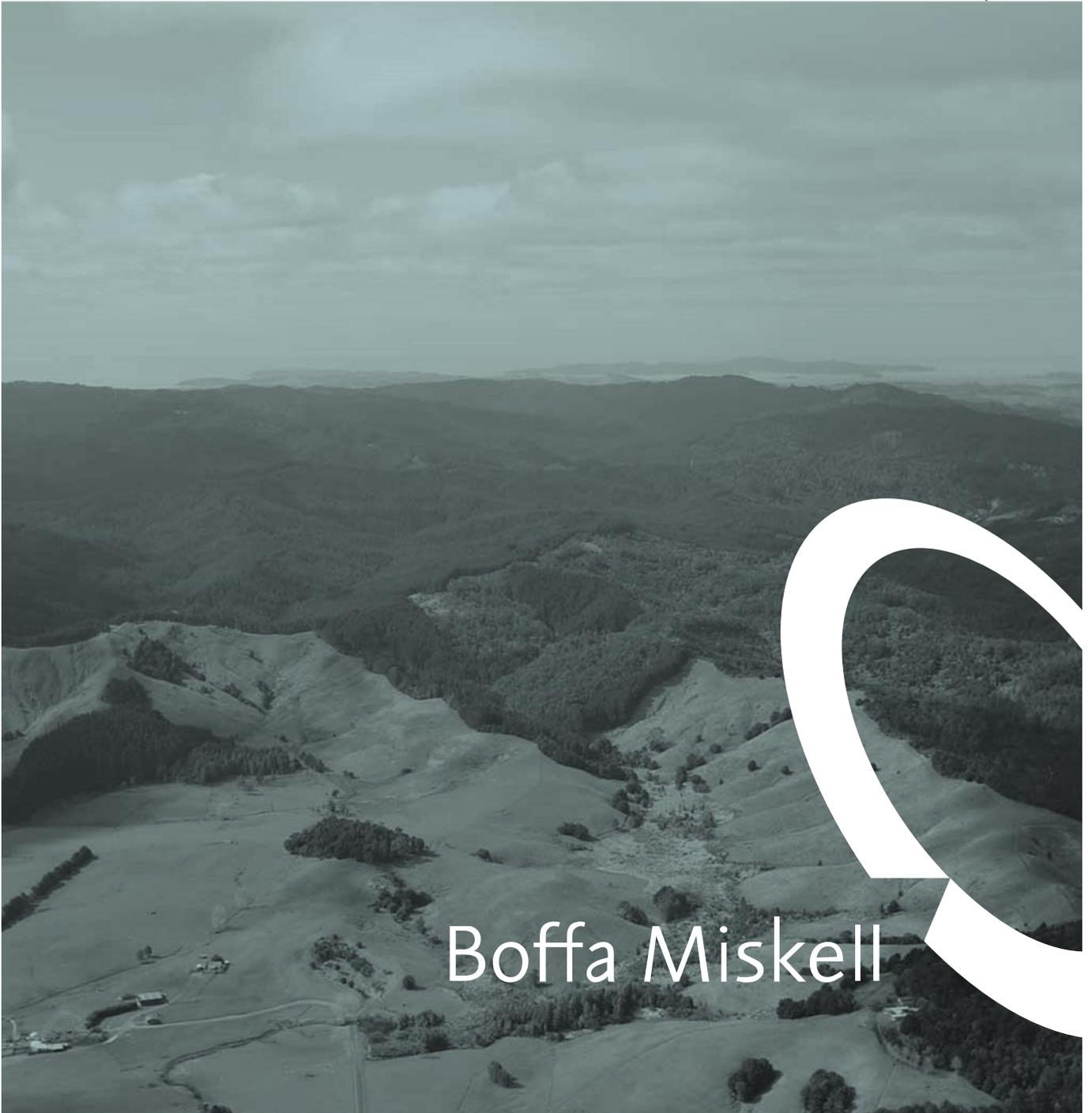


Auckland Regional Landfill

Landscape and Visual Assessment
Prepared for Waste Management NZ Limited

24 May 2019



Boffa Miskell

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Glossary

General Terms	Definition
Auckland Regional Landfill	Project name, encompassing the landfill itself as well as all ancillary activities.
Waste Management NZ Limited or WMNZ	Company name of applicant.
Wayby Valley	The site is located in the Wayby Valley catchment.
WMNZ's landholding	The entire landholding secured by WMNZ.
Project activity areas	The areas where works are anticipated associated with the project.
Landfill footprint	The area directly impacted by the landfill itself within Valley 1.

Landholding Description	Definition
Western Block	The farm property previously known as Springhill Estate.
Eastern Block	Pine forestry block which includes Valley 1 and 2
Southern Block	Strip of land which access road runs through until it reaches the Eastern Block. This strip is mostly occupied by bush and forest plantation, within a separate valley across the southern side of the Western Block.
Waitemata Tributary Block	South east corner of the site, covering tributaries that flow down towards the Sunnybrook Reserve.
Valley 1	The southernmost of the two valleys currently in forestry suitable for landfilling.
Valley 2	The northernmost of the two valleys currently in forestry suitable for landfilling, and that might be considered for development after Valley 1 has been filled, but does not form part of this consent application.
Waitemata Stream	Stream next to the access road and bin exchange area.

Project Description	Definition
Airspace, or airspace volume	The gross volume available between the landfill basegrade and the top of the landfill cap. This volume includes the volume of all materials placed within this space including waste, daily cover, intermediate cover and final cap.
Basegrade	The surface at the base of the landfill (depicted as the top of lining system i.e. before placing the leachate drainage blanket)
Daily cover	A thin layer of soil placed on top of refuse at the end of each day to manage nuisance conditions such as odour, wind-blown litter, birds and vermin.

Footprint, or landfill footprint	The area (plan area) occupied by the landfill which has a lining system onto which waste is placed.
Intermediate cover	A layer of soil, placed over areas of refuse where further waste placement will take place but not for some time (typically > 6 months).
Landfill gas or LFG	The gas produced by the anaerobic decomposition of waste comprising predominantly methane and carbon dioxide.
Leachate	The liquid produced when water percolates through the waste and that contains dissolved and/or suspended matter from the waste.
Leachate drainage system	A combination of the leachate drainage blanket and the leachate collection pipework.
Nett Usable Airspace	The nett volume available between the upper surface of the leachate drainage blanket and the underside of the landfill cap. This volume is available for the disposal of waste and includes the volume of daily cover and intermediate cover.
Liner or landfill liner	A low permeability layer within the lining system at the bottom of the landfill to prevent the seepage of leachate into the underlying environment.
Lining system	A series of layers of liner at the bottom of the landfill to prevent the seepage of leachate into the underlying environment.
Leachate drainage blanket	Free draining aggregate placed above the landfill liner to collect leachate percolating from the waste above. The leachate drainage blanket will convey leachate to a leachate collection pipe system. The leachate drainage blanket controls the depth of leachate that can form on top of the liner.
Soil stockpile	Soil, surplus to current needs, placed as an earth fill in a specific area of the site on a temporary basis and which will be used for later operation or construction purposes. In the case of a landfill a stockpile may be in use throughout the operating life of the landfill in episodes of soil placement and soil removal.
Waste	The material that is delivered to the site for disposal in the landfill. The material will comply with defined waste acceptance criteria.
Wastewater	Domestic type wastewater from staff and visitor toilets, washing facilities and kitchens that will be treated and disposed of on site.
Working face	The place where waste is being disposed daily.
Mule	Vehicle used to transport waste contained in detachable bins from the bin exchange area to the landfill working face.
Bin exchange area	Area where road vehicles hauling waste will exchange full bins for empty bins prior to leaving the site. Mules will collect full bins from the area and transport to the working face, returning empty bins to the area. Both full bins and empty bins may be present on the ground at any one time.

Renewable energy centre	LFG treatment plant site with flares, electricity generators, leachate treatment plant, and potential other gas utilisation technologies.
Access Road	Private road constructed from State Highway 1 through the Southern Block, bypassing the bin exchange area, to the landfill.
Farm entrance	Existing private driveway at 1232 SH1 leading to the Western Block, airfield and three neighbours.
Crowther Road	Existing access road into Mahurangi Forest from 770 SH1 up to Wilson Road.

1.0 Introduction

- 1.1 This report sets out an assessment of the potential landscape (including natural character) and visual amenity effects of the proposed landfill facility ('the project') which will be located in the WMNZ landholding ('the landholding') situated in the Wayby Valley. In March 2018 Boffa Miskell Ltd. ('BML') was engaged by Waste Management NZ Limited ('WMNZ') to undertake these services.
- 1.2 In undertaking this assessment, the author and peer reviewer have visited the landholding and its surrounds (which together are considered the 'receiving environment') to understand its existing condition and its physical and visual relationship to the surrounding environment, as well as the context, character and visual catchment and viewing audiences within the wider area.

2.0 Methodology

Overview

- 2.1 This assessment has been undertaken and peer reviewed by NZILA registered landscape architects with reference to the Quality Planning Landscape Guidance Note¹ and its signposts to examples of best practice, which include:
- Best Practice Note 10.1, Landscape Assessment and Sustainable Management, New Zealand Institute of Landscape Architects (2010).
 - Guidelines for Landscape and Visual Impact Assessment 3rd Edition, Landscape Institute (UK) and IEMA (2013).
 - Auckland Council Information Requirements for the assessment of Landscape and Visual Effects (September 2017).
- 2.2 Boffa Miskell has undertaken the following steps in preparing this assessment:
- Familiarisation of the project and receiving environment;
 - Desktop analysis of the receiving environment;
 - 3 site visits to conduct an on-site analysis of the receiving environment;
 - Preparation of visual simulations;
 - Assessment of landscape and visual effects.

Familiarisation of the Project and Receiving Environment

Desktop Analysis of the Receiving Environment

- 2.3 Prior to conducting the assessment, a desktop study was completed which included a review of the relevant information relating to the landscape and visual aspects of the project. This information included:
- A review of the statutory context of the landholding and surrounding area;

¹ <http://www.qualityplanning.org.nz/index.php/planning-tools/land/landscape/landscape-assessment>

- A review of existing landscape assessments undertaken within the receiving environment;
- Preparation and review of base map data (such as contours and aerial photography);
- Review of project drawings prepared by Tonkin & Taylor Limited and Stantec;
- Review of project visibility through the preparation of ZTVs.

Review of Statutory Context

2.4 The statutory context of the landholding and its environs was undertaken in preparation for this assessment. This included a review of RMA (Part 2) and the Auckland Unitary Plan ("AUP").

Review of Existing Landscape Assessments

2.5 A number of landscape assessments have been undertaken in the area, including the WMNZ landholding. These range from high level regional character assessments (dating back over 30 years), to assessments more focused on the identification and review of Outstanding Natural Landscapes ("ONL"). To assist in understanding the landholding and surrounding landscape character and values, a review of these has been undertaken, and a summary provided below in chronological order.

Auckland Regional Landscape Study (1984)

2.6 This study was undertaken by the Auckland Regional Authority, Planning Department, and was the first regional landscape character assessment to take place in Auckland. It has informed later landscape assessment work in the Auckland Region; including work delineating ONLs. This study assessed the landscape of the Auckland region and delineated 633 individual landscape units, defined by 85 landscape types. Members of the public, drawn from all sectors of the regional community were then invited to participate in the survey by comparing and rating the 85 landscape types. Each unit was rated and given a quality and sensitivity value from 1 (low) – 7 (high), and the final ratings were used to produce the distribution of values that appeared on the report's Landscape Quality Maps.

2.7 The same landscape units were assessed against 6 criteria as indicators to the visual sensitivity, i.e. descriptors of the general level to which new development would be more or less absorbed into an existing landscape. The criteria specifically included, land use diversity and type, slope, vegetation cover, vegetation diversity and type, topographical diversity, and site recoverability potential (the capacity of a site's physical elements to accommodate the growth of screening vegetation and surface restoration).

2.8 The WMNZ landholdings are located across 5 (of the 633) different landscape units, each with an individual quality and sensitivity rating. The majority of the landholding falls within a large unit covering much of the existing forestry land. The study considered that this area had a sensitivity rating of 2 and a quality rating of 3. The remaining areas of the landholding, towards the west, had higher ratings of 3 and 4 for sensitivity, and 4 and 5 for quality. These values were then combined in the assessment to produce 'composite values'. An extract of this is illustrated below, and the eastern portion of the landholding (where Valley 1 is proposed to be located), had a composite landscape value of 2, which the assessment considered to be of 'poor quality typically conducive to modification'. The western areas of the landholding (where stockpile 1 and the clay borrow bit is proposed to be located), however resulted in values of 4, considered 'average with variable suitability for modification' (4). A composite value of 5, considered 'above average quality restricted in suitability or development' (5) is located within the landholding, however this is in the north western portion, outside of the project footprint.

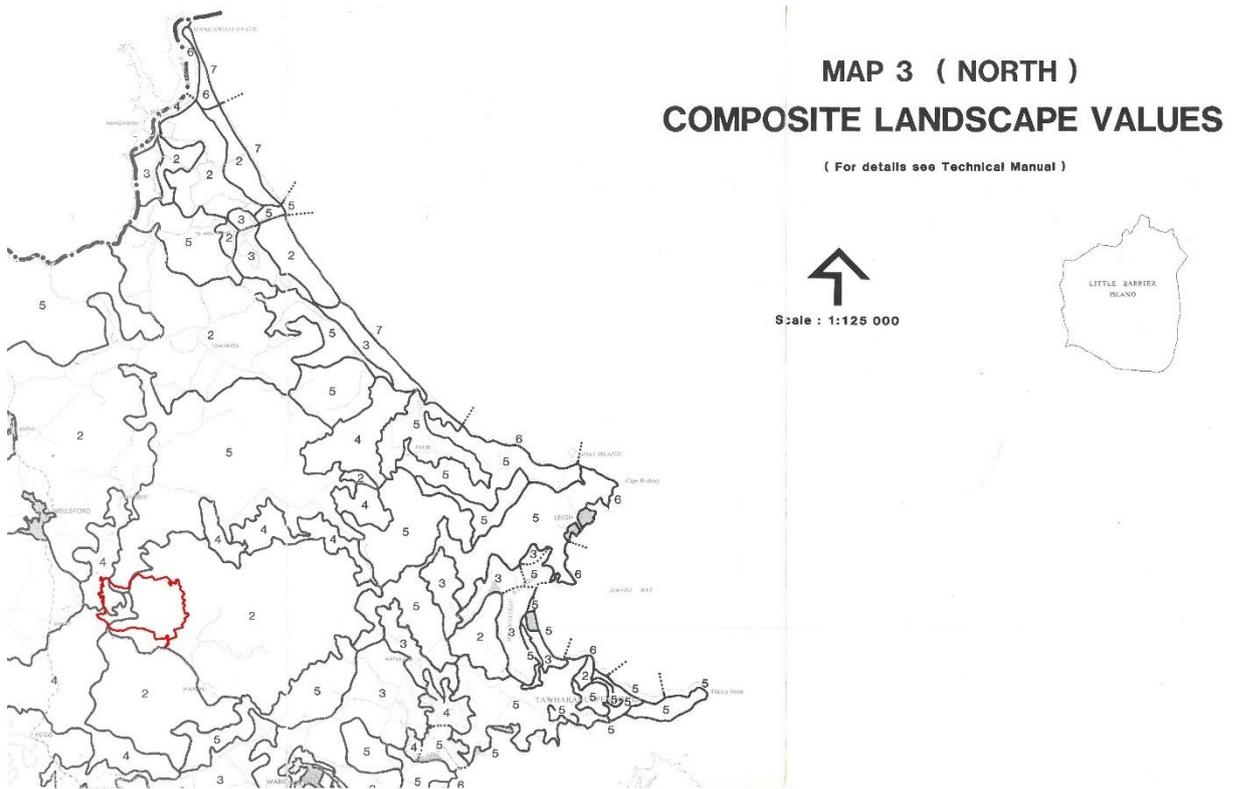


Plate 1: Extract from Landscape Study (Original image edited to illustrate landholding)

Auckland Regional Landscape Assessment (2003)

2.9 Boffa Miskell formed part of a wider team commissioned by Auckland Regional Council to update the 1984 assessment which focused on identifying ONLs via a process of public consultation. One ONL area was identified in the area adjacent to WMNZ's landholding, which was 'Area 32, Dome Forest'. The identified ONLs from this study are illustrated on the plate below, with the landholding boundary indicated.

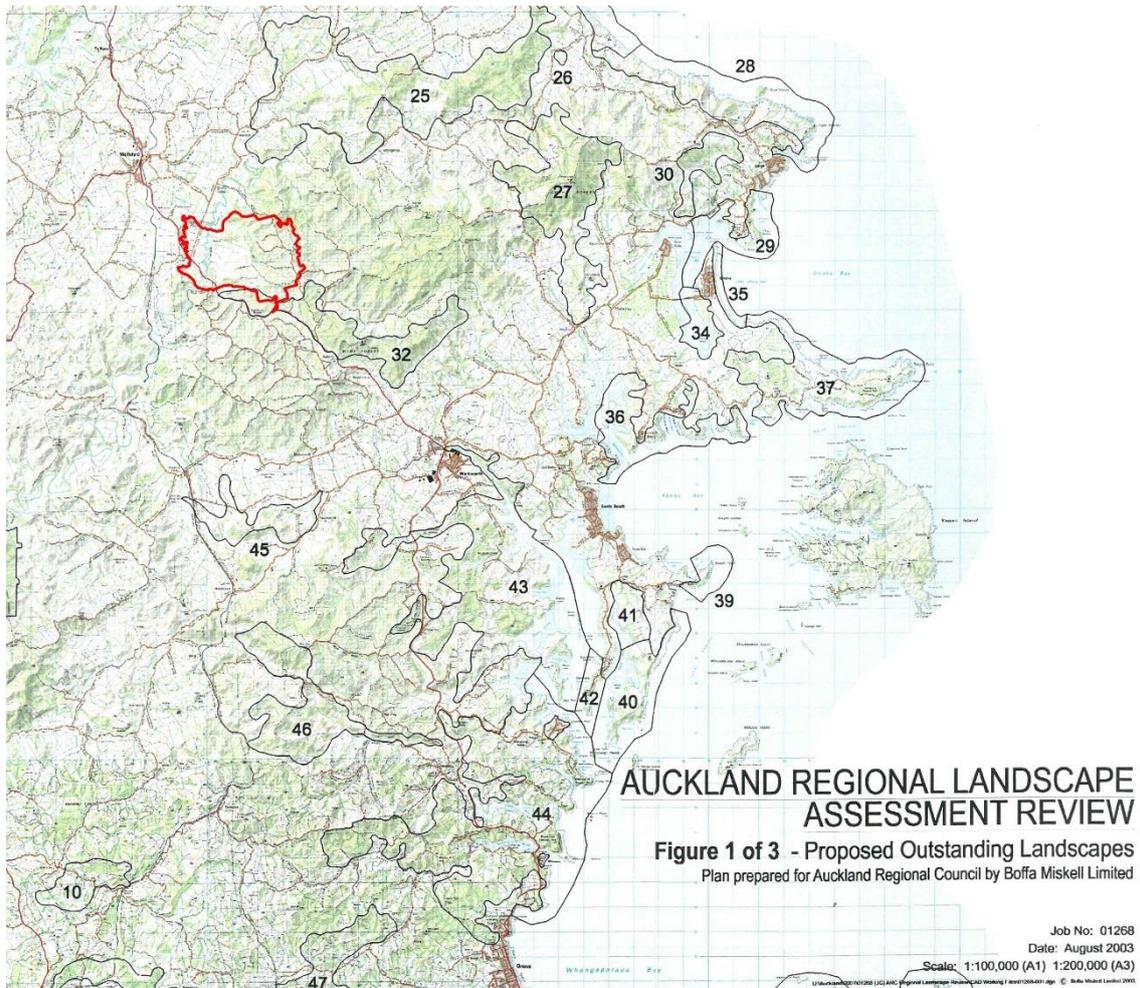


Plate 2: Extract from Auckland Regional Landscape Assessment with 'Area 32' illustrated (south east of landholding).

Landscape Review of Outstanding Natural Landscapes (2008)

2.10 This assessment, undertaken by Boffa Miskell and Stephen Brown Environments Ltd, assessed the ONL areas identified in 2003 against nationally accepted criteria (known as the WESI criteria). Area 32, outlined above, remained classified as outstanding after the 2008 review.

Natural Character Assessment – Auckland Region (2013)

2.11 In 2013, Brown NZ Ltd undertook an assessment of natural character in the Auckland Region on behalf of Auckland Council (to inform the Proposed Auckland Regional Plan – “PAUP”). The assessment identified areas within the coastal environment, wetlands, rivers and lake margins that display either high or outstanding levels of natural character. In total 200 areas were identified, 35 of which were Outstanding and 165 were High.

2.12 Although this study is not a statutory document, it does provide guidance on the extent of the coastal environment. The coastal environment line indicated in this study does not include WMNZ’s landholdings and no rivers or wetlands within the landholding were identified with any high or outstanding natural character values.

Summary of existing Landscape Assessments

In summary, the WMNZ landholdings are not within the coastal environment and much of it has been rated as ‘low quality’ and ‘low sensitivity’. An ONL has been identified adjacent to the southern portion of the landholding.

Preparation and Review of Base Map Data

- 2.13 Base map data of the landholding and its surrounds has been prepared and reviewed as part of this assessment. **Appendix 3** of this assessment provides a series of base maps. These have been created using a variety of recognised sources and assist in the understanding of the landholding and its context.

Review of Project drawings

- 2.14 Project drawings have been included as part of the AEE. Notable drawing sets that are most relevant to the landscape and visual aspects of the project are located in **Appendix C of the AEE** and should be referred to and reviewed alongside this assessment.

Preparation of a Zone of Theoretical Visibility Analysis

- 2.15 To determine the potential visual catchment and viewing audiences of the Project, a Zone of Theoretical Visibility Analysis (ZTV) was undertaken (**refer figures 9 to 13 in Appendix 3**). The ZTV analysis was generated by using a 3D landform model of the project², and incorporating proposed aboveground built elements (such as offices and workshops) into the analysis.
- 2.16 Once this base data was prepared, points were set across the project elements and landform and the analysis was undertaken using computer software. No existing above ground features such as buildings, or vegetation were part of the base model or the analysis. Accordingly, this base model did not include any existing vegetation within the WMNZ landholdings, and or any of the proposed vegetation to be incorporated to mitigate adverse effects.
- 2.17 It is important to note that although the project would result in a gradual change to parts of the landholding over the life of the landfill, and the visual extent of the project would also change over time, the analysis has been run when the visibility of the project would be at its greatest. This is when all built elements are present (such as the offices), all infrastructure has been built (such as the roads), and when all proposed landforms are at the largest volumes and heights proposed. This would be towards the end of the landfill's operating life of several decades.
- 2.18 Consequently, recognising that no on-ground features (e.g. vegetation), has been included in the ZTV, and the analysis has been run when all proposed buildings, roads and final landforms are present, this analysis represents a 'worst case scenario' in terms of theoretical visibility.
- 2.19 The resulting zone of visibility is shown across a colour band, with a green colour illustrating a small number of points (in the location of proposed elements and landforms), being visible, and red colour illustrating a large number of points being visible. These areas of visibility are seen together with distance bands which have been offset from the landholding boundary.

