotless surveys that spanned the width (West-East) of the block and recorded plant species present, the tier occupied for most species, dbh for dominant species, stem counts of larger individuals and an estimation of overall canopy cover. The eastern perimeter of this forest block is bound by an access track from the site office to the head of the quarry (Figure 3). This will be modified to maintain safe access to the head of the quarry. To do this it is proposed that the track will be lowered by five metres into the adjacent gully to the east. A visual assessment of the vegetation in the gully to the east of the access track was conducted from the track as the bank was too steep to make safe access practical.

A plant species list is attached in Appendix A.

## 3.3 Assessment of Effects Methodology

### 3.3.1 EIANZ Guidelines

Guidelines for undertaking Ecological Impact Assessments (EcIA) published by the Environment Institute of Australia and New Zealand (EIANZ, 2018) have been used to aid assessing impacts on vegetation from the Project. The guidelines assist in assessing values and effects in a consistent and transparent way. However, sound professional judgement is still required when applying the framework and matrix approach recommended.

The approach involves assigning values for vegetation, habitats or species and then assigning a magnitude of effects rating using the criteria in Table 1. An overall level of effects is then determined by combining the value of an ecological feature or attribute with the rating for the magnitude of effect (Table 1) using the matrix in Table 2.

Note that this assessment considers the values and magnitude of effects on vegetation communities and plants species only. It does not account for habitat value for fauna.

### 3.3.2 Assessment of Ecological Value

Section 11A of the Waikato Regional Policy Statement (2016) provides criteria for determining the significance of sites for indigenous biodiversity within the Waikato Region. In determining the values of significant natural areas within the Waikato District van der Zwan & Kessels (2018) used the same criteria to identify significant natural areas and WRC guidelines for determining the level of significance. Van der Zwan and Kessels (2018) have already identified the SNF impacted by the

proposed quarry expansion as being of regional (west of the quarry) or local significance (east of the quarry).

The first step of the EclA guidelines requires ecological values to be assigned on a scale of 'negligible', 'low', 'moderate', 'high', or 'very high' to each ecological feature. Since, in this case, an ecological value has already been assigned to the SNF (either regionally or locally significant), the value of the SNF was assumed to be High (regionally significant SNF) and Moderate (locally significant SNF), for the purposes of this assessment. The field assessment therefore sought to confirm the validity of including the impacted areas of regenerating forest within the SNF, and the relative quality of the affected vegetation. Plant species were valued according to their conservation status; those 'At Risk' or 'Threatened' were valued at a higher level than those classified as 'Not Threatened' (De Lange et al. 2018).

The field assessment determined that the vegetation values of the quarry expansion and overburden storage areas, outside the SNF, were too low to merit a detailed assessment of effects.

### 3.3.3 Magnitude of Effects

In determining a rating for the magnitude of effects the ecological value was given to the scale of habitat loss relative to the size of the available resource, duration of the effect, likely effect at population level with respect to individual species and degree to which the Project was likely to impact on the sustainability of the ecosystem and associated species. The magnitude of the effects are described as 'Negligible', 'Low', 'Moderate', 'High', or 'Very High' (Table 1). In assessing the magnitude of effects, standard best practice in terms of minimising effects and post construction restoration of affected areas have been assumed to be part of the Project. However, ecological offset has not been factored into the assessment.

Table 1 Criteria for describing the magnitude of effects (EIANZ, 2018)

MAGNITUDE	DESCRIPTION
Very high	Total loss of, or very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally change and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Noticeable shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population.



Table 2 Criteria for describing the level of effects (EIANZ, 2018)

MAGNITUDE	ECOLOGICAL VALUE				
	Very High	High	Moderate	Low	Negligible
Very High	<i>Very High</i>	<i>Very High</i>	<i>High</i>	Moderate	Low
High	<i>Very High</i>	<i>Very High</i>	Moderate	Low	Very Low
Moderate	<i>High</i>	<i>High</i>	Moderate	Low	Very Low
Low	Moderate	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

### 3.3.4 Overall Level of Effects

The last step in the effects assessment process was to determine the overall level of effect using the EIANZ matrix (Table 2).

The level of effect or risk posed on ecological values ranges from very high/high (signified by italics in Table 2) to low level (signified by an effect of low or very low in Table 2). Moderate level effects, or greater, typically require measures to avoid, remedy or mitigate effects, while Low to Very low effects levels are not normally of concern, although care may be required to minimise effects through design, construction and operation.