On-Site Analysis of the Receiving Environment

- 2.20 Following the desktop study, in order to further understand both the landholding, the surrounding context, and the extent of visibility, a site visit was undertaken. The site visit took place on 12 July 2018 and focused on gaining an understanding of the physical impact the project would have on the landscape within the WMNZ landholdings, and the confirmation of the potential viewing audiences. The site visit also included visiting key off site areas to the west (e.g. Wellsford), to select representative viewpoints. A second site visit took place on 27 August 2018 which involved visually surveying the landholding from a helicopter, in addition to visiting other ground locations.
- 2.21 During this time, viewpoint photographs were taken as representative views from the identified viewing audiences. A list of these viewpoints is detailed in **Section 7** of this

² Provided by Tonkin & Taylor

report. Photographs have been taken from publicly accessible land only, such as public roads and walkways, and illustrate the existing condition of the landholding and its surrounding context.

- 2.22 A third site visit was undertaken by the author on 7 March 2019. This included revisiting particular areas on the site as well as a number of key viewpoints. During this site visit, the Council consultant landscape architect was also present, so key issues of the project could be discussed.

Preparation of Visual Simulations

- 2.23 A series of visual simulations has been prepared to provide a greater understanding of the project and its extent of visibility within the visual catchment. A selection of viewpoint photographs was nominated and agreed with the Council consultant landscape architect, as they provide representative views from a variety of viewing audiences which are located at a range of viewing distances and locations. The visual simulations have been prepared in accordance with the NZILA Best Practice Guideline for Visual Simulations³ (located in **Appendix 2**), with a project specific methodology located alongside the visual simulations in **Appendix 4**. To provide an accurate understanding of the project, the visual simulations depict the project at a range of moments in time, throughout the operating life of the landfill. Two approaches for this have been undertaken in order to understand the visibility of the project.
- Three viewpoint photographs have been selected to illustrate the project at key points in time. These are as follows:
 - Site Establishment and Initial Construction Works;
 - Operation Scenario (Year 5);
 - Operation Scenario (Year 35).
 - Six viewpoint photographs (including the 3 viewpoints used above), have been selected to illustrate the project once the landfill has been completed (assume 5 years after landfill completion).
 - Lastly, one viewpoint has been selected to illustrate the project at 'Year 1' and 'Year 5' during operation. This viewpoint is located along State Highway 1 ('SH1') near to the proposed site entrance.
- 2.24 As mitigation planting, and indeed forestry planting will continue to grow (and be harvested), the visual simulations needed to capture a likely growth rate. Three broad planting types were then used throughout these phases of the project and include:
- Screen Planting; Fast growing evergreen trees such as pine and/or eucalyptus.
 - Native Planting: This would be a mix of native trees and shrubs suitable to the specific location.
 - Pine Forest: This would be the same tree species existing in the forestry blocks within the landholding.
- 2.25 The modelled heights of these three planting types are outlined in **Table 1** below.

³ http://www.nzila.co.nz/media/53263/vissim_bpg102_lowfinal.pdf

Table 1: Visual Simulation Planting Heights

Vegetation Type	Year	Modelled Height (m)
Mitigation Planting: Screen Planting	Year 1	5*
	Year 5	10**
	Year 35	20
	Completed landfill	20
Mitigation Planting: Native Vegetation	Year 1	1
	Year 5	5
	Year 35	10
	Completed landfill	10
Pine Forest	Year 1	2
	Year 5	7***
	Year 35	9
	Completed landfill	30 for new forest areas + existing forest shown in other areas.

* no screen planting on eastern portion of Valley 1 as this will still be in forest

** Note screen planting along eastern boundary and Stockpile 2 shown as 5m in height

*** Pine planting along eastern boundary and Stockpile 2 shown as 2m in height

Assessment of Effects

2.26 A full methodology of this assessment is located in **Appendix 1** of this report. In summary, the assessment of the significance of effects identified within this assessment is based upon a seven-point scale which includes very low; low; moderate-low; moderate; moderate-high; high; and very high ratings.

2.27 The effects covered in this assessment include:

- Visual effects relating to the changes that arise in the composition of available views as a result of changes to the landscape, and to the overall effects with respect to visual amenity.
- Physical landscape and landscape character effects derived from changes, which may give rise to changes in its character and how this is experienced.

2.28 Landscape and visual effects result from natural or induced change in the components, character or quality of a landscape. Usually these are the result of landform or vegetation modification or the introduction of new structures, activities or facilities into the landscape. The process of change itself, that is the construction process and/or activities associated with the project, also carries its own visual impacts, as distinct from those generated by a completed project.

2.29 The type of natural character, landscape and visual effects generated by any particular project can therefore be:

- positive (beneficial), contributing to the visual character and quality of the environment;
- negative (adverse), detracting from existing character and quality of environment; or

- neutral (benign), with essentially no effect on existing character or quality of environment.
- 2.30 The degree to which natural character, landscape and visual effects are generated by a project depends on a number of factors, these include:
- The degree to which the project contrasts, or is consistent, with the qualities of the surrounding landscape.
 - The proportion of the project that is visible, determined by the observer's position relative to the objects viewed.
 - The distance and foreground and background context within which the project is viewed.
 - The area or extent of visual catchment from which the project is visible.
 - The number of viewers, their location and situation (static or moving) in relation to the view.
 - The predictable and likely known future character of the locality.
 - The quality of the resultant landscape, its aesthetic values and contribution to the wider landscape character to the area.
- 2.31 Change in a landscape does not, of itself, necessarily constitute an adverse landscape or visual effect. Landscape is dynamic and is constantly changing over time in both subtle and more dramatic transformational ways. These changes are both natural and human induced. What is important in managing landscape change is that adverse effects are avoided or sufficiently mitigated to ameliorate the effects of the change in land use.
- 2.32 The main elements of the project that could give rise to landscape and visual effects are:
- The location, nature and extent of the proposed bin exchange area and access road in relation to the main viewing audiences and the way in which these elements would be seen within the local and wider landscape context;
 - The location and nature of ancillary structures, including workshops, energy centre, signage and lighting;
 - The location, nature and extent of the stockpile areas, landfill valley (Valley 1), and clay borrow pit, in addition to the staged timing of these and their degree of visibility;
 - Physical changes to watercourses, wetlands and landform;
 - The location and extent of existing vegetation (to be retained and removed) and proposed new vegetation.
- 2.33 To determine the level of landscape and visual effects, both the sensitivity of the landscape or viewing audience and magnitude of change resulting from a proposed development are considered. The sensitivities of the viewing audiences to visual change vary, however residential and recreational viewing audiences are generally considered to be more sensitive to change, while travelling and working viewing audiences are less sensitive.
- 2.34 For each of the effects, a level of effect rating has been given. This rating is based upon the assumption that all mitigation measures proposed in **Section 6** of this report have been fully adopted as part of the project.
- 2.35 The Project adjoins a number of private properties, and those that are likely to be affected have been assessed based on a survey from the nearest publicly accessible location and with reference to the desktop analysis methods as outlined earlier in this report.

3.0 Location, Context and Character

Refer Appendix 3, figures 1 to 8 for relevant plans, and figures 16 to 29 for site context photographs.

Location and Context

- 3.1 The landholding is situated within the Wayby Valley, approximately 6 kilometres south east from the Wellsford town centre. Warkworth is located approximately 13 kilometres by road south of the landholding, and Matakana approximately 10 kilometres to the east.

Wellsford and Environs

- 3.2 Wellsford, located to the north west of the landholding, is a small rural township which supports a community of approximately 1,698⁴ people. Wellsford is a major regional centre as it is located at the junction of SH1 and SH16. The town centre of Wellsford is focused along Rodney Street, being a portion of SH1. Commercial business including shops, cafes and service stations occupy much of the high street, with branching roads providing links to the supporting residential streets. Wellsford's main public open space is the Memorial Park which is adjacent to the public library. These services are positioned at the southern end of the town centre between Rodney Street and Port Albert Road. Further south is Centennial Park and the Wellsford Golf and Squash Club. To the north of the town centre is the Wellsford Convention Centre, positioned along Matheson Road. Beyond the centre of the township, land use becomes more focused on lifestyle dwellings and agricultural activities.

The Wayby Valley and Dome Forest

- 3.3 The majority of the landholding is located in the Wayby Valley and consists of a series of ridges (primarily occupied by forestry land uses), that descend in elevation and extend to the eastern side of the Hōteō River. To the south of SH1, the Wayby Valley is almost entirely occupied by forestry land uses. To the north, forestry land uses are more restricted to the upper slopes of the hill range, whereas minor ridges and lowlands are retained in pasture before meeting the vegetated margins of the Hōteō River.
- 3.4 The Mahurangi Forest, commonly referred to as 'Dome Forest', sits on of the northern side of State Highway 1 (SH1) which navigates through the area in a northwest / southeast orientation. This large hill range features as a backdrop to the townships of Wellsford and Warkworth. The forest is predominantly occupied by forestry land uses, however public reserves also occupy some areas, particularly east of SH1. These reserves are the Dome Forest Stewardship Area and Sunnybrook Scenic Reserve. The Dome Forest Stewardship Area is over 1.8km from the project footprint and the Sunnybrook Scenic Reserve is just outside of the project footprint. The Te Araroa Trail route is located approximately 2.8km from the project footprint, and traverses through the forest, following a number of ridges and peaks, providing users with panoramic views of the wider area, including the Dome Forest and Wellsford.
- 3.5 The Dome Forest contains a number of hills and valleys. The largest hill is Conical Peak (385m), however the Dome Summit (329m), is also a notable elevated feature. Both peaks are located outside of the project footprint by over 3.3km and 6.3km respectively. Various tributaries and streams occupy the Dome Forest, the main being the Waiwhiu Steam which originates from Conical Peak. The Waiwhiu Steam remains outside of the

⁴ http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-a-place.aspx?request_value=13172&parent_id=13171&tabname=&sc_device=pdf

project footprint and meanders its way through the hill range before reaching the Hōteō River.

- 3.6 A network of unpaved roads punctuates these areas which primarily service forest operations. Many of these roads are therefore private, with restricted access. Although much of the forest hillsides in the area are uninhabited, residential properties do exist along the fringes, mainly along Waiwhiu Road, to the east of SH2, and Govan Wilson Road, to the north, accessed off Matakana Valley Road.

Hōteō River

- 3.7 The Hōteō River is the Auckland Region's longest river and it flows southwest from its sources near the east coast before reaching the Kaipara Harbour. The river traverses through steep hill country including the western edge of the forest, in addition to pastoral lowlands, before reaching Mangakura and the Kaipara Harbour. The Hōteō River is located to the west of the landholding, and forms part of the boundary to the WMNZ landholding, although the closest reach of the Hōteō River is approximately 2km from the landfill footprint.

Landscape Character Context

- 3.8 The wider landscape context is largely made up of the hill range country of the Dome Forest and Wayby Valley. The hill range of these areas extend to the east and south of the landholding and comprise a mosaic of forestry land uses and indigenous vegetation. The wider forest then meets the pastoral lands of Matakana to the east, Whangaripo to the north, Warkworth and Kaipara Flats to the south and Hōteō to the west. The northern extend of the hill range meets the pastoral areas of Wayby Valley, and Wellsford beyond.
- 3.9 The area is sparsely occupied with residential dwellings, and because much of the landscape is managed through forestry, the absence of human occupation allows some sense of remoteness throughout the area.

Ongoing Forestry Management

- 3.10 As outlined earlier in this section, much of the area is part of an established plantation forest. The very nature of this land use means that the visual nature of this landscape is dynamic and is constantly changing. Forestry blocks are harvested approximately every 27 years, and during this time, machinery such as bulldozers, log harvesters and haul trucks are a notable activity. After harvesting, slash, (which is the scrap timber, branches, and off cuts), is left behind on the landscape. Approximately after 1 year of harvesting, the forestry blocks are replanted with young trees and maintained until the next scheduled harvest.
- 3.11 Forestry blocks therefore typically have different harvesting dates, and the result can be a patchwork of treed or harvested areas. It is considered that this cyclical nature of forestry practices is important to note as the landscape and its associated land use, which in large part defines the character of these areas, will change through these practices.

4.0 WMNZ Landholdings

- 4.1 The WMNZ landholding totals approximately 1020 ha and is irregular in shape, consisting of 33 land parcels. The Hōteō River forms the western boundary and the

Waiwhiu Stream forms the eastern boundary of the landholding. The northern and southern edges of the landholding loosely correspond with the ridges of the incised hill range.

- 4.2 For ease of description, the landholding has been delineated into four areas based on current land use and the activities proposed by WMNZ. These are shown on **figure 2**, in **Appendix 3** and described as follows:
- Eastern Block – includes Valley 1 (proposed landfill location), currently under pine forest.
 - Southern Block - located to the south of Springhill Estate, comprising native bush, wattle and pine forest plantation.
 - Western Block – formerly known as Springhill Estate, predominantly farmland.
 - Waiteraire Tributary Block – South east corner of the site, covering tributaries to streams within the Sunnybrook Reserve.
- 4.3 The delineation of the landholding is consistent with all of the other application material, including the AEE and ecology report.

Landscape Resources of the Landholding

Topography

- 4.4 The topography of the landholding can be described as follows:
- The topography of the Eastern Block continues to increase in elevation from the Western Block, with the folds of the topography becoming ridges, valleys and small gullies before descending in elevation to the east.
 - The Southern Block is predominantly defined by a valley which extends from SH1 into the landholding; and supports a small stream which is a tributary of the Hōteu River.
 - The topography of the Western Block rises at a gradual rate from the margins of the Hōteu River before increasing more steeply in elevation on the pasture covered hills.
 - The Waiteraire Tributary Block is predominantly a series south facing slopes and small ridges which extend to the edge of the landholding.
- 4.5 The landholding illustrates a variety of topographical characteristics such as gullies, ridges, valleys and flood plains. These are not rare topographical features and examples of these types of landforms are a common occurrence within the local area of Wayby Valley, and the wider area of the Dome Forest.
- 4.6 The landholding is part of a managed landscape and activities associated with these existing land uses do result in permanent change to the landform. This is evident in the Western Block where constructed drainage channels are present. Additionally, modification has occurred throughout the Eastern Block where over the years, forestry practices have in part, degraded the unmodified / natural topography through the construction of roads, skid sites and cyclical harvesting activities.
- 4.7 Notwithstanding this, the physical nature of the landform within the landholding remains clearly legible and relatively distinctive, which reads as low-lands leading to a series of folding valleys and ridges.

Vegetation

- 4.8 The ecology report defines the vegetation on the landholding into three broad categories. These are exotic forest, pasture and native habitats. Native habitats include

11 habitat types including 5 mature native forest habitats, 3 regenerating native forest habitats and 3 wetland habitats. A summary of the location of these vegetation types is provided in **Table 2** below.

Table 2: Vegetation Types in the Landholding (By Area)

EASTERN BLOCK	<ul style="list-style-type: none"> • Pine & wattle forest
SOUTHERN BLOCK	<ul style="list-style-type: none"> • Kānuka scrub/forest • Pine & wattle forest • Mānuka, tangle fern scrub/fernland
WESTERN BLOCK	<ul style="list-style-type: none"> • Pūriri forest • Kahikatea, pukatea forest • Taraire, tawa, podocarp forest • Kauri, podocarp, broadleaved forest • Farm forest fragments/treelands • Pine & wattle forest • Mānuka, tangle fern scrub/fernland • Flaxland • Raupō reedland • Pasture wetland
WAITERAIRE TRIBUTARY BLOCK	<ul style="list-style-type: none"> • Pūriri forest • Pine & wattle forest

4.9 Areas of pasture are focussed in the Western Block of the landholding. These areas of pasture are fenced and grazed and are part of an established working farm. Exotic forestry plantations occupy large portions of the landholding, and these areas are mostly located within the elevated hillsides towards the east within the Eastern Block and south, within the Southern Block. The Eastern Block is currently covered by exotic plantation forestry which is in its third harvest cycle and is between 13 -16 years old.

4.10 Although native vegetation is not considered to be an overall defining characteristic of the wider landholding, native vegetation does exist within a number of areas particularly to the north of Sunnybrook Scenic Reserve (within the Southern Block) along the margins of the Hōteu River and, in pockets within the low-lying areas and grazed slopes (within the Western Block). Areas of native vegetation considered to have the highest sensitivity are those within Significant Ecological Areas (“SEA’s”) or Natural Stream Management Area (‘NSMA’).

Streams and Wetlands

4.11 The landholding includes a number of streams which are all tributaries of the Hōteu River. A permanent stream which is part of the Valley 1 catchment is located in the Eastern Block, where the landfill is proposed to be situated. Native vegetation is present along some of these stream margins with the balance largely plantation pine.

- 4.12 The Western Block contains a variety of streams some of which are modified and others natural. Modified streams tend to occur in the flatter land, such as modified stream channels. Other streams within steeper portions are supported by some pockets of native and exotic vegetation. The Ecology Report notes that the Southern Block is the most intact of the stream catchments surveyed, and that vegetation within the area is regenerating native and exotic wattle. This stream is located in a NSMA and is particularly sensitive.
- 4.13 The wetlands of the landholding are located within the Western Block and occupy the foot of the hills as they meet the lowland areas. Some of these wetlands are degraded, however indigenous wetlands do exist. Two of these wetlands are identified in the AUP as Wetland Management Areas ('WMA's'), specifically as '159 and 164 Wayby Wetland' which are also identified as SEA's. The two WMA wetlands notably contain Raupo reedland.

Land use and buildings

- 4.14 The landholding broadly comprises of two rural land uses, which include farming in the Western Block, and forestry in the remaining areas. The landholding is absent of any buildings within the forestry areas, however unpaved forestry roads have been formed throughout, with access being attained from a private road off SH1. The Western Block supports the Springhill Aerodrome, with supporting workshops and hangars, in addition to a farm house and associated farm buildings. These are accessed from a private road which also services a number of dwellings outside of the landholding boundary.

Landscape Character of the Landholding

- 4.15 The character of the landholding comprises a mix of hillsides and valleys which are vegetated in native vegetation and forestry (both wattle and pine), and lowland pasture farmland. In general, the lowland pasture farmland occupies the Western Block and the vegetated hillsides and valleys occupy the remainder of the site areas.

5.0 Statutory Context

- 5.1 The applicant's landholding falls within the jurisdiction of Auckland Council. The landholding is zoned as 'Rural Production Zone' under the AUP, (**refer figure 6 in Appendix 3**).
- 5.2 The purpose of the Rural – Rural Production Zone is to provide for the use and development of land for rural production activities and rural industries and services, while maintaining rural character and amenity values.
- 5.3 The AUP also identifies Outstanding Natural Features (ONFs), and Outstanding Natural Landscapes (ONLs) to the south of the landholding. The location of these are shown on **figure 7 in Appendix 3** and described in **Appendix 5**.

6.0 The Project

- 6.1 A full description of the project is provided in the AEE, however in summary, the project comprises the construction of a 25.8 million cubic metre landfill to provide for the disposal of municipal solid waste for a period in excess of 35 years. The development

of a landfill is essentially a long-term construction project, with the working face of the landfill being intended to be open from 5am to 10pm. During the life of the project it is anticipated that earthworks and landfill operations machinery such as harvesters, trucks, diggers and bulldozers will be present within the project footprint.

6.2 The landfill will be developed in phases, with one phase being filled with waste while the next phase is being prepared.

6.3 The activities of the project fall into three general categories:

- Initial construction activities.
- Ongoing operational and phase development activities.
- Closure and aftercare activities.

Initial Construction Activities

6.4 Initial construction activities occur prior to the landfill accepting its first waste. Initial construction activities may be undertaken over a period of three or more construction seasons⁵ prior to the landfill accepting waste.

6.5 Initial construction activities will include:

- Construction of permanent site stormwater controls downstream of the landfill and any other stormwater controls required for initial earthworks (e.g. at stockpile areas).
- Establishment of the site entrance and any works on SH1.
- Construction of the bin exchange area.
- Construction of the main site access road through the Southern Block.
 - The length of the access road is just under 2 km.
 - The access will be a two-way road, with 3.6 m width lanes and with a sealed surface.
 - The road has been located along the more gently sloping southern side of the valley, avoiding the identified SEA at the western end and the identified NSMA through the base of the valley.
 - The road crosses the stream to rise to the ridge on the southern side of the valley to enter Valley 1 at approximately RL140m.
 - The road will be constructed primarily in cut.
- Site access roading to the first stage for landfilling and to all stockpile areas.
 - These will typically be gravel roads although WMNZ may consider sealing portions of road that will be used for extended periods.
 - Access for waste vehicles will be constructed as required over the landfill surface.
- Construction of the main site office area and workshop facilities.
- Above ground 11kV powerlines anticipated to be installed along the main access road.
- Formation of basegrades for Phase 1 of the landfill, construction of the toe bund, low permeability liner system and leachate collection system.
- Formation of Stockpile 1 and the Topsoil Stockpile.

⁵ Generally being defined as the period from October one year to May the following year.

Ongoing Operational and Phase Development Activities

- 6.6 During the operational period, construction activities will be undertaken as required to develop each landfill stage so that it is ready to accept waste when required. Wherever possible, soils required for operation of a stage will be taken from the footprint of the next or subsequent stages to minimise earthworks movements and the need for stockpiling of soils.
- 6.7 Ongoing operational and phase development activities include:
- Waste filling.
 - Placement of daily cover and intermediate cover as required. This may also include stockpiling soils close to where they may be required.
 - Formation of Stockpile 2 and the continued filling of Stockpile 1 and Topsoil Stockpile.
 - Stormwater management and maintenance works.
 - Construction of the next landfill phase (detailed under a separate heading below), and other required construction work.
 - Subsequent removal of stockpiles to achieve capping.
 - A landfill gas (“LFG”) management system will be installed progressively as the landfill is developed, including an energy centre where the LFG will be utilised to generate electricity or burnt off in a flare. Visible emissions from LFG flares are very rare (water vapour, light, steam or smoke). It is anticipated that only a shimmer (heat haze) may be visible within the WMNZ landholding.

Closure and Aftercare Activities

- 6.8 Closure activities include, placing the final capping layer on completion (where it is intended that the remainder of the material in the stockpiles will be used for this purpose), establishing any final landscaping and removing any facilities and infrastructure that is not required during the aftercare period, or modifying such infrastructure for the aftercare period.
- 6.9 Aftercare activities include maintenance of the cap and stormwater systems, management and maintenance of the leachate and landfill gas management systems and ongoing site and environmental monitoring (including vegetation maintenance where required).

Landfill Phasing

- 6.10 A conceptual phase plan has been prepared to show the expected phasing of the development of the landfill. This is shown in the project drawings accompanying the AEE⁶. The Landfill Design Report provides some supporting commentary on the landfill phasing and is outlined below:
- **Phase 1** constructed below the first bench, with filling progressing from the interim toe of the landfill heading up-valley in a west to east direction. A culvert would be constructed below the phase one liner to carry stream flow from the eastern end of the valley.
 - **Phase 2** constructed up to the next bench above Stage 1 but leaving the lower bench to the south to provide future drainage from the east of the valley. A pipe

⁶ Drawing ENG-20

would need to be installed on the first bench below the northern side of Phase 2 to carry stormwater from areas of this bench to the west when Phase 3 is constructed.

- **Phase 3** located to the east of Stage 1 to complete filling on the floor of the landfill below the first bench. Access to the eastern portion of Phase 3 is only available after 2031.
 - **Phase 4** will fill up to the second bench above Phase 3 along the northern side of the landfill, connecting to the eastern edge of Phase 2. The southern portion of Phase 4 would be completed to the perimeter road level.
 - **Phase 5** will fill complete filling at the eastern end of the landfill, above Phase 4 to final cap levels.
 - **Phase 6** will fill above Phase 1 and 2 to fill to final cap levels in this area.
 - **Phase 7** will complete filling from the toe of the landfill over the face of Phases 1, 2 and 6 to complete filling the landfill. Any infrastructure on the footprint of Phase 7 would be relocated as part of the construction.
- 6.11 The final capping system will be constructed progressively after filling in any area has been brought up to final level. It is intended that the landfill cap will be established with grass and/or shallow rooting vegetation.

Recommended Avoidance and Mitigation Measures

- 6.12 In considering the nature of the project and the anticipated change to the receiving environment, there are a number of measures which will help to mitigate the landscape and visual effects associated with the project, both during operation and post closure when the landfill is complete. These measures are currently proposed as part of the project and have been considered in this assessment of landscape and visual effects.
- Avoidance of native vegetation clearance within SEA areas and Wetland Management Areas as far as practicable.
 - Avoidance of effects and encroachment into NSMA, which are limited to an area of approximately 80m² at the eastern extent of the overlay, along the proposed main access road.
 - Avoidance of project footprint on the identified ONL.
 - Re-establishment of Poplar trees along SH1 adjacent to the Bin Exchange Area
 - Native revegetation planting along the cut and fill slopes particularly along the main access road.
 - Where practicable, fill stockpiles from the proposed final toe of the stockpile, with the front face formed and shaped as filling progresses. As soon as sufficient area is available, remote from current filling works, the surface of the front face will be vegetated. This will comprise covering with a layer of topsoil or other suitable growth layer and sowing grass seed, or hydroseeding the face.
 - On completion of filling at the end of each summer earthmoving season, all bare earth surfaces of the construction-related earth fills will be stabilised with grass, erosion mats or tarps.
 - Establishment of native and exotic (pine) planting on the sides of the valley in which the landfill is to be located, above the landfill footprint.
 - Establishment of grass and/or native planting on the landfill's final cap, noting that the extent and type of planting will need to be determined by engineering considerations. One consideration is ensuring that plants that are established on

the landfill would need to be shallow rooting species, so they do not pierce the landfill cap. As a minimum the entire cap would be planted with grass (i.e. it will not be left as bare earth).

- Screen planting on ridges around the perimeter of Valley 1 and around Stockpile 2. The nature of this planting would be fast growing evergreen trees such as pine or eucalyptus, to assist in screening works and the project.
 - Provision for adding recreation value through the establishment of a walking track along the Waiwhiu stream.
 - Sensitive design of buildings, particularly the proposed office near Valley 1, and office near the landholding entrance. This would include neutral colours which relate to the vegetative setting.
 - Signage for the entrance of the landholding should be as discrete as practicable (adhering to NZTA sign requirements), and not visually dominate the entrance. It is recommended that any signage should be well set back (i.e. at least 10 m) from SH1.
 - Lighting throughout the project will be minimised as far as practicable so it meets the permitted standards of the zone. Placement and direction of lights should avoid high points which are visible outside of the landholding. Light shields should be used where necessary, and all lightings shall be down facing to minimise effects on the night sky.
- 6.13 Ecological mitigation planting is also proposed and can assist in the mitigation of landscape effects. The Ecology Report prepared by Tonkin + Taylor and included in the AEE, covers the proposed mitigation planting in more detail. In summary:
- Freshwater mitigation planting will predominantly entail the planting of stream margins with a selected mix of riparian species, consistent with other species on the site and/or within the ecological district.
 - Terrestrial mitigation planting will include planted buffers in the northern portion of the Western Block of the landholding.
 - Wetland mitigation planting will include a combination of either 3m or 10m planted buffers around the retained wetlands within the landholding.
- 6.14 **Figure 14 and 15 of Appendix 3** illustrates the proposed landscape and visual mitigation plan. The mitigation plan also illustrates anticipated ecological mitigation planting. To ensure the certainty of these measures, it is recommended that a condition of consent requiring a landscape mitigation and management plan is included.

7.0 Visual Catchment and Viewing Audiences

- 7.1 An examination of the topographical characteristics, ZTV analysis and the result of site visits has enabled an understanding of the visual catchment of the project, (**refer figures 9 to 13 in Appendix 3**). Due to the topography of the landholding and surrounding context, much of the visual catchment includes areas to the north west and west of the landholding, with isolated high points attaining visibility of the project from the north east, south west and south east. These include the areas of Wayby Valley, Wellsford and Waiwhiu. Further analysis on the visibility of the project footprint from these locations are provided in **Section 8** of this report.
- 7.2 A number of roads are located within the vicinity of the landholding. Many of these roads only service a limited number of residential properties, and several are cul de

sacs. In particular, these include Waiwhiu Road, Conical Peak Road, Spindler Road and Wilson Road. None of these roads, nor most of the residential properties accessed from them, obtain views of the project. Additionally, from Govan Wilson Road, to the north east there will not be views of the project and this was confirmed by desktop and field analysis which included capturing a viewpoint photo (**refer Figure 24, Appendix**).

7.3 The main public and private viewing audiences located within the visual catchment which attain views of the landholding are described in the following subsections. Public viewing audiences are primarily located on roads, the Te Araroa Trail and parks close to the Wellsford Township. Private viewing audiences include residents and workers (e.g. Wellsford shops along the high street).

- **Wellsford Township and Environs:** Road users, residents, workers and visitors to the town centre (including Memorial Park), and the vicinity of the township.
- **Wayby Station Road and Environs:** Road users and residents of the surrounding working landscape including those along Pricor Road and Port Albert Road.
- **Wayby Valley Road and Environs:** Road users and residents of the surrounding working landscape including those along Wayby Valley Road, Robertson Road and Rustybrook Road.
- **Views on or nearby SH1 including nearby residents:** Road users and residents located along SH1.
- **Residents Adjacent to Springhill Farm:** Three residential properties located off a private road that services the Springhill Farm.
- **Dome Forest:** Residents of Waiwhiu and Te Araroa Trail walkers.

7.4 With reference to the identified viewing audiences and as outlined in para. 2.23 of this report, viewpoint photographs were nominated and agreed with the Council consultant landscape architect, as they provide representative views from a variety of viewing audiences which are located at a range of viewing distances and locations. The assessment viewpoints are described in **Table 3** below and can be located in **Figure 16**, within **Appendix 3**.

Table 3: Assessment Viewpoints

VP No.	Location	Distance from landholding (approx.)	Direction of View	Reason for selection	Project Stages Visual Sim	Final Landform Visual Sim
1	Wellsford Convention centre	3,700m	South east	Representative of residents along Matheson Road and visitors to the convention centre	Yes	Yes
2	Wellsford Petrol Station	3,600m	South east	Representative of visitors to Wellsford high street	No	No
3	Wellsford Memorial Park	3,400m	South east	Representative of recreational viewing audiences within public open space	No	No
4	State Highway 16	4,300m	South east	Representatives of residents and road users along State Highway 16	No	Yes
5	Davies Road	3,250m	South east	Representatives of residents in Wellsford, particularly along Davies Road	No	Yes
6	Prictor Road	3,000m	South east	Representatives of residents and road users along Prictor Road	No	No
7	North Hōteo Cemetery	5,100m	East	Representative of visitors to North Hōteo Cemetery	No	No
8	Wayby Station Road	4,750m	East	Representatives of residents and road users along Wayby Station Road	No	Yes
9	Wayby Station Road	3,600m	East	Representatives of residents and road users along Wayby Station Road	No	No
10	State Highway 1	840m	East	Representatives of residents and road users along State Highway 1	Yes	Yes
11	Wayby Valley Road	470m	East	Representatives of residents and road users along Wayby Valley Road	Yes	Yes
12	State Highway 1	10m	East	Representatives of residents and road users along State Highway 1	No	No
13	Kraack Road	5,100m	North	Representatives of residents and road users within Waiwhui, particularly Kraack Road	No	No
14	Dome Summit	2,800m	North east	Representative of views attainable from Dome Summit and along the Te Araroa Trail	Yes	Yes
15	Govan Wilson Road	5,700m	West	Representatives of residents and road users along Govan Wilson Road	No	No

8.0 Assessment of Landscape Effects

8.1 To understand the effects on the values of the landscape resource and character throughout the life of the project, the project has been considered in three stages as follows:

- Site Establishment and Initial Construction Works
 - This is the works required to be undertaken before the landfill is ready to receive waste.

- Ongoing Operation
 - This is when the landfill is full operation and includes a number of project phases as outlined earlier in the report.
 - Post Closure
 - This is when the landfill has been completed.
- 8.2 A description of the works within these stages are detailed in the project description earlier in this report.

Site Establishment and Initial Construction Works

Eastern Block (Site Establishment)

Landscape Resources

Topography

- 8.3 During site establishment, the areas of change to the topography within the Eastern Block are portions of the earthworks required for the main access road, site access roads and the formation of base grades for Phase 1 of the landfill.
- 8.4 This change will occur within areas which over time have been altered by ongoing forestry practices. The key characteristics of the landform within this area (i.e. the legibility of the ridges and slopes), will remain, and the scale of this change will be restricted to the south western portion of the area only. This means that the remaining topographical nature of the Eastern Block will remain unchanged. Taking the above into account, it is considered that this will result in **low** adverse effects.

Vegetation

- 8.5 Most of the effects on vegetation during the establishment of the site will result from the removal of the existing pine forest within Valley 1. This harvesting practice is permitted and anticipated to take place approximately every 27 years. However, as the first phases of the operation of the project will occur away from the eastern portion of Valley 1, existing pine plantations within the eastern area are expected to remain and be removed at a later date. Understorey native shrub vegetation along the margins of the main stream within Valley 1 will also be removed for the formation of the landfill. This area is not part of a SEA and has been largely established following the previous harvesting of the pine forest. Notwithstanding this removal, new native vegetation will be established within Valley 1 around the perimeter of the landfill.
- 8.6 With the above in mind, it is acknowledged that the removal of native vegetation will be permanent. However, a substantial area of native planting is proposed to be established in the western portion of valley 1 (outside of the landfill footprint), occupying the areas outside of the footprint of the project elements such as the site access roads, ponds and built structures. Exotic screening planting around the southern and western perimeter of Valley 1 will also be established. With the above in mind, taking into account the large area of proposed native planting, the adverse effects on the vegetation of the Eastern Block would be **low**.

Streams and Wetlands

- 8.7 There are no wetlands in the Eastern Block, although streams have been identified. Whilst the streams within the area of change within Valley 1 are not modified (e.g. do not contain man-made channels or diversions), they have not been identified as part of a SEA or NSMA. Historically, the streams undergo routine disturbance as part of the permitted forestry land uses in this site area, particularly during harvesting.

- 8.8 The Waiwhiu stream, located along the eastern boundary of the landholding, will not be adversely impacted during the site establishment and initial construction works. Instead, buffer planting is proposed to be introduced along its margins where the section of the stream adjoins the landholding resulting in **low** beneficial effects. Other streams within the Eastern Block that are outside of Valley 1 will not be impacted.
- 8.9 Considering the above, it is recognised that while many streams will not be impacted, the streams within Valley 1 will be permanently reclaimed. These streams have however been subject to a level of human induced disturbance through forestry for decades and are not considered as part of a SEA or NSMA. It is therefore considered that the reclamation of streams within Valley 1 would have **moderate** adverse landscape effects.

Landscape Character

- 8.10 Change to the character of the Eastern Block will be limited to the initial earthworks required in Valley 1 as well as construction of the main access road (partial section), and associated forest harvesting within this area. It is recognised that the majority of the Eastern Block will remain unchanged and continue to operate as a working forestry area, and that earthworks resulting in presence of exposed soil (as indicated in *Plate 3* below), would remain broadly in line with the character of the Eastern Block. It is therefore considered the adverse effects to the landscape character would be **very low**.



Plate 3: Example of exposed soil from recent forestry harvesting (source: Farm Forestry New Zealand, www.nzffa.org.nz)

Southern Block (Site Establishment)

Landscape Resources

Topography

- 8.11 The change to the landform within the Southern Block will result from the construction of a roundabout/entry from SH1, construction of a bridge, the construction of the bin exchange area, and part of the main access road. The SH1 works will require earthworks along both margins of the existing road, including batters along the eastern portion, a stream crossing via a bridge, and a cut into the headland landform which meets the western side of the road (this headland is partially intact although an existing cut occupies the lower portions of the slopes).

- 8.12 Landform modification for the bin exchange area will involve cut on a slope which adjoins the eastern side of this project element, in addition to earthworks to increase the level of the area above the RL32m flood level.
- 8.13 Amongst other reasons described in the Engineering Design Report, to accommodate a grade that vehicles can negotiate, the main access road has been located on the more gently sloping southern side of the valley. The road will be constructed primarily in cut⁷. Slopes will be cut as 1H:2V in rock and no steeper than 1V:2H in residual soils, which will result in some cut slopes being over 30m in height. Other site access roads servicing the first stage for landfilling in addition to stockpile areas will also be constructed although the required earthworks are not anticipated to require a comparable volume of earthworks, and these will mainly occur in forestry areas.
- 8.14 Taking the above into account it is considered that change to the topography associated with SH1, the bridge and the bin exchange area will result in **low** adverse effects. Adverse effects to the landform associated with the main access road are however considered to be **moderate**.

Vegetation

- 8.15 Vegetation within the project footprint will be removed in order to construct key project elements required for the site establishment and initial construction works within the Southern Block. SEA's, which are recognised for their ecological value and scheduled in the AUP will be avoided and protected during these works. Most of the areas of vegetation that will be felled are wattle or pine forest. Notwithstanding this, some native trees will need to be removed. These native trees, although not the overall dominating species in this area, being wattle and pine, include species such as totara, kawaka, rewarewa and areas of kanuka/manuka.
- 8.16 The initial removal of these trees will result in adverse effects, and while considered an unavoidable outcome of the creation of the project elements, native revegetation planting is proposed to be established as soon as practicable on the cut and fill areas. Furthermore, areas of grass adjacent to SH1 will also be vegetated in a native mix which will include the same, or similar species.
- 8.17 With the above in mind, it is recognised native vegetation within the SEA's, will be retained. Areas of native vegetation to be felled are limited to parts of the project footprint along portions of the main access road and around the proposed bridge and the adverse effects of this would be mitigated by the planting of cut and fill batters. Evaluating the above, it is considered that the effects would be **low** adverse on the vegetation of the Southern Block. However, it is considered that **low** beneficial effects would also arise due to the introduction of native vegetation within the pasture areas along SH1.

Streams and Wetlands

- 8.18 The Southern Block stream catchment will be impacted by the main access road, notably at the eastern end of the catchment. The area that will be impacted is limited and will be partially mitigated through freshwater offset mitigation in the Western Block. The main stream within this catchment is particularly sensitive due to the presence of the NSMA. Works would affect two small areas, one near the top of the catchment, and another where an existing farm bridge is present. The remainder of the stream would be left intact. Overall it is considered that the adverse effects to the streams in this area will be **moderate-low** adverse.

Landscape Character

- 8.19 Change to the Southern Block would not be in line with the existing landscape character of this portion of the landholding. To form the roundabout/entry the bin exchange area and main access road earthworks will modify the landform. However as these works will

⁷ Estimated cut: 750,000 m³, estimated fill: 152,000 m³

be restricted to the project footprint, the legibility of the valley character within this area will remain.

- 8.20 The cover of existing vegetation would be reduced, yet mitigation measures would include the introduction of native species. The character of the open areas of pasture associated with the bin exchange area will be affected at a localised level, however native vegetation in this area will connect with existing riparian planting along the stream margins.
- 8.21 Considering the above and acknowledging that the most sensitive areas (i.e. SEA and NSMA) will almost entirely be preserved, and native planting will be incorporated throughout, the adverse effects to the landscape character in the southern block during site establishment will be **moderate** adverse.

Western Block (Site Establishment)

Landscape Resources

Topography

- 8.22 During the establishment of the site, Stockpile 1, the Topsoil Stockpile and site access roading to Stockpile 1 and the clay borrow pit will be created.
- 8.23 Stockpile 1 would occupy a valley which opens towards the lowland areas in the western portion of the landholding. The Topsoil Stockpile would be located to the west of the proposed main access road. These project elements would be progressively created and be formed to meet the adjacent contours.
- 8.24 This change will occur within areas which over time have been partially altered by ongoing forestry and farming practices. The legibility of the ridges and sloping landform will be retained, and the scale of this change will be concentrated to the eastern portion of the Western Block and therefore the series of other valleys, slopes and low-lying areas will remain unchanged. Taking the above into account, the legibility of the wider area of the Western Block will remain, and it is considered that this change will result in **low** adverse effects.

Vegetation

- 8.25 Stockpiles, the clay borrow pit and access roads to these elements will require the removal of vegetation within the site area.
- 8.26 Pasture will be removed where Stockpile 1 and the Clay Borrow Pit will be formed, however, both will be hydroseeded as soon as practicable to ensure grass is re-established. Some trees in the location of Stockpile 1 and the Topsoil Stockpile will be removed and these include mature natives. Nevertheless, planting of native vegetation within available areas on Springhill Farm along the northern boundary and along the Hōteo River is proposed to assist in mitigating these adverse effects.
- 8.27 Considering the above, it is evaluated that **low** adverse effects will be generated by the removal of vegetation and pasture areas. However, mitigation planting consisting of hydroseeding Stockpile 1, and the provision for planting native trees across the site area will result in **low** beneficial effects.

Streams and Wetlands

- 8.28 A wetland in the location of Stockpile 1 will be impacted during site establishment and initial construction works. This wetland is considered to be degraded in its condition, and therefore has lower landscape value than the other wetlands further downstream which have been identified as SEA's. These higher value wetlands will however be protected. Furthermore, a 10m terrestrial buffer is proposed around the two SEA wetlands to contribute to terrestrial vegetation enhancement. It is therefore considered **low** adverse effects will be generated by these aspects of the project. Over time it is

considered that **low** beneficial effects would be generated as a result of the enhancement planting of the protected wetlands within this site area.

Landscape Character

- 8.29 Change to the character of this site area will result from the presence of Stockpile 1, the clay borrow pit, the topsoil stockpile and the site roads. Whilst the stockpile will change the character at a local level, this will alter gradually from the lower level areas of the valley first. Completing a 'leading edge' landform on the stockpile as early as possible, will assist in mitigating the adverse effects. This leading edge will be orientated towards the west. Furthermore, hydroseeding throughout the work on the stockpile will assist this element in integrating with the characteristics of the site area. Site roads would also be constructed within this area; however, these new elements are not considered to substantially alter the character of this farmland landscape to any great extent.
- 8.30 Taking the above into account, it is considered that the character effects on this site area would be **low** adverse.

Waiteraire Tributary Block (Site Establishment)

- 8.31 There will be no change within this site area during this period and it is therefore considered that there would be no adverse effects.

Ongoing Operation (year 1 operation to year 35 operation)

Eastern Block (Year 1 to 35)

Landscape Resources

Topography

- 8.32 As the project continues to develop, fill within Valley 1 will alter the landform. However, this change will be relatively gradual and take place over a number of decades. The elevation of the refuse landform will remain below the most prominent ridge of the landholding ('Wilson Road Ridge', refer **figure 2, Appendix 3**). Furthermore, the contouring of Valley 1 will avoid abrupt transitions in slopes, and rising topography will be naturalised in its representation as far as practicable.
- 8.33 It is therefore considered that the adverse level of effects on this landscape resource will be **moderate-low**.

Vegetation

- 8.34 After the initial removal of vegetation, pine forestry will continue to be harvested as part of the forestry operations and will occur in different stages and forestry blocks across the site area. Existing pine forest in the eastern portion of Valley 1, (that is anticipated to remain during site establishment), is expected to be felled as part of forestry operations, and the upper portions of these eastern slopes within Valley 1 will be established with forestry.
- 8.35 Existing native vegetation planted in the western portion of Valley 1 during site establishment will continue to establish, and new native planting will be established along the southern slope of Valley 1. Screen planting will also be planted along the 'Wilson Road Ridgeline' to form a permanent vegetated backdrop to the landfill.
- 8.36 As the landfill footprint progresses, a 20m band of grass will be established around the perimeter of the landfill as a fire break. This grass area will also be integrated with the engineered cut slopes around the landfill footprint. Furthermore, as the landfill is capped, grass and/or shallow rooting native plants will be established on the landfill.

- 8.37 With the above in mind, and discounting the permitted harvesting activities, it is considered that there would be **low beneficial** effects on the vegetation due to the reestablishment of native species in place of areas currently occupied by pine.

Streams and Wetlands

- 8.38 No other wetlands or streams will be impacted during the ongoing operation of the project within the site area and therefore there will be no additional effects to this landscape resource. The anticipated effects will remain as **moderate** adverse.

Landscape Character

- 8.39 Further change to the character of the Eastern Block will be due to the expansion of the landfill within Valley 1, in addition to the maturing of native vegetation and screen planting implemented during site establishment. Forestry harvesting cycles will continue to operate outside of the project footprint and across most of the WMNZ landholding. It is considered that as the project evolves, the presence of these activities will continue to maintain the overall open space character of the landscape. It is therefore considered that the adverse effects to the landscape character would be **moderate-low**.

Southern Block (Year 1 to 35)

Landscape Resources

- 8.40 During the ongoing operation of the landfill, the landscape resources of the site area will remain the same as the site establishment, although it is acknowledged that native vegetation will have become progressively more established. It is therefore considered that there will be no additional adverse effects to the landscape resources. It is however considered that there would be **low** beneficial effects to the vegetation within the site area as the vegetation becomes more established.

Landscape Character

- 8.41 Change to the character of the southern block would not have altered substantially since the site establishment and initial construction works as new elements have not been incorporated. During the operation of the landfill, revegetation within this area will have matured over time, thereby enhancing the wider vegetated valley character of the area. Considering the above, the adverse effects to the landscape character will reduce to **low** adverse.

Western Block (Year 1 to 35)

Landscape Resources

Topography

- 8.42 During the ongoing operation of the landfill, the clay borrow pit will have been established and become progressively larger throughout the operation of the landfill. This project element is however located within a low-lying pasture area and avoids any topographical characteristics such as ridges, slopes or valleys. During the final stages of the landfill, material from Stockpile 1 and the Topsoil Stockpile will be gradually removed and used for final capping, and these areas of landform will be returned to similar topographical characteristics as they are at present. It is therefore considered that the adverse effects would remain as **low** for the topography of the Western Block. Once the material from the stockpiles is removed, it is considered that the adverse effects on the topography would reduce to **very low** adverse.

Vegetation

- 8.43 Apart from pasture in the location of the clay borrow pit, no other areas of vegetation will be impacted during the ongoing operation of the project within the site area. During the

final stages of the landfill, pasture will be established where Stockpile 1 and the clay borrow pit were located. Furthermore, native vegetation will be established in the location of the Topsoil Stockpile after the material is removed. It is considered that the level of adverse effects will remain the same for this landscape resource. It is however considered that there would be **low** beneficial effects to the vegetation within the site area as the vegetation becomes more established.

Streams and Wetlands

- 8.44 No other wetlands or streams will be impacted during the ongoing operation of the project within the site area and therefore there will be no additional effects to this landscape resource. It is however recognised that as the project progresses, terrestrial buffer planting around these elements will continue to establish and positively contribute to the landscape value of these areas.