## 4 Vegetation Description

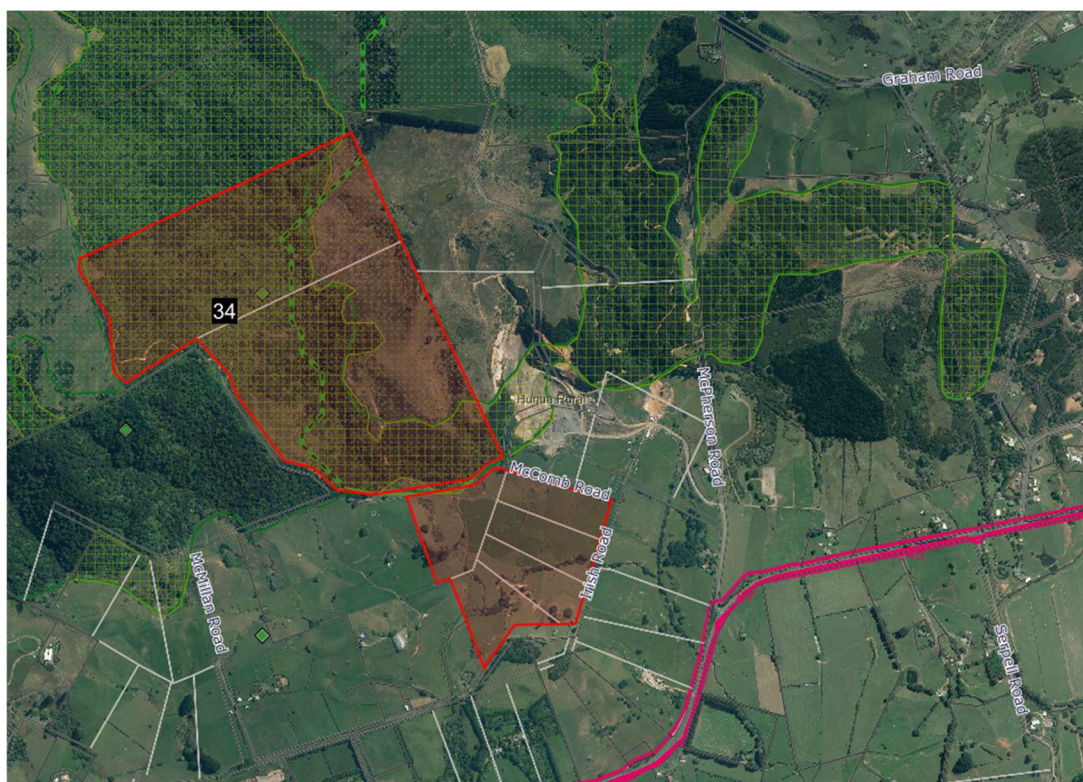
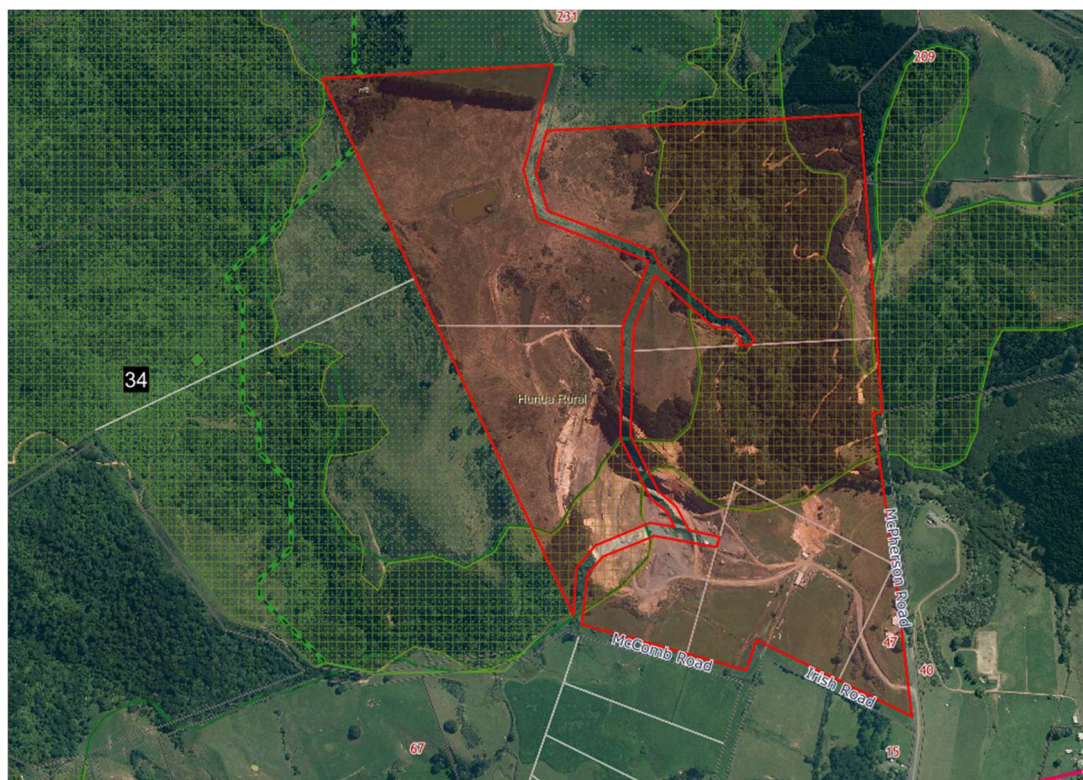
### 4.1 Ecological Context

#### 4.1.1 Significant Natural Area

Areas of the site have been identified as Significant Natural Areas by the Waikato Regional Council (WRC) using the 11 criteria outlined in the section 11A of the Waikato Regional Policy Statement (2016). These same criteria were used by the Waikato District Council to determine the Identified Significant Natural Features in the Franklin section online planning maps of the Operative District Plan (Figure 1). These significant areas identify the habitat for the at-risk, declining king fern (*Ptisana salicina*) and the southern limit of taraire (*Beilschmedia tarairi*)/puriri (*Vitex lucens*) forest (McEwan, 1987; van der Zwan and Kessels, 2018). Any Taraire forest is considered underrepresented in the district, as is kauri (*Agathis australis*) forest. The current Significant Natural Feature forms a link between protected forest blocks to the east and west of the Project.