Landscape Character

- 8.45 During the operation of the project, portions of farmland will have become established in areas of forestry reinforcing the character of the wider landholding. Although, the new forestry areas will remain consistent with the mosaic of land uses within the area. Areas where Stockpile 1 and the clay borrow pit will also be returned to pasture as they are at present. Taking the above into account, the adverse effects on landscape character of this block would continue to be **low** adverse.

Waiteraire Tributary Block (Year 1 to 35)

Landscape Resources

Topography

- 8.46 During the operation of the project, Stockpile 2 would be formed and result in the modification of a portion of the landform. The stockpile would occupy a portion of a valley and be progressively created and formed to meet the adjacent contours. During the final stages of the landfill, Stockpile 2 will be gradually removed and used for final capping and return this area of landform to a similar topographical characteristic as it is at present.
- 8.47 This change will occur within an area which overtime has been modified by ongoing forestry practices. The scale of this change will be concentrated in the eastern portion, therefore and the other valleys and associated ridges will remain unchanged. Considering the above, the legibility of the wider area of the Waiteraire Tributary Block will remain. Taking the above into account, it is considered this will result in **low** adverse effects.

Vegetation

- 8.48 The effects on vegetation in this phase will be the removal of the existing pine forest. This harvesting practice is however permitted and anticipated. Screen planting will be established around the perimeter of Stockpile 2, and the stockpile itself, will be grassed for much of the project's duration. Once material has been gradually removed from Stockpile 2, forestry planting will be re-established in the footprint of this project element. With the above in mind, discounting the effects from the permitted harvesting activities, it is considered that the level of effect would be **very low** adverse.

Streams and Wetlands

- 8.49 Effects on the streams within this site area would be limited to the small stream which is located in the footprint of Stockpile 2. The other streams within this area would be retained and unaffected by the project. It is considered that the adverse effects associated with the reclamation of this upper portion of the stream would be **low**.

Landscape Character

- 8.50 There will be limited change within this area, being restricted to the presence of Stockpile 2 during the operation of the landfill. Whilst this will be a change to the area, this is relatively small in scale and located in a similar position to corresponding clearings associated with the forestry operation. Additionally, material will eventually be removed from Stockpile 2 until this feature is removed entirely. Vegetation established in this location will return this area to the same character of a working forestry landscape. On balance and given that the remaining area will be unaffected, it is considered that **very low** adverse landscape character effects would be generated.

Post Closure

Eastern Block (post closure)

Landscape Resources

- 8.51 Post closure there will be no additional change or adverse effects to the landscape resources.

Landscape Character

- 8.52 There will be no material change or adverse effects to the landscape character of the site area after the closure of the landfill. The only notable change will be the presence of grass or native vegetation on the final cap of the landfill in Valley 1 and the fully established native vegetation and screen planting. Although this is not representative of the character of the forestry areas within the landholding, it is considered that the presence of this landscape and its treatment will broadly reflect the wider WMNZ landholdings in the Western Block and contribute to the mosaic of farmland land uses in this area.

Southern Block (post closure)

- 8.53 Post closure there will be no additional change or adverse effects to the resources or character of the landscape in the Southern Block, other than those considered in the operation of the project.

Western Block (post closure)

- 8.54 Post closure there will be no additional change or adverse effects to the landscape resources or character over and above those outlined in the operation of the project. The only notable change will be the presence of grass where Stockpile 1 and the clay borrow pit were located. It is considered that the presence of this landscape treatment will broadly reflect the wider area.

Waitemata Tributary Block (post closure)

Landscape Resources

- 8.55 Post closure there will be no additional change or adverse effects to the landscape resources or character in this area.

Summary of Landscape Effects

8.1 A summary of the anticipated level of landscape effects is provided in the table below.

Table 4: Summary of Landscape Effects

Landscape (Resource / Character / Value)	Level of Effects (Adverse, unless stated otherwise)		Post Closure
	Site Establishment	Ongoing Operation	
LANDSCAPE RESOURCE			
TOPOGRAPHY			
Eastern Block	Low	Moderate-Low	Moderate-Low
Southern Block – Main Access Road	Moderate	Moderate	Moderate
Southern Block – SH1 & Bin exchange Area	Low	Low	Low
Western Block	Low	Very Low	Very Low
Waitemata Tributary Block	No Effects	Low	Low
VEGETATION			
Eastern Block	Low	Low*	Low*
Southern Block	Low	Low	Low
Western Block	Low	Low	Low
Waitemata Tributary Block	No Effects	Very Low	Very Low
STREAMS AND WETLANDS			
Eastern Block	Moderate	Moderate	Moderate
Southern Block	Moderate-Low	Moderate-Low	Moderate-Low
Western Block	Low	Low	Low
Waitemata Tributary Block	No Effects	Low	Low
LANDSCAPE CHARACTER			
Eastern Block	Very Low	Moderate-Low	Moderate-Low
Southern Block	Moderate	Low	Low
Western Block	Low	Low	Low
Waitemata Tributary Block	No Effects	Very Low	Very Low

* Beneficial effect

8.2 During site establishment and initial construction works, the greatest adverse effects on the landscape resources will be **moderate**, which translates to *more than minor* under RMA terminology. These effects will be on the streams within Valley 1, located in the Eastern Block and the topography associated with the main access road in the Southern Block. **Moderate** adverse effects are also anticipated on the landscape character of the Southern Block during this period of works. **Moderate-low** adverse

effects (*minor*) are anticipated on the streams within the Southern Block, however the remaining effects on landscape resources and landscape character will be **low**, **very low**, or **no effects** (*less than minor*).

- 8.3 During ongoing operation, and post closure, **moderate** adverse effects (*more than minor*), will remain on the topography of the Southern Block and streams in the Eastern Block. All other effects on the landscape resources and landscape character are anticipated to be either **moderate-low** (*minor*), or **low** or **very low** (*less than minor*). **Beneficial effects** (considered either **low** or **very low**), are anticipated on the vegetation within some site areas. This would be a direct result of the proposed mitigation planting, which involves establishing native revegetation that will replace some areas of existing pasture and forestry.

9.0 Assessment of Visual Amenity Effects

- 9.1 This section of the assessment considers the anticipated effects on visual amenity. To understand the visual amenity effects throughout the life of the project, these effects are considered in a number of stages as outlined below. It is considered that these stages represent the key changes anticipated throughout the duration of the project. These effects consider the that the mitigation measures outlined earlier in the report have been implemented.
- 9.2 Visual simulations have been prepared (located in **Appendix 4** of this report) and should be referred to when reading this section.
- 9.3 The visual effects are considered in the below stages as follows:
- Site Establishment and Initial Construction Works.
 - This is the same assessment stage considered in the landscape effects section of this report where works are undertaken before the landfill is ready to receive waste.
 - Ongoing Operation.
 - Post site establishment to year 5: This is when the landfill is in full operation and includes works up to the end of phase 3, based on the anticipated project phasing as outlined earlier in the report.
 - Year 5 to 35: This is when the landfill is in full operation and includes work up to the beginning of phase 7, based on the anticipated project phasing as outlined earlier in the report.
 - Post Closure (Completed Landfill).
 - This is when the landfill has been completed, capped and grassed or planted and all material in the stockpiles have been extracted.

Wellsford Township and Environs

Refer Appendix 3 and 4 for viewpoints 1 to 5.

- 9.4 The area includes the developed areas of the Wellsford township which notably includes a section of SH1 (Rodney Street), Davies Road, Bellevue Avenue, Hazelmere Street, Port Albert Road, Station Road, Olympus Road, Wi Apo Place and Matheson Road.

- 9.5 Existing site context photos from this area are located in **Appendix 3** of this report. Visual simulations from a number of these viewpoints are illustrated in **Appendix 4**.

Nature of Current Views

- 9.6 The township of Wellsford is positioned on elevated land between 4 and 6 kilometres from the project footprint. The township is located on a series of small ridges, and these are defined by SH16 and Davies Road, which then come to a point and meet Rodney Street (referred to as SH1), near the War Memorial Park.
- 9.7 Viewing audiences to the west of these ridges do not obtain views towards the landholding as they are on the other side of the ridge which only provides views towards the west. Additionally, due to the topographical characteristics of the landscape to the north of the township, viewing audiences north of Matheson Road are unlikely to obtain any views towards the landholding, except for properties accessed from Matheson Road and those in this immediate vicinity⁸.
- 9.8 Those properties accessed from Matheson Road⁹, will obtain a view of the landholding, however this would be a partial view due to intervening landforms (within and outside of the landholding), and elements (such as vegetation and buildings) in the foreground and background of their views (**refer Viewpoint 1, Appendix 3 and 4**). It is however noted that those that do obtain views of the landholding within this area, also obtain views of the Dome Summit.
- 9.9 Viewing audiences within the town centre¹⁰, would have glimpse views of the landholding between the local businesses due to the compact urban nature of this central area. It is however acknowledged that these views would often be transitory for most people (i.e. walking or driving), and views towards the site at the rear of these businesses are either limited (given they are 'back of house') or appreciated for a short duration (arriving / leaving the business, and/or restricted to business hours).
- 9.10 To the south of the township, properties west of SH1, between Davis Road, and SH16 will have the opportunity to view the landholding and the wider landscape (**refer Viewpoint 5, Appendix 3 and 4**). These viewing audiences are able to observe the gradually descending topography to the east, occupied by pasture and shelterbelts, which then visually intersects with the grassed and vegetated lower slopes of the Wayby Valley. More distantly, these viewing audiences can observe the dark hues of the plantation forestry occupying the upper slopes¹¹ and wider hill range before forming a largely uninterrupted and forested horizon. Views of the landholding are however restricted to those that do not have intervening vegetation and roof profiles of the neighbouring properties within their view. These tend to be those located on SH1, Davis Road and the most elevated portions of this area, which is towards SH16.
- 9.11 Properties that are located to the east of SH1, south of the town centre, could obtain views of the landholding and surrounding landscape as these viewing audiences are more unlikely to have their views interrupted by neighbouring buildings. However, trees established along the railway line at the base of the slope do occupy the foreground of these views, and therefore interrupt the outlook of the landholding for some of these residents.
- 9.12 Evaluating the above, it is considered that over half of the viewing audiences within the Wellsford township will not obtain views of the landholding. For those that do have the opportunity to obtain views, for many, the outlook will be interrupted by intervening

⁸ Specifically, these properties are residential properties no. 5 to 1 Wai Apo Place and no. 2 to 18 Centennial Park Road, and commercial properties 37 to 59 Olympus Road.

⁹ And in the immediate vicinity

¹⁰ For the purpose of this assessment, it is considered that the 'town centre' is between Port Albert Road (SH16) / Rodney Street (SH1) intersection, and Matheson Road / Rodney Street (SH1) intersection.

¹¹ Noting that at the time of harvesting, the view of the forestry will considerably change and instead of being characterised by pine, it will be seen as a harvested area, with the trees removed.

buildings or vegetation in the foreground of their view, and/or be at distances of at least 4 kilometres from the project footprint.

Site Establishment and Initial Construction Works

- 9.13 The visible change for these viewing audiences would differ across the visual catchment of this area, and would be dependent on intervening landforms, buildings and vegetation. However, viewing audiences that do obtain views of the landholding could see one, or a combination of the following elements within the project footprint:
- The upper parts of the main access road and the associated cut faces. Initially these would be viewed as bare earth / cleared slopes before they are planted.
 - The formation of Stockpile 1, which initially would not be visible, as the works would begin at the base of the valley. The leading edge as it rises higher (orientated towards these viewing audiences), would initially be seen as soil/bare earth until being grassed in the following winter.
- 9.14 When considering the level of change, a number of factors have been evaluated. These include the size or scale of the effect, the geographical extent of change within the view (distance) and the nature of the change within the receiving environment.
- 9.15 For those viewing audiences that do obtain views of the project elements, when considering the change within the view, it is recognised that these views are from distances between 4 and 6 kilometres. Furthermore, the scale and nature of change is relative to the open nature of the appreciable view and forestry and farming activities within it.
- 9.16 Given the above analysis, the greatest level of effects will be **moderate-low** adverse for the viewing audiences that obtain views within the Wellsford Township and environs. These effects will be temporary in nature until mitigation measures such as hydroseeding and native planting has been established. Additionally, for many viewing audiences within this area, there will be no change within their view as a result of the project.

Ongoing Operation – Post site establishment to year 5

- 9.17 When considering the visual change, permitted forestry harvesting of the surrounding area, would result in the greatest change in the outlook for these viewing audiences. This harvesting would reveal the hillside landforms and slash would be a clear by-product of these established land uses.



Plate 4: Example of 'slash' from recent forestry harvesting in Wayby Valley

- 9.18 By this time, vegetation will have become established on the cut slopes of the main access road, any stockpiles will have been hydroseeded. These measures will have reduced the amount of visible bare earth for these viewing audiences. Vehicle activity will be visible in the distance as trucks haul the material along the access roads. Notwithstanding this, during harvesting of these areas, forestry machinery would be visible on the hillsides. Additionally, due to the phasing of the project, it is not anticipated that any imported waste will be visible in the landfill as the first phasing will occur at the lower portions of Valley 1.
- 9.19 The anticipated level of effect during this period is considered to reduce to **low** adverse due to the reduction in visible bare earth as a result of hydroseeding and vegetation establishment. Furthermore, it is recognised that the outlook for these viewing audiences will remain characterised by the forestry cycle occurring within this wider outlook, and it is considered that as these changes continue to occur, the project will remain observed alongside these activities.

Ongoing Operation – Years 5 to 35

- 9.20 The key visual changes from year 5 to year 35 will be the phasing of the landfill within Valley 1. Over these years, this gradual change will result in the landfill becoming more visible within the visual envelope. The greatest appreciable change will be when works on Phase 5 and 6 commence, as this is when the landfill will become most visible to the viewing audiences given these phases relate to the areas of the landfill that will reach the greatest elevation. However, depending on waste volumes, these phases will not commence until at least 20 years into the operation of the landfill.
- 9.21 During years 5 to 35, the forestry activities are anticipated to undertake a second cycle of harvesting. Forestry, which would have provided some visual screening of the activities, including a well-established vegetated backdrop may be felled, and it is during this time that the project will partially rely on the proposed vegetative screen along the east, west and southern boundaries of Valley 1.
- 9.22 As the project progresses, the landfill will be covered daily and visible portions will be seen from distances of at least 4km away for viewing audiences within Wellsford and its environs. The landfill would be progressively capped and hydroseeded and appear as a

distant vegetated landform which will be seen alongside the patchwork of pasture and vegetation covered hillsides. By year 35, it is anticipated that the landfill will have reached its greatest elevation and works on phase 7 would take place in the lower western area of Valley 1.

- 9.23 As outlined earlier, it is recognised that from northern locations within the Wellsford township (such as Viewpoint 1), views of the landfill and upper portion of Stockpile 1 will be seen directly in front of the Dome Summit, and it is considered that the appreciation of this landscape feature for these viewing audiences will be adversely affected.
- 9.24 Notwithstanding this, change would be seen in the context of the working forestry environment which exists within the landholding and beyond. If the landfill did not take place, harvesting activities and associated slash would be seen in Valley 1, in front of the Dome Summit resulting in as similar change and potentially similar level of effects.
- 9.25 Taking the above into account, it is considered that the adverse effects for viewing audiences to the north of Wellsford would be **moderate-low** during Phase 4 and up to **moderate** adverse effects during Phase 5 and 6, providing they are those which attain views of the project elements directly in front of Dome Summit. This would be limited to those accessed off the elevated section of Matheson Road, thereby affecting approximately up to 25 residential properties and approximately up to 10 commercial properties / community facilities¹².
- 9.26 For the remainder of the viewing audiences in Wellsford that attain views, it is anticipated that **low** adverse effects would be generated during Phase 4, increasing up to **moderate-low** adverse effects during Phases 5 and 6.
- 9.27 For all affected viewing audiences, although the works associated with the upper portion of the landfill could be visible, this would be seen in the context of a working forestry landscape, and with the landfill covered each day, and hydroseeding applied, and supportive vegetative screening in front and to the rear of Valley 1 the effects would reduce.

Post Closure (Completed Landfill)

- 9.28 After the completion of the landfill, the primary visible element will be the vegetated landform within Valley 1 as it is intended that all of the stockpile material will have been used for capping. It is considered that the outlook for these viewing audiences would continue to be characterised as a working rural landscape and that the adverse visual effects would be **low**.

Wayby Station Road and Environs

Refer Appendix 3 and 4 for viewpoints 6 to 9.

- 9.29 This area includes the visual catchment between SH1 and SH16 and therefore includes viewing audiences located off Wayby Station Road and Pricor Road. The representative viewpoints used for these viewing audiences are Viewpoint 6, 7, 8 & 9. Existing site context photos from these locations are located in **Appendix 3** of this report. Visual simulations of a number of these viewpoints are illustrated in **Appendix 4**.

Nature of Current Views

- 9.30 Wayby Station Road is broadly oriented east to west and provides a connection between SH1 and SH16. Wayby Station Road services approximately 30 residents, many of which are on lifestyle blocks. The road meanders through a pastoral landscape with fields, remnant native vegetation and shelterbelts. From west to east, the road gradually climbs in elevation from approximately RL40m to RL100m near the Hōteō

¹² Specifically, these properties are residential properties no. 5 to 1 Wai Apo Place and no. 2 to 18 Centennial Park Road, and commercial properties 37 to 59 Olympus Road.

North Cemetery before gradually descending in elevation before meeting SH1. Views of the landholding are not revealed along the western section of the road as it climbs in elevation from SH16, however, views of the ridges and western facing slopes of the Eastern and Southern Blocks are attainable beyond this minor ridge. Some of these views however are partially filtered by intervening vegetation such as shelterbelts and tree stands and these inhibit the ability to view the landholding.

- 9.31 Pricor Road, also considered to be situated in this visual envelope, is located directly west of the landholding and SH1. The road is orientated north to south and connects Wayby Station Road and SH16, providing residents with direct access to Wellsford township. From north to south, the road descends in elevation to a low point of approximately RL35m, before negotiating over rolling hills up to RL75m. The road then descends to roughly RL40m before intersecting with Wayby Station Road. Pricor Road is metalled and provides access to approximately 20 residential dwellings, increasing in density at the northern end, towards the township. Being an unpaved local road, vehicle numbers are infrequent and more likely to consist of local residents to the surrounding area.
- 9.32 This landscape features a variety of vegetative patterns such as exotic shelterbelts, remnant native tree stands and exotic trees which interrupt some distant views towards the landholding, particularly the western areas of the Southern and Western Blocks.

Site Establishment and Initial Construction Works

- 9.33 The visible change for these viewing audiences would differ across the visual catchment of this area, and is dependent on intervening landforms, buildings and vegetation. However, viewing audiences that currently obtain views of the project footprint could see one or a combination of the following:
- The main access road and the associated cut faces. Initially these would be viewed as earth / cleared slopes before they are planted.
 - The formation of Stockpile 1, which initially would not be visible, as the works would begin at the base of the valley. The leading edge (orientated towards these viewing audiences), would initially be seen as soil/bare earth, but it would be progressively hydroseeded.
- 9.34 For those that attain views of the landholding and the project elements, it is considered that these viewing audiences would experience a similar change in their view as those anticipated in the southern portion of the Wellsford township. Although these viewing audiences could be closer to the source of effects, the outlook and orientations from these locations are comparable where views from this area capture a panoramic view of the surrounding environment, including the Dome Forest and farmland of Wayby Valley.
- 9.35 The greatest change to their view would be the recently cleared eastern slopes of Valley 1 and cut faces of the upper portion of the main access road, which until planting on these slopes is established, will be a visible contrast to the existing vegetated slopes. The stockpiles would also gradually become visible during this time, as material is placed from the bottom of the valley to the top. As mentioned above, this would be progressively hydroseeded as material is added to the stockpile.
- 9.36 It is considered that the activity and change would be seen within the context of a wide view capturing an everchanging environment where forestry and farming practices that from time to time include visible bare earth. With this in mind, it is considered that the greatest level of effects would be **moderate-low** adverse for up to 4 years, and this would be on those residents east of Pricor Road (including those on Wayby Station Road, west of this position). **Moderate-low** adverse effects are also anticipated on those residents at the eastern end of Wayby Station Road, near the intersection with SH1 (approximately 20 properties), as they will attain views of Stockpile 1.
- 9.37 Residents along Oldfield Street (south of Wayby Station Road) will not see the project elements due to intervening landforms.

Ongoing Operation – Post site establishment to year 5

- 9.38 During operation, harvesting of the surrounding area, as part of the ongoing forestry operations, would considerably change the nature of the visual outlook for viewing audiences by revealing the hillside landforms and associated slash across the landscape.
- 9.39 During the 5 years since constructing the main access road, vegetation will become relatively well established and this will mitigate the visibility of the cut slopes by visually integrating them into the vegetated hillside that the road sits within. Forestry planting would be re-established in the upper portion of the eastern slopes of Valley 1 and continue to be viewed as part of the wider forestry operations. The topsoil stockpile would remain visible from locations within this area however, this would be progressively hydroseeded. Vehicular movement may also be visible from these distant locations whilst waste is brought to Valley 1. As the first 3 Phases of the landfill will occur in the lower elevations of the Valley 1, it is not anticipated that any fill in these areas will be visible during this time.
- 9.40 The outlook for these viewing audiences will remain characterised by the forestry cycle occurring within this wider outlook, and it is considered that as these changes continue to occur, the project will be observed alongside these activities. The anticipated level of effect during this period is therefore considered to reduce to **low** adverse, as areas of cut and /or bare earth will be established with grass and vegetation, and the visible activities associated with the project are more likely to be appreciable through the truck movements to the stockpiles.

Ongoing Operation – Years 5 to 35

- 9.41 It is anticipated that the landfill will become visible on the northern slope of Valley 1 when the higher elevations of the Phase 4 fill is created. During this period, the surrounding forest may have been re-established and subsequently harvested, and therefore it is anticipated that the wider forest within the landholding will contain young trees. Although this has the potential to result in more areas of the project being visible, early establishment of screen planting will assist in limiting the visibility of the project elements.
- 9.42 By year 35, the landfill would have gradually risen above the ridge to the west of Valley 1 and reached its greatest elevation (during Phase 5 and 6). The landfill would be covered daily, capped and hydroseeded and appear as a landform in the background of their outlook.
- 9.43 Unlike the views from Wellsford and its surrounds, these views are from a more western location and the Dome Summit will appear as a separate feature within the wider Dome Forest landscape. Furthermore, this change would be appreciable in the setting of the working forestry environment, and it is acknowledged that harvesting of this landscape would prevail regardless.
- 9.44 While the works associated with the upper portion of the landfill will become visible, views would be distant and seen in the context of a working forestry landscape. Taking the above into account, it is considered that the adverse effects would be up to **moderate-low** adverse for these viewing audiences.

Post Closure (Completed Landfill)

- 9.45 As assessed above, there would be some change during the post closure of the project with the primary changes being the now fully established vegetated (landfill) landform within Valley 1 and the absence of all stockpiles. Therefore, the most visible remaining project element will be the vegetated (landfill) landform. It is considered that the removal of the stockpiles will reduce the visual effects and the outlook for these viewing audiences would continue to be characterised as a working rural landscape. It is therefore considered that the adverse visual effects would reduce to **low**.

Wayby Valley Road and Environs

Refer Appendix 3 and 4 for viewpoint 11.