#### 4.1.2 Local and Regional Significance

A linkage identified between 47 McPherson Road and 93 Irish Road was identified as a Significant Natural Feature (Waikato District Council). This includes the indigenous forest blocks on each property and the link between each block that creates a connection to the Mt William Scenic Reserve and the Pouraureroa Stream Bush. To the west, Mt William Walkway is Regionally significant with some of the bush protected by council covenants and DOC scenic reserves. A small area of this SNA protrudes into the impact site at Stage 3 (Figure 3). The Pouraureroa Stream Bush to the east is locally significant, as is the regenerating forest to the east of and including the eastern boundary of the impact site (Figure 3). This indigenous forest block represents a small portion of linkage between the Mt William reserve and the Hunua Ranges Regional Park (WDC).





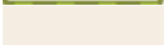




Property number	302646	Management Area	
Ecological Corridor		Rural Zone	
Environmental Enhancement Overlay Area		Schedule 5	
Identified Significant Natural Feature		Waikato River Catchment	

Figure 1a & b. The properties impacted by the proposed expansion of McPherson quarry showing the Significant Natural features (source: Waikato District Council Online Planning Maps – Intramaps, 2018)



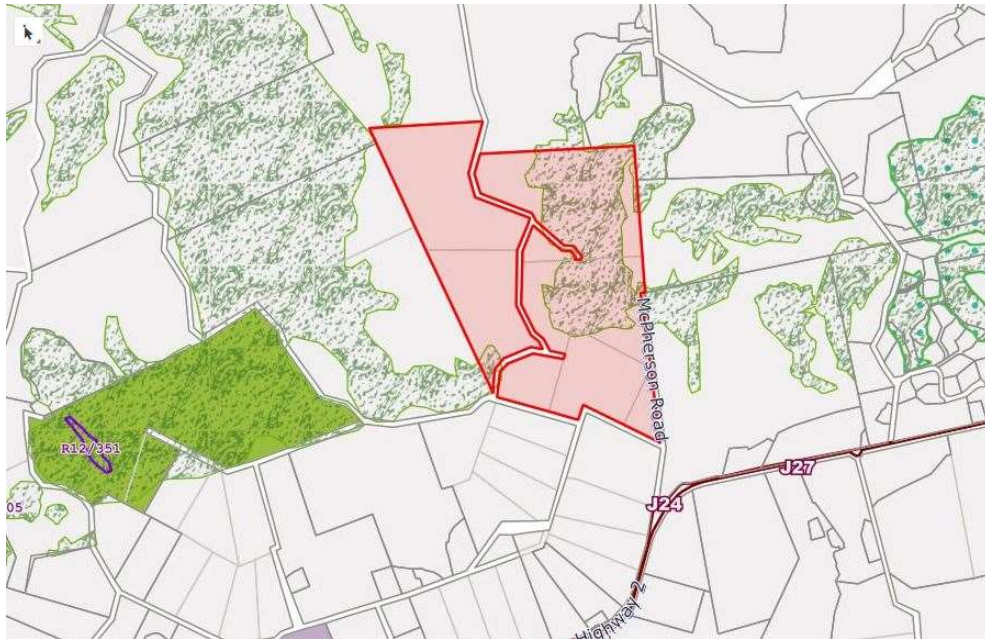


Figure 2 Proposed Waikato District Plan Map showing the Significant Natural Area not crossing the existing quarry.

Note: The online plan maps of the Operative Waikato District Plan indicate that this Significant Natural Feature passes through the existing quarry access zone and as such supports no vegetation. The high degree of modification of the quarry access zone precludes from being an effective biodiversity link (Figure 1a & b). The areas to the east and west of the site are identified as Significant Natural Areas in the Proposed Waikato District Plan (2018). The existing quarry is not part of this updated Significant Natural Area (Figure 2).

## 4.2 Vegetation

A substantial proportion of the Project site, including areas within the expansion footprint (Stages 1 to 3 and the overburden disposal area), consist of either low quality grazed pasture with patches of wiwi (*Juncus edgariae*), and gorse (*Ulex europaeus*) or have been impacted by previous quarrying activity (Figure 3). Indigenous vegetation is localised into small fragments across the 3 stages of the extraction site.