- 9.46 This area includes Wayby Valley Road, Robertson Road and Rustybrook Road, located to the west of the landholding. The representative viewpoint used for these viewing audiences is Viewpoint 11. An existing site context photo from Wayby Valley Road is located in **Appendix 3** of this report and visual simulations of this viewpoint is illustrated in **Appendix 4**.

Nature of Current Views

- 9.47 Wayby Valley Road forks off from State Highway 1 and tracks in a more or less straight alignment to the north east, adjacent to the Hōteō River. On either side of Wayby Valley Road, low lying pasture fields occupy this landscape with intermittent tree stands and shelterbelts. Robertson Road and Rustybrook Road intersect with Wayby Valley Road to the west, and both ascend up small ridges towards SH1 and Wellsford.
- 9.48 Views of the landholding from Wayby Valley Road are oblique and focused to the south of Robertson Road, with the low-lying areas of the landholding obstructed from view due to the intervening vegetation along the Hōteō River. Views of the upper slopes of the Wayby Valley and Dome Forest, including the pasture covered slopes which meet the forestry areas are however visible.
- 9.49 Views of the landholding are not attainable to the north of Robertson Road, along Wayby Valley Road due to an elevated landform which extends across the low-lying areas toward the Hōteō River.
- 9.50 Views of the landholding are however attainable from locations along Robertson Road and Rustybrook Road, but due to roadside vegetation, these views are primarily limited to a small number of residential properties along the southern slopes of these elevated areas.
- 9.51 To the east, off Wayby Valley Road, Spindler Road and Wilson Road extend across the low-lying areas to the north west of the landholding. Views of the landholding are not attainable from Spindler Road or the approximately 8 residential dwellings which it services, although a glimpse view near the intersection with Wayby Valley Road is attainable. This view captures the upper slopes of the landholding and the associated forestry areas. Intervening vegetation along the Hōteō River screens remaining views from the road, and residents along the road have views focused towards the north, away from the landholding.

Site Establishment and Initial Construction Works

- 9.52 The visible change for these viewing audiences would differ across the visual catchment of the area, however, views of the main access road and associated cut faces in addition to the formation of Stockpile 1 and the topsoil stockpile could be visible.
- 9.53 Viewing audiences along Wayby Valley Road would be approximately 1.8km from the base of Stockpile 1 and as outlined above, vegetation along the Hōteō River would obscure low elevation oblique views of works within the landholding (particularly in the proposed location of clay borrow pit). Change in the view as a result of the project would be the eventual visibility of the upper portion of Stockpile 1, the topsoil stockpile and sections of the cut faces of the landform associated with the main access road. It is however recognised that vegetation nearby the Robertson Road / Wayby Valley Road intersection does screen much of these views, and where the cut slopes along the main access road are visible, this would be the upper portion of the road only.
- 9.54 As outlined above, views from Robertson Road and Rustybrook Road are difficult to attain due to intervening vegetation along the roadside. Those that do capture glimpse

views of the project during this time may get partial views of Stockpile 1, the topsoil stockpile and the distant cuts in the upper portion of the main access road.

- 9.55 When considering the level of effects during this period, some views would either be transient or oblique or a combination of both. Furthermore, it is recognised that large portions of the project would not be visible from these locations due to intervening vegetation and/or topography from the vantage points or within the landholding. It is therefore considered that the adverse visual effects during this period would be up to **moderate-low** for these viewing audiences (particularly those in elevated areas on Robertson and Rustybrook Road), noting that this would be for a limited duration – until grassing and vegetation has become established.

Ongoing Operation – Post site establishment to year 5

- 9.56 During operation, vegetation along the cuts of the main access road will become relatively well established and soften the appearance of the cut slopes. Stockpile 2 would now become established in the landscape; however, it is unlikely that this would be entirely visible. Although filling of waste within Valley 1 will occur during this time, it is anticipated that waste will remain obscured as the first 3 Phases will occur in the lower elevation areas of Valley 1.
- 9.57 During this period of time, the surrounding forest within the landholding will likely have been recently harvested and new forestry planting within a number of the pasture slopes will also have been established. The ongoing forestry operations would considerably change the nature of the visual outlook for viewing audiences by revealing the hillside landforms and associated slash across the landscape, and these activities will continue to characterise the outlook for these viewing audiences even if the project did not occur.
- 9.58 As these anticipated activities continue to take place within the landscape, the project will remain visible alongside these land uses. Considering the above, the anticipated level of effect for these viewing audiences during this period would reduce to **low** adverse.

Ongoing Operation – Years 5 to 35

- 9.59 As outlined previously, the greatest change to the landholding during this time would be the phasing of the landfill within Valley 1.
- 9.60 The appreciable change in the landscape during this period would be difficult to discern for these viewing audiences as it is anticipated that the filling activities in Valley 1 would largely remain behind intervening landforms or filtered by screen planting. Views of the stockpiles (particularly Stockpile 1), would however be retained and therefore it is considered that the adverse effects would remain as **low**.

Post Closure (Completed Landfill)

- 9.61 As assessed above, the primary change would be the absence of the stockpiles, and if at all visible, the upper portion of a vegetated (landfill) landform in Valley 1. It is considered that from locations within Wayby Valley Road and its environs, any residual visible change would be minimal and seen within an established working landscape. Taking the above into account, given many viewing audiences would experience limited visual change, the level of effects would reduce to **very low** adverse once the project is complete.

Views on or nearby SH1 including nearby residents

Refer Appendix 3 and 4 for viewpoints 10 and 12.

- 9.62 This area encompasses the SH1 route, in addition to residents on or near the road corridor as well as Wellsford Golf and Squash Club users. Specifically, the residents

which are included are those alongside SH1 to the north of Wayby Valley Road, and those south of Wayby Valley Road including 1207, 795, 761A, 761B and 701 SH1.

- 9.63 Although the residential properties located on 1207 are positioned within the current Warkworth to Wellsford indicative route, visual effects on viewing audiences in these properties are still considered.
- 9.64 The representative viewpoints used for these viewing audiences are Viewpoint 10 and 12. Existing landholding context photos from SH1 are located in **Appendix 3** of this report. Visual simulations from one of these viewpoints is illustrated in **Appendix 4**.

Nature of Current Views

- 9.65 SH1 is the longest road in New Zealand and locally provides the primary route from Wellsford to Warkworth. Due to the linear nature of the road, the visual catchment towards the landholding begins shortly after Wellsford, encompassing the Wayby Valley area, before obtaining a more restricted view when it has negotiated its way south of the Hōteō River. A number of residents live nearby SH1, in addition to the Wellsford Golf and Squash Club, and these viewing audiences are included in this section of the assessment.
- 9.66 From positions north of Wayby Valley Road, the upper slopes and distant hillsides of the landholding and the wider context are particularly visible. Views of the landholding are most attainable when viewing audiences are orientated towards the south east, although for travelling viewing audiences, their view of the landholding would be at an oblique angle and from a moving vehicle. Views from SH1 would be most attainable from vehicles travelling south, instead of travelling north.
- 9.67 In general, the degree of visibility towards the landholding lessens as the elevation of the road decreases, and landscape elements such as trees form the foreground of the view, particularly around the intersection of Wayby Station Road and Wayby Valley Road. From these lower elevation locations along the road, the visibility of the landholding captures the vegetated hillside where the proposed access road would reach Valley 1.
- 9.68 South of Wayby Valley Road, views of the landholding become limited due to vegetation along the Hōteō River and in intervening knoll landform. Further south, beyond the Hōteō River, views of the hillside which will accommodate the main access road are currently limited by intervening landforms and vegetation (including Poplar which line the State Highway). However, the project would require the removal of many of these poplar trees in order for vehicles to safely access the entrance to the landholding. This will open views towards the bin exchange area and access road as it negotiates its way up the valley within the Southern Block.
- 9.69 For residents south of Wayby Valley Road, although some of these properties are well vegetated, it is likely that eastern views are attainable from these dwellings. This would mean that the eastern portions and ridges around the landholding will be visible to these residents at distances of approximately (but not less than) 1 kilometre.

Site Establishment and Initial Construction Works

- 9.70 Viewing audiences north of Wayby Valley Road would experience varying degrees of visibility due to the undulating topography. People at the Wellsford Golf and Squash Club would attain low elevation views of Stockpile 1, the topsoil stockpile, and the upper portions of the main access road works. However, the vegetated edges of the fairways would reduce the visibility of these project elements. Roadside vegetation along this stretch of SH1 would also mean that views toward the project from vehicles are very limited and if views of Stockpile 1 and the main access road works are attainable, these would be glimpsed and transient. Due to the activities the visitors to the golf and squash club would be engaged in (e.g. playing golf), it is considered that these viewing audiences would not be particularly sensitive to change. With the above in mind, it is

considered that the level of effect for viewing audiences playing golf or driving along the section of SH1 in the vicinity of the golf course would be **very low** adverse.

- 9.71 Residents adjacent to the golf course would have elevated views of Stockpile 1, the topsoil stockpile and the main access road works, as the landform the viewing audience is located on gently increases in elevation in this vicinity, although intervening vegetation on their properties would filter views. Road users on SH1, who are south of the golf course, up to Wayby Valley Road would also obtain a similar outlook, with views opening up to the south of Mcpherson Way¹³.
- 9.72 Taking the above into account, it is considered that the adverse visual effects on road users would be **low** as these views would be transient in nature and at an oblique angle to the direction of travel. Residents on the other hand would obtain **moderate-low** adverse effects, noting that this change will be seen in a wide view capturing the surrounding rural landscape outside of the project.
- 9.73 To the south of Wayby Valley Road, as referenced above, 1207 SH1, which contains a residential property, is located on an eastern facing slope, near to the bin exchange area. The dwelling sits within the Warkworth to Wellsford indicative route and may be removed in the future. In terms of the dwelling's setting, mature trees surround the building and restrict views towards the east. This established vegetation will limit views of the works associated with site access/roundabout, bin exchange area, and main access road. The residential property is also orientated with views opening out towards the north east and therefore views of the other proposed project elements (such as Stockpile 1) would not be attainable. In considering this outlook, it is determined that the visual effects for this viewing audience would be up to **low** adverse, as filtered views could be attainable of the works associated with the site entrance.
- 9.74 Road users near the site entrance would experience a change in their view and this would be due to the works anticipated in this location, including those associated with the widening and proposed cut along the western side of SH1, construction of a roundabout, bin exchange area and the main access road - with associated cut faces. Whilst it would be for a brief moment (i.e. while driving through the area), the viewing audiences experience of this portion of the road corridor will alter due to the proposed works. Viewing audiences travelling south would obtain the most extensive views into the landholding as they begin to slow down before the proposed new roundabout.
- 9.75 The main access road and bin exchange landform cuts will be visible at this time, particularly given the proximity to these, and because vegetation on these slopes will not yet have established. Furthermore, it is anticipated that there would be a view of the entrance to the landholding, including other project elements such as an office and bridge.
- 9.76 When considering the level of effects, it is recognised that the viewing audiences in this area are transient in nature, and although they will eventually negotiate a roundabout, the change would be appreciated for a short time period. It is considered that the adverse visual effects for these viewing audiences, taking into account the scenic qualities of the area, would by in large be **moderate-low**, however taking into consideration the scenic qualities of the area, adverse effects could be up to **moderate** – albeit for a brief moment as they pass through this section of road.
- 9.77 Residential viewing audiences opposite Forestry Road located south of the site entrance, have also been considered¹⁴, however it is not anticipated that they would experience any appreciable change during site establishment apart from the potential to view some permitted forestry works along the perimeter of Valley 1.

¹³ Mcpherson Way is a small unformed road located to the west of SH1 and links into Wayby Station Road at its southern end.

¹⁴ These are: 795, 761A, 761B, 701 SH1

Ongoing Operation – Post site establishment to year 5

- 9.78 During the early phases of the project's operation, viewing audiences at the Wellsford Golf and Squash Club would continue to have some opportunity to obtain views of the landholding through the vegetated edges of the fairways. Given the source of the additional change (principally being the first three Phases of filling), would mostly remain hidden, it is considered that the level of effect for this viewing audience would remain as **very low**. Road users on SH1 in this vicinity would also continue to have a restricted outlook towards the project and continue to experience **very low** adverse effects.
- 9.79 Residents adjacent to the golf course would continue to view Stockpile 1, the topsoil stockpile and cut slopes of the main access road. Much of the works associated with the first three phases would however remain hidden. It is anticipated that during this period, the vegetation on the cuts associated with the main access road would now have become more established, and the stockpiles would principally be viewed as grassed areas, contributing to the patchwork of pasture fields in the existing outlook. It is considered that these mitigation measures will assist in reducing the visual effects for these residential viewing audiences and result in effects that are **low** adverse.
- 9.80 Road users between the golf course and Wayby Valley Road would continue to view the project at an oblique angle whilst travelling at speed. As much of the works associated with the first three phases would remain hidden and the vegetation and grass treatment being implemented it is considered that these effects would reduce to **very low** adverse.
- 9.81 Residential viewing audiences at 1207 SH1, opposite the proposed site entrance, would continue to be mostly screened from viewing the project. If attainable, any filtered views of the project from the property would include the proposed native vegetation occupying existing areas of low-lying pasture, and the proposed row of poplars along SH1. It is anticipated that vegetation and intervening landforms would screen much of the built project elements (such as the bridge and bin exchange area), and it is therefore considered that the resultant visual effects would be **low** adverse.
- 9.82 Change for road users in the vicinity of the bin exchange area would continue to experience the presence of the main access road, roundabout, bin exchange area and associated project elements. However, it is considered that as vegetation begins to establish, the visibility of these elements would lessen. Taking the above into account, it is determined that the adverse visual effects for these traveling viewing audiences would be **low**, however it is recognised that the experience of this view would be for a very short time.
- 9.83 The residential properties located opposite Forestry Road¹⁵ would now have an opportunity to view portions of Stockpile 2 as it is formed. Screen planting along the perimeter of the stockpile would assist in filtering some views, however it is not considered that this would substantially change the level of anticipated effects given the planting would not have fully established. Considering the above, it is determined that the adverse visual effects would be **moderate-low**, as these views would be fixed, and alternative views are not readily available due to the valley landform.

Ongoing Operation – Years 5 to 35

- 9.84 For viewing audiences on the golf course, the landfill will continue to increase in size and elevation and this will become partially visible from the elevated portions of the course¹⁶, particularly during Phase 5 and 6 as the landfill reaches its greatest height. This change in view would continue to be seen against the cyclical forestry activities which characterise the area. With the above in mind, is considered that the adverse effects for this viewing audience would be up to **low**. This level of effect would largely

¹⁵ 795, 761A, 761B and 701 SH1

¹⁶ Particularly holes 3, 11 and 12.

affect those in the elevated sections of the course, with clear views towards the project, additionally depending on waste volumes, phases 5 and 6 will not commence until at least 20 years into the operation of the landfill.

- 9.85 Residents adjacent to the golf course would continue to view Stockpile 1, the topsoil stockpile, the cut slopes of the main access road and in particular, the landfill, as it becomes more visible during phases 5 and 6. The landfill would however be covered daily, progressively capped and hydroseeded, and the majority of it would become increasingly hidden as perimeter screen planting continues to grow in height, particularly along the 'Dividing Ridge' which forms the boundary between the Eastern and Western Block's. It is therefore considered that the adverse visual effects would incrementally increase up to **moderate-low** before vegetation is established on the landfill.
- 9.86 As the waste is continued to be imported into Valley 1, the landfill will progressively become more visible. Road users between the golf course and Wayby Valley Road would continue to view the project at an oblique angle and travelling at speed, however views of the upper portion of the landfill would become apparent in these transient views. It is therefore considered that these effects would increase to **low** adverse.
- 9.87 For residential viewing audiences at 1207 SH1, it is not considered that there would any appreciable change during this time, and visual effects would remain as **low** adverse.
- 9.88 Road users in the vicinity of the Site entrance would continue to experience visual change to this area due to the project elements such as the bin exchange area and bridge. With vegetation now established, it is determined that the adverse visual effects for these traveling viewing audiences would be **very low**.
- 9.89 The residential properties located opposite Forestry Road may attain partial views of the upper portion of Valley 1, although it is acknowledged that by this stage, screening vegetation around the perimeter of Valley 1, would be established and increasingly filter views of the project. Because if this, it considered that the effects would reduce to **low** adverse for these viewing audiences.

Post Closure (Completed Landfill)

- 9.90 Post closure, the primary visual difference would be the absence of the stockpiles, and if visible, the upper portion of a vegetated (landfill) landform in Valley 1. It is considered that from locations along SH1 any residual visible change would be minimal and seen within an established working landscape. Taking the above into account, it is considered that adverse effects would be no more than **low** for these viewing audiences.

Residents Adjacent to Springhill Farm

Nature of Current Views

- 9.91 There are three residential properties located off the road servicing Springhill Farm, namely 1232, 1232A and 1282 SH1. These residents are all located on elevated land and will therefore view the Western Block and portions of the Eastern block from their properties (including their dwellings). This will include the low-lying pasture areas and the slopes and distant hillsides of the landholding.



Plate 5: Residential viewing audiences located off private road which services Springhill Aerodrome. Enlargement photo taken from existing forestry road near top of proposed Stockpile 1 within landholding.

Site Establishment and Initial Construction Works

- 9.92 These residents would have largely unrestricted views of the project from their dwellings and during this stage of the project, would view Stockpile 1, the topsoil stockpile and the main access road cuts. Nevertheless, these views are not solely focused on the landholding, and alternative outlooks (toward the north and north west) are available.
- 9.93 To restrict the visibility of the works, screen planting is proposed along the boundary of 1232 SH1, although initially, vegetation will not be sufficient in restricting views of the project. Furthermore, it is acknowledged that while this vegetation would eventually restrict views of the project elements, it would in turn limit these residents' view of the vegetated/pasture covered hillsides and associated ridges of the area. Given the elevated positions, relatively unencumbered views of the project, and general proximity to the works, it is considered that the adverse visual effects for residents in the three properties in this area would be **moderate-high**.

Ongoing Operation – Post site establishment to year 5

- 9.94 During this time, the primary change in view for all three of the properties will be the establishment of grass and vegetation on Stockpile 1, the topsoil stockpile, cut slopes of the upper portions of the main access road, and some of the internal site roads around Stockpile 1. Vehicle activity within the view will continue throughout this time, and isolated sections of Stockpile 1 will remain as bare earth, where material is utilised. Given the elevated positions of the properties, relatively unencumbered views of the project, and proximity to the works, some adverse effects will be unavoidable. However, with established vegetation and grass in much of the visible disturbed areas, it is considered that the effects will reduce to **moderate** adverse.

Ongoing Operation – Years 5 to 35

- 9.95 During this time period, the height of the landfill will increase, and it is during phase 5 and 6 that there would be the greatest observable change as viewing audiences will have the opportunity to view the landfill. However, depending on waste volumes, these phases will not commence until at least 20 years into the operation of the landfill. Screen planting along the 'Dividing Ridge' to the west, would provide some visual relief of this change, and existing vegetation along cut slopes along the site roads would be well established. Additionally, screen planting adjacent to 1232 SH1 will assist in reducing views towards the works. Nevertheless, given the proximity and fixed views that are obtainable, it is considered that the adverse effects for this viewing audiences

would remain up to **moderate**, during periods where the fill is visible, and yet to be grassed.

Post Closure (Completed Landfill)

- 9.96 After the completion of the landfill, the primary visible element will be the vegetated (landfill) landform within Valley 1 as it is intended that the stockpiles will be entirely removed. It is considered that the outlook for these viewing audiences would continue to be characterised as a working rural landscape and therefore the adverse visual effects would reduce to **moderate-low**.

Dome Forest and Environs

Refer Appendix 3 and 4 for viewpoints 13 and 14.

- 9.97 Viewing audiences considered in this part of the assessment are those who are located within the Dome Forest. Specifically, these include the geographic area of Waiwhiu and the Te Araroa Trail route. The representative viewpoints used for these viewing audiences are Viewpoint 13 and 14. Existing site context photos from these locations are located in **Appendix 3** of this report. Visual simulations from the Te Araroa Trail (Dome Summit) are illustrated in **Appendix 4**. Viewpoint 15, from Govan Wilson Road, to the north east of the landholding has been included for completeness, although it is not anticipated that the project will be visible within this area.

Nature of Current Views

- 9.98 Waiwhiu is an area located approximately 3 kilometres south of the project footprint, and provides elevated views across the Dome Forest, particularly to the east and north, towards the landholding. There are approximately 12 residential dwellings which stem off Kraack Road, and Grimmer Road. Much of the eastern slopes of this elevated land is pasture, with groupings of native vegetation focussed around the small gullies which lead towards SH1. Waiwhiu Road, located to the east of this location also services residential dwellings, but they are generally in a valley and do not obtain views of the project. No. 54 Waiwhiu may obtain a partial view of the project, although it is acknowledged that the desktop analysis was undertaken without considering existing vegetation which may screen views.
- 9.99 The Te Araroa Trail route also encounters Kraack Road, to the west of SH1, and additionally traverses the Dome Summit and Conical Peak, to the east of SH1. Views from the trail along Kraack Road are similar to road users and residents within Waiwhiu which include elevated views of the Dome Forest with distant visual connections across the landholding and to Wellsford. Forestry plantations along the western side of Kraack Road currently obstruct views towards the landholding and beyond, however it is acknowledged that once the forestry is felled, (when the trees are approximately 27 years of age), distant views of south-east facing parts of the landholding would be attainable, (i.e. views at least 2.4km from landholding).
- 9.100 The route within the Dome Forest follows a number of ridges as it navigates the hill range before linking into Govan Wilson Road, to the north east of the landholding. The route predominantly negotiates areas of native vegetation, avoiding areas of forestry plantations, and these vegetated hill sides only allow snapshot views across the Dome Forest through the vegetation. Views towards the landholding for these viewing audiences are of a western and northern outlook and are at a distance of at least 2.8 kilometres from the project footprint.

Site Establishment and Initial Construction Works

- 9.101 Views from locations in Waiwhiu (including those on the Te Araroa Trail in this area), are unlikely to substantially change during this period of time, as the works would be undertaken beyond the ridge of Valley 1. Some pine harvesting might be visible in the outlook however these activities would be broadly in line with that anticipated as part of

the working forestry environment. With this in mind it is considered that there would be no change associated with the project within this view.

- 9.102 Views along the Te Araroa Trail within the Dome Forest would also have elevated views of the area, although these are heavily filtered and restricted to one or two instances where the surrounding landscape is visible. Views of the landholding and its associated works at this time would primarily contain the harvesting of trees.
- 9.103 Considering the above, there will be no visual effects associated with this stage of works.

Ongoing Operation – Post site establishment to year 5

- 9.104 Viewing audiences in Waiwhiu (including residents and trail walkers), would obtain south facing views of the project, and this would mean that views of Stockpile 2 could become partially visible, particularly as forestry will have been cleared to the south of this proposed project element. The proposed fill however, would most likely remain hidden behind the intervening ridge of Valley 1.
- 9.105 It is considered that there would be a small change within the view, particularly when considered alongside the ongoing harvesting operations observable from locations within Waiwhiu. With the above in mind, it is considered that the adverse effects would be **low** for these viewing audiences.
- 9.106 From locations within the Dome Forest, the outlook would continue to be filtered due to the native vegetation screening many of the views along the side of the Te Araroa Trail. This is not to discount that views are not available, although they are largely attainable near the summits of the taller peaks. Where views are attainable, forestry harvesting will provide a different outlook to what is currently experienced, and this would result in a visual change. However, this alteration to the view is anticipated as part of the working landscape and not part of this project. Change relating to the project would principally materialise as the visible western slopes of Valley 1, and indeed its perimeter of screening vegetation now becoming established. It is not anticipated that views of the landfill will be discernible at this time.
- 9.107 It is determined that the visual change associated with the project would be **low**, recognising that although these viewing audiences have a high sensitivity, these views are transient, glimpse views and there would be limited change associated with the project within their attainable outlook.

Ongoing Operation – Years 5 to 35

- 9.108 As the project continues to operate, the landfill will become visible for the viewing audiences in Waiwhiu and the Dome Forest. Forestry operations may continue to occur outside of the project footprint and result in an ever-changing context. Notwithstanding this, planted native vegetation and screen planting will continue to establish and mature and perimeter screen planting associated with the project would filter views of much of the new landform for these viewing audiences. Taking the above into account, it is considered that the adverse visual effects for these viewing audiences would increase up to **moderate-low** as the project progresses during Phase 5 and 6 when the landfill reaches its greatest height. This is partly because it is unlikely that screen planting will fully obscure views, although it is recognised that views towards the landholding would continue to consist of the wider working forestry land uses.

Post Closure (Completed Landfill)

- 9.109 There would be limited visual change for these viewing audiences during the post closure of the project. The primary change would be the now fully established screen planting and native vegetation associated with the project. The vegetated (landfill) landform within Valley 1 will remain seen in the context of the wider landscape.
- 9.110 It is therefore considered that the level of effects for all viewing audiences would be no greater than **low** adverse after the completion of the landfill.

Summary of Visual Amenity Affects

9.111 A summary of the anticipated level of visual effects is provided in **Table 5** below.

Table 5: Summary of Visual Effects

Viewing Audience	Level of Effects (Adverse)			Post Closure
	Site Establishment	Operation - Up to Year 5	Operation – Year 5 to 35	
WELLSFORD TOWNSHIP AND ENVIRONS				
All viewing audiences (road users, recreationalists, workers, and residents)	Moderate-Low	Low	Low to Moderate*	Low
WAYBY STATION ROAD AND ENVIRONS				
All viewing audiences (road users, recreationalists, workers, and residents)	Moderate-Low	Low	Moderate-Low	Low
WAYBY VALLEY ROAD AND ENVIRONS				
All viewing audiences (road users, recreationalists, workers, and residents)	Moderate-Low	Low	Low	Very Low
VIEWS ON OR NEARBY SH1				
Wellsford Golf and Squash Club and nearby road users	Very Low	Very Low	Low	Low
Road users south of Wellsford Golf and Squash Club up to Wayby Valley Road	Low	Very Low	Low	Low
Residents adjacent to the Wellsford Golf and Squash Club	Moderate-Low	Low	Moderate-Low	Low
Residents at 1207 SH1	Low	Low	Low	Low
Residents opposite Forestry Road	No Effects	Moderate-Low	Low	Low
Road users opposite landholding entrance	Moderate-Low	Low	Very Low	Very Low
RESIDENTS ADJACENT TO SPRINGHILL FARM				
Residents adjacent to Springhill Farm	Moderate-High	Moderate	Moderate	Moderate-Low
DOME FOREST AND ENVIRONS				
Waiwhiu	No Effects	Low	Moderate-Low	Low
Te Araroa Trail	No Effects	Low	Moderate-Low	Low

* Note: **Moderate** rating only applicable to a limited area within Wellsford township

- 9.112 During site establishment and initial construction works, the greatest adverse visual effects will be on the residents adjacent to Springhill Farm. These viewing audiences would experience **moderate-high** adverse visual effects (*'more than minor'*). **Moderate-low** (*minor*) visual effects are anticipated for viewing audiences within Wellsford township and environs, Wayby Station Road and environs, Wayby Valley Road and environs, residents adjacent to the Wellsford Golf and Squash Club and road users opposite the landholding entrance.
- 9.113 Up to the fifth year of operation¹⁷, residents adjacent to Springhill Farm would have their effects reduced to a **moderate** level (*more than minor*). Residents opposite Forestry Road would have **moderate-low** adverse effects (*minor*). All other viewing audiences would have effects considered *less than minor*.
- 9.114 During operation, between year 5 and 35, **moderate** (*more than minor*) effects are anticipated for residents adjacent to Springhill Farm. **Moderate** (*more than minor*) effects are also anticipated for Wellsford viewing audiences however this is restricted to a limited area. All other viewing audiences including viewing audiences in Wellsford which attain views would have effects considered *minor*, or *less than minor* during this period of time.
- 9.115 The greatest effects during post closure would be on the residents adjacent to Springhill Farm, and these residents would have **moderate-low** adverse effects (*minor*). All other viewing audiences would have adverse effects considered to be *less than minor*.

Night Time Lighting Effects

- 9.116 Due to the hours that the landfill is intended to be operating (5am to 10pm), lighting will be required in certain locations. The project will adhere to the permitted lighting standards of the AUP. In summary the locations requiring lighting for the safe operation of the facility are:
- Site entrance.
 - Bin Exchange Area.
 - Office and staff car park (near Valley 1).
 - Landfill working face.
- 9.117 Most of the existing environment within the landholding is unlit, and with these limited light sources the night sky would not contain much sky glow. Residential properties are also located within the vicinity of the landholding and some sources of light will be attainable to viewing audiences toward the west.
- 9.118 The lighting of the project is to be minimised throughout and restricted to the safe operation of the facility. Lighting near site entrance and bin exchange area will be will be very limited and expected to be contained within the valley and enclosing ridgelines.
- 9.119 The main access road will not be lit, and lighting of the office and staff car park will be lit only to allow for the safety of staff. The working face of the landfill will need some lighting by using a portable lighting rig. This would remain hidden until the later stages of the project.
- 9.120 Mitigation measures including low level lighting, downlights, light shields and directional lighting orientated away from Wellsford will assist in reducing effects in relation to glare (observing the light source), and sky glow (ambient light spill). The lighting standards of the AUP zoning will also be adhered to. With the above in mind, it is considered that the adverse night time lighting effects as a result of the project would be **very low**.

¹⁷ Operation – “Up to year 5”

10.0 Conclusion

- 10.1 In conclusion the project is predominantly located in a working landscape that accommodates farming and forestry practices. These land uses provide an ever-changing context that the developing landfill will be seen against.
- 10.2 Areas of the landholding are recognised as being sensitive to change, and these areas are avoided as far as practicable. Landscape and visual mitigation, primarily in the form of substantial revegetation and re-establishment of these natural landscape elements are proposed.
- 10.3 Viewing audiences will be affected throughout the life of the project and the level of effect will vary as the project evolves. Visual effects on viewing audiences typically reduce after site establishment as mitigation measures such as hydroseeding and revegetation begin to establish. As the project progresses, the later phases (i.e. phases 4 to 6) may become partially visible and temporarily increase adverse visual effects. Screen planting established around the perimeter of Valley 1 will assist in obscuring portions of the visible fill. Furthermore, progressive capping and vegetation establishment across these phases will manage these effects and contribute to the integration of the project post closure.
- 10.4 The greatest level of adverse visual effects are on the three residential properties located adjacent to Springhill Farm. Moderate-high (*'more than minor'*) adverse visual effects will occur during the site establishment, reducing to moderate (*'more than minor'*) and moderate-low (*'minor'*) throughout the life of the project.
- 10.5 Many viewing audiences in Wellsford township and environs will experience no effects as the project will not be visible. Those that will attain views will experience up to moderate-low (*'minor'*) adverse visual effects during site establishment. For most, these effects will reduce to low (*'less than minor'*) throughout the life of the project, however it is acknowledged that moderate (*'more than minor'*) adverse effects will be bought upon a limited number of viewing audiences around Matheson Road. These effects would only peak in periods when uncapped fill is observable, during phases 5 and 6, and for the remainder of the time moderate-low (*'minor'*) effects will occur.
- 10.6 Overall, the outlook for the majority of viewing audiences will remain characterised by the forestry cycle occurring within this wider outlook, and it is considered that as these changes continue to occur, the project will remain observed alongside these activities.

Appendix 1: Assessment Methodology

Introduction

The Boffa Miskell Ltd landscape and visual effects assessment (LVA) process provides a framework for assessing and identifying the nature and level of likely effects that may result from a proposed development. Such effects can occur in relation to changes to physical elements, the existing character of the landscape and the experience of it. In addition, the landscape assessment method may include an iterative design development processes, which includes stakeholder involvement. The outcome of any assessment approach should seek to avoid, remedy or mitigate adverse effects (see **Figure 1**). A separate assessment is required to assess changes in natural character in coastal areas and other waterbodies.

This outline of the landscape and visual effects assessment methodology has been undertaken with reference to the **Quality Planning Landscape Guidance Note**¹⁸ and its signposts to examples of best practice, which include the **UK guidelines for landscape and visual impact assessment**¹⁹ and the **New Zealand Landscape Institute Guidelines for Landscape Assessment**²⁰.

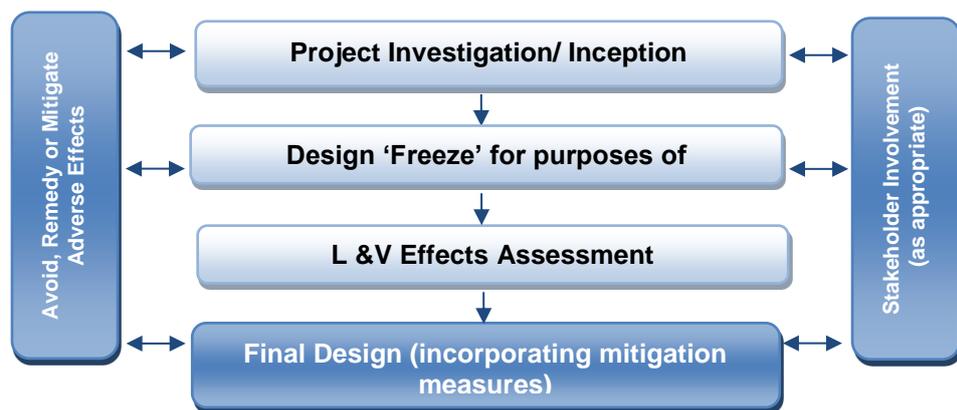


Figure 6: Design feedback loop

When undertaking a LVA, it is important that a **structured and consistent approach** is used to ensure that **findings are clear and objective**. Judgement should be based on skills and experience and be supported by explicit evidence and reasoned argument.

While landscape and visual effects assessments are closely related, they form separate procedures. The assessment of the potential effect on the landscape forms the first step in this process and is carried out as an effect on landscape elements, features and on landscape character. The assessment of visual effects considers how changes to the physical landscape affect the viewing audience. The types of effects can be summarised as follows:

Landscape effects: *Change in the physical landscape, which may affect its characteristics or qualities.*

Visual effects: *Change to views which may affect the visual amenity experienced by people.*

¹⁸ <http://www.qualityplanning.org.nz/index.php/planning-tools/land/landscape>

¹⁹ Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3)

²⁰ Best Practice Note Landscape Assessment and Sustainable Management 10.1, NZILA

The policy context, existing landscape resource and locations from which a development or change is visible, all inform the 'baseline' for landscape and visual effects assessments. To assess effects, the landscape must first be **described**, including an understanding of the **key landscape characteristics and qualities**. This process, known as landscape characterisation, is the basic tool for understanding landscape character and may involve subdividing the landscape into character areas or types. The condition of the landscape (i.e. the state of an individual area of landscape or landscape feature) should also be described together with, a judgement made on the value or importance of the potentially affected landscape.

Landscape Effects

Assessing landscape effects requires an understanding of the landscape resource and the magnitude of change which results from a proposed activity to determine the overall level of landscape effects.

Landscape Resource

Assessing the sensitivity of the landscape resource considers the key characteristics and qualities. This involves an understanding of both the ability of an area of landscape to absorb change and the value of the landscape.

Ability of an area to absorb change

This will vary upon the following factors:

- Physical elements such as topography / hydrology / soils / vegetation;
- Existing land use;
- The pattern and scale of the landscape;
- Visual enclosure / openness of views and distribution of the viewing audience;
- The zoning of the land and its associated anticipated level of development;
- The scope for mitigation, appropriate to the existing landscape.

The ability of an area of landscape to absorb change takes account of both the attributes of the receiving environment and the characteristics of the proposed development. It considers the ability of a specific type of change occurring without generating adverse effects and/or achievement of landscape planning policies and strategies.

The value of the Landscape

Landscape value derives from the importance that people and communities, including tangata whenua, attach to particular landscapes and landscape attributes. This may include the classification of Outstanding Natural Feature or Landscape (ONFL) (RMA s.6(b)) based on important biophysical, sensory/ aesthetic and associative landscape attributes, which have potential to be affected by a proposed development. A landscape can have value even if it is not recognised as being an ONFL.

Magnitude of Landscape Change

The magnitude of landscape change judges the amount of change that is likely to occur to areas of landscape, landscape features, or key landscape attributes. In undertaking this assessment, it is important that the size or scale of the change is considered within the geographical extent of the area influenced and the duration of change, including whether the change is reversible. In some situations, the loss /change or enhancement to existing landscape elements such as vegetation or earthworks should also be quantified.

When assessing the level of landscape effects, it is important to be clear about what factors have been considered when making professional judgements. This can include consideration of any benefits which result from a proposed development. **Table 1** below helps to explain this process. The tabulating of effects is only intended to inform overall judgements.

Contributing Factors		Higher	Lower
Landscape (sensitivity)	Ability to absorb change	The landscape context has limited existing landscape detractors which make it highly vulnerable to the type of change resulting from the proposed development.	The landscape context has many detractors and can easily accommodate the proposed development without undue consequences to landscape character.
	The value of the landscape	The landscape includes important biophysical, sensory and shared and recognised attributes. The landscape requires protection as a matter of national importance (ONF/L).	The landscape lacks any important biophysical, sensory or shared and recognised attributes. The landscape is of low or local importance.
Magnitude of Change	Size or scale	Total loss or addition of key features or elements. Major changes in the key characteristics of the landscape, including significant aesthetic or perceptual elements.	The majority of key features or elements are retained. Key characteristics of the landscape remain intact with limited aesthetic or perceptual change apparent.
	Geographical extent	Wider landscape scale.	Site scale, immediate setting.
	Duration and reversibility	Permanent. Long term (over 10 years).	Reversible. Short Term (0-5 years).

Table 1: Determining the level of landscape effects

Visual Effects

To assess the visual effects of a proposed development on a landscape, a visual baseline must first be defined. The visual 'baseline' forms a technical exercise which identifies the area where the development may be visible, the potential viewing audience, and the key representative public viewpoints from which visual effects are assessed.

The viewing audience comprises the individuals or groups of people occupying or using the properties, roads, footpaths and public open spaces that lie within the visual envelope or 'zone of theoretical visibility (ZTV)' of the site and proposal. Where possible, computer modelling can assist to determine the theoretical extent of visibility together with field work to confirm this. Where appropriate, key representative viewpoints should be agreed with the relevant local authority.

Zone of Theoretical Visibility

As an initial step in the visual analysis, a Zone of Theoretical Visibility (ZTV) mapping exercise was undertaken of the site in its context to determine the likely extent of visibility in the wider landscape. ZTV mapping represents the area that a development may theoretically be seen – that is, it may not actually be visible in reality due to localised screening from intervening vegetation, buildings or other structures. In addition, TV mapping does not convey the nature or magnitude of visual impacts, for example whether visibility will result in positive or negative effects and whether these will be significant

'Zone of Theoretical Visibility' (ZTV) is based on a Digital Terrain Model (DTM) overlaid on a map base. It is also known as a Zone of Visual Influence (ZVI), Visual Envelope Map (VEM) or Viewshed Map. The term ZTV is preferred for its emphasis of two key factors that are often misunderstood:

- Visibility maps represent where a development may be seen theoretically – that is, it may not actually be visible in reality, for example due to localised screening from intervening vegetation, buildings or other structures which is not represented by the DTM; and
- the maps indicate potential visibility only – that is, the areas within which there may be a line of sight. They do not convey the nature or magnitude of visual impacts, for example whether visibility will result in positive or negative effects and whether these will be significant or not.

ZTVs are calculated by computer, using any one of a number of available software packages and based upon a DTM that represents topography. The resulting ZTV is usually produced as an overlay upon a base map, representing theoretical visibility within a defined study area.

As the ZTV mapping is based entirely on 'bare ground' topographic data, it does not take into account the screening, unless LIDAR based vegetation data is used to generate the DTM. In addition, the level of reliability of the contour information will influence the accuracy of the mapping. ZTV mapping does however take into account factors relating to the curvature of the earth and light refraction. ZTV is helpful where to focus field work but it should be remembered that while ZTV is a useful assessment tool, is important to recognise its limitations.

The Sensitivity of the viewing audience

The sensitivity of the viewing audience is assessed in terms of assessing the likely response of the viewing audience to change and understanding the value attached to views.

Likely response of the viewing audience to change

Appraising the likely response of the viewing audience to change is determined by assessing the occupation or activity of people experiencing the view at particular locations and the extent to which their interest or activity may be focussed on views of the surrounding landscape. This relies on a landscape architect's judgement in respect of visual amenity and the reaction of people who may be affected by a proposal. This should also recognise that people more susceptible to change generally include: residents at home, people engaged in outdoor recreation whose attention or interest is likely to be focussed on the landscape and on particular views; visitors to heritage assets or other important visitor attractions; and communities where views contribute to the wider landscape setting.

Value attached to views

The value or importance attached to particular views may be determined with respect to its popularity or numbers of people affected or reference to planning instruments such as viewshafts or view corridors. Important viewpoints are also likely to appear in guide books or tourist maps and may include facilities provided for its enjoyment. There may also be references to this in literature or art, which also acknowledge a level of recognition and importance.

Magnitude of Visual Change

The assessment of visual effects also considers the potential magnitude of change which will result from views of a proposed development. This takes account of the size or scale of the effect, the geographical extent of views and the duration of visual change, which may distinguish between temporary (often associated with construction) and permanent effects where relevant. Preparation of any simulations of visual change to assist this process should be guided by best practice as identified by the NZILA²¹.

Visual Simulations

As part of the assessment process, visual simulations have been prepared in accordance with NZILA Best Practice Guide: Visual Simulations BPG 10.2²². This has entailed taking digital photographs from each of the identified viewpoints and recording their GPS locations. Preparation of visual simulations required the preparation of a 3D model of the proposed landform using 2 metre contour information supplied by OGNZL and LiDAR information

²¹ Best Practice Guide: Visual Simulations BPG 10.2, NZILA

²² Best Practice Guide: Visual Simulations BPG 10.2, NZILA

supplied by Auckland Council. The GPS coordinates for each viewpoint were also added to the model and using the same focal length parameters as that of the camera, an image of the 3D wire frame of the proposed landform was then generated for each viewpoint. This was then registered over the actual photograph, using known reference points to bring the two together. The surface of the proposed landform was then rendered to approximate the likely appearance of the Site.

When determining the overall level of visual effect, the nature of the viewing audience is considered together with the magnitude of change resulting from the proposed development. **Table 2** has been prepared to help guide this process:

Contributing Factors		Higher	Lower	Examples
The Viewing Audience (sensitivity)	Ability to absorb change	Views from dwellings and recreation areas where attention is typically focussed on the landscape.	Views from places of employment and other places where the focus is typically incidental to its landscape context. Views from transport corridors.	Dwellings, places of work, transport corridors, public tracks
	Value attached to views	Viewpoint is recognised by the community such as an important view shaft, identification on tourist maps or in art and literature. High visitor numbers.	Viewpoint is not typically recognised or valued by the community. Infrequent visitor numbers.	Acknowledged viewshafts, Lookouts
Magnitude of Change	Size or scale	Loss or addition of key features in the view. High degree of contrast with existing landscape elements (i.e. in terms of form scale, mass, line, height, colour and texture). Full view of the proposed development.	Most key features of views retained. Low degree of contrast with existing landscape elements (i.e. in terms of form scale, mass, line, height, colour and texture). Glimpse / no view of the proposed development.	- Higher contrast/ Lower contrast. - Open views, Partial views, Glimpse views (or filtered); No views (or obscured)
	Geographical extent	Front on views. Near distance views; Change visible across a wide area.	Oblique views. Long distance views. Small portion of change visible.	- Front or Oblique views. - Near distant, Middle distant and Long distant views
	Duration and reversibility	Permanent. Long term (over 15 years).	Transient / temporary. Short Term (0-5 years).	- Permanent (fixed), Transitory (moving)

Table 2: Determining the level of visual effects

Nature of Effects

In combination with assessing the level of effects, the landscape and visual effects assessment also considers the nature of effects in terms of whether this will be positive (beneficial) or negative (adverse) in the context within which it occurs. Neutral effects can also occur where landscape or visual change is benign.

It should also be noted that a change in a landscape does not, of itself, necessarily constitute an adverse landscape or visual effect. Landscape is dynamic and is constantly changing over time in both subtle and more dramatic transformational ways; these changes are both natural and human induced. What is important in managing landscape change is that adverse effects are avoided or sufficiently mitigated to ameliorate the effects of the change in land use. The aim is to provide a high amenity environment through appropriate design outcomes.

This assessment of the nature effects can be further guided by **Table 3** set out below:

Nature of effect	Use and Definition
Adverse (negative):	The activity would be out of scale with the landscape or at odds with the local pattern and landform which results in a reduction in landscape and / or visual amenity values
Neutral (benign):	The activity would be consistent with (or blend in with) the scale, landform and pattern of the landscape maintaining existing landscape and / or visual amenity values
Beneficial (positive):	The activity would enhance the landscape and / or visual amenity through removal or restoration of existing degraded landscape activities and / or addition of positive elements or features

Table 3: Determining the Nature of Effects

Cumulative Effects

During the scoping of an assessment, where appropriate, agreement should be reached with the relevant local authority as to the nature of cumulative effects to be assessed. This can include effects of the same type of development (e.g. wind farms) or the combined effect of all past, present and approved future development²³ of varying types, taking account of both the permitted baseline and receiving environment. Cumulative effects can also be positive, negative or benign.

Cumulative Landscape Effects

Cumulative landscape effects can include additional or combined changes in components of the landscape and changes in the overall landscape character. The extent within which cumulative landscape effects are assessed can cover the entire landscape character area within which the proposal is located, or alternatively, the zone of visual influence from which the proposal can be observed.

Cumulative Visual Effects

Cumulative visual effects can occur in combination (seen together in the same view), in succession (where the observer needs to turn their head) or sequentially (with a time lapse between instances where proposals are visible when moving through a landscape). Further visualisations may be required to indicate the change in view compared with the appearance of the project on its own.

Determining the nature and level of cumulative landscape and visual effects should adopt the same approach as the project assessment in describing both the nature of the viewing audience and magnitude of change leading to a final judgement. Mitigation may require broader consideration which may extend beyond the geographical extent of the project being assessed.

Determining the Overall Level of Effects

The landscape and visual effects assessment concludes with an overall assessment of the likely level of landscape and visual effects. This step also takes account of the nature of effects and the effectiveness of any proposed mitigation. The process can be illustrated in Figure 2:



²³ The life of the statutory planning document or unimplemented resource consents.

Figure 2: Assessment process

This step informs an overall judgement identifying what level of effects are likely to be generated as indicated in **Table 4** below. This table which can be used to guide the level of landscape and visual effects uses an adapted seven-point scale derived from NZILA's Best Practice Note.