### 4.2.1 Stage 1

The Stage 1 expansion footprint includes the largest block of indigenous forest. This is in the south west edge of an extant 30-hectare regenerating manuka shrubland and mixed hardwood/podocarp forest at 47 McPherson Road (Figure 3). This forest block covers two main ridges and is bisected by a stream. It has three time phases of regeneration evident. The bottom of the stream gully and east to the ridge line is the oldest area of regeneration. It has large examples of kahikatea (*Dacrycarpus dacrydoides*) on the lower area, rewarewa (*Knightia excelsa*), tanekaha (*Phyllocladus trichomanoides*), rimu (*Dacrydium cupressinum*) and some kauri (*Agathis australis*) are evident as emerging from the canopy. East of this area is the youngest regeneration and consists of manuka shrubland that forms a dense canopy. This area exists due to stock exclusion by the property owner. These two areas are outside the expansion footprint (Figure 3).

The approximately 2.6 ha area within the expansion footprint was surveyed across the width of the block in four parts from the top of the track south down the ridge toward the base of the hill. It consists largely of mature manuka with occasional larger trees emerging from the

thinning canopy. This area covers the top of the ridge and east down into the stream gully and marked as “Regen – Mixed Podocarp/Hardwood/Manuka” in Figure 3. There is a South-east aspect into the gully with a slope of approximately 50 degrees. It is an area that is separated from the lower gully by the access track to the top of the quarry. It also has a track through the west and south of the block. These tracks have resulted in three fragmented sections (Figure 6). The fragmented nature of this forest vegetation has created an edge effect throughout the site with gorse and pasture grasses encroaching into its western edge (Figure 4). Along the track, koromiko (*Hebe stricta* var. *stricta*), hanghange (*Geniostoma rupstre*) and karamu (*Coprosma robusta*), as well as pampus (*Cortaderia selloana*), gorse (*Ulex europaeus*), wild pines (*Pinus radiata*), black wattle (*Acacia mearnsii*), privet (*Ligustrum* spp.) and other weed species were establishing in the open spaces and along the banks. A small grove of natives including kohekohe (*Dysoxylum spectabile*), tanekaha, mapou, silver fern, mahoe and manuka connected from the track edge to the lower gully bush.

The fragments themselves were dominated by mature manuka with a thinning canopy at 10-12 metres. At the north of the ridge, occasional specimens of tanekaha, totara (*Podocarpus totara*), rewarewa and rimu were starting to emerge from the canopy. These larger trees had a dbh in the range of 25 to 35 cm with the solitary rimu the largest at 65 cm dbh (Figure 5). Silver ferns were in the sub-canopy with a mature mapou (*Myrsine australis*) present. Also present in the lower sapling tiers 4 & 5 were hangehange, kawakawa, mapou, *Olearia rani*, mahoe (*Melicactus ramiflorus*), karamu and the occasional juvenile lancewood (*Pseudopanax crassifolius*). The ground cover was sparse but many seedlings of the above-mentioned species and the ferns *Asplenium longifolium*, bracken (*Pteridium esculentum*), and pikopiko (*Pseudopanax bulbiferum*) were present along with the occasional *Coprosma rotundifolia*. Epiphytes present were white rata (*Metrosideros diffusa*), Northern rata (*M. robusta*), *Astelia solandri*, and ferns, hounds tongue (*Microsorium pustulatum*), and *A. flaccidum*. Most of these were at least 2 metres above the ground. There was a gap in the structure of the forest with a lack of shrubs and saplings in Tier 4 and 3, above 2 metres and below the manuka canopy (Figure 7). This is typical of previously grazed forest that has recently had an absence of stock.

In the southern survey plots manuka dominance with silver ferns in the sub canopy and abundant mahoe saplings were found throughout the block. However, the species of large hardwoods, seedlings and saplings identified changes heading south through the block. Where tanekaha saplings are abundant along the ridge, there is also an area with lemonwood (*Pittosporum eugenioides*) as the dominant in the canopy. Totara and *Olearia rani* are dense in tiers 5 to 3, 2-12 metres in height closer to the access track. A small grove of the mature exotic, privet is also dominant in the canopy above the access track in the south. Ground cover is sparse but there are juvenile miro (*Prumnopitys ferruginea*), karaka (*Corynocarpus laevigatus*), pidgeonwood (*Hedycarya arborea*) and taraire at its southern limit, are present in the lower tiers in the south of the block, whilst absent in the northern area.

The remainder of the vegetation that will be impacted by Stage 1 was either removed due to excavation or consisted of pasture and areas of gorse.





Legend

Pasture	Manuka Shrubland	Gorse	Proposed Stage 2
Occasional Trees	Mature - Podocarps/Hardwood	Overburden Storage Site	Proposed Stage 3
Open Water/Pond	Regen - Mixed podocarps/Hardwood/Manuka	Proposed Stage 1	Proposed Stage 4

Figure 3. Map showing the vegetation distribution at McPherson Quarry. Proposed Stage 4 is the area available of the potential offset site. Note the access track to the head of the quarry is located along the eastern boundary of survey area one.





*Figure 4 Gorse at edge of Stage 1 forest block within the expansion footprint*



*Figure 5 Large rimu tree located in the forest block within the Stage 1 footprint.*





Figure 6 Fragment of vegetation observed within the Stage 1 expansion footprint.



Figure 7 Fragment of forest highlighting the gap between recent growth and the canopy within Stage 1 expansion.



## Stage 2

Stage 2 is a heavily modified landscape with several vehicle access tracks and a constructed pond located with the footprint. The vegetation was dominated by pasture with clumps of wiwi (*Juncus edgariae*). Woody vegetation consists of gorse, small patches of manuka. The gorse had been sprayed in this area and evidence of spray drift was observed effecting the manuka patches. Some noteworthy trees were located in the northeast of this stage. Seven mature totara, a rimu and kahikatea were observed on top of the hill with dbh from 45 to 95 cm. To the east of these large trees a grove of 32 totara, and 7 manuka was found adjacent to the forest outside the construction footprint (Figure 8). The ground cover was dominated by kikiyu (*Pennisetum clandestinum*) and grazed by sheep and no sub canopy, seedlings or saplings were evident.

Some large old pine trees were observed between the boundaries of the Stage 2 and 3 footprints. This row of trees was found to run down the slope toward a constructed pond in the southern part of the site. Manuka and gorse was observed at the head of the pond. The pond had planted raupo (*Typha orientalis*) growing in a small area (Figure 3).

### 4.2.2 Stage 3

Stage 3 is grazed throughout and consists of primarily pasture with a large area of gorse. Noteworthy in this impact site are the two areas of forest vegetation included in the Significant Natural Features identified by WDC (Figure 1b and Figure 9). Combined together, these impact areas make up less than 1 ha of the proposed 15 ha Stage 3 site. They are connected to the indigenous forest linked to the Mt William Scenic Reserve, a habitat for the At-Risk Declining king fern. These portions of forest occupy a position over the headwater of springs that feed into the stream in the adjacent gully. Within the impact site the understory is heavily grazed and little undergrowth is present (Figure 10). The canopy is dominated by manuka with silver ferns. Mahoe, mapou and the occasional putaputaweta (*Capodatus serratus*) were present as saplings near the spring. Groundcover transitions from kikuyu to the grass *Oplismenus airtellus* with the ferns *Lastreopsis* sp., *Blechnum* sp. and juvenile silver ferns are scattered near the spring fed stream (Figure 10).

### 4.2.3 Overburden storage area

This impact site is situated over both properties on flat lowland pasture south of the quarry (Figure 3). This is a modified landscape dominated by mixed pasture grasses and pasture weeds (Figure 11). A barberry hedge occupies one paddock boundary and a scrambling holly bush is in the middle of the site. Drains and a pond area have been constructed on site. These have watercress and the rushes wiwi, *Juncus acutus* and *Juncus effusus* along the drain banks.





Figure 8 Stage 2 totara and manuka grove



Figure 9 Stage 3 pasture, gorse and forest remnant





Figure 10 Interior of Stage 3 bush showing the head of the spring



Figure 11 Overburden storage area



## 5 Value of vegetation

Table 3 provides an assessment of the vegetation within the quarry expansion site. Of the approximately 55-ha of vegetation within the expansion footprint approximately, 51 ha of this is considered to be of Negligible value. It is either dominated by pasture, gorse or is already impacted by the existing quarry activity. Only approximately 4 ha of this consists of indigenous vegetation. This includes manuka dominant shrubland and manuka dominated regenerating mixed broadleaved/podocarp forest, as well as individual noteworthy trees. The conservation status of species identified within the expansion footprint were assessed using the latest version of Conservation status of New Zealand Indigenous Vascular plants 2017 (2018).

### 5.1 Assessment of Values

The pasture and gorse typifies most of the vegetation within the quarry expansion and overburden storage areas and has been determined to have Negligible value. This is due to it being a highly modified rural environment with low representation of indigenous vegetation and low levels of diversity.

The survey of the regenerating bush areas impacted by the quarry expansion confirmed that the inclusion within the SNF is justified. The lack of primary forest in the Manukau Ecological District (van der Zwan & Kessels, 2018) and presence of species identified as threatened on the flora conservation status lists are the primary criteria determining the significance of these areas.

The indigenous vegetation present has been evaluated in two parts. Firstly, The 2.6 ha block of indigenous forest in Stage 1, a locally significant SNF and secondly, the area to the west of Stage 3, a regionally significant SNF (Figure 3 For the purpose of this assessment the value of the regionally significant SNF has been scored High and locally significant SNF, Moderate (Table 4). Key to this is the presence of king fern in the Mt William Reserve to the west and a north Waikato hill country biodiversity corridor from Mt William scenic reserve to the covenanted Pouraureroa Stream Bush in the east.