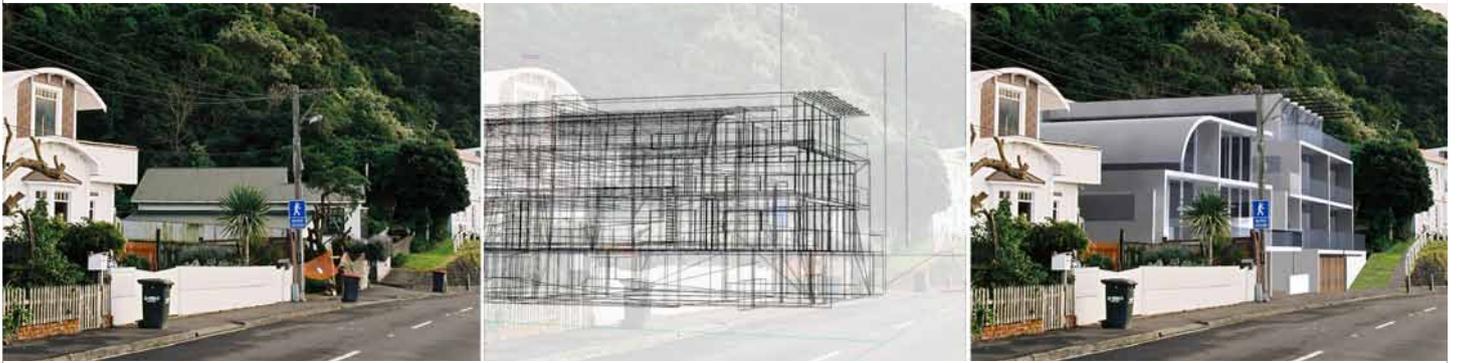
Effect Rating	Use and Definition
Very High:	Total loss of key elements / features / characteristics, i.e. amounts to a complete change of landscape character in views.
High:	Major modification or loss of most key elements / features / characteristics, i.e. little of the pre-development landscape character remains and a major change in views. <u>Concise Oxford English Dictionary Definition</u> <i>High: adjective- Great in amount, value, size, or intensity.</i>
Moderate- High:	Modifications of several key elements / features / characteristics of the baseline, i.e. the pre-development landscape character remains evident but materially changed and prominent in views.
Moderate:	Partial loss of or modification to key elements / features / characteristics of the baseline, i.e. new elements may be prominent in views but not necessarily uncharacteristic within the receiving landscape. <u>Concise Oxford English Dictionary Definition</u> <i>Moderate: adjective- average in amount, intensity, quality or degree</i>
Moderate - Low:	Minor loss of or modification to one or more key elements / features / characteristics, i.e. new elements are not prominent within views or uncharacteristic within the receiving landscape.
Low:	Little material loss of or modification to key elements / features / characteristics. i.e. modification or change is not uncharacteristic or prominent within views and absorbed within the receiving landscape. <u>Concise Oxford English Dictionary Definition</u> <i>Low: adjective- 1. Below average in amount, extent, or intensity.</i>
Very Low:	Negligible loss of or modification to key elements/ features/ characteristics of the baseline, i.e. approximating a 'no change' situation and a negligible change in views.

Table 4: Determining the overall level of landscape and visual effects

Appendix 2: NZILA Visual Simulation Guidelines

BEST PRACTICE GUIDE

VISUAL SIMULATIONS BPG 10.2



Members Documentation



NEW ZEALAND INSTITUTE
OF LANDSCAPE ARCHITECTS

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Figure Acknowledgements

Boffa Miskell Ltd - Cover, Figures 1-4, 8, 10-11, 13

Truescape Ltd - Figures 5-7, 9, 12

Scottish Natural Heritage - Figure 14

VIEWPOINT 1



Existing View



Simulated View



As Built View

VIEWPOINT 2



Existing View



Simulated View



As Built View

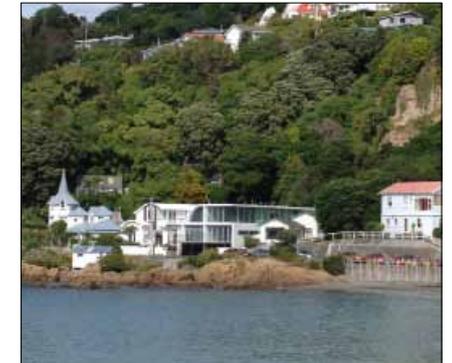
VIEWPOINT 3



Existing View



Simulated View



As Built View

Visual Simulations can accurately portray in a realistic manner and in a realistic context, a proposed change or modification in the landscape. The illustrations above from three viewpoints show the existing view, the simulated view and the constructed outcome.

The application and use of visual simulations of this nature for consultation, assessment, design development and for assistance in RMA decision making processes can be extremely helpful to all parties.

The purpose of this guideline is to promote best practice standards and procedures in the preparation and use of visual simulations by the landscape profession.

1 Background

- 1.1 In August 2008, the New Zealand Institute of Landscape Architects (NZILA) Education Foundation hosted a Landscape Planning Initiative (LPI) in Christchurch. The purpose of the initiative, which was attended by over fifty practising landscape planners and landscape architects, was to discuss a range of Resource Management Act (RMA) matters relative to the preparation and presentation of expert landscape evidence at Council Hearings and Environment Court fixtures.
- 1.2 The major outcome from the Landscape Planning Initiative was the directive that a series of best practice notes be prepared, and that these should be aimed at landscape practitioners and decision makers involved in the planning, design and management of our diverse and distinctive landscapes. This technical guide for photomontage based visual simulations is the first in a series which will be progressively published by the NZILA.
- 1.3 Judges and Commissioners of the NZ Environment Court were invited to the opening session of the Christchurch LPI, and a number attended and offered observations from their experience, about issues surrounding the use of visual simulations in hearings before the Court. Following consideration of the draft guidelines the Court noted that, “It must be remembered by parties, counsel and witnesses that the document cannot receive formal approval from the Court, and also that every case proceeds on its own merits, such that any given portion of the Guideline may or may not be found relevant or accurate in any situation in which reference is made to it”.
- 1.4 The NZILA Education Foundation also acknowledges the Visual Representation of Windfarms, Good Practice Guidance document (29 March 2006), prepared for Scottish Natural Heritage, The Scottish Renewables Forum and the Scottish Society of Directors; and Advice Note 01/09 which deals with the use of photography and photomontages in landscape and visual assessments, published by the British Landscape Institute. These documents clarify many issues relative to photography and the preparation and presentation of visual simulations.
- 1.5 While the visual simulation technique referred to in this practice note uses a photomontage output, the technique involves considerably more than what is available in terms of the sometimes used “Photoshop” technique. The simulation approach outlined in this document is based on and reliant upon accurate 3D models and methodologies which ensure accurate representations on a photographic image.

2 Executive Summary

Visual Simulations

- The primary purpose of a visual simulation is to accurately portray, in as realistic manner and context as possible, a proposed activity, modification or change in the viewed landscape.
- Visual simulations are not “real life views” – they are, however, very useful tools to assist in the assessment and decision making processes whereby better informed and more transparent judgments on appearance and effects can be made.
- Visual simulations illustrate a two dimensional view of a proposed activity from a particular viewpoint as depicted in a photograph – not as it would appear as a three dimensional image as seen in the field with the human eye.

Viewpoints

- Photographic viewpoints must be carefully selected with respect to their representativeness and their significance.
- The number of viewpoints will vary depending on the nature and scale of the project and the number of locations required to provide a representative range of views.
- All viewpoints should be clearly identified and located on appropriate maps or plans with accompanying relevant viewpoint data.

Visibility Mapping

- Where digital ZTV (Zone of Theoretical Visibility) maps are used to assist in the determining the indicative pattern of visibility and/or the selection of simulation viewpoints, the following limitations must be clearly acknowledged –
 - i). Generally ZTV maps are based on bare ground lines of sight information – they do not take into account the screening effects of intervening vegetation or structures in the landscape.
 - ii). The accuracy of ZTV maps is limited by a map's contour interval. For example, the use of 20m contours that are standard on 1:50,000 scale topographic maps can, where they are the only source of height information, produce inaccurate results.
 - iii). ZTV maps do not show how a project will appear nor do they show the magnitude of visual effects – they simply show the indicative area and extent of potential visibility.

Viewpoint Photography

- Photography for use and presentation in visual simulations requires the use of appropriate photographic equipment, knowledge of the limitations of the technology and technical skills.
- While this guideline does not advocate a particular focal length lens or camera format for use in all situations, a 50mm focal length lens (or its digital equivalent) continues to be widely used in the preparation of visual simulations.
- When panorama views are used, the extent of both the completed panorama and of the individual frames that make up the panorama should be identified.
- Generally panoramas should not exceed the 124 degree horizontal primary field of view or the 55 degree vertical primary field of view.
- All relevant photographic parameters used to create a visual simulation should be presented in order to illustrate transparency, and allow the rationale to be open to scrutiny.

Preparation of Visual Simulations

- The steps involved in the preparation of a visual simulation, the software used, and other relevant date, limitations or assumptions made must be clearly identified and documented.

Presentation of Visual Simulations

- Simulations should be capable of being enlarged, reproduced and printed in a clear and readily understood manner.
- Information accompanying simulations should include all relevant viewpoint information, camera and photographic data, and all other information to enable the reader/viewer to understand the basis and parameters used in the preparation of the simulations.
- The reading distance, at which the photograph or simulation correctly reconstructs the perspective seen from the viewpoint location at which the photograph was taken, should be clearly stated on each image.
- For most landscape photography, an A4 or A3 size photographic image will produce an illustration that can be used by most people to view a particular scene in scale with its setting. For example, a photograph taken with a 50mm lens printed at a size of 360mm x 240mm (approximately A3 size) should be held at a distance of 500mm from the eye in order to replicate the scale of the image with the real scene. If a 28mm lens were used with the same sized printed image, the reading distance would be 280mm, and with a 100mm lens the reading distance would be 1000mm.

3 Visual Simulations

- 3.1 In recent years, techniques that illustrate change in the appearance of the landscape, including the addition of new activities or structures, have become increasingly reliant upon the use of computer based modelling technology (see Figure 1).
- 3.2 In New Zealand, these techniques generally involve photography based representations, generally referred to as visual simulations. While the common aim of these representations is to accurately and realistically illustrate the general appearance and context of modifications and/or changes in the landscape, visual simulations are not, and indeed can not be “real life views”. Accordingly, visual simulations do not in themselves provide answers – they are simply very useful tools to assist in the assessment and decision making processes whereby better informed and more transparent judgements on effects can be made.

FIGURE 1



Existing View



Simulated View



Constructed View

- 3.3** The primary purpose of a visual simulation is to accurately portray, in as realistic a manner and context as possible, the proposed activity, modification or change. While in the past landscape assessment and landscape design studies have been aided by hand drawn sketches, diagrams and models, these illustrative techniques, along with the developing computer animation and video montage techniques, are not included within the scope of this particular guideline.
- 3.4** The visual simulation practice note has been prepared specifically for viewpoint based visual simulations where representation, accuracy and photographic realism (albeit with some limitations) are the prime objective.
- 3.5** While visual simulations can not replicate the “real experience” of being within the landscape, the accuracy of what is depicted, in terms of its relative position, elevation, scale and general appearance in the context of its landscape setting, can be portrayed in a manner that utilises the highest and most appropriate technical methodologies, specifications and skills.
- 3.6** Accordingly, the aim of the Best Practice Note for photomontage based Visual Simulations is –
To promote and encourage best practice standards and procedures for the production of photomontage based visual simulations, and to ensure the methods and techniques used in their preparation and presentation are technically accurate and credible.
- 3.7** The scope of this practice note includes the following -
- The selection of representative viewpoints
 - Viewpoint photography
 - The preparation of photomontage based visual simulations
 - The presentation of photomontage based visual simulations

4 Viewpoints

- 4.1** Viewpoints are locations selected as being those places from where a proposed activity or development may be visible and is likely to result in noticeable effects on the landscape, the view, and potentially the people who experience that view.

Viewpoint Selection

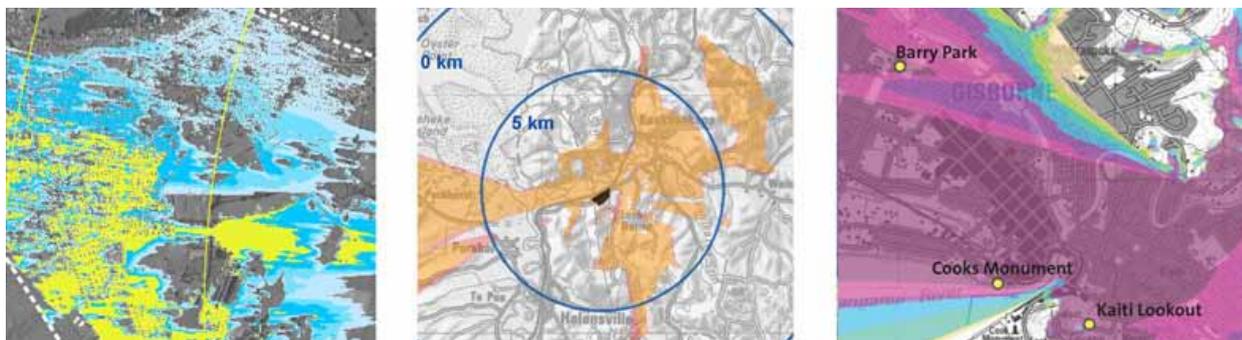
- 4.2** The selection of viewpoints must be carefully considered with respect to their representativeness and their importance, for example, settlements, major public roads, and recreational and culturally significant areas. These locations can be supplemented by other viewpoint locations established in consultation with residents, community, special interest organisations and local councils.
- 4.3** The number of viewpoints will vary depending on the nature and scale of the project and the number of locations required to provide a representative range of views. All viewpoints should be clearly identified and their location shown on detailed viewpoint maps which illustrate the specific position, and orientation of the viewpoint, and the extent of the view relative to the proposed project. Viewpoint mapping may include illustration of the extent of visibility, along with other relevant and appropriate viewpoint and viewing data, such as the distance (or a range of distances) to an object or group of objects.

- 4.4** It is essential that all viewpoint information and conditions be recorded and made available in order that others may locate and visit the same sites for viewing and assessment purposes.
- 4.5** While the potential visibility and selection of viewpoints on some projects may be quite apparent, there are other projects where the extent and pattern of visibility and the selection of viewpoints can be difficult to determine without the aid of project based visibility maps.

Visibility Mapping

- 4.6** A technique using readily available digital terrain data is often used to establish Zones of Theoretical Visibility (ZTV)¹ maps. (see Figure 2) These maps are usually prepared as an overlay on a suitable base map of the study area, incorporating the potential area likely to be affected by the proposed development. ZTV maps are also a useful guide to the selection of possible simulation viewpoints. Depending on the nature and scale of the proposed development relative to its landscape setting characteristics, the area to be mapped can be relatively confined or quite expansive.

FIGURE 2 - ZTV Mapping



¹ Visibility mapping is sometimes referred to as Intervisibility Mapping or maps showing Zones of Visual Influence (ZVI).

- 4.7** When using ZTV maps it is important to explicitly note the purpose and limitations of ZTV mapping in general, and with particular reference to the project at hand. In particular the following should be noted –
- (i) ZTV maps indicate areas from where an activity or project may be visible within a defined study area – they do not and can not show how a project will appear, nor do they indicate the nature or magnitude of visual effects.
 - (ii) The accuracy of ZTV maps is limited by a map's contour interval. For example, the use of 20m contours that are standard on 1:50,000 scale topographic maps can, where they are the only source of height information, produce inaccurate results.
 - (iii) ZTV maps are based on lines of sight and as they are generated from “bare ground” topographic information - they do not take into account the screening effects of intervening vegetation and/or structures in the landscape. Laser based aerial surveys are now becoming available that can be used to obtain the height to tops of trees and buildings, thereby enabling greater levels of detail and accuracy to be achieved.
- 4.8** All input material including contour and elevation data, viewing height and project specifications need to be clearly identified and documented. The computer software and its limitations also need to be identified, along with confirmation as to whether the software incorporates curvature and atmospheric refraction calculations and other visibility relevant attributes or constraints.

5 Viewpoint Photography

- 5.1 Photographs are important visualisations, not only in their own right, but also as a component of other visualisations such as photomontages. Visual simulations, being illustrations that aim to represent an observer's view of a proposed development, combine photography, survey point data, and wire frame and digital project imagery to create a single photomontage (see Figure 3).

FIGURE 3



- 5.2 Photographs are two dimensional images and can not replicate a three dimensional image or what a person would actually see and experience from any particular viewpoint. Light and atmospheric conditions as well as the time of day will influence the photography, and in particular the clarity of objects within the photograph (see Figure 4).

FIGURE 4

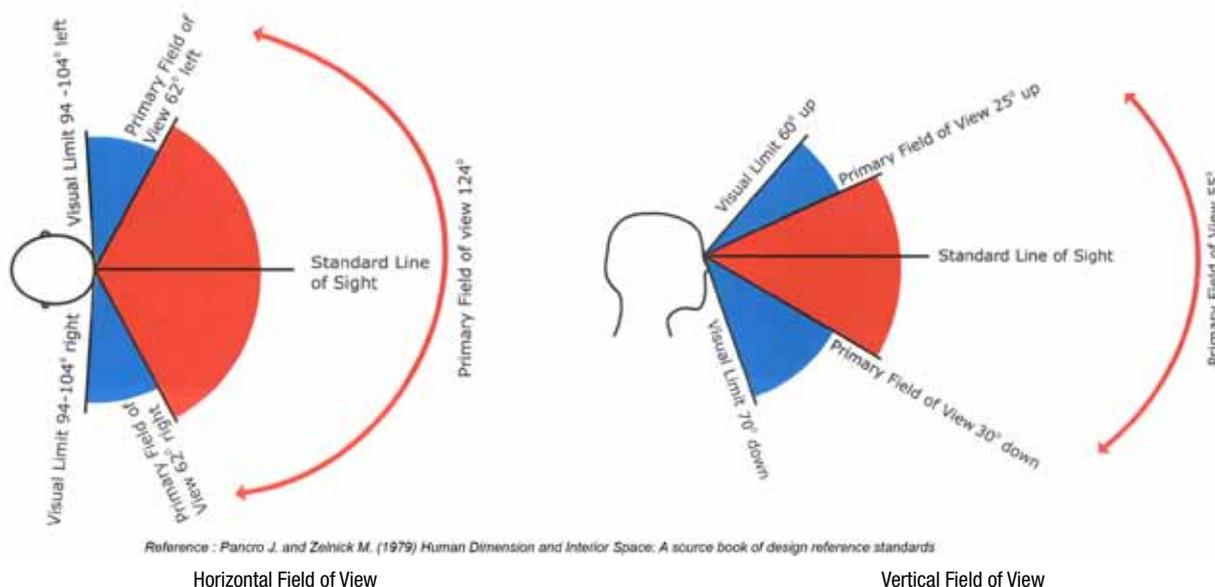


- 5.3 Notwithstanding this, visual simulations are important and useful tools that enable an activity or development to be represented, viewed and assessed from each viewpoint in a manner that would otherwise not be possible. Visual simulations are used to illustrate the likely view of a proposed development from a particular viewpoint, as would be seen within a photograph – not as it would appear to the human eye in the field.
- 5.4 Photography for use and presentation in visual simulations necessitates the use of appropriate photographic equipment, knowledge of the limitations of the technology, and skill. While this guideline does not specifically address photographic technique or how to take better photographs, it does cover some of the more technical issues and considerations relative to photography and the preparation and presentation of visual simulations.

Human Field of View

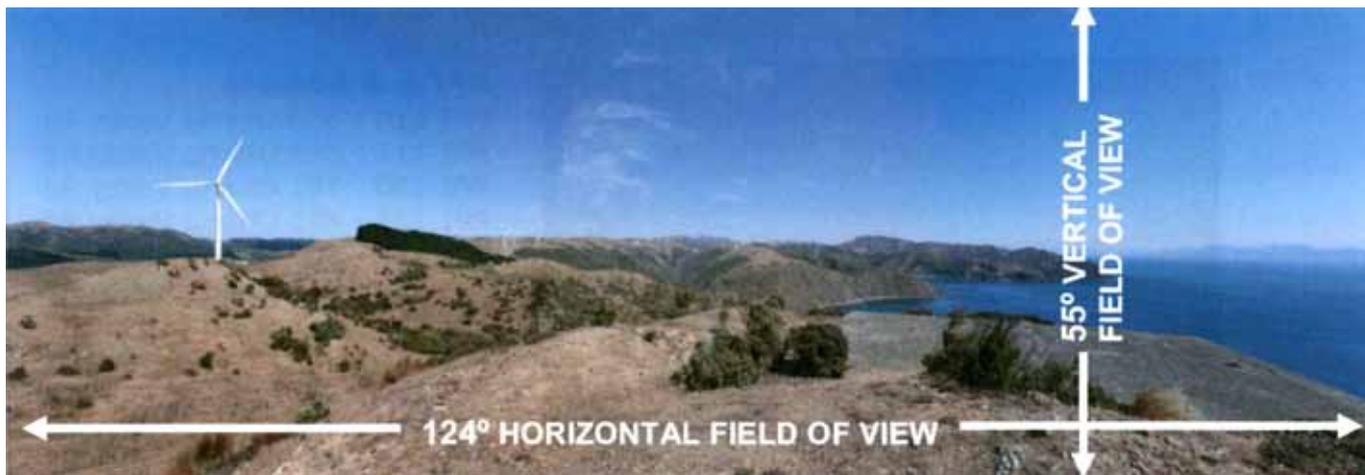
5.5 The term field of view describes the height and width of a view, or an image of a view. In terms of the primary human field of view, it is generally accepted that this is in the order of 124° horizontal and 55° vertical. Figure 5 graphically illustrates the primary human field of view relative to the field of view limits. And while the overall human field of view is around 200° , only a very small central area, the foveal view, will be seen in detail ($6-10^\circ$). Therefore, a viewer must move their eye and head around in order to capture the full view. For this reason it is difficult to directly link and/or confine limits to photographic and simulated views. While a viewer may move their eyes and head around a field of view, a central point of focus can be identified.

FIGURE 5



5.6 As viewers typically direct their attention over different widths of view, the size of the photograph required to represent a particular view may vary for different projects and viewpoints, depending on the specific characteristics of the view and the extent of the proposed activity or modification that needs to be included. In some instances a single frame photograph may capture all that is required, while in other instances it may be necessary to use a series of frames joined together to form a panoramic image (see Figure 6 overleaf). The difference in geometry between a single frame and a panorama may not be apparent, so photographs should be clearly identified as being either a single frame or a panorama. However, it is generally accepted that the horizontal field of view is 124° , and it is recommended that this angle of view not be exceeded, but rather a separate simulation that encompasses the area beyond the 124° be generated.