The attributes of Manuka as an At-Risk Declining determine the species value of all manuka as on site as High (Table 3). Manuka has had its inclusion in the threatened species list due to the rise of Myrtle rust which has spread through the family *Myrtaceae* in New Zealand. Although, no myrtle rust was observed on the site visit its presence in the Auckland and Waikato regions puts areas of regenerating indigenous forest such as this north Waikato site at risk. Land on the McPherson property at 47 McPherson Road has been retired from grazing over the last decade. This lead to the regeneration of 5 hectares of manuka scrub. This scrub expands and buffers the existing older forest block in the adjacent gully and forms a continuous link to the forested area on the neighbouring property.

Table 3 Assignment of values to vegetation and species within the Project site.

VEGETATION/SPECIES	VALUE	COMMENTS
Regionally Significant SNF (Stage 3 - West)	High	WDC/WRC identified SNF/SNA
Locally Significant SNF (Stage 1 -East)	Moderate	WDC/WRC identified SNF/SNA
Remaining Vegetation (51 ha)	Negligible	Exotic grasses and gorse shrubland
Plants species, notably manuka	High	Conservation Status listed as At Risk-Declining (DOC)

## 6 Assessment of Ecological Effects

The main effects on vegetation is direct loss of High and Moderate value vegetation that will result from future quarry expansion. Additional effects include dust and edge effects from removal of the vegetation adjacent to extant forest blocks.

### 6.1 Magnitude of Effects

The EIANZ criteria for describing the magnitude and timescale of the effect was applied to the vegetation within the impact site including the overburden storage site.

The total impact site is approximately 55 ha in area. Of this the proposed overburden storage site is 13 ha of lowland area at the south of the properties and consists almost entirely of pasture. The proposed extraction site is approximately 42-ha of hill country. Quarry expansion in Stage 1 and 2 at 47 McPherson Road will impact 27 ha of this directly (Figure 1a & Figure 3). Existing quarry activities occupy 7 ha and therefore has had vegetation already removed. Of the remaining, 15-ha is grazed pasture, 2-ha is also grazed but is dominated by gorse. The remaining 3 ha is indigenous forest (Table 4). The 15-ha impact site of Stage 3 on the property at 93 Irish Road is dominated by pasture and is heavily grazed (Figure 3). A further 4 ha of this site is dominated by gorse. Two small areas (1 ha combined) of indigenous forest protrude from the adjacent forest over the headwaters of two springs to the east of the site (Figure 3 & Figure 9).

*Table 4 Approximate proportions of vegetation groups impacted by the quarry expansion and overburden storage (OB = overburden site)*

VEGETATION TYPE	STAGE	AREA (HA)	PERCENT OF PROPOSED EXCAVATION SITE (%)
Pasture dominant	1,2,3, OB	38	69
Gorse dominant	1,2,3	6.0	11
Manuka shrubland	1	0.4	1
Manuka dominant mixed podocarp/hardwood	1	2.8	5
Heavily grazed Indigenous vegetation	2, 3	0.8	1
Unvegetated	1	7.0	13

## 6.2 Magnitude of Effects Summary

Table 5 summarizes the magnitude of effects on the key vegetation feature of the impact site.

Table 5 Assignment of magnitude of effects rating to effects on vegetation

VEGETATION/HABITAT/SPECIES	MAGNITUDE	COMMENTS
Effects on indigenous vegetation in Stage 1 and 2	Moderate	Loss of a small area of the extent of the SNF bush block it is attached to (3%). While modified by historic logging and grazing a diversity of species present.
Effects on indigenous vegetation in Stage 3	Low	Loss of a very small area of the total bush block within the SNF (<0.5%). This vegetation is heavily grazed in the sub canopy and functions as wooded pasture.
Grazed pasture grasses	Low	The loss of pasture on the project site is a small proportion of grazing in the region.
Gorse	Negligible	Removal of gorse, an invasive species of NZ forests will reduce the seed source into the surrounding forests. Balanced against the increase of edge effect from the quarry.

## 7 Overall Level of Effects Rating

Table 6 provides an overall level of effects rating based on the EIANZ 2018 matrix shown in 2. Ecological values have been taken from Table 3 and the magnitude of effect from

Table 5. The Moderate overall effects rating resulting from the Stage 1 and 2 expansion effects on the SNF reflects the loss of a small proportion of a Moderate value (locally significant) vegetation, that while modified, still retains good plant species diversity. The Low overall effects rating for the Stage 3 expansion on the SNF reflects the very small proportion of the SNF impacted and the very high degree of modification of the habitat due to grazing. The Very Low level of effects on pasture and gorse reflects the lack of indigenous vegetation and scale of the removal relative to the pastoral land in the region and the positive impact on the surrounding forests of removing gorse from the Project site.

Table 6 Overall level of effects rating (EIANZ, 2018)

VEGETATION/HABITAT/SPECIES	ECOLOGICAL VALUE	MAGNITUDE OF EFFECT	LEVEL OF EFFECT
Effects on SNF vegetation in Stage 1 and 2	Moderate	Moderate	Moderate
Effects on SNF vegetation in Stage 3	High	Low	Low
Grazed pasture grasses	Negligible	Low	Very Low
Gorse	Negligible	Negligible	Very Low

## 8 Effects Management

### 8.1 Exotic Vegetation Clearance

The Very Low category for the level of effects for the removal of exotic vegetation raises no concern, in terms of vegetation, for 93% of the Project site.

### 8.2 Indigenous Vegetation Clearance

The Moderate overall effects rating for loss of indigenous vegetation during the Stage 1 and 2 of the quarry expansion requires consideration of measures to avoid, remedy or mitigate the effect. If the expansion of the quarry precludes avoidance of this vegetation then mitigation will be required to compensate for the loss of the vegetation. This is likely to be most effectively achieved by offset planting of vegetation of a similar character to the vegetation lost.

### 8.3 Mitigation Recommendations

Where quarrying removes indigenous vegetation then it is recommended that care is taken to ensure stabilisation of exposed earthworks as soon as possible along the exposed edge, with suitable native tree and shrub species. It is also important that invasive weeds are managed along these edges.

### 8.4 Offset Recommendations

Offset will need to be calculated and a detailed planting and rehabilitation plan generated to mitigate for the loss of forest from the SNF on the eastern side of the quarry. This will need to be calculated to establish a no net loss impact from the quarries activities. An area on site at 47 McPherson Road has been identified as suitable for such offset planting along the edge of the proposed Stage 4 (Figure 3), situated at the northern boundary of the property. The offset required has not been calculated as part of this assessment. Planting along the northern boundary of the property will have the added advantage of forming a linkage between the forest of the Mt William Walkway and the remaining established forest vegetation on the property and will strengthen the forest corridor between Mt William and the Pouraureroa Stream Bush. Additional planting areas should be considered west of the Stage 3 expansion boundary. This would provide an enhanced buffer between the proposed quarry and the adjacent forest. These areas will need a detailed planting plan and timeframe and to be fenced from grazing and managed for pest plants and animals.

## 9 Discussion and conclusions

It has been determined through desktop and field analysis of the proposed McPherson Quarry expansion footprint, that over 92 percent of the vegetation affected is of Very Low value. The remaining indigenous vegetation is classified as being of High or Moderate value due to the identification as a Significant Natural Feature (Significant Natural Area(s) by Waikato Regional Council). The total area of affected indigenous vegetation removal is approximately 4 ha. Of this, the 2.6 ha fragment between the access track and the existing quarry is the most intact of the regenerating forest, although it has gaps within forest tiers, weed invasion and edge effect it is representative of the surrounding hill country forest, albeit less diverse (Cameron, 1999). Below the track, weed species mostly occupy the top five metres with a small grove of natives including kohekohe part way down. The expansion of the quarry will require the lowering of this track for safety reasons.

The Moderate overall effects rating resulting from the Stage 1 and 2 expansion effects on the SNF reflects the loss of a small proportion of a Moderate value (locally significant) vegetation, that while modified, still retains good species diversity. The Low overall effects rating for the Stage 3 expansion on the SNF reflects the very small proportion of the SNF impacted and the very high degree of modification of the vegetation due to grazing. The Very Low level of effects on pasture and gorse reflects the lack of indigenous vegetation and scale of the removal relative to the pastoral land in the region and the positive impact on the surrounding forests of removing gorse from the Project site.

The Operative Waikato District Plan shows a SNF linking the adjacent indigenous forests as passing through the current existing quarry access, suggesting connecting indigenous vegetation. This is not the reality, and has not been for some time, as the quarry provides a physical separation of these two areas. As a result, this area is not suitable as a biodiversity corridor as there is no vegetation there. This report supports the modification of the boundary of the significant natural feature as proposed in the Proposed Waikato District Plan, which accurately identifies the separation of the areas.

The Moderate overall level of effect of the indigenous vegetation removal resulting from Stages 1 and 2 will require offset planting to create a no net loss outcome. An appropriate site for offset planting has been identified along the northern boundary of the property (Figure 3). This offset site will form a definitive link between the existing indigenous forests blocks and create a functional ecological corridor. This will generate a net gain for the biodiversity value of the area.



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## References

- Cameron E.K. (1999). Vascular Plants of Mt William Scenic Reserve. *Auckland Botanical Society Journal* 54(1): 8-12.
- de Lange, P.J; Rolfe, J.R; Barkla, J.W; Courtney, S.P; Champion, P.D; Perrie, L.R.; Beadel, S.M.; Ford, K.A.; Breitwiser, I.; Schonberger, I.; Hindmarsh-Walls, R.; Heenan, P.B and Ladley, K. (2018). Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series 22*, Department of Conservation, Wellington, New Zealand.
- Environmental Institute of Australia and New Zealand Inc. (EIANZ) (2018). Environmental Impact Assessment (EIA): EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems 2<sup>nd</sup> Edition. *EIANZ, Melbourne, Australia*.
- Hurst J.M. and Allen R.B. (2007) The Recce Method for Describing New Zealand Vegetation – Field Protocols. *Landcare Research, Lincoln, New Zealand*
- McEwan, M. (1987). Ecological Regions and Districts of New Zealand Part 1. 3<sup>rd</sup> Edition. *Department of Conservation, Wellington, New Zealand*.
- van de Zwan, W. and Kessels, G. (2018). Significant natural areas of the Waikato District: terrestrial and wetland ecosystems. Waikato Regional Council Technical Report 2017/36. *Waikato Regional Council, Hamilton, New Zealand*.
- Waikato District Council (2013). Waikato District Plan. *Waikato District Council, Huntly, New Zealand*.
- Waikato District Council. (2018). Waikato District Operative Plan Online Maps. *IntraMaps*. <http://maps.waikatodistrict.govt.nz/IntraMaps90/default.htm?project=Waikato&configId=b2549ae1-f643-4ac6-9586-211ba985dd8f&module=Operative%20District%20Plan>
- Waikato Regional Council (2016). The Waikato Regional Policy Statement. *Waikato regional Council, Hamilton New Zealand*.