FIGURE 6



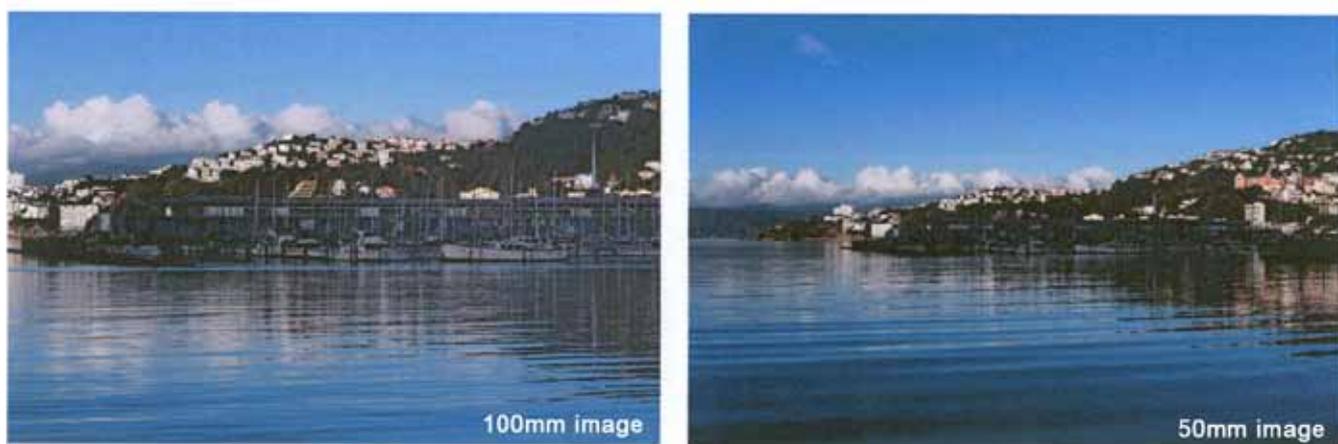
Field of View

5.7 While panoramic cameras are available, most panoramas are produced using conventional single frame photography and then digitally splicing the individual images together to form a panoramic view. A panorama manually spliced together from conventional planar photographs and viewed on a flat surface does not result in a true panorama, as it does not form a true cylindrical or rectilinear representation.. However, appropriate image editing software should have the ability to join each individual frame by applying rigorous mathematical transformations.

Lens Focal Length

5.8 The printed size of an image is independent of the focal length of the camera lens. Focal length does not alter the perspective of the image. The main difference that various focal lengths make is to change the extent of the image captured on the film or the digital sensor.

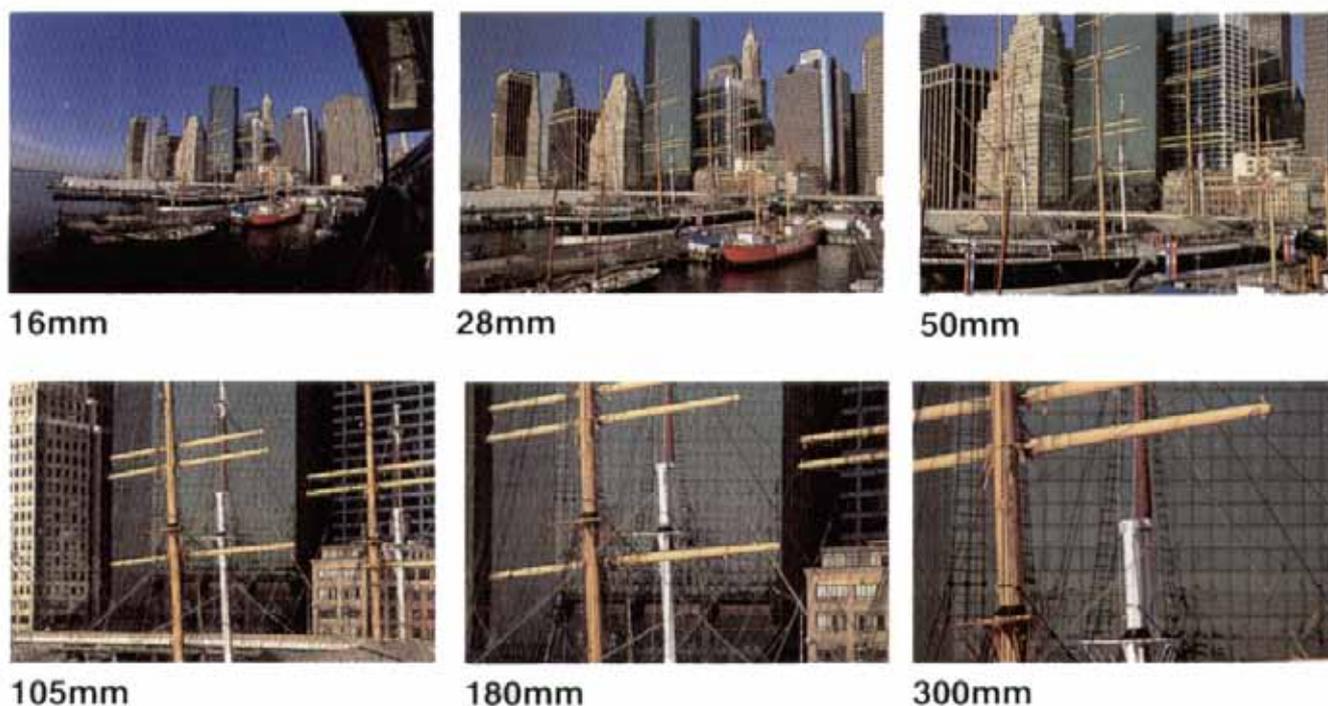
FIGURE 7



100mm Focal Length vs. 50mm Focal Length

- 5.9** Today good lenses should be relatively free of distortion and other defects. The image taken with a 100mm lens will be the same as the centre portion of that taken with a 50mm lens and enlarged to fill the whole frame (see Figure 7 on previous page). The printed size of an image is therefore independent of the focal length. If an image is defined in terms of its horizontal field of view and its correct viewing distance, then these parameters identify the printed size of the image for optimum viewing.
- 5.10** The larger image scale obtained by using a longer focal length lens is accompanied by a correspondingly smaller field of view in the image – Figure 8 illustrates this. Wide angle lenses of 28mm focal length or less are prone to distortion around the image margins and should therefore be used with caution.

FIGURE 8



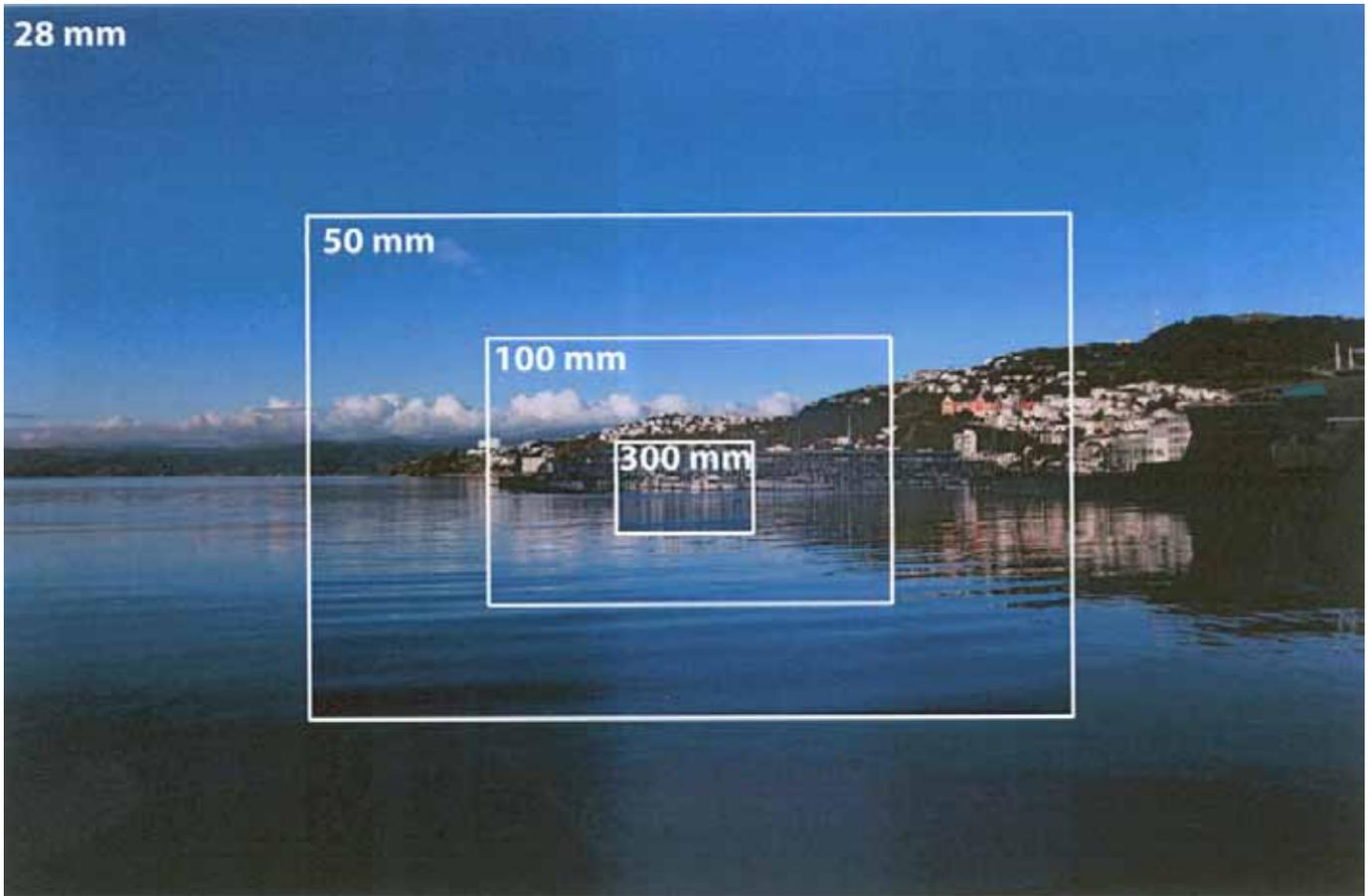
Focal Length vs. Field of View

Viewpoint Photography Summary

- Camera lenses of different focal lengths create images with different fields of view. None of these fields of view are the same as the human field of view. A camera lens does not encompass the same horizontal and vertical “degrees of arc” that is captured by human binocular vision. This is why a picture taken with a “non-human” receptor such as a camera does not represent what we actually see.
- To understand how illusions are created by lens size, one must understand depth of field, and how “depth of field” and “field of view” are related. As the millimetre specification (or focal length) of a lens is increased, it incorporates less field of view – some of the view to the left and right, and above and below, is cropped out. The view is not only less wide, it is also less deep.

- As the field of view is decreased, the amount of visible foreground is reduced in the image, whilst leaving the vanishing point of distant centre unaltered. It is this truncation of depth of field, which causes far objects in images to appear nearer to other physically closer objects in the scene. Figure 9 below shows the combined view when comparing 28mm, 50mm, 100mm and 300mm lenses.

FIGURE 9



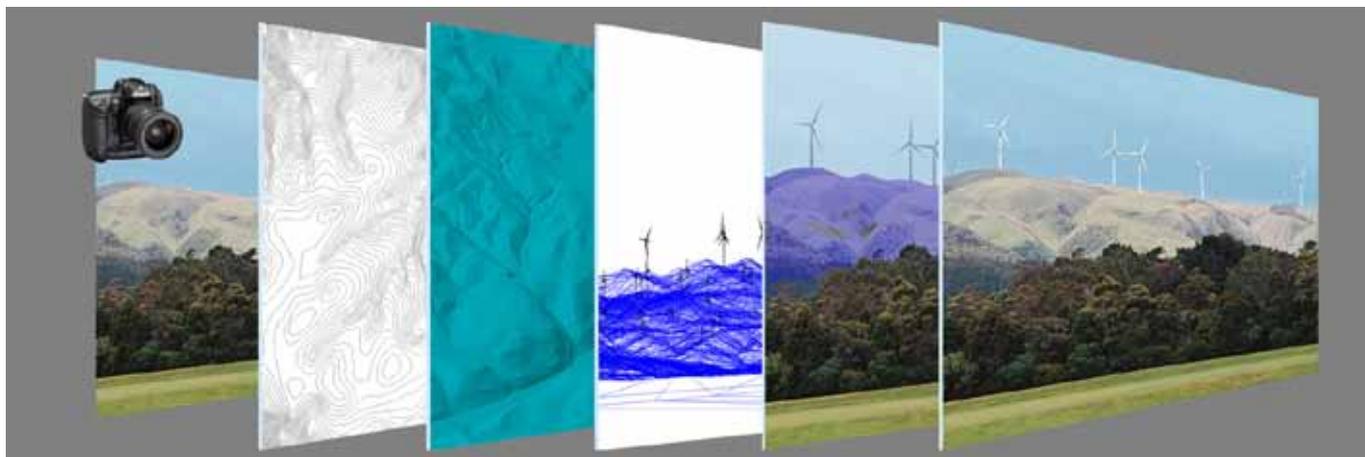
Focal Length and Depth of Field

- The field of view of a 50mm lens is contained within the field of view of a 28mm lens because a 28mm lens has a greater field of view than a 50mm lens. The 28mm image has a correspondingly greater depth of field because it incorporates more foreground image. Photographs only represent a part of the primary human field of vision. However, photographs taken using a 28mm lens show a far greater portion of the primary human field of vision than a 50mm lens.

6 Preparation of Visual Simulations

- 6.1** Visual simulations are accurate representations built up from detailed contour and other data relative to the change or activity being proposed. The layout, position, scale, appearance and orientation can be accurately modelled for specific sites and localities, and depicted as a photographic montage. While variations in light and atmospheric conditions can influence the appearance and visibility of elements within the images, the simulation technique does provide an accurate representation of location, scale and general appearance, even though there may be variations in light and atmospheric conditions at various times of the day, differing seasons and under varying weather conditions.
- 6.2** The preparation of photomontage based visual simulations generally involves the following steps –
- The selection of a range of representative viewpoint locations from which photographs will be taken. Each camera viewpoint needs to be clearly identified and recorded in terms of its coordinates and elevation. In addition, appropriate reference points within the field of view also need to be identified, fixed and recorded. The SLR camera used to take the photographs should be capable of producing photographs at a high resolution and clarity.
 - A 3D digital terrain model of the site and its wider environs is then created using appropriate 3D CAD software.
 - A 3D computer model of the proposed activity or modification is then constructed and positioned within the 3D terrain model.
 - Coinciding with the photographs taken in Step (i), the camera viewpoints are then registered within the digital terrain model using the survey fixed reference points and translated into the 3D wireframe computer model.
 - The 3D wireframe model is then superimposed over the photograph, utilising the known survey reference points and terrain features in order to register the two together.
 - A fully rendered photo composite image is then produced.

FIGURE 10



From Photograph to Visual Simulation

- 6.3** As well as accurately placing the rendered image into the photograph, specialist software can replicate the sun and shadow effects as they were at the time the original photograph was taken.

7 Presentation of Visual Simulations

7.1 The factors that influence the manner in which photomontage based visual simulations are presented include:

- What is required to be simulated
- How and by whom the information will be used
- How the information is to be distributed
- Where the material will be used.

7.2 While the needs of the expert assessors require a high level of accuracy and clarity, the quality of the presentation needs to be sufficient to enable an informed assessment to be made. Notwithstanding this, the visual simulations will inevitably be used at public meetings, for consultation, and as an important component of any consent application documentation, in particular the Assessment of Environmental Effects (AEE). Accordingly, the simulations need to be capable of being enlarged, reproduced and printed in a clear and readily understood manner. Given the limitations of website and PowerPoint presentations, copies at a meaningful scale and image size, showing sufficient detail, need to be provided. Printing should be high quality paper.

7.3 Information accompanying simulations should include all relevant viewpoint information, camera and photographic data, and all other information to enable the reader/viewer to understand the basis and parameters used in the preparation and viewing of the simulations. Information of this nature should be shown on each simulation, particularly that information that assists in interpreting the visualisation. Other and more generic material can be included within the written assessment documentation.

Paper and Printing

7.4 Given the range of different printers and paper types available, to obtain the best results advice should be sought from specialist providers. Generally glossy paper, similar to photographic paper tends to produce the best images. If colour laser printing is used, a smooth white copy paper of 90 to 100gm weight will produce good copies.

7.5 In the reproduction of printed images (either colour or black and white), all reasonable steps should be taken to ensure copies are of a high quality, particularly when photocopied. Where photocopies (rather than original copies) are produced, this should be noted on the image.

Image Reading Distance

7.6 The reading distance is the distance at which the photograph or simulation correctly reconstructs the perspective seen from the viewpoint location from which the photograph was taken. Thus, with a photograph printed onto a transparent sheet, it would be possible to go to that viewpoint location and look through the image at the actual scene. Clearly if the photograph is held too close to the eye, the elements in the image will be too large. If, on the other hand, the image is held too far away, the elements will appear too small (see Figure 11 overleaf).

FIGURE 11



Image Reading Distance

- 7.7** A comfortable reading distance from where the viewer can alternate their view between the existing landscape and the simulation is 400-500mm. At shorter reading distances (300mm or less) the viewer can only focus on the simulation in front of them, or the existing view – not both at once. For most single frame landscape photography, an A4 or A3 sized photographic image will produce an illustration that can be used by most people to view a particular scene or simulation (in part or in full) in scale with its true setting.
- 7.8** For example, a 50mm focal length lens using 35mm film would produce a 36x24mm image that would need to be viewed approximately 50mm from the eye. A simple scaling up of the image dimensions by a factor of 10 would result in an image 360x240mm and with a correct reading distance of 500mm. In other words, if a photograph is taken with a 50mm lens on a 35mm camera and the image is printed at a size of 360mmx240mm, standing at the point from which the photograph was taken, it will be possible to hold up the image at a distance of 500mm from the eye and see the photographic image line up with the real scene. Similarly a 180x120mm print will line up with the scene when held 250mm from the eye, however, for some people this will be too close to focus comfortably. Alternatively a 720x480mm image held 1000mm from the eye is further than the length of one's arms and therefore creates difficulties.

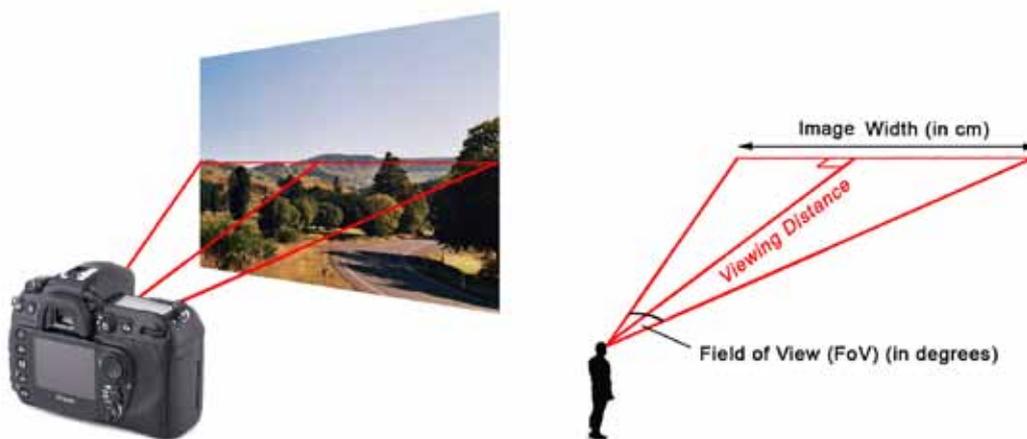
FIGURE 12



Reading Distance vs. Printed Size

7.9 The example noted above is based on a 50mm focal length lens. Where a 100mm lens is used, the field of view would be reduced. Likewise where a 28mm lens is used, the field of view would be increased. Figure 9 illustrates the change in the field of view with differing focal lengths. In the case of the 100mm lens, the reading distance of a 360mm wide image (albeit with a reduced field of view) would be approximately 1000mm. With a 28mm lens, the reading distance would be approximately 280mm.

FIGURE 13



Geometry of Image Reading Distance

7.10 The formula for calculating the correct reading distance is:

$$\text{Reading Distance} = \frac{\text{Image Width} \div 2}{\text{Tangent (FoV} \div 2)}$$

7.11 The following table for single frame landscape photography shows the calculated reading distances for A4, A3 and A2 paper sizes:

LENS	HORIZ FoV ¹	PAPER SIZE	ACTUAL IMAGE SIZE ²	READING DISTANCE ³
28mm	65°	A4	277mm W x 185mm H	215mm
		A3	400mm W x 267mm H	315mm
		A2	574mm W x 383mm H	450mm
50mm	40°	A4	277mm W x 185mm H	380mm
		A3	400mm W x 267mm H	550mm
		A2	574mm W x 383mm H	790mm
70mm	29°	A4	277mm W x 185mm H	535mm
		A3	400mm W x 267mm H	775mm
		A2	574mm W x 383mm H	1110mm
100mm	20°	A4	277mm W x 185mm H	785mm
		A3	400mm W x 267mm H	1135mm
		A2	574mm W x 383mm H	1625mm
300mm	6°50'	A4	277mm W x 185mm H	2320mm
		A3	400mm W x 267mm H	3350mm
		A2	574mm W x 383mm H	4805mm

¹ Horiz FoV = Horizontal Field of View of lens

² Actual Image Size allows for a 10mm margin on either side of the standard 'A' series paper width (W).

³ Reading Distances have been rounded off

Viewing a Panorama

7.12 The ideal method of viewing a cylindrical panorama is with the image presented in a curved format, viewed at the correct radius from the centre of the curve (distance D in Figure 14A). If mounted on a flat surface, it should ideally be viewed by one repositioning along it's length, maintaining distance D as one moves.

7.13 Where a planar or flat panorama is viewed, one must look directly at the centre of the image without moving one's head, and rely on peripheral vision to see the extremities of the image. Movement of the head to view the extremities of the panorama will result in a viewing distance that is larger than the optimum distance of D - shown as distance E in Figure 14B.

FIGURE 14A

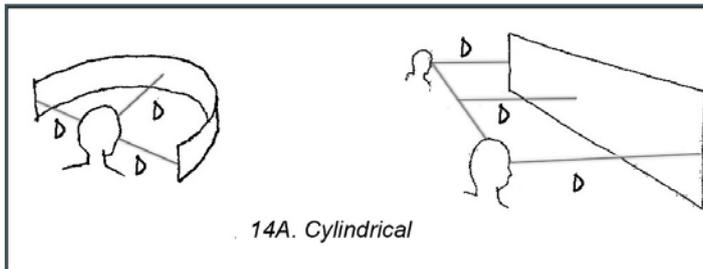
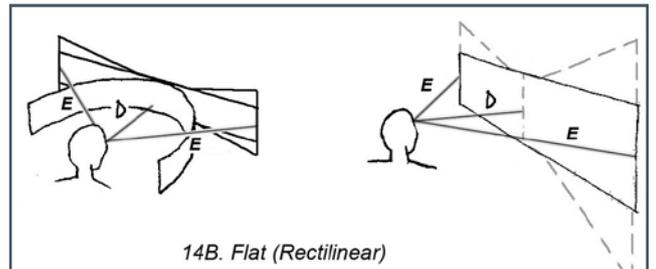


FIGURE 14B



Geometry of Panoramas

8 Summary of General Principles

8.1 In supporting the use of visual simulations as an effective and useful assessment and communication tool, the NZILA recommend, that when using this form of representation, photomontage based visual simulations must:

- be as accurate as possible in order to assist in the making of well informed and balanced judgments;
- be based on transparent, structured and replicable procedures that enable others to test and confirm the accuracy and credibility of the simulations;
- use techniques and explanations that best represent the project or scheme in its true environmental context in a fair and reasonable manner;
- be clear in its communication and be easily understood by non technical viewers.