# Appendix A

## Plant Species List

Data collected – 31 July 2018

## Appendix A Plant species list

COMMON NAME	BOTANICAL NAME	CONSERVATION STATUS
Black wattle	<i>Acacia mearnsii</i>	Exotic
Kauri	<i>Agathis australis</i>	Not Threatened
Fools watercress	<i>Apium nodiflorum</i>	Exotic
Pikopiko	<i>Asplenium bulbifium</i>	Not Threatened
	<i>A. flaccidum</i>	Not Threatened
	<i>A. oblongifolium</i>	Not Threatened
	<i>Astelia solandri</i>	Not Threatened
taraire	<i>Belschmedia taraire</i>	Not Threatened
barberry	<i>Berberis vulgaris</i>	exotic
	<i>Blechnum nigrum</i>	Not Threatened
hook grass	<i>Carex uncinata</i>	Not threatened
putaputaweta	<i>Capodatus serratus</i>	Not Threatened
	<i>Coprosma grandifolia</i>	Not Threatened
Karamu	<i>Coprosma robusta</i>	Not Threatened
	<i>Coprosma rotundifolia</i>	Not Threatened
Common pampus	<i>Cortaderia selloana</i>	Exotic
karaka	<i>Corynocarpus laevigatus</i>	Not Threatened
Silver Fern	<i>Cyathea dealbata</i>	Not Threatened
kahikatea	<i>Dacrycarpus dacrydoides</i>	Not Threatened
Rimu	<i>Dacrydium cupressinum</i>	Not Threatened
foxglove	<i>Digitalis purpurea</i>	Exotic
kohekohe	<i>Dysoxylum spectabile</i>	Not Threatened
Willow weed	<i>Epilobium spp.</i>	Exotic
hangehange	<i>Geniotea rupstre</i>	Not Threatened
koromiko	<i>Hebe stricta var. stricta</i>	Not Threatened
Pidgeonwood	<i>Hedycarya arborea</i>	Not Threatened
wiwi	<i>Juncus edgariae</i>	Not Threatened
Rewarewa	<i>Knightia excelsa</i>	Not Threatened
Manuka	<i>Leptospermum scoparium</i>	Not Threatened
Soft Mingimingi	<i>Leucopogon fasciculatus</i>	Not Threatened
Tree privet	<i>Ligustrum lucidum</i>	Exotic
Chinese privet	<i>Ligustrum sinense</i>	Exotic
Kawakawa	<i>Macropiper excelsum</i>	Not Threatened
mahoe	<i>Melicytus ramiflorus</i>	Not Threatened

COMMON NAME	BOTANICAL NAME	CONSERVATION STATUS
Climbing rata	<i>Metrosideros diffusa</i>	Not Threatened
Northern rata	<i>Metrosideros robusta</i>	Not Threatened
Hounds tongue fern	<i>Microsorium pustulatum</i>	Not Threatened
Mapou	<i>Myrsine australis</i>	Not Threatened
Watercress	<i>Nasturtium microphyllum</i>	Not Threatened
Tree daisy	<i>Olearia rani</i>	Not Threatened
Bush grasses	<i>Oplismenus airtellus</i>	Not Threatened
kikuyu	<i>Pennisetum clandestinum</i>	Exotic
Tanekaha	<i>Phyllocladus trichomanoides</i>	Not Threatened
Inkweed	<i>Phytolacca actundra</i>	Exotic
Radiata pine	<i>Pinus radiata</i>	Exotic
Lemonwood	<i>Pittosporum eugenoides</i>	Not Threatened
plantain	<i>Plantago lanceolata</i>	Exotic
Totara	<i>Podocarpus totora</i>	Not Threatened
Miro	<i>Prumnopitys ferruginea</i>	Not Threatened
Lancewood	<i>Pseudopanax crassifolius</i>	Not Threatened
Bracken	<i>Pteridium esculentum</i>	Not Threatened
Leather leaf fern	<i>Pyrrosia eleagnifolia</i>	Not Threatened
buttercup	<i>Ranunculus repens</i>	Exotic
Supple jack	<i>Ripogonum scandens</i>	Not Threatened
Rumex crispus	<i>Rumex crispus</i>	Exotic
Raupo	<i>Typha orientalis</i>	Not Threatened
Corse	<i>Ulex europaeus</i>	Exotic

